terra firma
Geotechnical & Geoenvironmental Specialists
www.terrafirmawales.co.uk

Our Ref: 12032

Your Ref:

Contact: Ruth Howells

16th July 2024

Equans
Equinox North
Ground Floor
Great Park road
Almondsbury
Bristol
BS32 4QL

For the attn. of Mark Davies

Dear Mark

23/1134 DECISION NOTICE: LAND TO SOUTH OF GLAN USK PRIMARY SCHOOL HERBERT ROAD, NEWPORT

I write in response to the requirement to fully satisfy Condition 16 (Remediation Verification) of Application 18/0293.

Condition 16: Prior to occupation of any part of the approved development, a verification report demonstrating completion of the works set out in the remediation strategy submitted under discharge of condition approval 17/0082 (or any other strategy that may be subsequently agreed) and the effectiveness of the remediation for that part of the site shall be submitted to and approved, in writing, by the Local Planning Authority. The report shall include results of sampling and monitoring carried out in accordance with the approved verification plan to demonstrate that the site remediation criteria have been met. It shall also include any plan (a "long-term monitoring and maintenance plan") for longer-term monitoring of pollutant linkages, maintenance and arrangements for contingency action, as identified in the verification plan, and for the reporting of this to the Local Planning Authority.

Reason: In order to demonstrate that the remediation criteria relating to controlled waters and human health have been met. In order to (if necessary) secure longer-term monitoring of groundwater quality. This will ensure that there are no longer remaining unacceptable risks to controlled waters or human health following remediation of the site.

Newport Council planners have refused full discharge of the condition, commenting 'The submitted information does not address the controlled waters element of the condition and it is not appropriate to split out the human health and controlled waters elements of the condition given the decontamination effort was the same for both elements of the condition; that is Human Health and Controlled Waters were to be addressed globally under a single decontamination process. No evidence has been provided to show the risk to controlled waters

had been adequately addressed contrary to Policy GP7 (Environmental Protection) of the adopted Newport Local Development Plan 2011-2026.'

Permission 18/0293 relates to the development of 195No new houses, covered under Phase 2 and Phase 3 of the Herbert Road Development.

Phase 2 comprises Plots 1-46, 56-119.
Phase 3 comprises Plots 47 & 55, 120-195.

TFW Group Limited has been involved with the site for many years and confirm there are no remaining risks to controlled waters. The risks have been assessed at different stages of the development, including works covered under different planning conditions previously.

I will summarise in the following sections the works carried out that confirmed no risk to controlled waters.

For reference, the table below summarises the planning history of the site.

Application ref.	Description	Decision
20/0875	PARTIAL DISCHARGE OF CONDITION 12 (DETAILS OF GLAZING AND VENTILATION) AND 16 (REMEDIATION VERIFICATION) IN RELATION TO PLOTS 39-46 AND 56-75 OF PLANNING PERMISSION 18/0293 FOR THE DEVELOPMENT OF 195NO. RESIDENTIAL UNITS, INTERNAL ROAD NETWORKS, PARKING, LANDSCAPING AND ASSOCIATED WORKS AFFECTING PUBLIC RIGHT OF WAY 407/1	Approved 01/02/21
21/0048	PARTIAL DISCHARGE OF CONDITION 16 (REMEDIATION VERIFICATION) OF PLANNING PERMISSION 18/0293 FOR DEVELOPMENT OF 195NO. RESIDENTIAL UNITS, INTERNAL ROAD NETWORKS, PARKING, LANDSCAPING AND ASSOCIATED WORKS AFFECTING PUBLIC RIGHT OF WAY 407/1 This was an updated remediation strategy.	Approved 08/05/21
21/0196	PARTIAL DISCHARGE OF CONDITION 02 (IMPORTED MATERIALS) IN RELATION TO PHASE 2 PLOTS 1-46 AND 56-99, CONDITION 12 (DETAILS OF GLAZING AND VENTILATION) IN RELATION TO PHASE 3 AND CONDITION 16 (REMEDIATION VERIFICATION) IN RELATION TO PHASE 2 PLOTS 1-38 OF PLANNING PERMISSION 18/0293 FOR DEVELOPMENT OF 195NO. RESIDENTIAL UNITS, INTERNAL ROAD NETWORKS, PARKING, LANDSCAPING AND ASSOCIATED WORKS AFFECTING PUBLIC RIGHT OF WAY 407/1	Approved 17/06/21
21/0570	PARTIAL DISCHARGE OF CONDITIONS 2 (IMPORTED MATERIALS TO RAISE THE SITE) AND 16 (REMEDIATION VERIFICATION) (PLOTS 76-99 & 100-119) OF PLANNING PERMISSION 18/0293 FOR THE DEVELOPMENT OF 195 RESIDENTIAL UNITS, INTERNAL ROAD NETWORKS, PARKING, LANDSCAPING AND ASSOCIATED WORKS AFFECTING PUBLIC RIGHT OF WAY 407/1	Approved 09/09/21

Phase 2 Plots 37-46 and 56-119, and Phase 3 Plots 47-55, 120-126 and 173-195

TFW Group Limited (previously trading as Terra Firma (Wales) Limited) initially was involved with investigation and earthworks to raise site levels on the area covered by Phase 2 Plots 37-46 and 56-119, and Phase 3 Plots 47-55, 120-126 and 173-195, as illustrated below.

Terra Firma first investigated this area of the site in 2013, as reported in Geotechnical and Geo-environmental Report 12032, dated March 2013 (**Annex A**). This investigation included the installation of groundwater monitoring wells and groundwater testing, analysis and assessment. The assessment concluded contamination present was very low and the risk posed to the River Usk was negligible. It also noted that the groundwater encountered was found to be confined within gravel lenses within the underlying river alluvial deposits, and therefore isolated and not in hydraulic continuity with the River Usk.

A remediation strategy was prepared for this area in August 2015 by Terra Firma.

A Piling Risk Assessment Report for this area was prepared in November 2016, Report 12032/PRA (**Annex B**). This concluded that due to the above reasons, there was no risk to contamination of the underlying Secondary A aquifer from creation of preferential pathways, driving contamination into the aquifer or risk of contamination of groundwater and surface waters by concrete, cement or grout due to the planned use of bored piles.

The earthworks, which completed in 2018, were supervised by Terra Firma. All soils imported were subject to laboratory testing, including leachate testing to ensure no risk to controlled waters, and all were approved by the Newport Council contaminated land officer on a source by source basis (**Annex C**).

A letter dated 30.08.206 addressed to NRW (letter 25) concluded that groundwater monitoring, as requested by NRW for this area of the site, had not identified any risks to controlled waters (**Annex D**). The NRW had specified testing of the groundwater prior to filling of the site, and two upon completion of the earthworks or within 6 months of the commencement of the earthworks. All three groundwater sampling and testing rounds were completed as required, and subsequent assessment determined that the fill works had not caused any impact to

controlled waters. This was also supported by the fact that all imported fill materials were being tested as necessary, including leachate testing, to ensure no unacceptable soils would be introduced to the site.

At the request of the contaminated land officer, water from the drainage reen crossing the site were also assessed to increase confidence that the fill imported for the earthworks had not had any adverse affects on the reen waters. A letter report issued in August 2018 (**Annex E**) concluded that the fill material had had negligible impact on the reen and River Usk.

The above testing and conclusions were submitted directly to Newport Council and NRW. Terra Firma was never notified that the above testing and conclusions were not acceptable.

Site remediation was specified to include the placement of 600mm of clean soils in garden and landscaped areas. This has now been completed and verified (**Annex F**).

Plots 1-36 (Phase 2a)

Plots 1-36 (Phase 2a) were subject to a separate site investigation in 2018, as detailed in Terra Firma Report 12032/P2, dated July 2018 (**Annex G**).

Soil testing was undertaken and a quantitative human health and environmental risk assessment performed. Whilst a risk to human health was identified, the assessment concluded that there was no risk to controlled waters from contamination in site soils.

This report was subsequently reviewed and approved by Newport City Council.

Proposed remediation was to comprise the importation of clean garden soils. The remediation strategy was detailed in the site investigation report only. A stand alone remediation strategy report for this area was never produced.

All remediation and validation works have now been completed and verified.

Plots 127-172

Plots 127-172 (Phase 3 north of the drainage reen) were similarly subject to a separate site investigation in 2018, as detailed in Terra Firma Report 12032/P3, see **Annex H**.

The investigation noted the historical waste deposited on site and subsequent remediation by others prior to the Terra Firma investigation. Soil and soil leachate testing was undertaken and a quantitative human health and environmental risk assessment performed. Whilst a risk to human health was identified, the assessment concluded that there was no risk to controlled waters from contamination in site soils.

Proposed remediation was to comprise the importation of clean garden soils. The remediation strategy was detailed in the site investigation report only. A stand alone remediation strategy report for this area was never produced.

All remediation and validation works have now been completed and verified.

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 Ltd

[redacted]

Mrs Ruth Howells

Enc.

ANNEX A
2013 Site investigation Report

GEOTECHNICAL AND GEO-ENVIRONMENTAL REPORT:

PROPOSED RESIDENTIAL DEVELOPMENT, LAND OFF HERBERT ROAD, NEWPORT

Prepared for:
GREENHILL CONSTRUCTION LIMITED

March 2013

Job No: 12032

terrafirma

REPORT TITLE	:	**Geotechnical and Geo-environmental Report: Proposed Residential Development, Land off Herbert Road, Newport**
REPORT STATUS	:	**Final**
JOB NUMBER	:	**12032**
DATE	:	**March 2013**
PREPARED BY	:	[redacted]..... **Michael Watkins**
REVIEWED BY	:	[redacted]..... **Louise J. Dow**
APPROVED BY	:	[redacted] **Dr Gwyn C. Lake**

Executive Summary

Greenhill Construction is proposing the development of land off Herbert Road in Newport.

Historically, the site has been occupied by a clothing factory after 1937 until before 1993. Some small buildings were located across the south of the site during its history. A historic landfill site also occupies the far north of the site.

The geological map of the area shows the site to be underlain by the St Maughn's Formation of the Devonian Period. Marine and estuarine alluvium is shown to overlie the site. Made ground of variable thickness was also believed to overlie the site.

A geotechnical and geo-environmental site investigation was carried out between the 31st of October and the 8th of November 2012 comprising 19 trial pits and six cable percussive boreholes. Three in-situ soakaway tests were also undertaken during the site investigation.

The trial pits found made ground to a depth of 0.20m to 3.30m with soft grey and brown mottled clay to 3.90/10.30m. Peat; at a thickness of between 0.6m and 2.30m was found at variable depth, ranging from 3.90 and 10.3 metres depth. The peat overlies the sand and gravel, which is itself underlain by weathered mudstone (firm becoming very stiff red brown gravelly clay) to 10.0/12.7m. Competent mudstone was encountered until termination of the borehole at 10.2/12.9m.

Fifteen small disturbed representative soil samples were collected for laboratory chemical analysis. Several substances tested for were found to be above the Tier 1 threshold values for a residential development.

A number of contaminants were also found to be above EQS guidelines. However, it is interpreted that the groundwater beneath the site is isolated from the nearby River Usk and therefore not in hydrological continuity with the river. It is therefore believed that the low levels of contamination will not affect the aquatic environment.

A Radon (RPM) Report for the site states that basic radon protection measures are required for new dwellings.

Following two rounds of gas monitoring undertaken so far, it is preliminarily considered that Gas Characteristic Situation 3 prevention measures should be used at the site.

Precast concrete driven piles founded within the underlying very weak red brown and grey mudstone are recommended.

For a 275mm square precast concrete pile driven to an appropriate set within the underlying gravels a safe working load of typically 500kN should be achieved. Pile lengths should vary between 12m and 15m beneath current ground levels.

The estimated working loads, pile type and lengths should be confirmed by a specialist piling contractor. It may be prudent to test drive piles at select locations.

For the quoted pile size, founded within the competent gravels, total settlements should not exceed 10mm with differential movements between adjacent piles being less than half this value.

Floor slabs should be designed as suspended.

Network Rail may also require a bored pile solution close to the railway.

Consolidation settlements of between 100 and 200mm of settlement are estimated beneath areas that are to be raised by 1.0 and 2.0m.

As the building foundations are to be piled this will result in differential settlements between the development infrastructure and the buildings of a similar order.

Based upon the above results we recommend that all buried concrete should conform to Design Class DS-1, ACEC Class AC-1, of BRE Digest 1:2005.

Two of the soakaways tests recorded no infiltration and TP5 recorded a permeability of 8.86 x 10-5 m/s.

TABLE OF CONTENTS

Section 1 Introduction and Proposed Development

1.1 Limitations and Exceptions of Investigation

Section 2 Review of Existing Data

2.1 Physical Setting, Current Use and Site Conditions
2.2 Review of Previous Reports
2.3 Site History
2.4 Geology
2.5 Hydrology & Hydrogeology
2.6 Radon
2.7 Environmental
- 2.7.1 Industrial Operator Scores
- 2.7.2 Industrial Pollution
- 2.7.3. Pollution Incidents
- 2.7.4 Landfills
- 2.7.5 Flooding
- 2.6.6 Groundwater Source Protection Zones

Section 3 Preliminary Risk Assessment

3.1 General
3.2 Potential Sources of Contamination
3.3 Qualitative Preliminary Human Health and Environmental Risk Assessment
3.4 Qualitative Preliminary Geotechnical Risk Assessment
3.5 Preliminary Site Conceptual Model

Section 4 Field Investigation

4.1 Site Works
4.2 Ground Conditions
4.3 Summary of Groundwater/Gas Monitoring Standpipe Installations
4.4 Groundwater Strikes
4.5 Laboratory Soil Chemical Testing
- 4.5.1 Exploratory Strategy and Sampling Regime
- 4.5.2 Laboratory Analysis of Soil
- 4.5.3 Laboratory Analysis of Groundwater

4.6 In-situ Soakaway Testing
4.7 In-situ Gas Monitoring

Section 5 Soil Analytical Results

5.1 General
5.2 Soil Chemical Test Results
5.3 Groundwater Chemical Test Results
5.4 Contaminants of Concern in Soils
5.5 Contaminants of Concern in Groundwater

TABLE OF CONTENTS (Continued)

Section 6 Quantitative Risk Assessment/Mitigation Measures

6.1 Summary of Human Health Risks
6.2 Summary of Risks to the Aquatic Environment
6.3 Refined Site Conceptual Model

Section 7 Evaluation of In-situ Gas Monitoring

Section 8 Engineering Recommendations

8.1 General
8.2 Preparation of Site
8.3 Foundation and Floor Slab Solution
8.4 Excavations and Formations
8.5 Roads and Car Parking Areas
8.5 Protection of Buried Concrete
8.7 In-situ Soakaway Testing

Tables

Table 3.1 Qualitative Preliminary Human Health Risk and Environmental Risk Assessment
Table 3.2 Preliminary Geotechnical Risk Assessment
Table 4.1 Summary of Ground Conditions
Table 4.2 Groundwater/Gas Installations
Table 4.3 Summary of Groundwater Strikes
Table 4.4 Soil Chemical Test Sample Locations and Depths
Table 5.1 Summary of Soil Chemical Test Results - Standard Suite
Table 5.2 Summary of Soil Chemical Test Results – Petroleum Hydrocarbons & PCBs
Table 5.3 Summary of Soil Chemical Test Results – Speciated Polycyclic Aromatic Hydrocarbons
Table 5.4 Summary of Groundwater Chemical Test Results - Standard Suite (dated 08/01/2013)
Table 5.5 Summary of Groundwater Chemical Test Results – Speciated PAH (dated 08/01/2013)
Table 5.6 Summary of Groundwater Chemical Test Results – Petroleum Hydrocarbons with Aliphatic and Aromatic Split (dated 08/01/2013)
Table 5.7 Summary of Groundwater Chemical Test Results – PCBs and Phenol (dated 08/01/2013)
Table 5.8 Summary of Groundwater Chemical Test Results - Standard Suite (dated 30/01/2013)
Table 5.9 Summary of Groundwater Chemical Test Results – Speciated PAH (dated 30/01/2013)
Table 5.10 Summary of Groundwater Chemical Test Results – Petroleum Hydrocarbons with Aliphatic and Aromatic Split (dated 30/01/2013)
Table 5.11 Summary of Groundwater Chemical Test Results – PCBs and Phenol (dated 30/01/2013)
Table 5.12 Summary of Soil Exceedances
Table 5.13 Summary of Groundwater Exceedances
Table 6.1 Human Health Risk Assessment
Table 6.2 Risks to the Aquatic Environment

TABLE OF CONTENTS (Continued)

Annexes

Annex A	Landmark History Plans
Annex B	Radon Report
Annex C	Terra Firma Definitions and Methodologies
Annex D	Trial Pit Logs
Annex E	Cable Percussive Borehole Logs
Annex F	Windowless Sample Borehole Logs
Annex G	Laboratory Soil & Groundwater Chemical Test Results
Annex H	In-situ Soakaway Test Results
Annex I	In-situ Gas Monitoring Results

Figures

Figure 1	Preliminary Site Conceptual Model
Figure 2	Refined Site Conceptual Model

Drawings

Drawing 01	Site Location
Drawing 02	Site Layout

SECTION 1 Introduction and Proposed Development

Greenhill Construction is proposing the development of land off Herbert Road in Newport.

Terra Firma (Wales) Limited have been commissioned to undertake a geotechnical investigation and geo-environmental assessment of the site.

The main objectives of the geotechnical site investigation were to:

- Determine the type, strength and bearing characteristics of the shallow superficial and underlying solid geology.
- Provide recommendations for a suitable and economic foundation/floor slab solution for the development.
- Provide recommendations with regard to any other geo-technical aspects pertaining to the development.
- Provide recommendations for any necessary supplementary site investigation works.

The main objectives of the geo-environmental assessment programme were to:

- Identify the potential environmental liabilities at the site associated with any soil and groundwater contamination.
- Provide a summary of the environmental conditions at the site, together with any necessary remediation works to render the site fit for its intended use.
- Provide recommendations with regard to any other geo-environmental aspects pertaining to the development.

In order to achieve the above objectives, Terra Firma (Wales) Limited carried out an assessment programme including a review of existing data, followed by a Phase I field investigation to confirm the prevailing ground conditions and also to collect and analyse soil samples from selected locations around the site.

A site investigation of an area, which encompasses the site has previously been undertaken and was reviewed by Integral Geotechnique in May 2007. A copy of the review is located in **Annex A** of the report and is discussed further in Section 2 of the report.

1.1 Limitations and Exceptions of Investigation

Greenhill Construction Ltd has requested that a Geotechnical Investigation (GI) and Geo-environmental Site Assessment (GSA) be performed in order to determine if contamination is present beneath the site and to determine a suitable foundation/floor slab solution for the development.

The GSA and GI were conducted and this report has been prepared for the sole internal reliance of Greenhill Construction Ltd and its design team. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Terra Firma (Wales) Limited. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The report represents the findings and opinions of experienced geotechnical and geo-environmental consultants. Terra Firma (Wales) Limited does not provide legal advice and the advice of lawyers may also be required.

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

The site investigation was limited by the following constraints;

- Underground utilities
- Dense vegetation
- Soft and waterlogged ground surface
- Topography
- Cycle track and pedestrians

SECTION 2 Review of Existing Data

2.1 Physical Setting, Current Use and Site Conditions

The site is a field located off Herbert Road in Newport at a National Grid Reference of 331690 189280. The location of the site is displayed in **Drawing 01**.

The site is irregular in shape and covers a total area of 4.52 hectares.

The site is currently unused with dense vegetation covering the centre and much of the south of the site. A cycle track passes from north to south along the west of the site. The north of the site is undulating and covered by short grass. The south east corner of the site is covered by rough hardstanding.

A drainage channel/reen passes from east to west at the north of the site, draining into the Usk, which is located to the immediate west of the site. A railway line runs along the east boundary of the site, a school to the north and commercial land to the south. hedgerows lining the north, south west and south east boundaries of the site. The site is part of a much larger field, which lies to the north east. Beyond the hedgerow to the south east is a housing estate on Cefn Coed, the A40 is located to the south west and another field is located to the north.

The site and general surrounding area is flat but undulating.

2.2 Review of Previous Reports

A Summary Report with Proposals for Land Remediation/Reclamation Works was undertaken by Integral Geotechnique in May 2007 for an area that encompassed the site.

A human health risk assessment compiled by White Young Green in 2003 recommended that the site be remediated to current soil guideline levels. The groundwater risk assessment concluded that River Usk was not at significant risk from contaminants at the site.

A ground gas risk assessment concluded that gas prevention measures are required at the site due to elevated levels of methane and carbon dioxide.

2.3 Site History

Historical maps of the site have been obtained from the Landmark Information Group and are presented in **Annex B** with the most relevant history maps summarised below.

1883 (1:2,500)
The site locates upon field land. A railway line is located to the immediate east of the site. A brick works is located approximately 115 metres south of the site and housing located within 320 metres south east of the site boundary. A rifle range is located on the opposite site of River Usk, approximately 160 metres west of the site. Two east two west reens/drainage channels cross the north and middle of the site.

1901-02 (1:2,500)
The 1901-02 maps shows no change to the site. The brick works to the south has seen some modification, with new building on the site and houses built upon some of the land. Land to the immediate east of the railway has become densely built upon by houses, churches and schools. A large excavation is located approximately 90 metres south of the site. The excavation is probably associated with the adjacent brick works. The rifle range no longer appears to be in existence.

2.2 Site History

1920 (Scale 1:2,500)
No change to the site has been made since the previous edition apart from a small rectangular building located at the far south of the site, on the present day cycle/walk path. Three saw mills are located along the west side of the railway, the closest of which is 80 metres east of the site. More houses have been built at the former brick works and to the east of the site. Allotment gardens are located to the south of the site.

1936-37 (Scale 1:2,500)
The 1936-37 editions again show no change to the site has been made apart from a series of small buildings located on the present day cycle track. The number of buildings at the saw mills to the south/east of the site has increased.

1955-57 (Scale 1:1,250)
The 1955-57 editions record a clothing factory at the south of the main portion of the site and at the top of Herbert Road. The drainage channel at the middle of the site has been removed/culverted. Houses have been built on some of the allotment gardens to the south of the site and the small building located upon the present day cycle/walk path have been replaced by two small buildings. The surrounding area continues to expand residentially.

1966-68 and 1969-70(Scale 1:2,500)
No change to the site has been made since the previous edition apart from the construction of a rectangular building at the north east of the site. To the south of the site, the land has become increasingly industrialised with engineering works, paint works and a light engineering works amongst the units. To the immediate north of the site is a sports stadium.

1993 (Scale 1:2,500)
The factory at the south of the site has been removed. Two tanks are located at the south east of the site and the far north of the site is known as St Julian's Glebelands Recreation Ground. A new building has also been built at the north east of the site. Some alteration has been made to the industrial units to the south of the site.

2012 (Scale 1:10,000)
No buildings are currently located on the site. A primary school has replaced the sports stadium to the immediate north of the site and many of the buildings to the south of the site have been removed.

2.4 Geology

The 1:50,000 scale geological map of the area (Sheet 249) shows the site to be underlain by the St Maughn's Formation of the Devonian Period. These rocks are interbedded argillaceous rocks with subordinated sandstone.

The solid geology is shown to be overlain by marine and estuarine alluvium.

Made ground of variable thickness is expected to overlie the site.

2.5 Hydrology & Hydrogeology

Surface runoff is likely to naturally drain into the soil underlying the site and chanel/reen vrossing the site which orientates towards the river Usk. Shallow groundwater is also likely to flow to the river.

Groundwater flow through the bedrock is likely to be heavily influenced by fractures within the rock, topography and bedding planes.

The Environment Agency website illustrates the bedrock beneath the site to be a Secondary A aquifer. These aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

The superficial material overlying the east of the site has also been classified as a Secondary A aquifer. The west portion of the site, along the bank of the River Usk is not classified as it is considered unproductive strata.

2.6 Radon

A British Geological Survey Radon Report obtained for the site confirms that **basic** radon protection is required for any new development. The radon report is presented in **Annex B**.

2.7 Environmental

The Environment Agency online 'What's in Your Back Yard' database was consulted. The relevant information is summarised below.

2.7.1 Industrial Operator Scores

There are no sites within a 1km radius of the site where pollution is regulated.

2.7.2 Industrial Pollution

There are no industrial pollution scores within a 1km radius of the site where pollution is regulated.

2.7.3 Pollution Incidents

There is one pollution incident within close proximity of the site. The incident took place in February 2004 approximately 250 metres south of the site. The incident caused a significant impact to land and involved 'specific waste materials'.

2.7.4 Landfills

Two historical landfill facilities are located within influencing distance of the site; one of which encroaches into the far north of the site.

Glebelands South is located at the far north of the site and beneath the school and playing fields to the north. The Environment Agency does not have any information in relation to the material disposed of, or the date that the facility was active.

Shaftsbury Park historic landfill is located approximately 120 metres west of the site. No information is provided regarding the date at which the landfill was active. Shaftsbury Park received industrial and household waste.

2.7.5 Flooding

The Environment Agency database confirms that the site is at risk from flooding from rivers, sea and reservoirs. The site does however benefit from flood defences.

2.7.6 Groundwater Source Protection Zones

The site does not locate within a groundwater protection zone.

SECTION 3 Preliminary Risk Assessment

The following sub-sections detail a preliminary risk assessment, based upon the desk study information.

3.1 General

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

Part IIA was introduced to achieve two aims:

(1) The identification of contaminated land
(2) The remediation of contaminated land that poses an unacceptable risk to human health and/or the environment

Under Part IIA the statutory definition of 'contaminated land' is:

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

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

For land to be classified as 'Contaminated Land' there must be a 'pollutant linkage'.

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

3.2 Potential Sources of Contamination

The potential contamination beneath the site, whether in the matrix of soil or groundwater is related to the sites past use.

As identified on historical plans, the site has been occupied by a clothing factory after 1937 until before 1993. Some small buildings were located across the south of the site during its history. The demolished buildings may be a source of asbestos.

A historic landfill site also occupies the far north of the site.

Peat or organic clay/silt may be found within the alluvium beneath the site, potentially the source of ground gas.

3.3 Qualitative Preliminary Human Health and Environmental Risk Assessment

The qualitative preliminary Human Health and Environmental Risk Assessment and site conceptual model are based on findings of the desk study and site walk over and include all potential sources, pathways and receptors that may be present on site.

The risk assessment and site conceptual model will be evaluated and modified in accordance with the findings from the site investigation and chemical testing.

Table 3.1 - Qualitative Preliminary Human Health Risk and Environmental Risk Assessment

Source	Pathway	Receptor During Construction	Level of Risk	Receptor Post Construction	Level of Risk
Made Ground /Natural Soil	Ingestion, inhalation and dermal contact with soil and soil dust	Construction Workers Neighbouring Site Users	Very low to low	Residents, workers, neighbours and visitors	Medium to high
Made Ground /Natural Soil	Ingestion of site grown vegetables	N/A	N/A	Residents and visitors	Medium to high
Radon Gas	Inhalation	N/A	N/A	Residents, workers, neighbours and visitors	Negligible
Drinking water	Ingestion	Construction workers	Medium to high	Residents, workers, and visitors	Medium to high
Surface Water	Run-off Accidental spillage	Adjacent Sites	Medium	Adjacent Sites River Usk	Medium
Groundwater	Leaching and groundwater leaching	Bedrock: St Maughn's Group (Secondary A)	Medium	Bedrock: St Maughn's Group (Secondary A)	Medium
Made Ground /Natural Soil	Absorption and uptake of contaminated soil	Vegetation	Medium	Vegetation	Medium
Made Ground /Natural Soil	Aggressive Ground Conditions	Building materials	Low to medium	Building materials	Low to medium
Ground gases – No landfills, made ground and peat not expected	Gas migration into houses and inhalation of gas	N/A	N/A	Residents, workers, neighbours and visitors	Medium to high

3.4 Qualitative Preliminary Geotechnical Risk Assessment

Table 3.2 Preliminary Geotechnical Risk Assessment

Potential Hazard	Level of Risk
Made Ground	**Medium Risk** Made ground is anticipated beneath the site. Significant thickness of loose/soft or variable made ground may lead to differential or excessive settlement.
Former basements and old foundations	**Low Risk** Excavations may be troublesome following demolition of the existing buildings if the foundations are not completely removed. Basements may also be located beneath the existing buildings adding greater costs from infilling.
Problem Soils	**Medium Risk** Estuarine alluvium deposits are present beneath the entire site. These sediments are very soft and can give unacceptable settlements for structures founded upon it.

3.5 Preliminary Site Conceptual Model

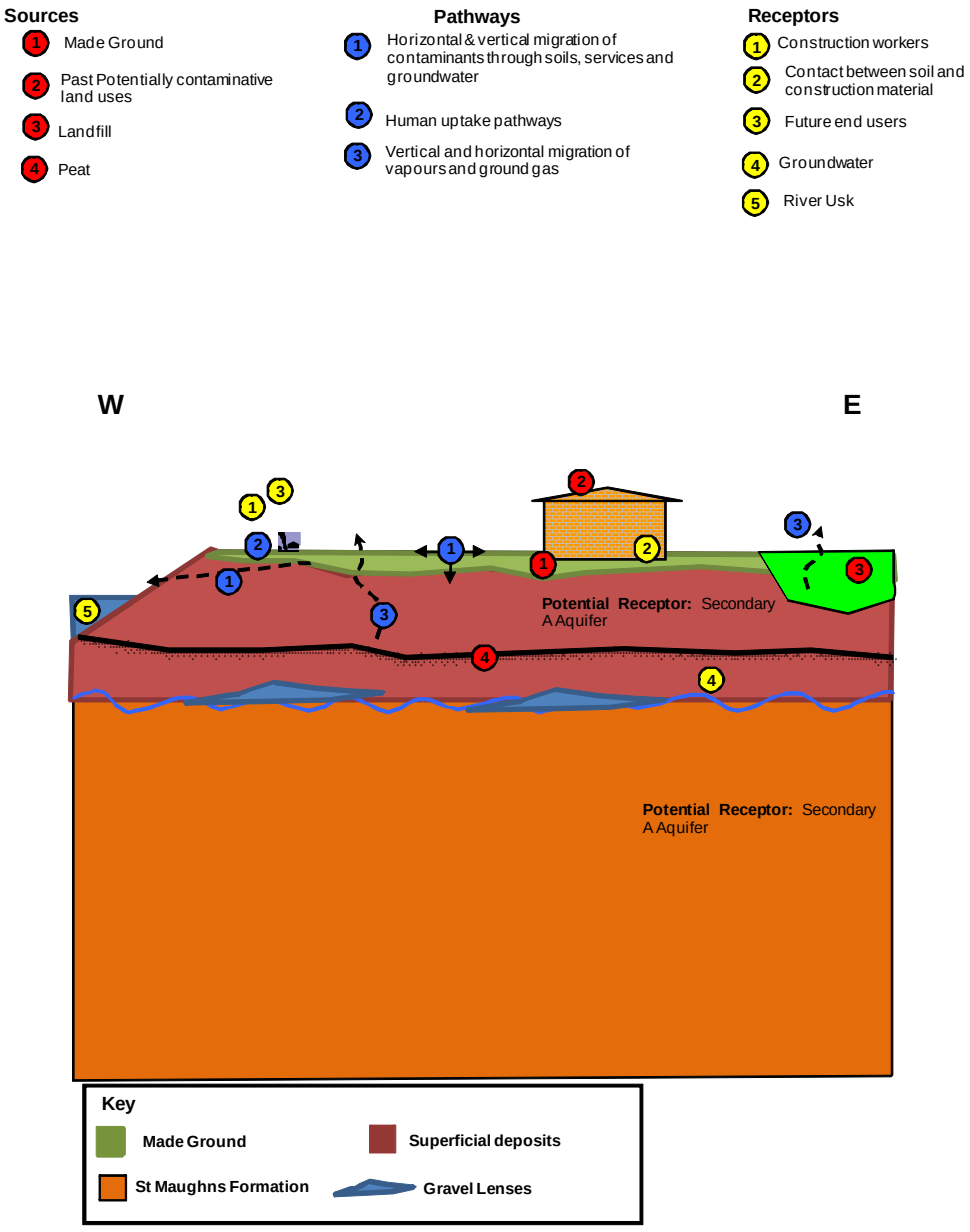


Figure 1 Preliminary Site Conceptual Model

SECTION 4 Field Investigation

4.1 Site Works

A geotechnical and geo-environmental site investigation was carried out between the 31st of October and the 8th of November 2012 comprising 19 trial pits and six cable percussive boreholes and three mini percussive boreholes. Three in-situ soakaway tests were also undertaken during the site investigation.

The trial pits were excavated using a JCB 3CX excavator.

The cable percussive boreholes, 200mm in diameter were sunk using a conventional drilling rig. Within the boreholes Standard/Cone (SPT/CPT) Tests were carried out at close and regular intervals. All of the boreholes were terminated within in-situ hard strata after a minimum of 1 hours chiselling in each hole for a nominal penetration.

The mini percussive boreholes were sunk using a Terrier 2000 mini percussive drilling rig. The mini percussive boreholes were sunk within the vicinity of the historic landfill at the north of the site. The holes were sunk for the installation of gas monitoring wells to check the ground gas potential from the landfill.

The fieldworks were supervised by Terra Firma (Wales) Limited. The trial pits and boreholes were logged to the requirements of BS5930:1999.

The trial pit logs, cable percussive logs and mini percussive borehole logs are presented in **Annex D, Annex E and Annex F** respectively and their positions are shown on **Drawing 02**.

4.2 Ground Conditions

The ground conditions encountered can in general be summarised as shown in **Table 4.1.**

Table 4.1 Summary of Ground Conditions

Depth (m)			Thickness (m)	Stratum
GL	-	0.20/3.30	0.20/3.30	**MADE GROUND**
0.30	-	3.90/10.30	2.20/8.40	Soft grey and brown mottled **CLAY**
3.90/10.30	-	4.10/8.60	0.60/2.30	**PEAT**
4.10/8.60	-	5.90/9.70	0.00/1.80	**SAND & GRAVEL (intermittent)**
5.90/10.30	-	10.00/12.70	0.50/4.10	Firm becoming very stiff red brown gravelly **CLAY**
10.00/12.70	-	>12.90	-	**MUDSTONE**

The basal Sand & Gravel layer was not encountered in BH1, BH2, BH4 and BH5.

Very loose red brown silty SAND and very soft red sandy SILT was encountered between 6.20m and 7.00m and 7.00m and 8.80m respectively.

Soft grey sandy SILT was encountered between 6.20m and 9.10m.

4.3 Summary of Groundwater/Gas Monitoring Standpipe Installations

Table 4.2 Groundwater/Gas Installations

Borehole	Full Installation Depth (m bgl)	Top of installation	Remaining installation depth (m)	Reaction Zone Strata(s)	Remainder of exploratory hole
BH1	GL – 10.6	9.0m plane pipe with bentonite surround	1.6m slotted pipe with gravel surround	Red brown gravelly **CLAY** **MUDSTONE**	Pipe to full depth, cap on base
BH2	GL – 12.9	2.5m plane pipe with bentonite surround	10.4m slotted pipe with gravel surround	Grey and brown mottled **CLAY** **PEAT** Red brown gravelly **CLAY** **MUDSTONE**	Pipe to full depth, cap on base
BH3	GL – 9.7	8.0m plane pipe with bentonite surround	1.7m slotted pipe with gravel surround	**SAND & GRAVEL**	Cap on base of standpipe, bentonite to base of borehole
BH4	GL – 10.2	9.2m plane pipe with bentonite surround	1.0m slotted pipe with gravel surround	**MUDSTONE**	Pipe to full depth, cap on base
BH5	GL – 8.0	4.6m plane pipe with bentonite surround	3.4m slotted pipe with gravel surround	Grey and brown mottled **CLAY** **PEAT**	Cap on base of standpipe, bentonite to base of borehole
BH6	GL – 10.3	7.0m plane pipe with bentonite surround	2.3m slotted pipe with gravel surround	**MUDSTONE**	Pipe to full depth, cap on base
WS1	GL – 3.0	1.0m plane pipe with bentonite surround	2.0m slotted pipe with gravel surround	**MADE GROUND**	Pipe to full depth, cap on base
WS2	GL – 3.0	1.0m plane pipe with bentonite surround	2.0m slotted pipe with gravel surround	**MADE GROUND**	Pipe to full depth, cap on base
WS3	GL – 3.0	1.0m plane pipe with bentonite surround	2.0m slotted pipe with gravel surround	**MADE GROUND**	Pipe to full depth, cap on base

4.4 Groundwater Strikes

A summary of groundwater strikes is presented below.

Table 4.3 Summary of Groundwater Strikes

Depth (m)	Description
BH1	Groundwater (medium) inflow at 3.70m rising to 3.00m after 20 min
BH3	Groundwater (slow) inflow at 2.60m rising to 2.40m after 20 mins
BH3	Groundwater (slow) inflow at 9.50m rising to 9.30m after 20 mins
BH4	Groundwater (medium) inflow at 5.80m rising to 4.30m after 20 mins
BH4	Groundwater (fast) inflow at 10.00m rising to 5.10m after 20 mins
BH5	Groundwater (medium) inflow at 4.00m rising to 3.80m after 20 mins
BH6	Groundwater (fast) inflow at 7.00m rising to 3.80m after 20 mins

Seasonal variability in the presence of groundwater can be expected.

Water levels may be shallower with proximity to the river and drainage channels.

4.5 Laboratory Soil Chemical Testing

4.5.1 Exploratory Strategy and Sampling Regime

During the intrusive investigation, small disturbed soil samples were collected. The sampling regime was conducted in accordance with BS5930: 1999. The methodology used is given in **Annex C**.

The sample locations and depths are listed in the following table.

Table 4.4 Soil Chemical Test Sample Locations and Depths

Sample	Depth (m)	MCerts Sample Description
TP2	0.90	Dark brown gravelly sandy CLAY
TP4	0.70	Dark brown gravelly sandy CLAY
TP5	1.30	Dark brown clayey gravelly SAND
TP6	0.60	Brown clayey gravelly SAND
TP6	1.80	Dark brown gravelly sandy CLAY with odd rootlets
TP7	0.20	Dark brown gravelly sandy CLAY with odd rootlets
TP8	0.50	Dark brown clayey gravelly SAND
TP9	1.00	Dark brown gravelly sandy CLAY
TP10	0.80	Dark brown gravelly sandy CLAY
TP12	0.40	Brown very gravelly SAND
TP13	0.60	Brown very gravelly SAND
TP14	0.40	Dark brown clayey gravelly SAND
TP15	0.40	Brown gravelly sandy CLAY with odd rootlets
TP17	0.15	Dark brown gravelly sandy CLAY with odd rootlets
TP18	0.50	Dark brown clayey gravelly SAND with odd rootlets

4.5.2 Laboratory Analysis of Soil

The soil samples taken were despatched to the laboratories of Derwentside Environmental Testing Services Limited for laboratory chemical testing. The following soil chemical tests were undertaken:

Metals and Metalloids
Lead
Arsenic
Mercury
Chromium
Copper
Nickel
Zinc
Selenium

In-Organics
Cyanide
Sulphate
Cadmium

Others
pH (acidity)
Organic Matter
Asbestos

Organic Chemicals
Phenols
Polycyclic Aromatic Hydrocarbons
Aromatic & Aliphatic Hydrocarbons
Polychlorinated Biphenyls

The laboratory soil chemical test results are presented in **Annex G**.

4.5.3 Laboratory Analysis of Groundwater

Samples of groundwater were collected from the boreholes and dispatched to the laboratories of Derwentside Environmental Testing Services Ltd. The following chemical testing was undertaken;

Metals and Metalloids
Lead
Arsenic
Mercury
Cadmium
Chromium
Copper
Nickel
Zinc
Selenium

In-Organics
Cyanide
Sulphate
Sulphide

Organic Chemicals
Phenols
Aromatic Petroleum Hydrocarbons (PAH)
Petroleum Hydrocarbons (aromatic/aliphatic split)
Polychlorinated Biphenyls

Others
pH (acidity)
Chemical Oxygen Demand
Biological Oxygen Demand
Conductivity
Hardness

The laboratory chemical test results are presented in **Annex G**.

4.6 In-Situ Soakaway Testing

During the site investigation, three in-situ soakaway tests were undertaken within TP2, TP2, and TP5. One fill was carried out per test.

The results of the tests are discussed further in Section 8.6 of the report and the results are presented in **Annex H**.

4.7 In-situ Gas Monitoring

Following the site investigation, to date, two rounds of gas monitoring have been undertaken. A further four gas monitoring visits will be undertaken on a roughly fortnightly basis.

The results of this monitoring are presented in **Annex I** of the report.

SECTION 5 Soil Analytical Results

5.1 General

See **Annex C** for the tiered approach to chemical testing methodology. All soil test results have been compared to thresholds for residential development as these are the most stringent guidelines. A summary of the soil chemical test results, which include the regulatory guidelines used in the Tier 1 assessment, are given in the tables on the following pages.

5.2 Soil Chemical Test Results

Table 5.1 Summary of Soil Chemical Test Results Standard Suite

Substance	SGV/ GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		95% UCL	Number of exceedences
			Minimum	Maximum		
Arsenic	32	CLEA	5.7	40	19.63	1
Cadmium	10	CLEA	0.4	6.2	1.82	0
Chromium III	3000	CIEH	7.9	100	46.45	0
Chromium	130	CLEA	7.9	100	46.45	0
Chromium VI	4.3	CIEH	1	1	1.00	0
Copper	2330^	CLEA	8.8	950	235.05	0
Lead	450	CLEA	10	290	132.69	0
Mercury	170	CLEA	0.05	1.9	0.65	0
Nickel	130	CLEA	7.7	69	39.82	0
Selenium	350	CLEA	0.5	1.4	0.71	0
Zinc	3750^	CIEH	45	440	256.17	0
Cyanide total	8	CLEA	0.1	10	2.49	1
Organic matter	-	-	0.8	23	8.64	-
Total Sulphate as SO_4	2400	BRE	200	2500	1500	1
Sulphate Aqueous Extract**	2400	BRE	160	160	-	-
pH	-	-	8.2	11.8	9.88	-
PAH	1.6*	-	<1.6	130	29.9	-
Phenol - Monohydric	420	CLEA	<0.3	0.5	0.35	0
Asbestos	-	-	Chrysotile – Loose Bundles		-	2

5.2 Soil Chemical Test Results (Continued)

Notes:

- CLEA - Soil Guideline Values for residential development
- CIEH - Generic Assessment Criteria for a residential setting, developed as Land Quality Management by the Chartered Institute of Environmental Health
- BRE - British Research Establishment (buried concrete risk assessment only, not human health related)
- A total of 15 samples were tested
- ^ CIEH copper and zinc thresholds based on 6% organic matter
- *Based upon laboratory detection limits for total PAH
- **One sample tested for Sulphate Aqueous Extract (mg/litre) in TP12 at 0.40m due to elevated level of Total Sulphate as SO_4

5.2 Soil Chemical Test Results (Continued)

TABLE 5.2 Summary of Soil Chemical Test Results Petroleum Hydrocarbons and PCBs

Substance	GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		95% UCL	Number of exceedences
			Minimum	Maximum		
Aliphatic						
PH C5 – C6 Ali	30	CEIH	<0.01	0.01	0.01	0
PH C6 – C8 Ali	73	CEIH	<0.01	0.01	0.01	0
PH C8 – C10 Ali	19	CEIH	<0.01	0.02	0.01	0
PH C10 – C12 Ali	93	CEIH	<1.5	<1.5	1.50	0
PH C12 – C16 Ali	740	CEIH	<1.2	16	4.76	0
PH C16 – C21 Ali	45000**	CEIH	<1.5	120	29.82	0
PH C21 – C35 Ali	45000**	CEIH	<3.4	340	88.23	0
Aromatic						
PH C5 – C7 Arom	0.33	CLEA	<0.01	<0.01	0.01	0
PH C7 – C8 Arom	610	CLEA	<0.01	<0.01	0.01	0
PH C8 – C10 Arom	27	CEIH	<0.01	0.05	0.02	0
PH C10 – C12 Arom	69	CEIH	<0.9	<0.9	0.90	0
PH C12 – C16 Arom	140	CEIH	<0.5	9.1	2.92	0
PH C16 – C21 Arom	250	CEIH	<0.6	50	19.67	0
PH C21 – C35 Arom	890	CEIH	<1.4	210	76.20	0
PCB	0.01	-	<0.01	0.16	0.06	2
2,4,4'-Trichlorobiphenyl	0.01	-	<0.01	0.12	0.03	1
2,2',5,5'-Tetrachlorobiphenyl	0.01	-	<0.01	0.05	0.02	1
2,2',4,5,5'-Pentachlorobiphenyl	0.01	-	<0.01	<0.01	0.01	0
2,3',4,4',5-Pentachlorobiphenyl	0.01	-	<0.01	0.02	0.01	1
2,2',4,4',5,5'-Hexachlorobiphenyl	0.01	-	<0.01	0.02	0.01	1
2,2',3,4,4',5'-Hexachlorobiphenyl	0.01	-	<0.01	0.05	0.02	1
2,2',3,4,4',5,5'-Heptachlorobiphenyl	0.01	-	<0.01	0.04	0.02	1

Notes:

- LQM/CIEH - Soil Guideline based upon 1% soil organic matter and residential land use
- CLEA - Soil Guideline Values (SGV) developed by the Contaminated Land Exposure Assessment - Residential with plant uptake
- * - Value used for Aromatic >5-7 (benzene)
- ** - Value used for Aromatic >7-8 (toluene)
- ***- Long term health advisory limit for a child based upon taste and odour (Environment Canada)
- Guidelines for PCBs based upon laboratory detection limits
- a soil organic matter content of 1%
- A total of 10 sample was tested for PCBs
- A total of 13 samples were tested for aromatic/aliphatic hydrocarbons

5.2 Soil Chemical Test Results (Continued)

Table 5.3 Summary of Soil Chemical Test Results Speciated Polycyclic Aromatic Hydrocarbons

Substance	GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		95% UCL	Number of exceedences
			Minimum	Maximum		
Acenaphthene	210	LQM/CIEH	<0.1	1.5	0.44	0
Acenaphthylene	170	LQM/CIEH	<0.1	1.4	0.51	0
Anthracene	2300	LQM/CIEH	<0.1	5.6	1.38	0
Benzo(a)anthracene	3.1	LQM/CIEH	<0.1	13	3.45	1
Benzo(a)pyrene	0.83	LQM/CIEH	<0.1	11	2.94	5
Benzo(b)fluoranthene	5.6	LQM/CIEH	<0.1	9	2.45	1
Benzo(k)fluoranthene	8.5	LQM/CIEH	<01	4.5	1.20	0
Benzo(g,h,i)perylene	44	LQM/CIEH	<0.1	8.7	2.23	0
Chrysene	6	LQM/CIEH	<0.1	13	3.45	1
Dibenzo(a,h)anthracene	0.76	LQM/CIEH	<0.1	1.6	0.48	1
Fluoranthene	260	LQM/CIEH	<0.1	22	5.65	0
Fluorene	160	LQM/CIEH	<0.1	2	0.52	0
Indeno(1,2,3-c,d)pyrene	3.2	LQM/CIEH	<0.1	7.5	2.07	1
Naphthalene	1.5	LQM/CIEH	<0.1	0.7	0.28	0
Phenanthrene	92	LQM/CIEH	<0.1	16	3.94	0
Pyrene	560	LQM/CIEH	<0.1	17	4.53	0

Notes:

- CIEH - Chartered Institute of Environmental Health Generic Assessment Criteria for a residential development
- A total of one sample was tested for Speciated PAH
- PAH - Polycyclic Aromatic Hydrocarbons
- Guidelines are based upon 1% soil organic matter
- Insufficient samples to form a statistical analysis

5.3 Groundwater Chemical Test Results

Two rounds of groundwater sampling have been carried out at the site on 08/01/2013 and 30/01/2013. Laboratory testing results for the first round of water sampling is presented below in **Table 5.4** to **5.7**.

Table 5.4 Summary of Groundwater Chemical Test Results – Standard Suite (dated 08/01/2013)

Substance	Thres-hold (mg/l)	Source	Measured Concentrations of Tested Substances (mg/l)		US95	Number of Exceedences
			Minimum	Maximum		
Arsenic	0.05	EQS (1)	0.00058	0.0054	0.0040	0
Cadmium	0.00008	EQS (2)	0.00003	0.00003	0.0000	0
Chromium	0.0034	EQS (3)	0.00039	0.001	0.0009	0
Copper	0.028	EQS (4)	0.0004	0.0018	0.0011	1
Lead	0.0072	EQS (2)	0.00009	0.0004	0.0003	0
Mercury	0.00005	EQS (2)	0.00001	0.00001	0.0000	0
Nickel	0.02	EQS (2)	0.0005	0.0049	0.0033	0
Selenium	0.01	EQS (5)	0.00025	0.0031	0.0018	BLDL
Zinc	0.008	EQS (4)	0.0013	0.0085	0.0049	1
Sulphate as SO4	250	EQS (5)	4.4	120	85.3729	0
BOD	-	-	4.9	22	14.4301	-
COD	-	-	10	160	137.8399	-
Cyanide total	0.05	EQS (6)	0.04	0.04	0.04	0
Conductivity	-	-	0.7	4.19	2.9425	-
Hardness	-	-	315	555	527.8708	-
Sulphide	0.00025	EQS (7)	0.01	0.01	0.01	BLDL
pH	-	EQS	0.0069	0.0074	0.0073	0
Phenol	0.0077	EQS (1)	0.0001	0.0001	0.0001	0

5.3 Groundwater Chemical Test Results (Continued)

Notes

- Twelve samples of perched water were tested.
- (1) Protection for Surface Water Quality (Good Standard for Rivers & Freshwater Lakes – Annual Mean)
- (2) Protection of Surface Water Quality (Inland Surface Water Environmental Quality Standard expressed as an annual average)
- (3) Protection for Surface Water Quality (Good Standard for Rivers & Freshwater Lakes – Annual Mean) – For Chromium VI
- (4) Protection of Surface Water Quality (Inland Surface Water Environmental Quality Standard expressed as an annual average for a water hardness $CaCO_3$ annual mean of >250mg)
- (5) Protection of Surface Waters Intended for the Abstraction of Drinking Water (A3 Waters – water needing intensive physical & chemical treatment, extended treatment & disinfection).
- (6) Protection of Surface Waters Intended for the abstraction of drinking water – Standard Value
- (7) Protection of Aquatic Life – Standard Value for Freshwater National Average (based upon Hydrogen Sulphide)
- BLDL - Below Laboratory Detection Limit

5.3 Groundwater Chemical Test Results (Continued)

Laboratory testing of a Speciated PAH was undertaken, the results of which are presented below in **Table 5.5**.

Table 5.5 Summary of Groundwater Chemical Test Results – Speciated PAH (dated 08/01/2013)

Substance	Thres-Hold (mg/l)	Source	Measured Concentrations of Tested Substances (mg/l)		US95	No. of exceedences
			Minimum	Maximum		
Acenaphthene	0.0002	TC	<0.00001	<0.00001	0.000010	0
Acenaphthylene	0.0002	TC	<0.00001	<0.00001	0.000010	0
Anthracene	0.0001	AA-EQS	<0.00001	<0.00001	0.000010	0
Benzo(a)anthracene	0.0002	TC	<0.00001	0.00007	0.000024	0
Benzo(a)pyrene	0.00005	AA-EQS	<0.00001	<0.00001	0.000010	0
Benzo(b)fluoranthene	0.00003	AA-EQS	<0.00001	<0.00001	0.000010	0
Benzo(k)fluoranthene	0.00003	AA-EQS	<0.00001	<0.00001	0.000010	0
Benzo(g,h,i)perylene	0.000002	AA-EQS	<0.00001	<0.00001	0.000010	BLDL
Chrysene	0.0002	TC	<0.00001	0.00002	0.000012	0
Dibenzo(a,h)anthracene	0.0002	TC	<0.00001	<0.00001	0.000010	0
Fluoranthene	0.0001	AA-EQS	<0.00001	<0.00001	0.000010	0
Fluorene	0.0002	TC	<0.00001	0.00001	0.000010	0
Indeno(1,2,3-c,d)pyrene	0.0002	TC	<0.00001	<0.00001	0.000010	0
Naphthalene	0.0024	AA-EQS	<0.00001	<0.00001	0.000010	0
Phenanthrene	0.0002	TC	<0.00001	0.00002	0.000012	0
Pyrene	0.0002	TC	<0.00001	0.00001	0.000010	0
Total PAH	-	-	<0.0002	<0.0002	0.0002	-

Notes:

- AA - EQS Annual Average Environmental Quality Standard. UK Standard, Protection of Surface Water Quality. Water Framework Directive.
- TC - Suggested Target concentration in absence of other standards.
- BLDL - Below Laboratory Detection Limit
- 6 samples were analysed

5.3 Groundwater Chemical Test Results (Continued)

Laboratory testing of Polychlorinated Biphenyls was undertaken, the results of which are presented below in **Table 5.6**.

Table 5.6 Summary of Groundwater Test Results – Petroleum Hydrocarbons with Aliphatic and Aromatic Split (dated 08/01/2013)

Substance	Thres-hold (mg/l)	Source EQS	Measured Concentrations of Tested Substances (mg/l)		95% UCL	Number of Exceedences
			Minimum	Maximum		
Aliphatic C5-C6	0.01	EQS	<0.0001	<0.0001	0.0001	0
Aliphatic C6-C8	0.01	EQS	<0.0001	<0.0001	0.0001	0
Aliphatic C8-C10	0.01	EQS	<0.0001	<0.0001	0.0001	0
Aliphatic C10-C12	0.01	EQS	<0.001	0.0035	0.0016	0
Aliphatic C12-C16	0.01	EQS	<0.001	0.017	0.0072	1
Aliphatic C16-C21	0.01	EQS	<0.001	0.037	0.0186	4
Aliphatic C21-C35	0.01	EQS	<0.001	0.42	0.1310	4
Aromatic C5-C7	0.03*	EQS	<0.0001	<0.0001	0.0001	0
Aromatic C7-C8	0.05**	EQS	<0.0001	<0.0001	0.0001	0
Aromatic C8-C10	0.03***	EQS	<0.0001	<0.0001	0.0001	0
Aromatic C10-C12	0.01	EQS	<0.001	0.0015	0.0011	0
Aromatic C12-C16	0.01	EQS	<0.001	0.014	0.0045	1
Aromatic C16-C21	0.01	EQS	<0.001	0.0024	0.0014	0
Aromatic C21-C35	0.01	EQS	<0.001	<0.001	0.001	0

Notes:

- A total of 6 samples were tested
- EQS – environmental quality standards – in the absence of actual guidelines, 0.01 mg/l has been used as a conservative assumption.
- * value used for benzene
- ** value used for toluene
- *** value used for xylene

5.3 Groundwater Chemical Test Results (Continued)

Laboratory testing of a petroleum hydrocarbons was undertaken, the results of which are presented below in **Table 5.6**.

Table 5.7 Summary of Groundwater Test Results – Polychlorinated Biphenyls and Phenol (08/01/2013)

Substance	Thres-hold (mg/l)	Source	Measured Concentrations of Tested Substances (mg/l)		95% UCL	Number of Exceedences
			Minimum	Maximum		
PCB	0.001	*	<0.001	<0.001	0.001	0
PCB 101	0.0003		<0.0003	0.0003	0.0003	0
PCB 138	0.0002		<0.0002	<0.0002	0.0002	0
PCB 153	0.0002		<0.0002	<0.0002	0.0002	0
PCB 180	0.0002		<0.0002	<0.0002	0.0002	0
PCB 28	0.0003		<0.0003	<0.0003	0.0003	0
PCB 52	0.0002		<0.0002	<0.0002	0.0002	0
PCB 118 + PCB 123	0.0006		<0.0006	<0.0006	0.0006	0
4-Chloro-3-methylphenol	0.04		<0.0001	<0.0001	0.0001	0
2,4-Dichlorophenol	0.02		<0.0001	<0.0001	0.0001	0
2,4-Dimethylphenol	0.00025		<0.0001	<0.0001	0.0001	0
p-cresol	0.00025		<0.0001	<0.0001	0.0001	0
2,6-Dimethylphenol	0.00025		<0.0001	<0.0001	0.0001	0
2,6-Dichlorophenol	0.00025		<0.0001	<0.0001	0.0001	0
2,4,6-Trichlorophenol	0.00025		<0.0001	<0.0001	0.0001	0

Notes:

- A total of 6 samples were tested
- * In the absence of actual guidelines, laboratory detection limits have been used as a conservative assumption.

5.3 Groundwater Chemical Test Results

Laboratory testing results for the second round of water sampling dated 30/01/2013 is presented below in **Table 5.8** to **5.11**.

Table 5.8 Summary of Groundwater Test Results – Standard Suite (dated 30/01/2013)

Substance	Thres-hold (mg/l)	Source	Measured Concentrations of Tested Substances (mg/l)		US95	Number of Exceedences
			Minimum	Maximum		
Arsenic	0.05	EQS (1)	0.0011	0.0092	0.0072	0
Cadmium	0.00008	EQS (2)	0.00003	0.00021	0.0002	3
Chromium	0.0034	EQS (3)	0.00025	0.00077	0.0006	0
Copper	0.028	EQS (4)	0.0004	0.003	0.0020	2
Lead	0.0072	EQS (2)	0.00009	0.0017	0.0009	0
Mercury	0.00005	EQS (2)	0.00001	0.000025	0.0000	0
Nickel	0.02	EQS (2)	0.00067	0.0046	0.0034	0
Selenium	0.01	EQS (5)	0.00025	0.0015	0.0011	BLDL
Zinc	0.008	EQS (4)	0.0013	0.018	0.0111	1
Sulphate as SO4	250	EQS (5)	0.0055	0.12	0.0972	0
BOD	-	-	0.0028	0.0066	0.0056	-
COD	-	-	0.019	0.11	0.0902	-
Cyanide total	0.05	EQS (6)	0.04	0.04	0.04	0
Conductivity	-	-	0.955	4.07	2.8609	-
Hardness	-	-	0.194	0.494	0.4526	-
Sulphide	0.00025	EQS (7)	0.01	0.01	0.01	BLDL
pH	-	EQS	0.007	0.0073	0.0073	0
Phenol	0.0077	EQS (1)	<0.0001	<0.00025	0.000175	0

5.3 Groundwater Chemical Test Results(Continued)

Notes

- Twelve samples of perched water were tested.
- (1) Protection for Surface Water Quality (Good Standard for Rivers & Freshwater Lakes – Annual Mean)
- (2) Protection of Surface Water Quality (Inland Surface Water Environmental Quality Standard expressed as an annual average)
- (3) Protection for Surface Water Quality (Good Standard for Rivers & Freshwater Lakes – Annual Mean) – For Chromium VI
- (4) Protection of Surface Water Quality (Inland Surface Water Environmental Quality Standard expressed as an annual average for a water hardness $CaCO_3$ annual mean of >250mg)
- (5) Protection of Surface Waters Intended for the Abstraction of Drinking Water (A3 Waters – water needing intensive physical & chemical treatment, extended treatment & disinfection).
- (6) Protection of Surface Waters Intended for the abstraction of drinking water – Standard Value
- (7) Protection of Aquatic Life – Standard Value for Freshwater National Average (based upon Hydrogen Sulphide)
- BLDL - Below Laboratory Detection Limit

5.3 Groundwater Chemical Test Results (Continued)

Laboratory testing of a Speciated PAH was undertaken, the results of which are presented below in **Table 5.9**.

Table 5.9 Summary of Groundwater Test Results – Speciated PAH

Substance	Thres-Hold (mg/l)	Source	Measured Concentrations of Tested Substances (mg/l)		US95	No. of exceedences
			Minimum	Maximum		
Acenaphthene	0.0002	TC	<0.00001	<0.00001	0.00001	0
Acenaphthylene	0.0002	TC	<0.00001	<0.00001	0.00001	0
Anthracene	0.0001	AA-EQS	<0.00001	<0.00001	0.00001	0
Benzo(a)anthracene	0.0002	TC	<0.00001	<0.00001	0.00001	0
Benzo(a)pyrene	0.00005	AA-EQS	<0.00001	<0.00001	0.00001	0
Benzo(b)fluoranthene	0.00003	AA-EQS	<0.00001	<0.00001	0.00001	0
Benzo(k)fluoranthene	0.00003	AA-EQS	<0.00001	<0.00001	0.00001	0
Benzo(g,h,i)perylene	0.000002	AA-EQS	<0.00001	<0.00001	0.00001	BLDL
Chrysene	0.0002	TC	<0.00001	<0.00001	0.00001	0
Dibenzo(a,h)anthracene	0.0002	TC	<0.00001	<0.00001	0.00001	0
Fluoranthene	0.0001	AA-EQS	<0.00001	<0.00001	0.00001	0
Fluorene	0.0002	TC	<0.00001	<0.00001	0.00001	0
Indeno(1,2,3-c,d)pyrene	0.0002	TC	<0.00001	<0.00001	0.00001	0
Naphthalene	0.0024	AA-EQS	<0.00001	<0.00001	0.00001	0
Phenanthrene	0.0002	TC	<0.00001	<0.00001	0.00001	0
Pyrene	0.0002	TC	<0.00001	<0.00001	0.000010	0
Total PAH	-	-	<0.0002	<0.0002	0.0002	-

Notes:

- AA - EQS Annual Average Environmental Quality Standard. UK Standard, Protection of Surface Water Quality. Water Framework Directive.
- TC - Suggested Target concentration in absence of other standards.
- BLDL - Below Laboratory Detection Limit
- 6 samples were analysed

5.3 Groundwater Chemical Test Results (Continued)

Laboratory testing of Polychlorinated Biphenyls was undertaken, the results of which are presented below in **Table 5.10**.

Table 5.10 Summary of Groundwater Test Results – Petroleum Hydrocarbons with Aliphatic and Aromatic Split

Substance	Thres-hold (mg/l)	Source EQS	Measured Concentrations of Tested Substances (mg/l)		95% UCL	Number of Exceedences
			Minimum	Maximum		
Aliphatic C5-C6	0.01	EQS	<0.0001	<0.0001	0.0001	0
Aliphatic C6-C8	0.01	EQS	<0.0001	<0.0001	0.0001	0
Aliphatic C8-C10	0.01	EQS	<0.0001	<0.0001	0.0001	0
Aliphatic C10-C12	0.01	EQS	<0.001	<0.0001	0.0001	0
Aliphatic C12-C16	0.01	EQS	<0.001	0.0057	0.0045	0
Aliphatic C16-C21	0.01	EQS	<0.001	0.01	0.0077	0
Aliphatic C21-C35	0.01	EQS	<0.001	<0.001	0.1310	0
Aromatic C5-C7	0.03*	EQS	<0.0001	<0.0001	0.0001	0
Aromatic C7-C8	0.05**	EQS	<0.0001	<0.0001	0.0001	0
Aromatic C8-C10	0.03***	EQS	<0.0001	<0.0001	0.0001	0
Aromatic C10-C12	0.01	EQS	<0.001	0.0011	0.0011	0
Aromatic C12-C16	0.01	EQS	<0.001	0.0062	0.0036	0
Aromatic C16-C21	0.01	EQS	<0.001	0.002	0.0015	0
Aromatic C21-C35	0.01	EQS	<0.001	<0.001	0.001	0

Notes:

- A total of 6 samples were tested
- EQS – environmental quality standards – in the absence of actual guidelines, 0.01 mg/l has been used as a conservative assumption.
- * value used for benzene
- ** value used for toluene
- *** value used for xylene

5.3 Groundwater Chemical Test Results (Continued)

Laboratory testing of a petroleum hydrocarbons was undertaken, the results of which are presented below in **Table 5.11**.

Table 5.11 Summary of Groundwater Test Results – Polychlorinated Biphenyls

Substance	Thres-hold (mg/l)	Source	Measured Concentrations of Tested Substances (mg/l)		95% UCL	Number of Exceedences
			Minimum	Maximum		
PCB	0.001	TC	<0.001	<0.001	0.001	0
PCB 101	0.0003	TC	<0.0003	0.0003	0.0003	0
PCB 138	0.0002	TC	<0.0002	<0.0002	0.0002	0
PCB 153	0.0002	TC	<0.0002	<0.0002	0.0002	0
PCB 180	0.0002	TC	<0.0002	<0.0002	0.0002	0
PCB 28	0.0003	TC	<0.0003	<0.0003	0.0003	0
PCB 52	0.0002	TC	<0.0002	<0.0002	0.0002	0
PCB 118 + PCB 123	0.0006	TC	<0.0006	<0.0006	0.0006	0
4-Chloro-3-methylphenol	0.04	TC	<0.0001	<0.00025	0.000135	0
2,4-Dichlorophenol	0.02	TC	<0.0001	<0.00025	0.000135	0
2,4-Dimethylphenol	0.00025	TC	<0.0001	<0.00025	0.000135	0
p-cresol	0.00025	TC	<0.0001	<0.00025	0.000135	0
2,6-Dimethylphenol	0.00025	TC	<0.0001	<0.00025	0.000135	0
2,6-Dichlorophenol	0.00025	TC	<0.0001	<0.00025	0.000135	0
2,4,6-Trichlorophenol	0.00025	TC	<0.0001	<0.00025	0.000136	0

Notes:

- A total of 6 samples were tested
- TC - Suggested Target Concentration in absence of other standards

5.4 Contaminants of Concern in Soils

A number of substances tested for were found to be above their respective threshold levels. These exceedances are summarised in Table 5.7 below.

Table 5.12 Summary of Soil Exceedances

Hole and depth (m bgl)	Chemical	Guideline (mg/kg)	Exceedance (mg/kg)
TP5 1.30m	Arsenic	32	40
TP2 0.90m	Cyanide	8	10
TP8 0.50m	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Chrysene Dibenzo(a,h)anthracene Indeno(1,2,3-c,d)pyrene	3.1 0.83 5.6 6 0.76 3.2	13 11 9 13 1.6 7.5
TP4 0.70m	Benzo(a)pyrene	0.83	0.90
TP6 0.60m	PCB 2,3',4,4',5-Pentachlorobiphenyl 2,2',4,4',5,5'Hexachlorobiphenyl 2,2',3,4,4',5'Hexachlorobiphenyl 2,2',3,4,4',5,5'Heptachlorobiphenyl	0.01 0.01 0.01 0.01 0.01	0.15 0.02 0.02 0.05 0.04
TP6 1.80m	Chrysotile – Loose Bundles	-	-
TP7 0.20m	Benzo(a)pyrene Chrysotile – Loose Bundles	0.83 -	1.90 -
TP9 1.00m	Benzo(a)pyrene	0.83	1.30
TP10 0.80m	Benzo(a)pyrene	0.83	1.50
TP13 0.60m	PCB 2,4,4'-Trichlorobiphenyl 2,2',5,5'-Tetrachlorobiphenyl	0.01 0.01 0.01	0.16 0.12 0.05

5.5 Contaminants of Concern in Groundwater

A number of substances tested for were found to be above their respective threshold levels. These exceedances are summarised in Table 5.8 below.

Table 5.13 Summary of Groundwater Exceedances

Borehole	Chemical	Threshold (mg/l)	Exceedance (mg/l)
BH1 (08/01/2013)	Aliphatic C16-C21 Aliphatic C21-C35	0.01 0.01	0.11 0.14
BH2 (08/01/2013)	Aliphatic C16-C21 Aliphatic C21-C35	0.01 0.01	0.037 0.19
BH3 (08/01/2013)	Aliphatic C12-C16 Aliphatic C16-C21 Aliphatic C21-C35 Aromatic C12-C16	0.01 0.01 0.01 0.01	0.017 0.031 0.42 0.014
BH4 (30/01/13)	Cadmium Copper Zinc	0.00008 0.001 0.008	0.00021 0.003 0.018
BH5 (08/01/2013)	Copper Zinc	0.001 0.008	0.0018 0.0085
BH5 (30/01/2013)	Cadmium	0.00008	0.00015
BH6 (08/012013)	Aliphatic C16-C21 Aliphatic C21-C35	0.001 0.001	0.03 0.011
BH6 (30/01/2013)	Cadmium Copper	0.00008 0.001	0.00014 0.0019

SECTION 6 Quantitative Risk Assessment/Mitigation Measures

6.1 Summary of Human Health Risks

A Quantitative Risk Assessment on the potential human health effects is detailed below:

Table 6.1 - Human Health Risk Assessment

Source	Pathway	Target	Risk Assessment	Mitigation Measures
In-Situ Soils	Dermal contact with soil/dust Inhalation of soil/dust/vapours Ingestion of soil/dust	Construction workers	**Moderate to high risk** to construction workers involved in excavation phase of development	COSHH assessment and good level of PPE/ hygiene by site workers/ staff; dust suppression measures if required.
	Inhalation of fugitive soil dust/vapours Ingestion of soil dust Dermal contact with soil dust	Passersby, neighbouring site occupants	**Moderate to high risk** during construction phase	The site should be managed well including screening and dust suppression measures if required
	Dermal contact with soil dust Inhalation of soil/dust/vapours Ingestion of soil/dust	Site end users, visitors	**Moderate to high risk** to future site users in an assumed residential scenario	The site should be capped. This will be achieved by the up filling of the site by up to 2m required as part of a flood prevention scheme.
	Adsorption into potable water plastic pipes	Site end users-residents	**Moderate to high risk**	Suitable materials should be selected and used for the water supply in accordance with UKWIR guidance.
Radon Gas	Inhalation	Site end users-residents	**Moderate Risk**	Basic radon protection measures are required
Ground gases from made ground	Gas migration into houses and inhalation of gas	Site end users-residents	**Moderate Risk** Made ground is a maximum of 1.70m thickness with little organic content	Preliminary – Gas Characteristic Situation 3 (see Section 7)
Hydrocarbon Vapours	Inhalation	Site end users-residents	**Low risk**	Installation of vapour barrier beneath buildings depending due to PCB contamination

6.1 Summary of Human Health Risks (Continued)

If during the development materials are encountered that are significantly different to those encountered in the investigation, the occurrence should be reported to the Engineer and appropriate action taken prior to continuing with the works.

In accordance with EC Regulation 1272/2008 and Environment Agency Guidance WM2 (v. 2.3/2011) soils and other materials destined for off-site disposal should be classified on the basis of their hazard phrases prior to disposal. Soils are classified as a mirror entry waste and should be classified on the basis of their specific chemical properties. Terra Firma Wales Ltd offer this service if required.

All imported material should be inspected and certified as inert prior to use.

During the ground works, the contractor should comply with all current Health and Safety regulations.

6.2 Summary of Risks to the Aquatic Environment

A Quantitative Risk Assessment on the potential effects to the aquatic environment is detailed in **Table 6.2.**

Table 6.2 Risks to the Aquatic Environment

Source	Pathway	Target	Risk Assessment	Mitigation Measures
Site soils Construction materials	Surface water run-off	River Usk Neighbouring sites Existing drainage channel/reen	**Low Risk during construction**	Measures to avoid accidental spillage of materials, and to control surface run off
Petroleum Hydrocarbons and heavy metals from surrounding and past industrial processes and made ground	Leaching	Groundwater	**Negligible Risk** (see below)	No mitigation measures necessary (see below)
Groundwater	Downward migration of groundwater	Bedrock: St Maughn's Group (Secondary A Aquifer) and superficial deposits (Secondary A)		
Groundwater	Groundwater migration	River Usk, St Maughn's Group (Secondary A Aquifer) and superficial deposits (Secondary A)		

It was discussed in Section 5.4 of the report that laboratory chemical testing shows low level contamination of the groundwater by petroleum hydrocarbons and some heavy metals.

It is clear that the initial slight hydrocarbon contamination was from contamination from the drilling process. Following purging of the boreholes on the second round of water sampling all hydrocarbons were below guideline values.

The nearest river/estuarine body to the site is the River Usk, which runs along the west boundary of the site. Throughout much of Newport, the River Usk is in hydrological continuity with the water-bearing alluvial gravels, which typically underlie the alluvial clay in the area. However, only small lens of gravel was encountered during the investigation and it is considered that the small intermittent lenses will be isolated from the River Usk.

6.2 Summary of Risks to the Aquatic Environment (Continued)

The groundwater inflows encountered within the alluvial clay (generally within and around the peat layers) were also sporadic. This groundwater is also not to be considered in hydrological continuity with the nearby River Usk. Therefore it is considered that as the levels of contamination are very low and the risk of the contamination reaching the nearby river body are so remote, there is a negligible risk posed to the aquatic environment from contamination at the site.

With regards to the drainage channel/reen that crosses the site, it is considered that as the near surface contamination is low and that the site is to be raised by up to 2m of inert materials there will be no risk to the river Usk from groundwater entering the river form this source.

6.3 Refined Site Conceptual Model

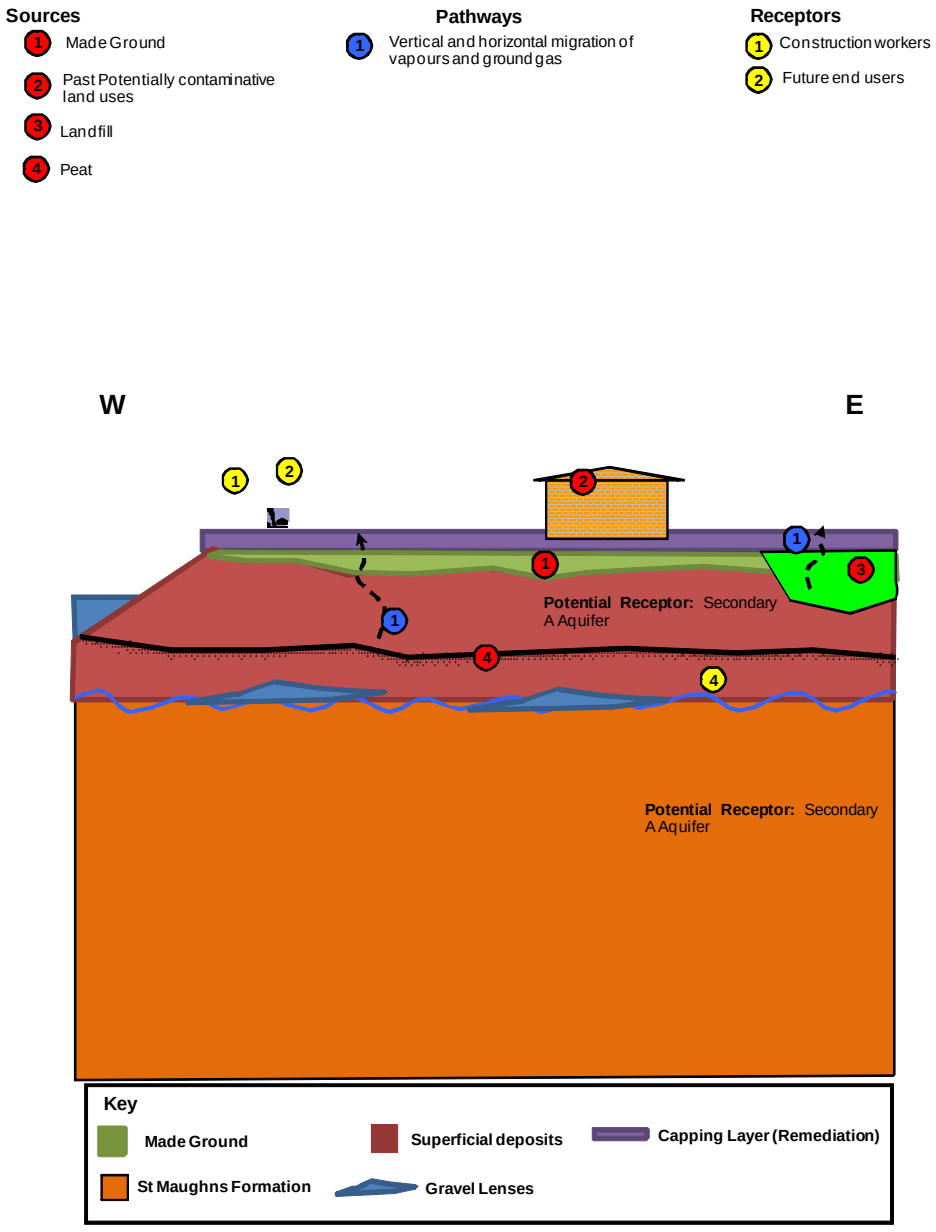


Figure 2 Refined Site Conceptual Model

SECTION 7 Evaluation of In-situ Gas Monitoring Results

Nine gas monitoring wells were installed and a programme of gas monitoring for the presence of methane, carbon dioxide and oxygen has been undertaken at the above site.

Two of the six proposed gas monitoring visits has been undertaken thus far.

No positive flow rate has been encountered.

The gas monitoring undertaken has identified a maximum methane concentration of 67.4% within the nine gas monitoring wells. The gas screening value (GSV) for Methane can thus be calculated as:

- 0.674 x 0.1 = 0.0674 litres/hour of CH_4

A maximum carbon dioxide value of 11.2% was encountered. The gas screening value (GSV) for Carbon Dioxide can thus be calculated as:

- 0.112 x 0.1 = 0.0112 litres/hour of CO_2

With reference to Table 8.5 of CIRIA Publication C665 (2007) the Gas Screening Value characterises the site as Gas Characteristic Situation 2

However, due to the methane and carbon dioxide values being so high, it is recommended that the site should be preliminarily characterised as **Characteristic Situation 3**.

The following protection measures should be undertaken;

a] Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft) with at least 2000 g DPM and under-floor venting

b] Beam and block or pre-cast concrete and 2000 g DPM/reinforced gas membrane and under-floor venting

c] All joints and penetrations must be sealed with propriety gas resistant membrane and passively ventilated or positively pressurised under-floor sub-space.

The Gas Monitoring Results are located within **Annex I** of the report. An addendum letter, which includes the remainder of the gas monitoring results will be compiled following the completion of the gas monitoring programme.

SECTION 8 Engineering Recommendations

8.1 General

In the following sections a number of foundation recommendations are given. However, as the works are to be carried out in close proximity to a main line railway, the views and approval of Network Rail Engineers needs to be gained.

Should Network Rail have any objections to the foundation recommendations given in the following sections then an alternative approach may need to be considered.

It is also likely that stringent measures will be put in place by Network Rail in order to guarantee the safety and integrity of the rail operations.

8.2 Preparation of Site

All grass and surface vegetation including all roots and any trees not under a preservation order beneath the underside of the proposed building, and any hard standing areas should also be excavated and removed from the site.

Any reduced levels should be brought up to the required levels with well, compacted imported granular materials. Department of Transport (DoT) Type 2 sub-base or similar may be used and should be compacted in layers, in accordance with the Specification for Highway Works. Alternatively, appropriate selected inert imported fill could be used.

Allowances should be made for removing any ‘soft spots/area’ and their replacement with well compacted granular materials.

Contingencies should be allowed for any necessary temporary and/or permanent support works to the existing roads and services and buildings made necessary as a result of the proposed works.

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

All materials to be removed from site should be taken to an appropriately licensed tip.

As part of the preparation works in order to comply with flood prevention levels, the site is to be raised by 1 to 2m. The materials used for the raising are to be inert mainly granular materials conforming to Type 6F2 or similar and should be compacted in layers to the Specification for Highway Works.

These works should be supervised on a full time basis by a qualified geotechnical engineer situ. In-situ testing of the filling as it progresses should be carried out. These tests should include in-situ density testing and plate load tests.

Contamination testing of the materials used of the filling should also be undertaken to the Newport City Council Protocol at source and once placed.

8.3 Foundation and Floor Slab Solution

Due to the presence of soft clay bands beneath the site traditional shallow foundations are not recommended. Such foundations are likely to lead to high total and differential settlements.

A piled foundation is advised for the proposed residential properties. Precast concrete driven piles founded within the underlying very weak red brown and grey mudstone are recommended.

For a 275mm square precast concrete pile driven to an appropriate set within the underlying gravels a safe working load of typically 500kN should be achieved. Based upon the site investigation data, pile lengths should vary between 12m and 15m beneath current ground levels. Following placement of the fill piles lengths will be increase to approximately 14 and 17m.

The estimated working loads, pile type and lengths should be confirmed by a specialist piling contractor. It may be prudent to test drive piles at select locations.

For the quoted pile size, founded within the competent gravels, total settlements should not exceed 10mm with differential movements between adjacent piles being less than half this value.

Allowances should be made for re-driving piles should buried obstructions be encountered.

Floor slabs should be designed as suspended.

Measurements should be kept on pile vibrations during driving. Measures should also be taken to dampen such vibrations. If, however, vibrations exceed permissible values then consideration should be given to using a contiguous flight auger (cfa)/bored pile solution.

Network Rail may also require a bored pile solution close to the railway.

As stated in Section 8.2, the site is to be raised by between 1.0 and 2.0m. Consolidation settlements of between 100 to 200mm have been estimated.

As the building foundations are to be piled this will result in differential settlements between the development infrastructure and the buildings of a similar order.

Therefore either the development is designed to accommodate this level of differential settlement with flexible constructions and service entries into buildings or alternatively the fill is placed prior to development and allowed to settle prior to construction. The settlement process can be speeded up by surcharging the site by ‘over filling’. Should this be the desired option then appropriate instrumentation should be installed to determine when 90% consolidation has been achieved.

8.4 Excavations and Formations

All of the shallow excavations should be possible with normal soil excavating machinery. However, hydraulic breakers may be necessary when excavating hardstanding and buried objects.

The shallow excavations are likely to encounter perched water/groundwater inflows. Inflows together with rainwater infiltration should be dealt with by conventional pumping techniques. It should also be noted that during periods of heavy rainfall, a higher groundwater table may be encountered.

The sides of any excavations deeper than 1.0m should be supported by planking and strutting or other proprietary means.

Precautions should be made for running sand conditions within the superficial material.

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

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

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

As a minimum the formation/excavation surfaces must be protected by blinding concrete or a minimum thickness of 300mm of hard cover immediately after exposure.

Allowances should be made for trimming, re-trimming and re-compaction if necessary.

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

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

It is recommended that approval be gained from a qualified engineer of the formation condition before covering them with any subsequent construction.

8.5 Roads and Car Parking Areas

The proposed development is to include the raising of the site as part of the flood prevention measures.

Following adequate compaction of the imported fill, a California Bearing Ratio (CBR) Value of 5% is likely to be acceptable for design purposes.

It should be noted that the local Highway Authority will require field in-situ CBR tests to be carried out at formation level of the roads to be adopted.

8.6 Protection of Buried Concrete

The laboratory soil chemical analysis reported concentrations of total sulphate of between 200 and 2500 mg/kg and pH of between 8.2 and 11.8 pH units.

Due to an elevated level of total sulphate in TP12 at 0.40m below ground level, sulphate aqueous extract was undertaken. A value of 160 mg/litre was recorded.

The classification should be based upon mobile water being present.

Based upon the above results we recommend that all buried concrete should conform to Design Class DS-1, ACEC Class AC-1, of BRE Digest 1:2005.

8.7 In-situ Soakaway Testing

During the investigation three in-situ soakaway tests were undertaken. The tests were not carried out strictly to the requirements of BRE 365.

Two of the soakaways tests recorded no infiltration and TP5 recorded a permeability of 8.86 x 10^{-5} m/s.

The in-situ soakaway test results are presented in **Annex H**.

ANNEX A
Landmark Historical Maps

Historical Mapping Legends

Ordnance Survey County Series 1:10,560

Gravel Pit
Sand Pit
Other Pits
Quarry
Shingle
Orchard
Osiers
Reeds
Marsh
Mixed Wood
Deciduous
Brushwood
Fir
Furze
Rough Pasture
Arrow denotes flow of water
Trigonometrical Station
Site of Antiquities
Bench Mark
Pump, Guide Post, Signal Post
Well, Spring, Boundary Post
285 Surface Level
Sketched Contour
Instrumental Contour
Main Roads
Fenced
Un-Fenced
Minor Roads
Fenced
Un-Fenced
Sunken Road
Raised Road
Road over Railway
Railway over River
Railway over Road
Level Crossing
Road over River or Canal
Road over Stream
Road over Stream
County Boundary (Geographical)
County & Civil Parish Boundary
Administrative County & Civil Parish Boundary
Co. Boro. Bdy. County Borough Boundary (England)
Co. Burgh Bdy. County Burgh Boundary (Scotland)
R.D. Bdy. Rural District Boundary
Civil Parish Boundary

Ordnance Survey Plan 1:10,000

Chalk Pit, Clay Pit or Quarry
Gravel Pit
Sand Pit
Disused Pit or Quarry
Refuse or Slag Heap
Lake, Loch or Pond
Dunes
Boulders
Coniferous Trees
Non-Coniferous Trees
Orchard
Scrub
Coppice
Bracken
Heath
Rough Grassland
Marsh
Reeds
Saltings
Building
Direction of Flow of Water
Shingle
Sand
Glasshouse
Pylon
Pylon
Electricity Transmission Line
Sloping Masonry
Cutting
Embankment
Standard Gauge Multiple Track
Road Under
Road Over
Level Crossing
Foot Bridge
Standard Gauge Single Track
Siding, Tramway or Mineral Line
Narrow Gauge
Geographical County
Administrative County, County Borough or County of City
Municipal Borough, Urban or Rural District, Burgh or District Council
Borough, Burgh or County Constituency
Shown only when not coincident with other boundaries
Civil Parish
Shown alternately when coincidence of boundaries occurs

BP, BS	Boundary Post or Stone	Pol Sta	Police Station
Ch	Church	PO	Post Office
CH	Club House	PC	Public Convenience
F E Sta	Fire Engine Station	PH	Public House
FB	Foot Bridge	SB	Signal Box
Fn	Fountain	Spr	Spring
GP	Guide Post	TCB	Telephone Call Box
MP	Mile Post	TCP	Telephone Call Post
MS	Mile Stone	W	Well

1:10,000 Raster Mapping

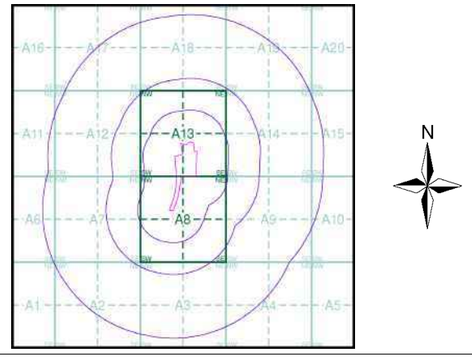
Gravel Pit
Refuse tip or slag heap
Rock
Rock (scattered)
Boulders
Boulders (scattered)
Shingle
Mud
Sand
Sand Pit
Slopes
Top of cliff
General detail
Underground detail
Overhead detail
Narrow gauge railway
Multi-track railway
Single track railway
County boundary (England only)
Civil, parish or community boundary
District, Unitary, Metropolitan, London Borough boundary
Constituency boundary
Area of wooded vegetation
Non-coniferous trees
Non-coniferous trees (scattered)
Coniferous trees
Coniferous trees (scattered)
Positioned tree
Orchard
Coppice or Osiers
Rough Grassland
Heath
Scrub
Marsh, Salt Marsh or Reeds
Water feature
Flow arrows
MHW(S) Mean high water (springs)
MLW(S) Mean low water (springs)
Telephone line (where shown)
Electricity transmission line (with poles)
BM 123.45 m Bench mark (where shown)
Triangulation station
Point feature (e.g. Guide Post or Mile Stone)
Pylon, flare stack or lighting tower
Site of (antiquity)
Glasshouse
General Building
Important Building

terrafirma

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Monmouthshire	1:10,560	1886	3
Monmouthshire	1:10,560	1902	4
Monmouthshire	1:10,560	1922	5
Monmouthshire	1:10,560	1938	6
Historical Aerial Photography	1:10,560	1947	7
Historical Aerial Photography	1:10,560	1947	8
Monmouthshire	1:10,560	1954	9
Ordnance Survey Plan	1:10,000	1964 - 1965	10
Ordnance Survey Plan	1:10,000	1972 - 1973	11
Ordnance Survey Plan	1:10,000	1981 - 1983	12
Newport	1:10,000	1983	13
Ordnance Survey Plan	1:10,000	1987	14
10K Raster Mapping	1:10,000	2006	15
10K Raster Mapping	1:10,000	2012	16

Historical Map - Slice A



Order Details

Order Number: 41914630_1_1
Customer Ref: 12044
National Grid Reference: 331690, 189280
Slice: A
Site Area (Ha): 4.52
Search Buffer (m): 1000

Site Details

., Herbert Road, NEWPORT, Gwent, NP19 7BH

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

Russian Military Mapping Legends

1:5,000 and 1:10,000 mapping

a. Not drawn to scale b. Drawn to scale

- Government and Administrative Buildings
- Military and Industrial Buildings
- Military and Communication Areas
- Subway Entrance
- Fireproof Building
- Prominent Fireproof Building
- Non-fireproof Building
- Non-fireproof Building (non-dwelling)
- Factory, mill, and flour mill, with chimneys
- Factory, mill, and flour mill, without chimneys
- Power Station, drawn to scale
- Hydroelectric Power Station
- Radio Station, drawn to scale
- Telephone Station, drawn to scale
- Abandoned Open-pit Mine or Quarry
- Open-pit Salt Mine
- Pit
- Oil Deposit or Well
- Oil Seepage
- Tailings Pile
- Fuel Storage Tanks
- Natural Gas Tank
- Bench Mark
- Drill Hole
- Burial Mound
- Triangulation Point on Burial Mound
- Single-track Railroad
- Double-track Railroad and Station Building
- Coniferous Forest
- Deciduous Forest
- Mixed Forest
- Lawns
- Citrus Orchard
- Wet Ground
- Scattered Vegetation

243,8 — Values for prominent elevations

186.0 — Numbers for spot elevations, depth soundings, contour lines, etc.

0,2 — Velocity of the current, width of river bed, depth of river

Fractional terms: length and capacity of bridges; depth of fords and condition of the river bottom; height of forest and the diameter of trees

Russian Alphabet (For reference and phonetic interpretation of map text)

А а (A)	З з (Z)	П п (P)	Ч ч (CH)
Б б (B)	И и (I)	Р р (R)	Ш ш (SH)
В в (V)	Й й (Y)	С с (S)	Щ щ (SHCH)
Г г (G)	К к (K)	Т т (T)	ъ (–)
Д д (D)	Л л (L)	У у (U)	ы (Y)
Е е (E)	М м (M)	Ф ф (F)	ь (')
Ё ё (YO)	Н н (N)	Х х (KH)	Э э (E)
Ж ж (ZH)	О о (O)	Ц ц (TS)	Ю ю (YU or IU)
			Я я (YA or IA)

1:25,000 mapping

a. Not drawn to scale b. Drawn to scale

- Government and Administrative Buildings
- Military and Industrial Buildings
- Military and Communication Areas
- Subway Entrance
- Partly Demolished Buildings
- Demolished Buildings
- Built-Up Area with Fireproof Buildings Predominant
- Built-Up Area with Non-Fireproof Buildings Predominant
- Individual Fireproof Building
- Prominent Industrial Building
- Individual Dwelling, Fireproof
- Ruins of an Individual Dwelling
- Factory or Mill Chimney
- Factory or Mill with Chimney
- Factory or Mill without Chimney
- Mine or Open Pit Mine
- Operating Shaft or Mine
- Non-Operating Shaft or Mine
- Salt Mine
- Tailings Pile
- Pit
- Stone Quarry
- Gas Pump or Service Station
- Fuel Storage or Natural Gas Tank
- Oil or Natural Gas Derrick
- Small Hydroelectric Power Station
- Power Station
- Transformer Station
- Cemetery
- Burial Mound (height in metres)
- Triangulation Point on Burial Mound
- Triangulation Point
- Bench Mark
- Bench Mark (monumented)
- Telegraph Office
- Telephone Station
- Radio Station
- Radio Tower
- Airfield or Seaplane Base
- Landing Strip
- Main Highway
- Highway under Construction
- Improved Dirt Road (former truck road)
- Double-track Railroad with First Class Station
- Dismantled Railroad
- Railroad Under Construction
- Shore Embankment
- River or Ditch with Embankment
- Direction and velocity of current
- Well
- Water Reservoir or Rain Water Pit
- Spring
- Isobath with value
- Heavy (Index) Contour Line
- Contour Line and Value
- Half Contour Line
- Spot Elevation Value
- Coniferous
- Deciduous
- Mixed
- Scrub

Key to Numbers on Mapping

ST38NW_Newport

No.	Description
15	Factory (Gas)
16	Factory (Gas)
21	Factory (Machinery)
23	Factory (Metals)
35	Factory (Non-Ferrous Metals)
40	Council/Government Buildings/Courts
44	Police Station/Headquarters
58	Post Office
59	Warehouses (Use Unknown)
63	Warehouses (Use Unknown) And Port Buildings
73	Railway Station

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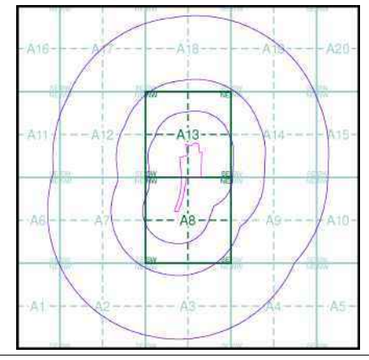
Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Monmouthshire	1:10,560	1886	3
Monmouthshire	1:10,560	1902	4
Monmouthshire	1:10,560	1922	5
Monmouthshire	1:10,560	1938	6
Historical Aerial Photography	1:10,560	1947	7
Historical Aerial Photography	1:10,560	1947	8
Monmouthshire	1:10,560	1954	9
Ordnance Survey Plan	1:10,000	1964 - 1965	10
Ordnance Survey Plan	1:10,000	1972 - 1973	11
Ordnance Survey Plan	1:10,000	1981 - 1983	12
Newport	1:10,000	1983	13
Ordnance Survey Plan	1:10,000	1987	14
10K Raster Mapping	1:10,000	2006	15
10K Raster Mapping	1:10,000	2012	16

Russian Map - Slice A



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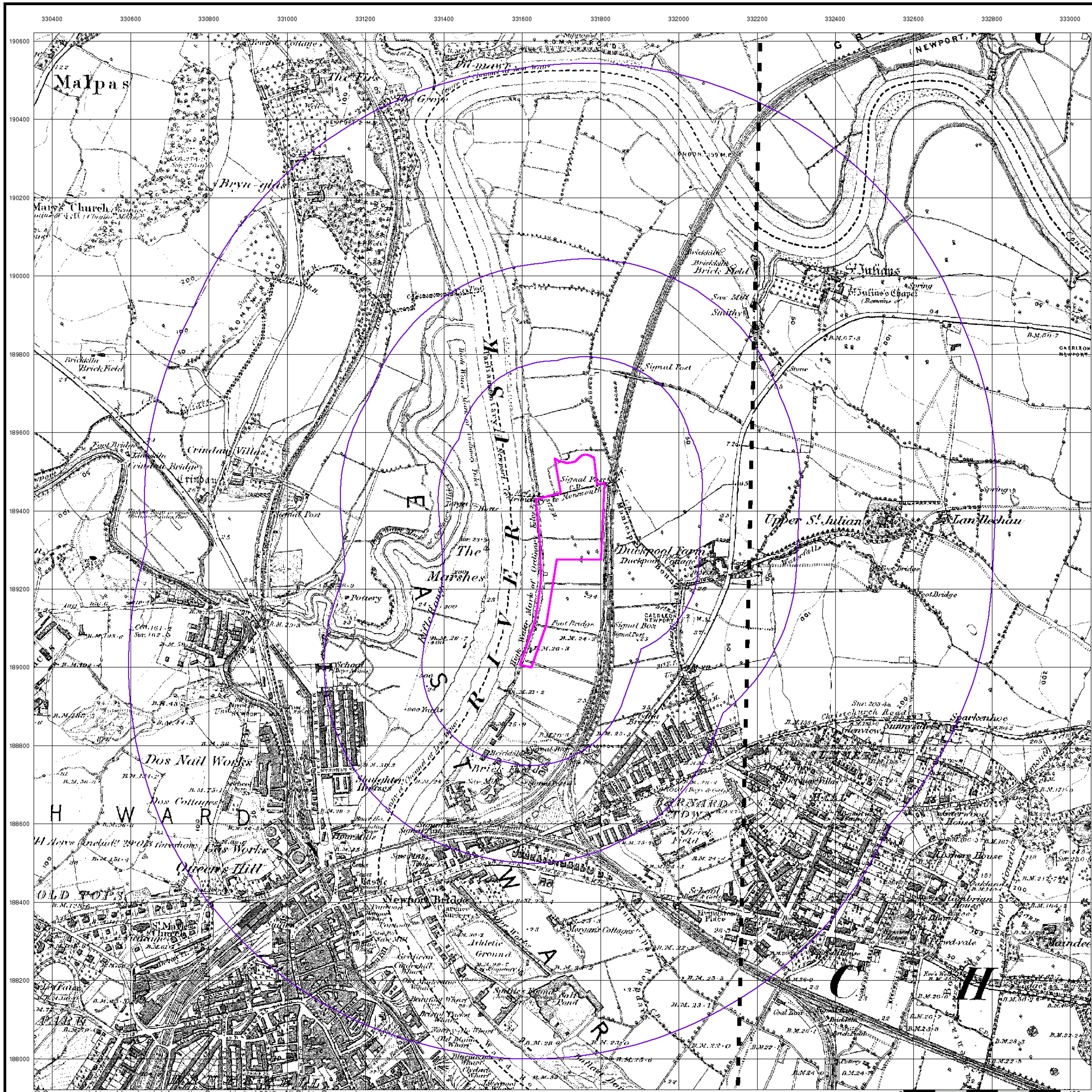

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Monmouthshire

Published 1886

Source map scale - 1:10,560

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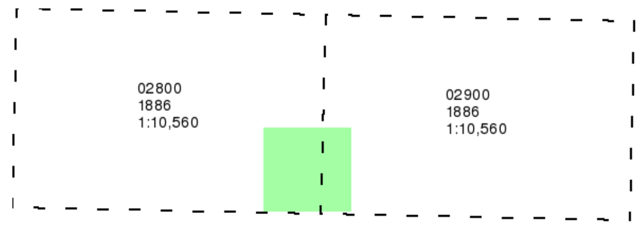
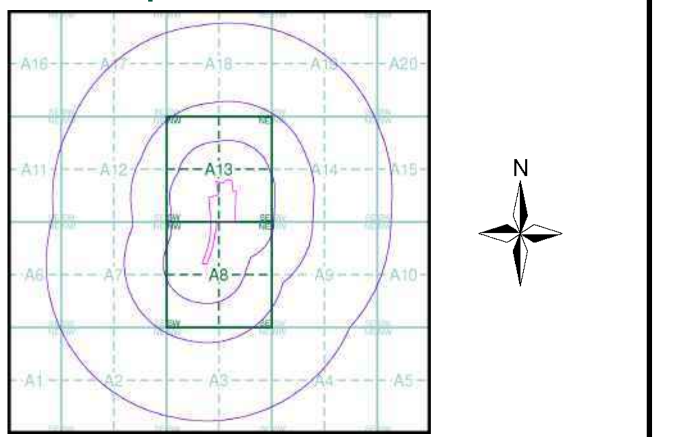
Map Name(s) and Date(s)



Historical Map - Slice A



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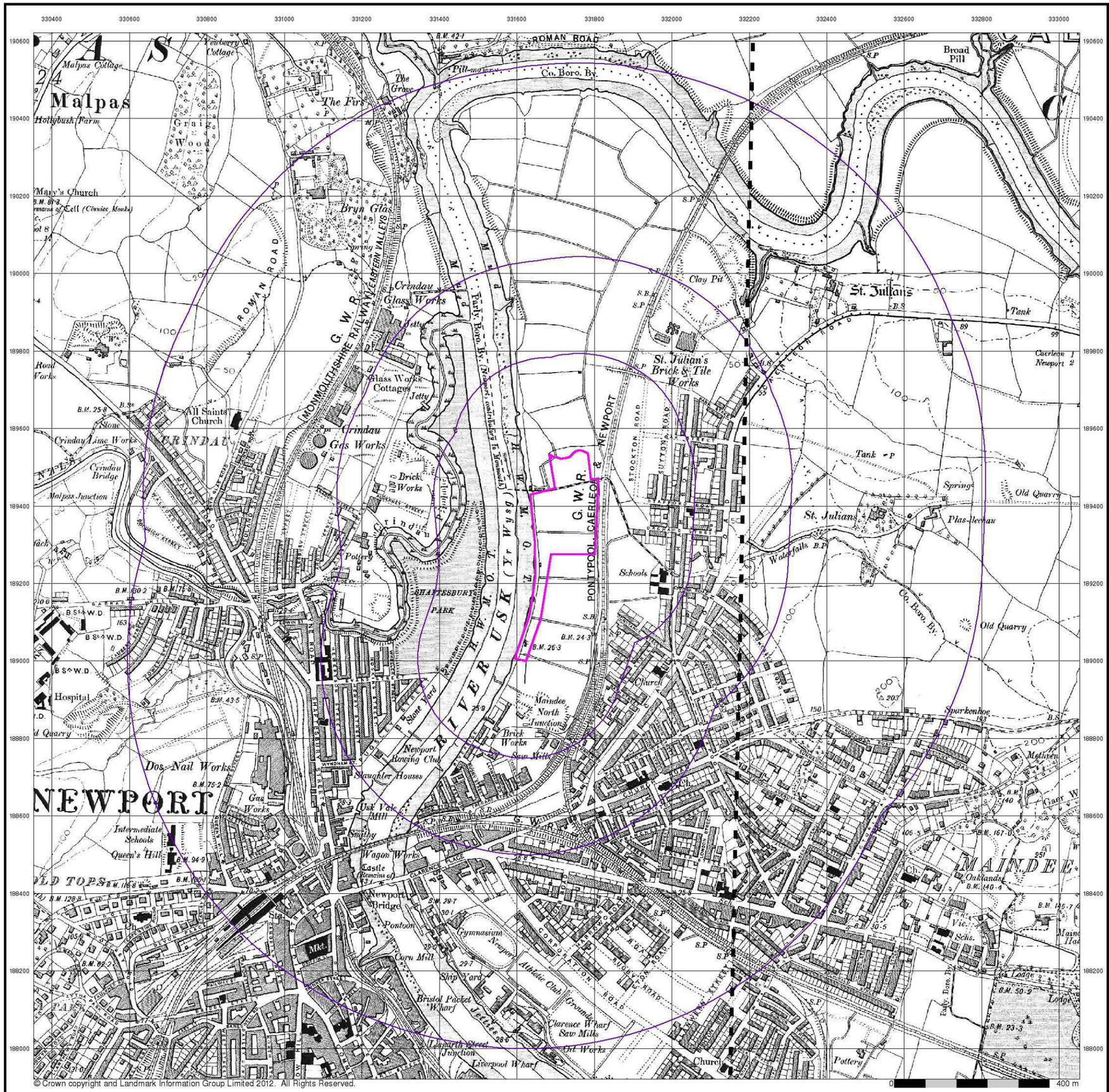

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Monmouthshire

Published 1902

Source map scale - 1:10,560

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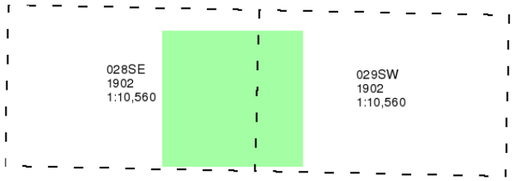
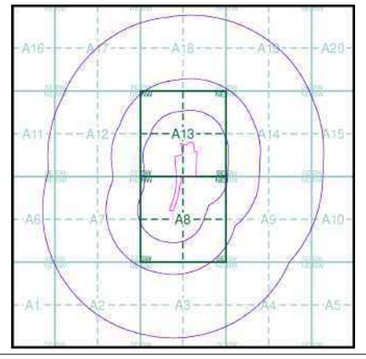
Map Name(s) and Date(s)



Historical Map - Slice A



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Monmouthshire

Published 1922

Source map scale - 1:10,560

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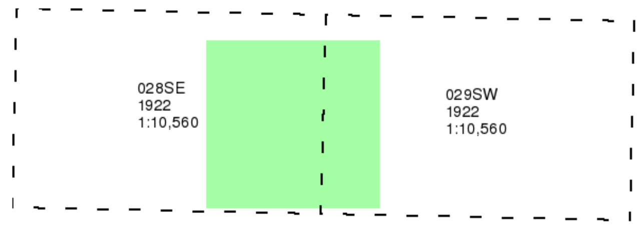
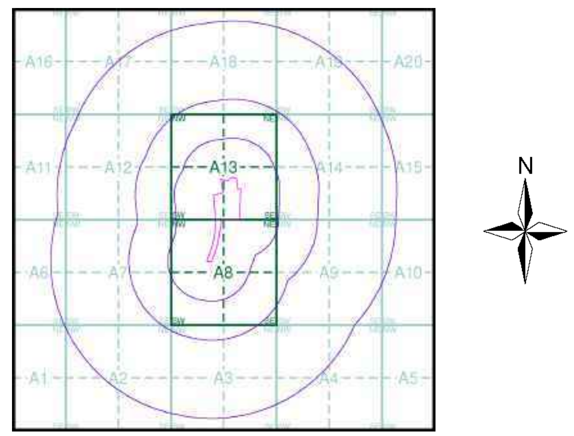
Map Name(s) and Date(s)



Historical Map - Slice A



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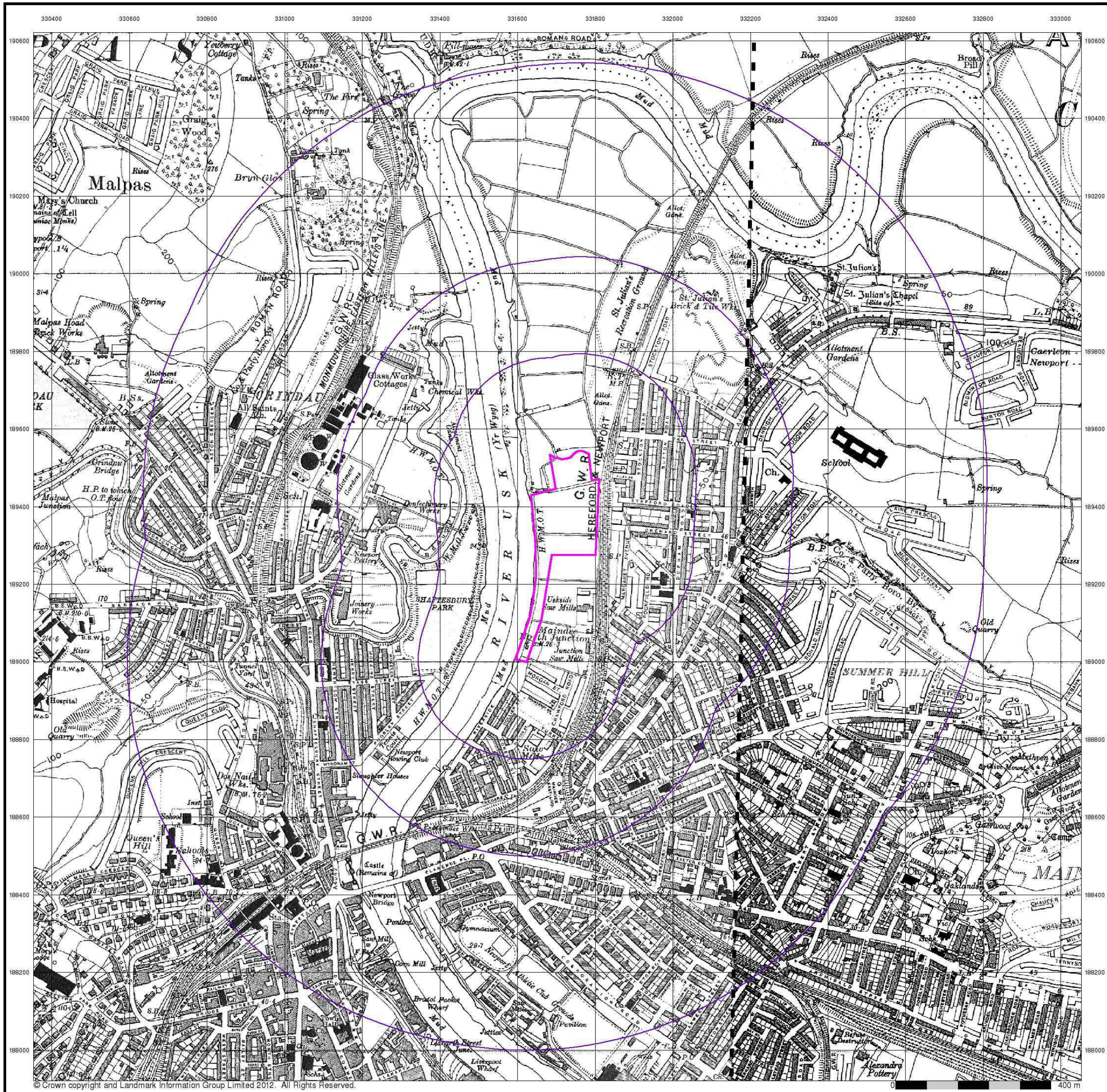


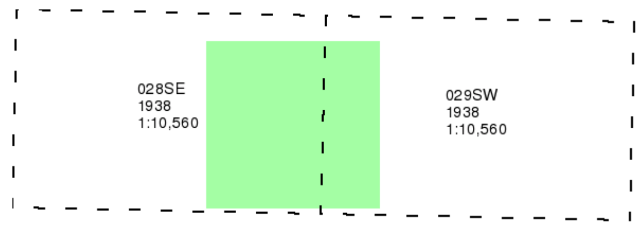
Monmouthshire

Published 1938

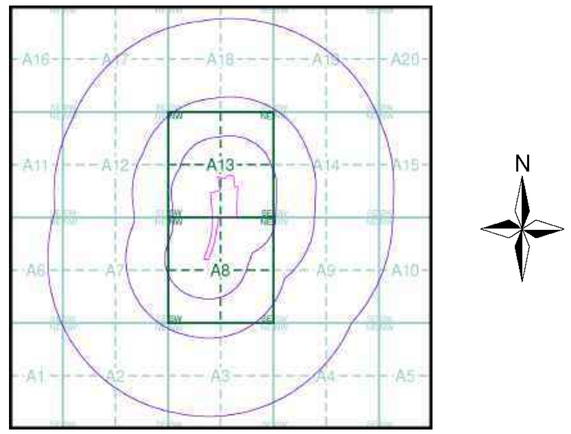
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



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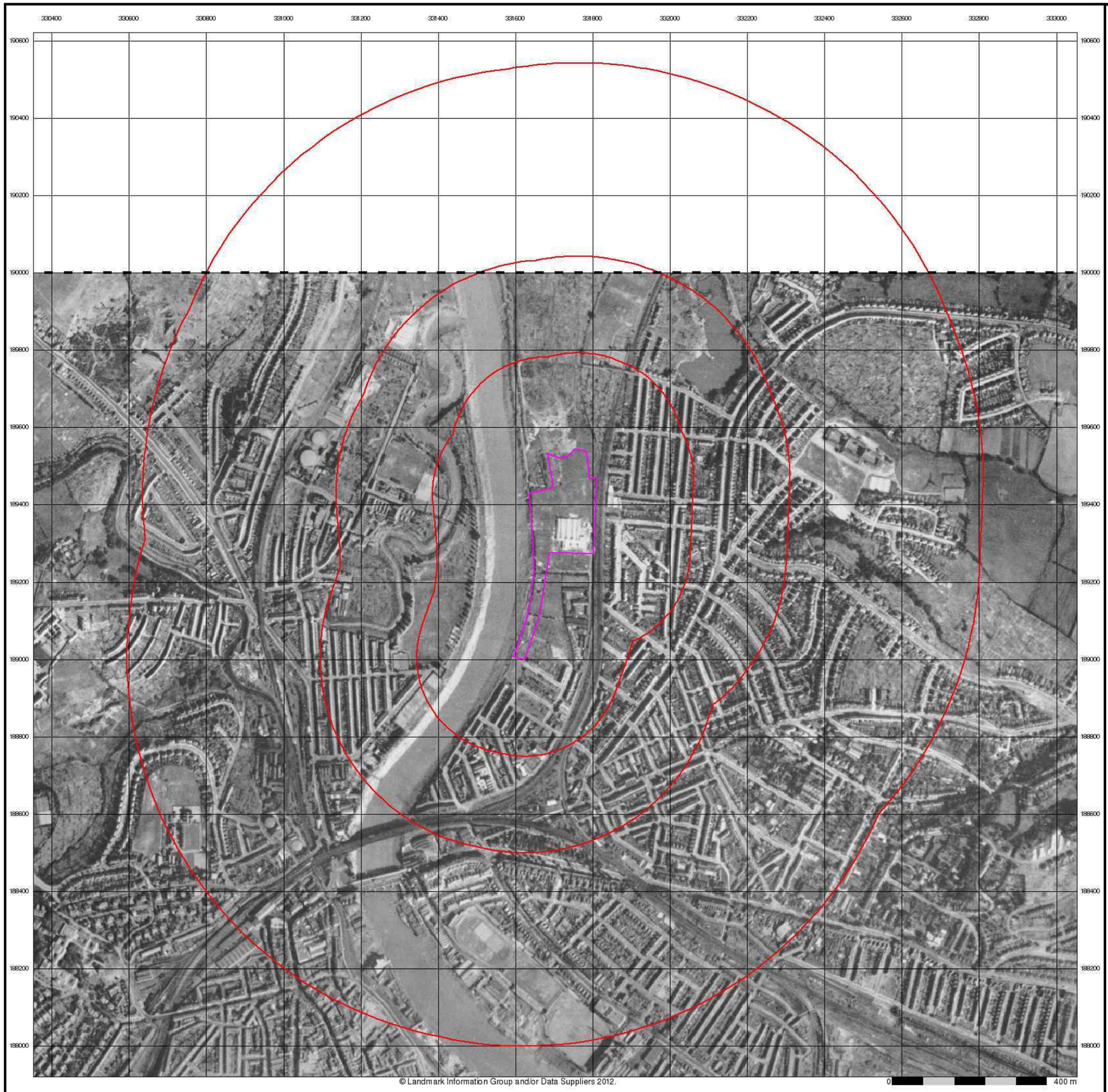

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Historical Aerial Photography

Published 1947

Source map scale - 1:10,560

The Historical Aerial Photos were produced by the Ordnance Survey at a scale of 1:1,250 and 1:10,560 from Air Force photography. They were produced between 1944 and 1951 as an interim measure, pending preparation of conventional mapping, due to post war resource shortages. New security measures in the 1950's meant that every photograph was re-checked for potentially unsafe information with security sites replaced by fake fields or clouds. The original editions were withdrawn and only later made available after a period of fifty years although due to the accuracy of the editing, without viewing both revisions it is not easy to spot the edits. Where available Landmark have included both revisions.

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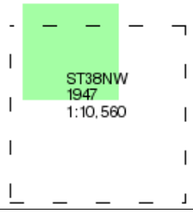
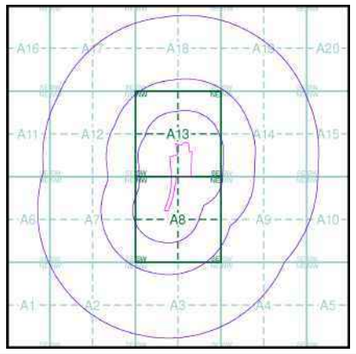
Map Name(s) and Date(s)



Historical Aerial Photography - Slice A



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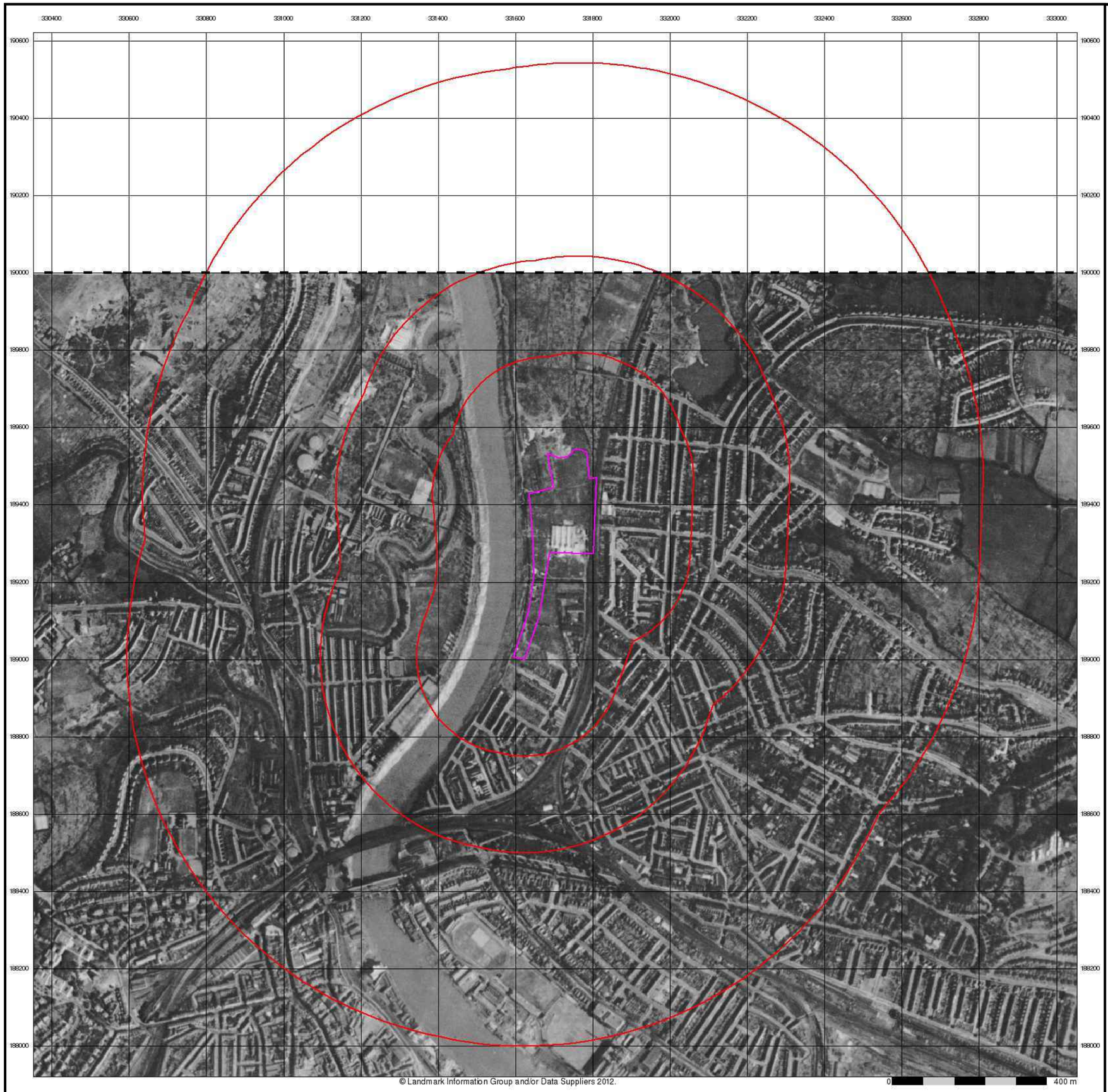

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Historical Aerial Photography

Published 1947

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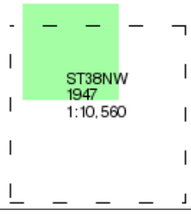
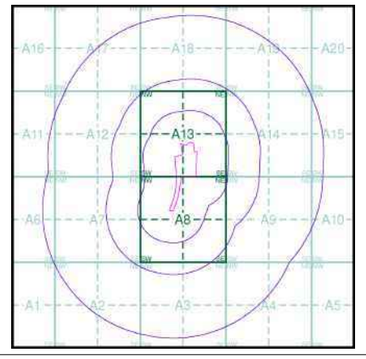


Historical Aerial Photography - Slice A



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Monmouthshire

Published 1954

Source map scale - 1:10,560

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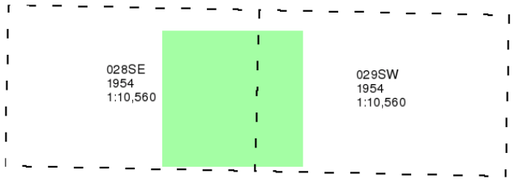
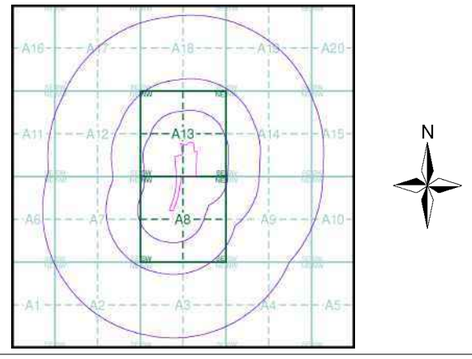


Historical Map - Slice A



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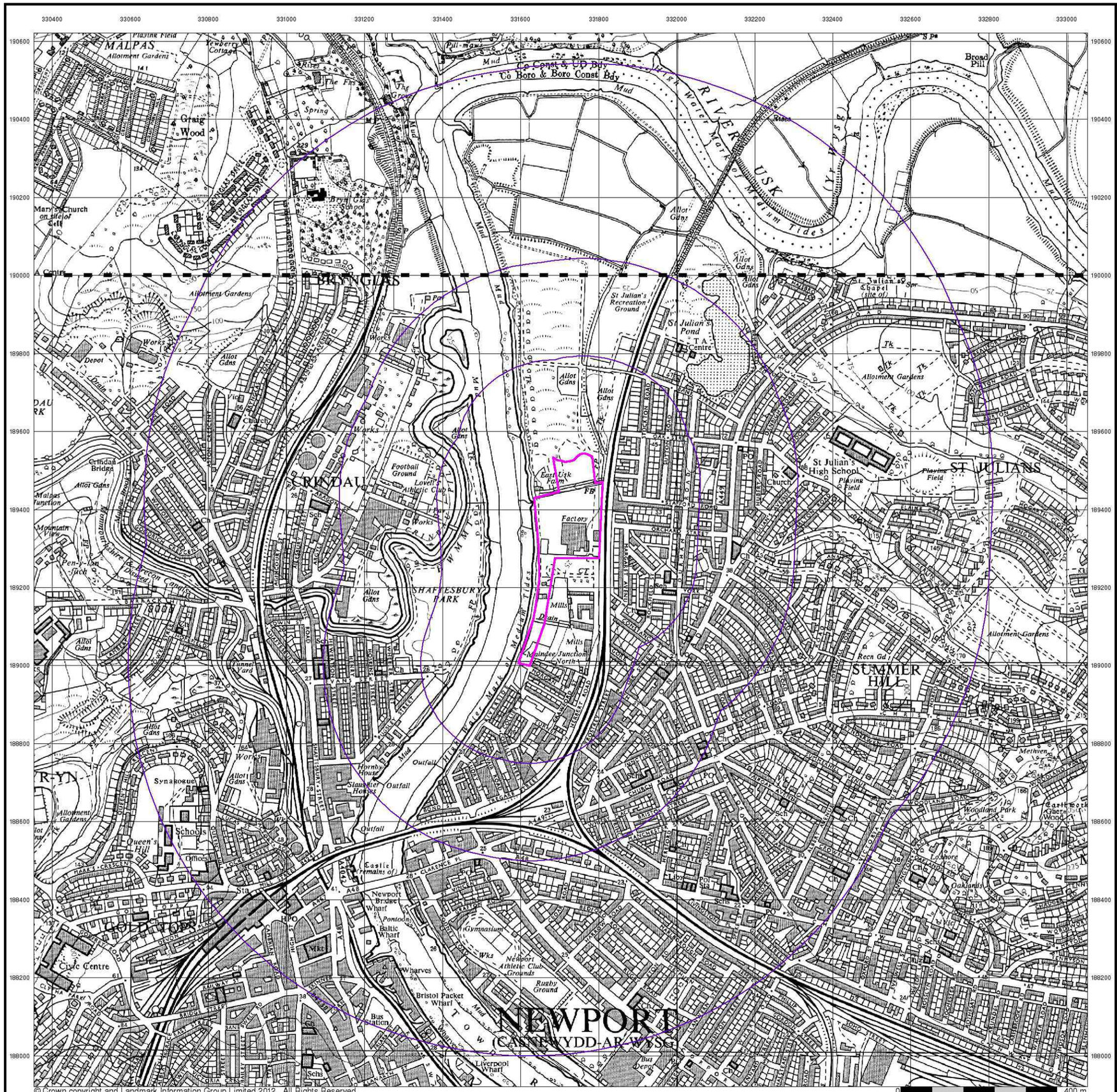

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Ordnance Survey Plan

Published 1964 - 1965

Source map scale - 1:10,000

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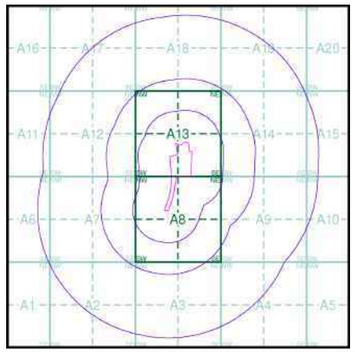
Map Name(s) and Date(s)

ST39SW
1964
1:10,560

ST38NW
1965
1:10,560

Historical Map - Slice A



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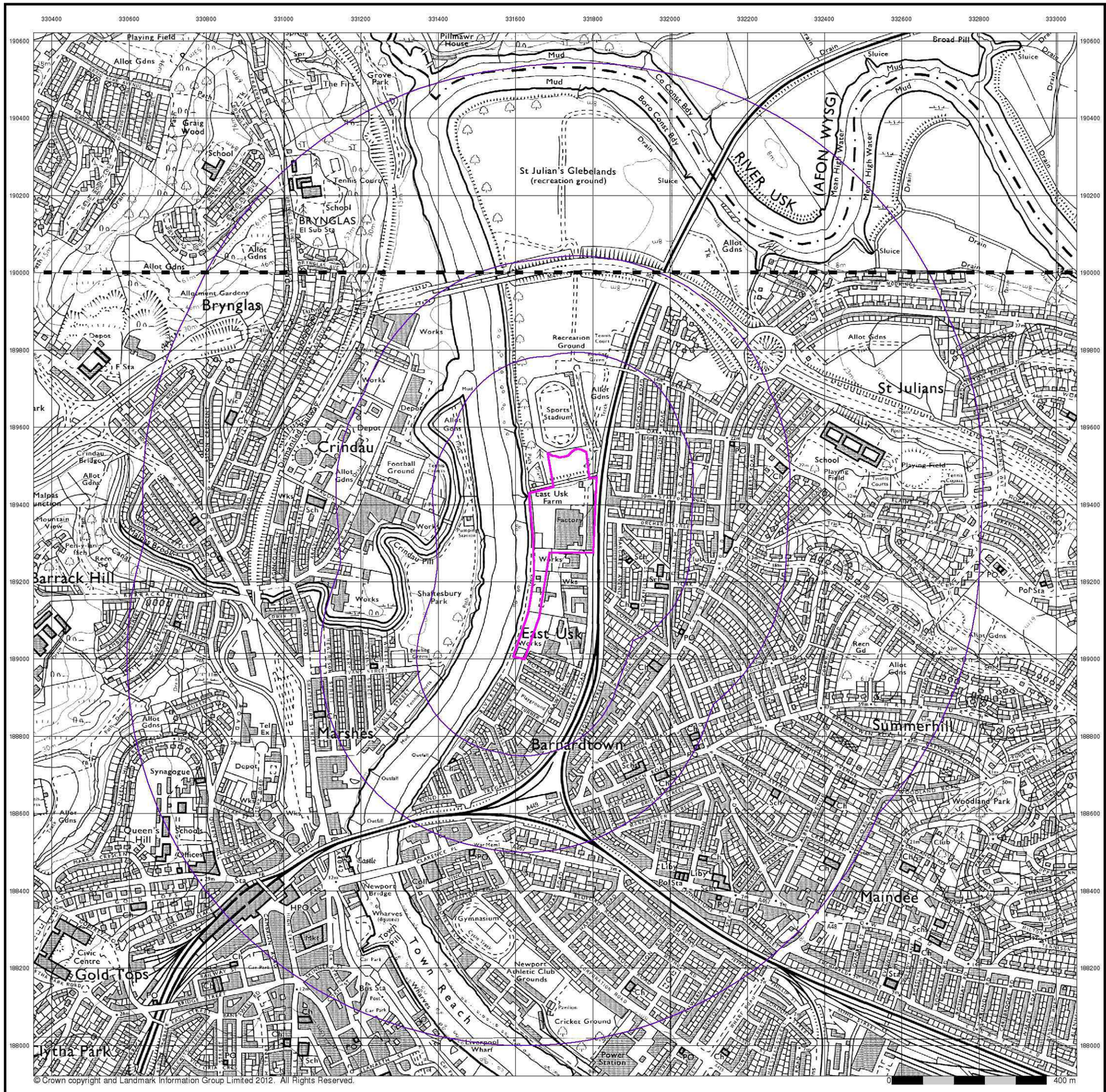

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Ordnance Survey Plan

Published 1972 - 1973

Source map scale - 1:10,000

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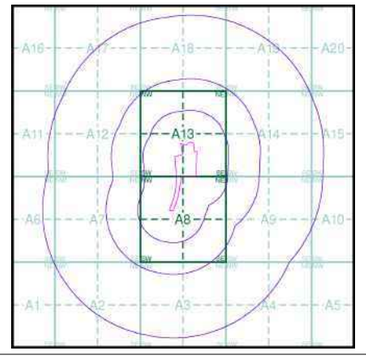
Map Name(s) and Date(s)

ST39SW
1972
1:10,000

ST38NW
1973
1:10,000

Historical Map - Slice A



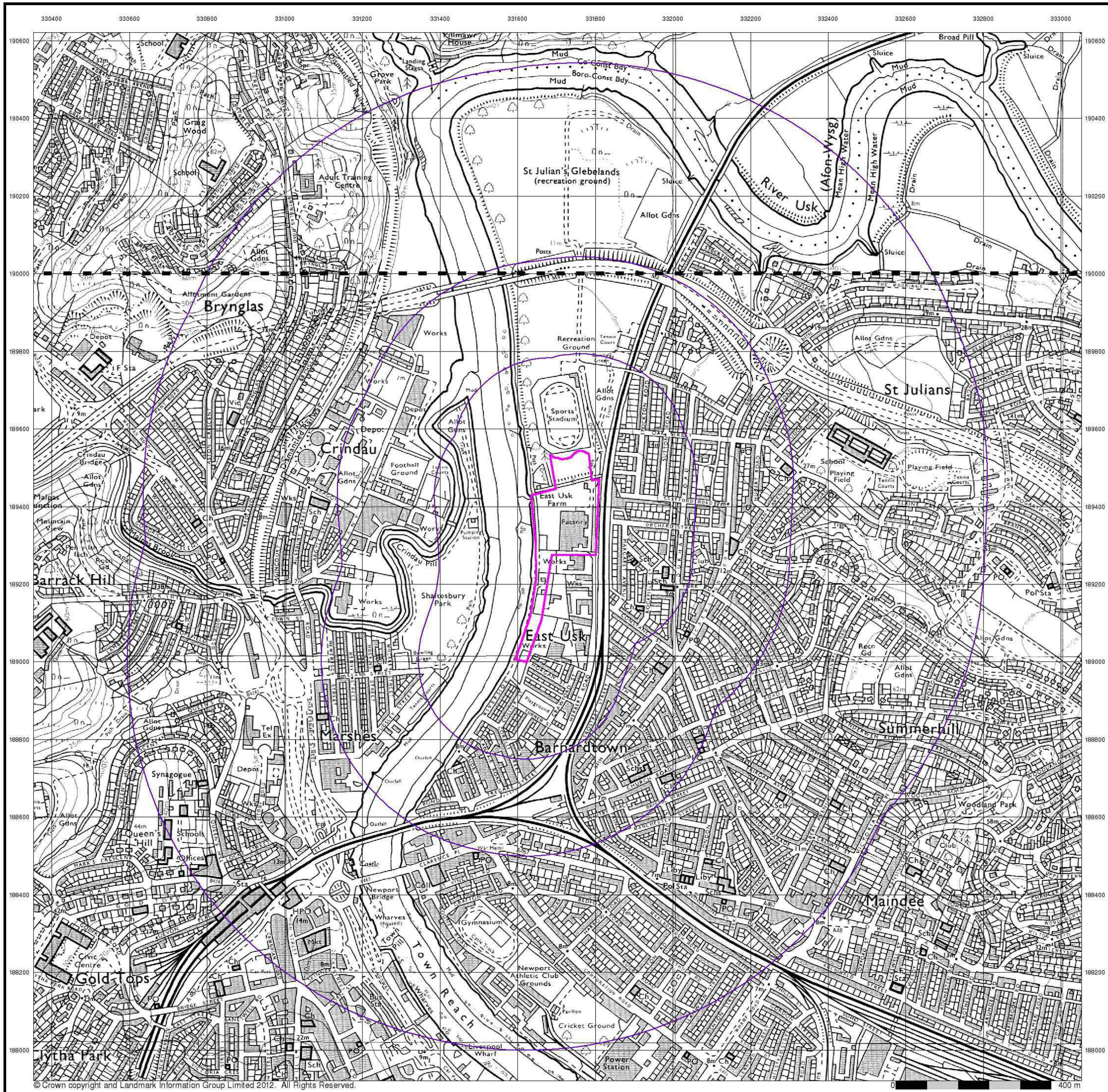
Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	1000

Site Details

., Herbert Road, NEWPORT, Gwent, NP19 7BH

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



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Ordnance Survey Plan

Published 1981 - 1983

Source map scale - 1:10,000

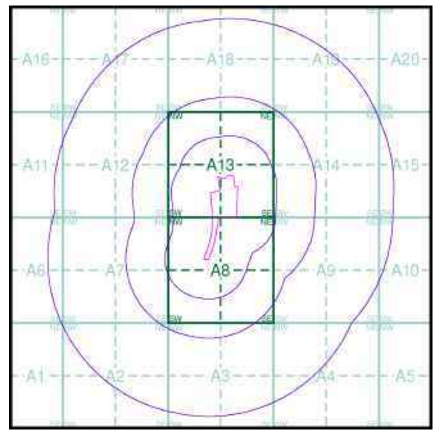
The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

ST39SW
1983
1:10,000

ST38NW
1981
1:10,000

Historical Map - Slice A



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Order Details

Order Number:	41914630_1_1
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National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	1000

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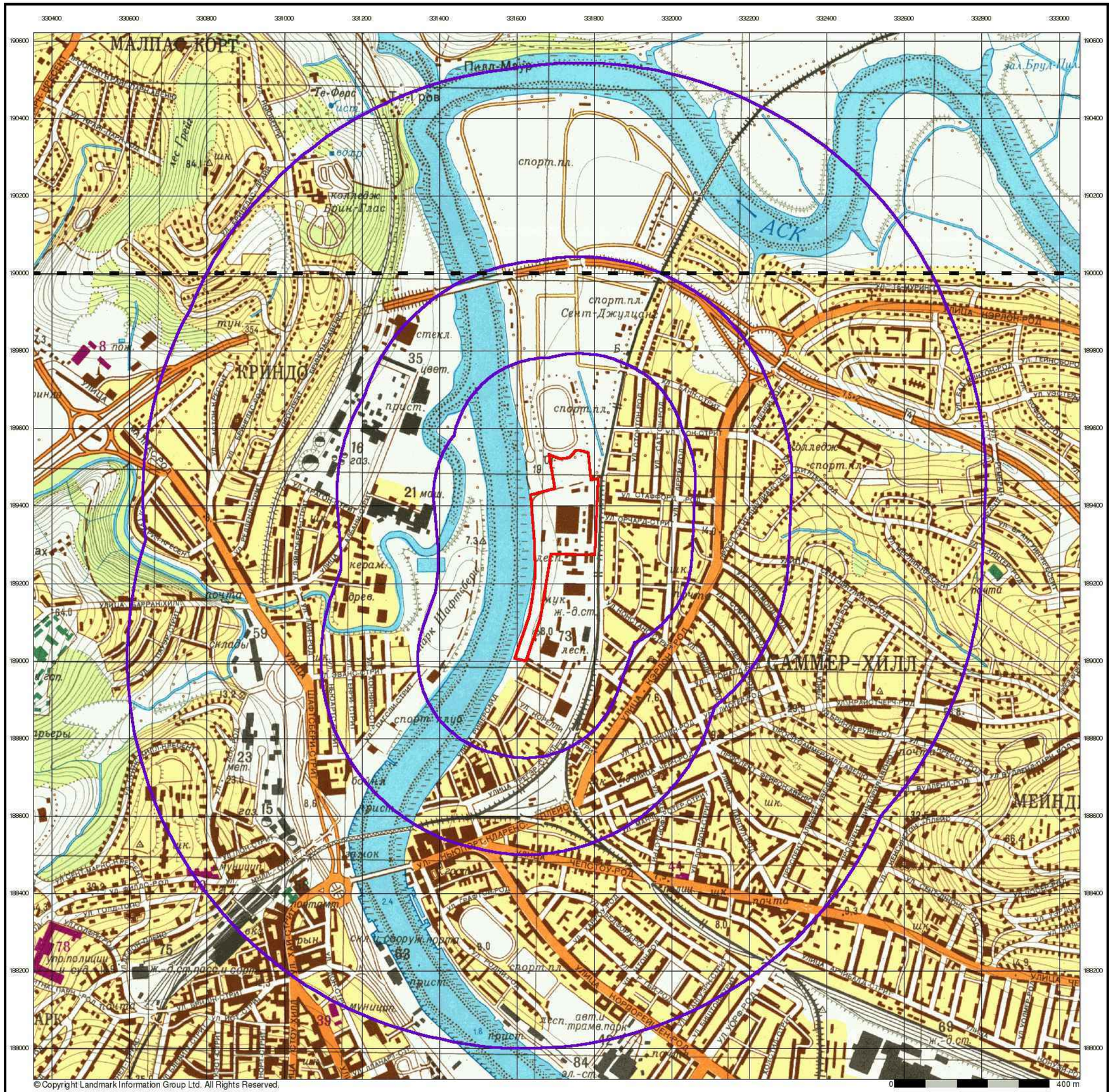
A Landmark Information Group Service v47.0 12-Oct-2012



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Newport

Published 1983

Source map scale - 1:10,000

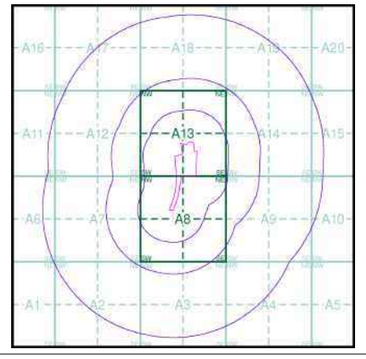
These maps were produced by the Russian military during the Cold War between 1950 and 1997, and cover 103 towns and cities throughout the U.K. The maps are produced at 1:25,000, 1:10,000 and 1:5,000 scale, and show detailed land use, with colour-coded areas for development, green areas, and non-developed areas. Buildings are coloured black and important building uses (such as hospitals, post offices, factories etc.) are numbered, with a numbered key describing their use.
They were produced by the Russians for the benefit of navigation, as well as strategic military sites and transport hubs, for use if they were to have invaded the U.K. The detailed information provided indicates that the areas were surveyed using land-based personnel, on the ground, in the cities that are mapped.

Map Name(s) and Date(s)

ST39SW
1983
1:10,000

ST38NW
1983
1:10,000

Russian Map - Slice A



Order Details

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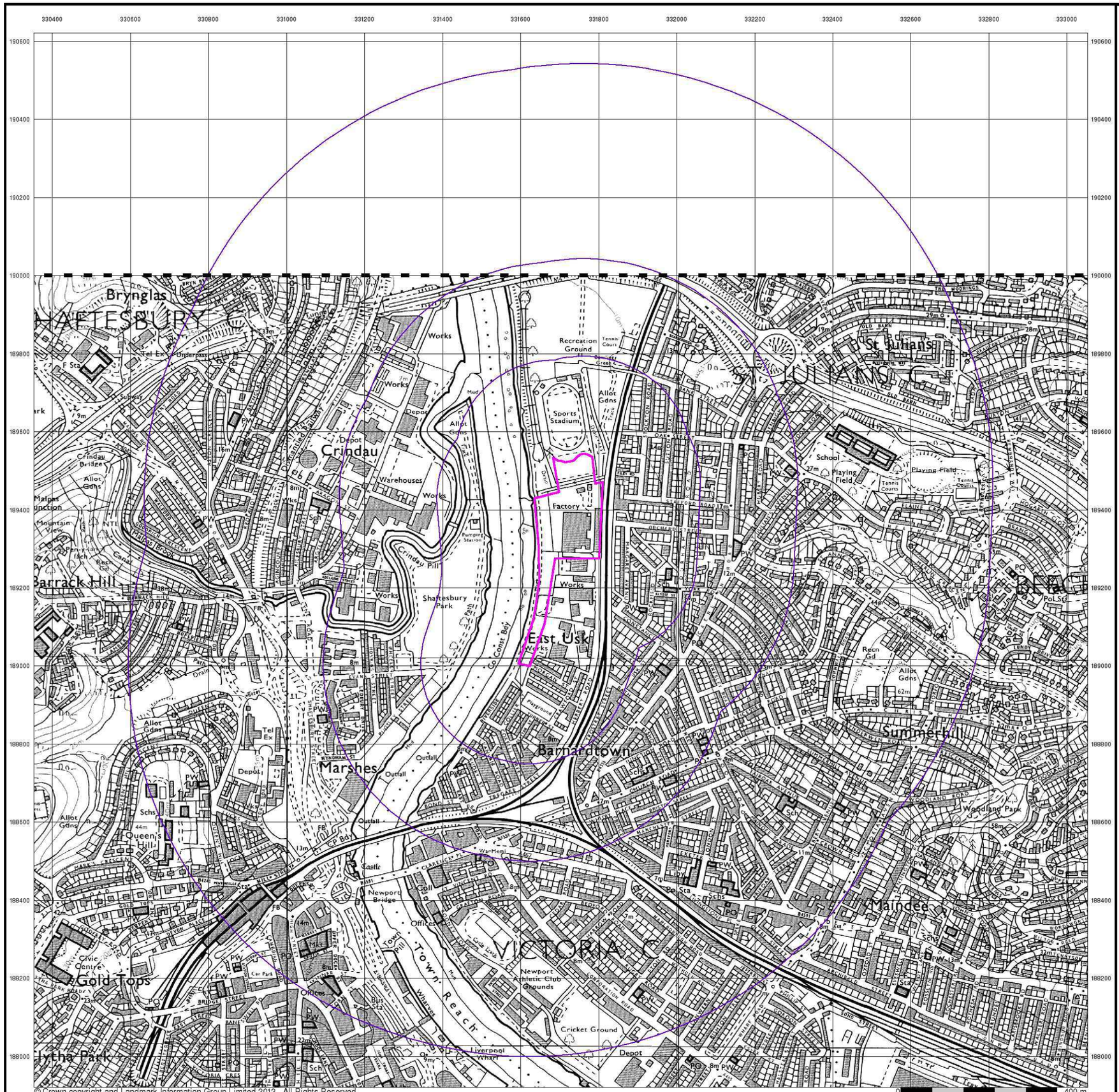

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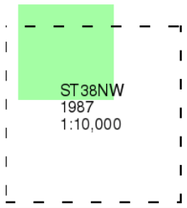
Ordnance Survey Plan

Published 1987

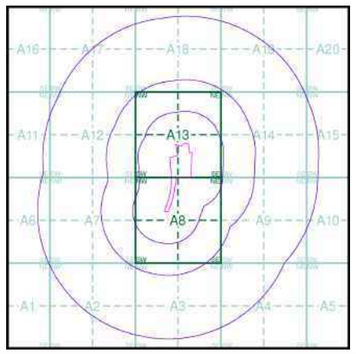
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



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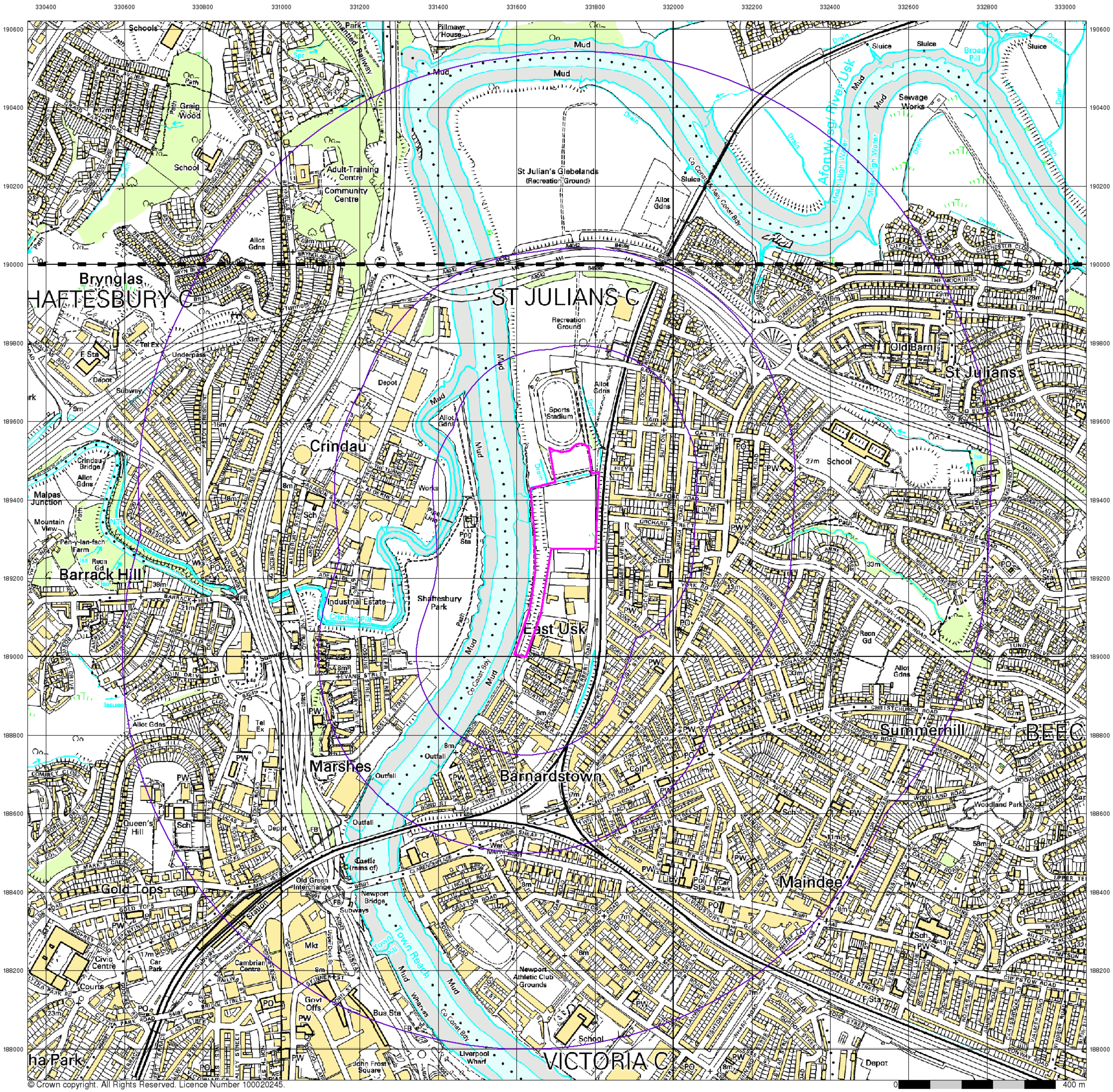

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10k Raster Mapping

Published 2006

Source map scale - 1:10,000

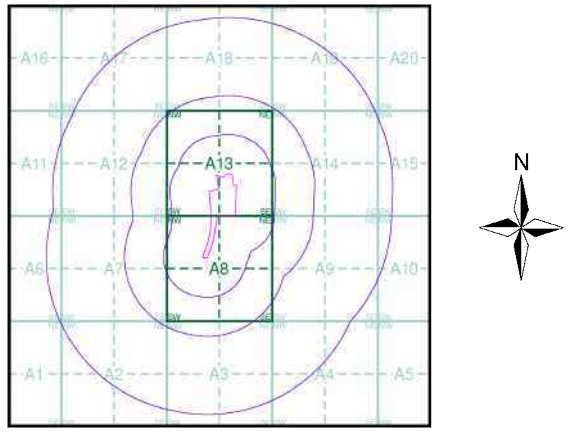
The historical maps shown were produced from the Ordnance Survey`s 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)

ST39SW
2006
1:10,000

ST38NW
2006
1:10,000

Historical Map - Slice A



Order Details

Order Number: 41914630_1_1
Customer Ref: 12044
National Grid Reference: 331690, 189280
Slice: A
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Site Details

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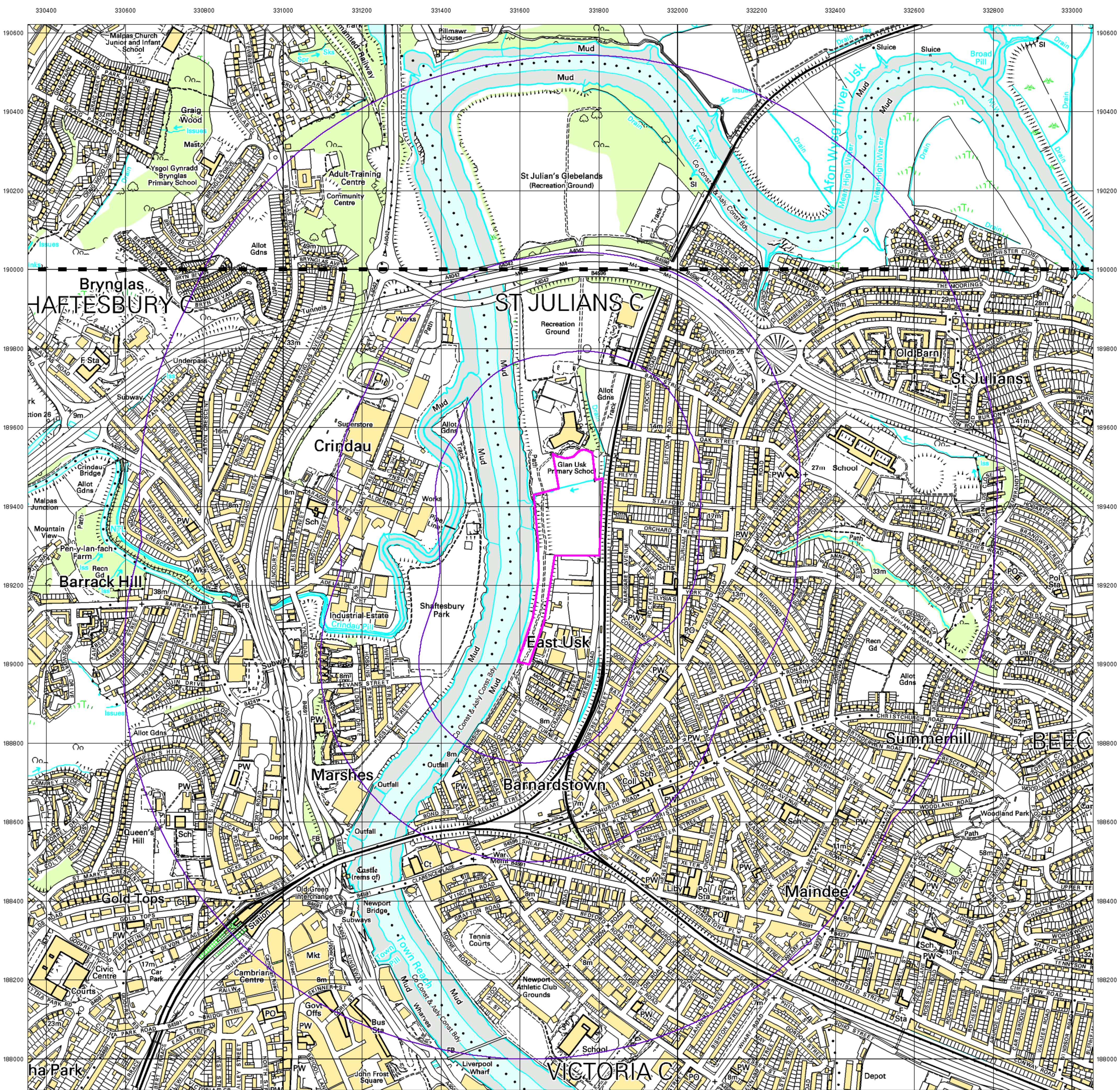

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10k Raster Mapping

Published 2012

Source map scale - 1:10,000

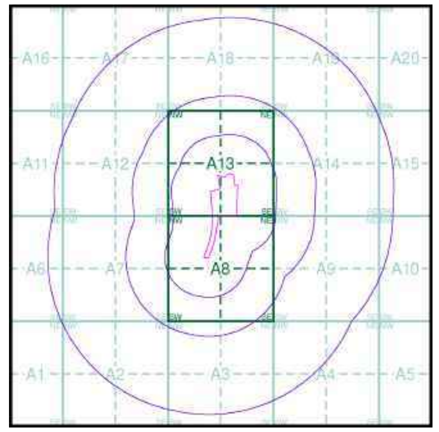
The historical maps shown were produced from the Ordnance Survey`s 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)

ST39SW
2012
1:10,000

ST38NW
2012
1:10,000

Historical Map - Slice A



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Order Details

Order Number: 41914630_1_1
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National Grid Reference: 331690, 189280
Slice: A
Site Area (Ha): 4.52
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Site Details

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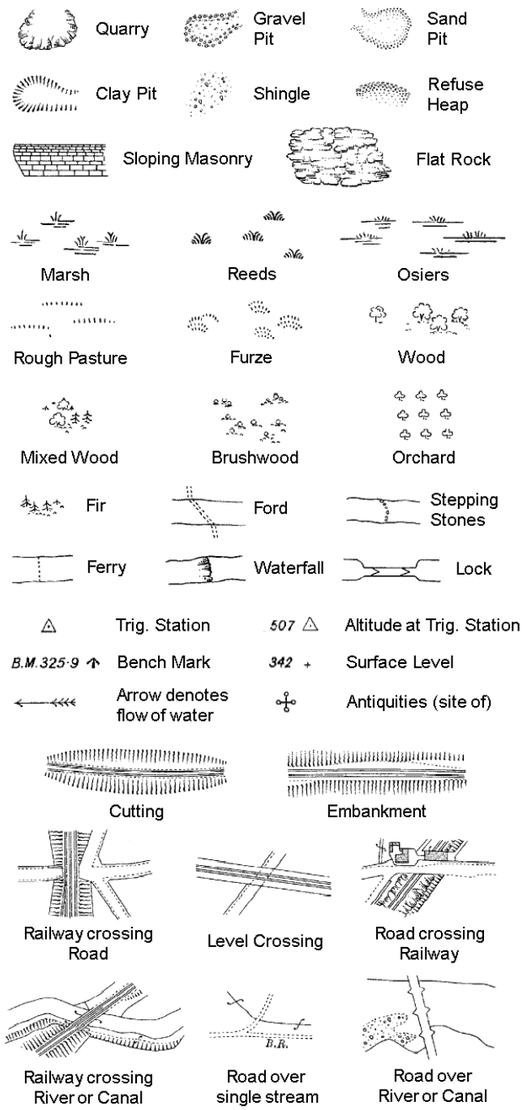
Historical Mapping Legends

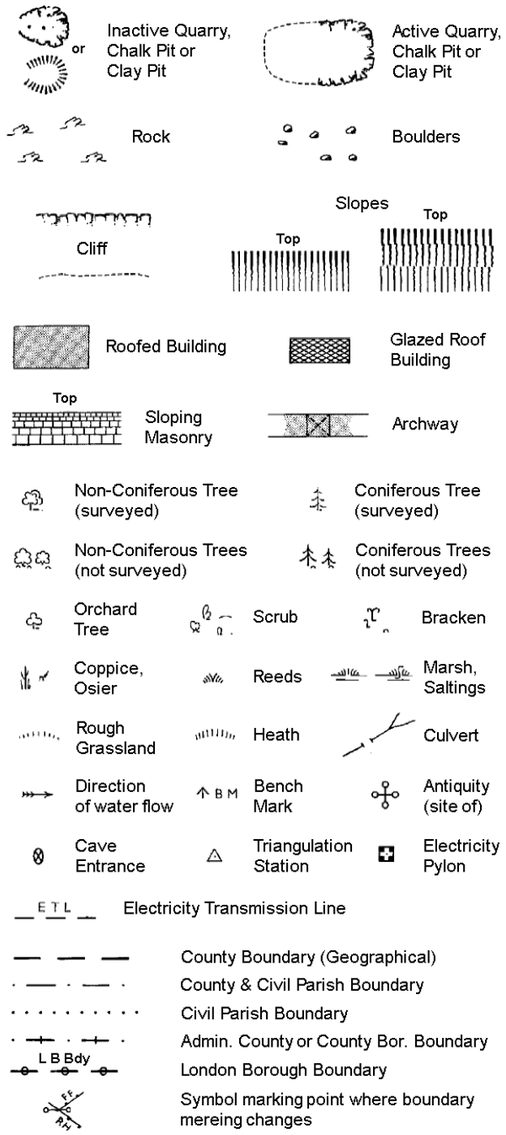
Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



County Boundary (Geographical)
County & Civil Parish Boundary
Administrative County & Civil Parish Boundary
Co. Boro. Bdy. County Borough Boundary (England)
Co. Burgh Bdy. County Burgh Boundary (Scotland)

B P B S	Boundary Post or Stone	P.C.B	Police Call Box
B.R.	Bridle Road	P	Pump
E.P	Electricity Pylon	S.P	Signal Post
F.B.	Foot Bridge	Sl.	Sluice
F.P.	Foot Path	Sp.	Spring
G.P	Guide Post or Board	T.C.B	Telephone Call Box
M.S	Mile Stone	Tr.	Trough
M.P M.R	Mooring Post or Ring	W	Well

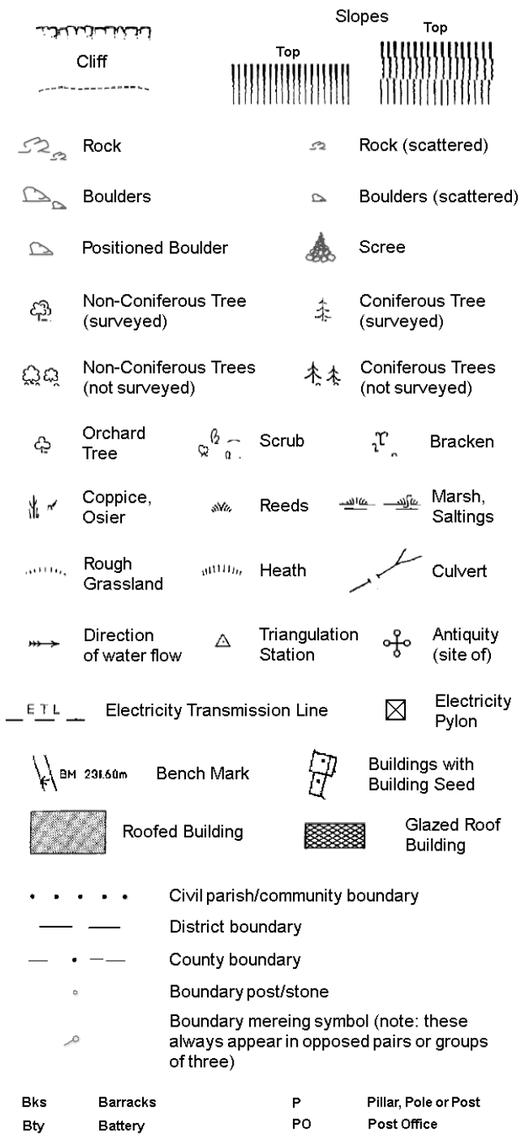
Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information 1:2,500 and 1:1,250



County Boundary (Geographical)
County & Civil Parish Boundary
Civil Parish Boundary
Admin. County or County Bor. Boundary
L B Bdy London Borough Boundary
Symbol marking point where boundary mereing changes

BH	Beer House	P	Pillar, Pole or Post
BP, BS	Boundary Post or Stone	PO	Post Office
Cn, C	Capstan, Crane	PC	Public Convenience
Chy	Chimney	PH	Public House
D Fn	Drinking Fountain	Pp	Pump
El P	Electricity Pillar or Post	SB, S Br	Signal Box or Bridge
FAP	Fire Alarm Pillar	SP, SL	Signal Post or Light
FB	Foot Bridge	Spr	Spring
GP	Guide Post	Tk	Tank or Track
H	Hydrant or Hydraulic	TCB	Telephone Call Box
LC	Level Crossing	TCP	Telephone Call Post
MH	Manhole	Tr	Trough
MP	Mile Post or Mooring Post	Wr Pt, Wr T	Water Point, Water Tap
MS	Mile Stone	W	Well
NTL	Normal Tidal Limit	Wd Pp	Wind Pump

Large-Scale National Grid Data 1:2,500 and 1:1,250



Civil parish/community boundary
District boundary
County boundary
Boundary post/stone
Boundary mereing symbol (note: these always appear in opposed pairs or groups of three)

Bks	Barracks	P	Pillar, Pole or Post
Bty	Battery	PO	Post Office
Cemy	Cemetery	PC	Public Convenience
Chy	Chimney	Pp	Pump
Cis	Cistern	Ppg Sta	Pumping Station
Dismtd Rly	Dismantled Railway	PW	Place of Worship
El Gen Sta	Electricity Generating Station	Sewage Ppg Sta	Sewage Pumping Station
El P	Electricity Pole, Pillar	SB, S Br	Signal Box or Bridge
El Sub Sta	Electricity Sub Station	SP, SL	Signal Post or Light
FB	Filter Bed	Spr	Spring
Fn / D Fn	Fountain / Drinking Ftn.	Tk	Tank or Track
Gas Gov	Gas Valve Compound	Tr	Trough
GVC	Gas Governer	Wd Pp	Wind Pump
GP	Guide Post	Wr Pt, Wr T	Water Point, Water Tap
MH	Manhole	Wks	Works (building or area)
MP, MS	Mile Post or Mile Stone	W	Well

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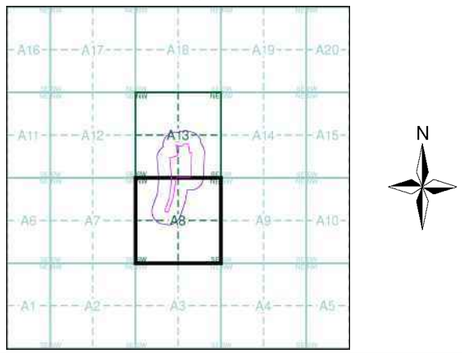
Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Monmouthshire	1:2,500	1883	2
Monmouthshire	1:2,500	1902	3
Monmouthshire	1:2,500	1920	4
Monmouthshire	1:2,500	1937	5
Ordnance Survey Plan	1:1,250	1955 - 1957	6
Ordnance Survey Plan	1:2,500	1955 - 1957	7
Additional SIMs	1:1,250	1957 - 1992	8
Ordnance Survey Plan	1:1,250	1966 - 1976	9
Ordnance Survey Plan	1:2,500	1969 - 1970	10
Supply of Unpublished Survey Information	1:1,250	1974	11
Additional SIMs	1:1,250	1978 - 1991	12
Additional SIMs	1:1,250	1989	13
Large-Scale National Grid Data	1:1,250	1993	14
Large-Scale National Grid Data	1:1,250	1994 - 1997	15
Large-Scale National Grid Data	1:1,250	1997	16

Historical Map - Segment A8



Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	100

Site Details

., Herbert Road, NEWPORT, Gwent, NP19 7BH

Landmark Information Group

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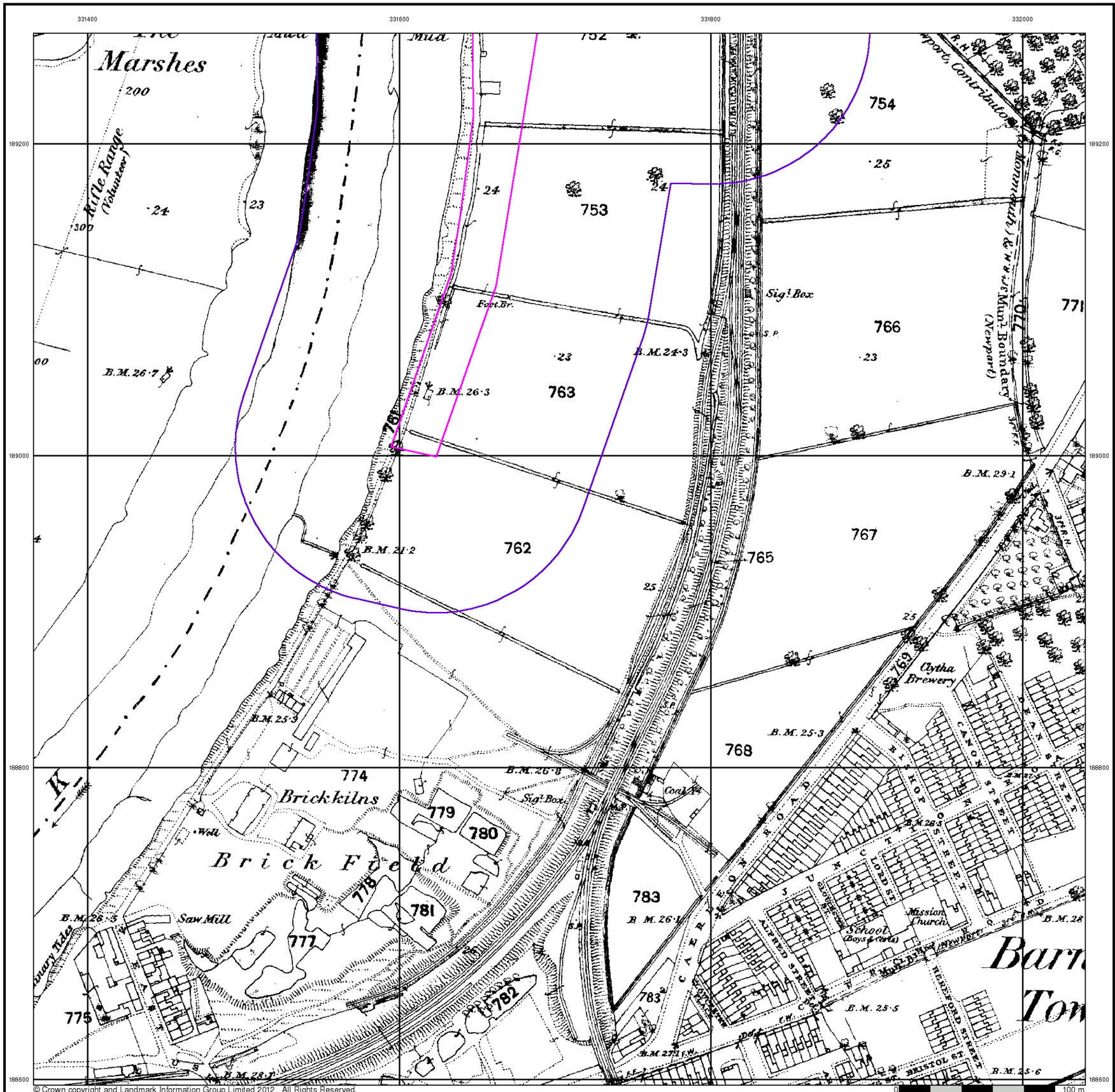

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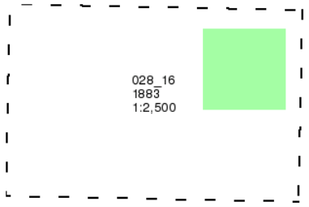
Monmouthshire

Published 1883

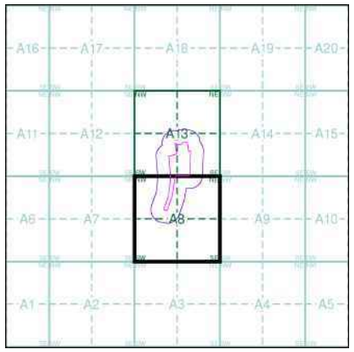
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A8



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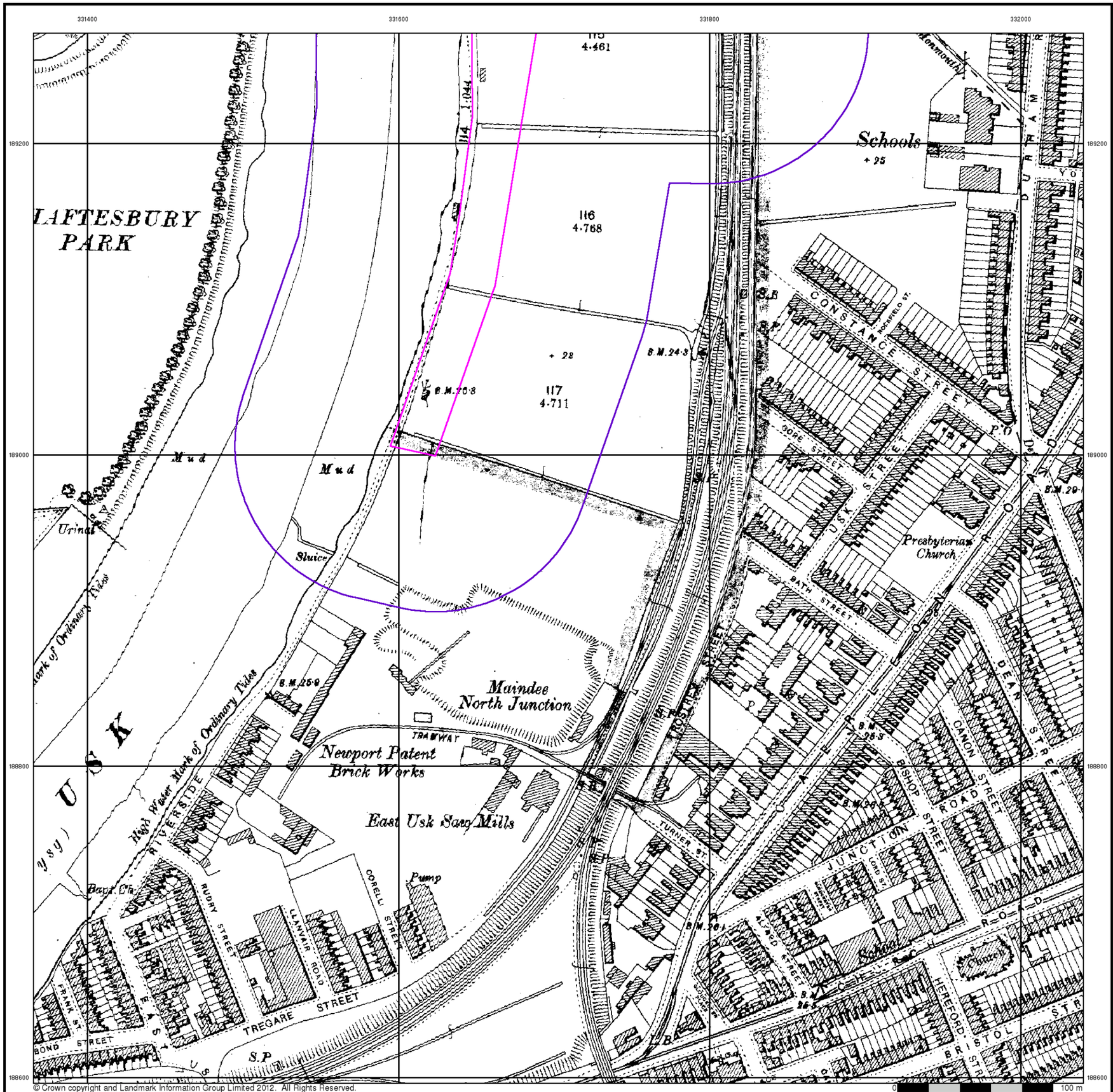

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Monmouthshire

Published 1902

Source map scale - 1:2,500

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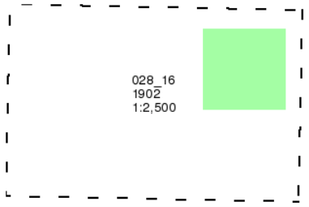
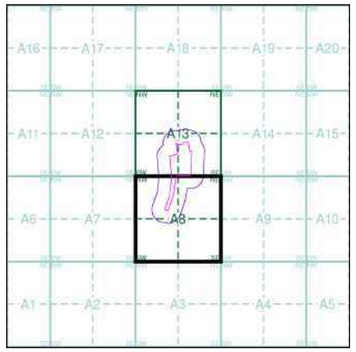


Historical Map - Segment A8



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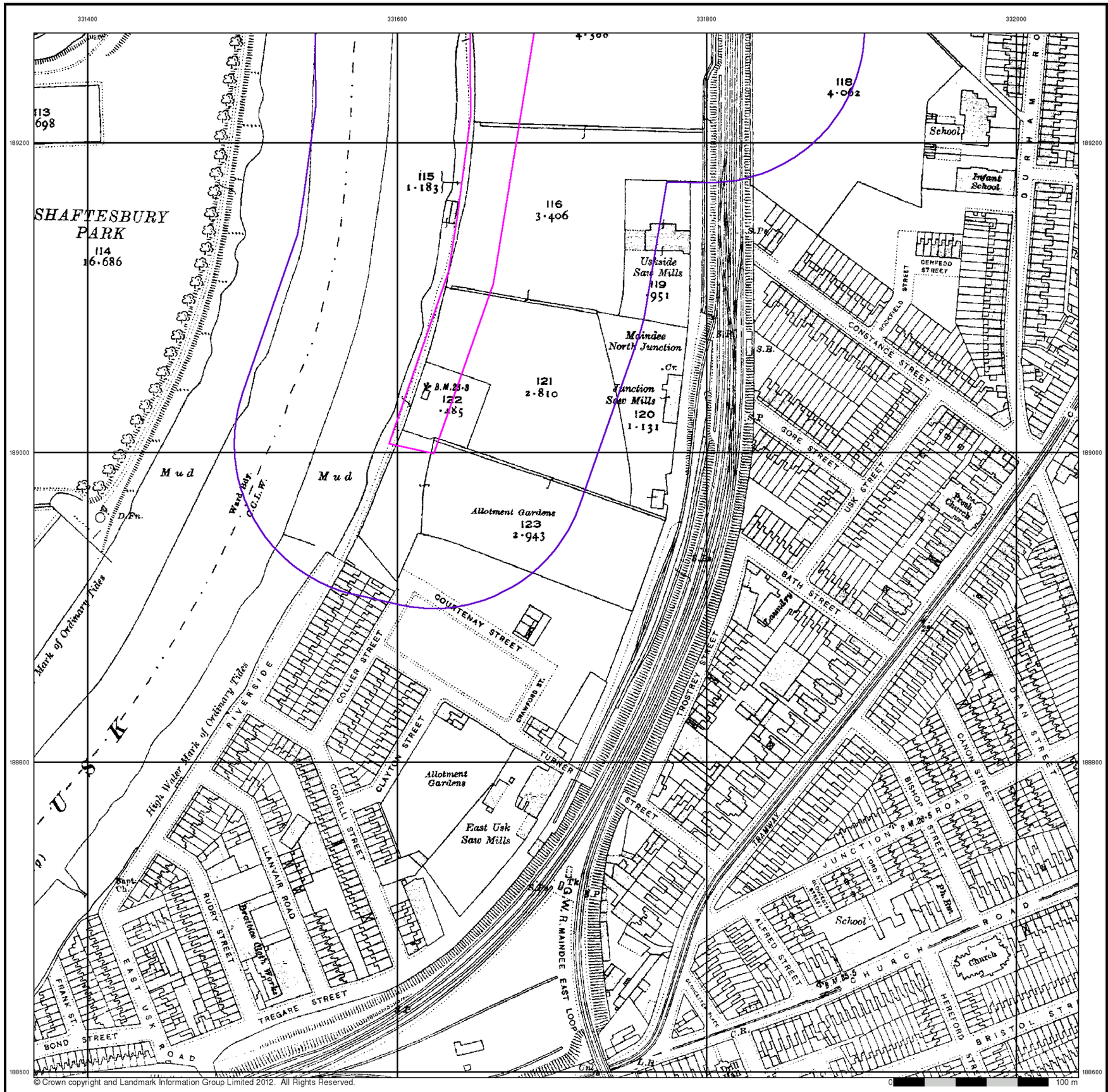

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Monmouthshire

Published 1920

Source map scale - 1:2,500

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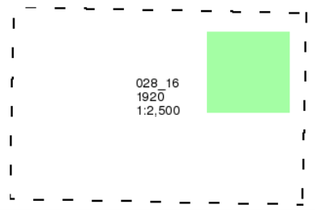
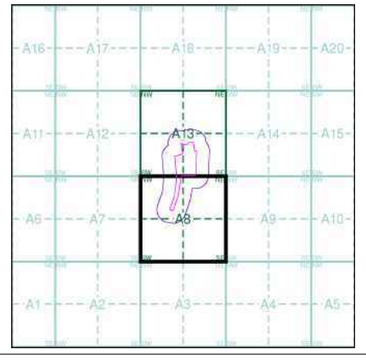
Map Name(s) and Date(s)



Historical Map - Segment A8



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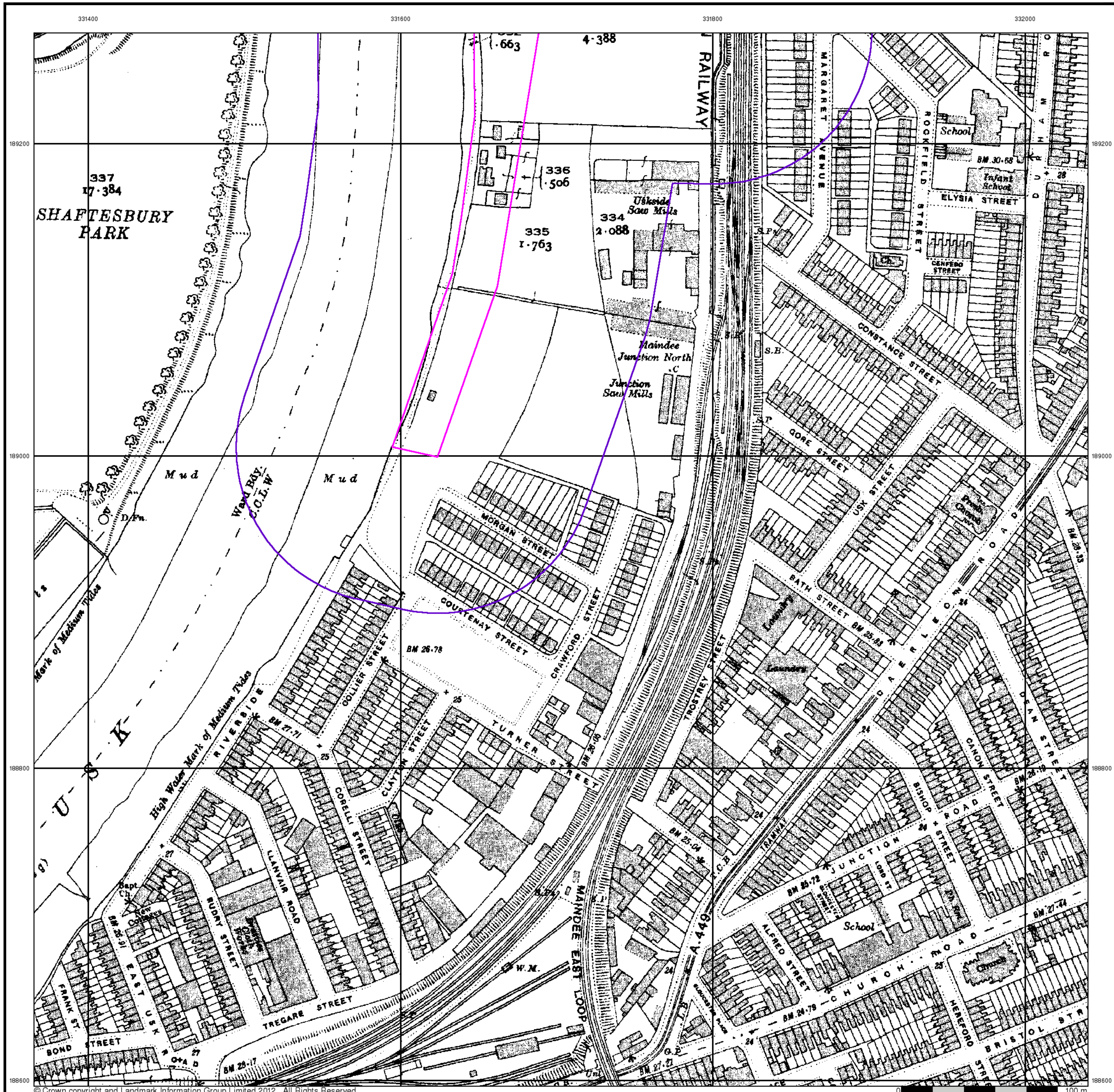

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Monmouthshire

Published 1937

Source map scale - 1:2,500

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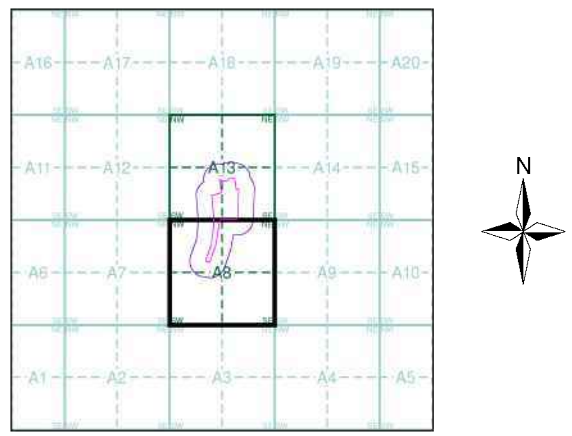
Map Name(s) and Date(s)

028_16
1937
1:2,500

Historical Map - Segment A8



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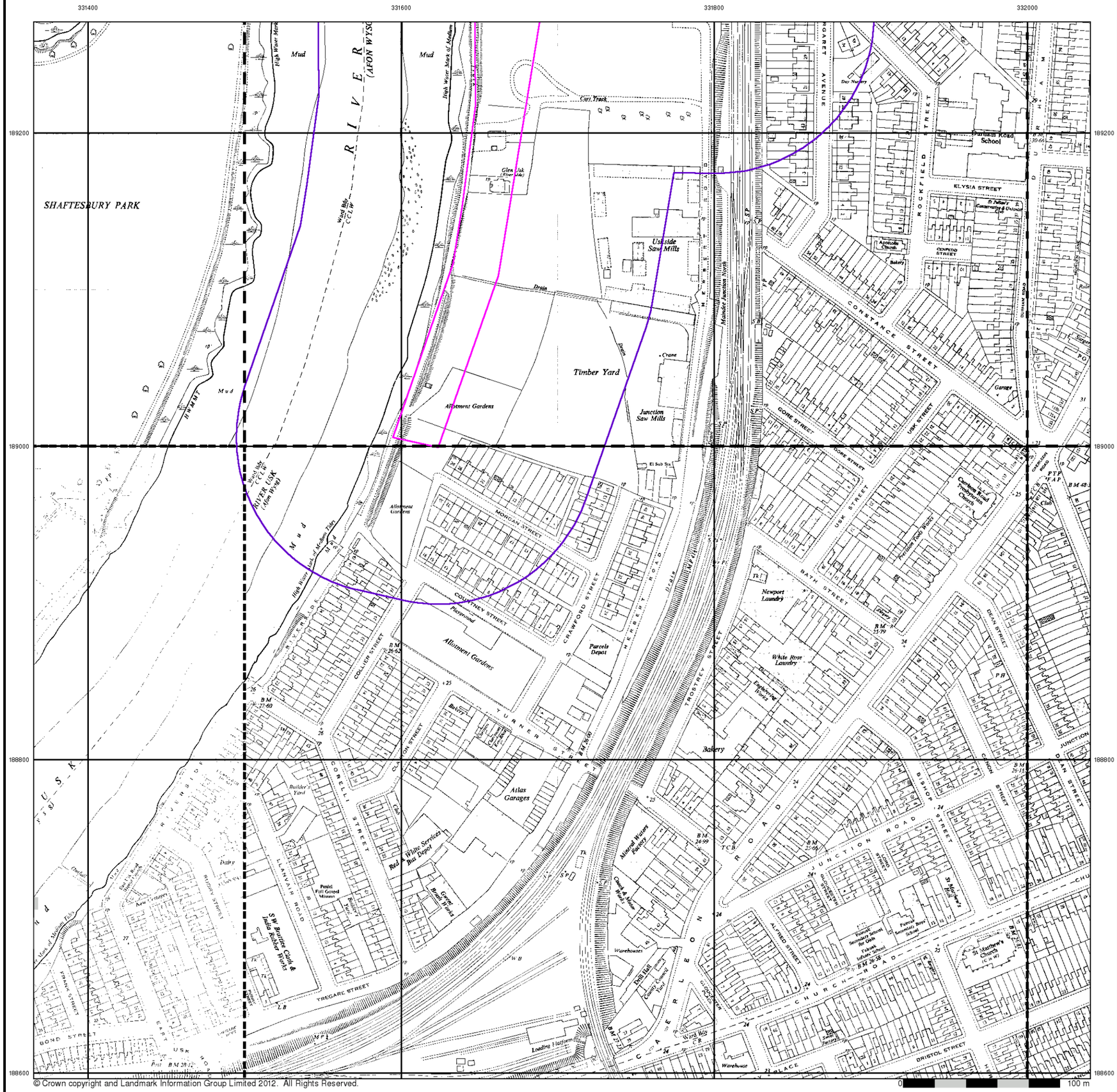

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Ordnance Survey Plan

Published 1955 - 1957

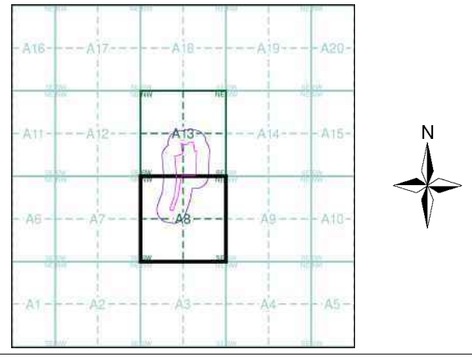
Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

ST3 189SW 1955 1:1,250	ST3 189SE 1955 1:1,250	ST3 289SW 1957 1:1,250
ST3 188NW 1955 1:1,250	ST3 188NE 1955 1:1,250	ST3 288NW 1956 1:1,250

Historical Map - Segment A8



Order Details

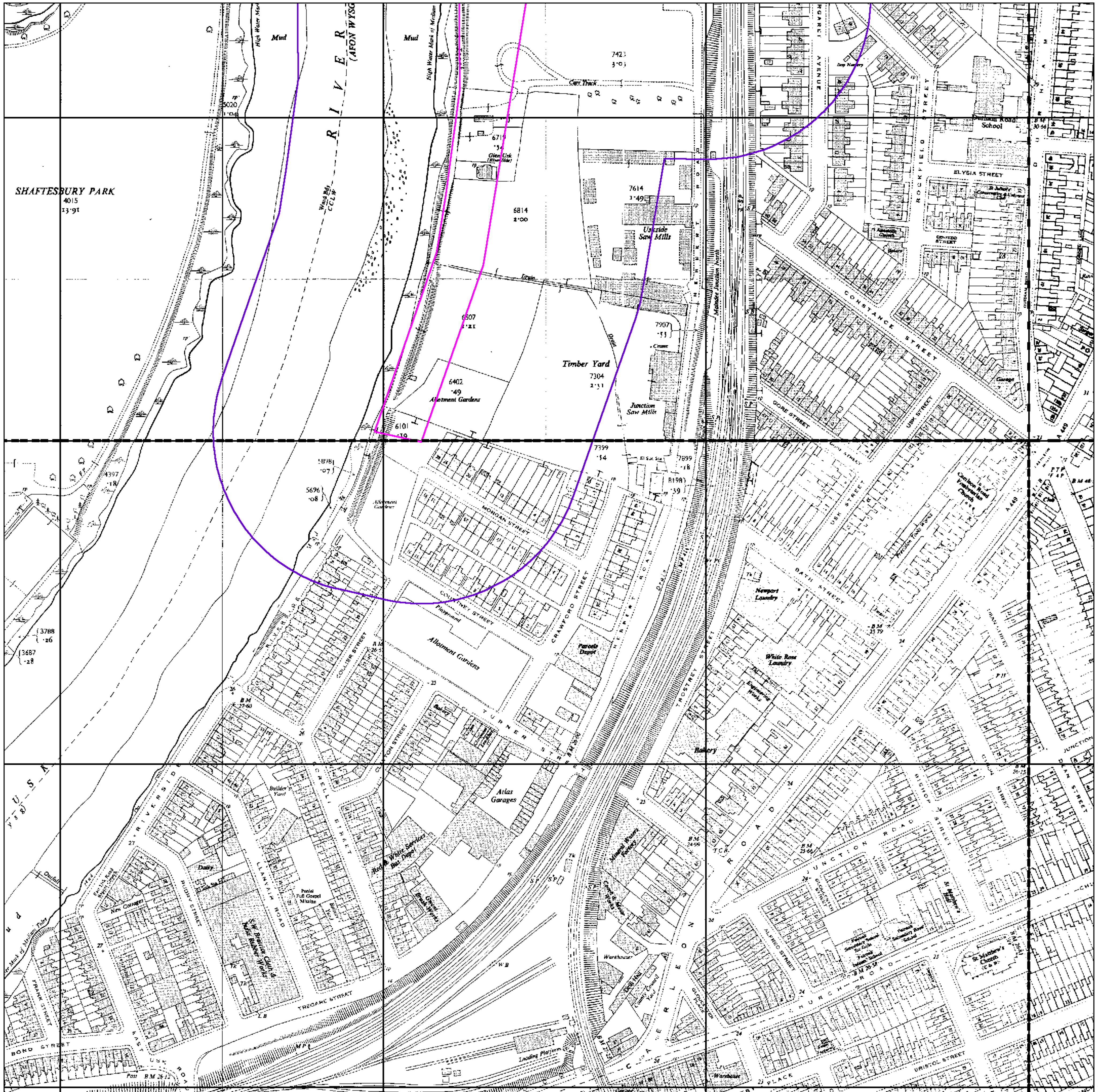
Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	100

Site Details

., Herbert Road, NEWPORT, Gwent, NP19 7BH

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

331400 331600 331800 332000



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0 100 m

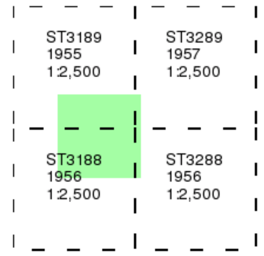
Ordnance Survey Plan

Published 1955 - 1957

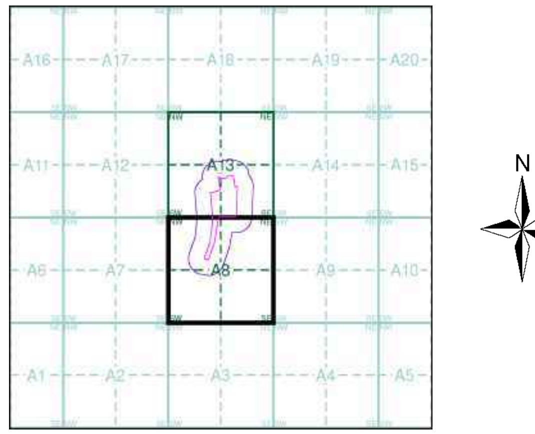
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A8



Order Details

Order Number: 41914630_1_1
Customer Ref: 12044
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Site Details

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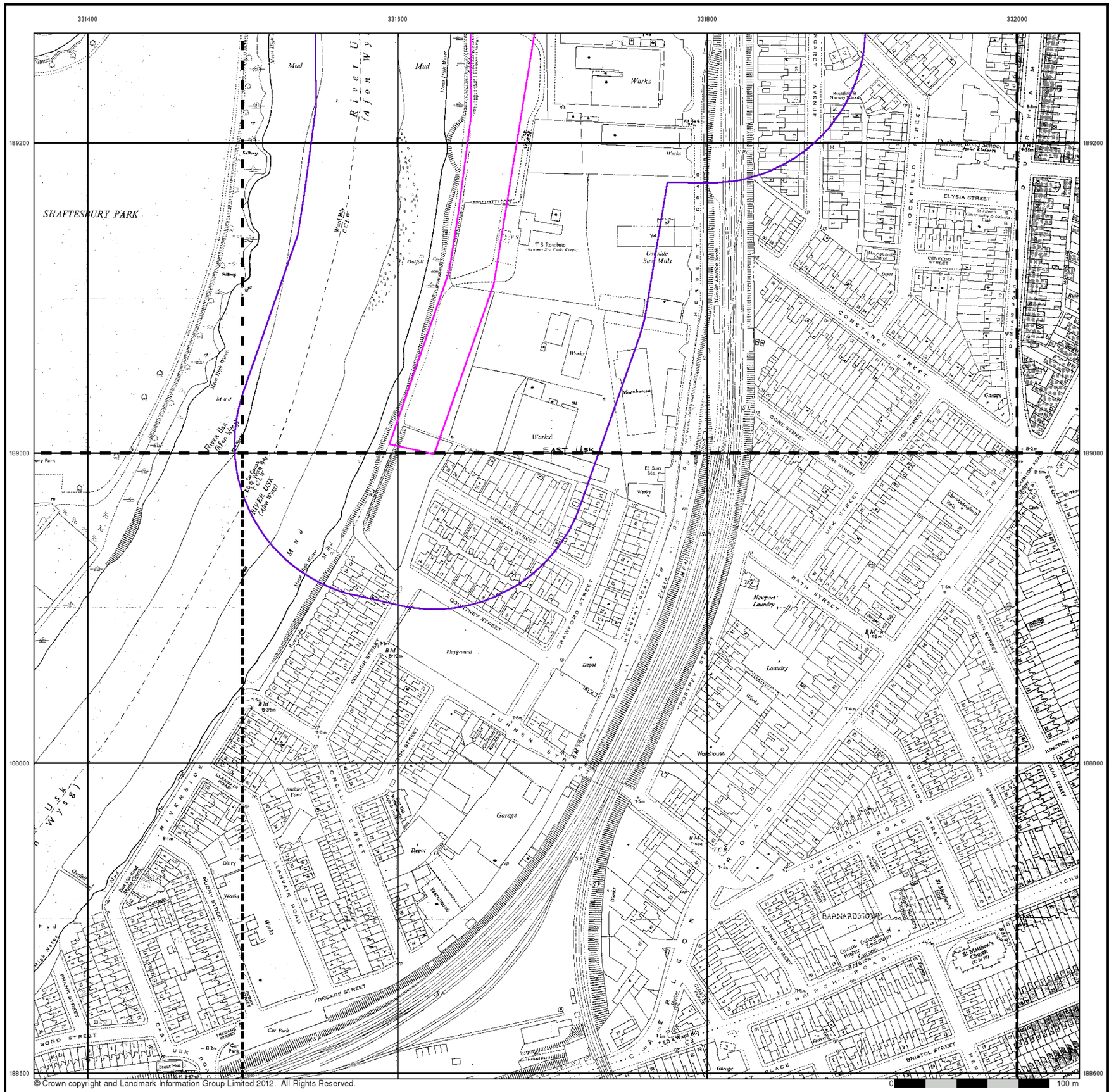

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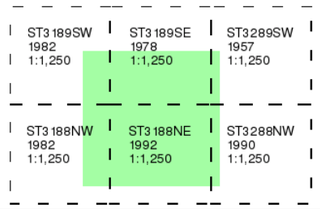
Additional SIMs

Published 1957 - 1992

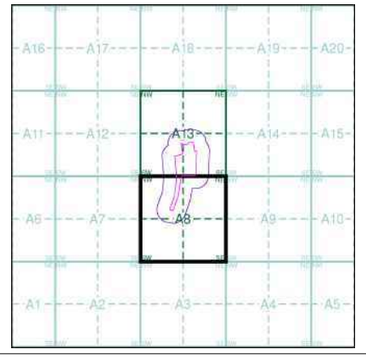
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A8



Order Details

Order Number:	41914630_1_1
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Slice:	A
Site Area (Ha):	4.52
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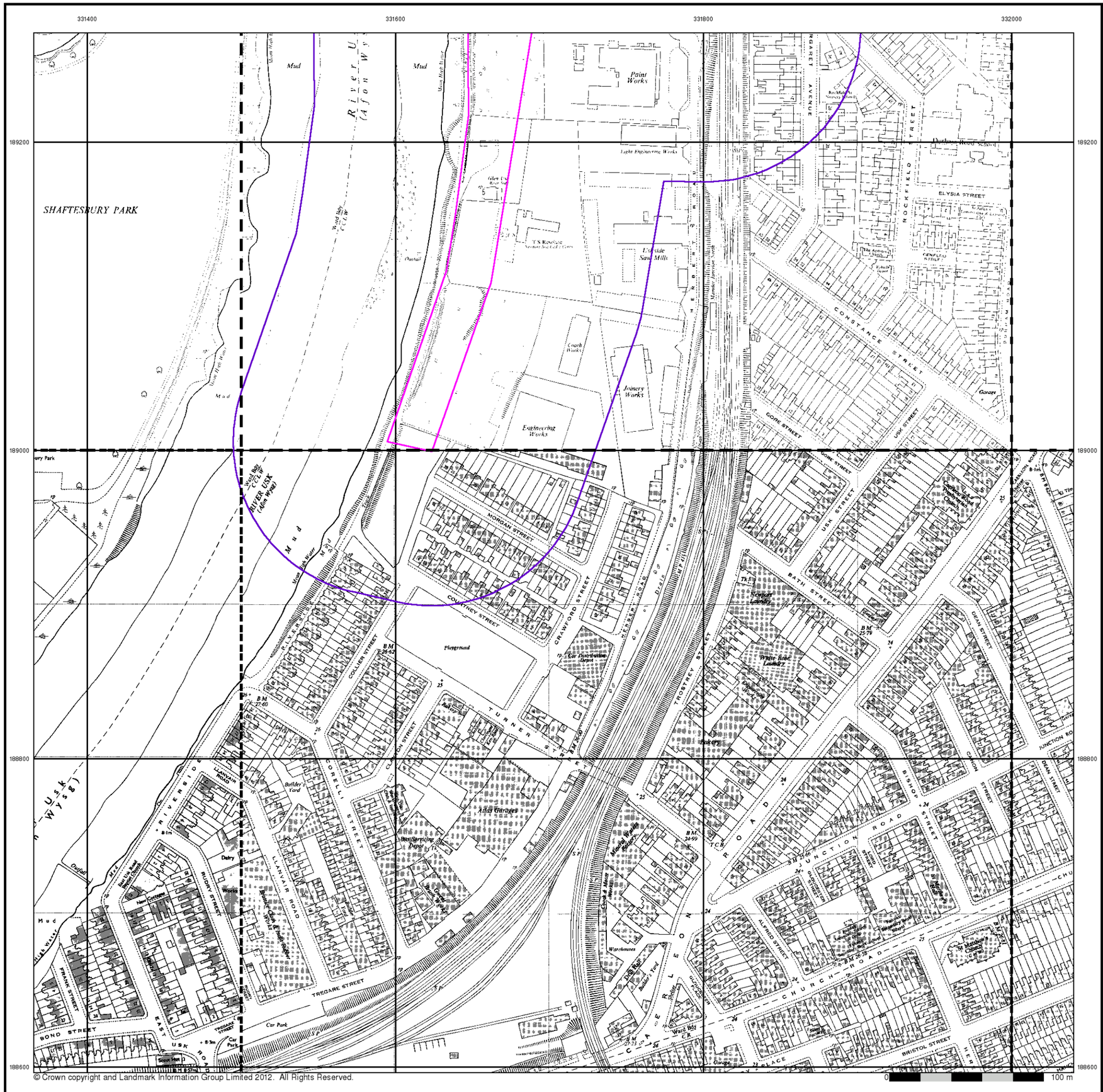

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Ordnance Survey Plan

Published 1966 - 1976

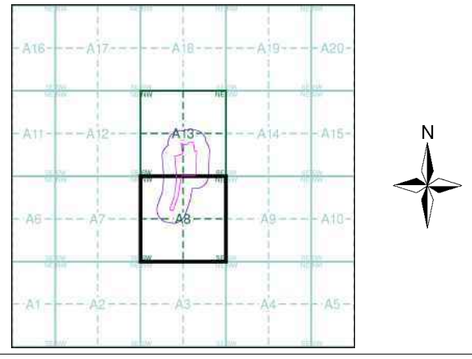
Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

ST3 189SW 1967 1:1,250	ST3 189SE 1966 1:1,250	
ST3 188NW 1976 1:1,250	ST3 188NE 1966 1:1,250	ST3 288NW 1974 1:1,250

Historical Map - Segment A8



Order Details

Order Number:	41914630_1_1
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Site Area (Ha):	4.52
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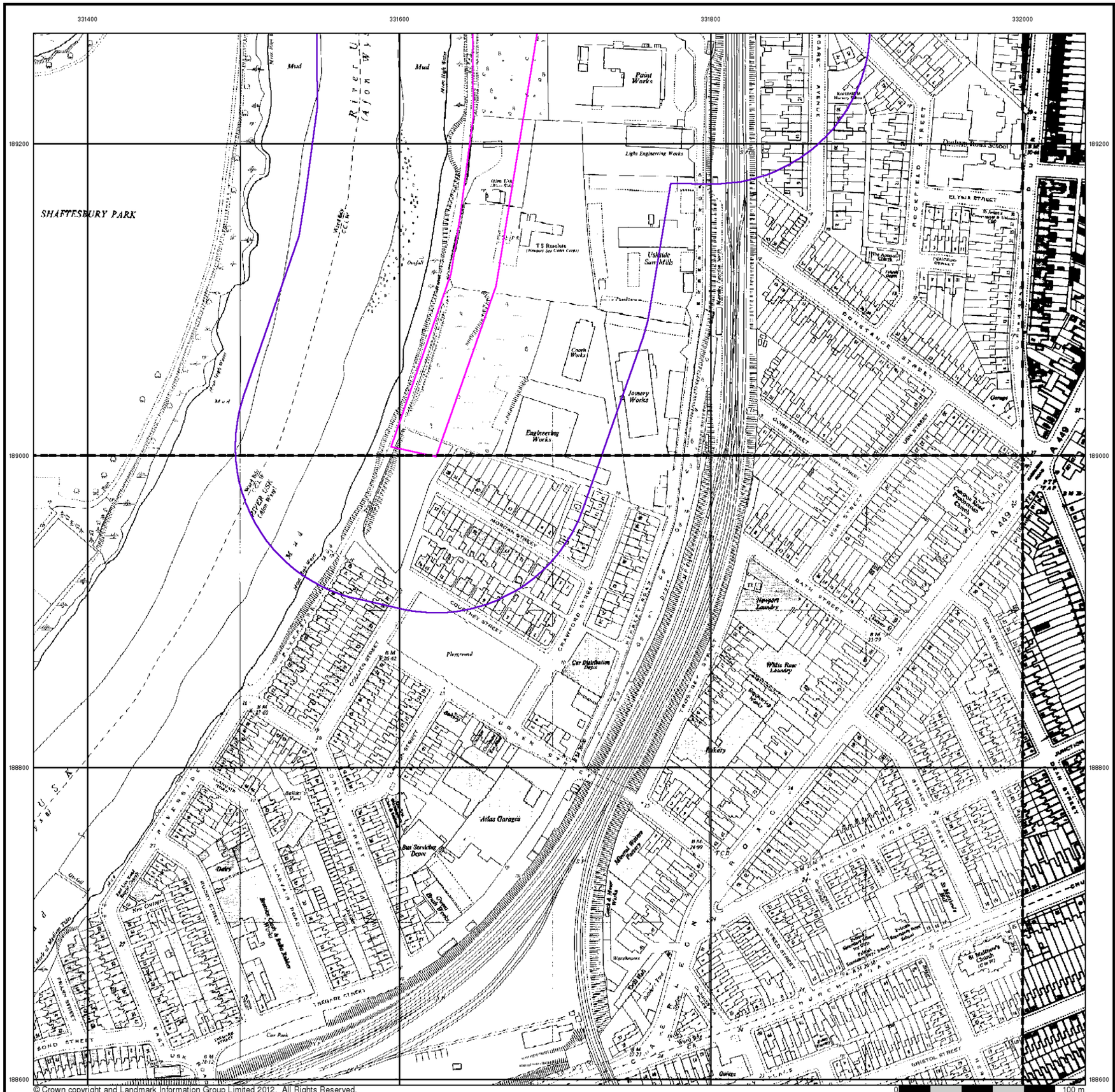

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Ordnance Survey Plan

Published 1969 - 1970

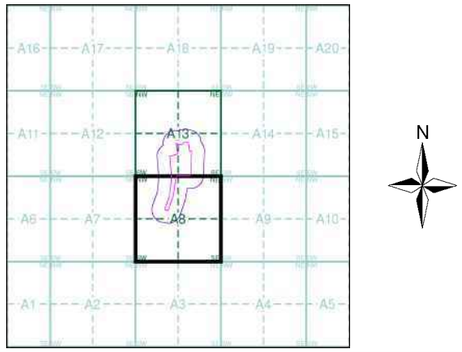
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

ST3189 1970 1:2,500	ST3289 1969 1:2,500
ST3188 1970 1:2,500	ST3288 1970 1:2,500

Historical Map - Segment A8



Order Details

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Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
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Site Details

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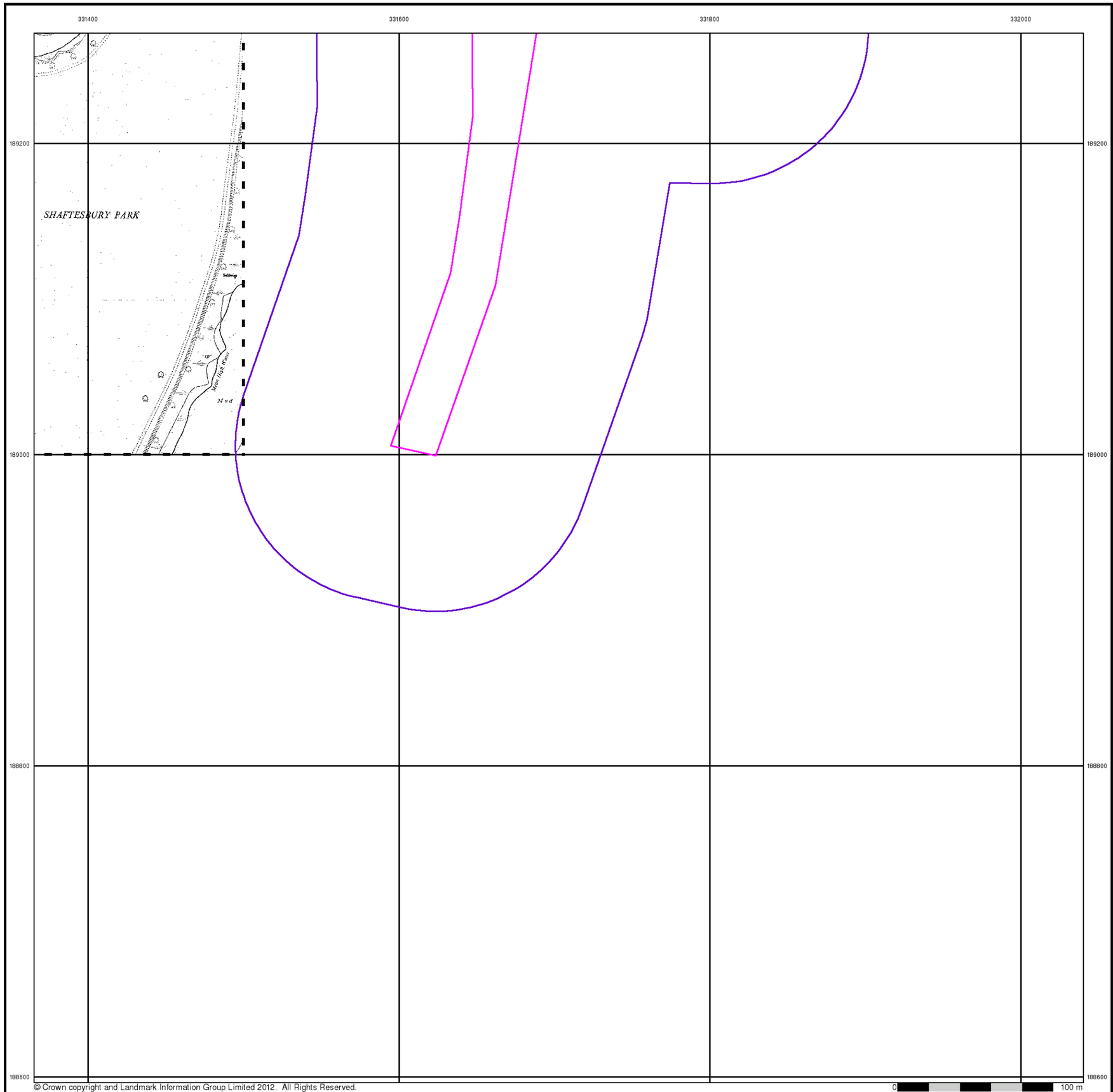

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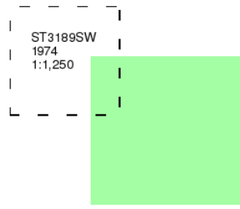
Supply of Unpublished Survey Information

Published 1974

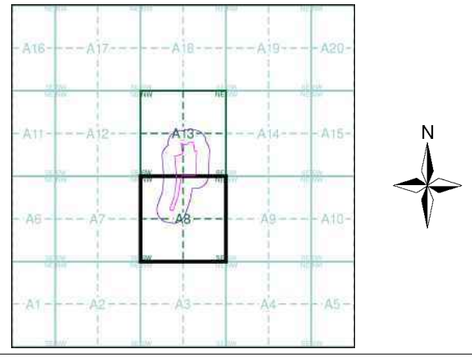
Source map scale - 1:1,250

SUSI maps (Supply of Unpublished Survey Information) were produced between 1972 and 1977, mainly for internal use at Ordnance Survey. These were more of a `work-in-progress' plan as they showed updates of individual areas on a map. These maps were unpublished, and they do not represent a single moment in time. They were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A8



Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	100

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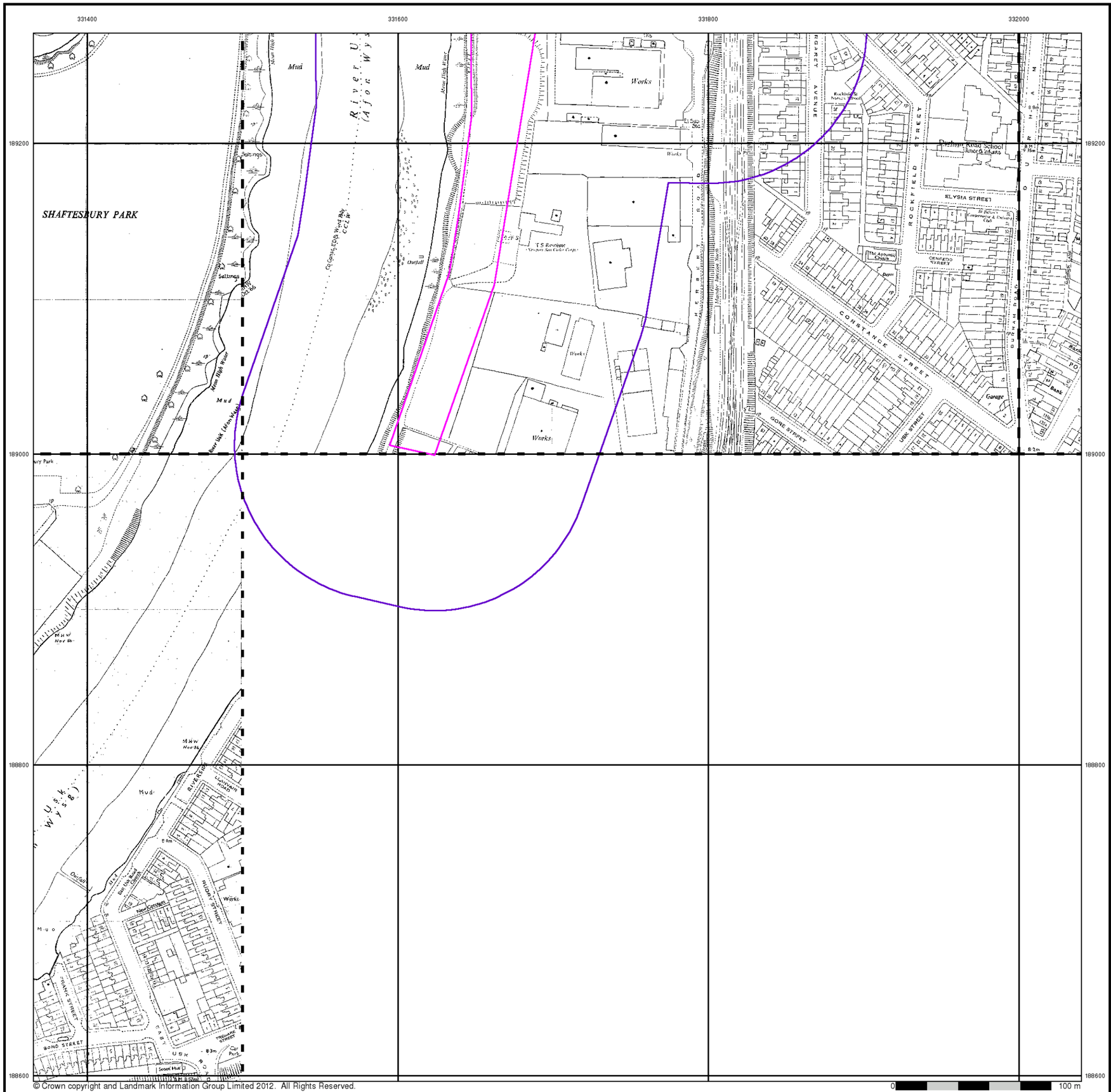

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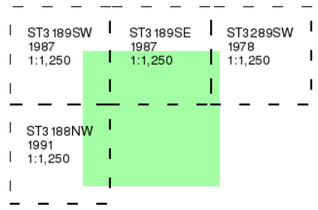
Additional SIMs

Published 1978 - 1991

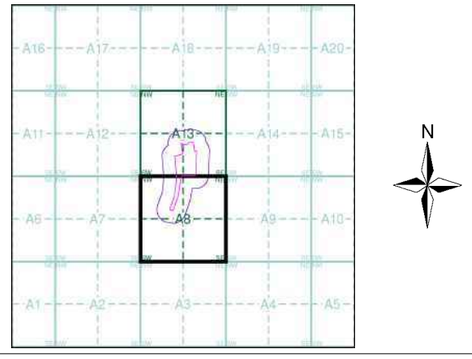
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A8



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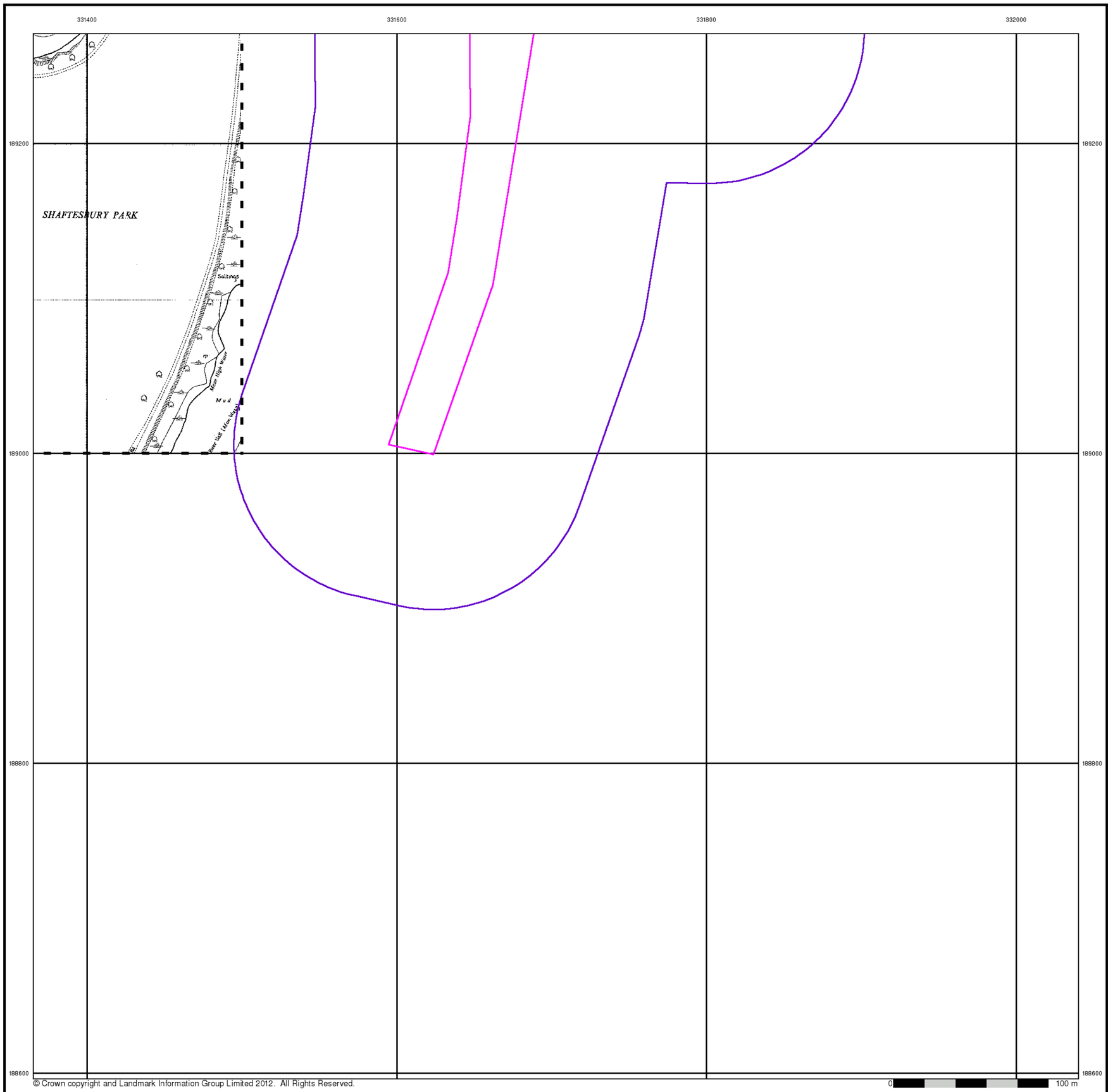

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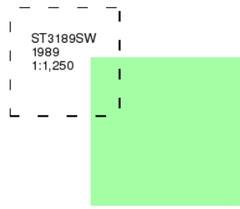
Additional SIMs

Published 1989

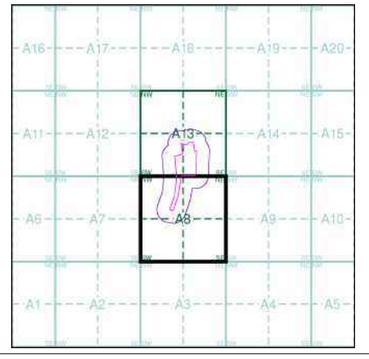
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A8



Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	100

Site Details

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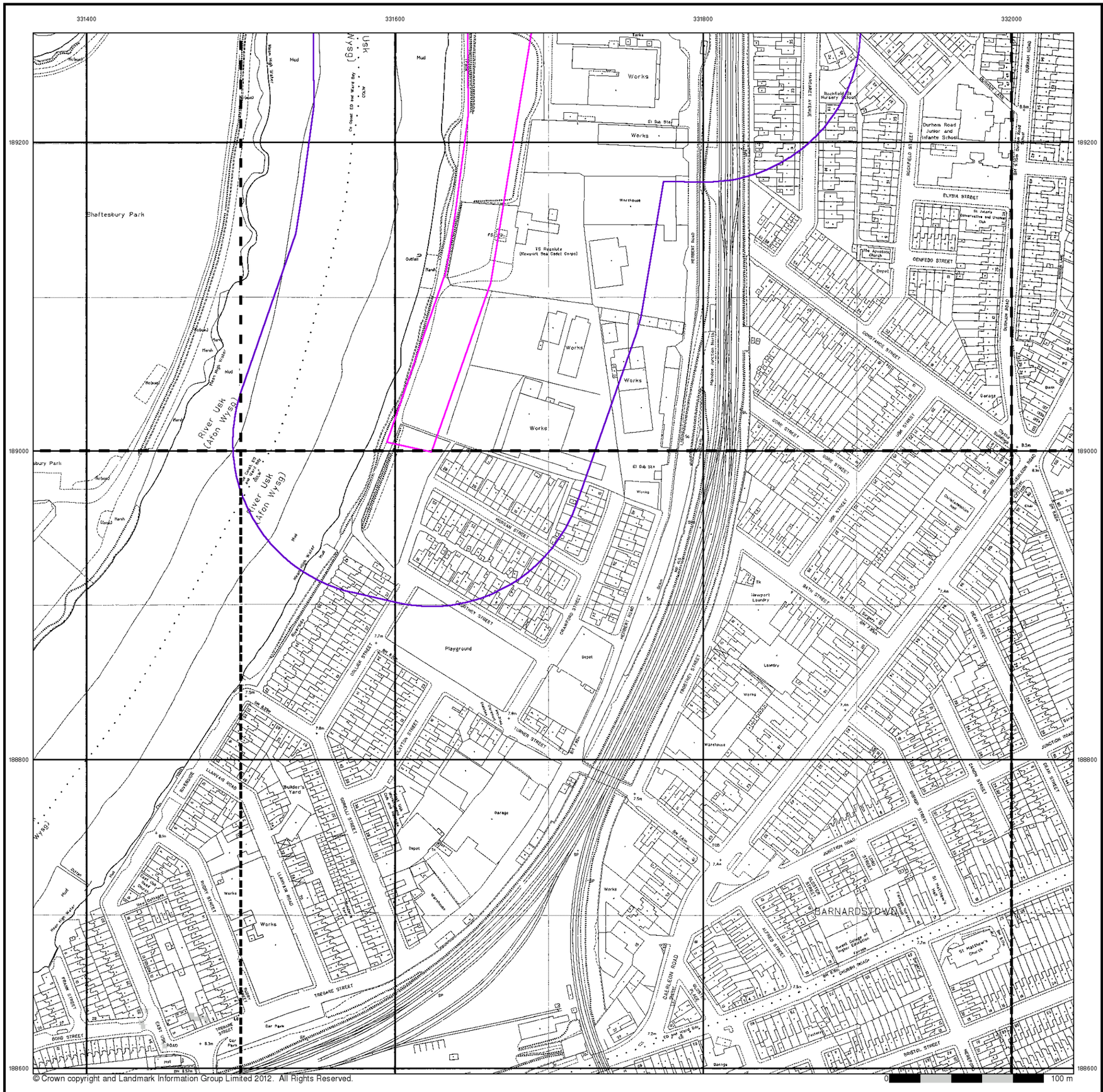

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Large-Scale National Grid Data

Published 1993

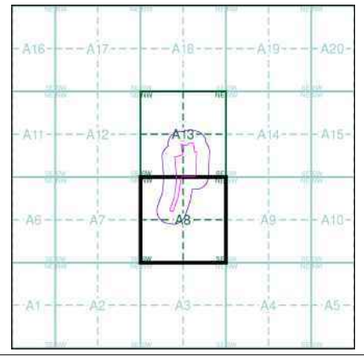
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

ST3 189SW 1993 1:1,250	ST3 189SE 1993 1:1,250	ST3 289SW 1993 1:1,250
ST3 188NW 1993 1:1,250	ST3 188NE 1993 1:1,250	ST3 288NW 1993 1:1,250

Historical Map - Segment A8



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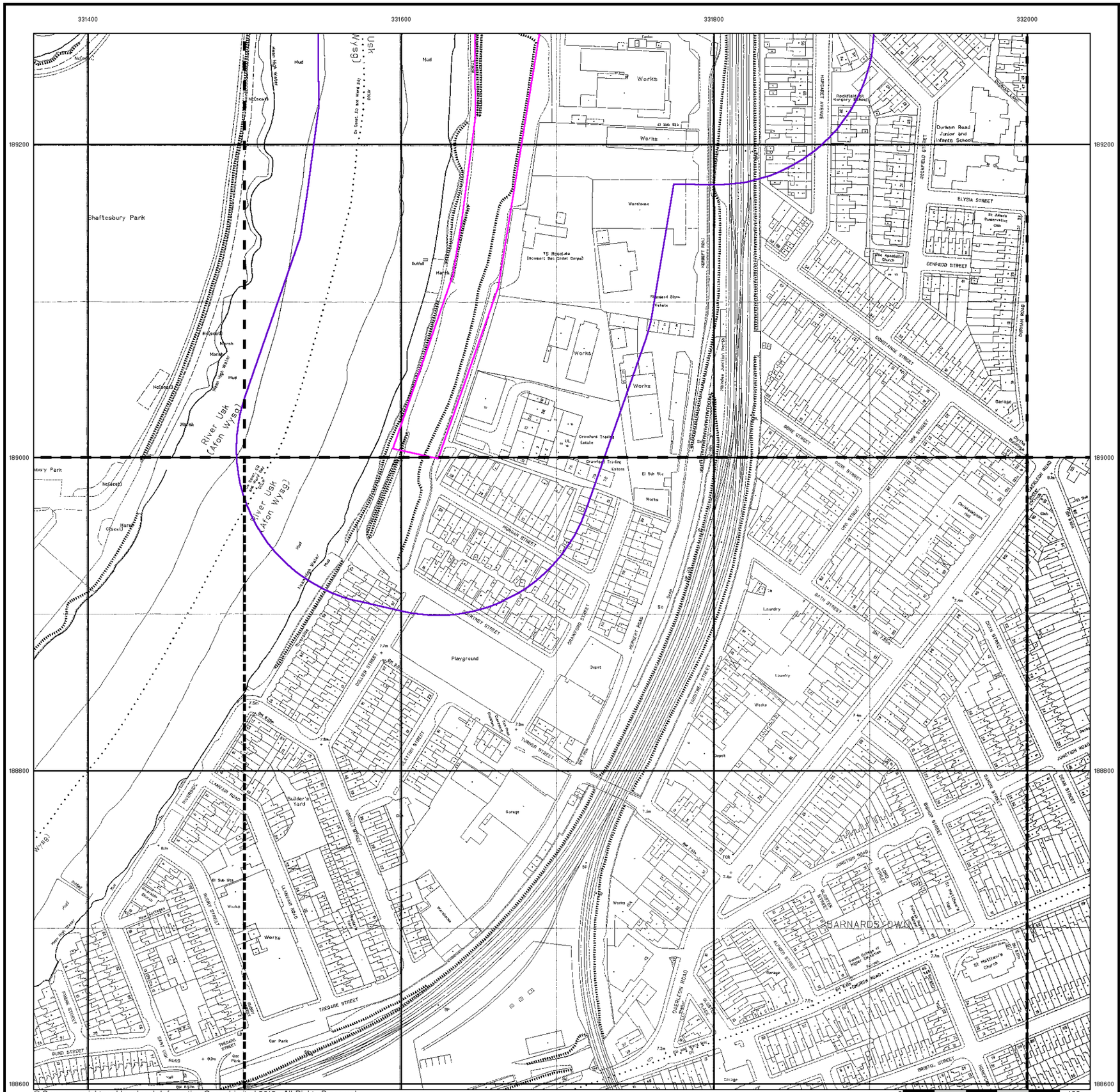

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Large-Scale National Grid Data

Published 1994 - 1997

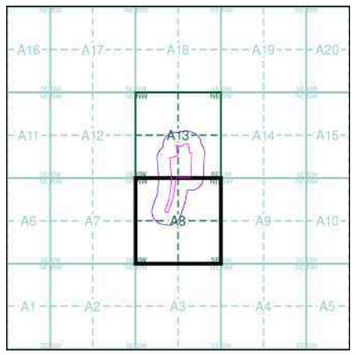
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

ST3 189SW 1994 1:1,250	ST3 189SE 1994 1:1,250	
ST3 188NW 1995 1:1,250	ST3 188NE 1994 1:1,250	ST3 288NW 1997 1:1,250

Historical Map - Segment A8



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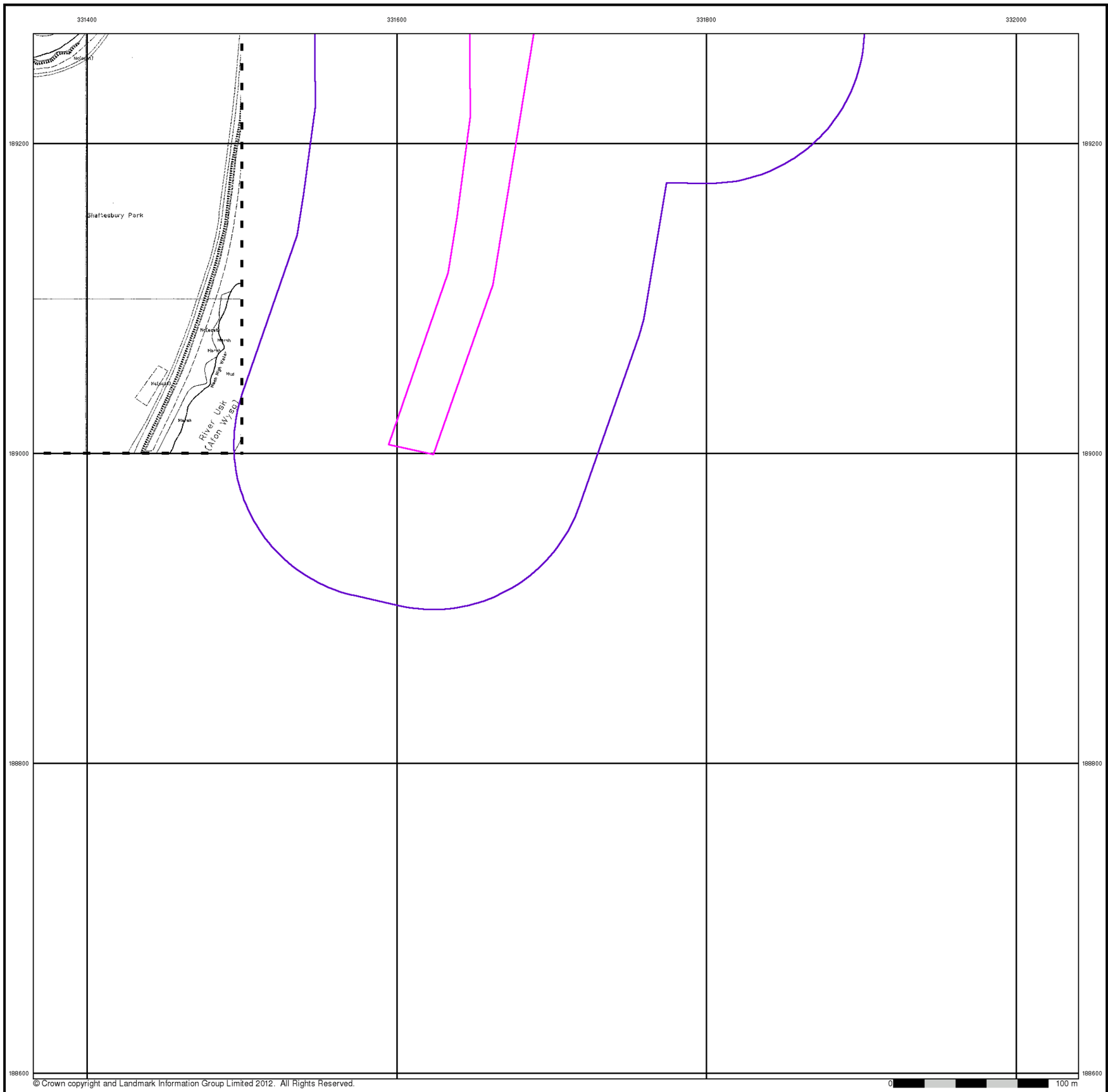

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Large-Scale National Grid Data

Published 1997

Source map scale - 1:1,250

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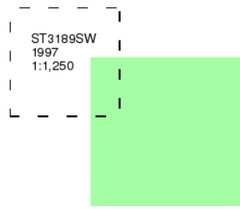
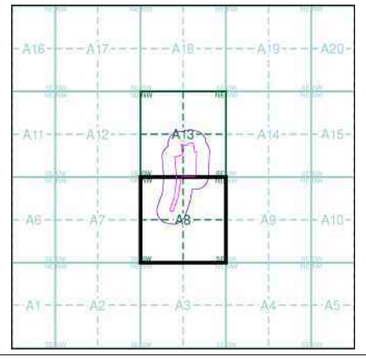


Historical Map - Segment A8



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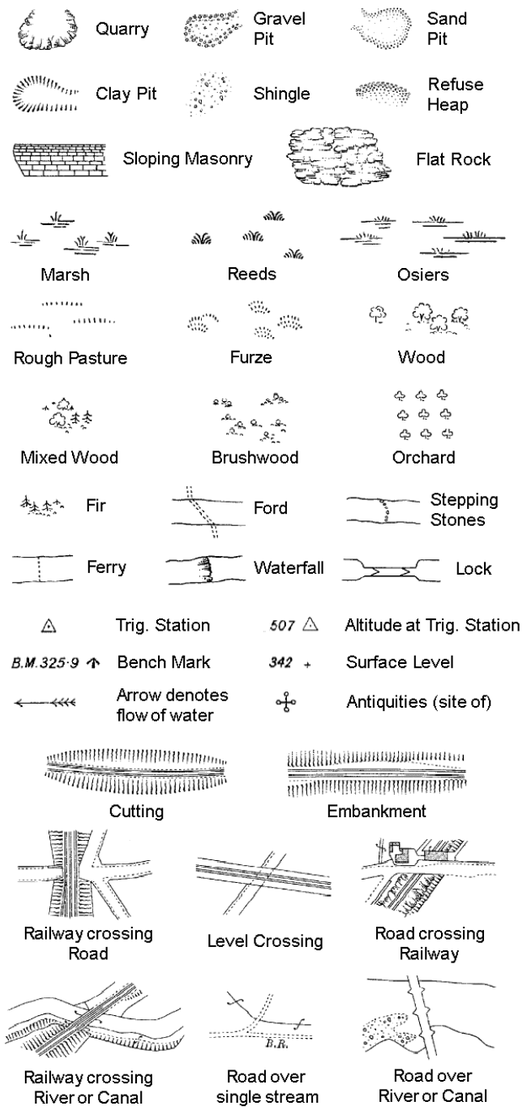
Historical Mapping Legends

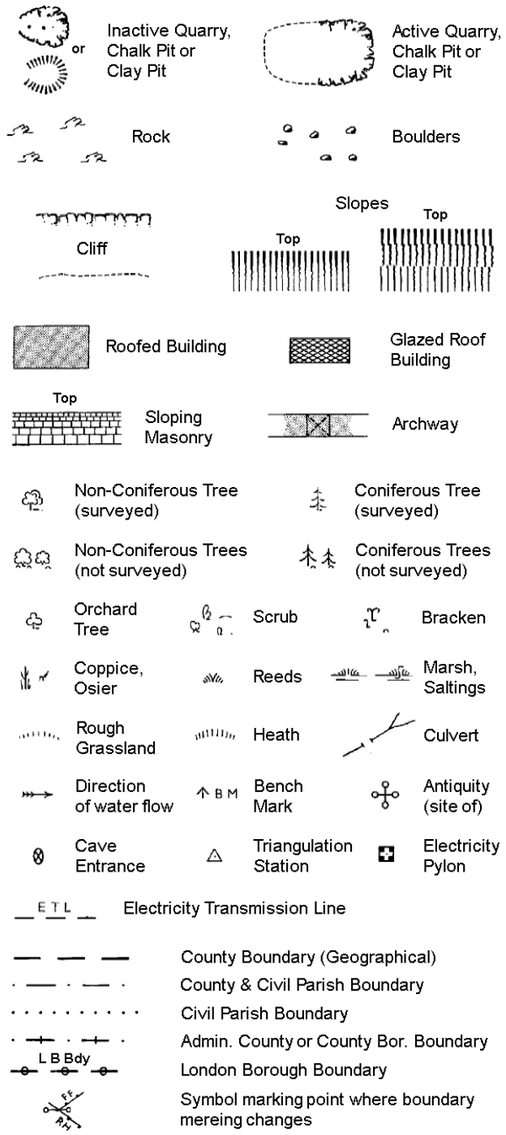
Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



County Boundary (Geographical)
County & Civil Parish Boundary
Administrative County & Civil Parish Boundary
Co. Boro. Bdy. County Borough Boundary (England)
Co. Burgh Bdy. County Burgh Boundary (Scotland)

B P B S	Boundary Post or Stone	P.C.B	Police Call Box
B.R.	Bridle Road	P	Pump
E.P	Electricity Pylon	S.P	Signal Post
F.B.	Foot Bridge	St.	Sluice
F.P.	Foot Path	Sp.	Spring
G.P	Guide Post or Board	T.C.B	Telephone Call Box
M.S	Mile Stone	Tr.	Trough
M.P M.R	Mooring Post or Ring	W	Well

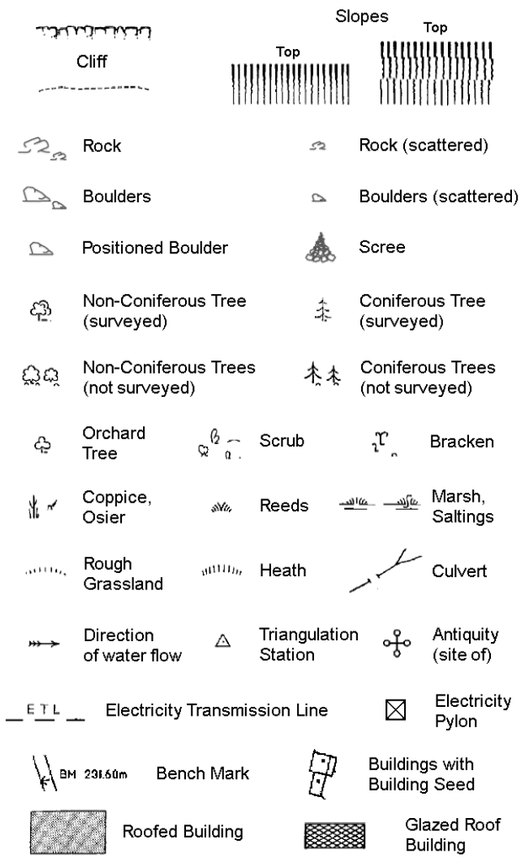
Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information 1:2,500 and 1:1,250



County Boundary (Geographical)
County & Civil Parish Boundary
Civil Parish Boundary
Admin. County or County Bor. Boundary
L B Bdy London Borough Boundary
Symbol marking point where boundary mereing changes

BH	Beer House	P	Pillar, Pole or Post
BP, BS	Boundary Post or Stone	PO	Post Office
Cn, C	Capstan, Crane	PC	Public Convenience
Chy	Chimney	PH	Public House
D Fn	Drinking Fountain	Pp	Pump
El P	Electricity Pillar or Post	SB, S Br	Signal Box or Bridge
FAP	Fire Alarm Pillar	SP, SL	Signal Post or Light
FB	Foot Bridge	Spr	Spring
GP	Guide Post	Tk	Tank or Track
H	Hydrant or Hydraulic	TCB	Telephone Call Box
LC	Level Crossing	TCP	Telephone Call Post
MH	Manhole	Tr	Trough
MP	Mile Post or Mooring Post	Wr Pt, Wr T	Water Point, Water Tap
MS	Mile Stone	W	Well
NTL	Normal Tidal Limit	Wd Pp	Wind Pump

Large-Scale National Grid Data 1:2,500 and 1:1,250



Civil parish/community boundary
District boundary
County boundary
Boundary post/stone
Boundary mereing symbol (note: these always appear in opposed pairs or groups of three)

Bks	Barracks	P	Pillar, Pole or Post
Bty	Battery	PO	Post Office
Cemy	Cemetery	PC	Public Convenience
Chy	Chimney	Pp	Pump
Cis	Cistern	Ppg Sta	Pumping Station
Dismtd Rly	Dismantled Railway	PW	Place of Worship
El Gen Sta	Electricity Generating Station	Sewage Ppg Sta	Sewage Pumping Station
El P	Electricity Pole, Pillar	SB, S Br	Signal Box or Bridge
El Sub Sta	Electricity Sub Station	SP, SL	Signal Post or Light
FB	Filter Bed	Spr	Spring
Fn / D Fn	Fountain / Drinking Ftn.	Tk	Tank or Track
Gas Gov	Gas Valve Compound	Tr	Trough
GVC	Gas Governer	Wd Pp	Wind Pump
GP	Guide Post	Wr Pt, Wr T	Water Point, Water Tap
MH	Manhole	Wks	Works (building or area)
MP, MS	Mile Post or Mile Stone	W	Well

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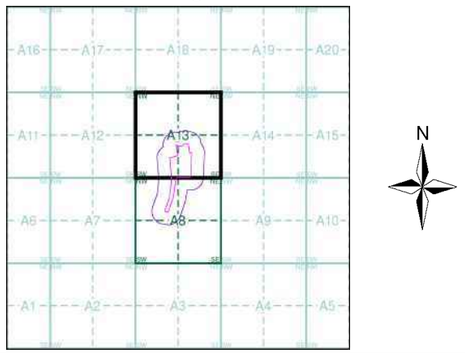
Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Monmouthshire	1:2,500	1883	2
Monmouthshire	1:2,500	1901 - 1902	3
Monmouthshire	1:2,500	1920	4
Monmouthshire	1:2,500	1936 - 1937	5
Ordnance Survey Plan	1:2,500	1955 - 1957	6
Ordnance Survey Plan	1:1,250	1955 - 1957	7
Additional SIMs	1:1,250	1957 - 1989	8
Ordnance Survey Plan	1:1,250	1966 - 1968	9
Ordnance Survey Plan	1:2,500	1969 - 1970	10
Supply of Unpublished Survey Information	1:1,250	1974	11
Ordnance Survey Plan	1:1,250	1977	12
Additional SIMs	1:1,250	1978 - 1989	13
Additional SIMs	1:1,250	1989	14
Large-Scale National Grid Data	1:1,250	1993	15
Large-Scale National Grid Data	1:1,250	1994 - 1995	16
Large-Scale National Grid Data	1:1,250	1995 - 1997	17
Large-Scale National Grid Data	1:1,250	1995	18

Historical Map - Segment A13



Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	100

Site Details

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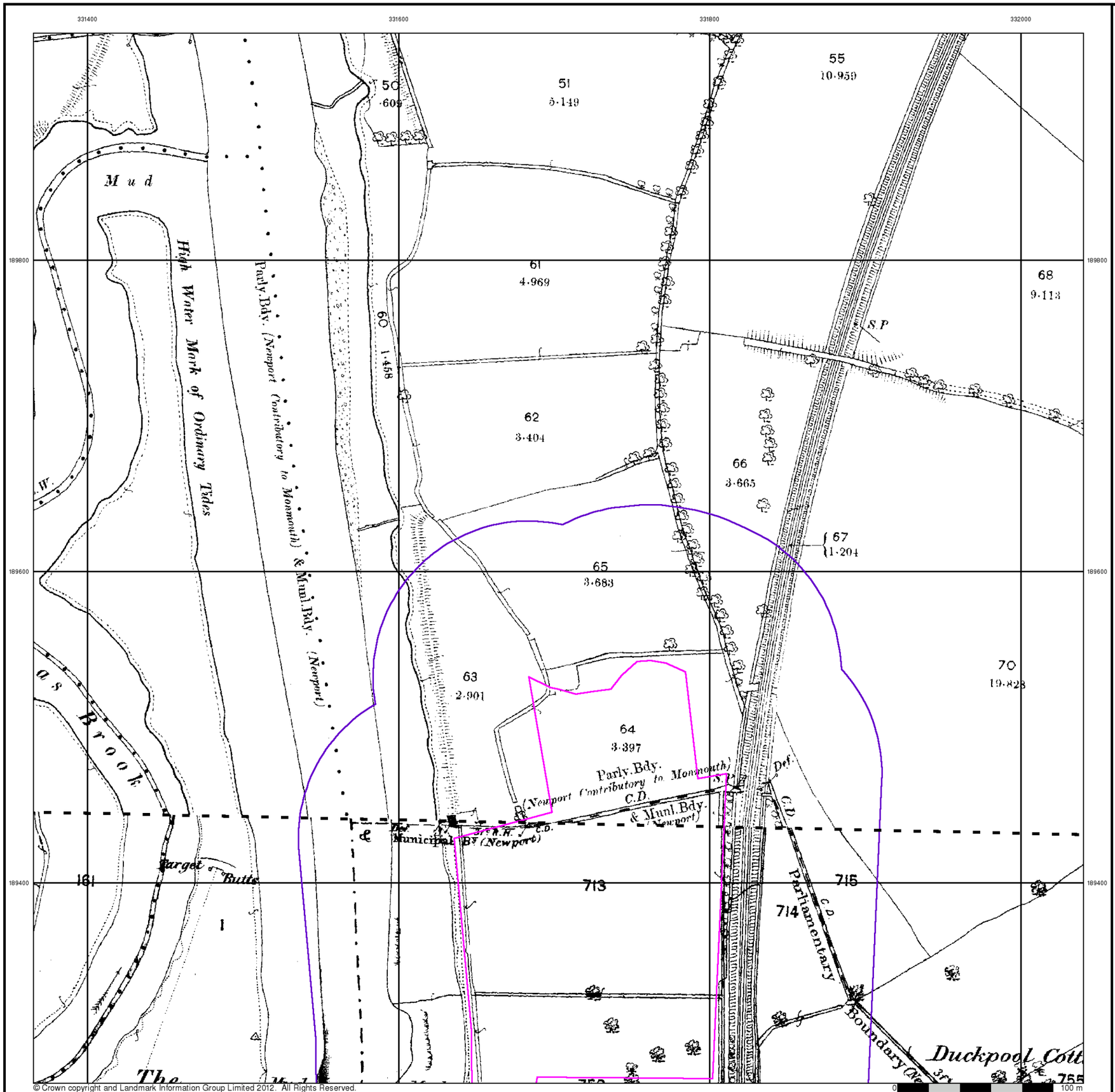

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Monmouthshire

Published 1883

Source map scale - 1:2,500

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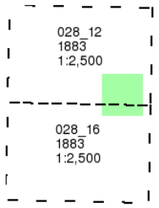
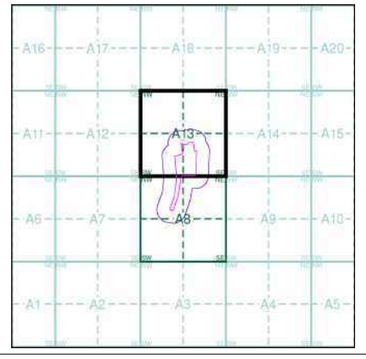
Map Name(s) and Date(s)



Historical Map - Segment A13



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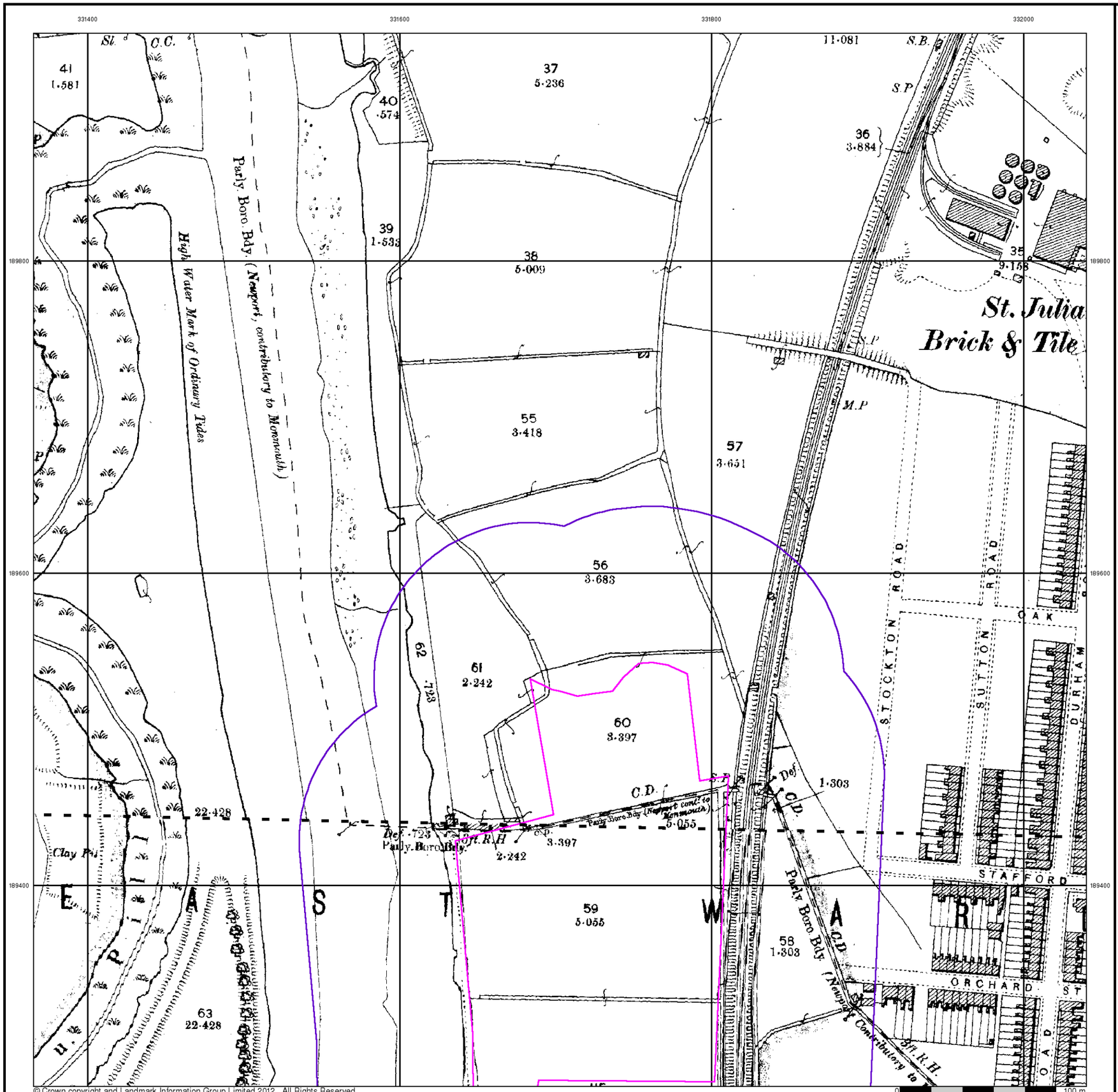

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Monmouthshire

Published 1901 - 1902

Source map scale - 1:2,500

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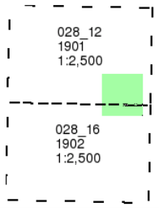
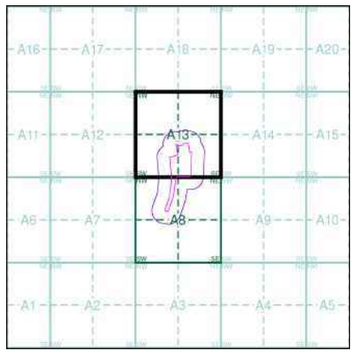
Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

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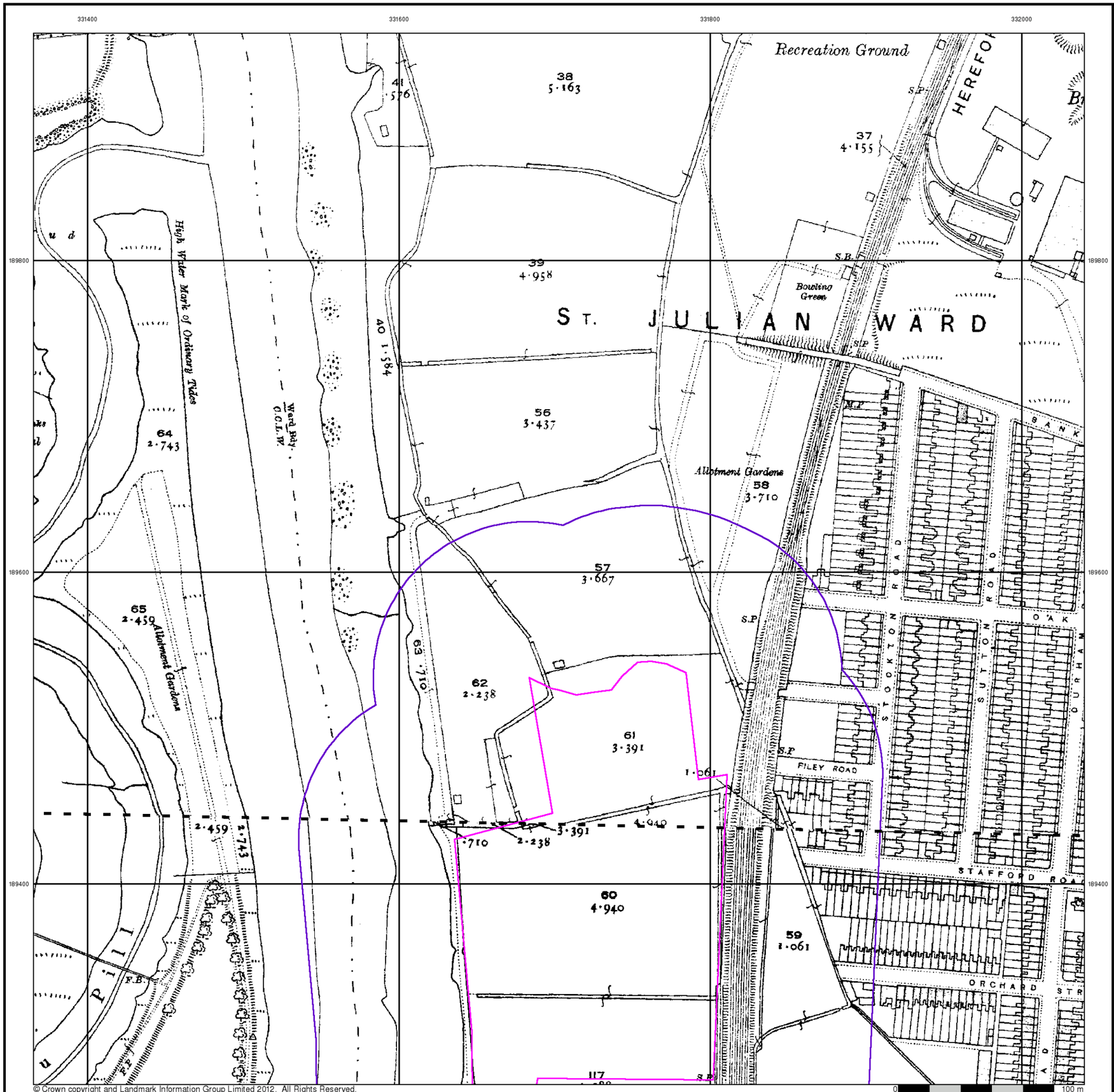

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Monmouthshire

Published 1920

Source map scale - 1:2,500

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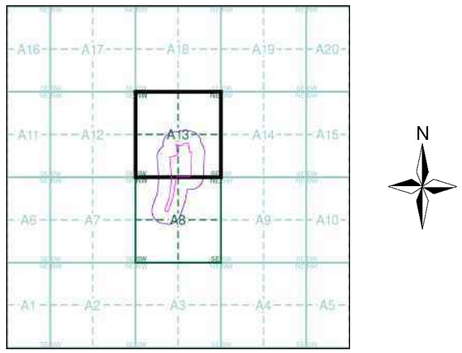
Map Name(s) and Date(s)

028_12
1920
1:2,500

028_16
1920
1:2,500

Historical Map - Segment A13



Order Details

Order Number:	41914630_1_1
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Slice:	A
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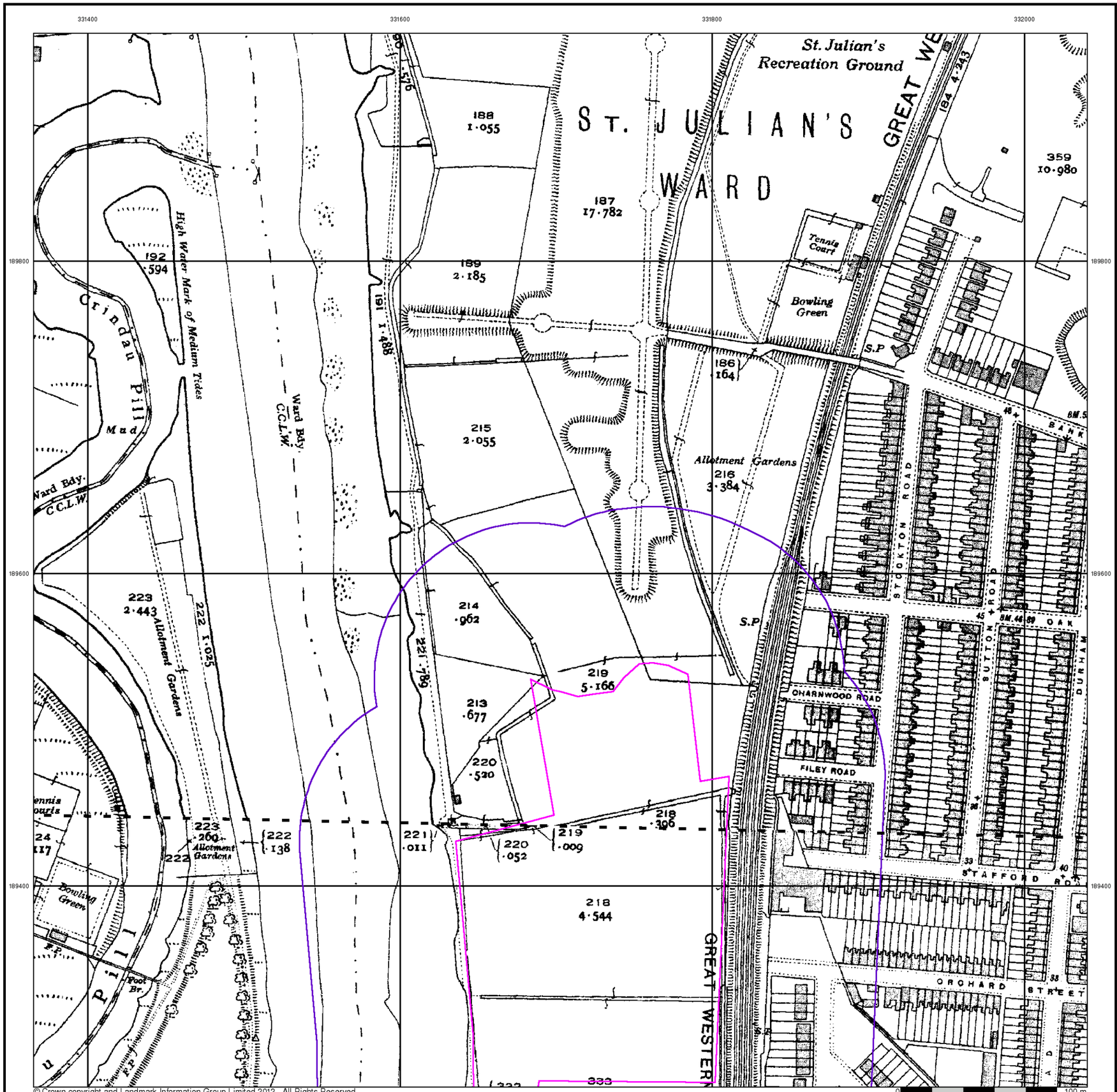

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Monmouthshire

Published 1936 - 1937

Source map scale - 1:2,500

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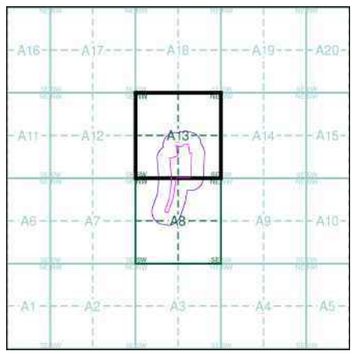
Map Name(s) and Date(s)

028_12
1936
1:2,500

028_16
1937
1:2,500

Historical Map - Segment A13



Order Details

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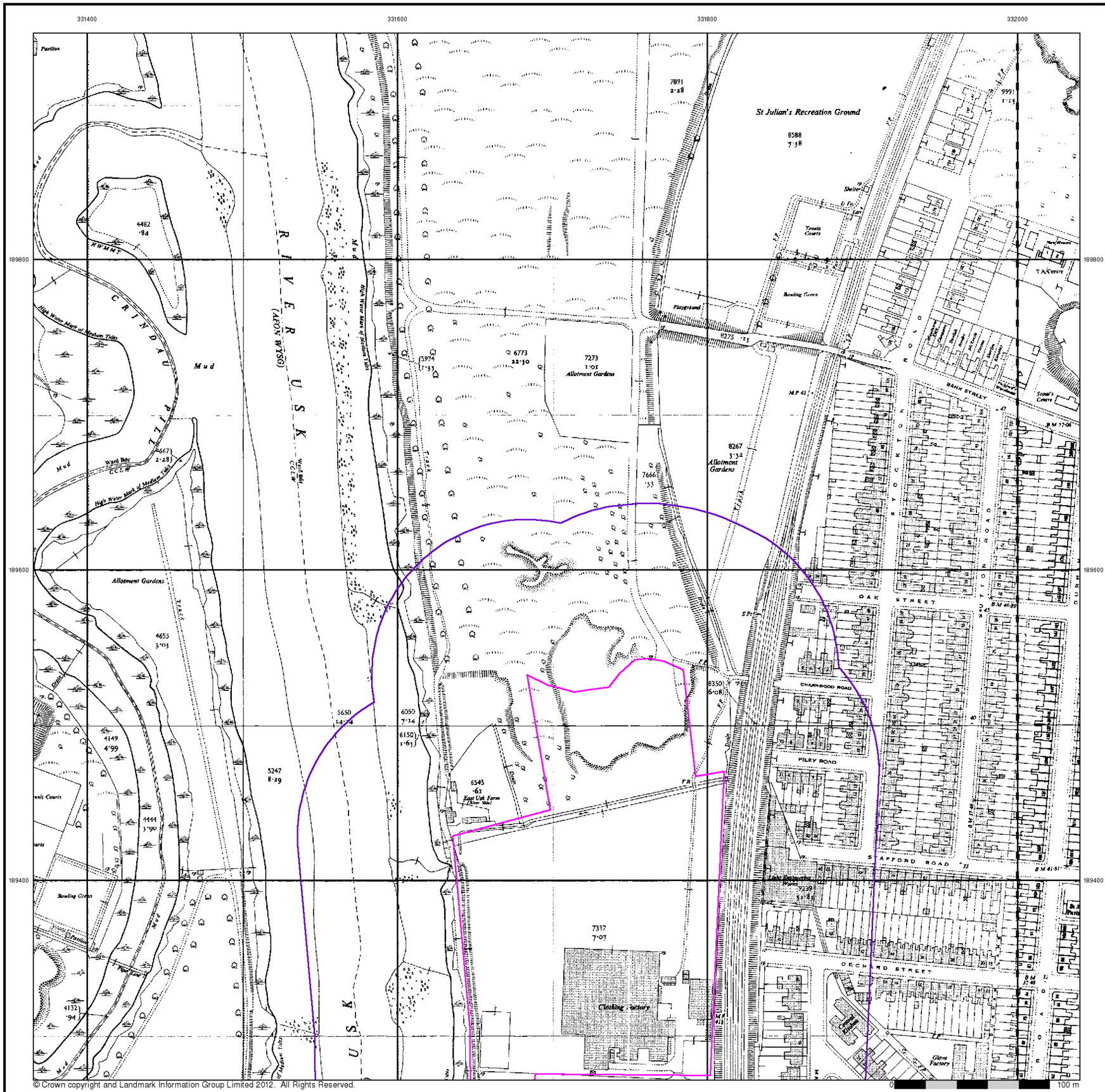

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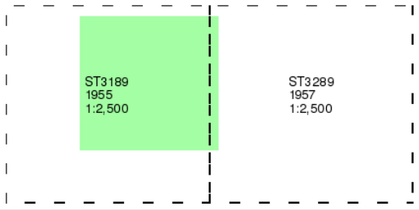
Ordnance Survey Plan

Published 1955 - 1957

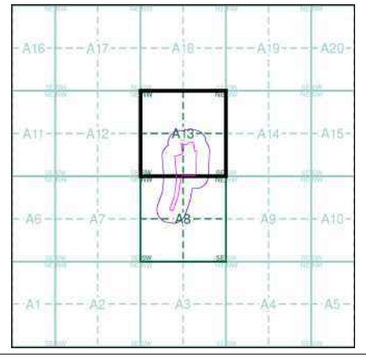
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number:	41914630_1_1
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Ordnance Survey Plan

Published 1955 - 1957

Source map scale - 1:1,250

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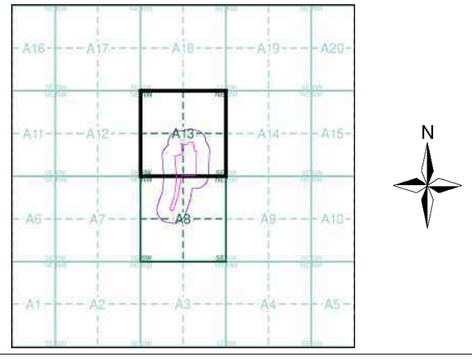
Map Name(s) and Date(s)

ST3189NW 1955 1:1,250	ST3189NE 1955 1:1,250	ST3289NW 1957 1:1,250
ST3189SW 1955 1:1,250	ST3189SE 1955 1:1,250	ST3289SW 1957 1:1,250

Historical Map - Segment A13



Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	100

Site Details

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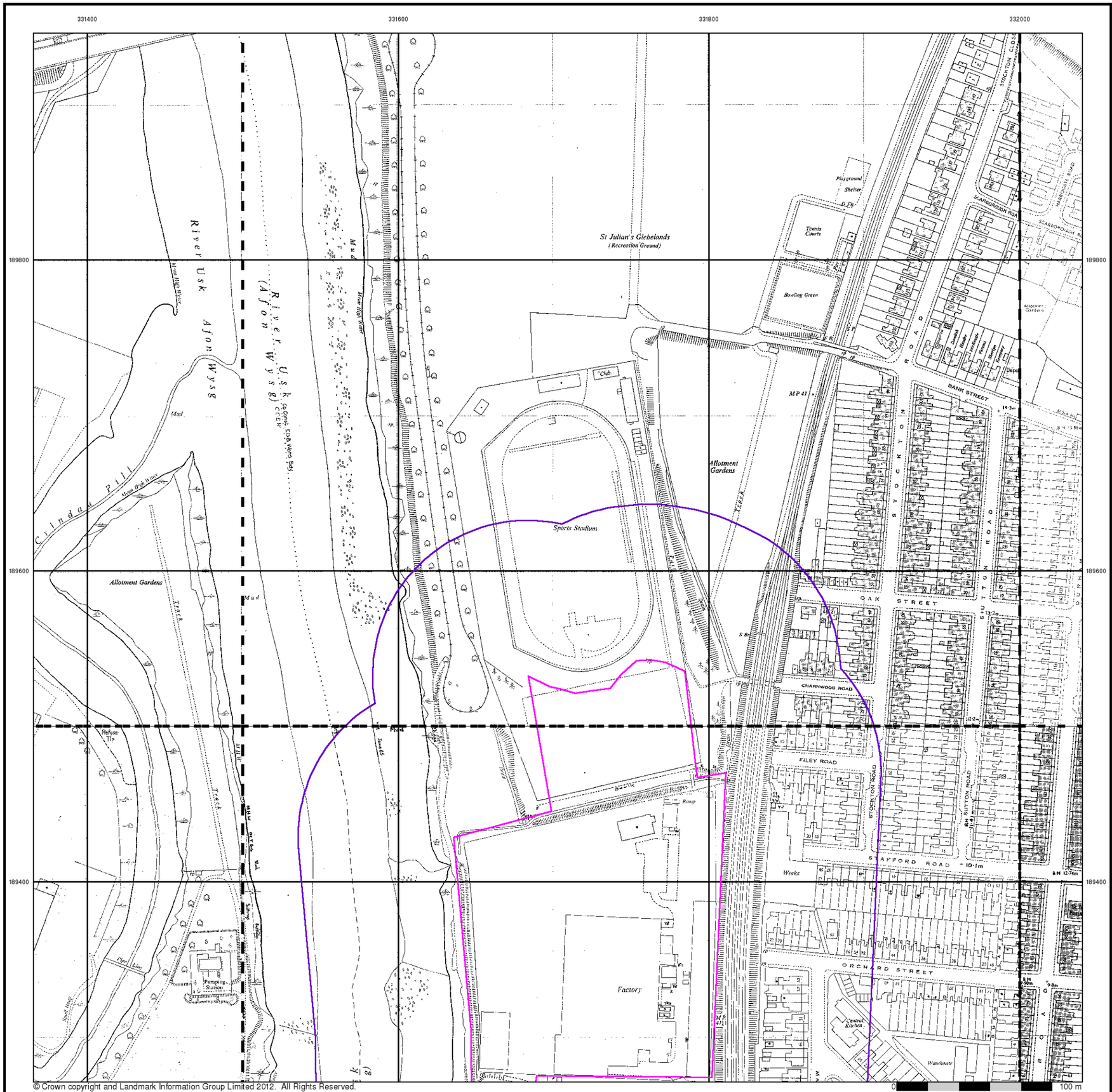

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Additional SIMs

Published 1957 - 1989

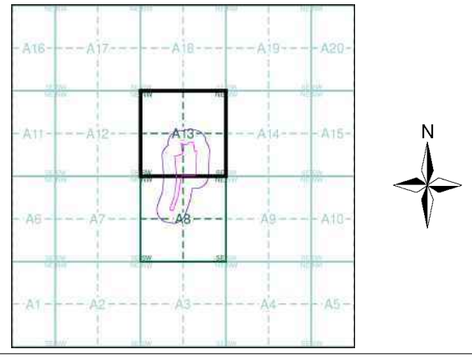
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

ST3189NW 1989 1:1,250	ST3189NE 1986 1:1,250	ST3289NW 1988 1:1,250
ST3189SW 1982 1:1,250	ST3189SE 1978 1:1,250	ST3289SW 1957 1:1,250

Historical Map - Segment A13



Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	100

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Ordnance Survey Plan

Published 1966 - 1968

Source map scale - 1:1,250

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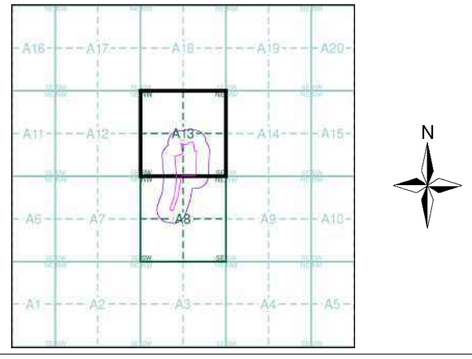
Map Name(s) and Date(s)

ST3 189NW 1968 1:1,250	ST3 189NE 1968 1:1,250	ST3 289NW 1968 1:1,250
ST3 189SW 1967 1:1,250	ST3 189SE 1966 1:1,250	

Historical Map - Segment A13



Order Details

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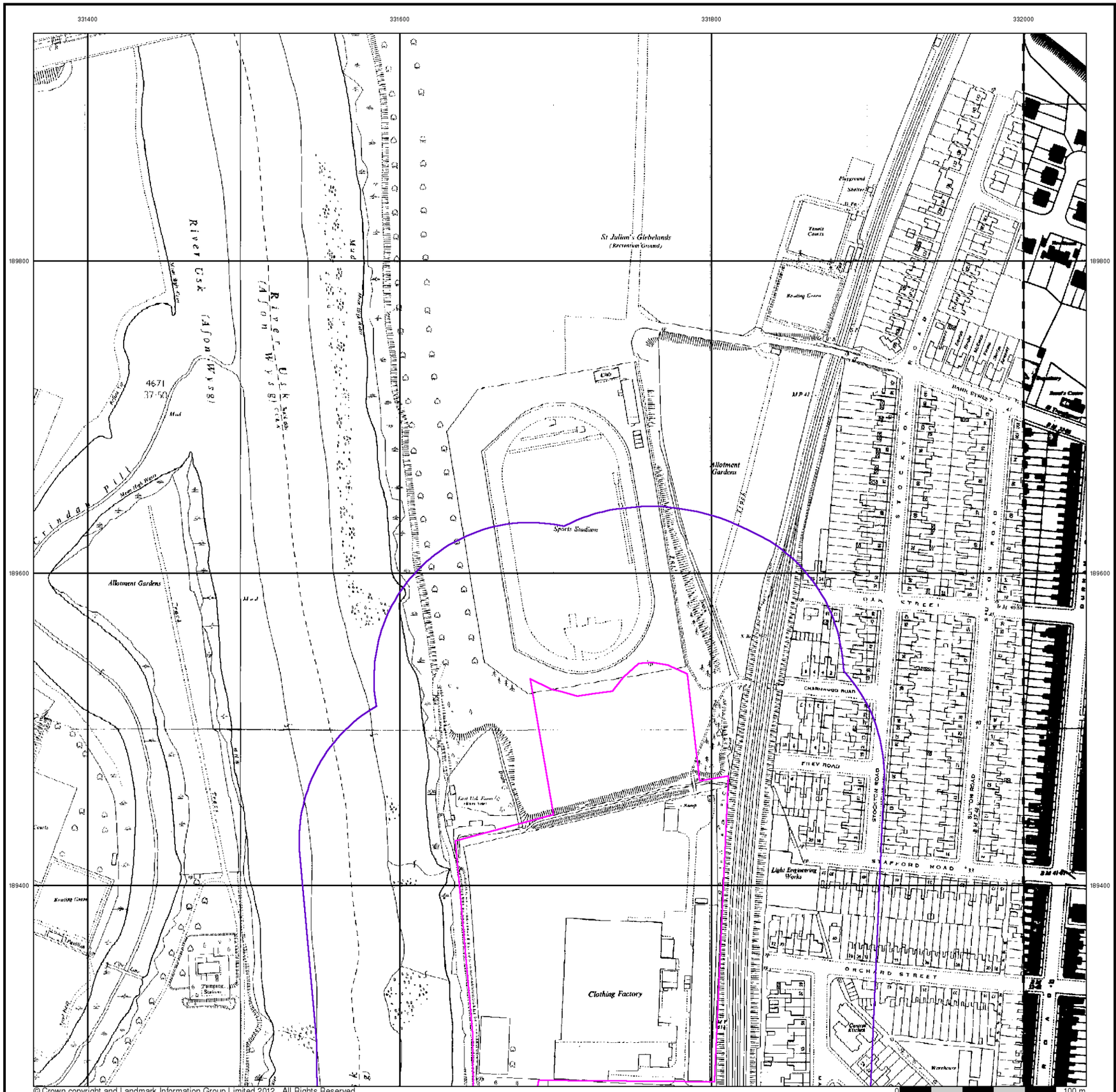

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Ordnance Survey Plan

Published 1969 - 1970

Source map scale - 1:2,500

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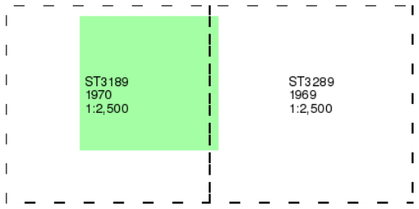
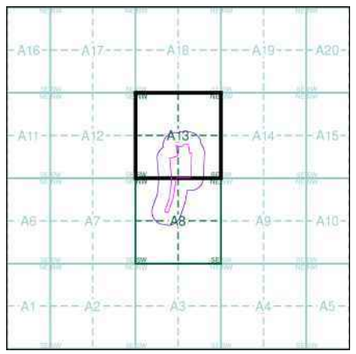
Map Name(s) and Date(s)



Historical Map - Segment A13



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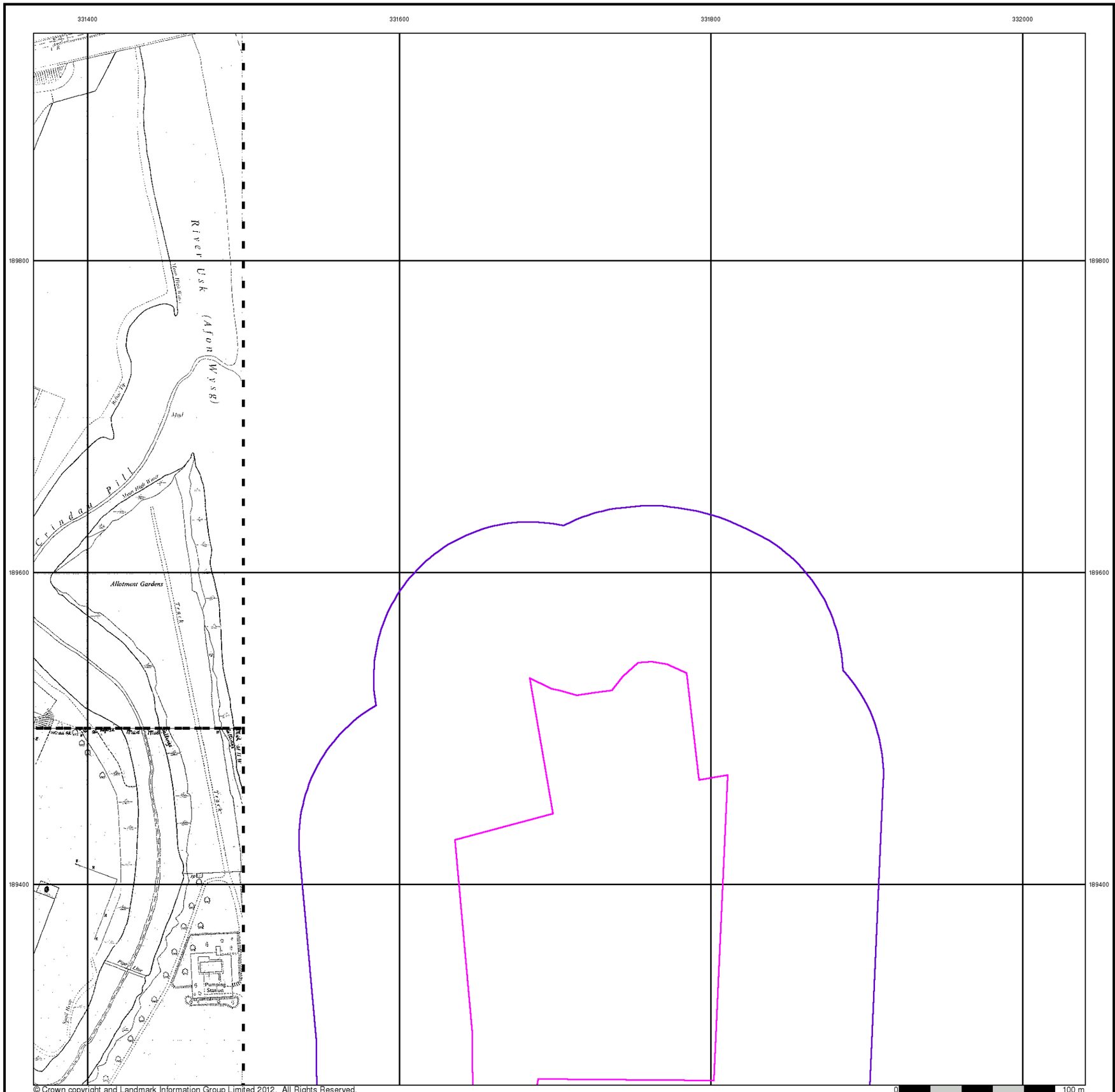

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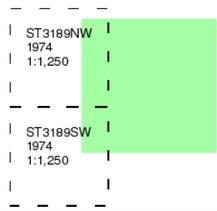
Supply of Unpublished Survey Information

Published 1974

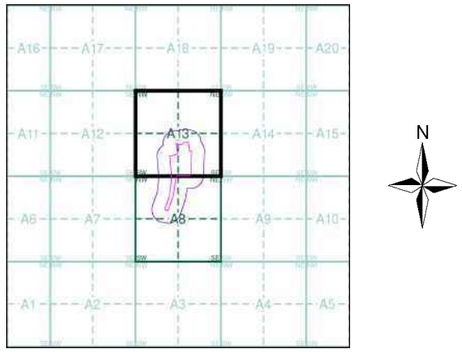
Source map scale - 1:1,250

SUSI maps (Supply of Unpublished Survey Information) were produced between 1972 and 1977, mainly for internal use at Ordnance Survey. These were more of a `work-in-progress' plan as they showed updates of individual areas on a map. These maps were unpublished, and they do not represent a single moment in time. They were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

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Customer Ref:	12044
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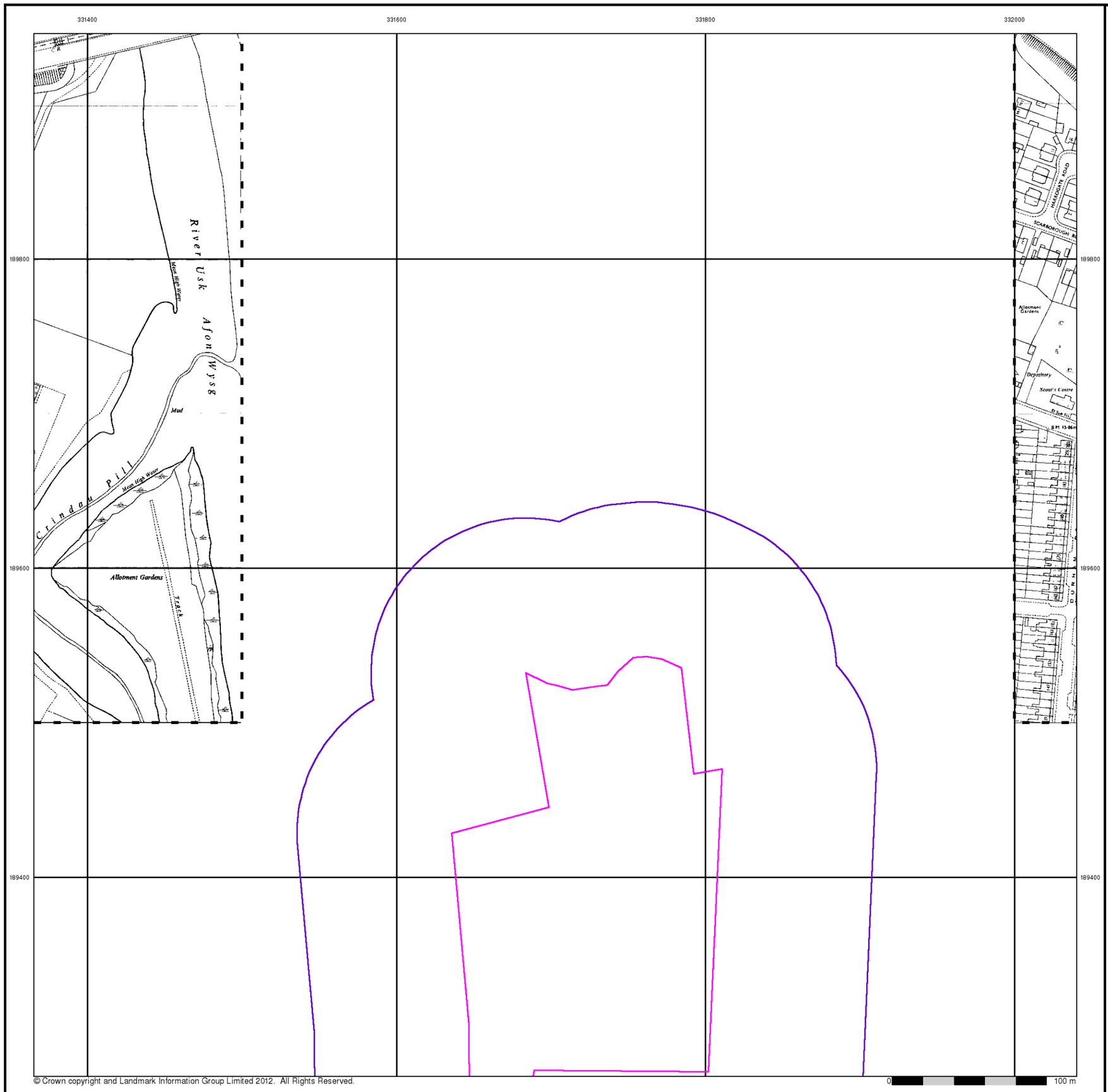

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Ordnance Survey Plan

Published 1977

Source map scale - 1:1,250

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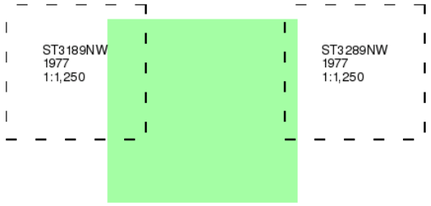
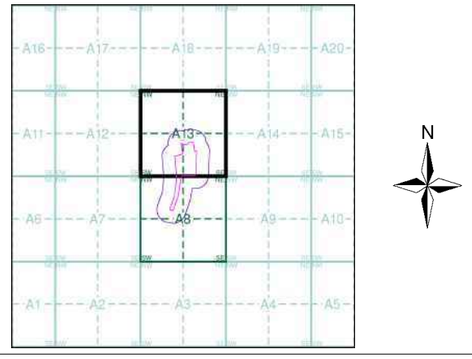
Map Name(s) and Date(s)



Historical Map - Segment A13



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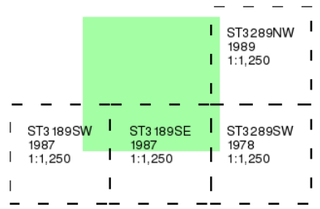
Additional SIMs

Published 1978 - 1989

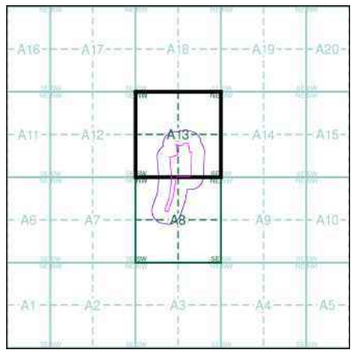
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	100

Site Details

., Herbert Road, NEWPORT, Gwent, NP19 7BH

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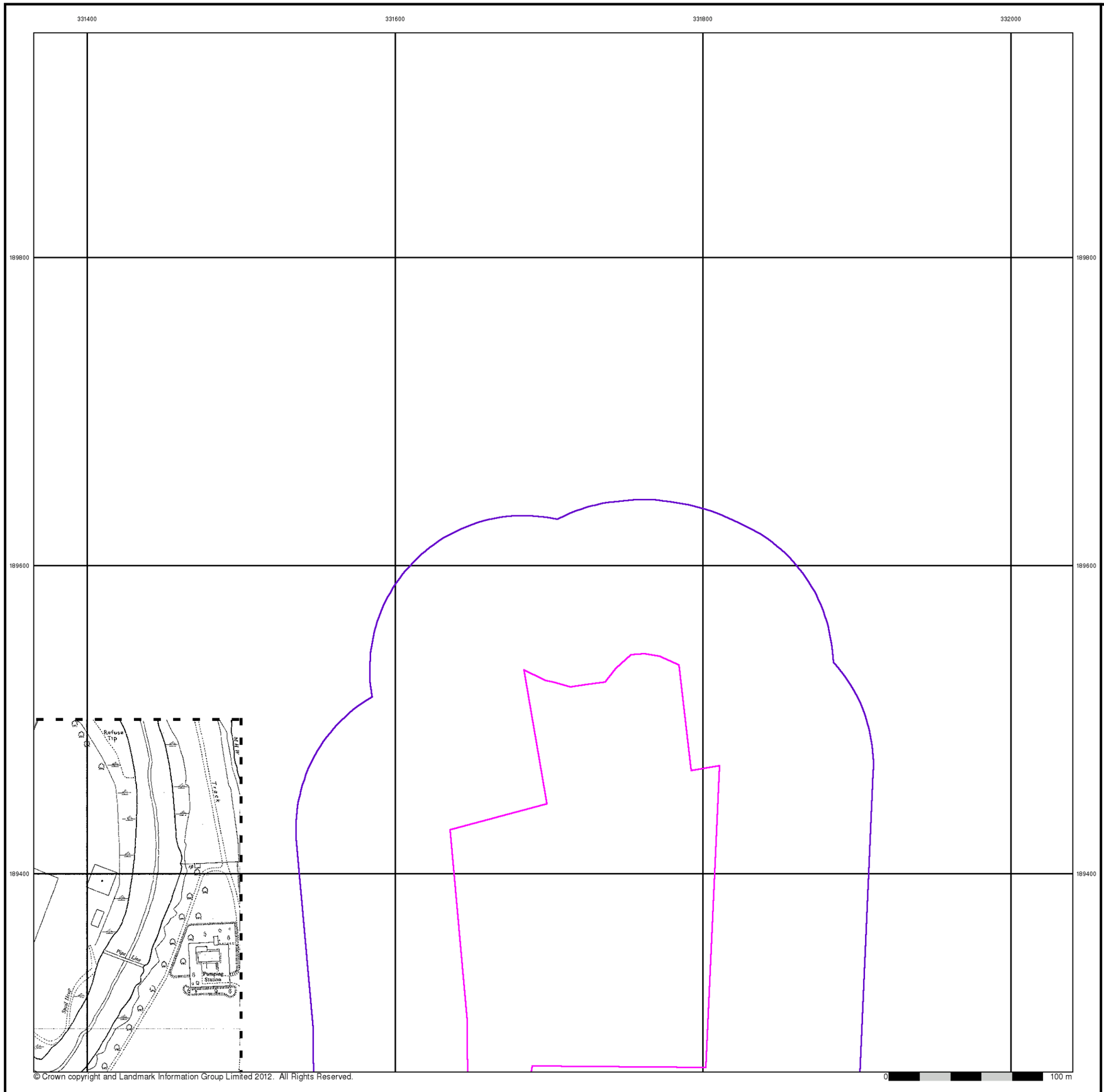

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Additional SIMs

Published 1989

Source map scale - 1:1,250

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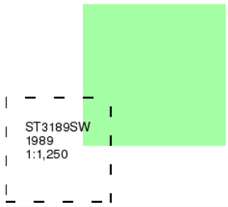
Map Name(s) and Date(s)



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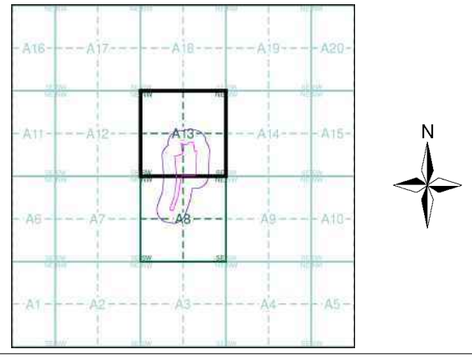

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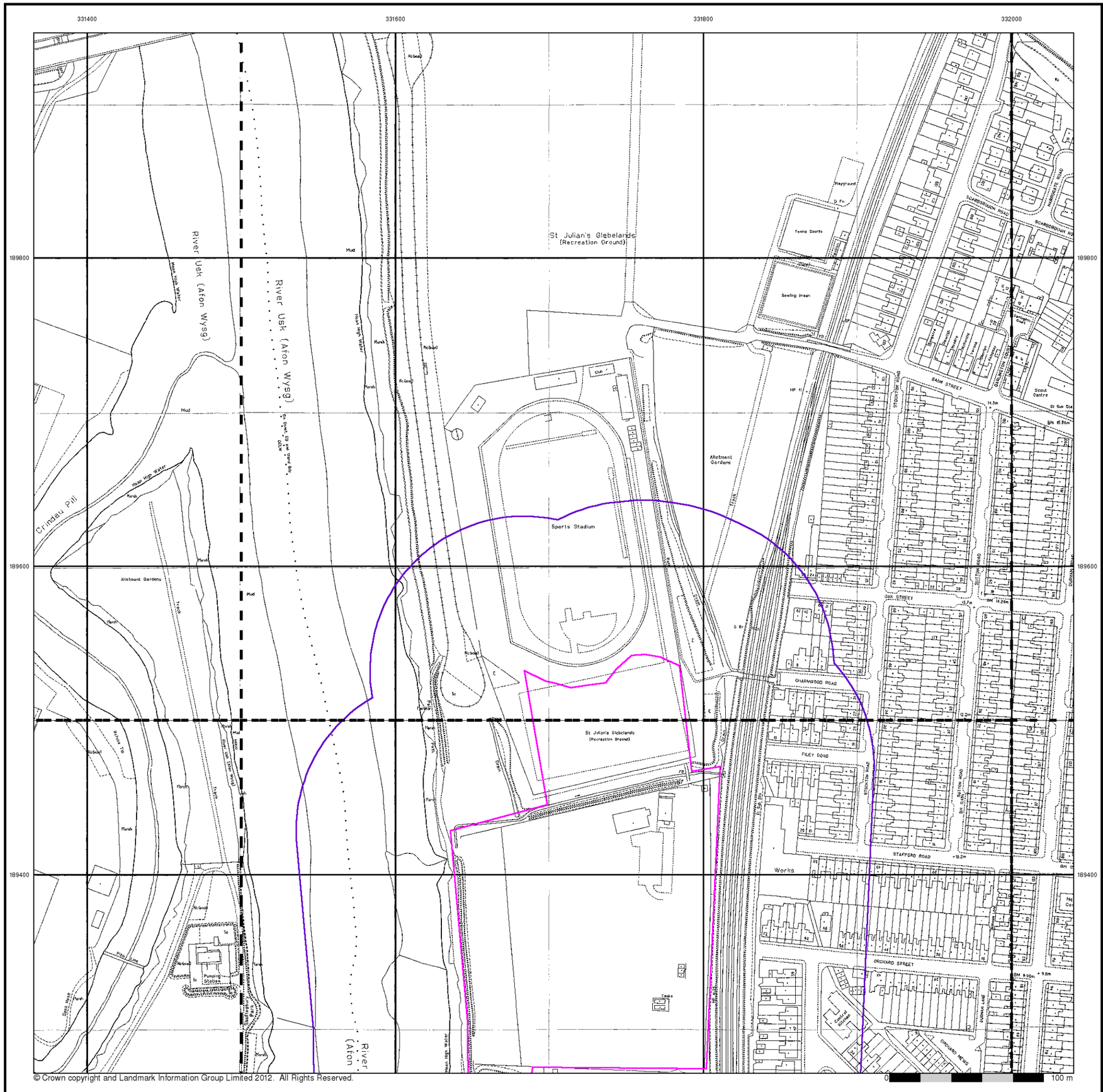

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Large-Scale National Grid Data

Published 1993

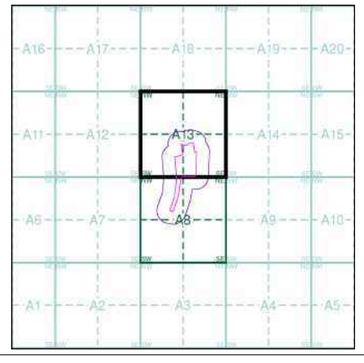
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

ST3189NW 1993 1:1,250	ST3189NE 1993 1:1,250	ST3289NW 1993 1:1,250
ST3189SW 1993 1:1,250	ST3189SE 1993 1:1,250	ST3289SW 1993 1:1,250

Historical Map - Segment A13



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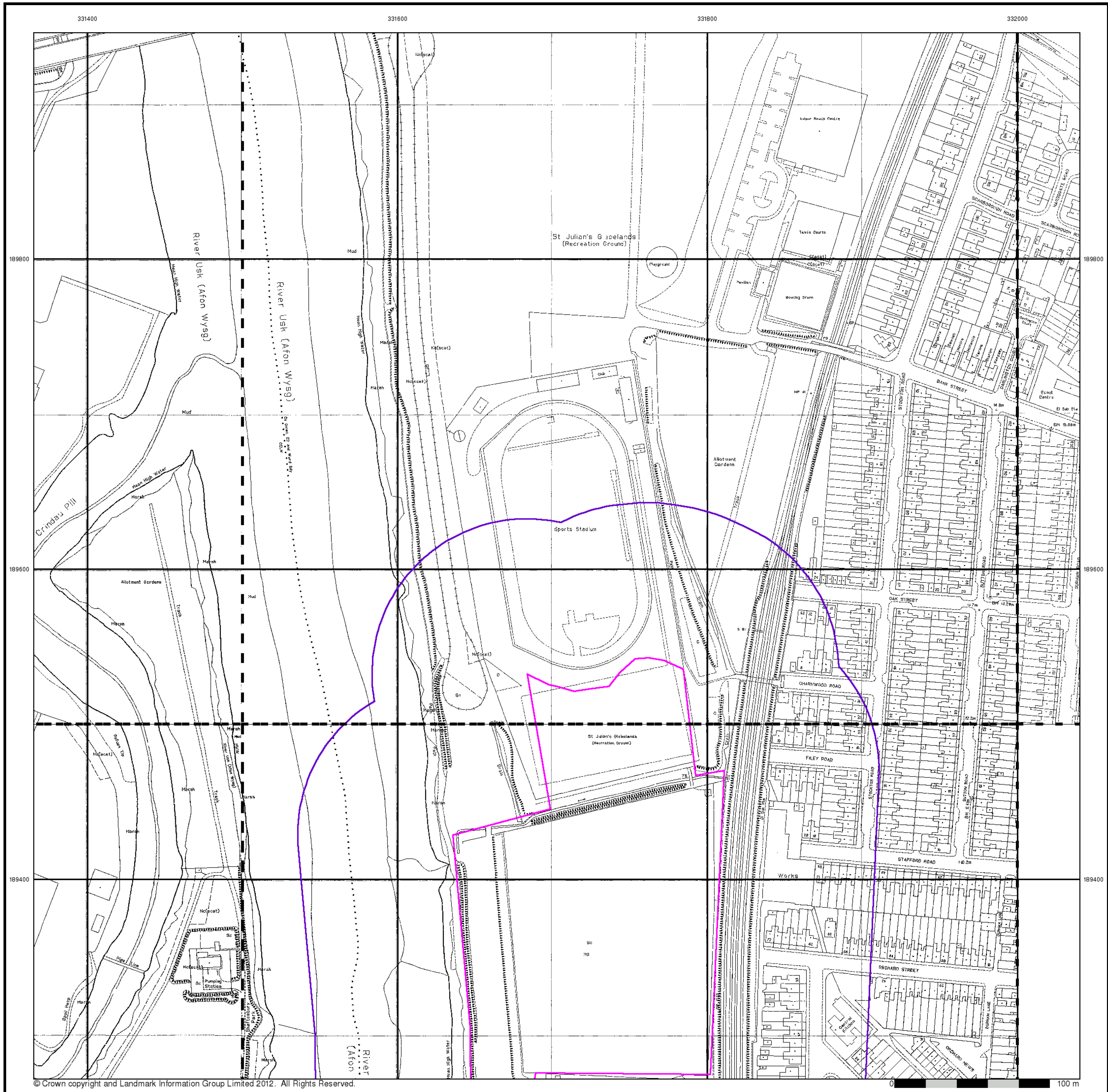

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Large-Scale National Grid Data

Published 1994 - 1995

Source map scale - 1:1,250

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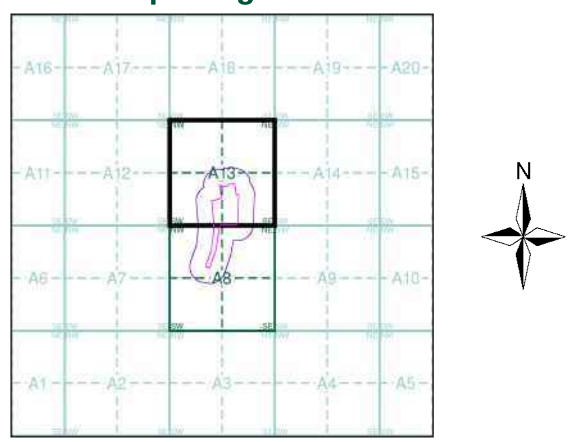
Map Name(s) and Date(s)

ST3189NW 1994 1:1,250	ST3189NE 1995 1:1,250	ST3289NW 1995 1:1,250
ST3189SW 1994 1:1,250	ST3189SE 1994 1:1,250	

Historical Map - Segment A13



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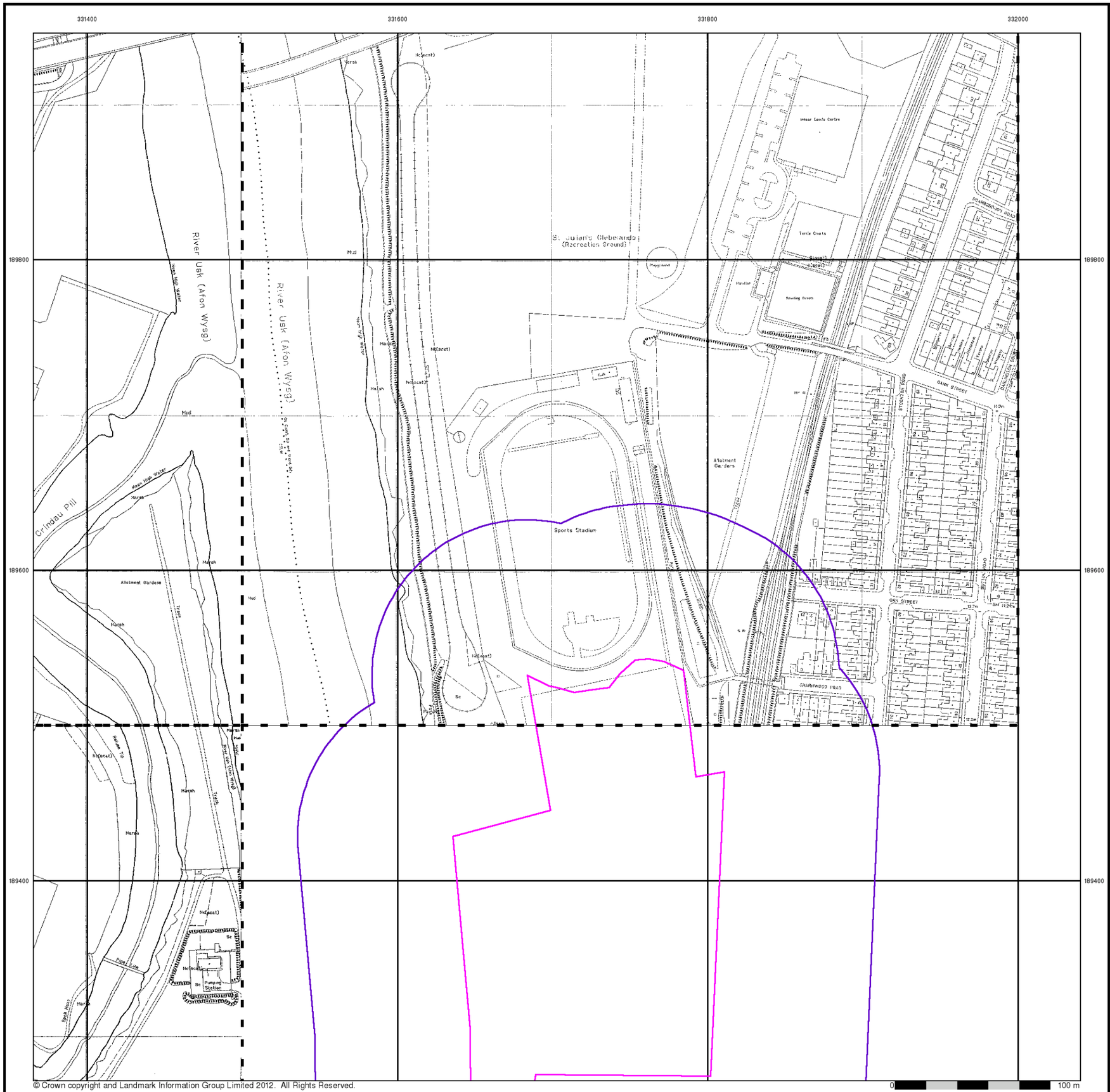

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Large-Scale National Grid Data

Published 1995 - 1997

Source map scale - 1:1,250

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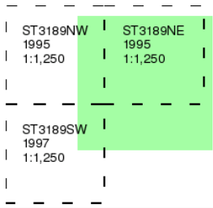
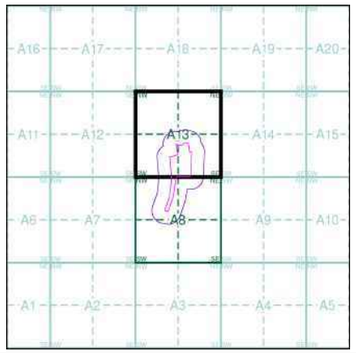


Historical Map - Segment A13



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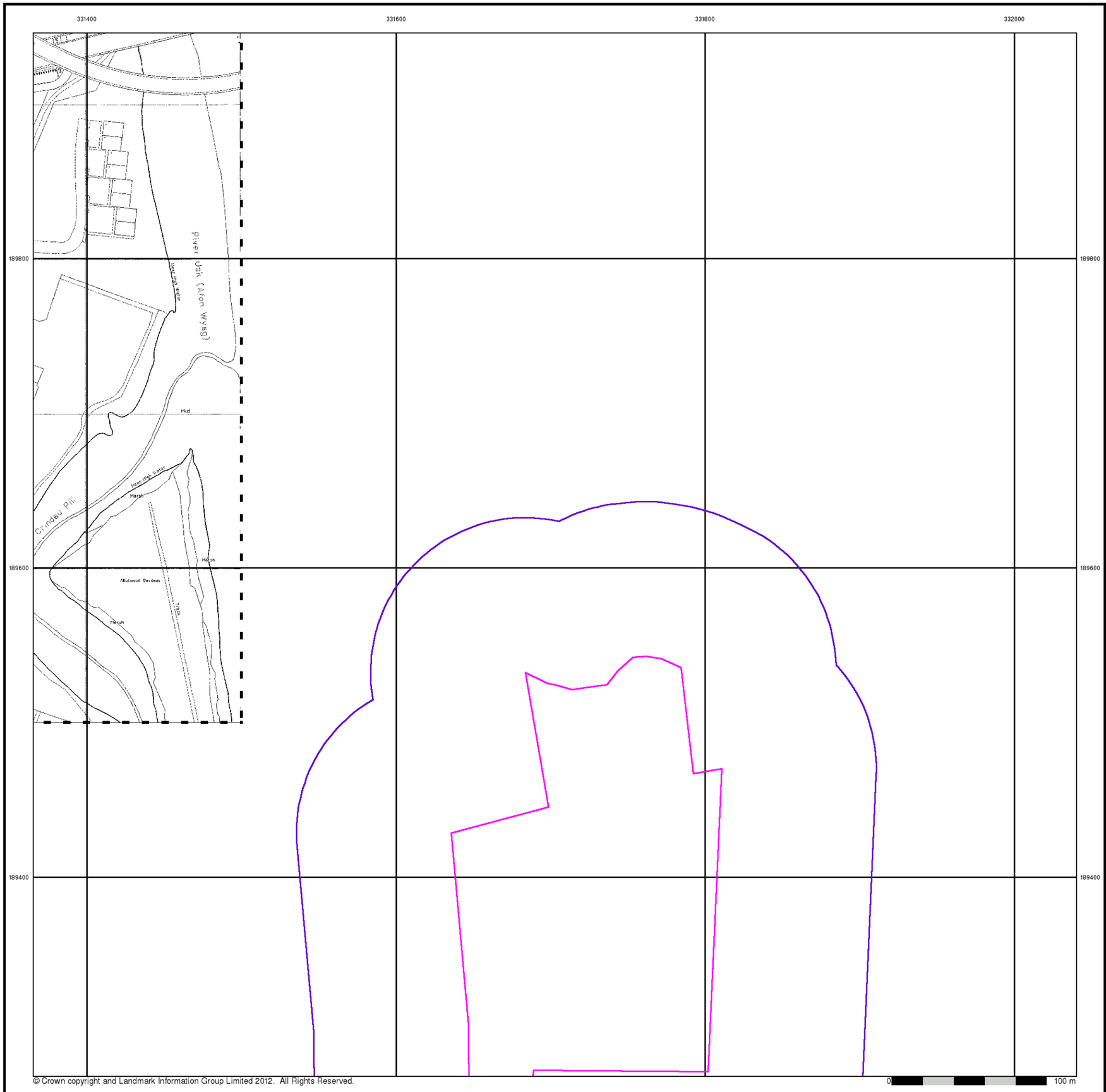

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Large-Scale National Grid Data

Published 1995

Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

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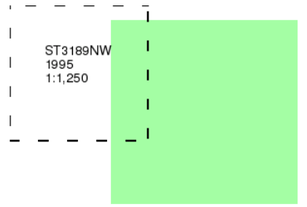
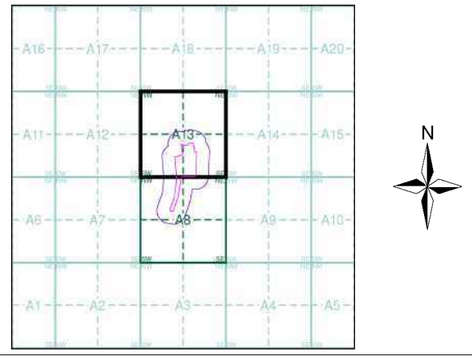


Historical Map - Segment A13



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Monmouthshire

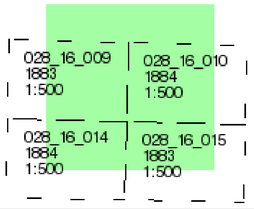
Published 1883 - 1884

Source map scale - 1:500

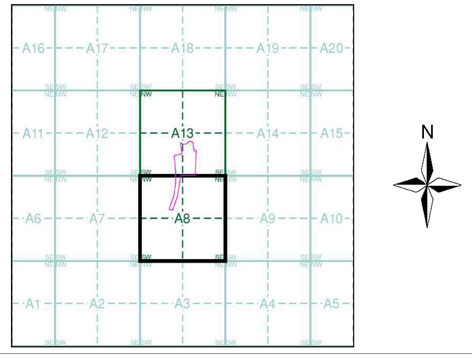
The 1:500 scale Ordnance Survey mapping was introduced in 1855 as a replacement for the 1:528 scale and to compliment the 1:2500 scale that had been implemented in 1853. By 1895, the 1:500 scale covered most towns over a population of about 4000 at the time of survey, although very few towns were mapped more than once at this scale, and none have been since 1910. The 1:500 scale gives particular emphasis to such features as lamp posts, man holes, arched passages and minor building projections. Also often featured are divisions between tenements, interior ground floor layouts of public buildings, and on earlier plans, the functions of the various parts of larger industrial premises are also indicated. Content of the plans does vary however, from one town to the next in terms of, for example, the completeness of railway tracks and the coverage of public buildings.

Please note: Due to the partial coverage of Historical Town Plans, it is possible that not all segments within an order will contain mapping. Only the segments that have Town Plan coverage will be generated.

Map Name(s) and Date(s)



Historical Town Plan - Segment A8



Order Details

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Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	0

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ANNEX B
Radon Report

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

GeoReports

Helen Eddy
Terra Firma Wales Ltd
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Wharfedales Road
Pentwyn
Cardiff
CF38 1AA

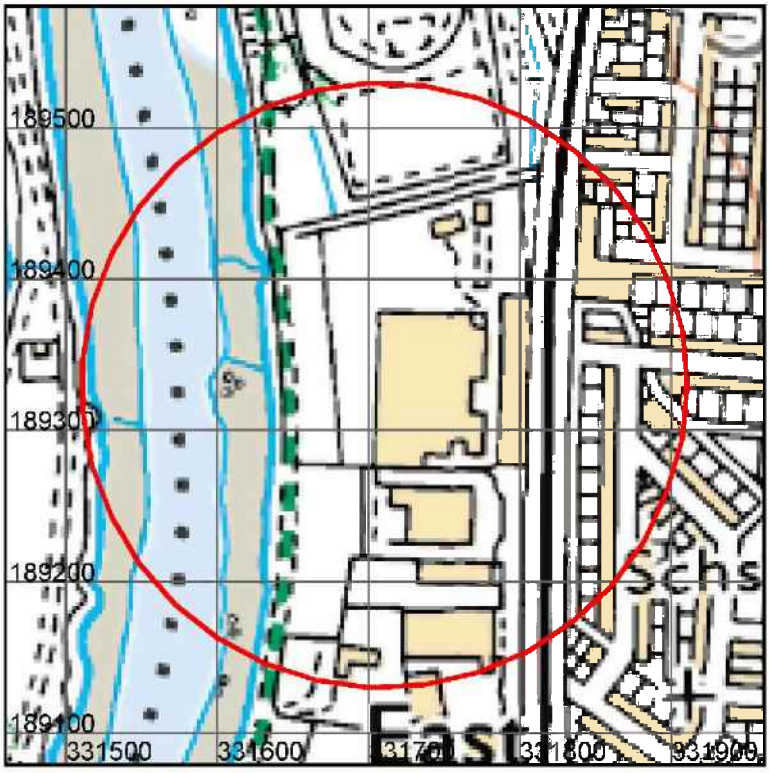
Radon Report: England and Wales

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

Report Id: *GR_205477/1*

Client reference: 12044

Search location



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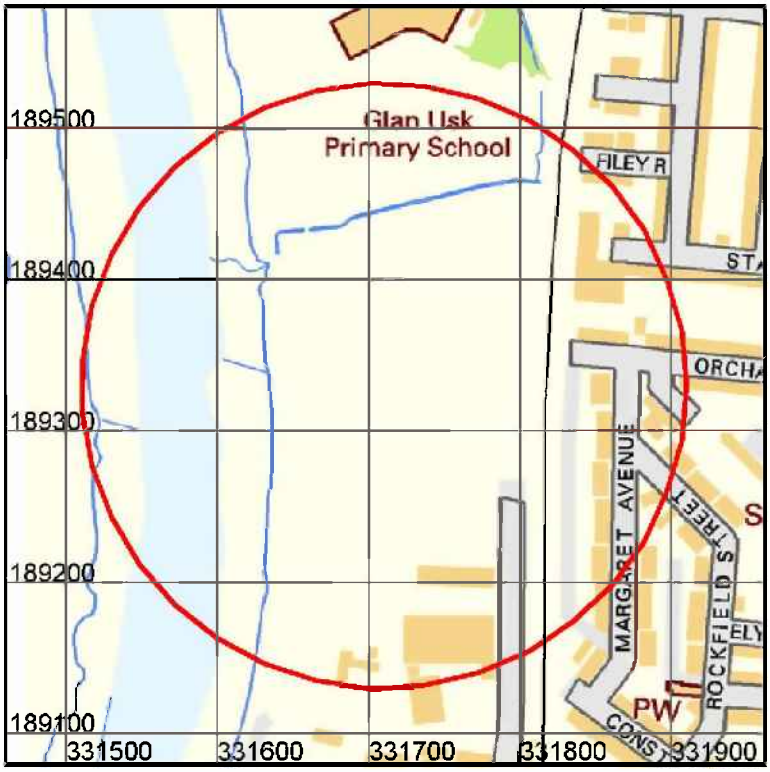
Scale: 1:5 000 (1cm = 50 m)



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OS Street View: Scale: 1:5 000 (1cm = 50 m)

This report describes a site located at National Grid Reference 331710, 189330. Note that for sites of irregular shape, this point may lie outside the site boundary. Where the client has submitted a site plan the assessment will be based on the area given.

Search location indicated in red

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Radon Report: England and Wales

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

Requirement for radon protective measures
The determination below follows advice in *BR211 Radon: Guidance on protective measures for new buildings (2007 edition)*, which also provides guidance on what to do if the result indicates that protective measures are required.

BASIC RADON PROTECTIVE MEASURES ARE REQUIRED FOR THE REPORT AREA.

The BGS is not able to provide advice on the technical specifications of 'basic' and 'full' radon protective measures. This information is detailed in **BRE Report BR211 Radon: guidance on protective measures for new buildings** which may be purchased from **brebookshop.com**. This report offers guidance on the technical solutions that are required to satisfy Building Regulations requirements.

Technical solutions to radon protection in new build and existing dwellings in radon affected areas are available on the BRE web site at:
http://www.bre.co.uk/page.jsp?id=1626 and http://www.bre.co.uk/radon/ and in a range of technical reports available from **brebookshop.com**; Tel: 01923 664262, email: bookshop@bre.co.uk.
Summary guidance is available on the web at:
http://www.bre.co.uk/radon/protect.html.

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

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Radon in existing buildings

Is this property in a radon affected area – YES

The answer to the standard enquiry on house purchase known as **CON29 Standard Enquiry of Local Authority 3.13 Radon Gas: Location of the Property in a radon Affected Area is** YES this property is in a Radon Affected Area as defined by the Health Protection Agency (HPA).

The estimated probability of the property being above the Action Level for radon is: 5-10% (INTERMEDIATE PROBABILITY).

The result informs you of the estimated probability that this particular property is above the Action Level for radon. This does not necessarily mean there is a radon problem in the property. The only way to determine whether it is above or below the Action Level is to carry out a radon measurement within the existing property.

Radon Affected Areas are designated by the HPA. They advise that radon gas should be measured in all properties within Radon Affected Areas.

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

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

In radon affected homes, the problem of radon can usually be tackled with simple, effective and relatively inexpensive measures. These measures are comparable in cost to work such as damp-proofing and timber treatment. You can get practical advice about construction work to reduce radon levels from the Building Control Officer at your local council.

For further information, advice about radon, its health risks and details of how to order the radon test, please contact the HPA Radon Helpline on 01235 822622 or go online at www.ukradon.org or write to Radon Survey, Health Protection Agency, Centre for Radiation, Chemical and Environmental Hazards, Chilton, Didcot, Oxon, OX11 0RQ, email: radon@hpa.org.uk. You can obtain an information pack from the HPA free Radon answerphone on 0800 614529

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What is radon?

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

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

Radon in workplaces

The Ionising Radiation Regulations, 1999, require employers to take action when radon is present above a defined level in the workplace. Advice may be obtained from your local Health and Safety Executive Area Office or the Environmental Health Department of your local authority. The BRE publishes a guide (BR293): **Radon in the workplace.** BRE publications may be obtained from the BRE Bookshop, Tel: 01923 664262, email: bookshop@bre.co.ukwebsite: www.brebookshop.com

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Email: hydroenq@bgs.ac.uk

Murchison House (MH) Office
British Geological Survey
Murchison House
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Edinburgh
EH9 3LA
Tel: 0131 650 0282
Fax: 0131 650 0252
Email: enquiry@bgs.ac.uk

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- Geological observations and interpretations are made according to the prevailing understanding of the subject at the time. The quality of such observations and interpretations may be affected by the availability of new data, by subsequent advances in knowledge, improved methods of interpretation, and better access to sampling locations.
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- The most appropriate techniques for copying original records are used, but there may be some loss of detail and dimensional distortion when such records are copied.
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- Note that for some sites, the latest available records may be quite historical in nature, and while every effort is made to place the analysis in a modern geological context, it is possible in some cases that the detailed geology at a site may differ from that described.

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Report issued by
BGS Enquiry Service

ANNEX C
Terra Firma Definitions and Methodologies

A pollutant linkage requires three essential elements:

(1) A **CONTAMINANT** (hazard) - a substance that is in, on or under the land and has the potential to cause harm or to cause pollution of **controlled waters**

(2) A **RECEPTOR** (target) - something which could be adversely affected by a contaminant

(3) A **PATHWAY** - a route or means which either allows the contaminant to cause significant harm to that receptor, or that there is a significant possibility of such harm being caused to the receptor, or that pollution of controlled waters is being or likely to be caused.

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

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

A 'Hazard' is defined as '*a property or situation that in particular circumstances could lead to harm'.*

The classification of consequences and probability and determining the risk category are defined in the following sections.

Table 3.1 Classification of Consequence

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

Table 3.2 Classification of Probability	
Classification	**Definition**
High	• There is a complete pollution linkage and an event appears very likely to occur in the short term and is inevitable in the long term. • Evidence of harm to the receptor
Medium	• There is a complete pollution linkage which means that is it probable that an event will occur • The event is not inevitable but possible in short term and likely in the long term
Low	• There is a complete pollution linkage and circumstances are possible under which an event could occur • It is not certain that an event will occur in the long term, and it is less likely to occur in the short term
Negligible	• There is a complete pollution linkage but circumstances are such that it is improbable that an event would occur even in the long term

By comparing the consequences of a risk and the probability of the risk of a pollution linkage, the likely risk category can be determined as shown in **Table 3.3** below.

Table 3.3 Risk Assessment Matrix					
Increasing acceptability →		**Consequence**			
		Severe	**Medium**	**Mild**	**Negligible**
Probability	**High**	High	High	Medium / Low	Near zero
	Medium	High	Medium	Low	Near zero
	Low	High / medium	Medium / Low	Low	Near zero
	Negligible	High / medium / Low	Medium / Low	Low	Near zero

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

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

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

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

Methodology

Environmental risk assessment evaluates the risk to receptors via an analysis of the 'source-pathway-receptor' linkage. In order for a risk to be present, there must be a contaminant source capable of causing a health risk, a vulnerable receptor, and a pathway linking the two.

This sort of risk assessment is usually conducted using a tiered approach. Tier 1 consists of a comparison of the analytical results obtained from the site investigation with Soil Guideline Values (SGV's) specific to the type of development obtained from The Environment Agency Contaminated Land Exposure Assessment (CLEA) Guidelines.

Where SGV values are not available reference has been made to Generic Assessment Criteria (GAC) provided by Land Quality Management Limited (LQM) and the Chartered Institute of Environmental Health (CIEH).

At each tier, the amount and detail of investigation work increases as more site-specific data are needed to refine the characterisation of the site. Conversely, as site conditions are better understood, a more site-specific remediation strategy can be determined.

Should Tier 1 levels be exceeded, a choice is made either to remediate the site to conservative Tier 1 levels, or proceed to Tier 2. Tier 2 makes use of site-specific data to evaluate acceptable concentrations of chemicals for the particular conditions present at the site.

For Tier 1, the site itself is considered to be the receptor. Therefore, attenuation of contaminants between the source and receptor is not considered.

All soil test results have therefore been compared to thresholds for residential development.

A summary of the soil and groundwater chemical test results, which include the regulatory guidelines used in the Tier 1 assessment, are given in the tables on the following pages.

ANNEX D
Trial Pit Logs

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Trialpit No
TP1
Sheet 1 of 1

Project Name: Herbert Road	Project No.: 12032	Co-ords: - Level: -	Date: 06/11/2012
Location: Newport		Dimensions: 2.20m Depth 3.00m 0.70m	Scale: 1:25
Client: Greenhill Construction			Logged By: MW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						MADE GROUND. Soft to firm brown organic rich slightly gravelly clay with occasional cobbles of angular brick and concrete. Occasional boulders of angular concrete. Gravel is fine to coarse angular concrete and brick.
			2.50			Firm grey mottled CLAY
			3.00			Trialpit Complete at 3.00 m

Remarks: Unstable

Groundwater: Groundwater inflow at 2.50m

AGS

HoleBASE III (Bld 426.48) Standard Trialpit Log v2 dated 27th Nov 03

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Trialpit No
TP2
Sheet 1 of 1

Project Name: Herbert Road	Project No.: 12032	Co-ords: - Level: -	Date: 06/11/2012
Location: Newport		Dimensions: 2.20m Depth 2.50m 0.70m	Scale: 1:25
Client: Greenhill Construction			Logged By: MW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						MADE GROUND. Soft to firm brown organic rich slightly gravelly clay with occasional cobbles of angular brick and concrete. Occasional boulders of angular concrete. Gravel is fine to coarse of angular concrete and brick.
			0.90			Firm to stiff grey and red CLAY with occasional organic matter
			2.50			Trialpit Complete at 2.50 m

Remarks: Stable

Groundwater: Groundwater inflow at 2.50m

AGS

HoleBASE III (Bld 426.48) Standard Trialpit Log v2 dated 27th Nov 03

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Trialpit No
TP3
Sheet 1 of 1

Project Name: Herbert Road	Project No.: 12032	Co-ords: - Level: -	Date: 06/11/2012
Location: Newport		Dimensions: 2.40m Depth 1.80m 0.70m	Scale: 1:25
Client: Greenhill Construction			Logged By: MW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						MADE GROUND. Long grass over soft brown organic rich clay with many rootlets and roots
			0.20			Firm becoming soft to firm at 1.0m grey and red brown CLAY
			1.80			Trialpit Complete at 1.80 m

Remarks: Stable

Groundwater: Groundwater inflow at 1.80m

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HoleBASE III (Bld 426.48) Standard Trialpit Log v2 dated 27th Nov 03

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Trialpit No
TP4
Sheet 1 of 1

Project Name: Herbert Road	Project No.: 12032	Co-ords: - Level: -	Date: 06/11/2012
Location: Newport		Dimensions: 2.20m Depth 2.00m 0.70m	Scale: 1:25
Client: Greenhill Construction			Logged By: MW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.20			MADE GROUND. Vegetation over soft brown organic rich clay with many rootlets and roots.
						MADE GROUND. Soft to firm brown organic rich clay
			0.80			Firm grey mottled CLAY
			2.00			Trialpit Complete at 2.00 m

Remarks: Stable

Groundwater: Groundwater seepage from clay beneath 0.80m

AGS

HoleBASE III (Bld 426.48) Standard Trialpit Log v2 dated 27th Nov 03

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Trialpit No
TP5
Sheet 1 of 1

Project Name: Herbert Road	Project No.: 12032	Co-ords: - Level: -	Date: 06/11/2012
Location: Newport		Dimensions: 2.20m Depth 2.50m 0.70m	Scale: 1:25
Client: Greenhill Construction			Logged By: MW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.20			MADE GROUND. Grass over soft red brown slightly gravelly clay with many rootlets. Gravel is fine to coarse of angular mudstone. Geosynthetic membrane at 0.70m
			0.70			MADE GROUND. Dense grey very gravelly sand with some cobbles of angular sandstone.
			2.50			MADE GROUND. Loose to medium dense brown mottled gravelly sand. Some litter, bottles, jars and ceramic. Gravel is fine to coarse of angular slate, mudstone and sandstone. Occasional cobble of angular brick. Trialpit Complete at 2.50 m

Remarks: Stable

Groundwater: Standing groundwater at 2.30m

AGS

HoleBASE III (Bld 426.48) Standard Trialpit Log v2 dated 27th Nov 03

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Trialpit No
TP6
Sheet 1 of 1

Project Name: Herbert Road	Project No.: 12032	Co-ords: - Level: -	Date: 06/11/2012
Location: Newport		Dimensions: 2.20m Depth 2.70m 0.70m	Scale: 1:25
Client: Greenhill Construction			Logged By: MW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						MADE GROUND. Grass over soft red brown slightly gravelly clay with many rootlets. Gravel is fine to coarse of angular mudstone.
			0.20			MADE GROUND. Dense grey very gravelly sand with some cobbles of angular sandstone
			0.80			MADE GROUND. Firm black very gravelly clay with some cobbles of angular concrete and brick. Many litter including bottles, rubber, plastic and ceramic. Gravel is fine to coarse of angular brick, concrete and vitreous slag.
			2.50			Firm grey mottled CLAY
			2.70			Trialpit Complete at 2.70 m

1
2
3
4

Remarks: Stable

Groundwater: Dry

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HoleBASE III (Bld 426.48) Standard Trialpit Log v2 dated 27th Nov 03

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Trialpit No
TP7
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Herbert Road	12032	Level: -	06/11/2012
Location: Newport		Dimensions: 2.20m	Scale 1:25
Client: Greenhill Construction		Depth 2.20m, 0.70m	Logged By MW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						MADE GROUND. Soft to firm organic rich gravelly clay with occasional cobbles of angular concrete and brick. Gravel is fine to coarse of angular brick, concrete, sandstone and mudstone. Occasional litter
			1.20			Firm brown mottled CLAY
			1.70			Firm grey mottled CLAY
			2.20			Trialpit Complete at 2.20 m

Remarks: Stable

Groundwater: Groundwater inflow at 1.20m

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HoleBASE III (Bld 426.48) Standard Trialpit Log v2 dated 27th Nov 03

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Trialpit No
TP8
Sheet 1 of 1

Project Name: Herbert Road	Project No.: 12032	Co-ords: - Level: -	Date: 06/11/2012
Location: Newport		Dimensions: 2.20m Depth 2.50m 0.70m	Scale: 1:25
Client: Greenhill Construction			Logged By: MW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						MADE GROUND. Soft to firm black organic rich sandy gravelly clay. Gravel is fine to coarse of angular brick and concrete. Occasional cobbles of angular brick and concrete. Occasional wood fragments and ash.
			1.40			Firm brown mottled CLAY
			1.80			Firm grey mottled CLAY
			2.50			Trialpit Complete at 2.50 m

Remarks: Stable

Groundwater: Groundwater inflow at 1.80m

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HoleBASE III (Bld 426.48) Standard Trialpit Log v2 dated 27th Nov 03

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Trialpit No
TP9
Sheet 1 of 1

Project Name Herbert Road	Project No. 12032	Co-ords: - Level: -	Date 07/11/2012
Location: Newport		Dimensions: 2.50m Depth 2.50m 0.70m	Scale 1:25
Client: Greenhill Construction			Logged By

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						MADE GROUND. Soft to firm brown organic rich gravelly clay with occasional cobbles and boulders of angular concrete and brick. Gravel is fine to coarse of angular brick, concrete, sandstone and mudstone. Occasional litter, wood and peat.
			1.60			Firm brown mottled CLAY with occasional relic plant fragments
			2.00			Firm grey mottled CLAY
			2.50			Trialpit Complete at 2.50 m

Remarks: Stable

Groundwater: Slow groundwater seepage at 2.40m below ground level

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HoleBASE III (Bld 426.48) Standard Trialpit Log v2 dated 27th Nov 03

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Trialpit No
TP10
Sheet 1 of 1

Project Name: Herbert Road	Project No.: 12032	Co-ords: - Level: -	Date: 07/11/2012
Location: Newport		Dimensions: 2.50m Depth 2.30m 0.70m	Scale: 1:25
Client: Greenhill Construction			Logged By: MW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						MADE GROUND. Soft to firm brown organic rich gravelly clay with occasional cobbles and boulders of angular concrete and brick. Gravel is fine to coarse of angular brick, concrete, sandstone and mudstone. Occasional litter, wood and peat.
			1.20			Firm brown mottled CLAY
			1.90			Firm grey mottled CLAY
			2.30			Trialpit Complete at 2.30 m

Remarks: Stable

Groundwater: Slow groundwater seepage at 1.90m

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HoleBASE III (Bld 426.48) Standard Trialpit Log v2 dated 27th Nov 03

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Trialpit No
TP11
Sheet 1 of 1

Project Name: Herbert Road	Project No.: 12032	Co-ords: - Level: -	Date: 07/11/2012
Location: Newport		Dimensions: 2.50m Depth 2.00m 0.70m	Scale: 1:25
Client: Greenhill Construction			Logged By: MW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						MADE GROUND. Vegetation over firm mottled sandy gravelly clay. Gravel is fine to coarse of angular brick and concrete. Some cobbles and boulders of angular concrete and brick.
			1.60			Firm grey mottled CLAY
			2.00			Trialpit Complete at 2.00 m

Remarks: Highly unstable

Groundwater: Groundwater inflow at 1.60m below ground level

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HoleBASE III (Bld 426.48) Standard Trialpit Log v2 dated 27th Nov 03

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Trialpit No
TP12
Sheet 1 of 1

Project Name: Herbert Road	Project No.: 12032	Co-ords: - Level: -	Date: 07/11/2012
Location: Newport		Dimensions: 2.50m (Depth 2.00m, 0.70m)	Scale: 1:25
Client: Greenhill Construction			Logged By: MW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						MADE GROUND. Dense mottled sandy gravel of angular concrete and brick. Many cobbles of angular brick and concrete. Occasional ash.
			0.80			Firm brown mottled CLAY
			1.00			Firm grey mottled CLAY
			2.00			Trialpit Complete at 2.00 m

Remarks: Highly unstable

Groundwater: Groundwater inflow at 1.60m below ground level

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HoleBASE III (Bld 426.48) Standard Trialpit Log v2 dated 27th Nov 03

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Trialpit No
TP13
Sheet 1 of 1

Project Name Herbert Road	Project No. 12032	Co-ords: - Level: -	Date 07/11/2012
Location: Newport		Dimensions: 2.50m Depth 2.20m 0.70m	Scale 1:25
Client: Greenhill Construction			Logged By MW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						MADE GROUND. Gravel over dense dark grey clayey sandy gravel with some cobbles of angular brick and concrete. Gravel is fine to coarse of angular brick and concrete. Occasional boulder of angular concrete.
			0.70			Firm grey mottled CLAY
			2.00			Trialpit Complete at 2.20 m

Remarks: Slightly unstable

Groundwater: Groundwater seepage at 2.20m below ground level

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HoleBASE III (Bld 426.48) Standard Trialpit Log v2 dated 27th Nov 03

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Trialpit No
TP14
Sheet 1 of 1

Project Name Herbert Road	Project No. 12032	Co-ords: - Level: -	Date 07/11/2012
Location: Newport		Dimensions: 2.50m Depth 2.10m 0.70m	Scale 1:25
Client: Greenhill Construction			Logged By MW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						MADE GROUND. Gravel over dense dark grey clayey sandy gravel with some cobbles of angular brick and concrete. Gravel is fine to coarse of angular brick and concrete. Occasional boulder of angular concrete.
			0.70			MADE GROUND. Firm to stiff brown organic rich clay (possibly reworked)
			1.20			Firm grey mottled CLAY
			2.10			Trialpit Complete at 2.10 m

Remarks: Stable

Groundwater: Groundwater inflow from 1.20m below ground level

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HoleBASE III (Bld 426.48) Standard Trialpit Log v2 dated 27th Nov 03

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Trialpit No
TP15
Sheet 1 of 1

Project Name: Herbert Road	Project No.: 12032	Co-ords: - Level: -	Date: 07/11/2012
Location: Newport		Dimensions: 2.50m Depth 2.20m 0.70m	Scale: 1:25
Client: Greenhill Construction			Logged By: MW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.20			TOPSOIL. Long grass over soft brown organic rich clay with many rootlets and roots.
			0.60			MADE GROUND. Firm red brown and grey clay with occasional cobble of angular brick
			1.20			Firm red brown CLAY
			2.20			Firm grey mottled CLAY
						Trialpit Complete at 2.20 m

Remarks: Stable

Groundwater: Groundwater inflow from 1.20m below ground level

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HoleBASE III (Bld 426.48) Standard Trialpit Log v2 dated 27th Nov 03

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Trialpit No
TP16
Sheet 1 of 1

Project Name: Herbert Road	Project No.: 12032	Co-ords: - Level: -	Date: 07/11/2012
Location: Newport		Dimensions: 2.50m (Depth 2.00m, 0.70m)	Scale: 1:25
Client: Greenhill Construction			Logged By: MW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.20			TOPSOIL. Long grass over soft brown organic rich clay with many rootlets and roots
						Soft dark brown organic rich CLAY
			0.90			Firm grey mottled CLAY
			2.00			Trialpit Complete at 2.00 m

Remarks: Stable

Groundwater: Slow groundwater seepage at 1.80m below ground level

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HoleBASE III (Bld 426.48) Standard Trialpit Log v2 dated 27th Nov 03

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Trialpit No
TP17
Sheet 1 of 1

Project Name: Herbert Road	Project No.: 12032	Co-ords: - Level: -	Date: 07/11/2012
Location: Newport		Dimensions: 2.50m Depth 2.00m 0.70m	Scale: 1:25
Client: Greenhill Construction			Logged By: MW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						TOPSOIL. Long grass over soft brown organic rich clay with many rootlets and roots
			0.30			Firm grey mottled CLAY
			2.00			Trialpit Complete at 2.00 m

Remarks: Stable

Groundwater: Slow groundwater seepage at 1.80m below ground level

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HoleBASE III (Bld 426.48) Standard Trialpit Log v2 dated 27th Nov 03

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Trialpit No
TP18
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Herbert Road	12032	Level: -	07/11/2012
Location: Newport		Dimensions: 2.50m	Scale 1:25
Client: Greenhill Construction		Depth 2.00m, 0.70m	Logged By MW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						TOPSOIL. Long grass over soft brown organic rich clay with many rootlets and roots
			0.20			MADE GROUND. Dense brown sandy gravel of angular fine to coarse limestone. Some cobbles of angular limestone.
			0.40			MADE GROUND. Soft dark brown slightly sandy slightly gravelly clay. Gravel is fine to coarse of angular concrete and brick.
			0.80			Firm grey mottled CLAY
			2.00			Trialpit Complete at 2.00 m

Remarks: Stable

Groundwater: Groundwater inflow from 0.80m below ground level

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HoleBASE III (Bld 426.48) Standard Trialpit Log v2 dated 27th Nov 03

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Trialpit No
TP19
Sheet 1 of 1

Project Name: Herbert Road	Project No.: 12032	Co-ords: - Level: -	Date: 07/11/2012
Location: Newport		Dimensions: 2.50m Depth 2.00m 0.70m	Scale: 1:25
Client: Greenhill Construction			Logged By: MW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.20			TOPSOIL. Long grass over soft brown organic rich clay with many rootlets and roots
						Firm grey and brown CLAY
			0.80			Firm grey mottled CLAY
			2.00			Trialpit Complete at 2.00 m

Remarks: Stable

Groundwater: Slow groundwater seepage from 1.80m below ground level

AGS

HoleBASE III (Bld 426.48) Standard Trialpit Log v2 dated 27th Nov 03

ANNEX E
Cable Percussive Borehole Logs

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Borehole No **BH1** Sheet 1 of 2

Project Name	Project No.	Co-ords: -	Hole Type
Herbert Road	12032		Cable
Location: Newport		Level: -	Scale 1:50
Client: Greenhill Construction		Dates: 31/10/2012-01/11/2012	Logged By MW

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		0.00-1.20	B					MADE GROUND. Gravel over loose dark grey clayey sandy gravel with some cobbles of angular brick and concrete. Gravel is fine to coarse of angular brick and concrete. Occasional boulders of angular concrete.
		1.20	CPT	N=3				
		1.20-1.70	B	N=3 (3,2,2,1,0,0)				
					1.70			Very soft grey slightly gravelly CLAY with occasional cobbles of angular brick and concrete. Gravel is fine to coarse of angular concrete and brick.
		2.00	SPT	N=1	2.10			Very soft blue CLAY with occasional remnant root fragments.
				N=1 (1,0,0,0,1,0)				
		2.45-3.00	B					
	▼	3.00	SPT	N=2				
				N=2 (1,0,0,1,0,1)				
	▽				3.60			Very soft grey CLAY
		3.45-4.00	B		3.90			PEAT
		4.00	SPT	N=5				
				N=5 (1,1,1,2,1,1)				
		4.45-5.00	B					
		5.00	SPT	N=7				
				N=7 (1,1,1,2,2,2)				
					6.20			Very loose red brown silty SAND
		6.20-6.50	B					
		6.50	SPT	N=0				
				N=0 (1,0,0,0,0,0)				
					7.00			Very soft red sandy SILT
		6.95-8.00	B					
		8.00	SPT	N=1				
				N=1 (1,0,0,0,0,1)				
		8.00-8.50	B					
					8.80			Very stiff red brown and grey gravelly CLAY. Gravel is fine to coarse of angular mudstone and mudstone lithorelicts.
		8.80-9.00	B					
		9.00	SPT	N=33				
				N=33 (1,1,5,8,9,11)				
			B					
			Type	Results				

Continued next sheet

Remarks:

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Borehole No **BH1** Sheet 2 of 2

Project Name	Project No.	Co-ords: -	Hole Type
Herbert Road	12032		Cable
Location: Newport		Level: -	Scale 1:50
Client: Greenhill Construction		Dates: 31/10/2012-01/11/2012	Logged By MW

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		9.45-10.60			10.30			Very stiff red brown and grey gravelly CLAY. Gravel is fine to coarse of angular mudstone and mudstone lithorelicts.
		10.60	SPT	50/80mm 80mm (5,11,26,24)				Very weak red brown and grey MUDSTONE
					11.00			End of Borehole at 11.00 m

Type Results

Remarks:

AGS

HoleBASE III (Bld 426.48) Standard Borehole Log v2 dated 27th Nov 03

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Borehole No **BH2**
Sheet 1 of 2

Project Name	Project No.	Co-ords: -	Hole Type
Herbert Road	12032		Cable
Location: Newport		Level: -	Scale 1:50
Client: Greenhill Construction		Dates: 02/11/2012-05/11/2012	Logged By MW

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		0.00-1.20	B					MADE GROUND. Sub-base over dense dark grey clayey sandy gravel with some cobbles of angular brick and concrete. Gravel is fine to coarse of brick and concrete. Occasional boulder of angular concrete.
		1.20	CPT	N=9				
		1.20-1.70	B	N=9 (4,5,3,2,2,2)				
		1.70-2.00	B		1.90			
		2.00	CPT	N=7				Soft becoming very soft blue grey CLAY
		2.00-2.50	B	N=7 (1,2,2,3,1,1)				
		2.45-3.00	B					
		3.00	SPT	N=7				
				N=7 (1,1,1,2,2,2)				
		3.50-4.00	B					
		4.00	SPT	N=2				
				N=2 (1,1,1,0,0,1)				
		4.45-5.00	B					
		5.00	SPT	N=3				
				N=3 (1,0,1,0,1,1)	5.20			Very soft to soft blue grey CLAY with occasional peat bands
		5.45-6.50	B					
		6.50	SPT	N=3				
				N=3 (1,1,0,0,1,2)				
		6.95-8.00	B					
		8.00	SPT	N=6				
				N=6 (1,2,2,2,1,1)				
		8.45-9.50	B					
		9.50	SPT	N=8				
				N=8 (1,1,2,2,2,2)				
			Type	Results				Continued next sheet

Remarks:

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Borehole No
BH2
Sheet 2 of 2

Project Name	Project No.	Co-ords: -	Hole Type
Herbert Road	12032		Cable
Location: Newport		Level: -	Scale 1:50
Client: Greenhill Construction		Dates: 02/11/2012-05/11/2012	Logged By MW

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
					10.30			Very soft to soft blue grey CLAY with occasional peat bands
		10.30-11.00	B					Stiff becoming very stiff red brown and grey gravelly CLAY. Gravel is fine to coarse of angular mudstone.
		11.00	SPT	N=29 N=29 (5,6,6,7,8,8)				
		11.60-12.50	B					
		12.50	SPT	50/245mm 245mm (2,4,7,11,17,15)	12.70			Very weak red brown and grey MUDSTONE
					12.90			End of Borehole at 12.90 m

Type | Results

Remarks:

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HoleBASE III (Bld 426.48) Standard Borehole Log v2 dated 27th Nov 03

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Borehole No **BH3** Sheet 1 of 2

Project Name	Project No.	Co-ords: -	Hole Type
Herbert Road	12032		Cable
Location: Newport		Level: -	Scale 1:50
Client: Greenhill Construction		Dates: 06/11/2012-07/11/2012	Logged By MW

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
					0.20			TOPSOIL. Grass over soft red brown slightly gravelly clay with many rootlets. Gravel is fine to coarse of angular mudstone.
		0.00-1.00	B		0.70			MADE GROUND. Dense grey very gravelly sand with some cobbles of angular sandstone.
		1.00	CPT	N=4				MADE GROUND. Very loose brown mottled gravelly sand. Some litter including bottles, jars and ceramic. Gravel is fine to coarse of angular slate, mudstone, brick and sandstone. Occasional cobble of brick.
		1.00-1.50	B	N=4 (2,2,2,1,1,0)				
		2.00	CPT	N=1				
	▽	2.00-2.50	B	N=1 (1,0,0,0,1,0)				
		3.00	CPT	N=2				
		3.00-3.50	B	N=2 (1,1,0,1,0,1)	3.30			Soft becoming very soft blue grey CLAY
		3.80-4.00	B					
		4.00	SPT	N=7				
		4.45-5.00	B	N=7 (1,1,1,2,2,2)				
		5.00	SPT	N=2				
		5.45-6.50	B	N=2 (1,0,0,1,0,1)				
		6.50	SPT	N=1				
		6.95-8.00	B	N=1 (1,0,0,0,0,1)	7.10			Very soft grey and dark brown silty PEAT
		8.00	SPT	N=4				
		8.45-8.80	B	N=4 (1,2,1,1,2,0)	8.60			Dense grey sand and gravel of fine to coarse angular sandstone
	▽	8.80-9.50	B					
		9.50	CPT	N=34				
		9.50-10.00	B	N=34 (4,6,5,6,11,12)	9.70			
			Type	Results				Continued next sheet

Remarks:

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Borehole No
BH3
Sheet 2 of 2

Project Name	Project No.	Co-ords: -	Hole Type
Herbert Road	12032		Cable
Location: Newport		Level: -	Scale 1:50
Client: Greenhill Construction		Dates: 06/11/2012-07/11/2012	Logged By MW

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
					10.20			Very stiff red brown and grey gravelly CLAY. Gravel is fine to coarse of angular mudstone.
		10.20-10.60	B					Very weak red brown and grey MUDSTONE
		10.60	CPT	50/40mm 40mm (21,4,50)	10.70			End of Borehole at 10.70 m

Type	Results

Remarks:

AGS

HoleBASE III (Bld 426.48) Standard Borehole Log v2 dated 27th Nov 03

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Borehole No **BH4**
Sheet 1 of 2

Project Name	Project No.	Co-ords: -	Hole Type
Herbert Road	12032		Cable
Location: Newport		Level: -	Scale 1:50
Client: Greenhill Construction		Dates: 07/11/2012-08/11/2012	Logged By MW

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		0.00-0.60	B		0.20			TOPSOIL. Soft brown organic rich clay
					0.60			MADE GROUND. Stiff brown clay
		0.60-1.20	B					MADE GROUND. Firm black very gravelly clay with some cobbles of angular concrete and brick. Many bottles, rubber, plastic, ceramic and litter. Gravel of fine to coarse angular brick, concrete, and vitreous slag.
		1.20	CPT	N=13 N=13 (2,5,4,4,3,2)				
		1.20-2.00	B					
		2.00	SPT	N=10 N=10 (1,2,2,2,3,3)	2.10			Firm becoming very soft grey CLAY
		2.00-3.00	B					
		3.00	SPT	N=9 N=9 (2,1,2,2,2,3)				
		3.00-4.50	B					
		4.00	SPT	N=5 N=5 (1,1,1,1,1,2)				
		4.50	SPT	N=4 N=4 (1,1,1,1,1,1)	4.50			Very soft dark brown peaty SILT/CLAY
		4.50-5.30	B					
		5.30	SPT	N=2 N=2 (1,0,0,1,0,1)	5.30			Very soft grey CLAY
		5.30-6.80	B					
		6.80	SPT	N=18 N=18 (1,2,4,4,4,6)	6.80			Stiff red brown and grey gravelly CLAY. Gravel is fine to coarse of angular mudstone and mudstone lithorelicts.
		6.80-8.30	B					
		8.30	CPT	N=28 N=28 (5,9,6,5,6,11)				
		8.30-9.50	B					
		9.50	CPT	50/237mm 237mm (7,10,10,13,15,12)	9.50			Very weak red brown and grey MUDSTONE
			Type	Results				Continued next sheet

Remarks:

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HoleBASE III (Bld 426.48) Standard Borehole Log v2 dated 27th Nov 03

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Borehole No
BH4
Sheet 2 of 2

Project Name	Project No.	Co-ords: -	Hole Type
Herbert Road	12032		Cable
Location: Newport		Level: -	Scale 1:50
Client: Greenhill Construction		Dates: 07/11/2012-08/11/2012	Logged By MW

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		10.00	CPT	50/11mm				Very weak red brown and grey MUDSTONE
		10.20	CPT	11mm (25,50) 0mm (25,50)	10.20			End of Borehole at 10.20 m

Type | Results

Remarks:

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HoleBASE III (Bld 426.48) Standard Borehole Log v2 dated 27th Nov 03

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Borehole No **BH5** Sheet 1 of 2

Project Name	Project No.	Co-ords: -	Hole Type
Herbert Road	12032		Cable
Location: Newport		Level: -	Scale 1:50
Client: Greenhill Construction		Dates: 07/11/2012-08/11/2012	Logged By MW

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		0.00-1.00	B					MADE GROUND. Soft brown organic rich gravelly clay with occasional cobbles of angular concrete and brick. Gravel is fine to coarse of angular brick, concrete, sandstone and mudstone. Occasional litter.
		1.20	CPT	N=6				
		1.20-1.70	B	N=6 (1,1,2,3,1,0)				
					1.60			Soft brown CLAY
		2.00	SPT	N=5 N=5 (1,2,2,1,2,0)				
		2.45-2.70	B					
					2.70			Very soft grey blue CLAY
		2.70-3.00	B					
		3.00	SPT	N=3 N=3 (1,0,1,0,1,1)				
	▼	3.45-4.00	B					
	▽	4.00	SPT	N=2 N=2 (1,1,1,0,0,1)				
		4.45-5.00	B					
		5.00	SPT	N=3 N=3 (1,1,2,0,0,1)				
					6.20			Soft grey sandy SILT
		6.20-6.50	B					
		6.50	SPT	N=5 N=5 (2,2,1,2,0,2)				
		6.95-8.00	B					
		8.00	SPT	N=6 N=6 (1,1,1,1,2,2)				
		8.45-9.10	B					
					9.10			Firm becoming stiff red brown and grey gravelly CLAY. Gravel is fine to coarse of angular mudstone.
		9.10-9.50	B					
		9.50	CPT	N=20 N=20 (2,3,4,4,5,7)				
		9.50-10.00	B					
		Type		Results				

Continued next sheet

Remarks:

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HoleBASE III (Bld 426.48) Standard Borehole Log v2 dated 27th Nov 03

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Borehole No
BH5
Sheet 2 of 2

Project Name	Project No.	Co-ords: -	Hole Type
Herbert Road	12032		Cable
Location: Newport		Level: -	Scale 1:50
Client: Greenhill Construction		Dates: 07/11/2012-08/11/2012	Logged By MW

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
								Firm becoming stiff red brown and grey gravelly CLAY. Gravel is fine to coarse of angular mudstone.
		11.00	CPT	50/285mm	11.10			
		11.00-11.40	B	285mm (6,6,9,12,14,15)				Very weak red brown and grey MUDSTONE
					11.40			End of Borehole at 11.40 m

Type Results

Remarks:

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HoleBASE III (Bld 426.48) Standard Borehole Log v2 dated 27th Nov 03

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Borehole No **BH6** Sheet 1 of 2

Project Name	Project No.	Co-ords: -	Hole Type
Herbert Road	12032		Cable
Location: Newport		Level: -	Scale 1:50
Client: Greenhill Construction		Dates: 08/11/2012-09/11/2012	Logged By MW

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		0.00-0.30	B		0.30			TOPSOIL. Soft brown organic rich clay with many rootlets and roots.
		0.30-1.20	B		0.70			MADE GROUND. Dense grey and brown gravel with some cobbles of angular brick and concrete. Gravel is fine to coarse of angular brick and concrete.
		1.20	SPT	N=2 N=2 (1,0,0,0,1,1)				Very soft grey CLAY
		1.20-2.00	B					
		2.00	SPT	N=2 N=2 (1,1,0,1,0,1)				
		2.00-3.50	B					
		3.00	SPT	N=3 N=3 (1,0,0,1,1,1)				
		3.50	SPT	N=4 N=4 (1,0,1,1,1,1)	3.50			Very soft PEAT
	▼	3.50-4.10	B					
					4.10			Very soft grey CLAY
		4.10-5.00	B					
		5.00	SPT	N=10 N=10 (1,3,2,2,3,3)	5.00			Medium dense grey SAND and GRAVEL of fine to coarse angular sandstone
		5.00-6.00	B					
		6.00	SPT	N=13 N=13 (2,2,3,3,3,4)	5.90			Firm becoming stiff red brown grey gravelly CLAY. Gravel is fine to coarse of angular mudstone.
		6.00-7.00	B					
	▽	7.00	SPT	N=24 N=24 (4,6,5,7,6,6)				
		7.00-9.00	B					
		8.50	SPT	50/209mm 209mm (9,11,15,19,16)				
		9.00	CPT	N=38 N=38 (8,10,15,8,7,8)				
		9.00-10.00	B					
			Type	Results				Continued next sheet

Remarks:

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Borehole No
BH6
Sheet 2 of 2

Project Name	Project No.	Co-ords: -	Hole Type
Herbert Road	12032		Cable
Location: Newport		Level: -	Scale 1:50
Client: Greenhill Construction		Dates: 08/11/2012-09/11/2012	Logged By MW

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		10.00 10.00-10.30	CPT B	50/225mm 225mm (10,16,16,17,17)	10.00 10.30			Very weak red brown and grey MUDSTONE End of Borehole at 10.30 m

Type	Results

Remarks:

AGS

HoleBASE III (Bld 426.48) Standard Borehole Log v2 dated 27th Nov 03

ANNEX F
Windowless Sample Borehole Logs

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Borehole No
WS1
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
Herbert Road	12032		WLS
Location: Newport		Level: -	Scale 1:50
Client: Greenhill Construction		Dates: 21/01/2013	Logged By

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
					0.20			TOPSOIL. Grass over soft red brown slightly gravelly clay with many rootlets. Gravel is fine to coarse of angular mudstone.
					0.70			MADE GROUND. Dense grey very gravelly sand with some cobbles of angular sandstone.
								MADE GROUND. Very loose brown mottled gravelly sand. Some litter including bottles, jobs and ceramic. Gravel is fine to coarse of angular slate, mudstone, brick and sandstone. Occasional cobbles of angular brick.
					3.00			End of Borehole at 3.00 m
			Type	Results				

Remarks:

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HoleBASE III (Bld 426.68) Standard Borehole Log v2 dated 27th Nov 03

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Borehole No
WS2
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
Herbert Road	12032		WLS
Location: Newport		Level: -	Scale 1:50
Client: Greenhill Construction		Dates: 21/01/2013	Logged By

Well	Water Strikes	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
					0.20			TOPSOIL. Grass over soft red brown slightly gravelly clay with many rootlets. Gravel is fine to coarse of angular mudstone.
					0.60			MADE GROUND. Stiff brown clay
								MADE GROUND. Very loose brown mottled gravelly sand. Some litter including bottles, jobs and ceramic. Gravel is fine to coarse of angular slate, mudstone, brick and sandstone. Occasional cobbles of angular brick.
					2.50			Soft blue grey CLAY
					3.00			End of Borehole at 3.00 m
			Type	Results				

Remarks:

AGS

HoleBASE III (Bld 426.68) Standard Borehole Log v2 dated 27th Nov 03

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Borehole No
WS3
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
Herbert Road	12032		WLS
Location: Newport		Level: -	Scale 1:50
Client: Greenhill Construction		Dates: 21/01/2013	Logged By

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
					0.20			TOPSOIL. Grass over soft red brown slightly gravelly clay with many rootlets. Gravel is fine to coarse of angular mudstone.
					0.60			MADE GROUND. Stiff brown clay
								MADE GROUND. Firm black very gravelly clay with some cobbles of angular concrete and brick. Many bottles, rubber, plastic, ceramic and litter. Gravel of fine to coarse of angular brick, concrete and ceramic and vitreous slag.
					2.20			Soft blue grey CLAY
					3.00			End of Borehole at 3.00 m
			Type	Results				

Remarks:

AGS

HoleBASE III (Bld 426.68) Standard Borehole Log v2 dated 27th Nov 03

ANNEX G
Laboratory Soil & Groundwater Chemical Test Results

Certificate of Analysis

2139

Certificate Number: 12-71357-2

Date: 11/01/2013

Client: Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference: 12-71357-2

Client Reference:

Contract Title: Herbert Road

Description: 15 soil samples

Date Received: 09 November 2012

Date Started: 09 November 2012

Date Completed: 28 November 2012

Test Procedures: Identified by prefix DETSn (details on request), Asbestos Analysis (DETS 082).

Notes: **This report supersedes 12-71357-1, additional testing carried out**
Observations and interpretations are outside the scope of UKAS accreditation

Approved By: [redacted]
Rob Brown, Business Manager

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Information in Support of the Analytical Results

Analysis

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425um sieve, in accordance with BS1377.
Organic soil analysis was carried out on an 'as received' sample.

Key

*	Denotes test not included in laboratory scope of accreditation
#	Denotes test that holds MCERTS accreditation, however, MCERTS accreditation is only implied if the report carries the MCERTS logo
$	Denotes tests completed by an approved subcontractor
I/S	Denotes insufficient sample to carry out test
U/S	Denotes that the sample is not suitable for testing

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-
Soils - 1 month
Liquids - 2 weeks
Asbestos (test portion) - 6 months

Summary of Chemical Analysis
Matrix Descriptions

Our Ref: 12-71357-2
Client Ref:
Contract Title: Herbert Road

Sample ID	Depth	Sample No	Completed	Matrix Description
TP2	0.90	460753	28/11/2012	Dark brown gravelly sandy CLAY
TP4	0.70	460754	28/11/2012	Dark brown gravelly sandy CLAY
TP5	1.30	460755	28/11/2012	Dark brown clayey gravelly SAND
TP6	0.60	460756	28/11/2012	Brown clayey gravelly SAND
TP6	1.80	460757	28/11/2012	Dark brown gravelly sandy CLAY with odd rootlets
TP7	0.20	460758	28/11/2012	Dark brown gravelly sandy CLAY with odd rootlets
TP8	0.50	460759	28/11/2012	Dark brown clayey gravelly SAND
TP9	1.00	460760	28/11/2012	Dark brown gravelly sandy CLAY
TP10	0.80	460761	28/11/2012	Dark brown gravelly sandy CLAY
TP12	0.40	460762	28/11/2012	Brown very gravelly SAND
TP13	0.60	460763	28/11/2012	Brown very gravelly SAND
TP14	0.40	460764	28/11/2012	Dark brown clayey gravelly SAND
TP15	0.40	460765	28/11/2012	Brown gravelly sandy CLAY with odd rootlets
TP17	0.15	460766	28/11/2012	Dark brown gravelly sandy CLAY with odd rootlets
TP18	0.50	460767	28/11/2012	Dark brown clayey gravelly SAND with odd rootlets

Summary of Chemical Analysis
Soil Samples

Our Ref: 12-71357-2
Client Ref:
Contract Title: Herbert Road

			Lab No.	460753	460754	460755
			Sample ID	TP2	TP4	TP5
			Depth	0.90	0.70	1.30
			Sample Ref			
			Sample Type			
			Sampling Date	06/11/2012	06/11/2012	06/11/2012
			Sampling Time			
Test	**Units**	**DETSxx**	**LOD**			
Arsenic	mg/kg	DETS 042#	0.2	21	26	40
Cadmium	mg/kg	DETS 042#	0.1	1.0	0.8	1.1
Chromium III	mg/kg	DETS 042*	0.15	41	42	35
Chromium	mg/kg	DETS 042#	0.15	41	42	35
Hexavalent Chromium	mg/kg	DETSC 2204*	1	< 1.0	< 1.0	< 1.0
Copper	mg/kg	DETS 042#	0.2	230	44	950
Lead	mg/kg	DETS 042#	0.3	110	100	290
Mercury	mg/kg	DETSC 2325	0.05	0.45	0.39	0.41
Nickel	mg/kg	DETS 042#	1	45	31	69
Selenium	mg/kg	DETS 042#	0.5	0.6	< 0.5	0.9
Zinc	mg/kg	DETS 042#	1	250	150	410
Cyanide total	mg/kg	DETSC 2130#	0.1	10	1.2	2.1
Organic matter	%	DETSC 2002#	0.1	7.5	8.6	23
Total Sulphate as SO4	%	DETSC 2321#	0.01	0.10	0.09	0.24
Sulphate Aqueous Extract as SO4	mg/l	DETSC 2076#	10			
pH		DETSC 2008#		8.9	8.8	8.2
Aliphatic C5-C6	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	mg/kg	DETSC 3072#	1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	mg/kg	DETSC 3072#	1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	mg/kg	DETSC 3072#	1.5	< 1.5	< 1.5	1.7
Aliphatic C21-C35	mg/kg	DETSC 3072#	3.4	< 3.4	< 3.4	7.9
Aromatic C5-C7	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	mg/kg	DETSC 3072#	0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	mg/kg	DETSC 3072#	0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	mg/kg	DETSC 3072#	0.6	1.8	< 0.6	< 0.6
Aromatic C21-C35	mg/kg	DETSC 3072#	1.4	5.9	< 1.4	2.0
Aliphatic C5-C35	mg/kg	DETSC 3072*	10	< 10	< 10	< 10
Aromatic C5-C35	mg/kg	DETSC 3072*	10	< 10	< 10	< 10
TPH Ali/Aro	mg/kg	DETSC 3072*	10	< 10	< 10	12

Summary of Chemical Analysis
Soil Samples

Our Ref: 12-71357-2
Client Ref:
Contract Title: Herbert Road

			Lab No.	460753	460754	460755
			Sample ID	TP2	TP4	TP5
			Depth	0.90	0.70	1.30
			Sample Ref			
			Sample Type			
			Sampling Date	06/11/2012	06/11/2012	06/11/2012
			Sampling Time			
Test	**Units**	**DETSxx**	**LOD**			
Acenaphthene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1	
Acenaphthylene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1	
Anthracene	mg/kg	DETSC 3301	0.1	0.2	0.1	
Benzo(a)anthracene	mg/kg	DETSC 3301	0.1	0.8	0.8	
Benzo(a)pyrene	mg/kg	DETSC 3301	0.1	0.8	0.9	
Benzo(b)fluoranthene	mg/kg	DETSC 3301	0.1	0.8	0.6	
Benzo(k)fluoranthene	mg/kg	DETSC 3301	0.1	0.3	0.3	
Benzo(g,h,i)perylene	mg/kg	DETSC 3301	0.1	0.5	0.4	
Chrysene	mg/kg	DETSC 3301	0.1	0.9	0.8	
Dibenzo(a,h)anthracene	mg/kg	DESTC 3301	0.1	0.2	0.2	
Fluoranthene	mg/kg	DETSC 3301	0.1	1.2	1.2	
Fluorene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1	
Indeno(1,2,3-c,d)pyrene	mg/kg	DETSC 3301	0.1	0.7	0.5	
Naphthalene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1	
Phenanthrene	mg/kg	DETSC 3301	0.1	0.6	0.5	
Pyrene	mg/kg	DETSC 3301	0.1	1.1	1.0	
PAH	mg/kg	DETSC 3301	1.6	8.3	7.4	< 1.6
Phenol - Monohydric	mg/kg	DETSC 2130#	0.3	< 0.3	< 0.3	< 0.3
PCB	mg/kg	DETSC 3401#	0.01			< 0.01
2,4,4'-Trichlorobiphenyl PCB 28	mg/kg	DETSC 3401#	0.01			< 0.01
2,2',5,5'-Tetrachlorobiphenyl PCB 52	mg/kg	DETSC 3401#	0.01			< 0.01
2,2',4,5,5'-Pentachlorobiphenyl PCB 101	mg/kg	DETSC 3401#	0.01			< 0.01
2,3',4,4',5-Pentachlorobiphenyl PCB 118	mg/kg	DETSC 3401#	0.01			< 0.01
2,2',4,4',5,5'-Hexachlorobiphenyl PCB 153	mg/kg	DETSC 3401#	0.01			< 0.01
2,2',3,4,4',5'-Hexachlorobiphenyl PCB 138	mg/kg	DETSC 3401#	0.01			< 0.01
2,2',3,4,4',5,5'-Heptachlorobiphenyl PCB 180	mg/kg	DETSC 3401#	0.01			< 0.01

Summary of Chemical Analysis
Soil Samples

Our Ref: 12-71357-2
Client Ref:
Contract Title: Herbert Road

			Lab No.	460756	460757	460758
			Sample ID	TP6	TP6	TP7
			Depth	0.60	1.80	0.20
			Sample Ref			
			Sample Type			
			Sampling Date	06/11/2012	06/11/2012	06/11/2012
			Sampling Time			
Test	**Units**	**DETSxx**	**LOD**			
Arsenic	mg/kg	DETS 042#	0.2	8.1	17	19
Cadmium	mg/kg	DETS 042#	0.1	0.8	1.2	0.9
Chromium III	mg/kg	DETS 042*	0.15	19	31	42
Chromium	mg/kg	DETS 042#	0.15	19	31	42
Hexavalent Chromium	mg/kg	DETSC 2204*	1	< 1.0	< 1.0	< 1.0
Copper	mg/kg	DETS 042#	0.2	10	130	110
Lead	mg/kg	DETS 042#	0.3	10	190	93
Mercury	mg/kg	DETSC 2325	0.05	0.05	1.9	0.43
Nickel	mg/kg	DETS 042#	1	31	43	43
Selenium	mg/kg	DETS 042#	0.5	< 0.5	< 0.5	< 0.5
Zinc	mg/kg	DETS 042#	1	140	330	240
Cyanide total	mg/kg	DETSC 2130#	0.1	0.5	3.1	0.5
Organic matter	%	DETSC 2002#	0.1	1.4	5.7	4.9
Total Sulphate as SO4	%	DETSC 2321#	0.01	0.02	0.21	0.06
Sulphate Aqueous Extract as SO4	mg/l	DETSC 2076#	10			
pH		DETSC 2008#		9.0	8.7	9.0
Aliphatic C5-C6	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	mg/kg	DETSC 3321*	0.01	< 0.01	0.02	< 0.01
Aliphatic C10-C12	mg/kg	DETSC 3072#	1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	mg/kg	DETSC 3072#	1.2	< 1.2	16	< 1.2
Aliphatic C16-C21	mg/kg	DETSC 3072#	1.5	< 1.5	120	< 1.5
Aliphatic C21-C35	mg/kg	DETSC 3072#	3.4	< 3.4	340	< 3.4
Aromatic C5-C7	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	mg/kg	DETSC 3321*	0.01	< 0.01	0.05	< 0.01
Aromatic C10-C12	mg/kg	DETSC 3072#	0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	mg/kg	DETSC 3072#	0.5	< 0.5	9.1	< 0.5
Aromatic C16-C21	mg/kg	DETSC 3072#	0.6	< 0.6	45	2.0
Aromatic C21-C35	mg/kg	DETSC 3072#	1.4	< 1.4	140	12
Aliphatic C5-C35	mg/kg	DETSC 3072*	10	< 10	480	< 10
Aromatic C5-C35	mg/kg	DETSC 3072*	10	< 10	190	14
TPH Ali/Aro	mg/kg	DETSC 3072*	10	< 10	670	14

Summary of Chemical Analysis
Soil Samples

Our Ref: 12-71357-2
Client Ref:
Contract Title: Herbert Road

			Lab No.	460756	460757	460758
			Sample ID	TP6	TP6	TP7
			Depth	0.60	1.80	0.20
			Sample Ref			
			Sample Type			
			Sampling Date	06/11/2012	06/11/2012	06/11/2012
			Sampling Time			
Test	**Units**	**DETSxx**	**LOD**			
Acenaphthene	mg/kg	DETSC 3301	0.1		1.5	0.4
Acenaphthylene	mg/kg	DETSC 3301	0.1		1.4	< 0.1
Anthracene	mg/kg	DETSC 3301	0.1		0.4	0.9
Benzo(a)anthracene	mg/kg	DETSC 3301	0.1		1.8	2.4
Benzo(a)pyrene	mg/kg	DETSC 3301	0.1		0.7	1.9
Benzo(b)fluoranthene	mg/kg	DETSC 3301	0.1		0.8	1.5
Benzo(k)fluoranthene	mg/kg	DETSC 3301	0.1		0.4	0.7
Benzo(g,h,i)perylene	mg/kg	DETSC 3301	0.1		0.9	1.1
Chrysene	mg/kg	DETSC 3301	0.1		1.1	2.3
Dibenzo(a,h)anthracene	mg/kg	DESTC 3301	0.1		0.2	0.3
Fluoranthene	mg/kg	DETSC 3301	0.1		1.1	4.4
Fluorene	mg/kg	DETSC 3301	0.1		0.1	0.3
Indeno(1,2,3-c,d)pyrene	mg/kg	DETSC 3301	0.1		0.6	1.3
Naphthalene	mg/kg	DETSC 3301	0.1		0.2	0.7
Phenanthrene	mg/kg	DETSC 3301	0.1		0.5	3.3
Pyrene	mg/kg	DETSC 3301	0.1		1.3	3.8
PAH	mg/kg	DETSC 3301	1.6	< 1.6	13	25
Phenol - Monohydric	mg/kg	DETSC 2130#	0.3	< 0.3	0.5	< 0.3
PCB	mg/kg	DETSC 3401#	0.01	0.15		< 0.01
2,4,4'-Trichlorobiphenyl PCB 28	mg/kg	DETSC 3401#	0.01	< 0.01		< 0.01
2,2',5,5'-Tetrachlorobiphenyl PCB 52	mg/kg	DETSC 3401#	0.01	< 0.01		< 0.01
2,2',4,5,5'-Pentachlorobiphenyl PCB 101	mg/kg	DETSC 3401#	0.01	0.01		< 0.01
2,3',4,4',5-Pentachlorobiphenyl PCB 118	mg/kg	DETSC 3401#	0.01	0.02		< 0.01
2,2',4,4',5,5'-Hexachlorobiphenyl PCB 153	mg/kg	DETSC 3401#	0.01	0.02		< 0.01
2,2',3,4,4',5'-Hexachlorobiphenyl PCB 138	mg/kg	DETSC 3401#	0.01	0.05		< 0.01
2,2',3,4,4',5,5'-Heptachlorobiphenyl PCB 180	mg/kg	DETSC 3401#	0.01	0.04		< 0.01

Summary of Chemical Analysis
Soil Samples

Our Ref: 12-71357-2
Client Ref:
Contract Title: Herbert Road

			Lab No.	460759	460760	460761
			Sample ID	TP8	TP9	TP10
			Depth	0.50	1.00	0.80
			Sample Ref			
			Sample Type			
			Sampling Date	06/11/2012	06/11/2012	06/11/2012
			Sampling Time			
Test	**Units**	**DETSxx**	**LOD**			
Arsenic	mg/kg	DETS 042#	0.2	14	19	15
Cadmium	mg/kg	DETS 042#	0.1	6.2	1.2	0.9
Chromium III	mg/kg	DETS 042*	0.15	16	51	30
Chromium	mg/kg	DETS 042#	0.15	16	51	30
Hexavalent Chromium	mg/kg	DETSC 2204*	1	< 1.0	< 1.0	< 1.0
Copper	mg/kg	DETS 042#	0.2	48	170	95
Lead	mg/kg	DETS 042#	0.3	190	130	100
Mercury	mg/kg	DETSC 2325	0.05	0.51	1.1	0.58
Nickel	mg/kg	DETS 042#	1	16	49	36
Selenium	mg/kg	DETS 042#	0.5	< 0.5	< 0.5	< 0.5
Zinc	mg/kg	DETS 042#	1	440	280	220
Cyanide total	mg/kg	DETSC 2130#	0.1	0.5	0.8	0.4
Organic matter	%	DETSC 2002#	0.1	5.8	6.9	6.7
Total Sulphate as SO4	%	DETSC 2321#	0.01	0.15	0.08	0.10
Sulphate Aqueous Extract as SO4	mg/l	DETSC 2076#	10			
pH		DETSC 2008#		9.0	8.9	8.9
Aliphatic C5-C6	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	mg/kg	DETSC 3072#	1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	mg/kg	DETSC 3072#	1.2	1.5	< 1.2	1.8
Aliphatic C16-C21	mg/kg	DETSC 3072#	1.5	4.1	2.8	4.3
Aliphatic C21-C35	mg/kg	DETSC 3072#	3.4	29	12	24
Aromatic C5-C7	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	mg/kg	DETSC 3072#	0.9	0.9	< 0.9	< 0.9
Aromatic C12-C16	mg/kg	DETSC 3072#	0.5	4.3	0.9	< 0.5
Aromatic C16-C21	mg/kg	DETSC 3072#	0.6	50	12	5.0
Aromatic C21-C35	mg/kg	DETSC 3072#	1.4	210	33	27
Aliphatic C5-C35	mg/kg	DETSC 3072*	10	34	14	30
Aromatic C5-C35	mg/kg	DETSC 3072*	10	260	46	32
TPH Ali/Aro	mg/kg	DETSC 3072*	10	300	60	62

Summary of Chemical Analysis
Soil Samples

Our Ref: 12-71357-2
Client Ref:
Contract Title: Herbert Road

			Lab No.	460759	460760	460761
			Sample ID	TP8	TP9	TP10
			Depth	0.50	1.00	0.80
			Sample Ref			
			Sample Type			
			Sampling Date	06/11/2012	06/11/2012	06/11/2012
			Sampling Time			
Test	**Units**	**DETSxx**	**LOD**			
Acenaphthene	mg/kg	DETSC 3301	0.1	0.3	< 0.1	< 0.1
Acenaphthylene	mg/kg	DETSC 3301	0.1	1.1	0.3	< 0.1
Anthracene	mg/kg	DETSC 3301	0.1	5.6	< 0.1	0.3
Benzo(a)anthracene	mg/kg	DETSC 3301	0.1	13	1.1	1.2
Benzo(a)pyrene	mg/kg	DETSC 3301	0.1	11	1.3	1.5
Benzo(b)fluoranthene	mg/kg	DETSC 3301	0.1	9.0	1.0	1.4
Benzo(k)fluoranthene	mg/kg	DETSC 3301	0.1	4.5	0.5	0.6
Benzo(g,h,i)perylene	mg/kg	DETSC 3301	0.1	8.7	0.8	0.6
Chrysene	mg/kg	DETSC 3301	0.1	13	1.5	1.5
Dibenzo(a,h)anthracene	mg/kg	DESTC 3301	0.1	1.6	0.3	0.3
Fluoranthene	mg/kg	DETSC 3301	0.1	22	1.1	2.2
Fluorene	mg/kg	DETSC 3301	0.1	2.0	< 0.1	0.1
Indeno(1,2,3-c,d)pyrene	mg/kg	DETSC 3301	0.1	7.5	1.1	1.3
Naphthalene	mg/kg	DETSC 3301	0.1	0.5	0.1	0.1
Phenanthrene	mg/kg	DETSC 3301	0.1	16	0.4	1.3
Pyrene	mg/kg	DETSC 3301	0.1	17	1.4	2.0
PAH	mg/kg	DETSC 3301	1.6	130	11	14
Phenol - Monohydric	mg/kg	DETSC 2130#	0.3	< 0.3	< 0.3	< 0.3
PCB	mg/kg	DETSC 3401#	0.01			< 0.01
2,4,4'-Trichlorobiphenyl PCB 28	mg/kg	DETSC 3401#	0.01			< 0.01
2,2',5,5'-Tetrachlorobiphenyl PCB 52	mg/kg	DETSC 3401#	0.01			< 0.01
2,2',4,5,5'-Pentachlorobiphenyl PCB 101	mg/kg	DETSC 3401#	0.01			< 0.01
2,3',4,4',5-Pentachlorobiphenyl PCB 118	mg/kg	DETSC 3401#	0.01			< 0.01
2,2',4,4',5,5'-Hexachlorobiphenyl PCB 153	mg/kg	DETSC 3401#	0.01			< 0.01
2,2',3,4,4',5'-Hexachlorobiphenyl PCB 138	mg/kg	DETSC 3401#	0.01			< 0.01
2,2',3,4,4',5,5'-Heptachlorobiphenyl PCB 180	mg/kg	DETSC 3401#	0.01			< 0.01

Summary of Chemical Analysis
Soil Samples

Our Ref: 12-71357-2
Client Ref:
Contract Title: Herbert Road

			Lab No.	460762	460763	460764	460765
			Sample ID	TP12	TP13	TP14	TP15
			Depth	0.40	0.60	0.40	0.40
			Sample Ref				
			Sample Type				
			Sampling Date	06/11/2012	07/11/2012	07/11/2012	07/11/2012
			Sampling Time				
Test	**Units**	**DETSxx**	**LOD**				
Arsenic	mg/kg	DETS 042#	0.2	6.0	8.6	5.7	10
Cadmium	mg/kg	DETS 042#	0.1	0.9	0.4	0.8	0.5
Chromium III	mg/kg	DETS 042*	0.15	7.9	23	100	40
Chromium	mg/kg	DETS 042#	0.15	7.9	23	100	40
Hexavalent Chromium	mg/kg	DETSC 2204*	1	< 1.0	< 1.0	< 1.0	< 1.0
Copper	mg/kg	DETS 042#	0.2	8.8	15	22	13
Lead	mg/kg	DETS 042#	0.3	51	34	64	20
Mercury	mg/kg	DETSC 2325	0.05	< 0.05	0.09	0.06	< 0.05
Nickel	mg/kg	DETS 042#	1	7.7	16	12	36
Selenium	mg/kg	DETS 042#	0.5	< 0.5	< 0.5	1.4	< 0.5
Zinc	mg/kg	DETS 042#	1	45	96	96	87
Cyanide total	mg/kg	DETSC 2130#	0.1	< 0.1	< 0.1	0.2	< 0.1
Organic matter	%	DETSC 2002#	0.1	1.2	1.5	2.3	0.8
Total Sulphate as SO4	%	DETSC 2321#	0.01	0.25	0.12	0.14	0.03
Sulphate Aqueous Extract as SO4	mg/l	DETSC 2076#	10	160			
pH		DETSC 2008#		11.8	10.9	11.6	9.3
Aliphatic C5-C6	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01	
Aliphatic C6-C8	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01	
Aliphatic C8-C10	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01	
Aliphatic C10-C12	mg/kg	DETSC 3072#	1.5	< 1.5	< 1.5	< 1.5	
Aliphatic C12-C16	mg/kg	DETSC 3072#	1.2	1.9	< 1.2	< 1.2	
Aliphatic C16-C21	mg/kg	DETSC 3072#	1.5	4.1	2.1	< 1.5	
Aliphatic C21-C35	mg/kg	DETSC 3072#	3.4	11	11	18	
Aromatic C5-C7	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01	
Aromatic C7-C8	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01	
Aromatic C8-C10	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01	
Aromatic C10-C12	mg/kg	DETSC 3072#	0.9	< 0.9	< 0.9	< 0.9	
Aromatic C12-C16	mg/kg	DETSC 3072#	0.5	< 0.5	< 0.5	< 0.5	
Aromatic C16-C21	mg/kg	DETSC 3072#	0.6	6.1	1.7	1.1	
Aromatic C21-C35	mg/kg	DETSC 3072#	1.4	31	17	31	
Aliphatic C5-C35	mg/kg	DETSC 3072*	10	17	13	19	
Aromatic C5-C35	mg/kg	DETSC 3072*	10	37	19	32	
TPH Ali/Aro	mg/kg	DETSC 3072*	10	54	32	50	

Summary of Chemical Analysis
Soil Samples

Our Ref: 12-71357-2
Client Ref:
Contract Title: Herbert Road

			Lab No.	460762	460763	460764	460765
			Sample ID	TP12	TP13	TP14	TP15
			Depth	0.40	0.60	0.40	0.40
			Sample Ref				
			Sample Type				
			Sampling Date	06/11/2012	07/11/2012	07/11/2012	07/11/2012
			Sampling Time				
Test	**Units**	**DETSxx**	**LOD**				
Acenaphthene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Anthracene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	mg/kg	DETSC 3301	0.1	0.5	0.3	0.2	< 0.1
Benzo(a)pyrene	mg/kg	DETSC 3301	0.1	0.3	0.2	0.3	< 0.1
Benzo(b)fluoranthene	mg/kg	DETSC 3301	0.1	0.3	0.2	0.3	< 0.1
Benzo(k)fluoranthene	mg/kg	DETSC 3301	0.1	< 0.1	0.1	0.1	< 0.1
Benzo(g,h,i)perylene	mg/kg	DETSC 3301	0.1	0.2	0.2	0.2	< 0.1
Chrysene	mg/kg	DETSC 3301	0.1	0.4	0.2	0.3	< 0.1
Dibenzo(a,h)anthracene	mg/kg	DESTC 3301	0.1	< 0.1	< 0.1	0.1	< 0.1
Fluoranthene	mg/kg	DETSC 3301	0.1	0.3	0.2	0.5	< 0.1
Fluorene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	mg/kg	DETSC 3301	0.1	0.2	0.2	0.2	< 0.1
Naphthalene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pyrene	mg/kg	DETSC 3301	0.1	0.2	0.2	0.5	< 0.1
PAH	mg/kg	DETSC 3301	1.6	2.6	2.0	2.8	< 1.6
Phenol - Monohydric	mg/kg	DETSC 2130#	0.3	< 0.3	< 0.3	< 0.3	< 0.3
PCB	mg/kg	DETSC 3401#	0.01	< 0.01	0.16	< 0.01	< 0.01
2,4,4'-Trichlorobiphenyl PCB 28	mg/kg	DETSC 3401#	0.01	< 0.01	0.12	< 0.01	< 0.01
2,2',5,5'-Tetrachlorobiphenyl PCB 52	mg/kg	DETSC 3401#	0.01	< 0.01	0.05	< 0.01	< 0.01
2,2',4,5,5'-Pentachlorobiphenyl PCB 101	mg/kg	DETSC 3401#	0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,3',4,4',5-Pentachlorobiphenyl PCB 118	mg/kg	DETSC 3401#	0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,2',4,4',5,5'-Hexachlorobiphenyl PCB 153	mg/kg	DETSC 3401#	0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,2',3,4,4',5'-Hexachlorobiphenyl PCB 138	mg/kg	DETSC 3401#	0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,2',3,4,4',5,5'-Heptachlorobiphenyl PCB 180	mg/kg	DETSC 3401#	0.01	< 0.01	< 0.01	< 0.01	< 0.01

Summary of Chemical Analysis
Soil Samples

Our Ref: 12-71357-2
Client Ref:
Contract Title: Herbert Road

			Lab No.	460766	460767
			Sample ID	TP17	TP18
			Depth	0.15	0.50
			Sample Ref		
			Sample Type		
			Sampling Date	07/11/2012	07/11/2012
			Sampling Time		
Test	**Units**	**DETSxx**	**LOD**		
Arsenic	mg/kg	DETS 042#	0.2	14	10
Cadmium	mg/kg	DETS 042#	0.1	0.6	0.4
Chromium III	mg/kg	DETS 042*	0.15	48	25
Chromium	mg/kg	DETS 042#	0.15	48	25
Hexavalent Chromium	mg/kg	DETSC 2204*	1	< 1.0	< 1.0
Copper	mg/kg	DETS 042#	0.2	23	40
Lead	mg/kg	DETS 042#	0.3	44	41
Mercury	mg/kg	DETSC 2325	0.05	0.15	0.20
Nickel	mg/kg	DETS 042#	1	31	20
Selenium	mg/kg	DETS 042#	0.5	< 0.5	< 0.5
Zinc	mg/kg	DETS 042#	1	130	92
Cyanide total	mg/kg	DETSC 2130#	0.1	0.2	0.2
Organic matter	%	DETSC 2002#	0.1	9.6	6.4
Total Sulphate as SO4	%	DETSC 2321#	0.01	0.08	0.10
Sulphate Aqueous Extract as SO4	mg/l	DETSC 2076#	10		
pH		DETSC 2008#		8.7	9.0
Aliphatic C5-C6	mg/kg	DETSC 3321*	0.01		
Aliphatic C6-C8	mg/kg	DETSC 3321*	0.01		
Aliphatic C8-C10	mg/kg	DETSC 3321*	0.01		
Aliphatic C10-C12	mg/kg	DETSC 3072#	1.5		
Aliphatic C12-C16	mg/kg	DETSC 3072#	1.2		
Aliphatic C16-C21	mg/kg	DETSC 3072#	1.5		
Aliphatic C21-C35	mg/kg	DETSC 3072#	3.4		
Aromatic C5-C7	mg/kg	DETSC 3321*	0.01		
Aromatic C7-C8	mg/kg	DETSC 3321*	0.01		
Aromatic C8-C10	mg/kg	DETSC 3321*	0.01		
Aromatic C10-C12	mg/kg	DETSC 3072#	0.9		
Aromatic C12-C16	mg/kg	DETSC 3072#	0.5		
Aromatic C16-C21	mg/kg	DETSC 3072#	0.6		
Aromatic C21-C35	mg/kg	DETSC 3072#	1.4		
Aliphatic C5-C35	mg/kg	DETSC 3072*	10		
Aromatic C5-C35	mg/kg	DETSC 3072*	10		
TPH Ali/Aro	mg/kg	DETSC 3072*	10		

Summary of Chemical Analysis
Soil Samples

Our Ref: 12-71357-2
Client Ref:
Contract Title: Herbert Road

			Lab No.	460766	460767
			Sample ID	TP17	TP18
			Depth	0.15	0.50
			Sample Ref		
			Sample Type		
			Sampling Date	07/11/2012	07/11/2012
			Sampling Time		
Test	**Units**	**DETSxx**	**LOD**		
Acenaphthene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1
Anthracene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1
Benzo(a)anthracene	mg/kg	DETSC 3301	0.1	0.3	0.1
Benzo(a)pyrene	mg/kg	DETSC 3301	0.1	0.4	0.2
Benzo(b)fluoranthene	mg/kg	DETSC 3301	0.1	0.4	0.2
Benzo(k)fluoranthene	mg/kg	DETSC 3301	0.1	0.2	< 0.1
Benzo(g,h,i)perylene	mg/kg	DETSC 3301	0.1	0.3	0.2
Chrysene	mg/kg	DETSC 3301	0.1	0.4	0.2
Dibenzo(a,h)anthracene	mg/kg	DESTC 3301	0.1	< 0.1	< 0.1
Fluoranthene	mg/kg	DETSC 3301	0.1	1.0	0.3
Fluorene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	mg/kg	DETSC 3301	0.1	0.3	0.2
Naphthalene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1
Pyrene	mg/kg	DETSC 3301	0.1	0.8	0.4
PAH	mg/kg	DETSC 3301	1.6	4.2	2.0
Phenol - Monohydric	mg/kg	DETSC 2130#	0.3	< 0.3	0.4
PCB	mg/kg	DETSC 3401#	0.01	< 0.01	< 0.01
2,4,4'-Trichlorobiphenyl PCB 28	mg/kg	DETSC 3401#	0.01	< 0.01	< 0.01
2,2',5,5'-Tetrachlorobiphenyl PCB 52	mg/kg	DETSC 3401#	0.01	< 0.01	< 0.01
2,2',4,5,5'-Pentachlorobiphenyl PCB 101	mg/kg	DETSC 3401#	0.01	< 0.01	< 0.01
2,3',4,4',5-Pentachlorobiphenyl PCB 118	mg/kg	DETSC 3401#	0.01	< 0.01	< 0.01
2,2',4,4',5,5'-Hexachlorobiphenyl PCB 153	mg/kg	DETSC 3401#	0.01	< 0.01	< 0.01
2,2',3,4,4',5'-Hexachlorobiphenyl PCB 138	mg/kg	DETSC 3401#	0.01	< 0.01	< 0.01
2,2',3,4,4',5,5'-Heptachlorobiphenyl PCB 180	mg/kg	DETSC 3401#	0.01	< 0.01	< 0.01

Summary of Asbestos Analysis
Soil Samples

Our Ref: 12-71357-2
Client Ref:
Contract Title: Herbert Road

Lab No	Sample Ref	Material Type*	Result	Comment	Analyst
460753	TP2 0.90	Soil	NAD	na	Emrhys Sheldon
460754	TP4 0.70	Soil	NAD	na	Emrhys Sheldon
460755	TP5 1.30	Soil	NAD	na	Emrhys Sheldon
460756	TP6 0.60	Soil	NAD	na	Emrhys Sheldon
460757	TP6 1.80	Soil	Chrysotile	Loose Bundles	Emrhys Sheldon
460758	TP7 0.20	Soil	Chrysotile	Loose Bundles	Emrhys Sheldon
460759	TP8 0.50	Soil	NAD	na	Emrhys Sheldon
460760	TP9 1.00	Soil	NAD	na	Emrhys Sheldon
460761	TP10 0.80	Soil	NAD	na	Emrhys Sheldon
460762	TP12 0.40	Soil	NAD	na	Emrhys Sheldon
460763	TP13 0.60	Soil	NAD	na	Emrhys Sheldon
460764	TP14 0.40	Soil	NAD	na	Emrhys Sheldon
460765	TP15 0.40	Soil	NAD	na	Emrhys Sheldon
460766	TP17 0.15	Soil	NAD	na	Emrhys Sheldon
460767	TP18 0.50	Soil	NAD	na	Emrhys Sheldon

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. NAD = No Asbestos Detected. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETS 082 using polarised light microscopy in accordance with HSG248 and documented in-house methods. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'.

Sample Comments

DETS cannot be held responsible for the integrity of sample(s) received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating.

Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note "Guidance on Deviating Samples".

All samples received are listed below. However, those samples that have additional comments in relation to hold time and/or inappropriate containers are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations.

If no sampled date (soils) or date/time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters), this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Lab No.	Sample ID	Date Sampled	Containers Received	Deviating due to holding time being exceeded for test	Deviating due to inappropriate container for test
460753	TP2 0.90 SOIL	06/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)		
460754	TP4 0.70 SOIL	06/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)		
460755	TP5 1.30 SOIL	06/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)		
460756	TP6 0.60 SOIL	06/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)		
460757	TP6 1.80 SOIL	06/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)		
460758	TP7 0.20 SOIL	06/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)		
460759	TP8 0.50 SOIL	06/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)		
460760	TP9 1.00 SOIL	06/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)		

460761	TP10 0.80 SOIL	06/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)
460762	TP12 0.40 SOIL	06/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)
460763	TP13 0.60 SOIL	07/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)
460764	TP14 0.40 SOIL	07/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)
460765	TP15 0.40 SOIL	07/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)
460766	TP17 0.15 SOIL	07/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)
460767	TP18 0.50 SOIL	07/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)

Appendix A - Details of Analysis

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS.
No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

Method	Name of Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic Matter	%	0.01	Air Dried	No	Yes	Yes
DETSC 2003	Loss on Ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2004	Total Sulphate	%	0.01	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate	%	0.01	Air Dried	No	Yes	Yes
DETSC 2004	Water Soluble Sulphate	mg/l	10.00	Air Dried	No	Yes	Yes
DETSC 2076	Water Soluble Sulphate	mg/l	10.00	Air Dried	No	Yes	Yes
DETSC 2006	Chloride	mg/kg	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	0.10	Air Dried	No	Yes	Yes
DETS 042	Selenium	mg/kg	0.50	Air Dried	No	Yes	Yes
DETSC 2119	Ammonia	mg/kg	0.02	Air Dried	No	Yes	Yes
DETS 020	Boron (Water Soluble)	mg/kg	0.20	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10.00	Air Dried	No	Yes	Yes
DETS 042	Antimony	mg/kg	1.00	Air Dried	No	No	No
DETS 042	Arsenic	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 042	Barium	mg/kg	1.50	Air Dried	No	Yes	Yes
DETS 042	Beryllium	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 042	Cadmium	mg/kg	0.10	Air Dried	No	Yes	Yes
DETS 042	Cobalt	mg/kg	0.70	Air Dried	No	Yes	Yes
DETS 042	Copper	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 042	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETS 042	Iron	mg/kg	1.00	Air Dried	No	Yes	No

Appendix A - Details of Analysis

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS.
No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

Method	Name of Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETS 042	Lead	mg/kg	0.30	Air Dried	No	Yes	Yes
DETS 042	Manganese	mg/kg	20.00	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETS 042	Molybdenum	mg/kg	0.40	Air Dried	No	Yes	Yes
DETS 042	Nickel	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 042	Thallium	mg/kg	1.00	Air Dried	No	No	No
DETS 042	Vanadium	mg/kg	0.80	Air Dried	No	Yes	Yes
DETS 042	Zinc	mg/kg	1.00	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (Free)	mg/kg	0.50	As Received	No	Yes	Yes
DETSC 3301	PAH by GC-FID	mg/kg	0.10	As Received	No	Yes	No
DETSC 3311	TPH (C10 - C40)	mg/kg	20.00	As Received	No	Yes	Yes
DETSC 3401	PCB	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	Ethylbenzne	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Easily Liberatable Cyanide	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Complex Cyanide	mg/kg	0.30	Air Dried	No	Yes	No
DETSC 2130	Total Cyanide	mg/kg	0.40	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes

Appendix A - Details of Analysis

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS.
No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

Method	Name of Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3431	VOC	mg/kg	0.01	As Received	No	No	No
DETSC 3303	PAH by GCMS (see list below)						
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Anthracene	mg/kg	0.03	As Received	No	Yes	No
DETSC 3303	Chrysene	mg/kg	0.03	As Received	No	Yes	No
DETSC 3303	Fluorene	mg/kg	0.03	As Received	No	Yes	No

Certificate of Analysis

2139

Date: 17/01/2013

Certificate Number: 13-73902

Client:	Terra Firma (Wales) Ltd 5 Deryn Court Wharfdale Road Pentwyn Cardiff CF23 7HB
Our Reference:	13-73902
Client Reference:	12032
Contract Title:	Herbert Road
Description:	6 water samples
Date Received:	09 January 2013
Date Started:	09 January 2013
Date Completed:	17 January 2013
Test Procedures:	Identified by prefix DETSn, details available upon request.
Notes:	Observations and interpretations are outside the scope of UKAS accreditation
Approved By:	[redacted] Rob Brown, Business Manager

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Information in Support of the Analytical Results

Analysis

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425um sieve, in accordance with BS1377.
Organic soil analysis was carried out on an 'as received' sample.

Key

*	Denotes test not included in laboratory scope of accreditation
#	Denotes test that holds MCERTS accreditation, however, MCERTS accreditation is only implied if the report carries the MCERTS logo
$	Denotes tests completed by an approved subcontractor
I/S	Denotes insufficient sample to carry out test
U/S	Denotes that the sample is not suitable for testing

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-
Soils - 1 month
Liquids - 2 weeks
Asbestos (test portion) - 6 months

Summary of Chemical Analysis
Water Samples

Our Ref: 13-73902
Client Ref: 12032
Contract Title: Herbert Road

			Lab No.	474935	474936	474937	474938	474939
			Sample ID	BH1	BH2	BH3	BH4	BH5
			Depth					
			Sample Ref					
			Sample Type					
			Sampling Date	08/01/2013	08/01/2013	08/01/2013	08/01/2013	08/01/2013
			Sampling Time					
Test	**Units**	**DETSxx**	**LOD**					
Arsenic, Dissolved	ug/l	DETSC 2306	0.16	2.2	4.0	0.74	5.4	1.7
Cadmium, Dissolved	ug/l	DETSC 2306	0.03	< 0.030	< 0.030	< 0.030	< 0.030	< 0.030
Chromium, Dissolved	ug/l	DETSC 2306	0.25	1.0	0.93	0.57	0.41	0.49
Copper, Dissolved	ug/l	DETSC 2306	0.4	< 0.40	< 0.40	< 0.40	< 0.40	1.8
Lead, Dissolved	ug/l	DETSC 2306	0.09	< 0.090	< 0.090	< 0.090	< 0.090	0.34
Mercury, Dissolved	ug/l	DETSC 2306	0.01	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Nickel, Dissolved	ug/l	DETSC 2306	0.5	2.0	2.4	1.0	0.98	4.9
Selenium, Dissolved	ug/l	DETSC 2306	0.25	3.1	0.66	< 0.25	< 0.25	0.29
Zinc, Dissolved	ug/l	DETSC 2306	1.25	1.6	< 1.3	< 1.3	< 1.3	8.5
Sulphate as SO4	mg/l	DETSC 2055	0.1	31	4.4	8.0	86	120
Total Biochemical Oxygen Demand	mg/l	DETSC 2031	1	5.6	8.2	22	7.2	4.9
Total Chemical Oxygen Demand	mg/l	DETSC 2032	10	15	120	160	150	11
Cyanide total	ug/l	DETSC 2130	40	< 40.0	< 40.0	< 40.0	< 40.0	< 40.0
Conductivity	uS/cm	DETSC 2009	1	1340	4190	2400	1770	940
Hardness	mg/l	DETSC 2303*	0.1	315	468	453	541	555
Sulphide	ug/l	DETSC 2208	10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
pH		DETSC 2008		7.1	6.9	7.1	7.0	7.2
Aliphatic C5-C6	ug/l	DETSC 3322	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	ug/l	DETSC 3322	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	ug/l	DETSC 3322	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	ug/l	DETSC 3072*	1	< 1.0	< 1.0	3.5	< 1.0	< 1.0
Aliphatic C12-C16	ug/l	DETSC 3072*	1	< 1.0	7.9	17	< 1.0	< 1.0
Aliphatic C16-C21	ug/l	DETSC 3072*	1	11	37	31	< 1.0	< 1.0
Aliphatic C21-C35	ug/l	DETSC 3072*	1	140	190	420	< 1.0	2.2
Aromatic C5-C7	ug/l	DETSC 3322	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	ug/l	DETSC 3322	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	ug/l	DETSC 3322	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	ug/l	DETSC 3072*	1	< 1.0	< 1.0	1.5	< 1.0	< 1.0
Aromatic C12-C16	ug/l	DETSC 3072*	1	< 1.0	< 1.0	14	< 1.0	< 1.0
Aromatic C16-C21	ug/l	DETSC 3072*	1	< 1.0	< 1.0	2.4	< 1.0	< 1.0
Aromatic C21-C35	ug/l	DETSC 3072*	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	ug/l	DETSC 3072*	10	150	240	470	< 10	< 10
Aromatic C5-C35	ug/l	DETSC 3072*	10	< 10	< 10	18	< 10	< 10
TPH Ali/Aro	ug/l	DETSC 3072*	10	150	240	490	< 10	< 10
Acenaphthene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	0.07	< 0.01	< 0.01
Benzo(a)pyrene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	ug/l	DETS 074*	0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01

Summary of Chemical Analysis
Water Samples

Our Ref: 13-73902
Client Ref: 12032
Contract Title: Herbert Road

			Lab No.	474935	474936	474937	474938	474939
			Sample ID	BH1	BH2	BH3	BH4	BH5
			Depth					
			Sample Ref					
			Sample Type					
			Sampling Date	08/01/2013	08/01/2013	08/01/2013	08/01/2013	08/01/2013
			Sampling Time					
Test	**Units**	**DETSxx**	**LOD**					
Dibenzo(a,h)anthracene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	ug/l	DETS 074*	0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Naphthalene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	ug/l	DETS 074*	0.01	0.01	< 0.01	0.02	< 0.01	< 0.01
Pyrene	ug/l	DETS 074*	0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01
PAH	ug/l	DETS 074*	0.2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
EPH (C10-C40)	ug/l	DETSC 3311	10	100	60	250	150	110
PCB	ug/l	DETSC 3402	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
PCB 101	ug/l	DETSC 3402	0.3	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
PCB 138	ug/l	DETSC 3402	0.2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
PCB 153	ug/l	DETSC 3402	0.2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
PCB 180	ug/l	DETSC 3402	0.2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
PCB 28	ug/l	DETSC 3402	0.3	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
PCB 52	ug/l	DETSC 3402	0.2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
PCB 118 + PCB 123	ug/l	DETSC 3402	0.6	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60
Phenol	ug/l	DETS 054*	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4-Chloro-3-methylphenol	ug/l	DETS 054*	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
2,4-Dichlorophenol	ug/l	DETS 054*	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
2,4-Dimethylphenol	ug/l	DETS 054*	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
p-cresol	ug/l	DETS 054*	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
2,6-Dimethylphenol	ug/l	DETS 054*	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
2,6-Dichlorophenol	ug/l	DETS 054*	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
2,4,6-Trichlorophenol	ug/l	DETS 054*	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

Summary of Chemical Analysis
Water Samples

Our Ref: 13-73902
Client Ref: 12032
Contract Title: Herbert Road

			Lab No.	474940
			Sample ID	BH6
			Depth	
			Sample Ref	
			Sample Type	
			Sampling Date	08/01/2013
			Sampling Time	
Test	**Units**	**DETSxx**	**LOD**	
Arsenic, Dissolved	ug/l	DETSC 2306	0.16	0.58
Cadmium, Dissolved	ug/l	DETSC 2306	0.03	< 0.030
Chromium, Dissolved	ug/l	DETSC 2306	0.25	0.39
Copper, Dissolved	ug/l	DETSC 2306	0.4	0.64
Lead, Dissolved	ug/l	DETSC 2306	0.09	0.40
Mercury, Dissolved	ug/l	DETSC 2306	0.01	< 0.010
Nickel, Dissolved	ug/l	DETSC 2306	0.5	< 0.50
Selenium, Dissolved	ug/l	DETSC 2306	0.25	0.87
Zinc, Dissolved	ug/l	DETSC 2306	1.25	< 1.3
Sulphate as SO4	mg/l	DETSC 2055	0.1	36
Total Biochemical Oxygen Demand	mg/l	DETSC 2031	1	7.1
Total Chemical Oxygen Demand	mg/l	DETSC 2032	10	< 10
Cyanide total	ug/l	DETSC 2130	40	< 40.0
Conductivity	uS/cm	DETSC 2009	1	700
Hardness	mg/l	DETSC 2303*	0.1	317
Sulphide	ug/l	DETSC 2208	10	< 10.0
pH		DETSC 2008		7.4
Aliphatic C5-C6	ug/l	DETSC 3322	0.1	< 0.1
Aliphatic C6-C8	ug/l	DETSC 3322	0.1	< 0.1
Aliphatic C8-C10	ug/l	DETSC 3322	0.1	< 0.1
Aliphatic C10-C12	ug/l	DETSC 3072*	1	< 1.0
Aliphatic C12-C16	ug/l	DETSC 3072*	1	9.3
Aliphatic C16-C21	ug/l	DETSC 3072*	1	30
Aliphatic C21-C35	ug/l	DETSC 3072*	1	11
Aromatic C5-C7	ug/l	DETSC 3322	0.1	< 0.1
Aromatic C7-C8	ug/l	DETSC 3322	0.1	< 0.1
Aromatic C8-C10	ug/l	DETSC 3322	0.1	< 0.1
Aromatic C10-C12	ug/l	DETSC 3072*	1	< 1.0
Aromatic C12-C16	ug/l	DETSC 3072*	1	< 1.0
Aromatic C16-C21	ug/l	DETSC 3072*	1	< 1.0
Aromatic C21-C35	ug/l	DETSC 3072*	1	< 1.0
Aliphatic C5-C35	ug/l	DETSC 3072*	10	50
Aromatic C5-C35	ug/l	DETSC 3072*	10	< 10
TPH Ali/Aro	ug/l	DETSC 3072*	10	50
Acenaphthene	ug/l	DETS 074*	0.01	< 0.01
Acenaphthylene	ug/l	DETS 074*	0.01	< 0.01
Anthracene	ug/l	DETS 074*	0.01	< 0.01
Benzo(a)anthracene	ug/l	DETS 074*	0.01	< 0.01
Benzo(a)pyrene	ug/l	DETS 074*	0.01	< 0.01
Benzo(b)fluoranthene	ug/l	DETS 074*	0.01	< 0.01
Benzo(k)fluoranthene	ug/l	DETS 074*	0.01	< 0.01
Benzo(g,h,i)perylene	ug/l	DETS 074*	0.01	< 0.01
Chrysene	ug/l	DETS 074*	0.01	< 0.01

Summary of Chemical Analysis
Water Samples

Our Ref: 13-73902
Client Ref: 12032
Contract Title: Herbert Road

			Lab No.	474940
			Sample ID	BH6
			Depth	
			Sample Ref	
			Sample Type	
			Sampling Date	08/01/2013
			Sampling Time	
Test	**Units**	**DETSxx**	**LOD**	
Dibenzo(a,h)anthracene	ug/l	DETS 074*	0.01	< 0.01
Fluoranthene	ug/l	DETS 074*	0.01	< 0.01
Fluorene	ug/l	DETS 074*	0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	ug/l	DETS 074*	0.01	< 0.01
Naphthalene	ug/l	DETS 074*	0.01	< 0.01
Phenanthrene	ug/l	DETS 074*	0.01	< 0.01
Pyrene	ug/l	DETS 074*	0.01	< 0.01
PAH	ug/l	DETS 074*	0.2	< 0.20
EPH (C10-C40)	ug/l	DETSC 3311	10	11
PCB	ug/l	DETSC 3402	1	< 1.0
PCB 101	ug/l	DETSC 3402	0.3	< 0.30
PCB 138	ug/l	DETSC 3402	0.2	< 0.20
PCB 153	ug/l	DETSC 3402	0.2	< 0.20
PCB 180	ug/l	DETSC 3402	0.2	< 0.20
PCB 28	ug/l	DETSC 3402	0.3	< 0.30
PCB 52	ug/l	DETSC 3402	0.2	< 0.20
PCB 118 + PCB 123	ug/l	DETSC 3402	0.6	< 0.60
Phenol	ug/l	DETS 054*	0.1	< 0.10
4-Chloro-3-methylphenol	ug/l	DETS 054*	0.1	< 0.10
2,4-Dichlorophenol	ug/l	DETS 054*	0.1	< 0.10
2,4-Dimethylphenol	ug/l	DETS 054*	0.1	< 0.10
p-cresol	ug/l	DETS 054*	0.1	< 0.10
2,6-Dimethylphenol	ug/l	DETS 054*	0.1	< 0.10
2,6-Dichlorophenol	ug/l	DETS 054*	0.1	< 0.10
2,4,6-Trichlorophenol	ug/l	DETS 054*	0.1	< 0.10

Sample Comments

DETS cannot be held responsible for the integrity of sample(s) received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating.

Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note "Guidance on Deviating Samples".

All samples received are listed below. However, those samples that have additional comments in relation to hold time and/or inappropriate containers are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations.

If no sampled date (soils) or date/time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters), this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Lab No.	Sample ID	Date Sampled	Containers Received	Deviating due to holding time being exceeded for test	Deviating due to inappropriate container for test
474935	BH1 WATER	08/01/2013	Glass Jar 1 litre (1 litre) x2, Plastic Bottle 1 litre (1 litre)		
474936	BH2 WATER	08/01/2013	Glass Jar 1 litre (1 litre) x2, Plastic Bottle 1 litre (1 litre)		
474937	BH3 WATER	08/01/2013	Glass Jar 1 litre (1 litre) x2, Plastic Bottle 1 litre (1 litre)		
474938	BH4 WATER	08/01/2013	Glass Jar 1 litre (1 litre) x2, Plastic Bottle 1 litre (1 litre)		
474939	BH5 WATER	08/01/2013	Glass Jar 1 litre (1 litre) x2, Plastic Bottle 1 litre (1 litre)		
474940	BH6 WATER	08/01/2013	Glass Jar 1 litre (1 litre) x2, Plastic Bottle 1 litre (1 litre)		

Certificate of Analysis

2139

Date: 07/02/2013

Certificate Number: 13-75083

Client:	Terra Firma (Wales) Ltd 5 Deryn Court Wharfdale Road Pentwyn Cardiff CF23 7HB
Our Reference:	13-75083
Client Reference:	12032
Contract Title:	Herbert Road
Description:	6 water samples
Date Received:	01 February 2013
Date Started:	01 February 2013
Date Completed:	07 February 2013
Test Procedures:	Identified by prefix DETSn, details available upon request.
Notes:	Observations and interpretations are outside the scope of UKAS accreditation
Approved By:	[redacted] Rob Brown, Business Manager

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Derwentside Environmental Testing Services Limited
Unit 2, Park Road Industrial Estate South, Consett, Co Durham, DH8 5PY
Tel: 01207 582333 • Fax 01207 582444 • email: info@dets.co.uk • www.dets.co.uk

Information in Support of the Analytical Results

Analysis

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425um sieve, in accordance with BS1377.
Organic soil analysis was carried out on an 'as received' sample.

Key

*	Denotes test not included in laboratory scope of accreditation
#	Denotes test that holds MCERTS accreditation, however, MCERTS accreditation is only implied if the report carries the MCERTS logo
$	Denotes tests completed by an approved subcontractor
I/S	Denotes insufficient sample to carry out test
U/S	Denotes that the sample is not suitable for testing

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-
Soils - 1 month
Liquids - 2 weeks
Asbestos (test portion) - 6 months

Summary of Chemical Analysis
Water Samples

Our Ref: 13-75083
Client Ref: 12032
Contract Title: Herbert Road

			Lab No.	480761	480762	480763	480764	480765
			Sample ID	BH1	BH2	BH3	BH4	BH5
			Depth					
			Sample Ref					
			Sample Type					
			Sampling Date	/ /	/ /	/ /	/ /	/ /
			Sampling Time					
Test	**Units**	**DETSxx**	**LOD**					
Arsenic, Dissolved	ug/l	DETSC 2306	0.16	9.2	4.1	1.8	1.4	8.0
Cadmium, Dissolved	ug/l	DETSC 2306	0.03	0.038	0.044	< 0.030	0.21	0.15
Chromium, Dissolved	ug/l	DETSC 2306	0.25	< 0.25	0.54	0.77	< 0.25	< 0.25
Copper, Dissolved	ug/l	DETSC 2306	0.4	0.91	< 0.40	0.41	3.0	< 0.40
Lead, Dissolved	ug/l	DETSC 2306	0.09	< 0.090	< 0.090	< 0.090	< 0.090	1.7
Mercury, Dissolved	ug/l	DETSC 2306	0.01	0.012	< 0.010	< 0.010	0.025	< 0.010
Nickel, Dissolved	ug/l	DETSC 2306	0.5	1.3	3.0	0.67	4.6	1.1
Selenium, Dissolved	ug/l	DETSC 2306	0.25	0.66	0.60	< 0.25	0.77	0.57
Zinc, Dissolved	ug/l	DETSC 2306	1.25	3.7	4.0	2.4	18	< 1.3
Sulphate as SO4	mg/l	DETSC 2055	0.1	14	5.5	100	120	77
Total Biochemical Oxygen Demand	mg/l	DETSC 2031	1	3.2	4.1	5.8	6.6	2.8
Total Chemical Oxygen Demand	mg/l	DETSC 2032	10	20	110	37	30	110
Cyanide total	ug/l	DETSC 2130	40	< 40.0	< 40.0	< 40.0	< 40.0	< 40.0
Conductivity	uS/cm	DETSC 2009	1	1540	4070	2160	955	1750
Hardness	mg/l	DETSC 2303*	0.1	327	194	256	492	494
Sulphide	ug/l	DETSC 2208	10	< 10	< 10	< 10	< 10	< 10
pH		DETSC 2008		7.2	7.0	7.1	7.3	7.1
Aliphatic C5-C6	ug/l	DETSC 3322	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	ug/l	DETSC 3322	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	ug/l	DETSC 3322	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	ug/l	DETSC 3072*	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	ug/l	DETSC 3072*	1	< 1.0	3.2	3.4	5.7	3.9
Aliphatic C16-C21	ug/l	DETSC 3072*	1	< 1.0	3.4	2.7	6.4	6.6
Aliphatic C21-C35	ug/l	DETSC 3072*	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C7	ug/l	DETSC 3322	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	ug/l	DETSC 3322	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	ug/l	DETSC 3322	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	ug/l	DETSC 3072*	1	< 1.0	< 1.0	1.1	< 1.0	< 1.0
Aromatic C12-C16	ug/l	DETSC 3072*	1	< 1.0	< 1.0	6.2	< 1.0	< 1.0
Aromatic C16-C21	ug/l	DETSC 3072*	1	< 1.0	< 1.0	2.0	< 1.0	< 1.0
Aromatic C21-C35	ug/l	DETSC 3072*	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	ug/l	DETSC 3072*	10	< 10	< 10	< 10	12	11
Aromatic C5-C35	ug/l	DETSC 3072*	10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro	ug/l	DETSC 3072*	10	< 10	< 10	15	12	11

Summary of Chemical Analysis
Water Samples

Our Ref: 13-75083
Client Ref: 12032
Contract Title: Herbert Road

			Lab No.	480761	480762	480763	480764	480765
			Sample ID	BH1	BH2	BH3	BH4	BH5
			Depth					
			Sample Ref					
			Sample Type					
			Sampling Date	/ /	/ /	/ /	/ /	/ /
			Sampling Time					
Test	**Units**	**DETSxx**	**LOD**					
Acenaphthene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenzo(a,h)anthracene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Naphthalene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	ug/l	DETS 074*	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
PAH	ug/l	DETS 074*	0.2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
EPH (C10-C40)	ug/l	DETSC 3311	10	< 10	< 10	< 10	380	50
PCB	ug/l	DETSC 3402	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
PCB 101	ug/l	DETSC 3402	0.3	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
PCB 138	ug/l	DETSC 3402	0.2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
PCB 153	ug/l	DETSC 3402	0.2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
PCB 180	ug/l	DETSC 3402	0.2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
PCB 28	ug/l	DETSC 3402	0.3	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
PCB 52	ug/l	DETSC 3402	0.2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
PCB 118 + PCB 123	ug/l	DETSC 3402	0.6	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60
Phenol	ug/l	DETS 054*	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.25
4-Chloro-3-methylphenol	ug/l	DETS 054*	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.25
2,4-Dichlorophenol	ug/l	DETS 054*	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.25
2,4-Dimethylphenol	ug/l	DETS 054*	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.25
p-cresol	ug/l	DETS 054*	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.25
2,6-Dimethylphenol	ug/l	DETS 054*	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.25
2,6-Dichlorophenol	ug/l	DETS 054*	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.25
2,4,6-Trichlorophenol	ug/l	DETS 054*	0.1	< 0.10	< 0.10	< 0.10	0.11	< 0.25

Summary of Chemical Analysis
Water Samples

Our Ref: 13-75083
Client Ref: 12032
Contract Title: Herbert Road

			Lab No.	480766
			Sample ID	BH6
			Depth	
			Sample Ref	
			Sample Type	
			Sampling Date	/ /
			Sampling Time	
Test	**Units**	**DETSxx**	**LOD**	
Arsenic, Dissolved	ug/l	DETSC 2306	0.16	1.1
Cadmium, Dissolved	ug/l	DETSC 2306	0.03	0.14
Chromium, Dissolved	ug/l	DETSC 2306	0.25	< 0.25
Copper, Dissolved	ug/l	DETSC 2306	0.4	1.9
Lead, Dissolved	ug/l	DETSC 2306	0.09	< 0.090
Mercury, Dissolved	ug/l	DETSC 2306	0.01	0.023
Nickel, Dissolved	ug/l	DETSC 2306	0.5	2.3
Selenium, Dissolved	ug/l	DETSC 2306	0.25	1.5
Zinc, Dissolved	ug/l	DETSC 2306	1.25	7.1
Sulphate as SO4	mg/l	DETSC 2055	0.1	31
Total Biochemical Oxygen Demand	mg/l	DETSC 2031	1	2.9
Total Chemical Oxygen Demand	mg/l	DETSC 2032	10	19
Cyanide total	ug/l	DETSC 2130	40	< 40.0
Conductivity	uS/cm	DETSC 2009	1	1030
Hardness	mg/l	DETSC 2303*	0.1	350
Sulphide	ug/l	DETSC 2208	10	< 10
pH		DETSC 2008		7.3
Aliphatic C5-C6	ug/l	DETSC 3322	0.1	< 0.1
Aliphatic C6-C8	ug/l	DETSC 3322	0.1	< 0.1
Aliphatic C8-C10	ug/l	DETSC 3322	0.1	< 0.1
Aliphatic C10-C12	ug/l	DETSC 3072*	1	< 1.0
Aliphatic C12-C16	ug/l	DETSC 3072*	1	1.7
Aliphatic C16-C21	ug/l	DETSC 3072*	1	10
Aliphatic C21-C35	ug/l	DETSC 3072*	1	< 1.0
Aromatic C5-C7	ug/l	DETSC 3322	0.1	< 0.1
Aromatic C7-C8	ug/l	DETSC 3322	0.1	< 0.1
Aromatic C8-C10	ug/l	DETSC 3322	0.1	< 0.1
Aromatic C10-C12	ug/l	DETSC 3072*	1	< 1.0
Aromatic C12-C16	ug/l	DETSC 3072*	1	< 1.0
Aromatic C16-C21	ug/l	DETSC 3072*	1	< 1.0
Aromatic C21-C35	ug/l	DETSC 3072*	1	< 1.0
Aliphatic C5-C35	ug/l	DETSC 3072*	10	12
Aromatic C5-C35	ug/l	DETSC 3072*	10	< 10
TPH Ali/Aro	ug/l	DETSC 3072*	10	12

Summary of Chemical Analysis
Water Samples

Our Ref: 13-75083
Client Ref: 12032
Contract Title: Herbert Road

			Lab No.	480766
			Sample ID	BH6
			Depth	
			Sample Ref	
			Sample Type	
			Sampling Date	/ /
			Sampling Time	
Test	**Units**	**DETSxx**	**LOD**	
Acenaphthene	ug/l	DETS 074*	0.01	< 0.01
Acenaphthylene	ug/l	DETS 074*	0.01	< 0.01
Anthracene	ug/l	DETS 074*	0.01	< 0.01
Benzo(a)anthracene	ug/l	DETS 074*	0.01	< 0.01
Benzo(a)pyrene	ug/l	DETS 074*	0.01	< 0.01
Benzo(b)fluoranthene	ug/l	DETS 074*	0.01	< 0.01
Benzo(k)fluoranthene	ug/l	DETS 074*	0.01	< 0.01
Benzo(g,h,i)perylene	ug/l	DETS 074*	0.01	< 0.01
Chrysene	ug/l	DETS 074*	0.01	< 0.01
Dibenzo(a,h)anthracene	ug/l	DETS 074*	0.01	< 0.01
Fluoranthene	ug/l	DETS 074*	0.01	< 0.01
Fluorene	ug/l	DETS 074*	0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	ug/l	DETS 074*	0.01	< 0.01
Naphthalene	ug/l	DETS 074*	0.01	< 0.01
Phenanthrene	ug/l	DETS 074*	0.01	< 0.01
Pyrene	ug/l	DETS 074*	0.01	< 0.01
PAH	ug/l	DETS 074*	0.2	< 0.20
EPH (C10-C40)	ug/l	DETSC 3311	10	130
PCB	ug/l	DETSC 3402	1	< 1.0
PCB 101	ug/l	DETSC 3402	0.3	< 0.30
PCB 138	ug/l	DETSC 3402	0.2	< 0.20
PCB 153	ug/l	DETSC 3402	0.2	< 0.20
PCB 180	ug/l	DETSC 3402	0.2	< 0.20
PCB 28	ug/l	DETSC 3402	0.3	< 0.30
PCB 52	ug/l	DETSC 3402	0.2	< 0.20
PCB 118 + PCB 123	ug/l	DETSC 3402	0.6	< 0.60
Phenol	ug/l	DETS 054*	0.1	< 0.10
4-Chloro-3-methylphenol	ug/l	DETS 054*	0.1	< 0.10
2,4-Dichlorophenol	ug/l	DETS 054*	0.1	< 0.10
2,4-Dimethylphenol	ug/l	DETS 054*	0.1	< 0.10
p-cresol	ug/l	DETS 054*	0.1	< 0.10
2,6-Dimethylphenol	ug/l	DETS 054*	0.1	< 0.10
2,6-Dichlorophenol	ug/l	DETS 054*	0.1	< 0.10
2,4,6-Trichlorophenol	ug/l	DETS 054*	0.1	< 0.10

Sample Comments

DETS cannot be held responsible for the integrity of sample(s) received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating.

Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note "Guidance on Deviating Samples".

All samples received are listed below. However, those samples that have additional comments in relation to hold time and/or inappropriate containers are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations.

If no sampled date (soils) or date/time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters), this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Lab No.	Sample ID	Date Sampled	Containers Received	Deviating due to holding time being exceeded for test	Deviating due to inappropriate container for test
480761	BH1 WATER		Glass Jar 1 litre (1 litre) x2, Plastic Bottle 1 litre (1 litre)	Sample is deviating (no sampled date/time supplied)	
480762	BH2 WATER		Glass Jar 1 litre (1 litre) x2, Plastic Bottle 1 litre (1 litre)	Sample is deviating (no sampled date/time supplied)	
480763	BH3 WATER		Glass Jar 1 litre (1 litre) x2, Plastic Bottle 1 litre (1 litre)	Sample is deviating (no sampled date/time supplied)	
480764	BH4 WATER		Glass Jar 1 litre (1 litre) x2, Plastic Bottle 1 litre (1 litre)	Sample is deviating (no sampled date/time supplied)	
480765	BH5 WATER		Glass Jar 1 litre (1 litre) x2, Plastic Bottle 1 litre (1 litre)	Sample is deviating (no sampled date/time supplied)	
480766	BH6 WATER		Glass Jar 1 litre (1 litre) x2, Plastic Bottle 1 litre (1 litre)	Sample is deviating (no sampled date/time supplied)	

ANNEX H
In-Situ Soakaway Test Results

terrafirma
Terra Firma (Wales) Limited
Wharfedale Road, Pentwyn
Cardiff
CF23 7HB
Tel: 029 20 375 354
Fax: 029 20 735 433
Email: info@terrafirmawales.co.uk

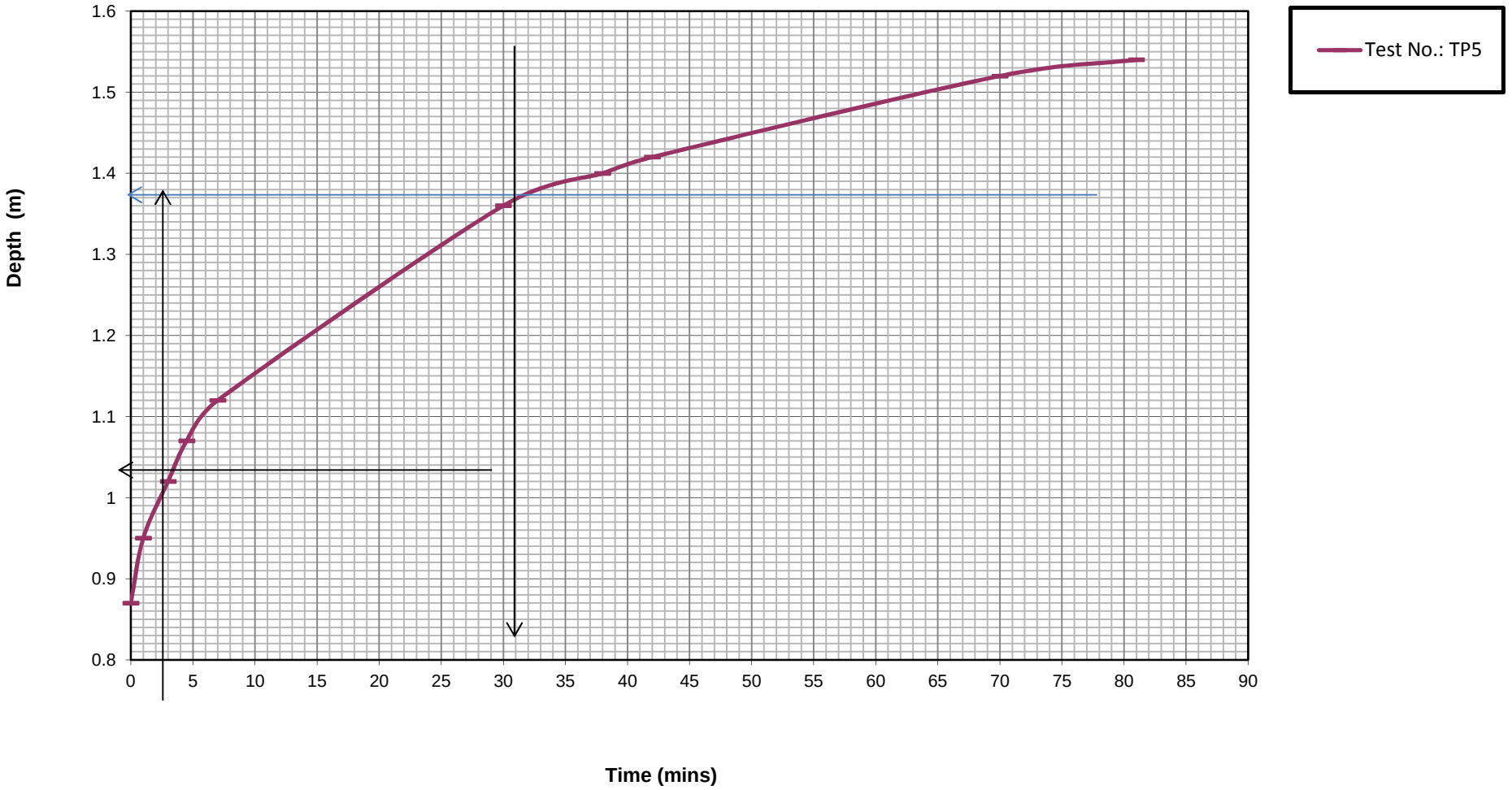
Site Name: Herbert Road
Number: 12032
Date Undertaken: 6.11.2012
Test No.: TP5

	Depth to Water (m)	Time (Mins)
(effective depth - 100%)	0.87	0
	0.95	1
	1.02	3
	1.07	4.5
	1.12	7
	1.36	30
	1.4	38
	1.42	42
	1.52	70
(effective depth - 0%)	1.540	81

Length of Trial Pit (m)	2.30	
Width of Trial Pit (m)	0.70	
Depth of Trial Pit (m)	1.70	
Effective Storage Depth (m)	0.670	
Vp25	1.0375	
Vp75	1.3725	
Vp75-25	0.539	
50% effective depth (m)	0.335	
Mean Surface area ap50 (m2)	3.620	
Time for 25% **Outflow** (t_{p25})	3.25	**From Graph**
Time for 75% **Outflow** (t_{p75})	31.25	**From Graph**
tp75 - 25	28	
Soil Infiltration Rate (m/s)	**8.86855E-05**	

Soil Infiltration Worksheet: This worksheet has been produced in combination with the document 'BRE Digest 365- September 1991'
This worksheet can be used to determine soil infiltration rates from trial pit field measurements
Worksheet options are identified by a green background

Soil Infiltration Measurements- TP5



ANNEX I
In-Situ Gas Monitoring Results

TERRA FIRMA (WALES) LIMITED

In-situ Gas Monitoring Results

Site: Herbert Road, Newport
Date Monitored: 16/01/2012
Barometric Pressure: 1014
Weather: Overcast, dry and very cold
Job No: **12032**

Gas Monitoring Well Number	Methane (CH_4) LEL(%)	Gas(%)	O_2 (%)	CO_2 (%)	Flow (litres/ hour)	CO	H_2S
BH1	0	0.0	19.8	0.3	0.0	0	0
BH2	0	0.0	19.8	0.4	0.0	0	0
BH3	>LEL	61.6	5.0	6.8	0.0	0	10
BH4	0	0.1	19.1	0.6	0.0	0	0
BH5	0	0.0	19.0	0.1	0.0	0	0
BH6	0	0.0	19.0	0.4	0.0	0	0

Notes:

1 Gas Measuring Instrument: Gas Measurement Instrument (GMI) Landsurveyor 2
2 LEL = Lower Explosive Limit
3 O_2 = Oxygen
4 CO_2 = Carbon Dioxide
5 CO = Carbon Monoxide
6 H_2S = Hydrogen Sulphide

TERRA FIRMA (WALES) LIMITED

In-situ Gas Monitoring Results

Site: Herbert Road, Newport
Date Monitored: 07/02/2012
Barometric Pressure: 1020-1021
Weather: Overcast, dry and cold
Job No: **12032**

Gas Monitoring Well Number	Methane (CH_4) LEL(%)	Gas(%)	O_2 (%)	CO_2 (%)	Flow (litres/ hour)	CO	H_2S
BH1	1	13.9	21.5	0.1	0.0	0	0
BH2	5	16.2	21.2	1.6	-0.1	0	0
BH3	>LEL	67.4	2.4	6.6	0.0	0	28
BH4	0	0.0	21.4	0.1	0.0	0	0
BH5	1	0.1	21.5	0.3	0.0	0	0
BH6	0	0.0	21.4	0.3	0.0	0	0
WS1	3	4.0	2.5	11.2	0.0	0	0
WS2	29	1.5	1.2	8.3	0.0	2	0
WS3	0	0.0	10.9	3.8	0.0	0	0

Notes:

1 Gas Measuring Instrument: Gas Measurement Instrument (GMI) Landsurveyor 2
2 LEL = Lower Explosive Limit
3 O_2 = Oxygen
4 CO_2 = Carbon Dioxide
5 CO = Carbon Monoxide
6 H_2S = Hydrogen Sulphide

terrafirma

Job Number:

12032

Job Title:

Land off Herbert Road, Newport

Drawing Title:

Site Location

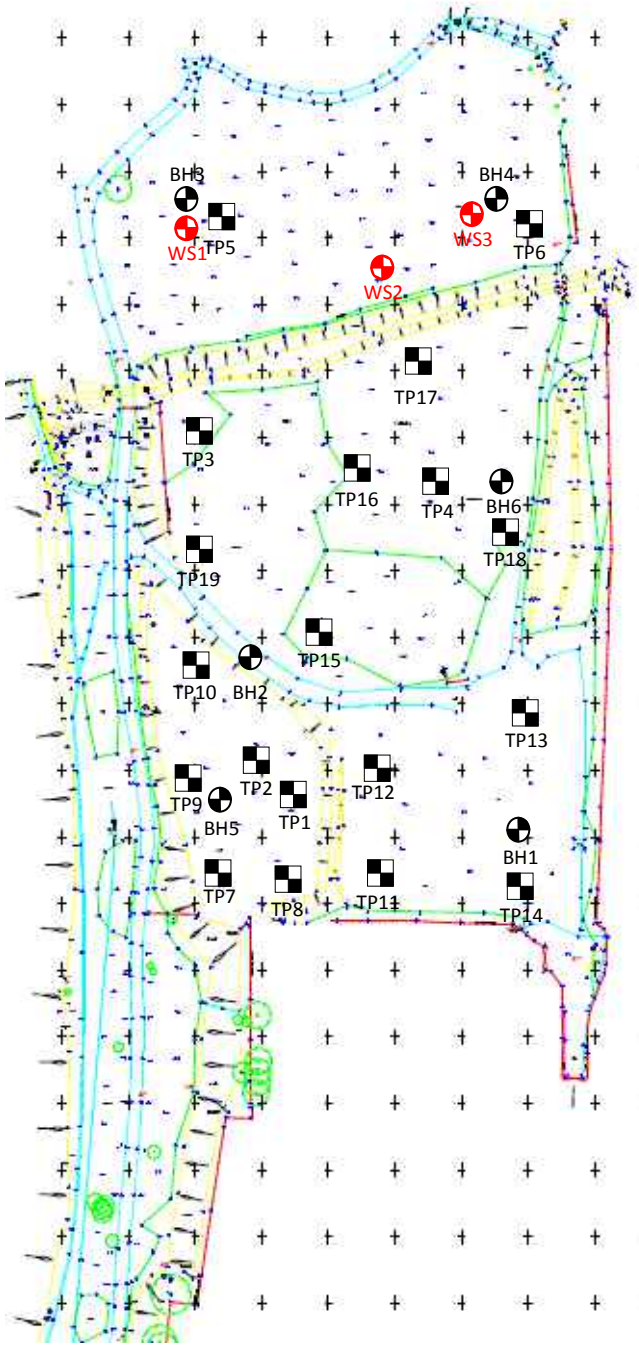
Drawing Number:

01

Scale:

Not to Scale

North



terrafirma

Job Number:

12032

Job Title:

Land off Herbert Road, Newport

Drawing Title:

Current Site Layout

Drawing Number:

02

Scale:

Not To Scale

Legend:

Trial Pit Location

Cable Percussive Borehole

Windowless Sample Borehole

ANNEX B
Piling Risk Assessment Report

PILING RISK ASSESSMENT REPORT:

Proposed Residential Development at Herbert Road, Newport

Prepared for:
Keepmoat

November 2016

Job No: 12032/PRA

Document Control

Report title	**Foundation Works Risk Assessment Report, Proposed** Proposed Residential Development at Herbert Road, Newport
Document status	**Issue 1**
Project ref	**12032/PRA**
Document date	**November 2016**
Originator	[redacted] **Ruth Howells**
Reviewed by	[redacted] **Mathew Lake**
Authorised by	[redacted] **Dr G C Lake**

Executive Summary

Site Summary	An area of land off Herbert Road, Newport is to be residentially developed. Due to the presence of soft clay identified beneath the site a piled foundation was advised for the development. For the majority of the development precast concrete driven piles are to be used. A trunk sewer passes beneath the site and the use of precast concrete piles is prohibited along its route. Due to these restrictions all new dwellings to be built along the sewer route are to be founded upon bored piles. Piles will be founded within the underlying very weak red brown and grey mudstone.
Pollution scenario 1: Creation of preferential pathways through a low permeability layer (aquitard), to allow potential contamination of an aquifer	Groundwater present site is confined to isolated bands of sand and gravel. The level of any contamination is considered very low. The groundwater is not in hydraulic continuity with the River Usk. It is considered that the superficial clay deposits will mould around the piles sealing any potential pathways.
Pollution scenario 2: Creation of preferential pathways, through a low permeability surface layer to allow upward migration of landfill gas, soil gas or contaminant vapours to the surface	Gas protection measures comprising a gas membrane, passive under-floor venting and taping and sealing of joints will be installed in all new housing. Further gas assessment is to be performed after fill completion and during/following piling and gas prevention measures reviewed.
Pollution scenario 3: Direct contact of site workers and others with contaminated soil arisings which have been brought to the surface	Installation of precast concrete piles is a displacement method will not bring site workers into contact with soil arisings. Installation of bored piles will involve removal of materials from each pile location, bringing arisings to the surface. Site construction workers are deemed to be at very low risk from the identified contaminants given that any exposure time would be comparatively, to how the trigger levels are derived, exceedingly short. Furthermore, these very low risks may be mitigated through appropriate health and safety measures and proceedures.
Pollution scenario 4: Direct contact of the piles or engineered structures with contaminated soil or leachate causing degradation of pile materials	ACEC Class AC-1 should be applied. Provided the concrete used for the piles is the correct class there is negligible risk of pile degradation.
Pollution Scenario 5: The driving of solid contaminants down into an aquifer during pile driving	All arisings from installation of bored piles are brought to the surface and removed. There is therefore no opportunity for contaminated soils to be driven downwards into the underlying aquifer. With regards to the precast concrete piles the use of a pointed or convex shoe is considered necessary during installation.
Pollution scenario 6: Contamination of groundwater and nearby surface waters by concrete, cement paste or grout	The risk of pollution via this scenario with bored piles is considered to be negligible. Driven piles are pre-fabricated off-site and thus do not pose a risk of wet concrete.

TABLE OF CONTENTS

SECTION 1 Introduction

SECTION 2 Review of Geotechnical and Geo-environmental Site Investigation

2.1 General
2.2 Geology and Ground Conditions
2.3 Hydrology and Hydrogeology
2.4 Human Health and Environmental Risk Assessment

SECTION 3 Piling Risk Assessment

3.1 General
3.2 Pollution Linkages
3.2.1 Pollution Scenario 1
3.2.2 Pollution Scenario 2
3.2.3 Pollution Scenario 3
3.2.4 Pollution Scenario 4
3.2.5 Pollution Scenario 5
3.2.6 Pollution Scenario 6

Tables
Table 2.1 Summary of Contaminants of Concern in Soil
Table 2.2 Summary of Contaminants of Concern in Groundwater
Table 3.1 Soil and Groundwater Sulphate and pH Results

SECTION 1 Introduction

An area of land off Herbert Road, Newport is to be residentially developed.

Terra Firma (Wales) Limited previously undertook geotechnical and geo-environmental investigation of the site for Greenhill Construction Limited, (Geo-environmental and Geo-technical Report No. 12032).

Based on the findings of the site investigation it was recommended that a piled foundation be used for the new development.

The Piling Risk Assessment Report has been prepared to achieve the following objectives:

1. Identify the source-pathway-receptor linkages associated with piling works
2. Undertake hazard assessment and risk estimation of the identified potential environmental consequences
3. Determine the requirement for mitigation measures and/or environmental monitoring

Keepmoat has requested that a Piling Risk Assessment is undertaken for the development. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Terra Firma (Wales) Limited.

If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill. The report represents the findings and opinions of experienced geo-environmental and geotechnical consultants. Terra Firma (Wales) Limited does not provide legal advice and the advice of lawyers may be required. Any subsurface geological profiles, contamination and other plots are generalised by necessity and have been based on the information found at the locations of the exploratory holes and depths sampled and tested.

SECTION 2 Review of Geotechnical and Geo-environmental Site Investigation

2.1 General

Investigation of the site was previously undertaken by Terra Firma (Wales) Limited. The details of the investigation were reported on in March 2013 (Geo-environmental and Geo-technical Report No. 12032). A copy of this report is provided in **Annex A**.

The site investigation was carried out between the 31st of October and the 8th of November 2012 comprising 19 trial pits and six cable percussive boreholes and three mini percussive boreholes.

In March 2014 additional testing of groundwater was performed.

A summary of the site is provided in the following sections.

2.2 Geology and Ground Conditions

Compared to original levels (prior to initiation of fill works) the ground conditions encountered beneath the site can in general be summarised as made ground to between 0.2m and 3.3m depth, underlain by soft grey and brown clay superficial alluvium with bands of peat and intermittent sand and gravel deposits. Below 5.9m/10.3m depth red brown gravelly clay prevailed, grading in to red mudstone (St Maughan's Formation) at between 10m to 12.7m depth.

Due to the required raising of the site, upon completion of the development the ground level will up to 2.75m above the original level.

2.3 Hydrology and Hydrogeology

A drainage reen flows east to west through the site. This converges with the River Usk approximately 40m west of the site. The River Usk flows southwards and parallels the western site boundary.

The underlying mudstone bedrock is classified a Secondary A aquifer. These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

The superficial deposits are also classed as a Secondary A aquifer. In-situ monitoring on site has confirmed that groundwater within the superficial deposits is confined to intermittent and inconsistent bands of granular deposits and that it is not in hydraulic connectivity with the River Usk.

No perched groundwater was noted in the made ground on site, and is not expected in the recently imported fill due to heavy compaction and low porosity.

2.4 Human Health and Environmental Risk Assessment

During site investigation works both site soils (made ground) and groundwater were sampled and chemically analysed.

A number of substances tested for were found to be above their respective threshold levels in made ground. These exceedences are summarised in **Table 2.1** below.

Table 2.1 Summary of Contaminants of Concern in Soil

Hole and depth (m bgl)	Chemical	Guideline (mg/kg)	Exceedance (mg/kg)
TP5 1.3m	Arsenic	32	40
TP2 0.90m	Cyanide	8	10
TP5 1.3	Lead	200	290
TP8 0.50m	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenzo(a,h)anthracene	7.2 2.2 2.6 0.24	13 11 9 1.6
TP6 1.8 TP7 0.20m	Chrysotile – Loose Bundles	-	-
TP13 0.60m	PCB 2,4,4'-Trichlorobiphenyl 2,2',5,5'-Tetrachlorobiphenyl	0.08 0.08 0.08	0.16 0.12 0.05

Subsequent to the site investigation fill materials have been imported across the site. These materials have been chemically tested in accordance with the Terra Firma Remediation Strategy and have been deemed acceptable by both Newport City Council and NRW.

Any further fill to be will similarly be screened and approved prior to importation.

Substances found to be elevated in groundwater, (found in isolated bands of sand and gravel within the alluvium) and reen water are summarised in **Table 2.2** below.

Table 2.2 Summary of Contaminants of Concern in Groundwater

Borehole	Chemical	Threshold (mg/l)	Exceedance (mg/l)
BH1 (08.01.2013)	Aliphatic C16-C21 Aliphatic C21-C35	0.01 0.01	0.11 0.14
BH2 (08.01.2013)	Aliphatic C16-C21 Aliphatic C21-C35	0.01 0.01	0.037 0.19
BH6 (08.01.2013)	Aliphatic C16-C21 Aliphatic C21-C35	0.001 0.001	0.03 0.011
Reen (Upstream)	Aliphatic C16 - C21 Aliphatic C21 - C35 Aromatic C10 - C12 Aromatic C21 - C35 Fluoranthene	0.01 0.0001	0.021 0.17 0.018 0.062 0.00013
BH5 (06.03.2014)	Zinc	0.125	0.16

2.4 Human Health and Environmental Risk Assessment (Continued)

The petroleum hydrocarbons identified were attributed to contamination that occurred from the drilling process.

The hydrocarbons noted at the reen were identified up-stream but not down-stream and it was concluded that all of the determinants exiting the site and entering the River Usk from the reen were below threshold values.

Two rounds of groundwater testing in March 2014 identified only a single exceedence of zinc, in one location.

With regards to ground gas, the site has been classified as 'gas characteristic situation 3-4' in accordance with Table 8.5 of CIRIA Report C665. Ground gas beneath the site is attributed to the buried bands of peat.

Taking the underlying clay ground conditions into consideration, which will act to prevent upward gas migration, gas protection measures in line with 'gas characteristic 2' may prove adequate to prevent the risk from ground gas to future site residents. Table 8.6 of the CIRIA report confirms that for gas characteristic 2 sites, the following precautions are required:

- A 2000 gauge DPM/reinforced gas membrane
- Passive under-floor venting
- All joints taped and sealed

As a minimum these protection measures will be implemented, subject to further monitoring upon completion of fill works and piling.

Also, gas protection measures will be suitable for basic radon protection and the radon/gas barrier should also be effective as a barrier to PCB vapours.

SECTION 3 Piling Risk Assessment

3.1 General

Due to the presence of soft clay beneath the site traditional shallow foundations are likely to lead to high total and differential settlements.

A piled foundation was therefore advised for the proposed residential properties.

For the majority of the development precast concrete driven piles are to be used, founded within the underlying very weak red brown and grey mudstone.

A trunk sewer passes beneath the site and the use of precast concrete piles is prohibited along its route. Due to these restrictions all new dwellings to be built along the sewer route are to be founded upon bored piles. The sewer lies around 25m depth below ground level, within the underlying mudstone. These piles should be bored and installed as specified by the piling contractor.

Pile lengths are expected to vary between 14 and 17m below final ground level following completion of earthworks on site.

3.2 Potential Pollution Linkages

The Environment Agency publication 'Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention (2001)' was consulted.

The Environment Agency has identified six possible pollution linkages (scenarios):

- **Pollution scenario 1:** Creation of preferential pathways through a low permeability layer (aquitard), to allow potential contamination of an aquifer
- **Pollution scenario 2:** Creation of preferential pathways, through a low permeability surface layer to allow upward migration of landfill gas, soil gas or contaminant vapours to the surface
- **Pollution scenario 3:** Direct contact of site workers and others with contaminated soil arisings which have been brought to the surface
- **Pollution scenario 4:** Direct contact of the piles or engineered structures with contaminated soil or leachate causing degradation of pile materials
- **Pollution Scenario 5:** The driving of solid contaminants down into an aquifer during pile driving
- **Pollution scenario 6:** Contamination of groundwater and nearby surface waters by concrete, cement paste or grout

3.2.1 Pollution Scenario 1

Creation of preferential pathways through a low permeability layer (aquitard), to allow potential contamination of an aquifer

Upon development the ground conditions beneath the site will comprise imported fill of approximately 2.5 – 2.75m thickness, underlain by made ground of up to 3.3m in thickness, further underlain by alluvial clays to an approximate depth of between 8.5m and 13m below finished ground level. Below this depth red brown gravelly clay prevails, grading into weathered red mudstone (St Maughan's Formation) between approximately 12.5m to 15.5m depth below finished level. Intermittent and laterally inconsistent bands/lenses of sand and gravel and/or peat feature within the alluvial clay, of varying depths and thicknesses.

This scenario considers the risk of migration of contaminated groundwater being transferred to the underlying St Maughan's Formation mudstone Secondary A Aquifer.

Investigative works found no perched groundwater within the made ground. Groundwater present site is confined to isolated bands of sand and gravel and the level of any contamination is considered very low. The groundwater is not in hydraulic continuity with the River Usk.

Precast piling is a displacement method, and due to significant stresses applied on soils during the process of driving these piles creation of preferential flow paths around the outside of the piles does not occur. In its publication 'Piling in Layered Ground: Risks to Groundwater and Archaeology' the Environment Agency state that square piles would 'be expected to seal when driven through a sufficient thickness of clay, that is, a thickness of two pile diameters. Although variable in thickness, and interrupted by bands of peat or granular deposits the alluvial clay is persistent across the site and it is considered that an adequate seal will be created between the piles and clay deposits.

Along the route of the trunk sewer bored piles are to be installed. This method involves boring a hole and its subsequent replacement by the pile. The pile is typically formed by casting concrete in situ. During drilling steel casing of the bored hole will be required to prevent collapse of the soft alluvial clays. This will be removed following pouring of the concrete pile.

The casing used during boring will act to minimise any downward flow of groundwater from the granular deposits. In addition, once the piles are concreted, as with the precast piles, it is considered that an adequate seal will be created between the piles and clay deposits.

3.2.2 Pollution Scenario 2

Creation of preferential pathways, through a low permeability surface layer to allow upward migration of landfill gas, soil gas or contaminant vapours to the surface

In-situ gas monitoring has identified a risk from ground gas on site in relation to the underlying peat and gas protection measures comprising a gas membrane, passive under-floor venting and taping and sealing of joints will be installed in all new housing.

The action of piling through the underlying peat deposits will potentially open up preferential gas pathways. However, it is considered that the alluvial deposits will seal around the piles closing these pathways.

As a precautionary measure further gas assessment is to be performed following completion of fill works to ensure the intended level of protection is adequate. This will entail monitoring of flux boxes placed across the site both immediately after fill completion and during/following piling. The frequency and sampling locations will be considered once the piling schedule has been determined.

Gas monitoring results will be assessed in accordance with CIRIA Report C665.

Should further monitoring identify concentrations of methane and/or carbon dioxide and flow rates beyond 'gas characteristic 2' criteria then more robust protection measures will be necessary.

In accordance with Table 8.6 of the CIRIA report, potential further protection measures could include:

- Proprietary gas resistant membrane
- Positively pressurised underfloor sub-space
- In-ground venting and venting wells

3.2.3 Pollution Scenario 3

Direct contact of site workers and others with contaminated soil arisings which have been brought to the surface

Installation of precast concrete piles is a displacement method will not bring site workers into contact with soil arisings.

Installation of bored piles will involve removal of materials from each pile location, bringing arisings to the surface.

The made ground and overlying imported fill are considered to be contaminated in terms of human health.

However, site construction workers are deemed to be at very low risk from the identified contaminants given that any exposure time would be comparatively, to how the trigger levels are derived, exceedingly short. Furthermore, these very low risks may be mitigated through good site management, COSHH, good standards of hygiene and appropriate health & safety on site, with personal protection equipment (PPE) and dust suppression where appropriate.

3.2.4 Pollution Scenario 4

Direct contact of the piles or engineered structures with contaminated soil or leachate causing degradation of pile materials

Soil and groundwater sulphate and pH results are summarised in **Table 3.1** below.

Table 3.1 Soil and Groundwater Sulphate and pH Results

Soil Sulphate Concentrations (mg/kg)	Soil pH	Aqueous sulphate concentrations (mg/l)	Groundwater sulphate concentrations	Groundwater pH
Site Investigation				
200 - 2500	8.2 – 11.8	160		
			4.4 – 120	6.9 – 7.4
2014 Groundwater Monitoring				
			2.9 - 70	7.0 – 7.4
2015/2016 Groundwater Monitoring				
			9.8 - 120	6.7 – 7.8

With reference to Table C2 of BRE Special Digest 1:2005, Design Sulphate Class DS-1, ACEC Class AC-1 should be applied.

Provided the concrete used for the piles is the correct class there is negligible risk of pile degradation and consequential increase in pile permeability, void formation, creation of contaminant migration pathways and obviously structural performance/safety.

3.2.5 Pollution Scenario 5

The driving of solid contaminants down into an aquifer during pile driving

Contamination was identified within the made ground. Limited contamination was also identified in the imported fill.

Along the route of the trunk sewer bored piles are to be installed. All arisings from boring are brought to the surface and removed. There is therefore no opportunity for contaminated soils to be driven downwards into the underlying aquifer.

With regards to the precast concrete piles publication 'Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination' states that 'Driven displacement piles may drag down contaminated material as they penetrate underlying strata. This drag down may occur by a frictional mechanism along the shaft of the pile, or by pushing material ahead of the pile shoe. However, geotechnical research on driven piles has shown that the magnitude of these effects is normally low.'

The publication also noted 'Boutwell et al (2000) suggest that the use of a pointed or convex shoe should reduce the volume of material being pushed down ahead of the pile by between 1 and 3 orders of magnitude.'

The use of a pointed or convex shoe is therefore considered necessary during installation of the precast concrete piles.

3.2.6 Pollution Scenario 6

Contamination of groundwater and nearby surface waters by concrete, cement paste or grout

The bored pile method involves the casting of concrete directly against soil and there is the potential for leaching of wet concrete, cement paste or grout into fast flowing groundwater.

Limited groundwater is present beneath the site, and it is confined to laterally inconsistent bands/lenses of granular deposits. Groundwater flow beneath the site is therefore minimal.

The risk of pollution via this scenario is considered to be negligible.

Contractors should provide a method statement detailed measures to mitigate the risk of concrete spillage.

Driven piles are pre-fabricated off-site and thus do not pose a risk of wet concrete.

ANNEX C
Earthworks Validation Letter

Earthworks Validation Report:
Proposed Residential Development
Herbert Road
Newport

Prepared for: Engie

July 2018

Report No. 12032/EVR

terrafirma

REPORT TITLE	**:**	**Earthworks Validation Report:** Herbert Road, Newport
REPORT STATUS	**:**	**Final**
JOB NUMBER	**:**	**12032/EVR**
DATE	**:**	**July 2018**
PREPARED BY	**:**	[redacted] **…..**
		(Mrs R. Howells)
REVIEWED BY	**:**	[redacted] **.**
		(Mr M. Lake)
APPROVED BY	**:**	[redacted] **.**
		(Dr G. C. Lake)

Executive Summary

In order to comply with current Government directives and the Flood Consequence Assessment (FCA) approved by NRW the site has been raised from its original level.

Fill works took place between June 2015 and August 2017.

All imported materials were chemically screened and were confirmed to be suitable for use in accordance with Terra Firma (Wales) Limited's Remediation Strategy, all in agreement with Newport City Council and National Resources Wales.

Any soft spots were removed and replaced during the works and in-situ geotechnical testing at numerous stages throughout the earthworks has confirmed the effectiveness of the compaction process.

TABLE OF CONTENTS

Section 1 Introduction

1.1 General
1.2 Limitations and Exceptions

Section 2 Chemical Validation of Imported Engineered Fill

Section 3 Verification of Fill Compaction

3.1 Overview
3.2 Riversee Limited Stockpile
3.3 Citivision, Fill from North of Reen, and Green Lane and Hawes Lane Fill
3.4 Neal Soils Piling Mat Material

Tables

Table 2.1 Summary of Imported Materials
Table 2.2 Summary of Correspondence
Table 3.1 Summary of In-situ Geotechnical Results
Table 3.2 Plate Test Results - Piling Mat

Annexes

Annex A Remediation Strategy Report
Annex B Upper Half of Riversee Limited Stockpile DETS test certificates 27313-1 & 27519-2
Annex C Lower Half of Riversee Limited Stockpile DETS test certificates 40034-2 & 40314
Annex D Citivision Soils DETS test certificates 47308-1 & 46635
Annex E Soils Sourced From North of Drainage Reen DETS test certificate 77110
Annex F Green Lane and Hawes Lane Soils - Risk Assessment Report
Annex G Neal Soils - Risk Assessment Correspondence
Annex H Soil and Leachate Test Results Chemical Summary Tables
Annex I Copies of Correspondence
Annex J Compaction Specification Reports
Annex K Geotechnical Test Results Certificates - 24.07.2015-19.08.2015
Annex L Geotechnical Test Results Certificates - 11.09.2015-26.05.2017
Annex M Geotechnical Test Results Certificates - July 2018

SECTION 1 Introduction

1.1 General

In order to comply with current Government directives and the Flood Consequence Assessment (FCA) approved by NRW the site has been raised from its original level to approximately 9.20m AOD.

Riversee Limited undertook the majority of the fill works to a level of 9.0m.

Pobl Group took possession of the site in 2017 and Engie, the Management Contractor, further raised the site during June - August 2017 with the importation of a 200mm piling mat.

The following sections provide a summary the Earthworks and both chemical and geotechnical validation of the imported fill.

1.2 Limitations and Exceptions

The Earthworks Validation Report has been prepared for Engie. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Terra Firma (Wales) Limited. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The report represents the findings and opinions of experienced geo-technical and geo-environmental consultants. Terra Firma (Wales) Limited does not provide legal advice and the advice of lawyers may also be required.

SECTION 2 Chemical Validation Imported Engineering Fill

Chemical validation of imported soils has been completed in accordance with Terra Firma (Wales) Limited Remediation Strategy Report dated August 2015. A copy of this report is provided in **Annex A.**

Sampling frequency, as agreed with Newport City Council. was the testing of one representative sample per 250m^3 (or part of), per source. However, for any new source 2 samples per 250m^3 applied for the first 1000m^3 of source imported.

Soil and leachate testing for a full suite of metals, inorganics, speciated PAH TPHCWG and asbestos was performed on all samples.

A summary of the materials imported during the entire earthworks is provided in **Table 2.1** below.

Table 2.1 Summary of Imported Materials

Soil Source	Volume Imported (m^3)	Date Imported on to Site	Number of Representative Samples Tested	Soil Validation Test Results and Sampling Details
Upper Half of Riversee Limited Stockpile (Adjacent Herbert Road Site)	14,000	June and July 2015	92	DETS test certificates 27313-1 & 27519-2 **Annex B**
Lower Half of Riversee Limited Stockpile (Adjacent Herbert Road Site)	9000	July 2015		DETS test certificates 40034-2 & 40314 **Annex C**
Taylor Wimpey Citivision Site	1000	August 2015	4	DETS test certificate 47308-1 **Annex D**
Taylor Wimpey Citivision Site	500	October 2015	2	DETS test certificate 46635 **Annex D**
Soils taken from area of site north of the drainage reen	500	October 2015	6	DETS test certificate 77110 **Annex E**
Soils sourced from Green Lane and Hawes Lane, Wentloog	12,000	November & December 2016	34	Proposed Fill for Importation Risk Assessment Report **Annex F**
	3000	April/May 2017		Proposed Fill for Importation Risk Assessment Report **Annex F**
Material Sourced from Neal Soils (Piling Mat)	5000	June - August 2017	30	Correspondence dated 19th May 2017 and 24th August 2017 **Annex G**

The Riversee Limited stockpile was sampled and tested in two halves. Each half was tested prior to import.

Other soil sources were sampled and tested once imported, except the Green Lane and Hawes Lane soils which were sampled at source and prior to import whilst stockpiled on land adjacent to site.

Chemical Validation Imported Engineering Fill (Continued)

The soil and leachate test results (except Green Lane and Hawes Lane soils) are summarised in table format, please refer to **Annex H**. On occasion some soil samples exhibiting exceedences of chemicals above their respective soil or water threshold level were identified. Newport City Council Environmental Protection officer and the NRW were contacted and acceptance of the soils confirmed in these instances.

Green Lane and Hawes Lane soil results were subject to a site-specific risk assessment as requested by NRW, see **Annex F**. This assessment was approved by NRW and Newport City Council prior to import.

Similarly, the piling mat materials from Neal Soils were approved for import by NRW and Newport City Council following site specific assessment, see **Annex G**.

Table 3.2 below and **Annex I** detail correspondence between Terra Firma, the NRW and Newport Council during fill works.

Table 2.2 Summary of Correspondence

From	To	Format	Date	Subject	Annex J Ref
TFW	Riversee Limited	letter	22.06.2015	Chemical summary of soils from upper part of Riversee stockpile. Concludes soils should be acceptable provided appropriate bespoke permit granted from the NRW to allow asbestos	1
TFW	Newport Council Planning	Email	22.06.2015	Sent copy of letter on upper part of stockpile (as above) for approval	2
TFW	Riversee Ltd Copied to NRW and Newport Council Pollution Control	letter	06.08.2015	Summary of chemistry of lower part of Riversee stockpile and updated Remediation Strategy. Riversee Limited stockpile material permitted for use on site. Remediation Strategy updated to include remedial measures required to protect against asbestos in fill material as requested by Newport Council Contaminated Land	3a&b
NRW	Newport Council Planning	Letter	14.08.2015	Response to letter regarding leachate chemistry of lower part of Riversee stockpile	4
NRW	TFW	let20	19.08.2015	Response to NRW letter dated 14.08.2015. Stockpile chemical summary - suggestion place Riversee stockpiled soils at least 50m from reen	5
TFW	Newport Council Pollution Control	Email	13.10.2015	Query of high lead exceedence in Citivision (Aberbargoed – wrongly named) soils	6
Newport Council Pollution Control	TFW	Email	15.10.2015	Response to TF email 13.10.2015	7
TFW	NRW	Email	27.10.2015	Regarding Citivision soil and leachate results	8
NRW	TFW	Email	12.11.2015	Reply to TFW email 27.10.2015	9
TFW	Newport Council Pollution Control	Email	17.11.2015	Regarding asbestos and lead in Citivision soils	10
TFW	NRW	let 21	18.11.2015	Citivision source leachate results - TFW justification for acceptance	11
Newport Council Planning	TFW	Email	25.11.2015	Council/NRW inform that they are not recommending discharge of condition. Request info by 02.12.2015	12
TFW	NRW	Email	26.11.2015	Regarding above Newport Council correspondence 25.11.2015 and reference to Let20	13

Chemical Validation Imported Engineering Fill (Continued)

Table 2.2 Summary of Correspondence (Continued)

From	To	Format	Date	Subject	Annex J Ref
NRW	NRW	Email	26.11.2015	Confirmed received TFW let20 and agreed informally that proposal to place Lower Riversee Stockpile material 50m from reen was acceptable	14
NRW	TFW and Newport Council Planning	Email with letter (SE-2015-119016-03-L02)	02.12.2015	NRW formal response to TFW let20 Partial discharge of condition 5 & 6 (remediation strategy) following receipt of TFW let20	15
NRW	TFW	Email	02.12.2015	Questioning how will know which part of the stockpile deposited where on site and placement of geotextile membrane	16
TFW	Newport Council Planning	Let 22	10.12.2016	Response to email 02.12.2015 (Annex Ref 14). Confirmation of fill placement and outline of intended remediation and validation procedures	17
Newport Council Pollution Control	TFW	Email	22.01.2016	Response to TFW email 18.11.2015 regarding Citivision soils Newport Council confirm Citivision soils are acceptable	18
Newport Council Pollution Control	TFW	Email	24.10.2016	Confirmation Risk Assessment Report on Green Lane and Hawes Lane soils is acceptable provided risk from ground gas considered Reference to proposed flux box testing subsequently added	19
TFW	NRW	Email	04.11.2016	Provision of Risk Assessment Report on Green Lane and Hawes Lane soils	20
NRW	TFW	Email	11.11.2016	Confirmation from NRW that Risk Assessment Report on Green Lane and Hawes Lane soils is acceptable and that soils are permitted to be imported	20
TFW	NRW and Newport Council Pollution Control	Email	24.08.2017	Provision of risk assessment report for Neal Soils piling mat material	-

SECTION 3 Verification of Fill Compaction

3.1 Overview

The compaction of the imported fill has been verified by a series of in-situ plate tests and sand replacement density tests. Tests were typically done at approximately 600mm intervals or on the top of each fill phase. The testing schedule is summarised in **Table 3.1** below.

Table 3.1 Summary of In-situ Geotechnical Tests

Fill Location and Details	Source	Date Imported	Date Tested	Test Type
Fill placed in south and northwest of site Max 600mm fill thickness	Top of Riversee Limited Stockpile	June 2015	24.07.2015	7No. Plate tests 7No. SRDs
400mm (2 layers) across north of site 200mm fill across southeast quadrant of site	Top of Riversee Limited Stockpile including previously imported bund	30.07.2015 – 04.08.2015	05.08.2015	5No. Plate tests 4No. SRDs
Small mound placed along eastern half of southern site edge	Bottom of Riversee Limited Stockpile	05.08.2015	18.08.2015 19.08.2015	8No. Plate tests
Fill stockpiled then spread in southwest quadrant of site (400mm thick) Small mound in south spread over southeast quadrant (200mm thick)	Bottom of Riversee Limited Stockpile	07.08.2015		
Fill now 600mm in north and 400mm in south Eastern half of site tested following period of stripping / drying / replacing material previously tested and spread of mound in southeast quadrant 05.08.2015		10.08.2015 - 11.08.2015		
Fill spread over eastern half of site	Bottom of Riversee Limited Stockpile	19.08.2015		
Fill stockpiled in northwest corner of site	First batch of Citivision soils	08.09.2015 – 10.09.2015	11.09.2015	7No. Plate tests
Fill placed across the site, Northern area, the haul road and southern area.	- Fill from North/CV - Fill from S.pile - Fill from S.pile			
SRD 1 – Centre North SRD 2 – Southwest SRD 3 – South	- Fill from North - Fill from S.pile - Fill from S.pile		14.09.2015	3No. SRDs
Placed in north of the site	Material taken from north of the reen	16.09.2015 – 18.09.2015	-	
Placed in central south of site	Bottom of Riversee Limited Stockpile	28.09.2015 & 02.10.2015	-	
Placed in south of the site	Second batch of Citi-vision soils and soils from north of reen	05.10.2015	-	
Across entire site	Hawes Lane and Green Lane Soils	15.11.2016 – May 2017	03.05.2017 09.05.2017 10.05.2017	24No. Plate tests
		May 2017	26.05.2017	8No. Plate tests
Across entire site	Piling Mat – Neal Soils sourced material	June 2017	18.07.2018	16No. Plate tests

3.2 Riversee Limited Stockpile

The Riversee Limited stockpile was geo-technically tested prior to import to enable an Earthworks Compaction Specification Report to be provided. The Compaction Specification Reports for the top half of this stockpile (Report No. 12032/CS1, dated July 2015) and bottom half (Report No. 12032/CS2, dated July 2015) are provided in **Annex J**.

A small portion of the top of the Riversee Limited stockpile was imported on to site prior to official commencement of the earthworks. This was placed across the southern end of the site. This fill was subject to plate testing and sand replacement density (SRD) tests on the 24th July 2015. A number of tests were also performed on the in-situ ground across the northern part of the site at this time.

As the fill levels were raised further plate load and SRD tests were completed to verify the adequacy of the compaction. These tests were conducted in accordance with BS 1377: Part 9: 1990 by Southern Ground Testing under the part time supervision of Terra Firma (Wales) Limited.

The maximum dry density of the materials prior to fill works was confirmed to range between 1.84mg/m^3 and 1.95mg/m^3. The results of the in-situ tests show dry densities of the placed fill varying between 1.79mg/m^3 and 1.98mg/m^3. These results prove the soils were generally compacted within the required 95% of their maximum dry density, and therefore confirm the effectiveness of the compaction process.

To verify adequate compaction plate loading tests were also performed in accordance with BS 1377: Part 9: 1990. Plate results recorded between 2.1mm and 10.96mm settlement at 50kN/m^2 applied pressure and between 4.4mm and 22.80mm at 100kN/m^2 applied pressure.

Where results were deemed unsatisfactory the fill was stripped or broken up to allow further drying before re-rolling and testing.

Test result certificates are provided in **Annex K.**

3.3 Citivision, Fill from North of Reen, and Green Lane and Hawes Lane Fill

These tests were conducted in accordance with BS 1377: Part 9: 1990 by Southern Ground Testing under the part time supervision of Terra Firma (Wales) Limited.

Plate tests performed on the 11.09.2015 recorded between 0.95mm and 6.44mm settlement at 50kN/m^2 applied pressure and between 1.56mm and 15.08mm at 100kN/m^2 applied pressure.

Plate tests performed between the 03.05.2017 and 26.05.2017 recorded between 0.4mm and 7.87mm settlement at 50kN/m^2 applied pressure and between 1.08mm and 18.99mm at 100kN/m^2 applied pressure.

Where results were deemed unsatisfactory the fill was stripped or broken up to allow further drying before re-rolling and testing.

Test result certificates are provided in **Annex L.**

3.4 Neal Soils Piling Mat Material

This fill was imported during the second half of 2017. Due to scheduled activity on site following placement the plate tests were scheduled for July 2018 once all activity had ceased.

These tests were conducted in accordance with BS 1377: Part 9: 1990 by Terra Firma (Wales) Limited.

Table 3.2 Plate Test Results – Piling Mat

Test Number	Applied Pressure (kN/m^2)	Deformation (mm)
1	71.9 120.3	0.79 1.21
2	69.1 126.3	0.45 0.92
3	61.6 118.3	0.69 1.14
4	59.4 115.9	0.55 1.06
5	64.5 122.4	0.67 1.23
6	65.6 117.6	0.56 0.92
7	63.1 120.1	0.32 0.57
8	66.7 119.1	1.29 1.86
9	62.0 125.6	0.47 1.03
10	62.5 116.7	0.88 1.32
11	66.4 119.7	0.57 0.87
12	63.5 133.3	1.41 1.98
13	53.3 117.3	0.55 1.54
14	61.2 118.1	0.69 1.47
15	65.2 113.9	0.43 0.79
16	70.0 127.3	0.36 0.41

Test result certificates are provided in **Annex M.**

Test results proved satisfactory and confirm adequate compaction.

ANNEX A
Remediation Strategy Report

REMEDIATION STRATEGY

PROPOSED RESIDENTIAL DEVELOPMENT
HERBERT ROAD
NEWPORT

Prepared for:
Riversee Limited

August 2015

Job No: 12032/RS

REPORT TITLE	**:**	**Remediation Strategy : Proposed Residential Development, Herbert Road, Newport**
REPORT STATUS	**:**	**Final**
JOB NUMBER	**:**	**12032/RS**
DATE	**:**	**August 2015**
PREPARED BY	**:**	[redacted] **…..** **(Mrs R. Howells)**
REVIEWED BY	**:**	[redacted] **…..** **(Miss L. Dow)**
APPROVED BY	**:**	[redacted] **(Dr G. C. Lake)**

Executive Summary

An area of land off Herbert Road, Newport, is to be residentially developed.

In order to comply with current Government directives and the FCA approved by NRW a large section of the development site needs to be raised to a finished floor slab level of 9.95m AOD, which is between 2.5-2.75m above existing levels. This operation will be undertaken in two stages, firstly filling the site to 8.95m AOD utilising material stored upon an adjacent site and then filling the site to 9.95m FFL during the main residential development works.

Riversee Limited is proposing to raise the site to 8.95m AOD before passing on the site to the developer, who will then raise the site further to a finished level of 9.95m AOD.

Investigation of the site was undertaken by Terra Firma (Wales) Limited. The details of the investigation were reported in March 2013 (Geo-environmental and Geo-technical Report No. 12032). In March 2014 additional testing of groundwater was performed.

Terra Firma (Wales) Limited has subsequently been commissioned to prepare a Remediation Strategy for the site. The proposed remediation measures for the site are:

1. ***Cover of site with between up to 2.75m of imported fill (intended to raise site above flood plain).***

2. ***Cover is to include subsoil and topsoil material in garden and landscaped areas. A minimum of 600mm of clean imported fill (topsoil/subsoil) is required in garden and landscaped areas.***

3. ***Monitoring and management of any soils if disturbed and excavated at the location of TP7 to protect against asbestos fibres.***

4. ***Current minimum requirements is the installation of a 2000 gauge membrane suitable for protection against ground gas, radon gas and PCB vapours in all new buildings. Passive under-floor venting and taping and sealing of all joints will also be required. Dependant on further on-site flux box gas monitoring more robust gas protection measures may be required.***

5. ***New water supply pipes to be chosen in accordance with UKWIR Report Ref No 10/WM/03/21 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites'.***

6. ***Additional assessment of groundwater quality during and immediately following placement of fill by Riversee Limited***

All works carried out on site should be documented and recorded, and reported to Newport City Council Environmental Protection and National Resources Wales in the form of a Validation Report.

Any unexpected ground conditions or contamination identified during site development should be inspected and appropriately investigated by a geo-environmental engineer. This may include suspension of site works until the details and severity of any contamination has been established and the potential risks to human health assessed.

TABLE OF CONTENTS

Section 1 Introduction and Proposed Development

1.1 Limitations and Exceptions

Section 2 Summary of Terra Firma (Wales) Limited Geotechnical and Geo-environmental Report

2.1 Site Works
2.2 Ground Conditions
2.3 Foundation Solution
2.4 Contamination Screening
2.5 Gas Monitoring
2.6 Human Health and Environmental Risk Assessment
2.6.1 Human Health
2.6.2 Aquatic Environment

Section 3 Proposed Site Remediation

3.1 Remediation Summary
3.2 Importation of Fill For Engineering Purposes
3.2.1 Fill Materials – Riversee Limited
3.2.2 Fill Materials – Proposed Developer
3.3 Importation of Soils For Garden and Landscaped Areas
3.4 Gas and Vapour Protection
3.5 Asbestos Management and Monitoring – In-situ Soils
3.6 Potable Water Supply
3.7 River Usk and Groundwater

Section 4 Validation Report

Tables

Table 2.1 Summary of Ground Conditions
Table 2.2 Summary of Contaminants of Concern in Soil
Table 2.3 Summary of Contaminants of Concern in Groundwater
Table 2.4 In-situ Gas Monitoring Results
Table 3.1 Soil Determinants and Guideline Values - Imported Engineered Fill Material
Table 3.2 Leachate Assessment Criteria
Table 3.3 Soil Determinants and Guideline Values- Imported Soils

Figures

Figure 3.1 Proposed Water Monitoring Well Locations

Annexes

Annex A Drawing Detailing Area to be Filled to 8.95m AOD by Riversee Limited

SECTION 1 Introduction and Proposed Development

An area of land off Herbert Road, Newport is to be residentially developed.

In order to comply with current Government directives and the FCA approved by NRW a large section of the development site needs to be raised to a finished floor slab level of 9.95m AOD, which is between 2.5-2.75m above existing levels. This operation will be undertaken in two stages, firstly filling the site to 8.95m AOD utilising material stored upon an adjacent site and then filling the site to 9.95m FFL during the main residential development works.

Riversee Limited is proposing to raise the site to 8.95m AOD before passing on the site to the developer. This area of fill is detailed in the drawing provided in **Annex A**.

In order to raise levels materials are to be imported and placed as engineered fill.

Terra Firma (Wales) Limited has been commissioned to prepare a Remediation Strategy for the site.

The objective of the Remediation Strategy is to address any human health risks and any risks to the aquatic environment previously identified on site, and to set out measures required to ensure that the planned earthworks and import of soils does not create a risk to human health or impact upon the surrounding environment.

1.1 Limitations and Exceptions

Riversee Limited has requested that a Remediation Strategy be prepared.

This report has been prepared for the sole internal reliance of Riversee Limited. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Terra Firma (Wales) Limited. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The report represents the findings and opinions of experienced geo-environmental and geo-technical consultants. Terra Firma (Wales) Limited does not provide legal advice and the advice of lawyers may also be required.

It is not within the scope of Terra Firma (Wales) Limited to:

- Provide Method Statements and Risk Assessments for site preparation and handling and control of soils containing asbestos.
- Design, install and validate the pipes for potable water supply beneath the site.

SECTION 2 Summary of Terra Firma (Wales) Limited Geotechnical and Geo-environmental Report

2.1 Site Works

Investigation of the site was previously undertaken by Terra Firma (Wales) Limited. This included the proposed development area to which this Remediation Strategy refers (south of the drainage reen), and the area north of the drainage reen.

The details of the investigation were reported on in March 2013 (Geo-environmental and Geo-technical Report No. 12032).

The site investigation was carried out between the 31st of October and the 8th of November 2012 comprising 19 trial pits and six cable percussive boreholes and three mini percussive boreholes.

In March 2014 additional testing of groundwater was performed.

2.2 Ground Conditions

The ground conditions encountered beneath the site can in general be summarised as shown in **Table 2.1.**

Table 2.1 Summary of Ground Conditions

Depth (m)	Thickness (m)	Stratum
GL - 0.20/3.30	0.20/3.30	**MADE GROUND**
0.30 - 3.90/10.30	2.20/8.40	Soft grey and brown mottled **CLAY**
3.90/7.1 - 4.10/8.60	0.60/2.30	**PEAT**
4.10/8.60 - 5.90/9.70	0.00/1.80	**SAND & GRAVEL (intermittent)**
5.90/10.30 - 10.00/12.70	0.50/4.10	Firm becoming very stiff red brown gravelly **CLAY**
10.00/12.70 - >12.90	-	**MUDSTONE**

The basal Sand & Gravel layer was not encountered in BH1, BH2, BH4 and BH5.

Very loose red brown silty SAND and very soft red sandy SILT was encountered between 6.20m and 7.00m and 7.00m and 8.80m respectively.

Soft grey sandy SILT was encountered between 6.20m and 9.10m.

2.3 Foundation Solution

Construction of shallow traditional foundations upon soft clay bands beneath the site would lead to high total and differential settlements.

Precast concrete driven piles founded within the underlying very weak red brown and grey mudstone with a suspended floor slab were therefore recommended.

2.4 Contamination Screening

During the intrusive investigation, small disturbed soil samples were collected for contamination screening. Groundwater wells were installed and groundwater samples were also retrieved for testing. Samples from the drainage reen were taken and analysed in June 2013.

Testing of soil and water samples for a standard suite of metals, inorganics and organics was undertaken as well as for asbestos, polycyclic aromatic hydrocarbons (PAH), petroleum hydrocarbons and polychlorinated biphenyls (PCBs)

A number of substances tested for were found to be above their respective threshold levels in soil on the proposed development site. These exceedences are summarised in **Table 2.2** below.

Table 2.2 Summary of Contaminants of Concern in Soil

Hole and depth (m bgl)	Chemical	Guideline (mg/kg)	Exceedance (mg/kg)
TP2 0.90m	Cyanide	8	10
TP8 0.50m	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Chrysene Dibenzo(a,h)anthracene Indeno(1,2,3-c,d)pyrene	3.1 0.83 5.6 6 0.76 3.2	13 11 9 13 1.6 7.5
TP4 0.70m	Benzo(a)pyrene	0.83	0.90
TP7 0.20m	Benzo(a)pyrene Chrysotile – Loose Bundles	0.83 -	1.90 -
TP9 1.00m	Benzo(a)pyrene	0.83	1.30
TP10 0.80m	Benzo(a)pyrene	0.83	1.50
TP13 0.60m	PCB 2,4,4'-Trichlorobiphenyl 2,2',5,5'-Tetrachlorobiphenyl	0.01 0.01 0.01	0.16 0.12 0.05

As seen in **Table 2.2** above, the occurrence of asbestos identified by Terra Firma was limited to one location, TP7, where chrysotile bundles at 0.2m depth were noted.

2.4 Contamination Screening (Continued)

Substances found to be elevated in groundwater and reen water are summarised in **Table 2.3** below.

Table 2.3 Summary of Contaminants of Concern in Groundwater

Borehole	Chemical	Threshold (mg/l)	Exceedance (mg/l)
BH1 (08.01.2013)	Aliphatic C16-C21 Aliphatic C21-C35	0.01 0.01	0.11 0.14
BH2 (08.01.2013)	Aliphatic C16-C21 Aliphatic C21-C35	0.01 0.01	0.037 0.19
BH6 (08.01.2013)	Aliphatic C16-C21 Aliphatic C21-C35	0.001 0.001	0.03 0.011
Reen (Upstream)	Aliphatic C16 - C21 Aliphatic C21 - C35 Aromatic C10 - C12 Aromatic C21 - C35 Fluoranthene	0.01 0.0001	0.021 0.17 0.018 0.062 0.00013
BH5 (06.03.2014)	Zinc	0.125	0.16

2.5 Gas Monitoring

The site is underlain by made ground of up to 3.3m thickness and the area north of the development site (north of the drainage reen) was previously used as a landfill. Peat deposits are present within the underlying alluvium. Nine gas monitoring wells were installed and a programme of gas monitoring for the presence of methane, carbon dioxide and oxygen was completed

In-situ gas monitoring results were also obtained from a previous investigation completed by White Young Green (WYG). The Terra Firma and WYG results for the site are summarised in **Table 2.4** below.

Table 2.4 In-situ Gas Monitoring Results

Monitoring Point	Max CH4 (%)	Max CO2 (%)	Max Flow Rate
White Young Green			
BH409	0.0	1.9	0.3
BH507	12.8	2.3	2.6
BH508	80.6	20.5	3.8
BH516	0.0	0.5	0.5
BH519	43.8	7.6	0.3
BH529	0.0	3.1	0.0
BH530	0.1	5.8	0.2
Terra Firma			
BH1	0.3	12.9	0.0
BH2	6.0	22.0	0.1
BH3	57.9	6.4	0.0
BH4	0.3	0.2	0.1
BH5	0.3	3.7	0.1
BH6	0.3	7.1	0.0
WS1	0.4	12.6	0.4
WS2	1.1	8.9	0.0
WS3	0.5	5.0	0.0

It is also noted that WYG recorded a maximum flow rate of 7.4l/hour on land immediately north of the site.

The in-situ gas monitoring has proven that methane and carbon dioxide gas are being released from the peat beneath the site. There is a risk of these gases entering and accumulating in all new buildings constructed on site.

CIRIA Report C665 can be used to assess the results.

Using the maximum recorded methane concentration of 80.6% and the maximum recorded flow rate of 7.4/hr, a gas screening value (GSV) of 5.96/hr is calculated, as follows:

(80.6/100) x 7.4 = 5.96/hr

When this result is compared with Table 8.5 of CIRIA report C665, the site is classified as ‘gas characteristic situation 3-4’.

2.6 Human Health and Environmental Risk Assessment

2.6.1 Human Health

It was concluded that future site users are potentially at risk from contamination in site soils through the following pathways:

- *Dermal contact with soil and soil dust*
- *Ingestion of soil and soil dust*
- *Inhalation of soil dust*
- *Consumption of site grown vegetables/fruit*
- *Ingestion of groundwater*
- *Inhalation of asbestos fibres*

The site is currently deemed to be at risk from flooding from the adjacent River Usk. As part of a flood prevention scheme the site is to be prior to development. This will be achieved by the importation of suitable fill materials.

The fill layer will effectively form a barrier between the made ground on site and site end users, acting to sever the contamination to receptor pathway. The engineered fill is discussed in **Section 3.2.**

No existing soils on site are intended to be disturbed. If any such excavations are to be undertaken at the location of TP7 then appropriate measures should be made for monitoring for airborne asbestos fibres and management of any materials to be removed from site. This is to ensure no adverse human health risks are created.

All garden and landscaped areas will be finished with clean imported subsoil and subsoil. This stage of the development will be fulfilled by the developer. Please refer to **Section 3.3**.

- *Inhalation of radon gas*
- *Inhalation of ground gas/landfill gas*
- *Inhalation of vapours*

Basic radon protection measures should be incorporated into all new buildings on site.

The radon/gas barrier should also be effective as a barrier to PCB vapours.

Gas protection measures are to be installed in the new development. As a minimum the following protection measures will be implemented:

- A 2000 gauge DPM/reinforced gas membrane
- Passive under-floor venting
- All joints taped and sealed

This stage of the development will be fulfilled by the developer

Gas protection measures are discussed in greater detail in **Section 3.4**.

2.6.1 Human Health (Continued)

- *Permeation of drinking water pipes*

Prior to the placement of water supply pipes an assessment should be made, by the water provider, of soil along the route of the pipe with reference made to the material selection criteria quoted in UKWIR Report Ref No 10/WM/03/21 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites'.

This stage of the development will be fulfilled by the developer.

2.6.2 Aquatic Environment

The River Usk flows along the western edge of the site and is considered as the most vulnerable environmental receptor.

The petroleum hydrocarbons identified during the first groundwater monitoring round were attributed to contamination that occurred from the drilling process. Following purging of the boreholes on the second round of water sampling all hydrocarbons were below guideline values.

The hydrocarbons noted at the reen were identified up-stream but not down-stream and it was concluded that all of the determinants exiting the site and entering the River Usk from the reen were below threshold values.

Two rounds of groundwater testing in March 2014 identified only a single exceedence of zinc, in one location.

Monitoring of groundwater level in boreholes in January 2014 confirmed that there was no tidal influence on groundwater in underlying gravel and no hydraulic continuity between groundwater and the River Usk.

The River Usk and hydrological environment are not therefore considered to be at risk.

Please refer to **Section 3.7**.

SECTION 3 Proposed Site Remediation

3.1 Remediation Summary

Based on the site investigative works the following is proposed to protect construction workers and future site end users:

1. Cover of site with up to 2.75m of imported fill (intended to raise site above flood plain).

   Riversee Limited is to raise the site to a level of 8.95m AOD before passing the site on to the developer. This will be an increase in level by up to 1.6m.

   The developer will further raise the site to a level of 9.95m AOD.

2. Capping with 600mm of clean soil (subsoil and topsoil) in garden and landscaped areas.

3. Current minimum requirements is the installation of a 2000 gauge membrane suitable for protection against ground gas, radon gas and PCB vapours in all new buildings. Passive under-floor venting and taping and sealing of all joints will also be required. Dependant on further on-site flux box gas monitoring (see Section 3.4) more robust gas protection measures may be required.

4. Sampling and analysis of groundwater prior to and following initial fill works.

5. New water supply pipes to be chosen in accordance with UKWIR Report Ref No 10/WM/03/21 ‘Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites’.

Any unexpected ground conditions or contamination identified during site development should be inspected and appropriately investigated by a geo-environmental engineer. This may include suspension of site works until the details and severity of any contamination has been established and the potential risks to human health assessed.

3.2 Importation of Fill for Engineering Purposes

Fill importation will need to take into account the location of the site adjacent to the River Usk and within a SSSI. It is essential that any material brought on to site will not have an impact on the underlying ground and the river, and that it will not present an unacceptable risk to the human health of future site end users.

Appropriate permits will therefore need to be in place.

In order to assess the suitability of intended fill soils they will need to undergo appropriate screening, prior to being brought on to site.

Testing needs to be carried out in accordance with ‘Requirements for the Chemical Testing of Imported Materials for Various End Uses and Validation of Cover Systems’.

All fill should as a minimum be screened for the substances listed in **Table 3.1** on the following page.

3.2 Importation of Fill for Engineering Purposes (Continued)

The Human Health Guidelines are based on CLEA Guidelines published by the Environment Agency, or in their absence Generic Assessment Criteria (GAC) for a residential setting, published by the Chartered Institute of Environmental Health (CIEH), or in the case of lead, the Category 4 Screening Level (C4SL).

Fill material will be capped with approximately 1.15m of further fill by the developer. Therefore residential guidelines, not taking into account plant uptake, have been used.

Table 3.1
Soil Determinants and Guideline Values
Imported Engineered Fill Material

Determinant	Comparable Guideline Value (mg/kg)			Source
Arsenic	32			CLEA
Beryllium	1.7			CIEH
Boron	11000			CIEH
Cadmium	10			CLEA
Chromium III	910			CIEH
Chromium VI	6.0			CIEH
Copper	7100			CIEH
Lead	310			C4SL
Mercury	170			CLEA
Manganese	-			-
Molybdenum	-			-
Nickel	130			CLEA
Selenium	350			CLEA
Zinc	40000			CIEH
Cyanide	8			CLEA
Antimony	-			-
Phenol	420			CLEA
pH (acidity)	-			-
Asbestos	-			-
	≤ 1% SOM	**≤ 2.5% SOM**	**≤ 6% SOM**	
Naphthalene	2.3	5.6	13	CIEH
Acenaphthylene	2900	4600	6000	CIEH
Acenaphthene	3000	4700	6000	CIEH
Fluorene	2800	3800	4500	CIEH
Phenanthrene	1300	1500	1500	CIEH
Anthracene	31000	35000	37000	CIEH
Fluoranthene	1500	1600	1600	CIEH
Pyrene	3700	3800	3800	CIEH
Benzo(a)anthracene	11	14	15	CIEH
Chrysene	30	31	32	CIEH
Benzo(b)fluoranthene	3.9	4.0	4.0	CIEH
Benzo(k)fluoranthene	110	110	110	CIEH
Benzo(a)pyrene	3.2	3.2	3.2	CIEH
Dibenzo(ah)anthracene	46	45	46	CIEH
Benzo(ghi)perylene	0.31	0.32	0.32	CIEH
Indeno(123cd)pyrene	360	360	360	CIEH

3.2 Importation of Fill for Engineering Purposes (Continued)

Table 3.1 (Continued)
Soil Determinants and Guideline Values
Imported Engineered Fill Material

Determinant	Comparable Guideline Value (mg/kg)			Source
Petroleum Hydrocarbons				
	≤ 1% SOM	**≤ 2.5% SOM**	**≤ 6% SOM**	
Aliphatic EC >5-6	42	78	160	CIEH
Aliphatic EC >6-8	100	230	530	CIEH
Aliphatic EC >8-10	27	65	150	CIEH
Aliphatic EC >10-12	130	330	760	CIEH
Aliphatic EC >12-16	1100	2400	4400	CIEH
Aliphatic EC >16-35	65000	92000	110000	CIEH
Aliphatic EC >35-44	65000	92000	110000	CIEH
Aromatic EC >5-7 (benzene)	- 370	- 690	0.33 1400	CLEA CIEH
Aromatic EC >7-8 (toluene)	- 860	- 1800	610 3900	CLEA CIEH
Aromatic EC >8-10	47	110	270	CIEH
Aromatic EC >10-12	250	590	1200	CIEH
Aromatic EC >12-16	1800	2300	2500	CIEH
Aromatic EC >16-21	1900	1900	1900	CIEH
Aromatic EC >21-35	1900	1900	1900	CIEH
Aromatic EC >35-44	1900	1900	1900	CIEH

Table Notes
- CLEA - Soil Guideline Values for residential development
- CIEH - Generic Assessment Criteria for a residential setting
- ATRISK – Generic assessment criteria (without plant uptake) developed by Atkins
- SOM - Soil Organic Matter

The tables list a general test suite of general determinants for soils although additional determinants may be recommended for situations where the donor site(s) is known to have a former industrial land use.

3.2 Importation of Fill for Engineering Purposes (Continued)

In respect to groundwater risk it is proposed that all materials will undergo 2:1 soil leachate analysis **in accordance with BS:EN:12457** for the substances listed in **Table 3.2**. Results should be compared to the Environment Agency Guidelines.

Table 3.2
Leachate Assessment Criteria

Determinant	Comparable Threshold (mg/l)	Source
Arsenic	0.025	WFD
Cadmium	0.0002	WFD
Chromium *	0.0006	WFD
Copper	0.005	WFD
Lead	0.0072	WFD
Mercury	0.0005	WFD
Nickel	0.02	WFD
Selenium	0.01	WHO
Zinc	0.04	WFD
Cyanide	0.001	WFD
Phenol	0.0077	WFD
Chloride	N/A	-
Fluoride	0.5	DSD
Speciated PAH		
Napthalene	0.0012	WFD
Acenaphthylene	-	-
Acenaphthene	-	-
Fluorene	-	-
Phenanthrene	-	-
Anthracene	0.0001	WFD
Fluoranthene	0.0001	WFD
Pyrene	-	-
Benzo(a)anthracene	-	-
Chrysene	-	-
Benzo(b)fluoranthene	0.00003	WFD
Benzo(k)fluoranthene	0.00003	WFD
Benzo(a)pyrene	0.00005	WFD
Dibenzo(ah)anthracene	-	-
Benzo(ghi)perylene	0.000002	WFD
Indeno(123cd)pyrene	0.00002	WFD

3.2 Importation of Fill for Engineering Purposes (Continued)

Table 3.2 (Continued)
Leachate Assessment Criteria

Determinant	Comparable Threshold (mg/l)	Source
Petroleum Hydrocarbons		
Aliphatic EC >5-6	-	-
Aliphatic EC >6-8	-	-
Aliphatic EC >8-10	-	-
Aliphatic EC >10-12	-	-
Aliphatic EC >12-16	-	-
Aliphatic EC >16-35	-	-
Aliphatic EC >35-44	-	-
Aromatic EC >5-7 (benzene)	0.008	WFD
Aromatic EC >7-8 (toluene)	0.04	WFD
Aromatic EC >8-10 (xylene)	0.03	WFD
Aromatic EC >10-12	-	-
Aromatic EC >12-16	-	-
Aromatic EC >16-21	-	-
Aromatic EC >21-35	-	-
Aromatic EC >35-44	-	-

Table Notes

- WFD – Water Framework Directive threshold for coastal and transitional waters/other waters (annual average)
- World Health Organisation threshold for drinking water (in absence of WFD threshold)
- DSD – Dangerous Substances Directive saltwater annual average (in absence of WFD threshold)
- *Threshold for Chromium VI
- - No guideline available

The number of representative samples of the fill that will require analysis will depend on the volume of soil and number of soil sources.

A significant volume of soil will be required to attain the desired levels.

It is proposed that for each 250m^3 (or part of) that 1 representative sample be taken for screening, per source. This has been agreed with Newport City Council.

As suggested by Newport City Council Environmental Protection, the sampling frequency may be reduced if fill is sourced from a quarry or quarried supply if accompanied with recent and representative analysis which includes heavy metals.

3.2.1 Fill Materials - Riversee Limited

Riversee Limited will be increasing the level of the site to 8.95m AOD before passing the site on to the developer. This will be an increase in level by up to 1.6m.

Riversee Limited currently retain a stockpile of soil on land adjacent to the site, which measures 23,000m^3 in volume. This stockpile is intended for use, in conjunction with imported quarry stone. The stockpile is derived from a number of indistinguishable sources, comprising 'recovered' soils from previous construction sites in the local area. It has therefore been treated as a singular source.

The stockpile has been sampled and tested. This comprised 92 samples in total.

All substances (as per **Table 3.1**) were confirmed to be present at levels below their respective threshold levels with the exception of one minor occurance of lead, and asbestos.

Asbestos was identified in a 38 of the 92 samples.

With the exception of four samples, the fibre content was found to be below the laboratory detection limit of 0.001%. This would classify the soils as non-hazardous waste with respect to asbestos. One occurrence of asbestos containing cement was recorded.

It is understood that the levels of asbestos are deemed acceptable by the NRW, who has issued a bespoke permit to allow the re-use of the stockpiled soils, provided that following placement as engineered fill the asbestos containing soils will be managed by the placement of an overlying 300mm clean capping layer above the stockpile sourced fill (from 8.65m – 8.95m AOD), including on all embankments.

Measures should be taken for the protection of the human health of site workers and neighbouring site users.

Soils identified with asbestos content above the limits of detection will be placed in the lowest layers of engineered fill on site.

Due to the presence of asbestos a geotextile membrane should be placed between the stockpiled materials and the 300mm clean fill. This will act to ensure adequate protection of future site users (developer site construction workers who are to raise the level of fill from 8.95m AOD to 9.95m AOD) and neighbouring site users from any fugitive asbestos fibres.

Leachate analysis found several PAH species, some petroleum hydrocarbon fractions and cadmium to be above threshold levels or the limits of detection in one or more samples. It is however, considered that levels remain relatively minor and will not pose a risk to the aquatic environment.

Reinforced earth embankments will be utilised to retain the filling works, along with the existing flood defence embankment along the front of the site. Please refer to the attached fill works drawing in **Annex A**.

The site will be further filled with an additional layer of approximately 1m during the residential development operation.

The 300mm capping layer should chemically strictly adhere to **Table 3.1.**

3.3 Importation of Soils for Gardens and Landscaped Areas

Following construction of the houses on site, the developer will complete all garden and landscaped areas with both imported subsoil and topsoil, attaining a total minimum thickness of 600mm.

For all imported soils appropriate certification should be provided by the supplier as well as details of the soil source.

All imported material should be chemically screened to ensure its suitability for use in accordance with the Welsh Land Contamination Working Group 'Requirements for the Chemical Testing of Imported Materials for Various End Uses and Validation of Cover Systems'.

Ideally imported soils should be stockpiled upon site for sampling. Any stockpiled soils should not be dispersed on site until test results have been received and soil suitability confirmed.

Typically, per source, 4 representative samples should be screened for a volume between $20m^3$ and $250m^3$. For volumes exceeding $250m^3$, 4 samples per $250m^3$ should be analysed.

Should the imported soils already have been put down in garden and soft landscaped areas before sampling the number of samples required should be calculated according to the volume imported.

Once in place validation of the 600mm thickness will be required. This should comprise the hand excavation of a trial hole in 1 in 3 gardens and photographic evidence documenting measurement to the full depth.

Test results should be compared with residential Soil Guideline Values (SGVs) sourced from The Environment Agency Contaminated Land Exposure Assessment (CLEA). Where SGV values are not available reference should be made to Generic Assessment Criteria (GAC) for a residential setting provided by Land Quality Management Limited and the Chartered Institute of Environmental Health (CIEH), or in the case of lead, the ATRISK guideline provided by Atkins.

3.3 Importation of Soils for Gardens and Landscaped Areas (Continued)

The required testing is detailed in **Table 3.3** below.

Table 3.3
Soil Determinants and Guideline Values
Imported Soils

Determinant	Comparable Guideline Value (mg/kg)			Source
Arsenic	32			CLEA
Boron	290			CIEH
Cadmium	10			CLEA
Chromium III	910			CIEH
Chromium VI	6.0			CIEH
Copper	2400			CIEH
Lead	200			C4SL
Mercury	170			CLEA
Nickel	130			CLEA
Selenium	350			CLEA
Zinc	3700			CIEH
Cyanide	8			CLEA
Phenol	420			CLEA
pH (acidity)	-			-
Asbestos	Non detectable			-
Speciated PAH				
	≤ 1% SOM	**≤ 2.5% SOM**	**≤ 6% SOM**	
Naphthalene	2.3	5.6	13	CIEH
Acenaphthylene	170	420	920	CIEH
Acenaphthene	210	510	1100	CIEH
Fluorene	170	400	860	CIEH
Phenanthrene	95	220	440	CIEH
Anthracene	2400	5400	11000	CIEH
Fluoranthene	280	560	890	CIEH
Pyrene	620	1200	2000	CIEH
Benzo(a)anthracene	7.2	11	13	CIEH
Chrysene	15	22	27	CIEH
Benzo(b)fluoranthene	2.6	3.3	3.7	CIEH
Benzo(k)fluoranthene	77	93	100	CIEH
Benzo(a)pyrene	2.2	2.7	3.0	CIEH
Dibenzo(ah)anthracene	27	36	41	CIEH
Benzo(ghi)perylene	0.24	0.28	0.3	CIEH
Indeno(123cd)pyrene	320	340	350	CIEH

Table Notes

- CLEA - Soil Guideline Values for a residential development
- CIEH - Generic Assessment Criteria for a residential setting, developed as Land Quality Management by the Chartered Institute of Environmental Health
- ATRISK – Generic assessment criteria (with plant uptake) developed by Atkins
- SOM – Soil Organic Matter

3.4 Gas and Vapour Protection

The site has been classified as 'gas characteristic situation 3-4' in accordance with Table 8.5 of CIRIA Report C665.

The action of piling through underlying peat deposits will potentially open up preferential gas pathways, but the alluvial deposits between the peat and made ground can be expected to settle and seal around the piles and drains considerably minimising this risk.

Taking the above into consideration, gas protection measures in line with 'gas characteristic 2' may prove adequate to prevent the risk from ground gas to future site residents.

Table 8.6 of the CIRIA report confirms that for gas characteristic 2 sites, the following precautions are required:

- A 2000 gauge DPM/reinforced gas membrane
- Passive under-floor venting
- All joints taped and sealed

As a minimum these protection measures will be implemented. However, further on-site gas monitoring from already installed wells and from flux boxes is to be undertaken during development to confirm that this level of protection will be suitable.

It is proposed that following placement of the fill, flux boxes will be placed across the site and monitored on a weekly basis for a period of 3 months.

Further flux box testing should be carried out once piling has commenced. The frequency and sampling locations will be considered once the piling schedule has been determined.

Should further monitoring identify concentrations of methane and/or carbon dioxide and flow rates beyond 'gas characteristic 2' criteria then more robust protection measures will be necessary.

In accordance with Table 8.6 of the CIRIA report, potential further protection measures could include:

- Proprietary gas resistant membrane
- Positively pressurised underfloor sub-space
- In-ground venting and venting wells

The results of all additional monitoring and consequent gas protection recommendations will be presented to Newport City Council for review.

The developer will also provide details on proposed validation testing of the gas mitigation measures.

All test certification will be issued to Newport City Council prior to occupancy.

The radon/gas barrier should also be effective as a barrier to PCB vapours.

3.5 Asbestos Management and Monitoring – In-situ Soils

If excavations are to be undertaken at the location of TP7 prior to site fill works then appropriate measures should be made to ensure there are no risks to construction workers and neighbouring site occupants/users.

Monitoring for airborne asbestos fibres would be required, including along the boundary of the site. A strategy should also be put in place to deal with any fibres, should they be detected.

Any materials to be removed from site should be appropriately managed to mitigate all potential risks.

If required, a strategy for monitoring asbestos and removing materials should be drawn up and approved by Newport City Council Environmental Protection prior to site works.

The details and data from any monitoring etc should be compiled and reported to Newport City Council Environmental Protection.

3.6 Potable Water Supply

Details of the proposed drinking water supply pipes should be supplied by the developer to Newport City Council for approval prior to development.

The UKWIR Report Ref No 10/WM/03/21 ‘Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites’ should be consulted.

3.7 River Usk and Groundwater

Groundwater and reen water testing to date has not identified a risk to the River Usk. No hydraulic continuity between the river and groundwater has been identified.

In order to increase confidence that no risks are presented the aquatic environment further assessment is proposed.

Prior to fill of the site by Riversee Limited six new water monitoring wells will be installed across the development site. The response zone of these wells will be the deep groundwater. The proposed location of these wells is indicated in **Figure 3.1** on the following page.

Six wells have been specified as it is assumed that previous wells may have been damaged or become inaccessible due to clearance of site vegetation and are no longer useable.

3.7 River Usk and Groundwater (Continued)

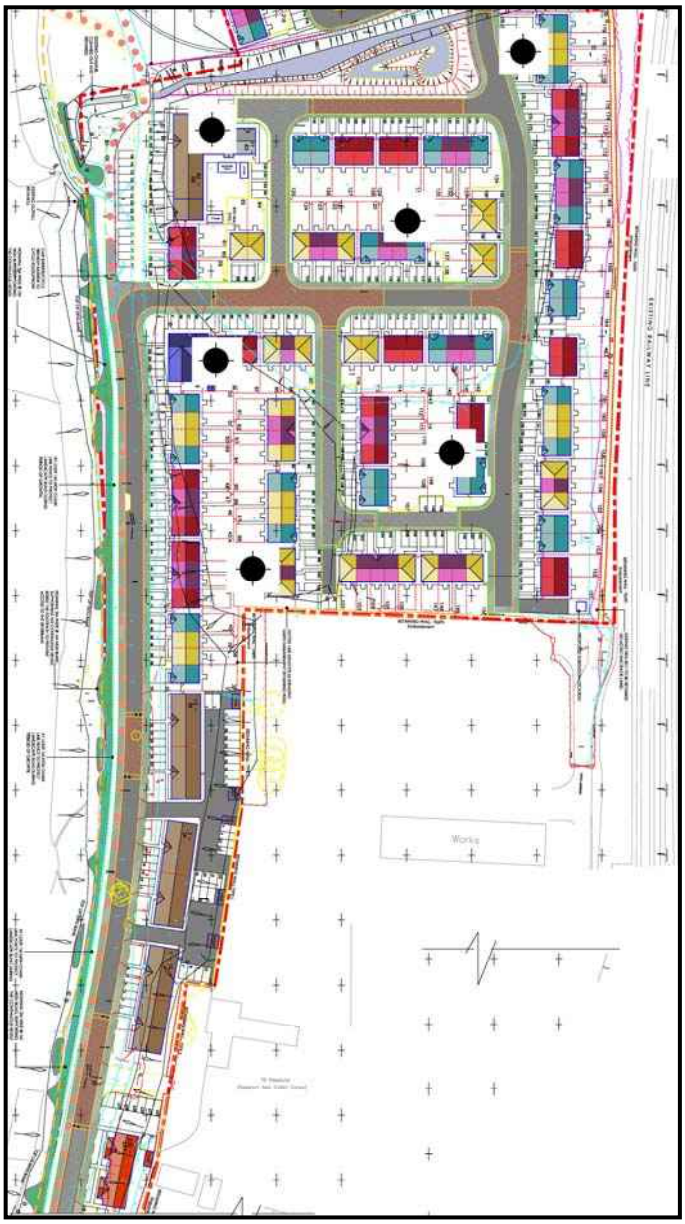


Figure 3.1: Proposed Water Monitoring Well Locations

The wells will be sampled on three occasions. Once prior to Riversee Limited fill works, and twice on completion of these earthworks. The second round will be carried out immediately after filling and the third one month later.

Should the Riversee Limited earthworks be subject to any unexpected delay beyond a five month period, the second water monitoring round should be scheduled for no later than five months following commencement of the earthworks, and the third round should follow at no later than 6 months following earthworks commencement.

Water samples will be analysed for a standard suite of metals and inorganics, PCBs, speciated PAH and petroleum hydrocarbons.

3.7 River Usk and Groundwater (Continued)

The results from this monitoring will be assessed and reported to both Newport City Council and National Resources Wales in due course.

Should the results highlight a concern with regard to a change in groundwater quality further sampling or remedial measures will be agreed with Newport City Council and National Resources Wales as appropriate.

SECTION 4 Validation Report

All remedial works should be documented and details compiled in the form of a Validation Report.

The validation will be reported in two stages.

A Validation Report will be compiled for Riversee Limited following completion of the initial fill of the site once all associated monitoring has concluded.

The Validation Report should include, but not limited to, the following:

1. Details of source of imported material including imported stone/aggregate
2. A record of the number of soil sources, their origin, and their respective volumes
3. Chemical certificates for fill imported for engineering purposes
4. Data from any asbestos monitoring carried out
5. Results from groundwater monitoring carried out during and immediately following the earthworks.
6. Records of any materials removed from site
7. Records of the flux box testing

The Developer will be responsible for commissioning a second Validation Report once the development has been completed.

The Validation Reports should include, but not limited to, the following:

1. Details of source of imported material including imported stone/aggregate
2. A record of the number of soil sources, their origin, and their respective volumes
3. Chemical certificates for fill imported for engineering purposes
4. Chemical certificate for imported garden soils where available from the provider
5. Chemical tests results for garden and landscaped soils once tested on site
6. Validation of the 600mm capping thickness in garden and landscaped areas including photographs
7. Details of the gas protection measures employed, including photos, test results and certificates.
8. Records of any materials removed from site

Validation reports should be submitted to Newport City Council and National Resources Wales for review.

Annex A
Drawing Detailing Area to be Filled to 8.95m AOD by Riversee Limited

ANNEX B
Upper Half of Riversee Limited Stockpile
DETS test certificates 27313-1 & 27519-2

Derwentside Environmental Testing Services

Certificate of Analysis

Certificate Number 15-27313-1

26-Feb-15

Client Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference 15-27313-1

Client Reference 12032-SP1

Contract Title Herbet Road Stockpile - Round 1

Description 25 Soil samples, 1 Misc sample.

Date Received 16-Feb-15

Date Started 16-Feb-15

Date Completed 26-Feb-15

Test Procedures Identified by prefix DETSn (details on request), Asbestos Analysis DETSC 1101.

Notes **This report supersedes 15-27313, Extra Testing**

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

Approved By [redacted]

Rob Brown
Business Manager

MCERTS
THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

UKAS TESTING
2139

Summary of Chemical Analysis
Matrix Descriptions

Our Ref 15-27313-1
Client Ref 12032-SP1
Contract Title Herbet Road Stockpile - Round 1

Sample ID	Depth	Lab No	Completed	Matrix Description
S1	0.5	768693	23/02/2015	Dark brown gravelly sandy CLAY
S2	1.7	768694	23/02/2015	Dark brown gravelly sandy CLAY (Made Ground includes brick)
S3	3	768695	23/02/2015	Dark brown gravelly sandy CLAY
S4	2	768696	23/02/2015	Dark brown gravelly sandy CLAY
S5	3	768697	23/02/2015	Dark brown gravelly sandy CLAY
S6	0.5	768698	23/02/2015	Dark brown gravelly sandy CLAY
S7	3	768699	23/02/2015	Dark brown gravelly sandy CLAY
S8	0.8	768700	23/02/2015	Dark brown gravelly sandy CLAY
S9	0.5	768701	23/02/2015	Dark brown gravelly sandy CLAY
S10	2	768702	23/02/2015	Dark brown gravelly sandy CLAY with odd rootlets
S11	3	768703	23/02/2015	Dark brown gravelly sandy CLAY (Made Ground includes brick)
S12	0.5	768704	23/02/2015	Dark brown gravelly sandy CLAY (Made Ground includes brick)
S13	2.3	768705	23/02/2015	Dark brown gravelly sandy CLAY
S14	3	768706	23/02/2015	Dark brown gravelly sandy CLAY with odd rootlets
S15	2	768707	23/02/2015	Dark brown gravelly sandy CLAY
S16	3	768708	23/02/2015	Dark brown gravelly sandy CLAY (Made Ground includes brick)
S17	0.3	768709	23/02/2015	Dark brown gravelly sandy CLAY
S18	1.3	768710	23/02/2015	Dark brown gravelly sandy CLAY with odd rootlets (Made Ground includes brick)
S19	2.8	768711	23/02/2015	Dark brown gravelly sandy CLAY (Made Ground includes brick)
S20	0.5	768712	23/02/2015	Dark brown gravelly sandy CLAY
S21	1.3	768713	23/02/2015	Dark brown gravelly sandy CLAY (Made Ground includes brick)
S22	2.5	768714	23/02/2015	Dark brown gravelly sandy CLAY (Made Ground includes brick)
S23	0.5	768715	23/02/2015	Dark brown gravelly sandy CLAY
S24	1.4	768716	23/02/2015	Dark brown gravelly sandy CLAY
S25	2.5	768717	23/02/2015	Dark brown gravelly sandy CLAY

Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 15-27313-1
Client Ref 12032-SP1
Contract Title Herbet Road Stockpile - Round 1

			Lab No	768693	768694	768695	768696	768697	768698
			Sample ID	S1	S2	S3	S4	S5	S6
			Depth	0.50	1.70	3.00	2.00	3.00	0.50
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	12/02/15	12/02/15	12/02/15	12/02/15	12/02/15	12/02/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	5.8	13	12	< 0.2	12	10
Cadmium	DETSC 2301#	0.1	mg/kg	1.1	0.7	0.7	< 0.1	0.7	0.6
Chromium	DETSC 2301#	0.15	mg/kg	53	25	20	< 0.15	18	18
Chromium III	DETSC 2301*	0.15	mg/kg	53	25	20	< 0.15	18	18
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	39	31	25	< 0.2	26	53
Lead	DETSC 2301#	0.3	mg/kg	51	47	43	< 0.3	43	93
Mercury	DETSC 2325#	0.05	mg/kg	0.09	0.09	< 0.05	0.05	0.06	< 0.05
Nickel	DETSC 2301#	1	mg/kg	53	21	22	< 1.0	20	16
Selenium	DETSC 2301#	0.5	mg/kg	0.7	< 0.5	1.2	< 0.5	0.9	1.1
Zinc	DETSC 2301#	1	mg/kg	140	89	80	< 1.0	85	110
Inorganics									
pH	DETSC 2008#			10.0	9.1	8.7	9.6	8.5	8.4
Cyanide total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
Organic matter	DETSC 2002#	0.1	%	3.0	2.4	2.0	2.7	2.6	2.5
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.11	0.16	0.13	0.10	0.06	0.06
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10

Key: * -not accredited. # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 15-27313-1
Client Ref 12032-SP1
Contract Title Herbet Road Stockpile - Round 1

			Lab No	768693	768694	768695	768696	768697	768698
			Sample ID	S1	S2	S3	S4	S5	S6
			Depth	0.50	1.70	3.00	2.00	3.00	0.50
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	12/02/15	12/02/15	12/02/15	12/02/15	12/02/15	12/02/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.04	< 0.03	0.06	< 0.03	0.05
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	0.08	0.07	0.10	0.04	0.07
Pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.07	0.05	0.08	0.04	0.06
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	0.04	< 0.03	0.04	< 0.03	< 0.03
Chrysene	DETSC 3303	0.03	mg/kg	< 0.03	0.06	0.04	0.04	< 0.03	< 0.03
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	0.05	< 0.03	0.04	< 0.03	0.04
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Total PAH - USEPA 16	DETSC 3303	0.1	mg/kg	< 0.10	0.33	0.16	0.36	< 0.10	0.22
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	0.4

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Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 15-27313-1
Client Ref 12032-SP1
Contract Title Herbet Road Stockpile - Round 1

			Lab No	768699	768700	768701	768702	768703	768704
			Sample ID	S7	S8	S9	S10	S11	S12
			Depth	3.00	0.80	0.50	2.00	3.00	0.50
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	12/02/15	12/02/15	12/02/15	12/02/15	12/02/15	12/02/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	9.8	14	< 0.2	17	9.0	9.2
Cadmium	DETSC 2301#	0.1	mg/kg	0.6	2.1	< 0.1	1.0	0.6	0.5
Chromium	DETSC 2301#	0.15	mg/kg	20	48	< 0.15	22	19	18
Chromium III	DETSC 2301*	0.15	mg/kg	20	48	< 0.15	22	19	18
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	25	140	< 0.2	48	20	29
Lead	DETSC 2301#	0.3	mg/kg	37	110	< 0.3	74	36	45
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	0.16	0.10	0.13	< 0.05
Nickel	DETSC 2301#	1	mg/kg	27	41	< 1.0	23	20	22
Selenium	DETSC 2301#	0.5	mg/kg	1.2	43	< 0.5	1.4	0.7	1.4
Zinc	DETSC 2301#	1	mg/kg	93	200	< 1.0	160	130	82
Inorganics									
pH	DETSC 2008#			8.6	8.1	8.2	11.0	9.0	8.6
Cyanide total	DETSC 2130#	0.1	mg/kg	0.1	< 0.1	0.1	< 0.1	< 0.1	< 0.1
Organic matter	DETSC 2002#	0.1	%	2.2	2.2	3.5	2.2	9.7	2.5
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.07	0.06	0.06	0.17	0.10	0.07
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10

Key: * -not accredited. # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 15-27313-1
Client Ref 12032-SP1
Contract Title Herbet Road Stockpile - Round 1

			Lab No	768699	768700	768701	768702	768703	768704
			Sample ID	S7	S8	S9	S10	S11	S12
			Depth	3.00	0.80	0.50	2.00	3.00	0.50
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	12/02/15	12/02/15	12/02/15	12/02/15	12/02/15	12/02/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.09	0.04	0.06	0.11	0.06	0.09
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.11	0.05	0.10	0.18	0.07	0.14
Pyrene	DETSC 3303#	0.03	mg/kg	0.09	0.04	0.09	0.15	0.06	0.11
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.05	< 0.03	0.04	0.07	< 0.03	0.06
Chrysene	DETSC 3303	0.03	mg/kg	0.05	< 0.03	0.06	0.09	< 0.03	0.07
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.04	< 0.03	0.07	0.10	< 0.03	0.08
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	0.04	< 0.03	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.05	0.06	< 0.03	0.05
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	0.04	< 0.03	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	0.04	< 0.03	< 0.03
Total PAH - USEPA 16	DETSC 3303	0.1	mg/kg	0.43	0.14	0.47	0.85	0.19	0.60
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	0.4	0.3	< 0.3	< 0.3	2.2	< 0.3

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Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 15-27313-1
Client Ref 12032-SP1
Contract Title Herbet Road Stockpile - Round 1

			Lab No	768705	768706	768707	768708	768709	768710
			Sample ID	S13	S14	S15	S16	S17	S18
			Depth	2.30	3.00	2.00	3.00	0.30	1.30
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	12/02/15	12/02/15	12/02/15	12/02/15	12/02/15	12/02/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	10	3.9	4.4	3.9	4.9	19
Cadmium	DETSC 2301#	0.1	mg/kg	0.7	0.5	0.4	0.5	0.5	1.2
Chromium	DETSC 2301#	0.15	mg/kg	24	17	24	20	29	25
Chromium III	DETSC 2301*	0.15	mg/kg	24	17	24	20	29	25
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	17	15	19	16	16	47
Lead	DETSC 2301#	0.3	mg/kg	26	11	8.4	27	25	130
Mercury	DETSC 2325#	0.05	mg/kg	0.05	< 0.05	0.13	0.27	0.08	0.13
Nickel	DETSC 2301#	1	mg/kg	20	23	27	19	25	26
Selenium	DETSC 2301#	0.5	mg/kg	1.0	1.0	0.6	0.7	0.6	2.8
Zinc	DETSC 2301#	1	mg/kg	77	72	51	56	64	1200
Inorganics									
pH	DETSC 2008#			8.6	8.5	10.3	10.5	8.8	8.0
Cyanide total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1
Organic matter	DETSC 2002#	0.1	%	2.4	2.7	2.0	4.5	2.0	4.9
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.07	0.08	0.16	0.27	0.07	0.07
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	0.06	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	0.01	0.14	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	0.12	0.01	0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	0.01	0.01	< 0.01	0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	0.07	0.01	0.12	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10

Key: * -not accredited. # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 15-27313-1
Client Ref 12032-SP1
Contract Title Herbet Road Stockpile - Round 1

			Lab No	768705	768706	768707	768708	768709	768710
			Sample ID	S13	S14	S15	S16	S17	S18
			Depth	2.30	3.00	2.00	3.00	0.30	1.30
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	12/02/15	12/02/15	12/02/15	12/02/15	12/02/15	12/02/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.04	0.13	0.04	0.31	0.09	0.06
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	0.07	< 0.03	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.07	0.20	0.05	0.43	0.11	0.12
Pyrene	DETSC 3303#	0.03	mg/kg	0.06	0.16	0.04	0.36	0.09	0.09
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	0.08	< 0.03	0.16	0.04	0.06
Chrysene	DETSC 3303	0.03	mg/kg	0.04	0.08	< 0.03	0.19	0.05	0.08
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.04	0.08	< 0.03	0.19	0.05	0.08
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	0.08	< 0.03	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.05	< 0.03	0.13	< 0.03	0.04
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	0.09	< 0.03	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	0.08	< 0.03	< 0.03
Total PAH - USEPA 16	DETSC 3303	0.1	mg/kg	0.24	0.77	0.14	2.1	0.42	0.54
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	0.3	0.5	0.6	0.7	0.6	0.6

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Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 15-27313-1
Client Ref 12032-SP1
Contract Title Herbet Road Stockpile - Round 1

			Lab No	768711	768712	768713	768714	768715	768716
			Sample ID	S19	S20	S21	S22	S23	S24
			Depth	2.80	0.50	1.30	2.50	0.50	1.40
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	12/02/15	12/02/15	12/02/15	12/02/15	12/02/15	12/02/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	< 0.2	9.1	11	9.8	15	7.0
Cadmium	DETSC 2301#	0.1	mg/kg	< 0.1	1.0	0.8	1.0	0.8	1.1
Chromium	DETSC 2301#	0.15	mg/kg	< 0.15	21	25	36	17	22
Chromium III	DETSC 2301*	0.15	mg/kg	< 0.15	21	25	36	17	22
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	< 0.2	25	25	40	40	19
Lead	DETSC 2301#	0.3	mg/kg	< 0.3	51	35	52	34	48
Mercury	DETSC 2325#	0.05	mg/kg	0.17	0.05	0.08	< 0.05	0.07	0.06
Nickel	DETSC 2301#	1	mg/kg	< 1.0	21	24	28	22	18
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	0.7	< 0.5	< 0.5	0.8
Zinc	DETSC 2301#	1	mg/kg	< 1.0	100	91	180	110	110
Inorganics									
pH	DETSC 2008#			10.2	8.4	9.8	9.7	8.5	10.6
Cyanide total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Organic matter	DETSC 2002#	0.1	%	2.2	2.7	3.5	2.6	2.3	2.2
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.15	0.06	0.12	0.11	0.05	0.17
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	0.02	< 0.01	0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	0.04	< 0.01	0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10

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Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 15-27313-1
Client Ref 12032-SP1
Contract Title Herbet Road Stockpile - Round 1

			Lab No	768711	768712	768713	768714	768715	768716
			Sample ID	S19	S20	S21	S22	S23	S24
			Depth	2.80	0.50	1.30	2.50	0.50	1.40
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	12/02/15	12/02/15	12/02/15	12/02/15	12/02/15	12/02/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.50	0.05	0.09	0.06	0.04	0.16
Anthracene	DETSC 3303	0.03	mg/kg	0.10	< 0.03	< 0.03	< 0.03	< 0.03	0.04
Fluoranthene	DETSC 3303#	0.03	mg/kg	1.2	0.10	0.11	0.07	0.09	0.21
Pyrene	DETSC 3303#	0.03	mg/kg	0.86	0.08	0.09	0.06	0.08	0.19
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.38	0.04	0.05	< 0.03	0.05	0.08
Chrysene	DETSC 3303	0.03	mg/kg	0.41	0.06	0.04	0.04	0.07	0.09
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.31	0.06	0.05	0.04	0.07	0.10
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.13	< 0.03	< 0.03	< 0.03	< 0.03	0.04
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.22	< 0.03	0.04	< 0.03	0.04	0.07
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.10	< 0.03	< 0.03	< 0.03	0.04	0.04
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.10	< 0.03	< 0.03	< 0.03	< 0.03	0.04
Total PAH - USEPA 16	DETSC 3303	0.1	mg/kg	4.3	0.38	0.47	0.27	0.48	1.1
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	0.4	0.5	0.5	0.4	0.6	0.6

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Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 15-27313-1
Client Ref 12032-SP1
Contract Title Herbet Road Stockpile - Round 1

Lab No	768717
Sample ID	S25
Depth	2.50
Other ID	
Sample Type	SOIL
Sampling Date	12/02/15
Sampling Time	n/s

Test	Method	LOD	Units	
Metals				
Arsenic	DETSC 2301#	0.2	mg/kg	7.5
Cadmium	DETSC 2301#	0.1	mg/kg	1.0
Chromium	DETSC 2301#	0.15	mg/kg	24
Chromium III	DETSC 2301*	0.15	mg/kg	24
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	27
Lead	DETSC 2301#	0.3	mg/kg	63
Mercury	DETSC 2325#	0.05	mg/kg	0.05
Nickel	DETSC 2301#	1	mg/kg	21
Selenium	DETSC 2301#	0.5	mg/kg	0.6
Zinc	DETSC 2301#	1	mg/kg	95
Inorganics				
pH	DETSC 2008#			10.7
Cyanide total	DETSC 2130#	0.1	mg/kg	< 0.1
Organic matter	DETSC 2002#	0.1	%	2.2
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.18
Petroleum Hydrocarbons				
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	30
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	30
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	53
Aromatic C5-C35	DETSC 3072*	10	mg/kg	53
TPH Ali/Aro	DETSC 3072*	10	mg/kg	83

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Summary of Chemical Analysis
Soil/Misc Samples

Our Ref 15-27313-1
Client Ref 12032-SP1
Contract Title Herbet Road Stockpile - Round 1

Lab No	768717
Sample ID	S25
Depth	2.50
Other ID	
Sample Type	SOIL
Sampling Date	12/02/15
Sampling Time	n/s

Test	Method	LOD	Units	
PAHs				
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.08
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.13
Pyrene	DETSC 3303#	0.03	mg/kg	0.12
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.05
Chrysene	DETSC 3303	0.03	mg/kg	0.05
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.08
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.05
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.05
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.04
Total PAH - USEPA 16	DETSC 3303	0.1	mg/kg	0.65
Phenols				
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	0.5

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Summary of Asbestos Analysis
Bulk & Soil Samples

Our Ref 15-27313-1
Client Ref 12032-SP1
Contract Title Herbet Road Stockpile - Round 1

Lab No	Sample ID	Sample Location	Material Type*	Result	Comment*	Analyst
768693	S1 0.50		SOIL	NAD	none	Andrew Little
768694	S2 1.70		SOIL	NAD	none	Andrew Little
768695	S3 3.00		SOIL	NAD	none	Andrew Little
768696	S4 2.00		SOIL	NAD	none	Andrew Little
768697	S5 3.00		SOIL	NAD	none	Andrew Little
768698	S6 0.50		SOIL	Chrysotile	Clumps of Chrysotile fibres present	Andrew Little
768699	S7 3.00		SOIL	Chrysotile	Bundle of chrysotile fibre present	Andrew Little
768700	S8 0.80		SOIL	NAD	none	Andrew Little
768701	S9 0.50		SOIL	NAD	none	Andrew Little
768702	S10 2.00		SOIL	NAD	none	Andrew Little
768703	S11 3.00		SOIL	Chrysotile	Small bundles of chrysotile fibres present	Andrew Little
768704	S12 0.50		SOIL	Amosite	Free Amosite fibres present	Andrew Little
768705	S13 2.30		SOIL	Amosite Chrysotile	Clump of Amosite/Chrysotile present	Andrew Little
768706	S14 3.00		SOIL	Chrysotile	Clump of Chrysotile fibres present	Andrew Little
768707	S15 2.00		SOIL	Chrysotile	Clump of Chrysotile fibres present	Andrew Little
768708	S16 3.00		SOIL	Chrysotile	Bundle of chrysotile fibre present	Andrew Little
768709	S17 0.30		SOIL	Chrysotile	Clump of Chrysotile fibres present	Andrew Little
768710	S18 1.30		SOIL	Chrysotile	Clump of Chrysotile fibres present	Andrew Little
768711	S19 2.80		SOIL	Chrysotile	Free Chrysotile fibres present	Andrew Little
768712	S20 0.50		SOIL	Chrysotile	Bundles of Chrysotile fibres present	Andrew Little
768713	S21 1.30		SOIL	Chrysotile	Bundle of chrysotile fibre present	Andrew Little
768714	S22 2.50		SOIL	Chrysotile	Bundles of Chrysotile fibres present	Andrew Little
768715	S23 0.50		SOIL	Chrysotile	Free Chrysotile fibres present	Andrew Little
768716	S24 1.40		SOIL	NAD	none	Andrew Little
768717	S25 2.50		SOIL	Chrysotile	Bundles of Chrysotile fibres present	Andrew Little
768718	S16A 3.00		Cement	Chrysotile	none	Andrew Little

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * -not included in laboratory scope of accreditation.

Summary of Asbestos Quantification Analysis
Soil Samples

Our Ref 15-27313-1
Client Ref 12032-SP1
Contract Title Herbet Road Stockpile - Round 1

		Lab No	768698	768699	768703	768704
		Sample ID	S6	S7	S11	S12
		Depth	0.50	3.00	3.00	0.50
		Other ID				
		Sample Type	SOIL	SOIL	SOIL	SOIL
		Sampling Date	12/02/15	12/02/15	12/02/15	12/02/15
		Sampling Time				
Test	**Method**	**Units**				
Total Mass% Asbestos (a+b+c)	DETSC 1102	Mass %	**0.001**	**< 0.001**	**< 0.001**	**< 0.001**
Gravimetric Quantification (a)	DETSC 1102	Mass %	na	na	na	na
Detailed Gravimetric Quantification (b)	DETSC 1102	Mass %	0.001	<0.001	<0.001	na
Quantification by PCOM (c)	DETSC 1102	Mass %	na	na	na	< 0.001
Potentially Respirable Fibres (d)	DETSC 1102	Fibres/g	na	na	na	na
Breakdown of Gravimetric Analysis (a)						
Mass of Sample		g	645.18	1061.41	748.41	1157.84
ACMs present*		type				
Mass of ACM in sample		g				
% ACM by mass		%				
% asbestos in ACM		%				
% asbestos in sample		%				
Breakdown of Detailed Gravimetric Analysis (b)						
% Amphibole bundles in sample		Mass %	na	na	na	na
% Serpentine bundles in sample		Mass %	0.001	<0.001	<0.001	na
Breakdown of PCOM Analysis (c)						
% Amphibole fibres in sample		Mass %	na	na	na	<0.001
% Serpentine fibres in sample		Mass %	na	na	na	<0.001
Breakdown of Potentially Respirable Fibre Analysis (d)						
Amphibole fibres		Fibres/g	na	na	na	na
Chrysotile fibres		Fibres/g	na	na	na	na

* Denotes test or material description outside of UKAS accreditation.
% asbestos in Asbestos Containing Materials (ACMs) is determined by
by reference to HSG 264.
Recommended sample size for quantification is approximately 1kg
# denotes deviating sample

Summary of Asbestos Quantification Analysi

Soil Samples

Our Ref 15-27313-1
Client Ref 12032-SP1
Contract Title Herbet Road Stockpile - Round 1

		Lab No	768705	768706	768707	768708
		Sample ID	S13	S14	S15	S16
		Depth	2.30	3.00	2.00	3.00
		Other ID				
		Sample Type	SOIL	SOIL	SOIL	SOIL
		Sampling Date	12/02/15	12/02/15	12/02/15	12/02/15
		Sampling Time				
Test	**Method**	**Units**				
Total Mass% Asbestos (a+b+c)	DETSC 1102	Mass %	**0.024**	**< 0.001**	**< 0.001**	**< 0.001**
Gravimetric Quantification (a)	DETSC 1102	Mass %	na	na	na	na
Detailed Gravimetric Quantification (b)	DETSC 1102	Mass %	0.024	<0.001	<0.001	<0.001
Quantification by PCOM (c)	DETSC 1102	Mass %	na	na	na	na
Potentially Respirable Fibres (d)	DETSC 1102	Fibres/g	na	na	na	na
Breakdown of Gravimetric Analysis (a)						
Mass of Sample		g	1226.44	1188.37	1497.67	838.56
ACMs present*		type				
Mass of ACM in sample		g				
% ACM by mass		%				
% asbestos in ACM		%				
% asbestos in sample		%				
Breakdown of Detailed Gravimetric Analysis (b)						
% Amphibole bundles in sample		Mass %	0.024	na	na	na
% Serpentine bundles in sample		Mass %	na	<0.001	<0.001	<0.001
Breakdown of PCOM Analysis (c)						
% Amphibole fibres in sample		Mass %	na	na	na	na
% Serpentine fibres in sample		Mass %	na	na	na	na
Breakdown of Potentially Respirable Fibre Analysis (d)						
Amphibole fibres		Fibres/g	na	na	na	na
Chrysotile fibres		Fibres/g	na	na	na	na

* Denotes test or material description outside of UKAS accreditation.
% asbestos in Asbestos Containing Materials (ACMs) is determined by
by reference to HSG 264.
Recommended sample size for quantification is approximately 1kg
# denotes deviating sample

Summary of Asbestos Quantification Analysi

Soil Samples

Our Ref 15-27313-1
Client Ref 12032-SP1
Contract Title Herbet Road Stockpile - Round 1

		Lab No	768709	768710	768711	768712
		Sample ID	S17	S18	S19	S20
		Depth	0.30	1.30	2.80	0.50
		Other ID				
		Sample Type	SOIL	SOIL	SOIL	SOIL
		Sampling Date	12/02/15	12/02/15	12/02/15	12/02/15
		Sampling Time				
Test	**Method**	**Units**				
Total Mass% Asbestos (a+b+c)	DETSC 1102	Mass %	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**
Gravimetric Quantification (a)	DETSC 1102	Mass %	na	na	na	na
Detailed Gravimetric Quantification (b)	DETSC 1102	Mass %	<0.001	<0.001	na	<0.001
Quantification by PCOM (c)	DETSC 1102	Mass %	na	na	< 0.001	na
Potentially Respirable Fibres (d)	DETSC 1102	Fibres/g	na	na	na	na
Breakdown of Gravimetric Analysis (a)						
Mass of Sample		g	1345.77	840.34	683.00	1038.48
ACMs present*		type				
Mass of ACM in sample		g				
% ACM by mass		%				
% asbestos in ACM		%				
% asbestos in sample		%				
Breakdown of Detailed Gravimetric Analysis (b)						
% Amphibole bundles in sample		Mass %	na	na	na	na
% Serpentine bundles in sample		Mass %	<0.001	<0.001	na	<0.001
Breakdown of PCOM Analysis (c)						
% Amphibole fibres in sample		Mass %	na	na	<0.001	na
% Serpentine fibres in sample		Mass %	na	na	<0.001	na
Breakdown of Potentially Respirable Fibre Analysis (d)						
Amphibole fibres		Fibres/g	na	na	na	na
Chrysotile fibres		Fibres/g	na	na	na	na

* Denotes test or material description outside of UKAS accreditation.
% asbestos in Asbestos Containing Materials (ACMs) is determined by
by reference to HSG 264.
Recommended sample size for quantification is approximately 1kg
# denotes deviating sample

Summary of Asbestos Quantification Analysi

Soil Samples

Our Ref 15-27313-1
Client Ref 12032-SP1
Contract Title Herbet Road Stockpile - Round 1

		Lab No	768713	768714	768715	768717
		Sample ID	S21	S22	S23	S25
		Depth	1.30	2.50	0.50	2.50
		Other ID				
		Sample Type	SOIL	SOIL	SOIL	SOIL
		Sampling Date	12/02/15	12/02/15	12/02/15	12/02/15
		Sampling Time				
Test	**Method**	**Units**				
Total Mass% Asbestos (a+b+c)	DETSC 1102	Mass %	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**
Gravimetric Quantification (a)	DETSC 1102	Mass %	na	na	na	na
Detailed Gravimetric Quantification (b)	DETSC 1102	Mass %	<0.001	<0.001	na	<0.001
Quantification by PCOM (c)	DETSC 1102	Mass %	na	na	< 0.001	na
Potentially Respirable Fibres (d)	DETSC 1102	Fibres/g	na	na	na	na
Breakdown of Gravimetric Analysis (a)						
Mass of Sample		g	960.31	964.16	1039.32	1100.66
ACMs present*		type				
Mass of ACM in sample		g				
% ACM by mass		%				
% asbestos in ACM		%				
% asbestos in sample		%				
Breakdown of Detailed Gravimetric Analysis (b)						
% Amphibole bundles in sample		Mass %	na	na	na	na
% Serpentine bundles in sample		Mass %	<0.001	<0.001	na	<0.001
Breakdown of PCOM Analysis (c)						
% Amphibole fibres in sample		Mass %	na	na	<0.001	na
% Serpentine fibres in sample		Mass %	na	na	<0.001	na
Breakdown of Potentially Respirable Fibre Analysis (d)						
Amphibole fibres		Fibres/g	na	na	na	na
Chrysotile fibres		Fibres/g	na	na	na	na

* Denotes test or material description outside of UKAS accreditation.
% asbestos in Asbestos Containing Materials (ACMs) is determined by
by reference to HSG 264.
Recommended sample size for quantification is approximately 1kg
# denotes deviating sample

Information in Support of the Analytical Results

Our Ref 15-27313-1
Client Ref 12032-SP1
Contract Herbet Road Stockpile - Round 1

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
768693	S1 0.50 SOIL	12/02/15	GJ 1L, GV, PT 1L x2		
768694	S2 1.70 SOIL	12/02/15	GJ 1L, GV, PT 1L x2		
768695	S3 3.00 SOIL	12/02/15	GJ 1L, GV, PT 1L x2		
768696	S4 2.00 SOIL	12/02/15	GJ 1L, GV, PT 1L x2		
768697	S5 3.00 SOIL	12/02/15	GJ 1L, GV, PT 1L x2		
768698	S6 0.50 SOIL	12/02/15	GJ 1L, GV, PT 1L x2		
768699	S7 3.00 SOIL	12/02/15	GJ 1L, GV, PT 1L x2		
768700	S8 0.80 SOIL	12/02/15	GJ 1L, GV, PT 1L x2		
768701	S9 0.50 SOIL	12/02/15	GJ 1L, GV, PT 1L x2		
768702	S10 2.00 SOIL	12/02/15	GJ 1L, GV, PT 1L x2		
768703	S11 3.00 SOIL	12/02/15	GJ 1L, GV, PT 1L x2		
768704	S12 0.50 SOIL	12/02/15	GJ 250ml, PT 1L		
768705	S13 2.30 SOIL	12/02/15	GJ 250ml, PT 1L		
768706	S14 3.00 SOIL	12/02/15	GJ 250ml, PT 1L		
768707	S15 2.00 SOIL	12/02/15	GJ 250ml x2, PT 1L		
768708	S16 3.00 SOIL	12/02/15	GJ 250ml x2, PT 1L		
768709	S17 0.30 SOIL	12/02/15	GJ 250ml, PT 1L x2		
768710	S18 1.30 SOIL	12/02/15	GJ 250ml x2, PT 1L x2		
768711	S19 2.80 SOIL	12/02/15	GJ 250ml x2, PT 1L x2		
768712	S20 0.50 SOIL	12/02/15	GJ 250ml x2, PT 1L x2		
768713	S21 1.30 SOIL	12/02/15	GJ 250ml x2, PT 1L x2		
768714	S22 2.50 SOIL	12/02/15	GJ 1L, GJ 250ml, PT 1L x2		
768715	S23 0.50 SOIL	12/02/15	GJ 250ml x2, PT 1L x2		
768716	S24 1.40 SOIL	12/02/15	GJ 250ml, PT 1L x2		
768717	S25 2.50 SOIL	12/02/15	GJ 250ml x2, PT 1L x2		
768718	S16A 3.00 MISC	12/02/15	PT 1L x2		

Key: G-Glass P-Plastic J-Jar V-Vial T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO4	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO4	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETSC2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

Certificate of Analysis

Certificate Number 15-27519

27-Feb-15

Client Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference 15-27519

Client Reference 12032-SP1

Contract Title Herbert Road Stockpile - Round 1

Description 11 Soil samples.

Date Received 17-Feb-15

Date Started 17-Feb-15

Date Completed 27-Feb-15

Test Procedures Identified by prefix DETSn (details on request), Asbestos Analysis DETSC 1101.

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

Approved By [redacted]

Rob Brown
Business Manager

2139

Summary of Chemical Analysis
Matrix Descriptions

Our Ref 15-27519
Client Ref 12032-SP1
Contract Title Herbert Road Stockpile - Round 1

Sample ID	Lab No	Completed	Matrix Description
S26	769704	27/02/2015	Dark brown gravelly sandy CLAY with odd rootlets
S27	769705	27/02/2015	Dark brown gravelly sandy CLAY
S28	769706	27/02/2015	Dark brown gravelly sandy CLAY with odd rootlets (Made Ground includes brick)
S29	769707	27/02/2015	Dark brown gravelly sandy CLAY with odd rootlets
S30	769708	27/02/2015	Dark brown gravelly sandy CLAY
S31	769709	27/02/2015	Dark brown gravelly sandy CLAY
S32	769710	27/02/2015	Dark brown gravelly sandy CLAY with odd rootlets
S33	769711	27/02/2015	Dark brown gravelly sandy CLAY
S34	769712	27/02/2015	Dark grey gravelly sandy CLAY
S35	769713	27/02/2015	Dark gravelly sandy CLAY
S36	769714	27/02/2015	Brown gravelly sandy CLAY

Summary of Chemical Analysis
Soil Samples

Our Ref 15-27519
Client Ref 12032-SP1
Contract Title Herbert Road Stockpile - Round 1

			Lab No	769704	769705	769706	769707	769708	769709	769710
			Sample ID	S26	S27	S28	S29	S30	S31	S32
			Depth							
			Other ID							
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	16/02/15	16/02/15	16/02/15	16/02/15	16/02/15	16/02/15	16/02/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**							
Metals										
Arsenic	DETSC 2301#	0.2	mg/kg	8.2	8.4	7.4	9.0	8.5	9.2	7.0
Cadmium	DETSC 2301#	0.1	mg/kg	0.6	0.5	1.4	0.6	0.6	2.0	0.6
Chromium	DETSC 2301#	0.15	mg/kg	21	19	21	25	19	21	22
Chromium III	DETSC 2301*	0.15	mg/kg	21	19	21	25	19	21	22
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	26	21	31	27	25	21	23
Lead	DETSC 2301#	0.3	mg/kg	40	38	78	41	42	82	33
Mercury	DETSC 2325#	0.05	mg/kg	0.07	< 0.05	0.12	0.10	0.07	0.10	0.09
Nickel	DETSC 2301#	1	mg/kg	24	21	21	25	19	20	26
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	120	80	130	92	80	140	74
Inorganics										
pH	DETSC 2008#			8.7	9.3	9.5	8.6	8.7	11.3	8.8
Cyanide total	DETSC 2130#	0.1	mg/kg	0.1	0.1	< 0.1	< 0.1	< 0.1	0.3	< 0.1
Organic matter	DETSC 2002#	0.1	%	3.1	2.6	2.1	3.8	3.1	2.5	2.8
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.07	0.07	0.08	0.16	0.27	0.07	0.07
Petroleum Hydrocarbons										
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	15	< 3.4	< 3.4	< 3.4	9.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	15	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	8.5	10
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10	10
TPH Ali/Aro	DETSC 3072*	10	mg/kg	< 10	15	< 10	< 10	< 10	18	10

Key: * -not accredited. # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 15-27519
Client Ref 12032-SP1
Contract Title Herbert Road Stockpile - Round 1

			Lab No	769704	769705	769706	769707	769708	769709	769710
			Sample ID	S26	S27	S28	S29	S30	S31	S32
			Depth							
			Other ID							
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	16/02/15	16/02/15	16/02/15	16/02/15	16/02/15	16/02/15	16/02/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**							
PAHs										
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.04	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.04	0.06	0.06	0.06	0.12	0.17	0.06
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	0.05	0.04	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.08	0.10	0.12	0.09	0.25	0.12	0.08
Pyrene	DETSC 3303#	0.03	mg/kg	0.07	0.09	0.10	0.07	0.22	0.10	0.07
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.04	0.04	0.05	< 0.03	0.11	0.04	0.04
Chrysene	DETSC 3303	0.03	mg/kg	0.05	0.06	0.06	0.05	0.12	0.06	0.04
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.04	0.06	0.06	0.04	0.13	0.05	0.04
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	0.04	< 0.03	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.04	0.05	< 0.03	0.09	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	0.06	< 0.03	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	0.05	< 0.03	< 0.03
Total PAH - USEPA 16	DETSC 3303	0.1	mg/kg	0.33	0.45	0.50	0.30	1.2	0.61	0.33
Phenols										
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	0.4	0.4	< 0.3	< 0.3	0.4	0.4	< 0.3

Summary of Chemical Analysis
Soil Samples

Our Ref 15-27519
Client Ref 12032-SP1
Contract Title Herbert Road Stockpile - Round 1

			Lab No	769711	769712	769713	769714
			Sample ID	S33	S34	S35	S36
			Depth				
			Other ID				
			Sample Type	SOIL	SOIL	SOIL	SOIL
			Sampling Date	16/02/15	16/02/15	16/02/15	16/02/15
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Metals							
Arsenic	DETSC 2301#	0.2	mg/kg	6.5	4.7	8.5	4.8
Cadmium	DETSC 2301#	0.1	mg/kg	1.2	0.6	0.6	1.0
Chromium	DETSC 2301#	0.15	mg/kg	14	21	15	18
Chromium III	DETSC 2301*	0.15	mg/kg	14	21	15	18
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	14	11	20	13
Lead	DETSC 2301#	0.3	mg/kg	39	21	26	41
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Nickel	DETSC 2301#	1	mg/kg	16	12	20	16
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	97	48	63	85
Inorganics							
pH	DETSC 2008#			11.5	10.9	9.0	11.5
Cyanide total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Organic matter	DETSC 2002#	0.1	%	0.7	4.5	1.9	1.0
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.15	0.06	0.12	0.11
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	7.1	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	15	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	9.8	150	17	19
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	180	17	19
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	0.03	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	0.10	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	2.5	14	< 0.6	0.8
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	19	260	< 1.4	15
Aromatic C5-C35	DETSC 3072*	10	mg/kg	22	270	< 10	16
TPH Ali/Aro	DETSC 3072*	10	mg/kg	32	450	17	34

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Summary of Chemical Analysis
Soil Samples

Our Ref 15-27519
Client Ref 12032-SP1
Contract Title Herbert Road Stockpile - Round 1

			Lab No	769711	769712	769713	769714
			Sample ID	S33	S34	S35	S36
			Depth				
			Other ID				
			Sample Type	SOIL	SOIL	SOIL	SOIL
			Sampling Date	16/02/15	16/02/15	16/02/15	16/02/15
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
PAHs							
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.21	0.22	< 0.03	0.10
Anthracene	DETSC 3303	0.03	mg/kg	0.07	0.04	< 0.03	0.04
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.41	0.17	0.07	0.20
Pyrene	DETSC 3303#	0.03	mg/kg	0.36	0.17	0.06	0.18
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.18	0.08	< 0.03	0.09
Chrysene	DETSC 3303	0.03	mg/kg	0.20	0.20	< 0.03	0.10
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.22	0.13	0.04	0.12
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.08	0.04	< 0.03	0.04
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.19	0.08	< 0.03	0.09
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.11	0.08	< 0.03	0.06
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.10	0.05	< 0.03	0.05
Total PAH - USEPA 16	DETSC 3303	0.1	mg/kg	2.1	1.3	0.17	1.1
Phenols							
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	0.3	< 0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 15-27519
Client Ref 12032-SP1
Contract Title Herbert Road Stockpile - Round 1

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
769704	S26	SOIL	NAD	none	Jeff Cruddas
769705	S27	SOIL	NAD	none	Jeff Cruddas
769706	S28	SOIL	NAD	none	Jeff Cruddas
769707	S29	SOIL	NAD	none	Jeff Cruddas
769708	S30	SOIL	NAD	none	Jeff Cruddas
769709	S31	SOIL	NAD	none	Jeff Cruddas
769710	S32	SOIL	Amosite	Amosite present as fibre bundles	Jeff Cruddas
769711	S33	SOIL	NAD	none	Jeff Cruddas
769712	S34	SOIL	NAD	none	Jeff Cruddas
769713	S35	SOIL	NAD	none	Jeff Cruddas
769714	S36	SOIL	NAD	none	Jeff Cruddas

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * -not included in laboratory scope of accreditation.

Summary of Asbestos Quantification Analysis
Soil Samples

Our Ref 15-27519
Client Ref 12032-SP1
Contract Title Herbert Road Stockpile - Round 1

Lab No	769710
Sample ID	S32
Depth	
Other ID	
Sample Type	SOIL
Sampling Date	16/02/15
Sampling Time	

Test	**Method**	**Units**	
Total Mass% Asbestos (a+b+c)	DETSC 1102	Mass %	**< 0.001**
Gravimetric Quantification (a)	DETSC 1102	Mass %	na
Detailed Gravimetric Quantification (b)	DETSC 1102	Mass %	<0.001
Quantification by PCOM (c)	DETSC 1102	Mass %	na
Potentially Respirable Fibres (d)	DETSC 1102	Fibres/g	na
Breakdown of Gravimetric Analysis (a)			
Mass of Sample		g	946.82
ACMs present*		type	
Mass of ACM in sample		g	
% ACM by mass		%	
% asbestos in ACM		%	
% asbestos in sample		%	
Breakdown of Detailed Gravimetric Analysis (b)			
% Amphibole bundles in sample		Mass %	<0.001
% Serpentine bundles in sample		Mass %	na
Breakdown of PCOM Analysis (c)			
% Amphibole fibres in sample		Mass %	na
% Serpentine fibres in sample		Mass %	na
Breakdown of Potentially Respirable Fibre Analysis (d)			
Amphibole fibres		Fibres/g	na
Chrysotile fibres		Fibres/g	na

* Denotes test or material description outside of UKAS accreditation.
% asbestos in Asbestos Containing Materials (ACMs) is determined by
by reference to HSG 264.
Recommended sample size for quantification is approximately 1kg
# denotes deviating sample

Information in Support of the Analytical Results

Our Ref 15-27519
Client Ref 12032-SP1
Contract Herbert Road Stockpile - Round 1

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
769704	S26 SOIL	16/02/15	GJ 1L, GJ 60ml, PT 1L x2		
769705	S27 SOIL	16/02/15	GJ 250ml x2, GJ 60ml, PT 1L x2		
769706	S28 SOIL	16/02/15	GJ 250ml x2, GJ 60ml, PT 1L x2		
769707	S29 SOIL	16/02/15	GJ 250ml x2, GJ 60ml, PT 1L x2		
769708	S30 SOIL	16/02/15	GJ 250ml x2, GJ 60ml, PT 1L x2		
769709	S31 SOIL	16/02/15	GJ 250ml x2, GJ 60ml, PT 1L x2		
769710	S32 SOIL	16/02/15	GJ 250ml x2, GJ 60ml, PT 1L x2		
769711	S33 SOIL	16/02/15	GJ 250ml x2, GJ 60ml, PT 1L x2		
769712	S34 SOIL	16/02/15	GJ 250ml x2, GJ 60ml, PT 1L x2		
769713	S35 SOIL	16/02/15	GJ 250ml x2, GJ 60ml, PT 1L x2		
769714	S36 SOIL	16/02/15	GJ 250ml x2, PT 1L x2		

Key: G-Glass P-Plastic J-Jar T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO4	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO4	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETSC2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

ANNEX C
Lower Half of Riversee Limited Stockpile
DETS test certificates 40034-2 & 40314

Certificate of Analysis

Certificate Number 15-40034-2

05-Aug-15

Client Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference 15-40034-2

Client Reference 12032

Contract Title Herbert Road

Description 32 Soil samples, 32 Leachate samples.

Date Received 10-Jul-15

Date Started 10-Jul-15

Date Completed 05-Aug-15

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

Notes **This report supersedes 15-40034. Extra testing.**
Opinions and interpretations are outside the scope of UKAS accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. Observations and interpretations are outside the scope of ISO 17025. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By [redacted]

Rob Brown
Business Manager

2139

Summary of Chemical Analysis
Matrix Descriptions

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

Sample ID	Depth	Lab No	Completed	Matrix Description
TP1	1	837846	27/07/2015	Brown, gravelly, sandy CLAY
TP1	2	837847	27/07/2015	Dark brown, gravelly, sandy CLAY
TP1	3	837848	27/07/2015	Dark brown, gravelly, sandy CLAY
TP2	1	837849	27/07/2015	Dark brown, gravelly, sandy CLAY
TP2	2	837850	27/07/2015	Dark brown, gravelly, sandy CLAY
TP2	2.9	837851	27/07/2015	Dark brown, gravelly, sandy CLAY
TP3	0.5	837852	27/07/2015	Dark brown, gravelly, sandy CLAY
TP3	1.5	837853	27/07/2015	Dark brown, gravelly, sandy CLAY
TP3	3.5	837854	27/07/2015	Dark brown, gravelly, sandy CLAY
TP4	0.5	837855	27/07/2015	Dark brown, gravelly, sandy CLAY
TP4	2	837856	27/07/2015	Dark brown, gravelly, sandy CLAY
TP4	3	837857	27/07/2015	Dark brown, gravelly, sandy CLAY
TP5	1	837858	27/07/2015	Dark brown, gravelly, sandy CLAY including odd rootlets (Made ground - ceramic)
TP5	2	837859	27/07/2015	Dark brown, gravelly, sandy CLAY including odd rootlets
TP5	3	837860	27/07/2015	Dark brown, gravelly, sandy CLAY including odd rootlets (Made ground - brick)
TP6	0.5	837861	27/07/2015	Dark brown, gravelly, sandy CLAY
TP6	2	837862	27/07/2015	Dark brown, gravelly, sandy CLAY
TP6	3	837863	27/07/2015	Dark brown, gravelly, sandy CLAY
TP7	0.3	837864	27/07/2015	Dark brown, gravelly, sandy CLAY including odd rootlets
TP7	0.6	837865	27/07/2015	Dark brown, gravelly, sandy CLAY
TP7	2	837866	27/07/2015	Dark brown, gravelly, sandy CLAY
TP8	0.5	837867	27/07/2015	Dark brown, gravelly, sandy CLAY
TP8	2	837868	27/07/2015	Dark brown, gravelly, sandy CLAY
TP8	2.5	837869	27/07/2015	Very dark brown gravelly, sandy CLAY including odd rootlets
TP9	0.3	837870	27/07/2015	Dark brown, gravelly, sandy CLAY including odd rootlets
TP9	1	837871	27/07/2015	Brown, gravelly, sandy CLAY including odd rootlets
TP9	1.6	837872	27/07/2015	Dark brown, gravelly, sandy CLAY (Made ground -brick)
TP10	0.5	837873	27/07/2015	Dark brown, gravelly, sandy CLAY including odd rootlets (Made ground - brick)
TP10	1.4	837874	27/07/2015	Brown, gravelly, sandy CLAY
TP10	2.2	837875	27/07/2015	Dark brown, gravelly, sandy CLAY
TP11	0.5	837876	27/07/2015	Dark brown, gravelly, sandy CLAY
TP11	1	837877	27/07/2015	Dark brown, gravelly, sandy CLAY

Summary of Chemical Analysis
Soil Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	837846	837847	837848	837849	837850	837851
			Sample ID	TP1	TP1	TP1	TP2	TP2	TP2
			Depth	1.00	2.00	3.00	1.00	2.00	2.90
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Asbestos Quantification OHR	DETSC 1102	0				Y		Y	Y
Preparation									
Moisture Content	DETSC 1004*	0.1	%	15	18	18	15	21	17
Metals									
Antimony	DETSC 2301*	1	mg/kg	1.7	3.0	2.2	2.0	2.6	2.0
Arsenic	DETSC 2301#	0.2	mg/kg	6.2	9.9	7.5	11	9.9	7.4
Beryllium	DETSC 2301#	0.2	mg/kg	0.6	1.1	1.2	1.2	1.1	1.2
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	1.1	1.2	1.0	1.2	1.2	1.2
Cadmium	DETSC 2301#	0.1	mg/kg	0.5	0.6	0.8	0.4	0.5	0.4
Chromium	DETSC 2301#	0.15	mg/kg	23	65	39	33	29	23
Chromium III	DETSC 2301*	0.15	mg/kg	23	65	39	33	29	23
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	14	41	33	23	32	40
Lead	DETSC 2301#	0.3	mg/kg	53	39	34	31	60	59
Manganese	DETSC 2301#	20	mg/kg	730	940	1100	860	770	600
Mercury	DETSC 2325#	0.05	mg/kg	0.06	0.14	0.10	0.11	0.27	0.19
Molybdenum	DETSC 2301#	0.4	mg/kg	1.1	4.9	1.2	0.9	1.9	1.0
Nickel	DETSC 2301#	1	mg/kg	17	44	30	21	26	29
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	0.8	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	55	100	89	74	90	78
Inorganics									
pH	DETSC 2008#			8.8	8.9	8.8	10.4	8.9	8.7
Cyanide Total	DETSC 2130#	0.1	mg/kg	0.1	0.2	0.2	0.1	0.2	0.1
Cyanide complex	DETSC 2130*	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Organic matter	DETSC 2002#	0.1	%	1.4	5.3	1.6	6.6	5.8	7.7
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.09	0.09	0.19	0.41	0.12	0.06

Key: * -not accredited. # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	837846	837847	837848	837849	837850	837851
			Sample ID	TP1	TP1	TP1	TP2	TP2	TP2
			Depth	1.00	2.00	3.00	1.00	2.00	2.90
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	2.0	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	4.1	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	19	11	< 3.4	< 3.4	< 3.4
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	19	11	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.12
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	1.7	4.4	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	35	37	< 1.4	< 1.4	< 1.4
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	37	41	< 10	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	mg/kg	< 10	56	53	< 10	< 10	< 10
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	1.3
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.09
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.09
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.06	0.09	0.09	0.03	0.06	0.44
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.09
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.13	0.18	0.22	0.05	0.08	0.43
Pyrene	DETSC 3303#	0.03	mg/kg	0.10	0.13	0.20	0.05	0.07	0.34
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.05	0.06	0.11	< 0.03	< 0.03	0.13
Chrysene	DETSC 3303	0.03	mg/kg	0.06	0.08	0.12	< 0.03	< 0.03	0.13
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.07	0.07	0.14	< 0.03	< 0.03	0.10
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.05	< 0.03	< 0.03	0.04
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.03	0.05	0.09	< 0.03	< 0.03	0.07
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.04	0.07	< 0.03	< 0.03	0.04
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	0.04	0.07	< 0.03	< 0.03	< 0.03
Total PAH - USEPA 16	DETSC 3303	0.1	mg/kg	0.50	0.73	1.2	0.13	0.22	3.3
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

				Lab No	837852	837853	837854	837855	837856	837857
				Sample ID	TP3	TP3	TP3	TP4	TP4	TP4
				Depth	0.50	1.50	3.50	0.50	2.00	3.00
				Other ID						
				Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Sampling Date	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15
				Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**							
Asbestos Quantification OHR	DETSC 1102	0					Y	Y	Y
Preparation										
Moisture Content	DETSC 1004*	0.1	%	15	20	15	17	15	19
Metals										
Antimony	DETSC 2301*	1	mg/kg	2.1	2.4	1.6	2.2	1.7	2.4
Arsenic	DETSC 2301#	0.2	mg/kg	9.9	13	8.3	22	8.1	8.6
Beryllium	DETSC 2301#	0.2	mg/kg	0.8	1.1	1.1	0.7	0.7	0.8
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	0.5	1.1	1.2	1.2	1.2	1.0
Cadmium	DETSC 2301#	0.1	mg/kg	0.4	0.6	3.0	0.6	1.1	0.4
Chromium	DETSC 2301#	0.15	mg/kg	21	25	20	19	20	30
Chromium III	DETSC 2301*	0.15	mg/kg	21	25	20	19	20	30
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	21	31	39	36	26	19
Lead	DETSC 2301#	0.3	mg/kg	27	45	130	59	37	330
Manganese	DETSC 2301#	20	mg/kg	550	890	980	630	640	730
Mercury	DETSC 2325#	0.05	mg/kg	0.07	0.14	0.20	0.17	0.10	0.10
Molybdenum	DETSC 2301#	0.4	mg/kg	0.9	1.1	0.8	1.2	0.8	0.9
Nickel	DETSC 2301#	1	mg/kg	24	25	16	20	20	30
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	0.6	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	70	96	180	110	83	89
Inorganics										
pH	DETSC 2008#			8.4	8.7	9.1	8.4	8.9	8.6
Cyanide Total	DETSC 2130#	0.1	mg/kg	0.1	0.2	0.1	0.2	0.1	0.2
Cyanide complex	DETSC 2130*	0.2	mg/kg	< 0.2	< 0.2	< 0.2	0.2	< 0.2	< 0.2
Organic matter	DETSC 2002#	0.1	%	2.4	7.2	5.2	3.1	3.1	1.2
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.06	0.10	0.28	0.08	0.08	0.07

Key: * -not accredited. # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	837852	837853	837854	837855	837856	837857
			Sample ID	TP3	TP3	TP3	TP4	TP4	TP4
			Depth	0.50	1.50	3.50	0.50	2.00	3.00
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	12	< 3.4	< 3.4	< 3.4
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	12	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	5.2	< 0.6	< 0.6	2.2
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	50	< 1.4	< 1.4	10
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	55	< 10	< 10	13
TPH Ali/Aro	DETSC 3072*	10	mg/kg	< 10	< 10	67	< 10	< 10	13
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.08	0.18	0.06	0.27	< 0.03
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	0.06	< 0.03	0.06	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	0.13	0.77	0.06	0.52	0.23
Pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.11	0.62	0.05	0.40	0.24
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	0.05	0.31	< 0.03	0.15	0.12
Chrysene	DETSC 3303	0.03	mg/kg	< 0.03	0.06	0.35	< 0.03	0.16	0.14
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	0.06	0.38	< 0.03	0.13	0.26
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.15	< 0.03	0.05	0.08
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.04	0.26	< 0.03	0.08	0.21
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.17	< 0.03	0.06	0.13
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.06	< 0.03	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.21	< 0.03	0.05	0.17
Total PAH - USEPA 16	DETSC 3303	0.1	mg/kg	< 0.10	0.53	3.5	0.16	2.0	1.6
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

				Lab No	837858	837859	837860	837861	837862	837863
				Sample ID	TP5	TP5	TP5	TP6	TP6	TP6
				Depth	1.00	2.00	3.00	0.50	2.00	3.00
				Other ID						
				Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Sampling Date	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15
				Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**							
Asbestos Quantification OHR	DETSC 1102	0				Y		Y	Y
Preparation										
Moisture Content	DETSC 1004*	0.1	%	17	23	30	17	21	21
Metals										
Antimony	DETSC 2301*	1	mg/kg	2.7	2.5	2.8	2.0	3.3	2.4
Arsenic	DETSC 2301#	0.2	mg/kg	7.1	23	15	9.6	13	12
Beryllium	DETSC 2301#	0.2	mg/kg	0.9	0.8	0.7	0.8	0.7	0.7
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	2.7	1.6	2.1	1.6	1.7	1.8
Cadmium	DETSC 2301#	0.1	mg/kg	0.9	0.7	0.6	0.5	0.5	0.5
Chromium	DETSC 2301#	0.15	mg/kg	130	25	28	25	20	25
Chromium III	DETSC 2301*	0.15	mg/kg	130	25	28	25	20	25
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	16	71	37	24	140	48
Lead	DETSC 2301#	0.3	mg/kg	31	81	64	38	130	76
Manganese	DETSC 2301#	20	mg/kg	1700	660	920	780	670	680
Mercury	DETSC 2325#	0.05	mg/kg	0.18	0.23	0.23	0.09	0.34	0.21
Molybdenum	DETSC 2301#	0.4	mg/kg	1.2	1.3	1.3	0.8	1.3	1.2
Nickel	DETSC 2301#	1	mg/kg	14	19	19	23	22	18
Selenium	DETSC 2301#	0.5	mg/kg	0.8	< 0.5	0.5	< 0.5	0.6	< 0.5
Zinc	DETSC 2301#	1	mg/kg	130	150	110	70	140	110
Inorganics										
pH	DETSC 2008#			9.6	8.3	8.3	9.2	9.2	8.6
Cyanide Total	DETSC 2130#	0.1	mg/kg	0.2	0.3	0.5	0.2	0.2	0.2
Cyanide complex	DETSC 2130*	0.2	mg/kg	< 0.2	< 0.2	0.3	< 0.2	0.2	0.2
Organic matter	DETSC 2002#	0.1	%	2.5	5.8	5.0	2.1	4.5	3.8
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.23	0.09	0.12	0.11	0.12	0.09

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Summary of Chemical Analysis
Soil Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	837858	837859	837860	837861	837862	837863
			Sample ID	TP5	TP5	TP5	TP6	TP6	TP6
			Depth	1.00	2.00	3.00	0.50	2.00	3.00
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	0.10	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	0.12	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	1.8	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	3.7	8.8	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	6.7	7.7	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	19	17	< 3.4	9.6	< 3.4	< 3.4
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	8.8	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	19	28	19	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	0.12	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	12	1.7	< 0.6	< 0.6	1.9	5.8
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	90	16	< 1.4	< 1.4	3.6	8.8
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	38	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	100	18	< 10	< 10	< 10	15
TPH Ali/Aro	DETSC 3072*	10	mg/kg	120	46	19	< 10	< 10	15
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	0.04	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	0.05	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.20	0.09	0.16	< 0.03	0.29	0.19
Anthracene	DETSC 3303	0.03	mg/kg	0.05	< 0.03	< 0.03	< 0.03	0.06	0.04
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.36	0.18	0.29	< 0.03	0.52	0.41
Pyrene	DETSC 3303#	0.03	mg/kg	0.26	0.16	0.22	< 0.03	0.43	0.33
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.12	0.09	0.10	< 0.03	0.19	0.16
Chrysene	DETSC 3303	0.03	mg/kg	0.14	0.10	0.16	< 0.03	0.23	0.18
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.14	0.12	0.16	< 0.03	0.24	0.22
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.05	0.04	0.05	< 0.03	0.07	0.07
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.08	0.09	0.09	< 0.03	0.15	0.13
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.06	0.05	0.05	< 0.03	0.09	0.07
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.05	0.05	0.06	< 0.03	0.09	0.07
Total PAH - USEPA 16	DETSC 3303	0.1	mg/kg	1.6	0.96	1.3	< 0.10	2.4	1.9
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

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Summary of Chemical Analysis
Soil Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	837864	837865	837866	837867	837868	837869
			Sample ID	TP7	TP7	TP7	TP8	TP8	TP8
			Depth	0.30	0.60	2.00	0.50	2.00	2.50
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Asbestos Quantification OHR	DETSC 1102	0		Y	Y				Y
Preparation									
Moisture Content	DETSC 1004*	0.1	%	16	12	29	16	16	14
Metals									
Antimony	DETSC 2301*	1	mg/kg	2.0	1.3	1.9	2.3	1.9	1.6
Arsenic	DETSC 2301#	0.2	mg/kg	10	4.3	10	13	6.7	9.1
Beryllium	DETSC 2301#	0.2	mg/kg	0.9	0.5	1.1	1.2	0.8	0.9
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	1.4	1.5	2.0	1.5	1.2	1.8
Cadmium	DETSC 2301#	0.1	mg/kg	0.6	0.6	0.5	0.4	1.6	0.3
Chromium	DETSC 2301#	0.15	mg/kg	25	19	26	35	27	31
Chromium III	DETSC 2301*	0.15	mg/kg	25	19	26	35	27	31
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	24	11	32	34	17	24
Lead	DETSC 2301#	0.3	mg/kg	43	20	20	90	95	20
Manganese	DETSC 2301#	20	mg/kg	820	510	590	690	830	930
Mercury	DETSC 2325#	0.05	mg/kg	0.15	< 0.05	0.07	0.20	0.09	< 0.05
Molybdenum	DETSC 2301#	0.4	mg/kg	0.8	0.5	3.6	1.2	0.6	0.9
Nickel	DETSC 2301#	1	mg/kg	27	18	30	27	24	22
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	97	52	77	95	130	60
Inorganics									
pH	DETSC 2008#			8.8	11.5	8.5	8.7	9.4	10.2
Cyanide Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	0.1	0.2	< 0.1	< 0.1
Cyanide complex	DETSC 2130*	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Organic matter	DETSC 2002#	0.1	%	2.4	1.6	1.5	5.8	0.9	10
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.11	0.22	0.10	0.11	0.12	0.10

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Summary of Chemical Analysis
Soil Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	837864	837865	837866	837867	837868	837869
			Sample ID	TP7	TP7	TP7	TP8	TP8	TP8
			Depth	0.30	0.60	2.00	0.50	2.00	2.50
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.17
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	0.01	< 0.01	< 0.01	< 0.01	0.05
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	2.7
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	5.9	< 3.4	< 3.4	< 3.4	< 3.4	66
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	15
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	69
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.03
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	0.01	< 0.01	< 0.01	< 0.01	0.05
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	9.1
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	140
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	41
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	150
TPH Ali/Aro	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	220
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	0.05	< 0.03	< 0.03	< 0.03	< 0.03	0.05
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.23	0.18	< 0.03	0.10	< 0.03	0.14
Anthracene	DETSC 3303	0.03	mg/kg	0.05	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.34	0.21	< 0.03	0.16	< 0.03	0.13
Pyrene	DETSC 3303#	0.03	mg/kg	0.27	0.17	< 0.03	0.14	< 0.03	0.13
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.13	0.10	< 0.03	0.07	< 0.03	0.06
Chrysene	DETSC 3303	0.03	mg/kg	0.15	0.11	< 0.03	0.07	< 0.03	0.14
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.16	0.10	< 0.03	0.09	< 0.03	0.09
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.06	0.03	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.09	0.07	< 0.03	0.06	< 0.03	0.05
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.06	0.03	< 0.03	0.03	< 0.03	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.06	0.04	< 0.03	0.03	< 0.03	0.05
Total PAH - USEPA 16	DETSC 3303	0.1	mg/kg	1.6	1.1	< 0.10	0.77	< 0.10	0.81
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

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Summary of Chemical Analysis
Soil Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

				Lab No	837870	837871	837872	837873	837874	837875
				Sample ID	TP9	TP9	TP9	TP10	TP10	TP10
				Depth	0.30	1.00	1.60	0.50	1.40	2.20
				Other ID						
				Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Sampling Date	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15
				Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**							
Asbestos Quantification OHR	DETSC 1102	0		Y		Y	Y		Y
Preparation										
Moisture Content	DETSC 1004*	0.1	%	14	15	21	13	17	21
Metals										
Antimony	DETSC 2301*	1	mg/kg	1.7	2.9	2.9	2.2	1.5	1.9
Arsenic	DETSC 2301#	0.2	mg/kg	7.1	6.8	9.3	8.8	4.2	8.7
Beryllium	DETSC 2301#	0.2	mg/kg	1.3	1.0	0.8	1.0	0.8	0.9
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	2.1	1.4	1.9	1.3	1.5	2.0
Cadmium	DETSC 2301#	0.1	mg/kg	0.5	0.5	0.5	0.4	0.6	0.3
Chromium	DETSC 2301#	0.15	mg/kg	34	36	27	31	29	29
Chromium III	DETSC 2301*	0.15	mg/kg	34	36	27	31	29	29
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	24	15	21	18	8.9	25
Lead	DETSC 2301#	0.3	mg/kg	28	43	69	35	30	70
Manganese	DETSC 2301#	20	mg/kg	1200	810	570	820	530	830
Mercury	DETSC 2325#	0.05	mg/kg	0.07	< 0.05	0.09	0.09	< 0.05	0.24
Molybdenum	DETSC 2301#	0.4	mg/kg	0.8	0.5	0.7	0.8	0.6	0.9
Nickel	DETSC 2301#	1	mg/kg	20	29	22	26	25	20
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	77	86	110	110	68	85
Inorganics										
pH	DETSC 2008#			10.0	9.0	9.7	8.4	11.2	9.8
Cyanide Total	DETSC 2130#	0.1	mg/kg	< 0.1	0.2	0.2	0.2	< 0.1	0.2
Cyanide complex	DETSC 2130*	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Organic matter	DETSC 2002#	0.1	%	6.4	1.3	1.5	2.3	0.5	6.2
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.41	0.09	0.18	0.07	0.21	0.17

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Summary of Chemical Analysis
Soil Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	837870	837871	837872	837873	837874	837875
			Sample ID	TP9	TP9	TP9	TP10	TP10	TP10
			Depth	0.30	1.00	1.60	0.50	1.40	2.20
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	9.9	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	140	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	36	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	150	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	25	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	290	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	94	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	320	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	mg/kg	470	< 10	< 10	< 10	< 10	< 10
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	0.25	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	0.08	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	0.08	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.58	0.08	0.13	0.20	0.25	< 0.03
Anthracene	DETSC 3303	0.03	mg/kg	0.10	< 0.03	< 0.03	0.06	0.05	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.51	0.20	0.31	0.41	0.49	< 0.03
Pyrene	DETSC 3303#	0.03	mg/kg	0.40	0.16	0.27	0.33	0.44	< 0.03
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.18	0.07	0.11	0.16	0.19	< 0.03
Chrysene	DETSC 3303	0.03	mg/kg	0.24	0.07	0.13	0.19	0.20	< 0.03
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.22	0.07	0.18	0.23	0.27	< 0.03
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.07	< 0.03	0.07	0.08	0.08	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.16	0.05	0.13	0.12	0.19	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.13	< 0.03	0.08	0.08	0.11	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.20	< 0.03	0.10	0.08	0.12	< 0.03
Total PAH - USEPA 16	DETSC 3303	0.1	mg/kg	3.2	0.69	1.5	1.9	2.4	< 0.10
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	0.8

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Summary of Chemical Analysis
Soil Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	837876	837877
			Sample ID	TP11	TP11
			Depth	0.50	1.00
			Other ID		
			Sample Type	SOIL	SOIL
			Sampling Date	08/07/15	08/07/15
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Asbestos Quantification OHR	DETSC 1102	0		Y	
Preparation					
Moisture Content	DETSC 1004*	0.1	%	14	18
Metals					
Antimony	DETSC 2301*	1	mg/kg	1.8	2.8
Arsenic	DETSC 2301#	0.2	mg/kg	9.4	6.2
Beryllium	DETSC 2301#	0.2	mg/kg	0.7	0.9
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	1.3	1.5
Cadmium	DETSC 2301#	0.1	mg/kg	0.4	0.6
Chromium	DETSC 2301#	0.15	mg/kg	18	29
Chromium III	DETSC 2301*	0.15	mg/kg	18	29
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	20	28
Lead	DETSC 2301#	0.3	mg/kg	47	35
Manganese	DETSC 2301#	20	mg/kg	690	800
Mercury	DETSC 2325#	0.05	mg/kg	0.13	0.06
Molybdenum	DETSC 2301#	0.4	mg/kg	0.8	0.5
Nickel	DETSC 2301#	1	mg/kg	20	29
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	85	96
Inorganics					
pH	DETSC 2008#			9.3	8.4
Cyanide Total	DETSC 2130#	0.1	mg/kg	0.2	0.2
Cyanide complex	DETSC 2130*	0.2	mg/kg	< 0.2	< 0.2
Organic matter	DETSC 2002#	0.1	%	2.0	1.4
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.16	0.06

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Summary of Chemical Analysis
Soil Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	837876	837877
			Sample ID	TP11	TP11
			Depth	0.50	1.00
			Other ID		
			Sample Type	SOIL	SOIL
			Sampling Date	08/07/15	08/07/15
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Petroleum Hydrocarbons					
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	57	< 3.4
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	14	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	57	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	1.9	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	110	< 1.4
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	33	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	110	< 10
TPH Ali/Aro	DETSC 3072*	10	mg/kg	170	< 10
PAHs					
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.13	0.05
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.26	0.09
Pyrene	DETSC 3303#	0.03	mg/kg	0.24	0.08
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.11	0.04
Chrysene	DETSC 3303	0.03	mg/kg	0.14	0.04
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.16	< 0.03
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.07	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.11	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.07	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.08	< 0.03
Total PAH - USEPA 16	DETSC 3303	0.1	mg/kg	1.4	0.30
Phenols					
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3

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Summary of Chemical Analysis
Leachate Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	837878	837879	837880	837881	837882	837883
			Sample ID	TP1	TP1	TP1	TP2	TP2	TP2
			Depth	1.00	2.00	3.00	1.00	2.00	2.90
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Preparation									
NRA Leachate Preparation	DETS 036*			Y	Y	Y	Y	Y	Y
Metals									
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	2.5	2.3	1.3	1.1	1.3	1.3
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03	0.09	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	1.0	0.26	< 0.25	< 0.25	< 0.25	< 0.25
Chromium III Dissolved	DETSC 2302*	1	ug/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexavalent Chromium	DETSC 2203	3	ug/l	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	3.3	2.8	1.9	1.2	2.0	1.6
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.72	0.70	0.37	0.13	0.66	0.57
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	0.9	0.8	< 0.5	0.6	0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.33	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Zinc, Dissolved	DETSC 2306	1.25	ug/l	1.67	1.42	1.29	2.45	1.52	1.38
Inorganics									
pH	DETSC 2008			8.2	7.7	7.6	7.5	7.7	7.6
Cyanide Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	1.1	0.81	0.93	1.2	0.95	0.93
Fluoride	DETSC 2055	0.1	mg/l	0.13	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	8.8	5.3	5.6	8.2	6.2	3.0
Total Organic Carbon	DETSC 2085	1	mg/l	4.1	3.7	2.5	1.8	2.8	2.2
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	837878	837879	837880	837881	837882	837883
			Sample ID	TP1	TP1	TP1	TP2	TP2	TP2
			Depth	1.00	2.00	3.00	1.00	2.00	2.90
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PAHs									
Naphthalene	DETSC 3304	0.01	ug/l	0.03	0.03	0.04	0.04	0.04	0.04
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01
Fluorene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.02	< 0.01	0.01	0.02
Phenanthrene	DETSC 3304	0.01	ug/l	0.03	0.02	0.07	0.05	0.05	0.06
Anthracene	DETSC 3304	0.01	ug/l	< 0.01	0.01	0.02	0.01	0.01	0.01
Fluoranthene	DETSC 3304	0.01	ug/l	0.04	0.05	0.06	0.06	0.05	0.06
Pyrene	DETSC 3304	0.01	ug/l	0.05	0.05	0.05	0.06	0.05	0.05
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	0.03	0.05	0.04	0.03	0.02	0.04
Chrysene	DETSC 3304	0.01	ug/l	0.03	0.05	0.06	0.04	0.03	0.04
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	0.12	0.09	0.03	0.03	0.04
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	0.04	0.03	0.01	< 0.01	0.02
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	0.11	0.06	0.03	0.02	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	0.02	0.09	0.06	0.02	< 0.01	0.02
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	0.05	0.20	0.08	0.02	< 0.01	0.04
PAH	DETSC 3304	0.04	ug/l	0.30	0.81	0.71	0.41	0.33	0.43
Phenols									
Phenol	*	0.5	ug/l	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	837884	837885	837886	837887	837888	837889
			Sample ID	TP3	TP3	TP3	TP4	TP4	TP4
			Depth	0.50	1.50	3.50	0.50	2.00	3.00
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Preparation									
NRA Leachate Preparation	DETS 036*			Y	Y	Y	Y	Y	Y
Metals									
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	0.90	1.5	0.68	1.2	1.6	1.5
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	0.07	< 0.03	< 0.03	0.47
Chromium, Dissolved	DETSC 2306	0.25	ug/l	0.40	< 0.25	< 0.25	0.55	< 0.25	< 0.25
Chromium III Dissolved	DETSC 2302*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexavalent Chromium	DETSC 2203	3	ug/l	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.3	2.1	1.1	2.4	1.6	0.9
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.47	0.81	0.65	0.96	0.40	0.30
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	< 0.5	< 0.5	0.5	< 0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Zinc, Dissolved	DETSC 2306	1.25	ug/l	2.20	< 1.25	2.61	3.09	< 1.25	3.26
Inorganics									
pH	DETSC 2008			7.6	7.7	7.6	7.6	7.5	7.5
Cyanide Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	1.1	0.89	0.83	0.94	0.94	0.73
Fluoride	DETSC 2055	0.1	mg/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	6.2	3.1	4.8	8.0	9.6	5.1
Total Organic Carbon	DETSC 2085	1	mg/l	2.5	2.5	1.6	3.9	3.0	1.7
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	837884	837885	837886	837887	837888	837889
			Sample ID	TP3	TP3	TP3	TP4	TP4	TP4
			Depth	0.50	1.50	3.50	0.50	2.00	3.00
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PAHs									
Naphthalene	DETSC 3304	0.01	ug/l	0.03	0.04	0.04	0.04	0.05	0.03
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.01	< 0.01	0.01	0.01
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.02	< 0.01	0.01	0.03
Fluorene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.01	< 0.01	0.02	0.02
Phenanthrene	DETSC 3304	0.01	ug/l	0.02	0.06	0.06	0.03	0.07	0.04
Anthracene	DETSC 3304	0.01	ug/l	< 0.01	0.01	0.02	< 0.01	0.02	0.02
Fluoranthene	DETSC 3304	0.01	ug/l	0.02	0.07	0.11	0.03	0.07	0.08
Pyrene	DETSC 3304	0.01	ug/l	0.02	0.07	0.12	0.03	0.08	0.11
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	< 0.01	0.02	0.10	0.02	0.04	0.05
Chrysene	DETSC 3304	0.01	ug/l	< 0.01	0.05	0.11	0.02	0.04	0.05
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	0.07	0.11	0.03	0.05	0.13
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	0.04	0.05	0.01	0.02	0.05
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	0.05	0.11	0.02	0.03	0.10
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	< 0.01	0.03	0.15	0.02	0.03	0.17
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.05	< 0.01	0.01	0.03
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	< 0.01	0.03	0.22	0.02	0.04	0.21
PAH	DETSC 3304	0.04	ug/l	0.10	0.53	1.3	0.27	0.58	1.1
Phenols									
Phenol	*	0.5	ug/l	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	837890	837891	837892	837893	837894	837895
			Sample ID	TP5	TP5	TP5	TP6	TP6	TP6
			Depth	1.00	2.00	3.00	0.50	2.00	3.00
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Preparation									
NRA Leachate Preparation	DETS 036*			Y	Y	Y	Y	Y	Y
Metals									
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	5.0	1.4	3.7	0.61	2.7	1.8
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03	0.12	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25	0.37	< 0.25	0.29	0.81
Chromium III Dissolved	DETSC 2302*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexavalent Chromium	DETSC 2203	3	ug/l	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	5.7	2.6	9.2	2.0	4.2	3.5
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.67	1.1	3.3	0.66	2.4	1.4
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	1.8	0.6	1.0	0.7	0.7	0.6
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.67	< 0.25	0.35	< 0.25	< 0.25	< 0.25
Zinc, Dissolved	DETSC 2306	1.25	ug/l	< 1.25	1.55	2.32	1.43	3.11	1.69
Inorganics									
pH	DETSC 2008			7.7	7.7	7.6	7.7	7.5	7.3
Cyanide Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	1.5	1.8	1.3	1.2	1.2	1.2
Fluoride	DETSC 2055	0.1	mg/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	3.5	6.2	8.8	9.1	4.7	5.8
Total Organic Carbon	DETSC 2085	1	mg/l	5.0	3.9	6.6	4.1	3.1	6.8
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	0.6	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	837890	837891	837892	837893	837894	837895
			Sample ID	TP5	TP5	TP5	TP6	TP6	TP6
			Depth	1.00	2.00	3.00	0.50	2.00	3.00
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PAHs									
Naphthalene	DETSC 3304	0.01	ug/l	0.07	0.04	0.05	0.03	0.04	0.04
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	0.10	0.01	0.02	< 0.01	0.01	0.01
Fluorene	DETSC 3304	0.01	ug/l	0.04	0.01	0.02	< 0.01	0.01	0.01
Phenanthrene	DETSC 3304	0.01	ug/l	0.06	0.04	0.07	0.03	0.06	0.06
Anthracene	DETSC 3304	0.01	ug/l	0.02	0.01	0.02	< 0.01	0.02	0.01
Fluoranthene	DETSC 3304	0.01	ug/l	0.07	0.06	0.11	0.04	0.07	0.08
Pyrene	DETSC 3304	0.01	ug/l	0.07	0.05	0.11	0.04	0.07	0.06
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	0.04	0.03	0.07	0.02	0.04	0.04
Chrysene	DETSC 3304	0.01	ug/l	0.04	0.04	0.06	0.02	0.05	0.05
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	0.05	0.06	0.09	0.03	0.10	0.08
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	0.02	0.02	0.03	0.01	0.03	0.03
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	0.03	0.03	0.05	0.02	0.06	0.04
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	0.04	0.04	0.06	0.01	0.07	0.06
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.02	< 0.01	0.02	0.02
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	0.05	0.04	0.08	0.02	0.07	0.06
PAH	DETSC 3304	0.04	ug/l	0.70	0.48	0.86	0.28	0.70	0.64
Phenols									
Phenol	*	0.5	ug/l	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	837896	837897	837898	837899	837900	837901
			Sample ID	TP7	TP7	TP7	TP8	TP8	TP8
			Depth	0.30	0.60	2.00	0.50	2.00	2.50
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Preparation									
NRA Leachate Preparation	DETS 036*			Y	Y	Y	Y	Y	Y
Metals									
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	1.6	0.82	0.35	0.97	1.9	3.4
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	2.4	< 0.25	< 0.25	1.1	< 0.25
Chromium III Dissolved	DETSC 2302*	1	ug/l	< 1.0	2.4	< 1.0	< 1.0	1.1	< 1.0
Hexavalent Chromium	DETSC 2203	3	ug/l	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.9	5.3	0.6	1.1	1.9	3.4
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.35	< 0.09	0.20	0.18	0.35	0.18
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	0.6	< 0.5	< 0.5	< 0.5	1.4
Selenium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	0.66
Zinc, Dissolved	DETSC 2306	1.25	ug/l	1.42	< 1.25	< 1.25	4.08	< 1.25	< 1.25
Inorganics									
pH	DETSC 2008			7.3	10.7	8.9	8.3	8.3	7.9
Cyanide Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	1.3	3.3	1.4	0.77	1.4	1.3
Fluoride	DETSC 2055	0.1	mg/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	9.5	2.3	15	8.5	6.2	4.7
Total Organic Carbon	DETSC 2085	1	mg/l	2.6	1.7	4.0	1.6	1.5	3.3
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	837896	837897	837898	837899	837900	837901
			Sample ID	TP7	TP7	TP7	TP8	TP8	TP8
			Depth	0.30	0.60	2.00	0.50	2.00	2.50
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PAHs									
Naphthalene	DETSC 3304	0.01	ug/l	0.04	0.07	0.04	0.03	0.03	0.05
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	0.01	< 0.01	< 0.01	< 0.01	0.01
Fluorene	DETSC 3304	0.01	ug/l	0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01
Phenanthrene	DETSC 3304	0.01	ug/l	0.05	0.03	0.02	0.04	0.02	0.08
Anthracene	DETSC 3304	0.01	ug/l	0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01
Fluoranthene	DETSC 3304	0.01	ug/l	0.05	0.02	0.01	0.04	0.02	0.05
Pyrene	DETSC 3304	0.01	ug/l	0.04	0.02	0.02	0.04	0.02	3.9
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	0.02	< 0.01	< 0.01	0.02	< 0.01	0.02
Chrysene	DETSC 3304	0.01	ug/l	0.03	< 0.01	< 0.01	0.02	< 0.01	0.03
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	0.03	< 0.01	< 0.01	0.03	< 0.01	0.03
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	0.02	< 0.01	< 0.01	0.02	< 0.01	0.02
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	0.02	< 0.01	< 0.01	0.01	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	0.02	< 0.01	< 0.01	0.02	< 0.01	0.02
PAH	DETSC 3304	0.04	ug/l	0.35	0.14	0.10	0.26	0.08	4.3
Phenols									
Phenol	*	0.5	ug/l	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	837902	837903	837904	837905	837906	837907
			Sample ID	TP9	TP9	TP9	TP10	TP10	TP10
			Depth	0.30	1.00	1.60	0.50	1.40	2.20
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Preparation									
NRA Leachate Preparation	DETS 036*			Y	Y	Y	Y	Y	Y
Metals									
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	3.9	1.7	1.7	0.56	3.7	1.1
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Chromium III Dissolved	DETSC 2302*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexavalent Chromium	DETSC 2203	3	ug/l	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	4.3	2.1	2.6	2.3	2.9	1.1
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.46	0.38	0.69	< 0.09	2.9	0.36
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	1.1	0.6	0.7	0.6	0.9	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.66	< 0.25	0.37	< 0.25	< 0.25	< 0.25
Zinc, Dissolved	DETSC 2306	1.25	ug/l	< 1.25	1.61	1.26	< 1.25	1.39	< 1.25
Inorganics									
pH	DETSC 2008			7.6	7.4	7.2	10.5	8.7	8.2
Cyanide Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	1.1	1.0	1.3	1.3	0.85	0.66
Fluoride	DETSC 2055	0.1	mg/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	5.8	6.2	8.6	2.9	3.9	7.2
Total Organic Carbon	DETSC 2085	1	mg/l	4.1	2.1	2.7	1.8	3.3	2.0
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	837902	837903	837904	837905	837906	837907
			Sample ID	TP9	TP9	TP9	TP10	TP10	TP10
			Depth	0.30	1.00	1.60	0.50	1.40	2.20
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15	08/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PAHs									
Naphthalene	DETSC 3304	0.01	ug/l	0.08	0.03	0.03	0.05	0.03	0.03
Acenaphthylene	DETSC 3304	0.01	ug/l	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	0.04	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	DETSC 3304	0.01	ug/l	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	DETSC 3304	0.01	ug/l	0.21	0.02	0.02	0.02	0.04	0.03
Anthracene	DETSC 3304	0.01	ug/l	0.05	< 0.01	< 0.01	< 0.01	0.01	< 0.01
Fluoranthene	DETSC 3304	0.01	ug/l	0.31	0.02	0.02	0.01	0.07	0.03
Pyrene	DETSC 3304	0.01	ug/l	0.35	0.02	0.02	0.01	0.06	0.02
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	0.25	0.01	0.01	< 0.01	0.03	0.01
Chrysene	DETSC 3304	0.01	ug/l	0.20	0.01	0.01	< 0.01	0.05	0.02
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	0.25	0.03	0.02	< 0.01	0.07	0.02
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	0.09	0.01	< 0.01	< 0.01	0.03	0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	0.17	0.02	< 0.01	< 0.01	0.05	0.02
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	0.16	< 0.01	< 0.01	< 0.01	0.06	0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	0.04	< 0.01	< 0.01	< 0.01	0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	0.19	0.01	0.01	< 0.01	0.07	0.02
PAH	DETSC 3304	0.04	ug/l	2.5	0.20	0.16	0.09	0.59	0.22
Phenols									
Phenol	*	0.5	ug/l	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	837908	837909
			Sample ID	TP11	TP11
			Depth	0.50	1.00
			Other ID		
			Sample Type	LEACHATE	LEACHATE
			Sampling Date	08/07/15	08/07/15
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Preparation					
NRA Leachate Preparation	DETS 036*			Y	Y
Metals					
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	0.72	0.56
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25
Chromium III Dissolved	DETSC 2302*	1	ug/l	< 1.0	< 1.0
Hexavalent Chromium	DETSC 2203	3	ug/l	< 3.0	< 3.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	0.8	2.2
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.19	0.19
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25
Zinc, Dissolved	DETSC 2306	1.25	ug/l	< 1.25	< 1.25
Inorganics					
pH	DETSC 2008			8.1	7.9
Cyanide Total	DETSC 2130	40	ug/l	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	0.69	0.57
Fluoride	DETSC 2055	0.1	mg/l	< 0.10	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	4.9	4.3
Total Organic Carbon	DETSC 2085	1	mg/l	1.5	1.9
Petroleum Hydrocarbons					
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	ug/l	< 10	< 10

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	837908	837909
			Sample ID	TP11	TP11
			Depth	0.50	1.00
			Other ID		
			Sample Type	LEACHATE	LEACHATE
			Sampling Date	08/07/15	08/07/15
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
PAHs					
Naphthalene	DETSC 3304	0.01	ug/l	0.03	0.03
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Fluorene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Phenanthrene	DETSC 3304	0.01	ug/l	0.03	0.02
Anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Fluoranthene	DETSC 3304	0.01	ug/l	0.03	0.02
Pyrene	DETSC 3304	0.01	ug/l	0.02	0.02
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	0.01	< 0.01
Chrysene	DETSC 3304	0.01	ug/l	0.02	< 0.01
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	0.02	< 0.01
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	0.01	< 0.01
PAH	DETSC 3304	0.04	ug/l	0.17	0.08
Phenols					
Phenol	*	0.5	ug/l	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
837846	TP1 1.00	SOIL	NAD	none	D Wilkinson
837847	TP1 2.00	SOIL	NAD	none	D Wilkinson
837848	TP1 3.00	SOIL	Chrysotile	Chrysotile present as fibre bundles	D Wilkinson
837849	TP2 1.00	SOIL	NAD	none	D Wilkinson
837850	TP2 2.00	SOIL	Chrysotile	Chrysotile present as small fibre bundles	D Wilkinson
837851	TP2 2.90	SOIL	Chrysotile	Chrysotile present as fibre bundles	D Wilkinson
837852	TP3 0.50	SOIL	NAD	none	D Wilkinson
837853	TP3 1.50	SOIL	NAD	none	D Wilkinson
837854	TP3 3.50	SOIL	NAD	none	D Wilkinson
837855	TP4 0.50	SOIL	Chrysotile	Chrysotile present as fibre bundles	D Wilkinson
837856	TP4 2.00	SOIL	Chrysotile	Chrysotile present as fibre bundles	D Wilkinson
837857	TP4 3.00	SOIL	Chrysotile	Chrysotile present as small fibre bundle	D Wilkinson
837858	TP5 1.00	SOIL	NAD	none	D Wilkinson
837859	TP5 2.00	SOIL	NAD	none	D Wilkinson
837860	TP5 3.00	SOIL	Chrysotile	Chrysotile present as fibre bundles	D Wilkinson
837861	TP6 0.50	SOIL	NAD	none	D Wilkinson
837862	TP6 2.00	SOIL	Chrysotile	Chrysotile present as fibre bundles	D Wilkinson
837863	TP6 3.00	SOIL	Chrysotile	Chrysotile present as fibre bundles	D Wilkinson
837864	TP7 0.30	SOIL	Chrysotile	Chrysotile present as fibre bundles	D Wilkinson
837865	TP7 0.60	SOIL	Chrysotile	Chrysotile present as small fibre bundle	D Wilkinson
837866	TP7 2.00	SOIL	NAD	none	D Wilkinson
837867	TP8 0.50	SOIL	NAD	none	D Wilkinson
837868	TP8 2.00	SOIL	NAD	none	D Wilkinson
837869	TP8 2.50	SOIL	Chrysotile	Chrysotile present as fibre bundles	D Wilkinson
837870	TP9 0.30	SOIL	Chrysotile Amosite	Chrysotile present as fibre bundles Amosite also present as small bundle	D Wilkinson
837871	TP9 1.00	SOIL	NAD	none	D Wilkinson
837872	TP9 1.60	SOIL	Chrysotile	Chrysotile present as fibre bundles	D Wilkinson
837873	TP10 0.50	SOIL	Amosite	Amosite present as small fibre bundle	D Wilkinson
837874	TP10 1.40	SOIL	NAD	none	D Wilkinson
837875	TP10 2.20	SOIL	Chrysotile	Chrysotile present as fibre bundles	D Wilkinson
837876	TP11 0.50	SOIL	Chrysotile	Chrysotile present as small fibre bundle	D Wilkinson
837877	TP11 1.00	SOIL	NAD	none	D Wilkinson

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where

Summary of Asbestos Analysis
Soil Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

Lab No	Sample ID	Material Type	Result	Comment*	Analyst

a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * -not included in laboratory scope of accreditation.

Summary of Asbestos Quantification Analysis
Soil Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

		Lab No	837848	837850	837851	837855
		Sample ID	TP1	TP2	TP2	TP4
		Depth	3.00	2.00	2.90	0.50
		Other ID				
		Sample Type	SOIL	SOIL	SOIL	SOIL
		Sampling Date	08/07/15	08/07/15	08/07/15	08/07/15
		Sampling Time				
Test	**Method**	**Units**				
Total Mass% Asbestos (a+b+c)	DETSC 1102	Mass %	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**
Gravimetric Quantification (a)	DETSC 1102	Mass %	na	na	na	na
Detailed Gravimetric Quantification (b)	DETSC 1102	Mass %	<0.001	<0.001	<0.001	<0.001
Quantification by PCOM (c)	DETSC 1102	Mass %	na	na	na	na
Potentially Respirable Fibres (d)	DETSC 1102	Fibres/g	na	na	na	na
Breakdown of Gravimetric Analysis (a)						
Mass of Sample		g	1036.29	1075.16	1046.26	989.45
ACMs present*		type				
Mass of ACM in sample		g				
% ACM by mass		%				
% asbestos in ACM		%				
% asbestos in sample		%				
Breakdown of Detailed Gravimetric Analysis (b)						
% Amphibole bundles in sample		Mass %	na	na	na	na
% Serpentine bundles in sample		Mass %	<0.001	<0.001	<0.001	<0.001
Breakdown of PCOM Analysis (c)						
% Amphibole fibres in sample		Mass %	na	na	na	na
% Serpentine fibres in sample		Mass %	na	na	na	na
Breakdown of Potentially Respirable Fibre Analysis (d)						
Amphibole fibres		Fibres/g	na	na	na	na
Chrysotile fibres		Fibres/g	na	na	na	na

* Denotes test or material description outside of UKAS accreditation.
% asbestos in Asbestos Containing Materials (ACMs) is determined by
by reference to HSG 264.
Recommended sample size for quantification is approximately 1kg
# denotes deviating sample

Summary of Asbestos Quantification Analysi

Soil Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

		Lab No	837856	837857	837860	837862
		Sample ID	TP4	TP4	TP5	TP6
		Depth	2.00	3.00	3.00	2.00
		Other ID				
		Sample Type	SOIL	SOIL	SOIL	SOIL
		Sampling Date	08/07/15	08/07/15	08/07/15	08/07/15
		Sampling Time				
Test	**Method**	**Units**				
Total Mass% Asbestos (a+b+c)	DETSC 1102	Mass %	**< 0.001**	**< 0.001**	**0.005**	**< 0.001**
Gravimetric Quantification (a)	DETSC 1102	Mass %	na	na	na	na
Detailed Gravimetric Quantification (b)	DETSC 1102	Mass %	<0.001	<0.001	0.005	<0.001
Quantification by PCOM (c)	DETSC 1102	Mass %	na	na	na	na
Potentially Respirable Fibres (d)	DETSC 1102	Fibres/g	na	na	na	na
Breakdown of Gravimetric Analysis (a)						
Mass of Sample		g	769.83	1181.87	1123.10	1055.83
ACMs present*		type				
Mass of ACM in sample		g				
% ACM by mass		%				
% asbestos in ACM		%				
% asbestos in sample		%				
Breakdown of Detailed Gravimetric Analysis (b)						
% Amphibole bundles in sample		Mass %	na	na	na	na
% Serpentine bundles in sample		Mass %	<0.001	<0.001	0.005	<0.001
Breakdown of PCOM Analysis (c)						
% Amphibole fibres in sample		Mass %	na	na	na	na
% Serpentine fibres in sample		Mass %	na	na	na	na
Breakdown of Potentially Respirable Fibre Analysis (d)						
Amphibole fibres		Fibres/g	na	na	na	na
Chrysotile fibres		Fibres/g	na	na	na	na

* Denotes test or material description outside of UKAS accreditation.
% asbestos in Asbestos Containing Materials (ACMs) is determined by
by reference to HSG 264.
Recommended sample size for quantification is approximately 1kg
# denotes deviating sample

Summary of Asbestos Quantification Analysi

Soil Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

		Lab No	837863	837864	837865	837869
		Sample ID	TP6	TP7	TP7	TP8
		Depth	3.00	0.30	0.60	2.50
		Other ID				
		Sample Type	SOIL	SOIL	SOIL	SOIL
		Sampling Date	08/07/15	08/07/15	08/07/15	08/07/15
		Sampling Time				
Test	**Method**	**Units**				
Total Mass% Asbestos (a+b+c)	DETSC 1102	Mass %	**0.003**	**< 0.001**	**< 0.001**	**< 0.001**
Gravimetric Quantification (a)	DETSC 1102	Mass %	na	na	na	na
Detailed Gravimetric Quantification (b)	DETSC 1102	Mass %	0.003	<0.001	<0.001	<0.001
Quantification by PCOM (c)	DETSC 1102	Mass %	na	na	na	na
Potentially Respirable Fibres (d)	DETSC 1102	Fibres/g	na	na	na	na
Breakdown of Gravimetric Analysis (a)						
Mass of Sample		g	997.47	460.41	502.83	664.80
ACMs present*		type				
Mass of ACM in sample		g				
% ACM by mass		%				
% asbestos in ACM		%				
% asbestos in sample		%				
Breakdown of Detailed Gravimetric Analysis (b)						
% Amphibole bundles in sample		Mass %	na	na	na	na
% Serpentine bundles in sample		Mass %	0.003	<0.001	<0.001	<0.001
Breakdown of PCOM Analysis (c)						
% Amphibole fibres in sample		Mass %	na	na	na	na
% Serpentine fibres in sample		Mass %	na	na	na	na
Breakdown of Potentially Respirable Fibre Analysis (d)						
Amphibole fibres		Fibres/g	na	na	na	na
Chrysotile fibres		Fibres/g	na	na	na	na

* Denotes test or material description outside of UKAS accreditation.
% asbestos in Asbestos Containing Materials (ACMs) is determined by
by reference to HSG 264.
Recommended sample size for quantification is approximately 1kg
# denotes deviating sample

Summary of Asbestos Quantification Analysi

Soil Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

		Lab No	837870	837872	837873	837875
		Sample ID	TP9	TP9	TP10	TP10
		Depth	0.30	1.60	0.50	2.20
		Other ID				
		Sample Type	SOIL	SOIL	SOIL	SOIL
		Sampling Date	08/07/15	08/07/15	08/07/15	08/07/15
		Sampling Time				
Test	**Method**	**Units**				
Total Mass% Asbestos (a+b+c)	DETSC 1102	Mass %	**< 0.001**	**0.002**	**< 0.001**	**< 0.001**
Gravimetric Quantification (a)	DETSC 1102	Mass %	na	na	na	na
Detailed Gravimetric Quantification (b)	DETSC 1102	Mass %	<0.001	0.002	<0.001	<0.001
Quantification by PCOM (c)	DETSC 1102	Mass %	na	na	na	na
Potentially Respirable Fibres (d)	DETSC 1102	Fibres/g	na	na	na	na
Breakdown of Gravimetric Analysis (a)						
Mass of Sample		g	983.64	1171.10	576.91	695.43
ACMs present*		type				
Mass of ACM in sample		g				
% ACM by mass		%				
% asbestos in ACM		%				
% asbestos in sample		%				
Breakdown of Detailed Gravimetric Analysis (b)						
% Amphibole bundles in sample		Mass %	na	na	<0.001	na
% Serpentine bundles in sample		Mass %	<0.001	0.002	na	<0.001
Breakdown of PCOM Analysis (c)						
% Amphibole fibres in sample		Mass %	na	na	na	na
% Serpentine fibres in sample		Mass %	na	na	na	na
Breakdown of Potentially Respirable Fibre Analysis (d)						
Amphibole fibres		Fibres/g	na	na	na	na
Chrysotile fibres		Fibres/g	na	na	na	na

* Denotes test or material description outside of UKAS accreditation.
% asbestos in Asbestos Containing Materials (ACMs) is determined by
by reference to HSG 264.
Recommended sample size for quantification is approximately 1kg
# denotes deviating sample

Summary of Asbestos Quantification Analysi

Soil Samples

Our Ref 15-40034-2
Client Ref 12032
Contract Title Herbert Road

		Lab No	837876
		Sample ID	TP11
		Depth	0.50
		Other ID	
		Sample Type	SOIL
		Sampling Date	08/07/15
		Sampling Time	
Test	**Method**	**Units**	
Total Mass% Asbestos (a+b+c)	DETSC 1102	Mass %	**< 0.001**
Gravimetric Quantification (a)	DETSC 1102	Mass %	na
Detailed Gravimetric Quantification (b)	DETSC 1102	Mass %	<0.001
Quantification by PCOM (c)	DETSC 1102	Mass %	na
Potentially Respirable Fibres (d)	DETSC 1102	Fibres/g	na
Breakdown of Gravimetric Analysis (a)			
Mass of Sample		g	457.75
ACMs present*		type	
Mass of ACM in sample		g	
% ACM by mass		%	
% asbestos in ACM		%	
% asbestos in sample		%	
Breakdown of Detailed Gravimetric Analysis (b)			
% Amphibole bundles in sample		Mass %	na
% Serpentine bundles in sample		Mass %	<0.001
Breakdown of PCOM Analysis (c)			
% Amphibole fibres in sample		Mass %	na
% Serpentine fibres in sample		Mass %	na
Breakdown of Potentially Respirable Fibre Analysis (d)			
Amphibole fibres		Fibres/g	na
Chrysotile fibres		Fibres/g	na

* Denotes test or material description outside of UKAS accreditation.
% asbestos in Asbestos Containing Materials (ACMs) is determined by
by reference to HSG 264.
Recommended sample size for quantification is approximately 1kg
# denotes deviating sample

Information in Support of the Analytical Results

Our Ref 15-40034-2
Client Ref 12032
Contract Herbert Road

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
837846	TP1 1.00 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837847	TP1 2.00 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837848	TP1 3.00 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837849	TP2 1.00 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837850	TP2 2.00 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837851	TP2 2.90 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837852	TP3 0.50 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837853	TP3 1.50 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837854	TP3 3.50 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837855	TP4 0.50 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837856	TP4 2.00 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837857	TP4 3.00 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837858	TP5 1.00 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837859	TP5 2.00 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837860	TP5 3.00 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837861	TP6 0.50 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837862	TP6 2.00 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837863	TP6 3.00 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837864	TP7 0.30 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837865	TP7 0.60 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837866	TP7 2.00 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837867	TP8 0.50 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837868	TP8 2.00 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837869	TP8 2.50 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837870	TP9 0.30 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837871	TP9 1.00 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837872	TP9 1.60 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837873	TP10 0.50 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837874	TP10 1.40 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837875	TP10 2.20 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837876	TP11 0.50 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837877	TP11 1.00 SOIL	08/07/15	GJ 250ml x2, PT 1L x2		
837878	TP1 1.00 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837879	TP1 2.00 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837880	TP1 3.00 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837881	TP2 1.00 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837882	TP2 2.00 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837883	TP2 2.90 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837884	TP3 0.50 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837885	TP3 1.50 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837886	TP3 3.50 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837887	TP4 0.50 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837888	TP4 2.00 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837889	TP4 3.00 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837890	TP5 1.00 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837891	TP5 2.00 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837892	TP5 3.00 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837893	TP6 0.50 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837894	TP6 2.00 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		

Information in Support of the Analytical Results

Our Ref 15-40034-2
Client Ref 12032
Contract Herbert Road

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
837895	TP6 3.00 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837896	TP7 0.30 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837897	TP7 0.60 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837898	TP7 2.00 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837899	TP8 0.50 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837900	TP8 2.00 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837901	TP8 2.50 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837902	TP9 0.30 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837903	TP9 1.00 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837904	TP9 1.60 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837905	TP10 0.50 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837906	TP10 1.40 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837907	TP10 2.20 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837908	TP11 0.50 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		
837909	TP11 1.00 LEACHATE	08/07/15	GJ 250ml x2, PT 1L x2		

Key: G-Glass P-Plastic J-Jar T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO4	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO4	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETSC2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

Certificate of Analysis

Certificate Number 15-40314

03-Aug-15

Client Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference 15-40314

Client Reference 12032

Contract Title Herbert Road

Description 24 Soil samples, 24 Leachate samples.

Date Received 15-Jul-15

Date Started 15-Jul-15

Date Completed 03-Aug-15

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

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

Approved By [redacted]

Rob Brown
Business Manager

2139

Summary of Chemical Analysis
Matrix Descriptions

Our Ref 15-40314
Client Ref 12032
Contract Title Herbert Road

Sample ID	Depth	Lab No	Completed	Matrix Description
TP12	1	839276	03/08/2015	Brown, gravelly, sandy CLAY
TP12	2	839277	03/08/2015	Brown, gravelly, sandy CLAY
TP12	3	839278	03/08/2015	Brown, gravelly, sandy CLAY
TP13	1	839279	03/08/2015	Brown, gravelly, sandy CLAY
TP13	2	839280	03/08/2015	Brown, gravelly, sandy CLAY
TP13	3	839281	03/08/2015	Brown, gravelly, sandy CLAY
TP14	1	839282	03/08/2015	Brown, gravelly, sandy CLAY
TP14	2	839283	03/08/2015	Brown, gravelly, sandy CLAY
TP14	3	839284	03/08/2015	Brown, gravelly, sandy CLAY
TP15	0.3	839285	03/08/2015	Brown, gravelly, sandy CLAY
TP15	1	839286	03/08/2015	Brown, gravelly, sandy CLAY
TP15	2.2	839287	03/08/2015	Brown, gravelly, sandy CLAY
TP16	0.5	839288	03/08/2015	Brown, gravelly, sandy CLAY
TP16	1.5	839289	03/08/2015	Brown, gravelly, sandy CLAY
TP16	2.5	839290	03/08/2015	Brown, gravelly, sandy CLAY
TP17	0.5	839291	03/08/2015	Brown, gravelly, sandy CLAY
TP17	1.5	839292	03/08/2015	Brown, gravelly, sandy CLAY
TP17	2.5	839293	03/08/2015	Brown, gravelly, sandy CLAY
TP18	0.5	839294	03/08/2015	Brown, gravelly, sandy CLAY
TP18	1.5	839295	03/08/2015	Brown, gravelly, sandy CLAY
TP18	2.5	839296	03/08/2015	Brown, gravelly, sandy CLAY
TP19	0.5	839297	03/08/2015	Brown, gravelly, sandy CLAY
TP19	1.5	839298	03/08/2015	Brown, gravelly, sandy CLAY
TP19	2.5	839299	03/08/2015	Brown, gravelly, sandy CLAY

Summary of Chemical Analysis
Soil Samples

Our Ref 15-40314
Client Ref 12032
Contract Title Herbert Road

	Lab No	839276	839277	839278	839279	839280	839281
	Sample ID	TP12	TP12	TP12	TP13	TP13	TP13
	Depth	1.00	2.00	3.00	1.00	2.00	3.00
	Other ID						
	Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampling Date	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15
	Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Asbestos Quantification OHR	DETSC 1102	0			Y				
Preparation									
Moisture Content	DETSC 1004*	0.1	%	16	21	23	13	19	16
Metals									
Antimony	DETSC 2301*	1	mg/kg	2.3	2.8	1.5	2.6	3.5	1.5
Arsenic	DETSC 2301#	0.2	mg/kg	6.7	12	9.6	16	23	7.5
Beryllium	DETSC 2301#	0.2	mg/kg	0.6	0.8	0.5	1.2	0.9	0.6
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	1.5	1.7	1.6	1.6	1.5	1.5
Cadmium	DETSC 2301#	0.1	mg/kg	0.6	1.8	0.6	0.6	0.7	0.5
Chromium	DETSC 2301#	0.15	mg/kg	120	40	16	26	23	25
Chromium III	DETSC 2301*	0.15	mg/kg	120	40	16	26	23	25
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	25	54	20	37	56	17
Lead	DETSC 2301#	0.3	mg/kg	35	84	70	110	180	35
Manganese	DETSC 2301#	20	mg/kg	1200	960	630	850	710	830
Mercury	DETSC 2325#	0.05	mg/kg	0.10	0.36	0.22	0.29	0.66	0.14
Molybdenum	DETSC 2301#	0.4	mg/kg	1.6	1.1	0.8	1.5	1.8	0.6
Nickel	DETSC 2301#	1	mg/kg	19	21	14	22	25	17
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	73	150	90	130	190	97
Inorganics									
pH	DETSC 2008#			10.1	10.7	11.1	10.2	10.0	10.4
Cyanide Total	DETSC 2130#	0.1	mg/kg	0.2	0.1	< 0.1	< 0.1	< 0.1	0.5
Cyanide complex	DETSC 2130*	0.2	mg/kg	0.2	< 0.2	< 0.2	< 0.2	< 0.2	0.5
Organic matter	DETSC 2002#	0.1	%	2.2	4.2	3.3	2.1	2.5	2.1
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.12	0.16	0.25	0.23	0.16	0.17

Key: * -not accredited. # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 15-40314
Client Ref 12032
Contract Title Herbert Road

			Lab No	839276	839277	839278	839279	839280	839281
			Sample ID	TP12	TP12	TP12	TP13	TP13	TP13
			Depth	1.00	2.00	3.00	1.00	2.00	3.00
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	4.0	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	13	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	47	< 3.4	14
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	< 3.4	< 3.4	< 3.4	13	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	64	< 10	14
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	3.1	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	22	2.8	19
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	84	4.3	67
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	< 1.4	< 1.4	< 1.4	25	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	110	< 10	86
TPH Ali/Aro	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	170	< 10	100
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	0.04	< 0.03	0.22	0.19	0.17
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	0.22	0.12	0.17
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	0.18	0.10	0.17
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.08	0.21	0.20	1.4	0.99	1.4
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	0.04	0.05	0.35	0.23	0.34
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.14	0.36	0.20	2.1	1.6	2.1
Pyrene	DETSC 3303#	0.03	mg/kg	0.13	0.30	0.15	1.9	1.3	1.8
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.07	0.15	0.06	0.82	0.57	0.78
Chrysene	DETSC 3303	0.03	mg/kg	0.08	0.18	0.07	0.92	0.61	0.85
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.08	0.19	0.06	0.94	0.61	0.89
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	0.07	< 0.03	0.31	0.23	0.30
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.05	0.12	0.05	0.69	0.44	0.63
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.03	0.07	< 0.03	0.32	0.19	0.29
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	0.10	0.07	0.10
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	0.07	< 0.03	0.37	0.22	0.32
Total PAH - USEPA 16	DETSC 3303	0.1	mg/kg	0.66	1.8	0.84	11	7.5	10
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

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Summary of Chemical Analysis
Soil Samples

Our Ref 15-40314
Client Ref 12032
Contract Title Herbert Road

			Lab No	839282	839283	839284	839285	839286	839287
			Sample ID	TP14	TP14	TP14	TP15	TP15	TP15
			Depth	1.00	2.00	3.00	0.30	1.00	2.20
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Asbestos Quantification OHR	DETSC 1102	0			Y				Y
Preparation									
Moisture Content	DETSC 1004*	0.1	%	19	10	28	14	15	19
Metals									
Antimony	DETSC 2301*	1	mg/kg	2.3	2.2	1.8	1.9	2.3	2.4
Arsenic	DETSC 2301#	0.2	mg/kg	11	13	8.5	8.1	11	9.5
Beryllium	DETSC 2301#	0.2	mg/kg	0.4	0.6	1.0	0.7	1.8	0.8
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	1.6	1.6	1.2	1.2	1.4	1.7
Cadmium	DETSC 2301#	0.1	mg/kg	0.4	0.6	0.5	0.5	0.5	0.6
Chromium	DETSC 2301#	0.15	mg/kg	17	20	35	22	25	32
Chromium III	DETSC 2301*	0.15	mg/kg	17	20	35	22	25	32
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	65	30	33	21	31	34
Lead	DETSC 2301#	0.3	mg/kg	85	43	42	52	61	39
Manganese	DETSC 2301#	20	mg/kg	540	660	760	880	1600	800
Mercury	DETSC 2325#	0.05	mg/kg	0.50	0.17	0.17	0.07	0.17	0.10
Molybdenum	DETSC 2301#	0.4	mg/kg	1.1	1.1	1.3	0.6	1.0	1.2
Nickel	DETSC 2301#	1	mg/kg	17	17	32	21	16	27
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	1.0	< 0.5
Zinc	DETSC 2301#	1	mg/kg	110	95	90	67	96	92
Inorganics									
pH	DETSC 2008#			10.1	7.6	8.5	8.7	8.8	9.6
Cyanide Total	DETSC 2130#	0.1	mg/kg	< 0.1	0.4	0.4	0.2	0.3	0.2
Cyanide complex	DETSC 2130*	0.2	mg/kg	< 0.2	< 0.2	0.4	< 0.2	0.3	< 0.2
Organic matter	DETSC 2002#	0.1	%	3.4	4.0	3.3	1.5	4.1	2.3
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.19	0.09	0.06	0.09	0.27	0.14

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Summary of Chemical Analysis
Soil Samples

Our Ref 15-40314
Client Ref 12032
Contract Title Herbert Road

			Lab No	839282	839283	839284	839285	839286	839287
			Sample ID	TP14	TP14	TP14	TP15	TP15	TP15
			Depth	1.00	2.00	3.00	0.30	1.00	2.20
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	0.08	0.07	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	0.01	0.01	0.01	< 0.01	0.01	0.02
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	0.05	0.07	< 0.03	< 0.03	0.15	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	0.08	< 0.03	< 0.03	0.09	0.06
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	0.08	< 0.03	< 0.03	0.08	0.06
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.19	0.62	0.08	0.05	0.40	0.25
Anthracene	DETSC 3303	0.03	mg/kg	0.05	0.13	< 0.03	< 0.03	0.09	0.04
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.30	0.96	0.15	0.08	0.53	0.21
Pyrene	DETSC 3303#	0.03	mg/kg	0.24	0.76	0.12	0.07	0.50	0.17
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.11	0.33	0.06	0.03	0.17	0.05
Chrysene	DETSC 3303	0.03	mg/kg	0.13	0.40	0.09	0.03	0.20	0.05
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.14	0.42	0.09	< 0.03	0.17	0.05
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.05	0.12	< 0.03	< 0.03	0.07	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.08	0.26	0.05	< 0.03	0.12	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.06	0.14	0.04	< 0.03	0.06	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	0.04	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.05	0.14	< 0.03	< 0.03	0.06	< 0.03
Total PAH - USEPA 16	DETSC 3303	0.1	mg/kg	1.4	4.5	0.68	0.26	2.7	0.93
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	0.4	< 0.3	< 0.3	< 0.3	< 0.3	0.4

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Summary of Chemical Analysis
Soil Samples

Our Ref 15-40314
Client Ref 12032
Contract Title Herbert Road

			Lab No	839288	839289	839290	839291	839292	839293
			Sample ID	TP16	TP16	TP16	TP17	TP17	TP17
			Depth	0.50	1.50	2.50	0.50	1.50	2.50
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Asbestos Quantification OHR	DETSC 1102	0							
Preparation									
Moisture Content	DETSC 1004*	0.1	%	23	16	22	17	22	18
Metals									
Antimony	DETSC 2301*	1	mg/kg	3.3	1.8	2.4	2.2	2.0	1.6
Arsenic	DETSC 2301#	0.2	mg/kg	9.4	5.1	7.1	8.3	8.9	7.1
Beryllium	DETSC 2301#	0.2	mg/kg	0.9	0.9	1.0	0.7	0.7	0.6
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	1.7	2.1	2.2	1.5	2.3	1.7
Cadmium	DETSC 2301#	0.1	mg/kg	0.8	0.5	0.8	0.8	0.7	1.0
Chromium	DETSC 2301#	0.15	mg/kg	39	59	64	25	35	24
Chromium III	DETSC 2301*	0.15	mg/kg	39	59	64	25	35	24
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	43	13	21	21	24	19
Lead	DETSC 2301#	0.3	mg/kg	52	22	49	81	66	84
Manganese	DETSC 2301#	20	mg/kg	960	2000	1400	700	760	880
Mercury	DETSC 2325#	0.05	mg/kg	0.15	< 0.05	0.13	0.08	0.15	0.13
Molybdenum	DETSC 2301#	0.4	mg/kg	0.8	0.6	1.0	0.7	1.0	0.6
Nickel	DETSC 2301#	1	mg/kg	23	24	26	27	20	19
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	110	56	99	110	110	99
Inorganics									
pH	DETSC 2008#			9.9	11.2	10.4	9.8	9.9	10.9
Cyanide Total	DETSC 2130#	0.1	mg/kg	0.2	0.1	0.2	0.2	0.2	0.2
Cyanide complex	DETSC 2130*	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Organic matter	DETSC 2002#	0.1	%	2.5	1.1	2.2	1.6	2.5	1.8
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.14	0.16	0.13	0.10	0.14	0.12

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Summary of Chemical Analysis
Soil Samples

Our Ref 15-40314
Client Ref 12032
Contract Title Herbert Road

				Lab No	839288	839289	839290	839291	839292	839293
				Sample ID	TP16	TP16	TP16	TP17	TP17	TP17
				Depth	0.50	1.50	2.50	0.50	1.50	2.50
				Other ID						
				Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Sampling Date	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15
				Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**							
Petroleum Hydrocarbons										
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
PAHs										
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	0.05	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	0.04	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.23	0.10	0.07	0.11	0.12	0.12
Anthracene	DETSC 3303	0.03	mg/kg	0.05	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.38	0.21	0.15	0.29	0.34	0.27
Pyrene	DETSC 3303#	0.03	mg/kg	0.31	0.17	0.12	0.55	0.53	0.45
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.12	0.07	0.06	0.08	0.09	0.07
Chrysene	DETSC 3303	0.03	mg/kg	0.16	0.08	0.07	0.09	0.10	0.08
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.17	0.10	0.09	0.11	0.10	0.09
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.05	0.03	< 0.03	< 0.03	< 0.03	0.05
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.10	0.07	0.06	0.08	0.09	0.08
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.06	0.05	0.05	0.06	0.05	0.06
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.06	0.05	0.04	0.09	0.09	0.09
Total PAH - USEPA 16	DETSC 3303	0.1	mg/kg	1.8	0.94	0.71	1.5	1.5	1.4
Phenols										
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 15-40314
Client Ref 12032
Contract Title Herbert Road

	Lab No	839294	839295	839296	839297	839298	839299
	Sample ID	TP18	TP18	TP18	TP19	TP19	TP19
	Depth	0.50	1.50	2.50	0.50	1.50	2.50
	Other ID						
	Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampling Date	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15
	Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Asbestos Quantification OHR	DETSC 1102	0		Y					
Preparation									
Moisture Content	DETSC 1004*	0.1	%	17	23	24	15	19	21
Metals									
Antimony	DETSC 2301*	1	mg/kg	2.1	1.9	2.5	1.5	2.0	2.6
Arsenic	DETSC 2301#	0.2	mg/kg	8.7	7.7	9.3	7.2	11	7.7
Beryllium	DETSC 2301#	0.2	mg/kg	0.6	0.6	0.8	0.7	0.8	0.6
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	1.9	2.1	2.3	1.3	1.3	2.4
Cadmium	DETSC 2301#	0.1	mg/kg	0.5	0.6	0.8	1.2	0.8	0.7
Chromium	DETSC 2301#	0.15	mg/kg	19	23	49	19	32	100
Chromium III	DETSC 2301*	0.15	mg/kg	19	23	49	19	32	100
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	19	19	24	18	19	48
Lead	DETSC 2301#	0.3	mg/kg	93	48	74	39	120	38
Manganese	DETSC 2301#	20	mg/kg	460	600	870	870	1200	1300
Mercury	DETSC 2325#	0.05	mg/kg	0.08	0.09	0.07	< 0.05	0.05	0.06
Molybdenum	DETSC 2301#	0.4	mg/kg	0.7	0.6	0.9	0.6	0.6	1.1
Nickel	DETSC 2301#	1	mg/kg	18	18	21	19	27	16
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	93	90	130	96	120	98
Inorganics									
pH	DETSC 2008#			11.5	10.8	9.9	10.2	11.2	10.6
Cyanide Total	DETSC 2130#	0.1	mg/kg	0.2	0.1	0.2	0.1	0.1	0.2
Cyanide complex	DETSC 2130*	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Organic matter	DETSC 2002#	0.1	%	1.7	1.8	1.6	4.2	3.3	2.1
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.19	0.21	0.14	0.11	0.14	0.24

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Summary of Chemical Analysis
Soil Samples

Our Ref 15-40314
Client Ref 12032
Contract Title Herbert Road

			Lab No	839294	839295	839296	839297	839298	839299
			Sample ID	TP18	TP18	TP18	TP19	TP19	TP19
			Depth	0.50	1.50	2.50	0.50	1.50	2.50
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	0.22	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	0.26	< 0.01	< 0.01	< 0.01	0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	0.14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	0.02	< 0.01	< 0.01	0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	0.15	< 0.01	< 0.01	0.01	0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.04
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.16	0.22	0.17	0.05	0.07	0.34
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	0.04	< 0.03	< 0.03	< 0.03	0.05
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.29	0.49	0.36	0.10	0.11	0.52
Pyrene	DETSC 3303#	0.03	mg/kg	0.43	0.60	0.48	0.24	0.25	0.57
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.07	0.16	0.10	< 0.03	< 0.03	0.17
Chrysene	DETSC 3303	0.03	mg/kg	0.09	0.21	0.12	< 0.03	< 0.03	0.23
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.07	0.20	0.11	< 0.03	< 0.03	0.21
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	0.06	0.05	< 0.03	< 0.03	0.07
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.06	0.16	< 0.03	< 0.03	< 0.03	0.16
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.05	0.10	0.07	< 0.03	< 0.03	0.10
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.07	0.14	0.10	< 0.03	0.06	0.14
Total PAH - USEPA 16	DETSC 3303	0.1	mg/kg	1.3	2.4	1.6	0.39	0.49	2.6
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

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Summary of Chemical Analysis
Leachate Samples

Our Ref 15-40314
Client Ref 12032
Contract Title Herbert Road

			Lab No	839300	839301	839302	839303	839304	839305
			Sample ID	TP12	TP12	TP12	TP13	TP13	TP13
			Depth	1.00	2.00	3.00	1.00	2.00	3.00
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Preparation									
NRA Leachate Preparation	DETS 036*			Y	Y	Y	Y	Y	Y
Metals									
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	1.4	4.7	2.0	7.4	5.0	2.3
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	0.28	< 0.25	0.41	0.31	< 0.25
Chromium III Dissolved	DETSC 2302*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexavalent Chromium	DETSC 2203	3	ug/l	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	2.4	4.3	2.5	5.4	2.8	1.1
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.67	2.4	0.39	1.0	0.94	0.26
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	0.01	< 0.01	0.02	0.02	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	0.8	1.1	0.9	1.0	0.6	0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.54	0.56	0.44	0.71	1.2	0.71
Zinc, Dissolved	DETSC 2306	1.25	ug/l	1.52	2.12	2.20	2.46	1.41	2.08
Inorganics									
pH	DETSC 2008			7.1	7.1	7.1	9.0	8.4	8.0
Cyanide Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	15	82	130	1.5	1.7	1.0
Fluoride	DETSC 2055	0.1	mg/l	0.14	0.14	0.17	< 0.10	0.11	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	19	6.2	7.0	5.8	11	51
Total Organic Carbon	DETSC 2033	2	mg/l	6.4	6.4	6.6	5.5	5.1	3.7
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	14	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	14	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	ug/l	14	< 10	< 10	< 10	< 10	< 10

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Summary of Chemical Analysis
Leachate Samples

Our Ref 15-40314
Client Ref 12032
Contract Title Herbert Road

			Lab No	839300	839301	839302	839303	839304	839305
			Sample ID	TP12	TP12	TP12	TP13	TP13	TP13
			Depth	1.00	2.00	3.00	1.00	2.00	3.00
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PAHs									
Naphthalene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.04	< 0.01	0.42
Acenaphthylene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.05
Phenanthrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	0.01	0.58
Anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.02
Fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.04	0.04	0.56
Pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.06	0.05	0.30
Benzo(a)anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.01	0.03	0.01
Chrysene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.02	0.03	< 0.01
Benzo(b)fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.03	0.03	< 0.01
Benzo(k)fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.01	0.02	< 0.01
Benzo(a)pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.03	0.03	< 0.01
Indeno(1,2,3-c,d)pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
PAH	DETS 074*	0.2	ug/l	< 0.20	< 0.20	< 0.20	0.24	0.24	2.0
Phenols									
Phenol	*	0.5	ug/l	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

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Summary of Chemical Analysis
Leachate Samples

Our Ref 15-40314
Client Ref 12032
Contract Title Herbert Road

			Lab No	839306	839307	839308	839309	839310	839311
			Sample ID	TP14	TP14	TP14	TP15	TP15	TP15
			Depth	1.00	2.00	3.00	0.30	1.00	2.20
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Preparation									
NRA Leachate Preparation	DETS 036*			Y	Y	Y	Y	Y	Y
Metals									
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	4.2	7.2	2.6	0.70	3.3	5.0
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	0.42	0.29	0.30	< 0.25	0.29
Chromium III Dissolved	DETSC 2302*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexavalent Chromium	DETSC 2203	3	ug/l	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	6.8	16	3.4	3.1	3.1	4.9
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.27	1.5	1.1	0.50	1.2	0.61
Mercury, Dissolved	DETSC 2306	0.01	ug/l	0.01	0.03	0.01	< 0.01	0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	2.0	2.1	1.3	22	1.1	1.7
Selenium, Dissolved	DETSC 2306	0.25	ug/l	1.1	1.0	0.80	0.70	0.45	0.75
Zinc, Dissolved	DETSC 2306	1.25	ug/l	< 1.25	< 1.25	1.53	6.20	1.96	< 1.25
Inorganics									
pH	DETSC 2008			8.7	8.6	8.1	8.0	7.9	7.8
Cyanide Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	1.8	20	17	2.0	1.3	2.7
Fluoride	DETSC 2055	0.1	mg/l	< 0.10	< 0.10	0.13	< 0.10	< 0.10	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	10	8.9	26	19	3.9	5.2
Total Organic Carbon	DETSC 2033	2	mg/l	3.8	13	5.7	4.7	4.6	9.7
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 15-40314
Client Ref 12032
Contract Title Herbert Road

			Lab No	839306	839307	839308	839309	839310	839311
			Sample ID	TP14	TP14	TP14	TP15	TP15	TP15
			Depth	1.00	2.00	3.00	0.30	1.00	2.20
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PAHs									
Naphthalene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	0.04	< 0.01
Pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	0.04	< 0.01
Benzo(a)anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01
Chrysene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01
Benzo(b)fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01
Benzo(k)fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01
Benzo(a)pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01
Indeno(1,2,3-c,d)pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
PAH	DETS 074*	0.2	ug/l	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Phenols									
Phenol	*	0.5	ug/l	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 15-40314
Client Ref 12032
Contract Title Herbert Road

				Lab No	839312	839313	839314	839315	839316	839317
				Sample ID	TP16	TP16	TP16	TP17	TP17	TP17
				Depth	0.50	1.50	2.50	0.50	1.50	2.50
				Other ID						
				Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
				Sampling Date	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15
				Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**							
Preparation										
NRA Leachate Preparation	DETS 036*			Y	Y	Y	Y	Y	Y
Metals										
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	1.7	2.0	2.9	5.6	7.5	4.8
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	0.31	< 0.25	< 0.25	< 0.25	0.27
Chromium III Dissolved	DETSC 2302*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexavalent Chromium	DETSC 2203	3	ug/l	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	2.1	1.3	3.0	2.1	6.7	2.6
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.86	< 0.09	0.12	1.3	1.1	3.1
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	0.6	0.8	1.0	0.8	2.1	1.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.57	0.56	0.64	0.46	0.76	0.54
Zinc, Dissolved	DETSC 2306	1.25	ug/l	< 1.25	1.67	< 1.25	< 1.25	< 1.25	2.14
Inorganics										
pH	DETSC 2008			7.7	8.9	9.3	8.2	8.2	7.9
Cyanide Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	1.8	1.1	0.99	1.6	2.0	2.2
Fluoride	DETSC 2055	0.1	mg/l	0.17	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	4.4	7.0	5.8	4.8	6.6	6.7
Total Organic Carbon	DETSC 2033	2	mg/l	10	17	3.7	16	7.5	11
Petroleum Hydrocarbons										
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	4.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 15-40314
Client Ref 12032
Contract Title Herbert Road

			Lab No	839312	839313	839314	839315	839316	839317
			Sample ID	TP16	TP16	TP16	TP17	TP17	TP17
			Depth	0.50	1.50	2.50	0.50	1.50	2.50
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PAHs									
Naphthalene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	4.0	< 0.01	< 0.01	< 0.01
Acenaphthylene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01
Fluorene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	0.47	< 0.01	< 0.01	< 0.01
Anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01
Fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	4.5	< 0.01	< 0.01	< 0.01
Pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	2.2	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
PAH	DETS 074*	0.2	ug/l	< 0.20	< 0.20	11	< 0.20	< 0.20	< 0.20
Phenols									
Phenol	*	0.5	ug/l	< 0.50	< 0.50	< 0.50	< 0.50	1.8	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 15-40314
Client Ref 12032
Contract Title Herbert Road

			Lab No	839318	839319	839320	839321	839322	839323
			Sample ID	TP18	TP18	TP18	TP19	TP19	TP19
			Depth	0.50	1.50	2.50	0.50	1.50	2.50
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Preparation									
NRA Leachate Preparation	DETS 036*			Y	Y	Y	Y	Y	Y
Metals									
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	7.4	1.8	6.0	2.5	3.6	4.2
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	0.30	0.35	0.35	0.32	< 0.25	< 0.25
Chromium III Dissolved	DETSC 2302*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexavalent Chromium	DETSC 2203	3	ug/l	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	5.0	9.1	3.6	2.7	3.4	5.4
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.52	0.13	1.3	0.68	0.35	0.24
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.01	< 0.01	0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	1.5	2.6	1.5	0.6	1.3	2.6
Selenium, Dissolved	DETSC 2306	0.25	ug/l	1.3	1.2	0.63	0.83	0.78	1.4
Zinc, Dissolved	DETSC 2306	1.25	ug/l	< 1.25	< 1.25	1.27	< 1.25	< 1.25	< 1.25
Inorganics									
pH	DETSC 2008			7.7	9.4	8.5	8.2	7.8	8.5
Cyanide Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	1.5	1.3	2.2	1.6	1.2	1.4
Fluoride	DETSC 2055	0.1	mg/l	< 0.10	< 0.10	0.11	0.11	< 0.10	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	3.6	3.9	11	7.0	2.0	3.9
Total Organic Carbon	DETSC 2033	2	mg/l	4.5	8.8	7.6	7.2	5.9	6.7
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	6.7	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	6.1	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	ug/l	< 10	14	< 10	< 10	< 10	< 10

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 15-40314
Client Ref 12032
Contract Title Herbert Road

			Lab No	839318	839319	839320	839321	839322	839323
			Sample ID	TP18	TP18	TP18	TP19	TP19	TP19
			Depth	0.50	1.50	2.50	0.50	1.50	2.50
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15	13/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PAHs									
Naphthalene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	DETS 074*	0.01	ug/l	< 0.01	0.11	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	DETS 074*	0.01	ug/l	< 0.01	0.08	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
PAH	DETS 074*	0.2	ug/l	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Phenols									
Phenol	*	0.5	ug/l	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 15-40314
Client Ref 12032
Contract Title Herbert Road

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
839276	TP12 1.00	SOIL	NAD	none	Colin Patrick
839277	TP12 2.00	SOIL	Chrysotile	small bundle of Chrysotile	Colin Patrick
839278	TP12 3.00	SOIL	NAD	none	Colin Patrick
839279	TP13 1.00	SOIL	NAD	none	Colin Patrick
839280	TP13 2.00	SOIL	NAD	none	Colin Patrick
839281	TP13 3.00	SOIL	NAD	none	Colin Patrick
839282	TP14 1.00	SOIL	NAD	none	Colin Patrick
839283	TP14 2.00	SOIL	Chrysotile	small bundle of Chrysotile	Colin Patrick
839284	TP14 3.00	SOIL	NAD	none	Colin Patrick
839285	TP15 0.30	SOIL	NAD	none	Colin Patrick
839286	TP15 1.00	SOIL	NAD	none	Colin Patrick
839287	TP15 2.20	SOIL	Chrysotile	small bundle of Chrysotile	Colin Patrick
839288	TP16 0.50	SOIL	NAD	none	Colin Patrick
839289	TP16 1.50	SOIL	NAD	none	Colin Patrick
839290	TP16 2.50	SOIL	NAD	none	Colin Patrick
839291	TP17 0.50	SOIL	NAD	none	Colin Patrick
839292	TP17 1.50	SOIL	NAD	none	Colin Patrick
839293	TP17 2.50	SOIL	NAD	none	Colin Patrick
839294	TP18 0.50	SOIL	Chrysotile	small bundle of Chrysotile	Colin Patrick
839295	TP18 1.50	SOIL	NAD	none	Colin Patrick
839296	TP18 2.50	SOIL	NAD	none	Colin Patrick
839297	TP19 0.50	SOIL	NAD	none	Colin Patrick
839298	TP19 1.50	SOIL	NAD	none	Colin Patrick
839299	TP19 2.50	SOIL	NAD	none	Colin Patrick

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * -not included in laboratory scope of accreditation.

Summary of Asbestos Quantification Analysis
Soil Samples

Our Ref 15-40314
Client Ref 12032
Contract Title Herbert Road

	Lab No	839277	839283	839287	839294
	Sample ID	TP12	TP14	TP15	TP18
	Depth	2.00	2.00	2.20	0.50
	Other ID				
	Sample Type	SOIL	SOIL	SOIL	SOIL
	Sampling Date	13/07/15	13/07/15	13/07/15	13/07/15
	Sampling Time				
Test	**Method**	**Units**			
Total Mass% Asbestos (a+b+c)	DETSC 1102	Mass %	**0.001**	**0.001**	**< 0.001**	**< 0.001**
Gravimetric Quantification (a)	DETSC 1102	Mass %	na	na	na	na
Detailed Gravimetric Quantification (b)	DETSC 1102	Mass %	0.001	0.001	<0.001	<0.001
Quantification by PCOM (c)	DETSC 1102	Mass %	na	na	na	na
Potentially Respirable Fibres (d)	DETSC 1102	Fibres/g	na	na	na	na
Breakdown of Gravimetric Analysis (a)						
Mass of Sample		g	712.36	609.14	657.71	579.34
ACMs present*		type				
Mass of ACM in sample		g				
% ACM by mass		%				
% asbestos in ACM		%				
% asbestos in sample		%				
Breakdown of Detailed Gravimetric Analysis (b)						
% Amphibole bundles in sample		Mass %	na	na	na	na
% Serpentine bundles in sample		Mass %	0.001	0.001	<0.001	<0.001
Breakdown of PCOM Analysis (c)						
% Amphibole fibres in sample		Mass %	na	na	na	na
% Serpentine fibres in sample		Mass %	na	na	na	na
Breakdown of Potentially Respirable Fibre Analysis (d)						
Amphibole fibres		Fibres/g	na	na	na	na
Chrysotile fibres		Fibres/g	na	na	na	na

* Denotes test or material description outside of UKAS accreditation.
% asbestos in Asbestos Containing Materials (ACMs) is determined by
by reference to HSG 264.
Recommended sample size for quantification is approximately 1kg
# denotes deviating sample

Information in Support of the Analytical Results

Our Ref 15-40314
Client Ref 12032
Contract Herbert Road

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
839276	TP12 1.00 SOIL	13/07/15	GJ 250ml x2, PT 1L x2		
839277	TP12 2.00 SOIL	13/07/15	GJ 250ml x2, PT 1L x2		
839278	TP12 3.00 SOIL	13/07/15	GJ 250ml x2, PT 1L x2		
839279	TP13 1.00 SOIL	13/07/15	GJ 250ml x2, PT 1L x2		
839280	TP13 2.00 SOIL	13/07/15	GJ 250ml x2, PT 1L x2		
839281	TP13 3.00 SOIL	13/07/15	GJ 250ml x2, PT 1L x2		
839282	TP14 1.00 SOIL	13/07/15	GJ 250ml x2, PT 1L x2		
839283	TP14 2.00 SOIL	13/07/15	GJ 250ml x2, PT 1L x2		
839284	TP14 3.00 SOIL	13/07/15	GJ 250ml x2, PT 1L x2		
839285	TP15 0.30 SOIL	13/07/15	GJ 250ml x2, PT 1L x2		
839286	TP15 1.00 SOIL	13/07/15	GJ 250ml x2, PT 1L x2		
839287	TP15 2.20 SOIL	13/07/15	GJ 250ml x2, PT 1L x2		
839288	TP16 0.50 SOIL	13/07/15	GJ 250ml x2, PT 1L x2		
839289	TP16 1.50 SOIL	13/07/15	GJ 250ml x2, PT 1L x2		
839290	TP16 2.50 SOIL	13/07/15	GJ 250ml x2, PT 1L x2		
839291	TP17 0.50 SOIL	13/07/15	GJ 250ml x2, PT 1L x2		
839292	TP17 1.50 SOIL	13/07/15	GJ 250ml x2, PT 1L x2		
839293	TP17 2.50 SOIL	13/07/15	GJ 250ml x2, PT 1L x2		
839294	TP18 0.50 SOIL	13/07/15	GJ 250ml x2, PT 1L x2		
839295	TP18 1.50 SOIL	13/07/15	GJ 250ml x2, PT 1L x2		
839296	TP18 2.50 SOIL	13/07/15	GJ 250ml x2, PT 1L x2		
839297	TP19 0.50 SOIL	13/07/15	GJ 250ml x2, PT 1L x2		
839298	TP19 1.50 SOIL	13/07/15	GJ 250ml x2, PT 1L x2		
839299	TP19 2.50 SOIL	13/07/15	GJ 250ml x2, PT 1L x2		
839300	TP12 1.00 LEACHATE	13/07/15	GJ 250ml x2, PT 1L x2		
839301	TP12 2.00 LEACHATE	13/07/15	GJ 250ml x2, PT 1L x2		
839302	TP12 3.00 LEACHATE	13/07/15	GJ 250ml x2, PT 1L x2		
839303	TP13 1.00 LEACHATE	13/07/15	GJ 250ml x2, PT 1L x2		
839304	TP13 2.00 LEACHATE	13/07/15	GJ 250ml x2, PT 1L x2		
839305	TP13 3.00 LEACHATE	13/07/15	GJ 250ml x2, PT 1L x2		
839306	TP14 1.00 LEACHATE	13/07/15	GJ 250ml x2, PT 1L x2		
839307	TP14 2.00 LEACHATE	13/07/15	GJ 250ml x2, PT 1L x2		
839308	TP14 3.00 LEACHATE	13/07/15	GJ 250ml x2, PT 1L x2		
839309	TP15 0.30 LEACHATE	13/07/15	GJ 250ml x2, PT 1L x2		
839310	TP15 1.00 LEACHATE	13/07/15	GJ 250ml x2, PT 1L x2		
839311	TP15 2.20 LEACHATE	13/07/15	GJ 250ml x2, PT 1L x2		
839312	TP16 0.50 LEACHATE	13/07/15	GJ 250ml x2, PT 1L x2		
839313	TP16 1.50 LEACHATE	13/07/15	GJ 250ml x2, PT 1L x2		
839314	TP16 2.50 LEACHATE	13/07/15	GJ 250ml x2, PT 1L x2		
839315	TP17 0.50 LEACHATE	13/07/15	GJ 250ml x2, PT 1L x2		
839316	TP17 1.50 LEACHATE	13/07/15	GJ 250ml x2, PT 1L x2		
839317	TP17 2.50 LEACHATE	13/07/15	GJ 250ml x2, PT 1L x2		
839318	TP18 0.50 LEACHATE	13/07/15	GJ 250ml x2, PT 1L x2		
839319	TP18 1.50 LEACHATE	13/07/15	GJ 250ml x2, PT 1L x2		
839320	TP18 2.50 LEACHATE	13/07/15	GJ 250ml x2, PT 1L x2		
839321	TP19 0.50 LEACHATE	13/07/15	GJ 250ml x2, PT 1L x2		
839322	TP19 1.50 LEACHATE	13/07/15	GJ 250ml x2, PT 1L x2		
839323	TP19 2.50 LEACHATE	13/07/15	GJ 250ml x2, PT 1L x2		

Information in Support of the Analytical Results

Our Ref 15-40314
Client Ref 12032
Contract Herbert Road

Key: G-Glass P-Plastic J-Jar T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO4	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO4	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETSC2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

ANNEX D
Citivision Soils
DETS test certificates 47308-1 & 46635

Certificate of Analysis

Certificate Number 15-46635

11-Oct-15

Client Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference 15-46635

Client Reference 12032ASP

Contract Title ABERBARGOED

Description 4 Soil samples, 4 Leachate samples.

Date Received 02-Oct-15

Date Started 02-Oct-15

Date Completed 11-Oct-15

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

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

Approved By [redacted]

Rob Brown
Business Manager

2139

Summary of Chemical Analysis
Matrix Descriptions

Our Ref 15-46635
Client Ref 12032ASP
Contract Title ABERBARGOED

Sample ID	Lab No	Completed	Matrix Description
AS1	878344	11/10/2015	Dark brown gravelly sandy CLAY (made ground includes brick)
AS2	878345	11/10/2015	Dark brown gravelly sandy CLAY (made ground includes brick)
AS3	878346	11/10/2015	Dark brown gravelly sandy CLAY (made ground includes brick)
AS4	878347	11/10/2015	Dark brown gravelly sandy CLAY (made ground includes brick)

Summary of Chemical Analysis
Soil Samples

Our Ref 15-46635
Client Ref 12032ASP
Contract Title ABERBARGOED

			Lab No	878344	878345	878346	878347
			Sample ID	AS1	AS2	AS3	AS4
			Depth				
			Other ID				
			Sample Type	SOIL	SOIL	SOIL	SOIL
			Sampling Date	30/09/15	30/09/15	30/09/15	30/09/15
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Preparation							
Moisture Content	DETSC 1004*	0.1	%	13	17	8.2	13
Metals							
Antimony	DETSC 2301*	1	mg/kg	1.9	2.4	1.6	2.5
Arsenic	DETSC 2301#	0.2	mg/kg	9.8	13	12	16
Beryllium	DETSC 2301#	0.2	mg/kg	0.4	0.6	0.5	0.4
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	1.7	2.2	1.6	1.9
Cadmium	DETSC 2301#	0.1	mg/kg	1.0	0.7	0.7	1.0
Chromium	DETSC 2301#	0.15	mg/kg	47	46	45	76
Chromium III	DETSC 2301*	0.15	mg/kg	47	46	45	76
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	29	38	26	34
Lead	DETSC 2301#	0.3	mg/kg	66	5000	59	130
Manganese	DETSC 2301#	20	mg/kg	1300	1400	980	2200
Mercury	DETSC 2325#	0.05	mg/kg	0.08	< 0.05	0.10	< 0.05
Molybdenum	DETSC 2301#	0.4	mg/kg	1.6	1.0	1.1	1.2
Nickel	DETSC 2301#	1	mg/kg	15	13	15	17
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	140	140	110	110
Inorganics							
pH	DETSC 2008#			11.2	11.2	11.2	11.7
Cyanide Total	DETSC 2130#	0.1	mg/kg	0.6	0.5	0.6	0.7
Cyanide complex	DETSC 2130*	0.2	mg/kg	0.6	0.5	0.6	0.7
Organic matter	DETSC 2002#	0.1	%	2.6	2.6	2.2	1.8
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.22	0.21	0.22	0.23
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	0.05	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	38	51	37	63
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	10	13	10	20
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	38	51	38	64
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	13	11	13	13
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	91	93	84	130

Key: * -not accredited. # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 15-46635
Client Ref 12032ASP
Contract Title ABERBARGOED

			Lab No	878344	878345	878346	878347
			Sample ID	AS1	AS2	AS3	AS4
			Depth				
			Other ID				
			Sample Type	SOIL	SOIL	SOIL	SOIL
			Sampling Date	30/09/15	30/09/15	30/09/15	30/09/15
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	19	93	84	29
Aromatic C5-C35	DETSC 3072*	10	mg/kg	100	100	97	140
TPH Ali/Aro	DETSC 3072*	10	mg/kg	140	150	130	200
PAHs							
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.12	0.19	0.30	0.19
Anthracene	DETSC 3303	0.03	mg/kg	0.03	0.05	0.08	0.05
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.25	0.35	0.57	0.36
Pyrene	DETSC 3303#	0.03	mg/kg	0.22	0.31	0.49	0.31
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.11	0.15	0.24	0.15
Chrysene	DETSC 3303	0.03	mg/kg	0.13	0.19	0.31	0.19
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.14	0.19	0.35	0.22
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.05	0.06	0.11	0.07
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.09	0.11	0.21	0.14
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.06	0.06	0.11	0.07
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.06	0.07	0.13	0.08
Total PAH - USEPA 16	DETSC 3303	0.1	mg/kg	1.3	1.7	3.0	1.8
Phenols							
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 15-46635
Client Ref 12032ASP
Contract Title ABERBARGOED

			Lab No	878348	878349	878350	878351
			Sample ID	AS1	AS2	AS3	AS4
			Depth				
			Other ID				
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	30/09/15	30/09/15	30/09/15	30/09/15
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Preparation							
NRA Leachate Preparation	DETS 036*			Y	Y	Y	Y
Metals							
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	2.2	2.5	2.1	2.0
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	0.36	0.37	0.32	0.28
Chromium III Dissolved	DETSC 2302*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Hexavalent Chromium	DETSC 2203	3	ug/l	< 3.0	< 3.0	< 3.0	< 3.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	2.8	2.2	2.1	2.1
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.32	0.39	0.29	0.37
Mercury, Dissolved	DETSC 2306	0.01	ug/l	0.01	< 0.01	0.01	0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	< 0.5	< 0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.47	< 0.25	0.37	0.34
Zinc, Dissolved	DETSC 2306	1.25	ug/l	< 1.25	< 1.25	1.73	< 1.25
Inorganics							
pH	DETSC 2008			7.4	7.6	7.3	7.4
Cyanide Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	1.7	1.9	1.7	1.8
Fluoride	DETSC 2055	0.1	mg/l	< 0.10	< 0.10	< 0.10	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	22	18	21	23
Total Organic Carbon	DETSC 2033	2	mg/l	4.2	4.8	5.0	4.8
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10
PAHs							
Naphthalene	DETS 074*	0.01	ug/l	< 0.01	0.11	< 0.01	< 0.01
Acenaphthylene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 15-46635
Client Ref 12032ASP
Contract Title ABERBARGOED

			Lab No	878348	878349	878350	878351
			Sample ID	AS1	AS2	AS3	AS4
			Depth				
			Other ID				
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	30/09/15	30/09/15	30/09/15	30/09/15
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Acenaphthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	DETS 074*	0.01	ug/l	< 0.01	0.07	< 0.01	< 0.01
Anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	DETS 074*	0.01	ug/l	< 0.01	0.14	< 0.01	< 0.01
Pyrene	DETS 074*	0.01	ug/l	< 0.01	0.13	< 0.01	< 0.01
Benzo(a)anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
PAH	DETS 074*	0.2	ug/l	< 0.20	0.45	< 0.20	< 0.20
PAH	DETSC 3304	0.04	ug/l	5.5	4.0	6.5	2.7
Phenols							
Phenol	*	0.5	ug/l	< 0.50	< 0.50	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 15-46635
Client Ref 12032ASP
Contract Title ABERBARGOED

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
878344	AS1	SOIL	NAD	none	Colin Patrick
878345	AS2	SOIL	NAD	none	Colin Patrick
878346	AS3	SOIL	NAD	none	Colin Patrick
878347	AS4	SOIL	NAD	none	Colin Patrick

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 15-46635
Client Ref 12032ASP
Contract ABERBARGOED

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
878344	AS1 SOIL	30/09/15	GJ 250ml x3, PT 1L x2		
878345	AS2 SOIL	30/09/15	GJ 250ml x3, PT 1L x2		
878346	AS3 SOIL	30/09/15	GJ 250ml x3, PT 1L x2		
878347	AS4 SOIL	30/09/15	GJ 250ml x3, PT 1L x2		
878348	AS1 LEACHATE	30/09/15	GJ 250ml x3, PT 1L x2		
878349	AS2 LEACHATE	30/09/15	GJ 250ml x3, PT 1L x2		
878350	AS3 LEACHATE	30/09/15	GJ 250ml x3, PT 1L x2		
878351	AS4 LEACHATE	30/09/15	GJ 250ml x3, PT 1L x2		

Key: G-Glass P-Plastic J-Jar T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO4	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO4	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETSC2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

Certificate of Analysis

Certificate Number 15-47308-1

30-Oct-15

Client Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference 15-47308-1

Client Reference 12032

Order No 12032

Contract Title HERBERT ROAD (H.RD)

Description 2 Soil samples, 2 Leachate samples.

Date Received 12-Oct-15

Date Started 12-Oct-15

Date Completed 30-Oct-15

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

Notes **This report supersedes 15-47308, extra testing.**

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

Approved By [redacted]

Rob Brown
Business Manager

2139

Summary of Chemical Analysis
Matrix Descriptions

Our Ref 15-47308-1
Client Ref 12032
Contract Title HERBERT ROAD (H.RD)

Sample ID	Lab No	Completed	Matrix Description
CITIVISION S1	882282	19/10/2015	Dark brown, gravelly, sandy CLAY
CITIVISION S2	882283	19/10/2015	Dark brown, gravelly, sandy CLAY

Summary of Chemical Analysis
Soil Samples

Our Ref 15-47308-1
Client Ref 12032
Contract Title HERBERT ROAD (H.RD)

			Lab No	882282	882283
				CITIVISION S1	CITIVISION S2
			Sample ID		
			Depth		
			Other ID		
			Sample Type	SOIL	SOIL
			Sampling Date	08/10/15	08/10/15
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Asbestos Quantification OHR	DETSC 1102	0		Y	Y
Preparation					
Moisture Content	DETSC 1004*	0.1	%	12	8.7
Metals					
Antimony	DETSC 2301*	1	mg/kg	3.5	3.0
Arsenic	DETSC 2301#	0.2	mg/kg	7.0	7.4
Beryllium	DETSC 2301#	0.2	mg/kg	0.6	0.5
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	2.7	2.5
Cadmium	DETSC 2301#	0.1	mg/kg	1.1	1.2
Chromium	DETSC 2301#	0.15	mg/kg	150	100
Chromium III	DETSC 2301*	0.15	mg/kg	150	100
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	27	21
Lead	DETSC 2301#	0.3	mg/kg	72	270
Manganese	DETSC 2301#	20	mg/kg	7400	5600
Mercury	DETSC 2325#	0.05	mg/kg	0.09	0.16
Molybdenum	DETSC 2301#	0.4	mg/kg	1.1	1.0
Nickel	DETSC 2301#	1	mg/kg	14	11
Selenium	DETSC 2301#	0.5	mg/kg	2.2	1.0
Zinc	DETSC 2301#	1	mg/kg	92	85
Inorganics					
pH	DETSC 2008#			11.6	11.5
Cyanide Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1
Cyanide complex	DETSC 2130*	0.2	mg/kg	< 0.2	< 0.2
Organic matter	DETSC 2002#	0.1	%	1.7	2.1
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.22	0.24

Key: * -not accredited. # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 15-47308-1
Client Ref 12032
Contract Title HERBERT ROAD (H.RD)

			Lab No	882282	882283
				CITIVISION S1	CITIVISION S2
			Sample ID		
			Depth		
			Other ID		
			Sample Type	SOIL	SOIL
			Sampling Date	08/10/15	08/10/15
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Petroleum Hydrocarbons					
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	19
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	130
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	150
TPH Ali/Aro	DETSC 3072*	10	mg/kg	< 10	150
PAHs					
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	0.04
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	0.05	0.07
Fluorene	DETSC 3303	0.03	mg/kg	0.04	0.05
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.37	0.46
Anthracene	DETSC 3303	0.03	mg/kg	0.10	0.12
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.72	1.0
Pyrene	DETSC 3303#	0.03	mg/kg	0.65	0.91
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.28	0.41
Chrysene	DETSC 3303	0.03	mg/kg	0.40	0.53
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.41	0.63
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.13	0.21
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.22	0.34
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.16	0.23
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	0.04	0.05
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.16	0.24
Total PAH - USEPA 16	DETSC 3303	0.1	mg/kg	3.8	5.4
Phenols					
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 15-47308-1
Client Ref 12032
Contract Title HERBERT ROAD (H.RD)

			Lab No	882284	882285
			Sample ID	CITIVISION S1	CITIVISION S2
			Depth		
			Other ID		
			Sample Type	LEACHATE	LEACHATE
			Sampling Date	08/10/15	08/10/15
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Preparation					
NRA Leachate Preparation	DETS 036*			Y	Y
Metals					
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	3.5	4.0
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	1.4	1.1
Chromium III Dissolved	DETSC 2302*	1	ug/l	1.4	1.1
Hexavalent Chromium	DETSC 2203	3	ug/l	< 3.0	< 3.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.5	1.0
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.53	1.0
Mercury, Dissolved	DETSC 2306	0.01	ug/l	0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25
Zinc, Dissolved	DETSC 2306	1.25	ug/l	< 1.25	< 1.25
Inorganics					
pH	DETSC 2008			9.8	8.0
Cyanide Total	DETSC 2130	40	ug/l	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	1.6	1.6
Fluoride	DETSC 2055	0.1	mg/l	< 0.10	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	6.3	7.1
Total Organic Carbon	DETSC 2033	2	mg/l	6.6	5.2
Petroleum Hydrocarbons					
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	2.0	2.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	7.3	19
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	29
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	4.9
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	54
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	8.2	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	8.1
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	ug/l	18	63

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 15-47308-1
Client Ref 12032
Contract Title HERBERT ROAD (H.RD)

			Lab No	882284	882285
			Sample ID	CITIVISION S1	CITIVISION S2
			Depth		
			Other ID		
			Sample Type	LEACHATE	LEACHATE
			Sampling Date	08/10/15	08/10/15
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
PAHs					
Naphthalene	DETS 074*	0.01	ug/l	0.02	< 0.01
Acenaphthylene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
Acenaphthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
Fluorene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
Phenanthrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
Anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
Fluoranthene	DETS 074*	0.01	ug/l	0.02	< 0.01
Pyrene	DETS 074*	0.01	ug/l	0.03	< 0.01
Benzo(a)anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
Chrysene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
Benzo(b)fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
Benzo(k)fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
Benzo(a)pyrene	DETS 074*	0.01	ug/l	< 0.01	0.01
Indeno(1,2,3-c,d)pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETS 074*	0.01	ug/l	< 0.01	< 0.01
PAH	DETS 074*	0.2	ug/l	< 0.20	< 0.20
Phenols					
Phenol	*	0.5	ug/l	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 15-47308-1
Client Ref 12032
Contract Title HERBERT ROAD (H.RD)

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
882282	CITIVISION S1	SOIL	Chrysotile	Bundles of Chrysotile present	Andrew Little
882283	CITIVISION S2	SOIL	Chrysotile	Bundles of Chrysotile present	Andrew Little

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * -not included in laboratory scope of accreditation.

Summary of Asbestos Quantification Analysis
Soil Samples

Our Ref 15-47308-1
Client Ref 12032
Contract Title HERBERT ROAD (H.RD)

		Lab No	882282	882283
		Sample ID	CITIVISION S1	CITIVISION S2
		Depth		
		Other ID		
		Sample Type	SOIL	SOIL
		Sampling Date	08/10/15	08/10/15
		Sampling Time		
Test	**Method**	**Units**		
Total Mass% Asbestos (a+b+c)	DETSC 1102	Mass %	**0.003**	**0.002**
Gravimetric Quantification (a)	DETSC 1102	Mass %	na	na
Detailed Gravimetric Quantification (b)	DETSC 1102	Mass %	0.003	0.002
Quantification by PCOM (c)	DETSC 1102	Mass %	na	na
Potentially Respirable Fibres (d)	DETSC 1102	Fibres/g	na	na
Breakdown of Gravimetric Analysis (a)				
Mass of Sample		g	621.13	427.37
ACMs present*		type		
Mass of ACM in sample		g		
% ACM by mass		%		
% asbestos in ACM		%		
% asbestos in sample		%		
Breakdown of Detailed Gravimetric Analysis (b)				
% Amphibole bundles in sample		Mass %	na	na
% Serpentine bundles in sample		Mass %	0.003	0.002
Breakdown of PCOM Analysis (c)				
% Amphibole fibres in sample		Mass %	na	na
% Serpentine fibres in sample		Mass %	na	na
Breakdown of Potentially Respirable Fibre Analysis (d)				
Amphibole fibres		Fibres/g	na	na
Chrysotile fibres		Fibres/g	na	na

* Denotes test or material description outside of UKAS accreditation.
% asbestos in Asbestos Containing Materials (ACMs) is determined by
by reference to HSG 264.
Recommended sample size for quantification is approximately 1kg
# denotes deviating sample

Information in Support of the Analytical Results

Our Ref 15-47308-1
Client Ref 12032
Contract HERBERT ROAD (H.RD)

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
882282	CITIVISION S1 SOIL	08/10/15	GJ 250ml x2, GJ 60ml, PT 1L x2		
882283	CITIVISION S2 SOIL	08/10/15	GJ 250ml x2, GJ 60ml, PT 1L x2		
882284	CITIVISION S1 LEACHATE	08/10/15	GJ 250ml x2, GJ 60ml, PT 1L x2		
882285	CITIVISION S2 LEACHATE	08/10/15	GJ 250ml x2, GJ 60ml, PT 1L x2		

Key: G-Glass P-Plastic J-Jar T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO4	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO4	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETSC2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

ANNEX E
Soils Sourced From North of Drainage Reen
DETS test certificate 77110

Derwentside Environmental Testing Services

Certificate of Analysis

Certificate Number 16-77110

06-Sep-16

Client Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference 16-77110

Client Reference 12032

Order No 12032-REEN

Contract Title Herbert Road (H.Rd) - Reen

Description 6 Soil samples, 6 Leachate samples.

Date Received 29-Aug-16

Date Started 29-Aug-16

Date Completed 06-Sep-16

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

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

Approved By [redacted]

Mark Hughes
Operations Manager

mCERTS
THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

UKAS TESTING
2139

Summary of Chemical Analysis
Matrix Descriptions

Our Ref 16-77110
Client Ref 12032
Contract Title Herbert Road (H.Rd) - Reen

Sample ID	Lab No	Completed	Matrix Description
Reen 1	1044577	06/09/2016	Brown, gravelly, sandy CLAY
Reen 2	1044578	06/09/2016	Brown, gravelly, sandy CLAY
Reen 3	1044579	06/09/2016	Brown, gravelly, sandy CLAY
Reen 4	1044580	06/09/2016	Brown, gravelly, sandy CLAY
Reen 5	1044581	06/09/2016	Brown, gravelly, sandy CLAY
Reen 6	1044582	06/09/2016	Brown, gravelly, sandy CLAY

Summary of Chemical Analysis
Soil Samples

Our Ref 16-77110
Client Ref 12032
Contract Title Herbert Road (H.Rd) - Reen

			Lab No	1044577	1044578	1044579	1044580	1044581	1044582
			Sample ID	Reen 1	Reen 2	Reen 3	Reen 4	Reen 5	Reen 6
			Depth						
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	26/08/16	26/08/16	26/08/16	26/08/16	26/08/16	26/08/16
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Preparation									
Moisture Content	DETSC 1004*	0.1	%	9.8	7.8	7.1	6.9	7.5	8.7
Metals									
Antimony	DETSC 2301*	1	mg/kg	1.4	2.4	1.2	1.4	1.3	1.3
Arsenic	DETSC 2301#	0.2	mg/kg	14	15	9.4	12	9.8	11
Beryllium	DETSC 2301#	0.2	mg/kg	0.7	0.5	0.6	0.7	0.5	0.6
Boron, Water Soluble	DETSC 2123#	0.2	mg/kg	0.5	0.7	< 0.2	< 0.2	< 0.2	< 0.2
Cadmium	DETSC 2301#	0.1	mg/kg	0.3	0.5	0.4	0.5	2.1	0.2
Chromium	DETSC 2301#	0.15	mg/kg	19	47	18	20	22	21
Chromium III	DETSC 2301*	0.15	mg/kg	17	45	18	20	20	18
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	1.6	1.4	< 1.0	< 1.0	2.6	2.8
Copper	DETSC 2301#	0.2	mg/kg	31	40	18	18	17	20
Lead	DETSC 2301#	0.3	mg/kg	48	77	20	22	44	25
Manganese	DETSC 2301#	20	mg/kg	770	1200	780	880	960	820
Mercury	DETSC 2325#	0.05	mg/kg	0.10	0.14	< 0.05	0.05	0.06	0.07
Molybdenum	DETSC 2301#	0.4	mg/kg	1.0	1.1	0.4	0.6	0.6	0.6
Nickel	DETSC 2301#	1	mg/kg	28	24	31	37	28	33
Selenium	DETSC 2301#	0.5	mg/kg	0.7	< 0.5	< 0.5	< 0.5	0.6	< 0.5
Zinc	DETSC 2301#	1	mg/kg	98	120	100	96	110	92
Inorganics									
pH	DETSC 2008#			9.1	10.3	8.7	8.5	9.7	9.5
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.1	0.3	< 0.1	< 0.1	< 0.1	< 0.1
Cyanide, Complex	DETSC 2130*	0.2	mg/kg	< 0.2	0.3	< 0.2	< 0.2	< 0.2	< 0.2
Organic matter	DETSC 2002#	0.1	%	2.5	2.2	1.2	1.9	1.2	1.8
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.08	0.13	0.04	0.05	0.08	0.04

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 16-77110
Client Ref 12032
Contract Title Herbert Road (H.Rd) - Reen

				Lab No	1044577	1044578	1044579	1044580	1044581	1044582
				Sample ID	Reen 1	Reen 2	Reen 3	Reen 4	Reen 5	Reen 6
				Depth						
				Other ID						
				Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Sampling Date	26/08/16	26/08/16	26/08/16	26/08/16	26/08/16	26/08/16
				Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**							
Petroleum Hydrocarbons										
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	12	15	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	< 3.4	3.5	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	14	17	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	11	21	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	< 1.4	8.6	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	12	21	< 10	< 10	< 10	< 10
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	25	39	< 10	< 10	< 10	< 10
PAHs										
Naphthalene	DETSC 3303#	0.03	mg/kg	0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.14	0.21	0.10	0.05	0.06	0.08
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	0.05	< 0.03	< 0.03	< 0.03	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.22	0.43	0.13	0.04	0.10	0.12
Pyrene	DETSC 3303#	0.03	mg/kg	0.19	0.40	0.12	0.03	0.09	0.10
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.10	0.24	0.06	< 0.03	0.05	0.06
Chrysene	DETSC 3303	0.03	mg/kg	0.12	0.27	0.07	0.03	0.06	0.06
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.13	0.38	0.08	< 0.03	0.08	0.08
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.03	0.11	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.07	0.27	0.05	< 0.03	0.04	0.04
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.04	0.12	< 0.03	< 0.03	< 0.03	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	0.03	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.06	0.16	0.03	< 0.03	< 0.03	< 0.03
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	1.1	2.7	0.65	0.16	0.48	0.54
Phenols										
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 16-77110
Client Ref 12032
Contract Title Herbert Road (H.Rd) - Reen

				Lab No	1044583	1044584	1044585	1044586	1044587	1044588
				Sample ID	Reen 1	Reen 2	Reen 3	Reen 4	Reen 5	Reen 6
				Depth						
				Other ID						
				Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
				Sampling Date	26/08/16	26/08/16	26/08/16	26/08/16	26/08/16	26/08/16
				Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**							
Preparation										
NRA Leachate Preparation	DETS 036*			Y	Y	Y	Y	Y	Y
Metals										
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	1.2	2.1	0.57	< 0.16	0.60	0.50
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	0.40	0.36	< 0.25	< 0.25	< 0.25	< 0.25
Chromium III, Dissolved	DETSC 2302*	1	ug/l	< 1.0	1.4	1.9	< 1.0	< 1.0	< 1.0
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.5	1.6	< 0.4	< 0.4	< 0.4	0.5
Lead, Dissolved	DETSC 2306	0.09	ug/l	1.1	0.71	0.28	0.09	0.36	0.26
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	0.9	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.31	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Zinc, Dissolved	DETSC 2306	1.3	ug/l	2.0	1.5	< 1.3	< 1.3	< 1.3	< 1.3
Inorganics										
pH	DETSC 2008			8.5	8.4	8.4	8.2	8.3	8.4
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	4.4	5.4	4.5	4.8	4.7	4.3
Fluoride	DETSC 2055	0.1	mg/l	0.42	0.34	0.35	0.33	0.34	0.33
Sulphate as SO4	DETSC 2055	0.1	mg/l	10	17	12	16	8.9	9.1
Total Organic Carbon	DETSC 2033	2	mg/l	5.3	4.9	5.0	5.1	4.7	5.1
Petroleum Hydrocarbons										
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 16-77110
Client Ref 12032
Contract Title Herbert Road (H.Rd) - Reen

			Lab No	1044583	1044584	1044585	1044586	1044587	1044588
			Sample ID	Reen 1	Reen 2	Reen 3	Reen 4	Reen 5	Reen 6
			Depth						
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	26/08/16	26/08/16	26/08/16	26/08/16	26/08/16	26/08/16
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PAHs									
Naphthalene	DETSC 3304	0.01	ug/l	0.47	0.24	0.28	0.29	0.24	0.32
Acenaphthylene	DETSC 3304	0.01	ug/l	0.03	0.06	0.03	0.01	0.03	0.02
Acenaphthene	DETSC 3304	0.01	ug/l	0.08	0.05	0.06	0.08	0.05	0.07
Fluorene	DETSC 3304	0.01	ug/l	0.04	0.04	0.02	0.02	0.03	0.04
Phenanthrene	DETSC 3304	0.01	ug/l	0.41	0.38	0.25	0.26	0.21	0.24
Anthracene	DETSC 3304	0.01	ug/l	0.07	0.10	0.03	0.03	0.03	0.03
Fluoranthene	DETSC 3304	0.01	ug/l	0.43	0.55	0.20	0.17	0.24	0.19
Pyrene	DETSC 3304	0.01	ug/l	0.37	0.49	0.17	0.13	0.22	0.16
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	0.26	0.38	0.13	0.09	0.17	0.13
Chrysene	DETSC 3304	0.01	ug/l	0.39	0.59	0.24	0.18	0.27	0.24
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	0.48	0.73	0.23	0.16	0.35	0.28
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	0.15	0.29	0.08	0.04	0.11	0.09
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	0.26	0.45	0.14	0.08	0.19	0.16
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	0.38	0.52	0.23	0.13	0.30	0.27
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	0.17	0.21	0.08	0.07	0.10	0.06
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	0.47	0.66	0.28	0.17	0.32	0.29
PAH Total	DETSC 3304	0.04	ug/l	4.5	5.8	2.4	1.9	2.9	2.6
Phenols									
Phenol	*	0.5	ug/l	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 16-77110
Client Ref 12032
Contract Title Herbert Road (H.Rd) - Reen

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1044577	Reen 1	SOIL	NAD	none	J Woodmansey
1044578	Reen 2	SOIL	NAD	none	J Woodmansey
1044579	Reen 3	SOIL	NAD	none	J Woodmansey
1044580	Reen 4	SOIL	NAD	none	J Woodmansey
1044581	Reen 5	SOIL	NAD	none	J Woodmansey
1044582	Reen 6	SOIL	NAD	none	J Woodmansey

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 16-77110
Client Ref 12032
Contract Herbert Road (H.Rd) - Reen

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1044577	Reen 1 SOIL	26/08/16	GJ 250ml x2, PT 1L x2		
1044578	Reen 2 SOIL	26/08/16	GJ 250ml x2, PT 1L x2		
1044579	Reen 3 SOIL	26/08/16	GJ 250ml x2, PT 1L x2		
1044580	Reen 4 SOIL	26/08/16	GJ 250ml x2, PT 1L x2		
1044581	Reen 5 SOIL	26/08/16	GJ 250ml x2, PT 1L x2		
1044582	Reen 6 SOIL	26/08/16	GJ 250ml x2, PT 1L x2		
1044583	Reen 1 LEACHATE	26/08/16	GJ 250ml x2, PT 1L x2		
1044584	Reen 2 LEACHATE	26/08/16	GJ 250ml x2, PT 1L x2		
1044585	Reen 3 LEACHATE	26/08/16	GJ 250ml x2, PT 1L x2		
1044586	Reen 4 LEACHATE	26/08/16	GJ 250ml x2, PT 1L x2		
1044587	Reen 5 LEACHATE	26/08/16	GJ 250ml x2, PT 1L x2		
1044588	Reen 6 LEACHATE	26/08/16	GJ 250ml x2, PT 1L x2		

Key: G-Glass P-Plastic J-Jar T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO4	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO4	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETSC2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

ANNEX F
Green Lane and Hawes Lane Soils –
Risk Assessment Report

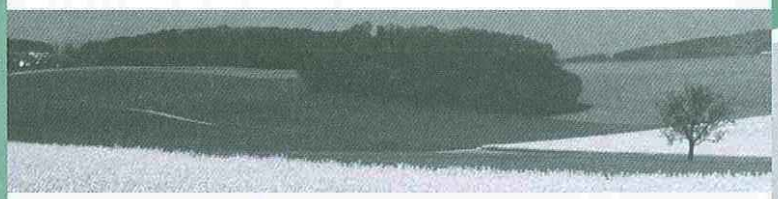
Proposed Fill For Importation
Risk Assessment Report
Proposed Residential Development
Herbert Road
Newport

Prepared for:

Riversee Limited

October 2016

Report No. 12032/RA1



terrafirma

REPORT TITLE	**:**	**Proposed Fill For Importation Risk Assessment Report:** Herbert Road, Newport
REPORT STATUS	**:**	**FINAL**
JOB NUMBER	**:**	**12032/RA1**
DATE	**:**	**November 2016**
PREPARED BY	**:**	[redacted] .. **(Mrs R. Howells)**
REVIEWED BY	**:**	[redacted] **(Mr M. Lake)**
APPROVED BY	**:**	[redacted] **(Dr G. C. Lake)**

Executive Summary

In order to comply with current Government directives and the Flood Consequence Assessment (FCA) approved by NRW the site is to be raised from its original level to an average formation level of 9.20m AOD. The proposed finished level of the site is 9.95m AOD.

Riversee Limited has to date completed partial fill of the site. Site earthworks are soon due to re-commence as two new potential fill sources have been identified, named Green Lane and Hawes Lane. Terra Firma Wales (Limited) have been commissioned to assess the suitability of these materials for use. The total proposed volume of fill to be imported will be 15,000m^3.

Eighty-eight samples of the proposed source soils have been chemically tested.

Comparison of soil results with regulatory guidelines has identified a number of contaminants of concern. However, it is concluded that the contamination is minimal and that there should be no risks to human health. Construction workers would not be at risk provided that appropriate PPE is used and dust suppression is provided. Site end users would be protected through placement of a 600mm clean capping layer in all gardens and landscaped areas and backfill of service trenches with clean materials. A capping layer or bund of clean materials along the drainage reen will also be installed. Gas monitoring via flux boxes post fill –placement will also ensure that any risks from ground gas from the fill are addressed.

In terms of the aquatic environment the drainage reen is deemed to be a direct receptor of any contamination. Assessment of the leachate test results was carried out. For those substances exceeding generic assessment thresholds site specific target concentrations were derived using the Remedial Targets Methodology. The reen was set as the compliance point, at a distance of 10m from any fill imported. This was chosen because a new road and footpath is to run alongside the new reen, which will be at least 10m wide and be constructed of clean imported quarry stone from current to proposed ground level. Copper, zinc, lead and cadmium were found to be in exceedence of the assessment criteria in a limited number of samples. Out of eighty-eight samples tested only 8 had elevated levels of zinc, 4 had elevated lead or copper concentrations, and a single sample was elevated in cadmium.

During earthworks and for a period of 1 to 2 years following earthworks (to allow settlement to occur) the fill will be exposed to rainfall and run-off of surface waters towards the reen could occur. However, the actual amount of run-off that could be expected would be very low. In addition, a 10m wide well compacted strip of clean quarry stone will be placed along the length of the reen in preparation for the new road. Towards the edge of the reen this should be raised above the level of the fill. Whilst the site is left to settle this will act to physically separate the fill materials from the reen and prevent/minimise any run-off into the reen. Upon development new drainage will be installed in the road to prevent any migration of run-off into the reen.

If the quality of the reen water is found to be significantly affected then it may be necessary to install a permanent deep cut-off drain connected to a sump that be emptied when necessary.

TABLE OF CONTENTS

SECTION 1 Introduction

1.1 General
1.2 Limitations and Exceptions

SECTION 2 Proposed Fill Source Sites

SECTION 3 Chemical Analysis of Source Site Soils

SECTION 4 Comparison of Fill Test Results With Assessment Criteria

4.1 Comparison of Soil Test Results With Generic Assessment Criteria
4.2 Comparison of Leachate Test Results With Generic Assessment Criteria
4.3 Comparison of Soil Test Results With Site Specific Assessment Criteria
4.3.1 General
4.3.2 Outline of Model Scenario
4.3.3 Calculated Remedial Targets and Comparison With Sample Concentrations

SECTION 5 Human Health and Environmental Risk Assessment

5.1 Human Health Assessment
5.1.1 Construction Workers
5.1.2 Future Site Users
5.2 Environmental Assessment
5.3 Site Conceptual Model

Figures

Figure 2.1 Source Site Locations (OS Map 151)
Figure 4.1 Hydrological Scenario Applied In Remedial Targets Methodology

Tables

Table 4.1 Green Lane Source - Contaminants of Concern
Table 4.2 Hawes Lane Source - Contaminants of Concern
Table 4.3 Input Parameters
Table 4.4 Calculated Remedial Target at 10m Compliance Point
Table 5.1 Site Conceptual Model

Annexes

Annex A Photographs of Source Sites
Annex B Ecovigour Sampling Location Plans
Annex C Ecovigour Green Lane Soil and Leachate Test Results
Annex D Ecovigour Hawes Lane Soil and Leachate Test Results
Annex E Terra Firma Stockpile and Hawes Lane and Green Lane Source Soil and Leachate Test Results
Annex F Soil Test Results - Exceedence Summary Tables
Annex G Remedial Targets Methodology Worksheets

SECTION 1 Introduction

1.1 General

In order to comply with current Government directives and the Flood Consequence Assessment (FCA) approved by NRW the site is to be raised from its original level to an average formation level of 9.20m AOD.

Riversee Limited has to date completed partial fill of the site. This has been achieved by importation of soils from various sources already validated and approved by Newport City Council and National Resources Wales.

Site earthworks are soon due to re-commence as two new potential fill sources have been identified, named Green Lane and Hawes Lane.

Terra Firma Wales (Limited) has been commissioned to assess the suitability of these materials for use.

The total proposed volume of fill to be imported will be 15,000m^3.

The fill materials have been transported and stored in a stockpile on a site on Herbert Road adjacent to the site in preparation for the earthworks.

For the two sources, 7500m^3 each, 8 samples are required for the first 1000m^3, 1 sample per 250m^3 for the remainder, i.e 34 samples per source and 68 samples in total, as specified in Terra Firma Remediation Strategy Report.

The fill materials were sampled and tested at source by Ecovigour Limited. It was proposed that half the number of samples for the volume, 34No, should be independently sampled and tested by Terra Firma.

1.2 Limitations and Exceptions

The Risk Assessment Report has been prepared for Riversee Limited. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Terra Firma (Wales) Limited. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The report represents the findings and opinions of experienced geo-technical and geo-environmental consultants. Terra Firma (Wales) Limited does not provide legal advice and the advice of lawyers may also be required.

SECTION 2 Proposed Fill Source Sites

The material at both the Green Lane and Hawes Lane source sites comprises fill from road embankments either site of a railway bridge crossing, along the rail line between Cardiff and Newport.

The source locations are illustrated in the **Figure 1** below.

Figure 2.1: Source Site Locations (OS Map 151)

Both source sites were visited by a Terra Firma engineer. Photographs of the source sites are provided in **Annex A**.

SECTION 3 Chemical Analysis of Source Site Materials

Alun Griffiths (Contractors) Limited were contracted to remove and replace the two road railway bridges.

Both the Green Lane and Hawes Lane embankment materials were sampled and tested at source by Ecovigour Limited via trial pits. Ecovigour documented the sample locations on aerial shots. These illustrations are provided in **Annex B**.

The trial pits were excavated using a 21 tonne excavator and were deep enough to ensure sampling from the core of the embankments Samples IDs have been designated according to location, for example: GLSW60/2.5

GL = Green Lane
SW = South side of the bridge, western side of the embankment
60 = 60m from the bridge abutment
/2.5 = depth below existing road levels (m)

The samples were submitted by Ecovigour Limited to the laboratories of Chemtech Environmental. The chemicals tested for were specified by Terra Firma, in line with our Remediation Strategy Report.

Twenty-four representative samples from Green Lane and thirty from Hawes Lane were tested. Soil sample results for Green Lane are provided in **Annex C**. Those for Hawes Lane may be found in **Annex D**.

Terra Firma subsequently undertook independent sampling and analysis of the Green Lane and Hawes Lane materials. Thirty-four samples were taken in total. Twenty-two samples were taken from the accumulating stockpile on Herbert Road (TFW SP S1 – S22 - 14 on one occasion and 8 on another) and a further 12 from the source sites – 4 from Green Lane (south of the railway TFW GLS), 4 from Hawes Lane (north of the railway TFW HLN) and 4 from Hawes Lane (south of the railway TFW HLS).

These test results may be found in **Annex E.**

SECTION 4 Comparison of Fill Test Results With Assessment Criteria

4.1 Comparison of Soil Test Results With Generic Assessment Criteria

The 88 sets of test results from Green Lane and Hawes Lane were compared to the residential (without plant uptake) soil assessment criteria quoted in Terra Firma Remediation Strategy.

Substances found to exceed the criteria are detailed in **Table 1** in **Annex F**. A summary of the table is provided in **Tables 4.1.**

Antimony, manganese and molybdenum were not assessed as no guidelines for these substances are available.

Table 4.1 Green Lane and Hawes Lane Soils Contaminants of Concern

Soils			
Chemical	**Guideline (mg/kg)**	**Exceedance (mg/kg)**	**No of Samples Exceeded (Out of 88)**
Asbestos	Chrysotile bundle of fibres <0.001% total mass		1
Arsenic	32	35 - 52	3
Beryllium	1.7	1.8 – 2.9	24
Lead	310	516 - 1700	4
Cadmium	10	17.9 - 26.4	2
Dibenzo(ah)anthracene	0.31 – 0.32	0.34 - 3.02	9
Benzo(b)fluoranthene	3.9 – 4.0	4.4 – 18.94	6
Benzo(a)pyrene	3.2	3.7 – 12.97	5

Those substances for which there are water framework directive threshold levels have been assessed. Please note that that the laboratory limit of detection used for PAHs for Ecovigour samples is 0.1ug/l which exceeds some of the available threshold levels. The Terra Firma laboratory tests for PAHs is 0.01ug/l.

The Ecovigour laboratory detection limit for Chromium VI is 10ug/l, and the Terra Firma detection limit used is 7ug/l. The threshold for CrVI is 0.6ug/l. Please note that for all Terra Firma samples (34No) the total level of chromium was <0.6ug/l.

Cyanide levels were <20ug/l compared the threshold level of 1.0ug/l.

All leachate concentrations of petroleum hydrocarbons were below the limits of laboratory detection or below 10ug/l, a target concentration used due to the absence of available regulatory threshold levels.

4.2 Comparison of Leachate Test Results With Generic Assessment Criteria

The 88 sets of test results from Green Lane and Hawes Lane were compared to the Water Framework Direction (2015) thresholds for saltwater/other surface waters.

Substances found to exceed the criteria are detailed in **Table 2** in **Annex F**. A summary of the tables is provided in **Table 4.2.**

Table 4.2 Green Lane and Hawes Lane Leachates Contaminants of Concern

Leachates			
Chemical	**Guideline (ug/l)**	**Exceedance (ug/l)**	**No of Samples Exceeded (Out of 88)**
Cadmium	0.2	0.59	1
Copper	3.67	3.9 - 6.8	10
Lead	1.2	1.3 – 8.8	7
Zinc	9.0	9.2 - 216	11
Cyanide	1.0	24	1
Anthracene	0.1	0.11 – 0.65	7
Fluoranthene	0.0063	0.04 – 3.4	34
Benzo(b)fluoranthene	0.017	0.11 - 10	25
Benzo(k)fluoranthene	0.017	0.03 – 4.5	24
Benzo(a)pyrene	0.00017	0.06 – 7.0	24
Benzo(ghi)perylene	0.0082	0.07 – 6.7	27

4.3 Comparison of Soil Test Results With Site Specific Assessment Criteria

4.3.1 General

Given the number and frequency of substances determined to be leachable (see **Table 4.2**) when compared to generic assessment criteria a hydrogeological risk assessment using the Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination has been completed.

The Level 3 Assessment 'considers whether attenuation in the saturated zone is sufficient to reduce contaminant concentrations to acceptable levels. The remedial target is defined as the Level 2 remedial target (unsaturated zone and dilution at the water table) multiplied by the saturated zone attenuation factor.'

4.3.2 Outline of Model Scenario

With reference to known ground conditions to the site and to the Remedial Targets Methodology handbook, **Figure 4.1** illustrates the simplified hydrological scenario applied in the model. The drainage reen on site is taken to be the compliance point.

The reen was set as the compliance point, at a distance of 10m from any fill imported. This was chosen because a new road and footpath is to run alongside the new reen, which will be at least 10m wide and be constructed of clean imported quarry stone from current to proposed ground level.

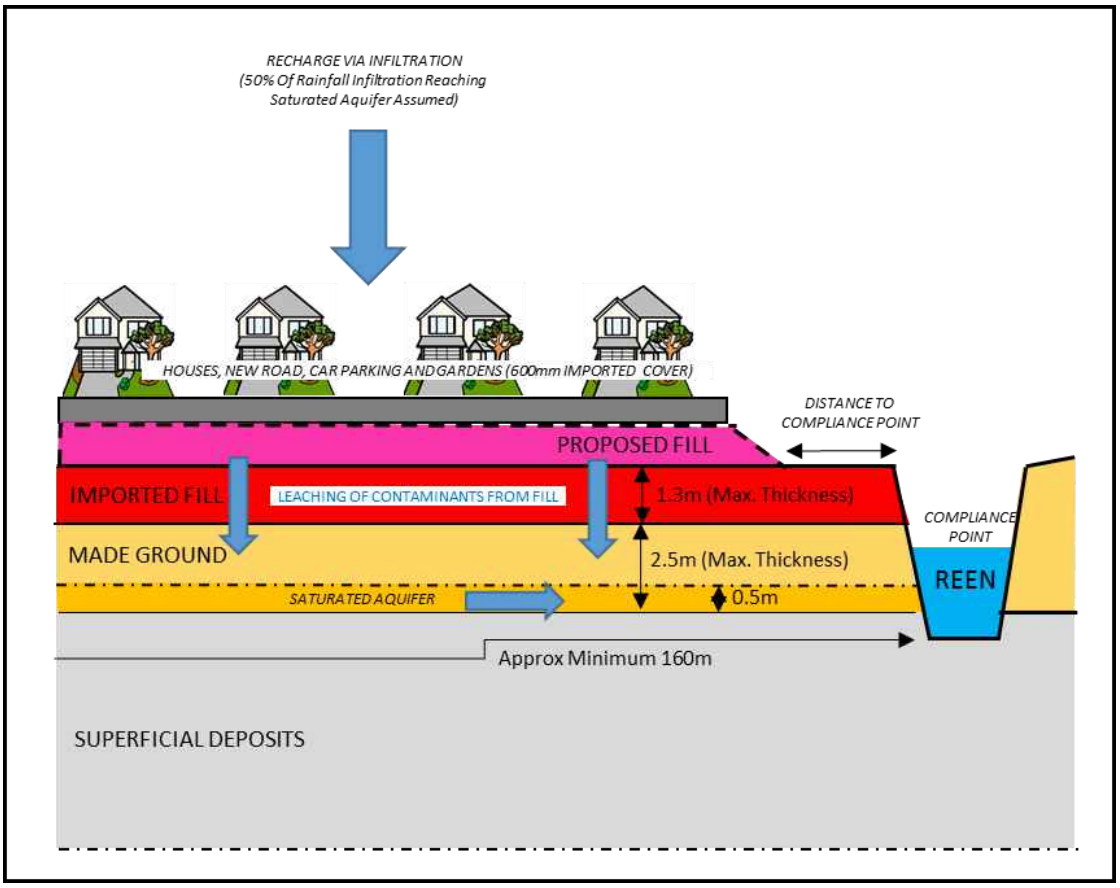


Figure 4.1 Hydrological Scenario Applied In Remedial Targets Methodology (Not to Scale)

4.3.2 Outline of Model Scenario (Continued)

Table 4.3 below details the input parameters used in the Remedial Targets Methodology assessment.

The model simplifies actual hydrogeological regime, and the model assumptions are:

- The aquifer is homogenous and isotropic
- Flow is laminar in one direction, with a constant velocity
- Contaminant and aquifer physiochemical properties are constant
- Darcy's Law is valid
- No dispersion other than that specified occurs

Table 4.3 Input Parameters

Parameter		Value	Source
Level 2 Soil			
Inf	**Infiltration**	**0.000179m/d**	Average infiltration for 2015 (0.00358m/d) taken from Cardiff monitoring station (closest to Newport) Value amended to assume 50% of rainfall reaches saturated zone
A	**Area of Contaminant Source**	**18000m^2**	Fill to be placed a suggested distance of 10m from the reen
L	**Length of Contaminant Source**	**150m**	Minimum length of site (north to south) and takes into account 10m distance between proposed contaminated fill and the reen (compliance point)
da	**Saturated Aquifer Thickness**	**0.5m**	Little to negligible groundwater anticipated due to heavy compaction of fill imported to date, which can be expected to have very low porosity.
K	**Hydraulic conductivity of aquifer in which dilution occurs**	**0.0864m/d**	Assumes a conservative infiltration rate of 1 x 10^{-6} m/s for the well compacted imported fill
I	**Hydraulic gradient of water table**	**0.000625**	Assumes 160m site length (north to south) and 0.1m drop in water level towards the reen
w	**Width of contaminant source perpendicular to groundwater flow**	**120m**	Width of site (east to west)
Cu	**Background concentration of contaminant of groundwater beneath site**	**0**	Not data available for groundwater in made ground (none identified during previous site investigation work)
Mz	**Mixing Zone Thickness**	**0.5m**	Same as saturated aquifer thickness

4.3.2 Outline of Model Scenario (Continued)

Table 4.3 Input Parameters (Continued)

Parameter		Value	Source
Level 3			
-	**Soil Leachate Concentration**	Maximum recorded value for each substance quoted	
T½	**Half Life for Degradation of Contaminant in Water**	For organic substances data obtained from Surampelli et al	
Sz	**Width of Aquifer Plume at Source**	**120m**	Width of site (east to west)
Sy	**Plume thickness at Source**	**0.5m**	From Level 2
p	**Bulk Density of Aquifer Material**	**2.09 g/cm^3**	Based on geotechnical tests undertaken on imported fill
n	**Effective Porosity of Aquifer**	**0.59 (fraction)**	SR3 Updated Technical Background to the CLEA model, Table 4.4. Clay soil type used for imported fill.
i	**Hydraulic Gradient**	**-**	From level 2 (adjusted by model)
K	**Hydraulic Conductivity of Saturated Aquifer**	**0.0864**	From level 2
koc	**Organic Carbon Partition Coefficient (non-polar organic)**	**Substance specific**	EA (2003) – Environment Agency Technical Report P5-079/TR1
foc	**Fraction of organic carbon (non-polar organic)**	**Substance specific**	Average value per substance calculated from laboratory test results (where exceedences recorded)

The Remedial Targets Methodology worksheets are presented in **Annex G.**

A target concentration for cyanide could not be derived due to the lack of available substance specific data.

4.3.3 Calculated Remedial Targets and Comparison With Sample Concentrations

The Level 3 remedial target concentrations calculated, which assume a 10m distance between the fill if placed on site to the compliance point (the reen), are compared to laboratory leachate tests results in **Table 4.4**.

Table 4.4 Calculated Remedial Target at 10m Compliance Point

Chemical	Level 3 Target Concentration 10m Compliance Point (ug/l)	No. of Samples Exceeded (Out of 88)
Cadmium	0.0272	1
Copper	4.98	4
Lead	1.63	4
Zinc	12.2	8
Anthracene	19.3	0
Fluoranthene	17.6	0
Benzo(b)fluoranthene	8×10^{24}	0
Benzo(k)fluoranthene	1.21×10^{39}	0
Benzo(a)pyrene	9.04×10^{16}	0
Benzo(ghi)perylene	1.59×10^{27}	0

SECTION 5 Human Health and Environmental Risk Assessment

5.1 Human Health Assessment

Current site levels range approximately between 7.9m and 8.45m AOD.

The Green Lane and Hawes Lane soils are currently proposed for use to raise current site levels on site to 9.25m AOD, allowing for placement of a 600mm capping layer in all garden and landscaped areas (taking levels to 9.85m AOD).

The imported fill could present a human health risk to two sets of receptors, construction workers and future site users (site residents and maintenance contractors).

5.1.1 Construction Workers

Site construction workers may be exposed to fill materials through activities such as placing the fill during earthworks or deep drainage works.

Potential pathways between the fill and construction workers are dermal contact with soil/soil dust, ingestion of soil/soil dust and inhalation of soil dust. Inhalation of asbestos fibres is also considered, but the risks from exposure to asbestos are considered exceedingly low.

Assessment of contamination has been carried out by comparison of results to residential thresholds, which considers long term exposure to site residents. Also, soil guidelines used assume a worst case and reflect the risk to the most vulnerable receptor, a child.

Site construction workers are deemed to be at very low risk from the identified contaminants given that any exposure time would be comparatively, to how the trigger levels are derived, exceedingly short. Furthermore, these very low risks may be mitigated through good site management, COSHH, good standards of hygiene and appropriate health & safety on site, with personal protection equipment (PPE) and dust suppression where appropriate.

The above is summarised in a site conceptual model in table format in **Section 5.3.**

5.1.2 Future Site Users

Possible contamination linkages between the fill and future site users are dermal contact with soil/soil dust, ingestion of soil/soil dust, inhalation of soil dust, ingestion of site grown vegetables/fruit and consumption of potable water.

Only one sample out of 88 was found to contain asbestos. The risk from asbestos to future site users through inhalation of fibres is therefore considered to be very low.

No substances have been identified that may potentially exist as vapours.

Any notable potentially degradable materials such as timber and old tree roots/branches will be removed from the fill upon placement. However, ground gas inhalation is also considered as a potential risk to human health from decomposition of any organic content in the fill.

5.1.2 Future Site Users (Continued)

Should the Green Lane and Hawes Lane materials be imported on to site future site users are not considered to be at risk from the contaminants provided the remedial measures outlined in Terra Firma Remediation Strategy Report are implemented. This includes flux box testing once placement of the fill has been completed, which will assess the levels of any carbon dioxide or methane being released. The currently recommended gas protection in line with 'gas characteristic situation 2' will be reviewed once flux box monitoring has been completed.

Proposed remedial measures are:

1. Placement of a 600mm clean capping layer in all garden and landscaped areas comprising imported subsoil and topsoil. These soils will be chemically validated in accordance with the Remediation Strategy and the capping thickness verified.

2. The new water supply pipes will be laid above 9.20m AOD. However, prior to the placement of water supply pipes an assessment should be made, by the water provider, of soil along the route of the pipe with reference made to the material selection criteria quoted in UKWIR Report Ref No 10/WM/03/21 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites'.

In addition to these previously proposed measures also recommended are:

3. Backfill of service trenches with clean imported materials/stone

4. Placement of clean soils along the drainage reen. This area will be fenced off from residents but a bund of clean soils and/or a capping layer of clean soils will be placed along the reen edges to ensure that site residents are not exposed to the fill.

5. Installation of appropriate gas protection measures.

The above is summarised in a site conceptual model in table format in **Section 5.3.**

5.2 Environmental Assessment

The proposed imported fill from Green Lane and Hawes Lane has been leachate tested. This assesses the susceptibility of substances to mobilise in groundwaters.

The potential receptors identified are the drainage reen that flows along the northern edge of the area of earthworks and the River Usk. The reen discharges into the River Usk that is located approximately 40m west of the site.

Groundwater beneath the site and the underlying St Maughan's Group Secondary A Aquifer are also potential receptors. However, groundwater beneath the site in the superficial deposits is confined to intermittent granular bands. Previous on-site groundwater monitoring during a tidal cycle confirmed that there was no tidal influence on groundwater beneath the site and therefore no hydraulic continuity between groundwater and the River Usk. The River Usk is therefore not considered to be a direct receptor, but a secondary receptor through discharge of waters from the drainage reen.

5.2 Environmental Assessment (Continued)

The drainage reen would be a direct receptor.

The Remedial Targets Methodology exercise carried out in **Section 4.3** calculated site specific target concentrations for substances found to exceed generic water framework directive thresholds.

This identified copper, lead zinc and cadmium as potential contaminants of the reen. However, the number of samples with exceedences out of the 88 in total analysed are few.

The Remedial Targets Methodology assessment does make conservative assumptions which means calculated thresholds are over-stringent. For example it assumes a saturated aquifer thickness of 0.5m. In reality little or no groundwater is anticipated to be in the made ground; no groundwater in the made ground was noted in previous site investigation works. For example, if the saturated aquifer thickness was taken to be 0.1m rather than 0.5m the zinc remedial target would be 50.9ug/l, meaning only 4 of 88 samples would be found to be in exceedence. The remedial target for lead would be 6.78ug/l, and only one sample out of 88 would exceed on lead. All levels of copper would be deemed acceptable.

Upon development the engineered fill will be capped with 600mm clean cover in garden and soft landscaped areas and a significant area of the site will be surfaced with houses and hardcover as well as new drainage significantly limiting the infiltration of rainfall.

In conclusion, it is considered that the risk to the reen through groundwater flow is very low to negligible.

During earthworks and for a period of 1 to 2 years following earthworks (to allow settlement to occur) the fill will be exposed to rainfall and run-off of surface waters towards the reen could occur. However, the actual amount of run-off that could be expected would be very low. In addition a 10m wide well compacted strip of clean quarry stone will be placed along the length of the reen in preparation for the new road. Towards the edge of the reen this should be raised above the level of the fill. Whilst the site is left to settle this will act to physically separate the fill materials from the reen and prevent/minimise any run-off into the reen. Upon development new drainage will be installed in the road to prevent any migration of run-off into the reen.

In order to confirm that there are no adverse effects on the water quality of the reen it recommended that regular sampling and testing of the reen waters be carried out during and two months following placement of the fill on a regular basis.

If the quality of the reen water is to found to be significantly affected then it may be necessary to install a permanent deep cut-off drain connected to a sump that be emptied when necessary.

The new housing development is to be constructed upon precast concrete piled foundations. Piles will extend down into the top of the St Maughan’s Group mudstone Secondary A Aquifer.

5.2 Environmental Assessment (Continued)

Piles are considered to present a potential pathway for contamination by downward migration of shallow waters along pile routes. However, as explained above, no significant perched groundwater is anticipated to be present.

The underlying estuarine alluvium is intersected by bands of peat or sand/gravel. However the alluvial clays themselves are largely impermeable and will act as an aquitard, preventing downward migration of any perched groundwater. Pollution Scenario 1 ‘Creation of preferential pathways through an aquitard to allow potential contamination of an aquifer’ detailed by the Environment Agency in publication ‘Piling into Contaminated Sites’ was considered. Precast piling is a displacement method, and due to significant stresses applied on soils during the process of driving these piles creation of preferential flow paths around the outside of the piles does not occur.

In its publication ‘Piling in Layered Ground: Risks to Groundwater and Archaeology’ the Environment Agency state that square piles would ‘be expected to seal when driven through a sufficient thickness of clay, that is, a thickness of two pile diameters. Although variable in thickness, and interrupted by bands of peat or granular deposits the alluvial clay is persistent across the site and it is considered that an adequate seal will be created between the piles and clay deposits.

As no preferential pathway for contamination is created and there is, therefore, no potential for contamination of the underlying Secondary A Aquifer.

Environment Agency Pollution Scenario 5 (‘Piling into Contaminated Sites’) was also considered. Driven piles can potentially drag down contaminated soils along the pile and in front of the pile. However, the effects of this can be expected to be low, particularly given the thickness of alluvium.

5.3 Site Conceptual Model

The risk assessment is summarised in **Table 5.1** on the following pages.

Table 5.1
Site Conceptual Model

Source of Contamination	Pollution Linkage	Potential Receptor During Construction	Level of Risk	Mitigation Measures to Reduce Risk to Acceptable Levels	Potential Receptor Post Construction	Level of Risk	Remedial Measures to Reduce Risk to Acceptable Levels
Contaminants of Concern identified in Green Lane and Hawes Lane fill soils are as follows: **Substances present above residential (without plant uptake) regulatory guidelines:** • **Arsenic** • **Beryllium** • **Lead** • **Cadmium** • **Benzo(b)fluoranthene** • **Benzo(a)pyrene** • **Dibenzo(ah)anthracene** • **Asbestos**	**Ingestion, inhalation and dermal contact with soil/soil dust**	Construction Workers	Medium Risk	**Working to site method statements and risk assessments.** **Use of appropriate PPE.** **Dust suppression.** **.**	Future site residents Maintenance Contractors	Medium Risk	**Capping of all garden and soft landscaped areas with 600mm clean capping soil.** **Backfill of service trenches with clean material** **Placement of capping and/or bund of clean materials along edge of reen**
	Inhalation o Asbestos fibres	Construction Workers	Very Low Risk *(Asbestos only identified in 1 of 88 samples)*		Future site residents Maintenance Contractors	Very Low Risk *(Asbestos only identified in 1 of 88 samples)*	
	Consumption of home grown produce *Contaminants may be susceptible to uptake by plants*	N/A	N/A	N/A	Future site residents	N/A	**Capping of all garden areas with 600mm clean imported soil suitable for planting produce**
	Inhalation of vapours *Accumulation of vapours indoors in confined spaces*	Construction Workers	No Risk *No substances present that occur as vapours*	No Risk	Future site residents	No Risk *No substances present that occur as vapours*	No Risk *No substances present that occur as vapours*
	Ingestion of potable water *Absorption of contamination from contaminated soils into potable water pipes*	N/A	N/A	N/A	Future site residents	Medium Risk	**Appropriate water pipes in accordance with UKWIR**

Potential Source	Pollution Linkage	Potential Receptor During Construction	Level of Risk	Mitigation Measures to Reduce Risk to Acceptable Levels	Potential Receptor Post Construction	Level of Risk	Remedial Measures to Reduce Risk to Acceptable Levels
<u>Leachable Contaminants of Concern identified in Green Lane and Hawes Lane fill soils are as follows:</u> **Substances present above water framework directive thresholds:** • **Cadmium** • **Copper** • **Lead** • **Zinc** • **Cyanide** • **Anthracene** • **Fluoranthene** • **Benzo(b)fluoranthene** • **Benzo(k)fluoranthene** • **Benzo(ghi)perylene** • **Benzo(a)pyrene**	**Leaching of contamination from the imported fill**	Shallow/ Perched Groundwater	Very Low Risk *Imported fill laid when dry and is heavily compacted leading to poor porosity. Therefore, negligible shallow waters present in new and previous imported fill.* *No groundwater previously noted in made ground on site*	N/A	Shallow/ Perched Groundwater	Very Low Risk *Imported fill laid when dry and is heavily compacted leading to poor porosity. Therefore, negligible shallow waters present in new and previous imported fill.* *No groundwater previously noted in made ground on site*	N/A *Significant coverage of the site with new buildings and impermeable hardstanding, and installation of storm water drainage will limit infiltration of rainwaters into the ground*
	Surface Run-off from imported fill	Drainage Reen	Very Low Risk	Placement of 10m wide strip of clean imported fill along the edge of the reen, separating the reen from the imported fill Monitoring of reen water during and following placement of the fill	Drainage Reen	Very Low Risk	Placement of 10m wide stripof clean imported fill along the edge of the reen, separating the reen from the imported fill Installation of a permanent deep cut-off drain and sump if required
	Downward migration of shallow/ perched groundwater	Groundwater in superficial deposits	Negligible Risk *Imported fill laid when dry and is heavily compacted leading to poor porosity. Therefore, negligible shallow waters present in new and previous imported fill.* *Largely impermeable superficial clays present beneath the site* *Groundwater in superficial deposits confined to inconsistent and isolated granular bands/lenses*	N/A	Groundwater in superficial deposits	Negligible Risk *Imported fill laid when dry and is heavily compacted leading to poor porosity. Therefore, negligible shallow waters present in new and previous imported fill.* *Largely impermeable superficial clays present beneath the site* *Groundwater in superficial deposits confined to inconsistent and isolated granular bands/lenses*	N/A
	Migration of Groundwater	River Usk	No Risk *River Usk not in hydraulic continuity with River Usk*	N/A	River Usk	No Risk *River Usk not in hydraulic continuity with River Usk*	N/A

	Downward migration of groundwaters	Secondary A Aquifer	No Risk *Very low risk of leaching of contaminants due to very low porosity well compacted fill.* *Very low to negligible downward migration of shallow waters due to very low porosity well compacted fill and presence of impermeable clays*	N/A	Secondary A Aquifer	No Risk *Very low risk of leaching of contaminants due to very low porosity well compacted fill.* *Very low to negligible downward migration of shallow waters due to very low porosity well compacted fill and presence of impermeable clays*	N/A
	Piled Foundation Solution	Groundwater Secondary A Aquifer	No Risk *Negligible shallow waters present in imported fill.* *Superficial clay largely impermeable and seals around piles preventing downward migration of any groundwater present.*	N/A	Groundwater Secondary A Aquifer	No Risk *Negligible shallow waters present in imported fill.* *Superficial clay largely impermeable and seals around piles preventing downward migration of any groundwater present.*	N/A

Annex A
Photographs of Source Sites

GREEN LANE SOURCE - FORMER EMBANKMENT SOUTH OF RAIL LINE

HAWES LANE SOURCE - FORMER EMBANKMENT NORTH OF RAIL LINE

KOMATSU
M&J Plant & Transport
VOLVO
M&J Plant & Transport
01449 675210
07976 254192
Y08 FGH

HAWES LANE SOURCE - FORMER EMBANKMENT SOUTH OF RAIL LINE

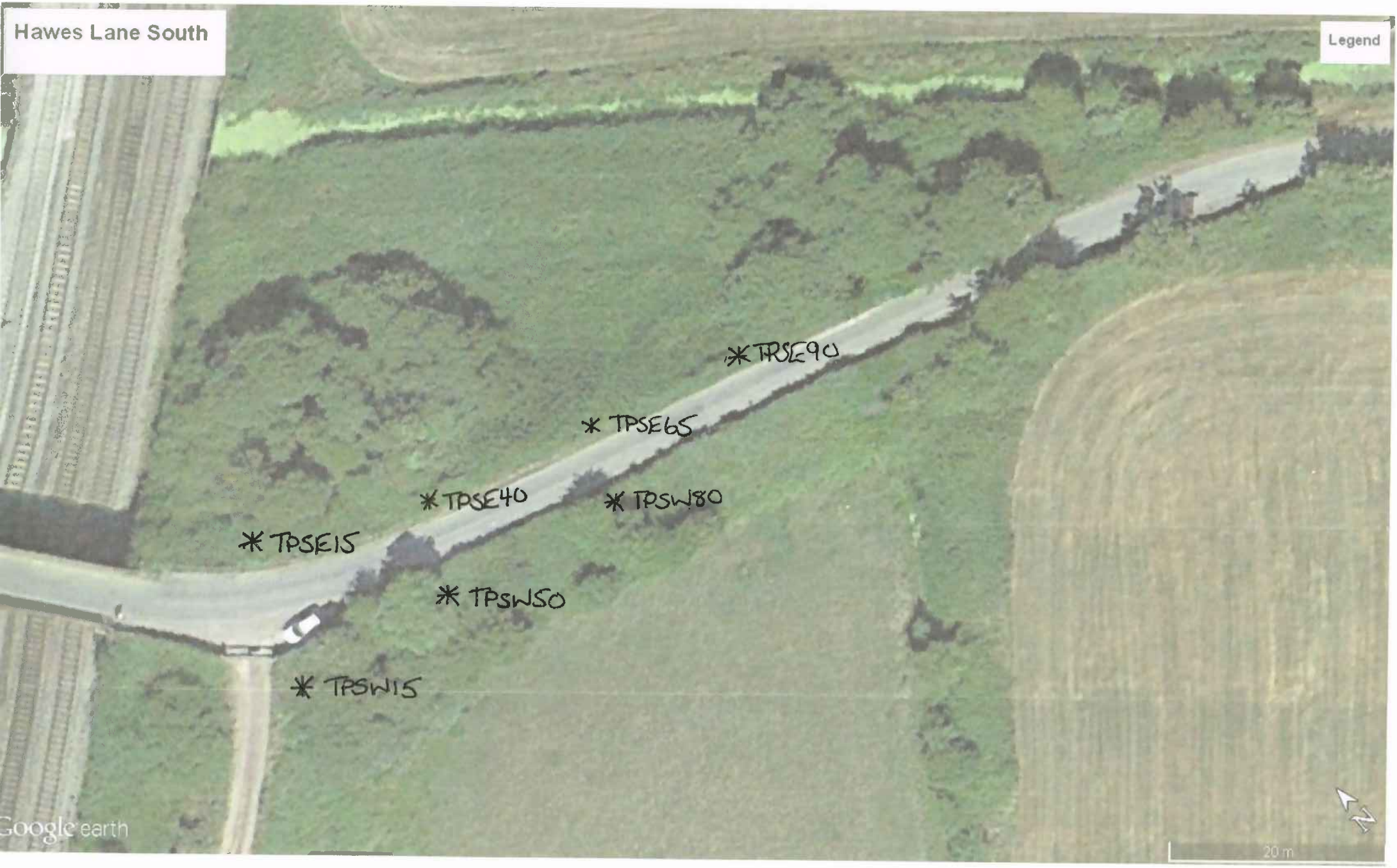
(Viewed Facing South From Northern Side of Railway

Annex B
Ecovigour Sampling Location Plans

Green Lane North
Legend
100m
Google earth
© 2018 Google
30 m
N

Green Lane South
Legend
100m
Google earth
© 2016 Google
N
20 m

Hawes Lane North
Legend
*TPNE80
*TPNW90
*TPNE50
*TPNW65
*TPNE20
*TPNW40
*TPNW15
Google earth
20 m
N


Hawes Lane South
Legend
TPSE90
TPSE65
TPSE40
TPSW80
TPSE15
TPSW50
TPSW15
Google earth
20 m
N

Annex C
Ecovigour Green Lane Soil and Leachate Test Results

2531

ANALYTICAL TEST REPORT

Contract no: 61237

Contract name: Green Lane Bridge

Client reference: -

Clients name: Eco Vigour

Clients address: 12 Devon Place
Newport
Gwent
NP20 4NN

Samples received: 12 September 2016

Analysis started: 12 September 2016

Analysis completed 19 September 2016

Report issued: 19 September 2016

Notes:
Opinions and interpretations expressed herein are outside the UKAS accreditation scope.
Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.
Methods, procedures and performance data are available on request.
Results reported herein relate only to the material supplied to the laboratory.
This report shall not be reproduced except in full, withour prior written approval.
Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

Key:
U UKAS accredited test
M MCERTS & UKAS accredited test
$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing
NAD No Asbestos Detected

Approved by: [redacted]
J
Customer Services Team Leader

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

All results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.
Analytical results are inclusive of stones.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
61237-1	GL NW 15/1	1.00	Sand with Gravel, Slag & Shale	-	-	6.7
61237-2	GL NW 15/2	3.00	Sand with Gravel, Slag & Shale	-	-	9.6
61237-3	GL NW 15/3	6.00	Sand with Shale	-	-	11.9
61237-4	GL SE 15/1	1.00	Sand with Coal & Slag	-	-	6.4
61237-5	GL SE 15/2	4.00	Sand with Coal & Slag	-	-	11.0
61237-6	GL SE 15/3	6.00	Sand with Coal & Slag	-	-	9.2
61237-7	GL SW 15/1	1.00	Sand with Slag, Coal & Shale	-	-	7.7
61237-8	GL SW 15/2	3.00	Sand with Slag & Coal	-	-	14.9
61237-9	GL SW 15/3	6.00	Sand with Gravel & Slag	-	-	6.9
61237-10	GL NW 35/1	1.00	Sand with Coal & Slag	-	-	7.8
61237-11	GL NW 35/2	4.00	Sand with Coal & Shale	-	-	10.3
61237-12	GL SE 40/1	1.00	Sand with Coal, Gravel & Roots	-	-	12.0
61237-13	GL SE 40/2	4.00	Sand with Coal & Shale	-	-	10.7
61237-14	GL SW 40/1	1.00	Sand with Shale & Gravel	-	-	6.1
61237-15	GL SW 40/2	5.00	Sand with Shale, Slag & Gravel	-	-	9.0
61237-16	GL NW 60/1	1.00	Sand with Coal	-	-	4.5
61237-17	GL NW 60/2	3.00	Sand with Coal	-	-	4.4
61237-18	GL SE 65/1	1.00	Sand with Gravel, Shale, Roots & Slag	-	-	10.9
61237-19	GL SE 65/2	3.00	Sand with Coal & Gravel	-	-	9.3
61237-20	GL SW 65/1	1.00	Sand with Coal & Shale	-	-	9.9
61237-21	GL SW 65/2	3.00	Sand with Shale & Coal	-	-	15.5
61237-22	GL NW 85/1	1.00	Sand with Shale & Coal	-	-	9.2
61237-23	GL SE 90/1	1.00	Sand with Gravel, Coal & Slag	-	-	8.2
61237-24	GL SW 90/1	1.00	Sand with Coal & Gravel	-	-	17.0

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SOILS

Lab number			61237-1	61237-2	61237-3	61237-4	61237-5	61237-6
Sample id			GL NW 15/1	GL NW 15/2	GL NW 15/3	GL SE 15/1	GL SE 15/2	GL SE 15/3
Depth (m)			1.00	3.00	6.00	1.00	4.00	6.00
Date sampled			07/09/2016	07/09/2016	07/09/2016	08/09/2016	08/09/2016	08/09/2016
Test	**Method**	**Units**						
Antimony (total)	CE127 U	mg/kg Sb	0.7	1.3	1.5	1.6	1.0	1.5
Arsenic (total)	CE127 M	mg/kg As	18	21	23	13	16	22
Beryllium (total)	CE127 U	mg/kg Be	1.7	1.7	2.3	1.3	2.9	1.2
Boron (water soluble)	CE063 M	mg/kg B	1.0	1.4	1.2	1.7	1.8	1.4
Cadmium (total)	CE127 M	mg/kg Cd	<0.2	<0.2	<0.2	1.3	0.3	0.3
Chromium (III)	-	mg/kg CrIII	45	48	60	21	28	19
Chromium (VI)	CE146	mg/kg CrVI	<1	<1	<1	<1	<1	<1
Copper (total)	CE127 M	mg/kg Cu	38	47	54	55	138	76
Lead (total)	CE127 M	mg/kg Pb	19	35	33	124	171	516
Manganese (total)	CE127	mg/kg Mn	351	376	288	519	630	407
Mercury (total)	CE127 M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Molybdenum (total)	CE127 M	mg/kg Mo	3.6	5.5	6.0	3.8	3.8	2.8
Nickel (total)	CE127 M	mg/kg Ni	32	38	42	37	84	31
Selenium (total)	CE127 M	mg/kg Se	1.4	2.4	2.1	2.1	2.2	2.2
Zinc (total)	CE127 M	mg/kg Zn	58	48	58	1937	100	64
pH	CE004 M	units	8.1	7.0	7.6	7.3	5.9	7.0
Cyanide (total)	CE077 M	mg/kg CN	<1	<1	<1	<1	<1	<1
Phenols (total)	CE078	mg/kg PhOH	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
PAH								
Naphthalene	CE087 M	mg/kg	0.12	0.15	0.02	0.13	0.21	0.72
Acenaphthylene	CE087 M	mg/kg	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	CE087 M	mg/kg	0.02	0.02	<0.01	<0.01	<0.01	<0.01
Fluorene	CE087 U	mg/kg	0.03	0.03	<0.01	0.03	0.06	0.21
Phenanthrene	CE087 M	mg/kg	0.33	0.52	0.07	0.29	0.59	1.75
Anthracene	CE087 U	mg/kg	0.08	0.12	<0.02	0.05	<0.02	<0.02
Fluoranthene	CE087 M	mg/kg	0.36	0.35	<0.02	0.08	0.13	0.33
Pyrene	CE087 M	mg/kg	0.39	0.31	<0.02	0.07	0.12	0.27
Benzo(a)anthracene	CE087 U	mg/kg	0.15	0.14	<0.02	0.09	0.19	0.13
Chrysene	CE087 M	mg/kg	0.25	0.23	0.01	0.08	0.16	0.37
Benzo(b)fluoranthene	CE087 M	mg/kg	0.39	0.33	<0.02	0.07	0.12	0.28
Benzo(k)fluoranthene	CE087 M	mg/kg	0.12	0.16	<0.02	0.02	0.03	0.07
Benzo(a)pyrene	CE087 U	mg/kg	0.26	0.30	<0.02	0.04	0.07	0.13
Indeno(123cd)pyrene	CE087 M	mg/kg	0.23	0.35	<0.02	0.03	0.05	0.09
Dibenz(ah)anthracene	CE087 M	mg/kg	0.06	0.07	<0.02	<0.02	0.03	0.06
Benzo(ghi)perylene	CE087 M	mg/kg	0.19	0.30	<0.02	0.05	0.08	0.17
PAH (total of USEPA 16)	CE087	mg/kg	2.97	3.41	<0.27	1.04	1.84	4.57
TPH								
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	<1	<1	<1	<1	<1	<1

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SOILS

Lab number			61237-1	61237-2	61237-3	61237-4	61237-5	61237-6
Sample id			GL NW 15/1	GL NW 15/2	GL NW 15/3	GL SE 15/1	GL SE 15/2	GL SE 15/3
Depth (m)			1.00	3.00	6.00	1.00	4.00	6.00
Date sampled			07/09/2016	07/09/2016	07/09/2016	08/09/2016	08/09/2016	08/09/2016
Test	**Method**	**Units**						
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	1	1	<1	<1	<1	3
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	1	2	<1	<1	<1	1
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C8-C10)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EPH Aliphatic (>C10-C12)	CE068	mg/kg	7	6	<4	<4	9	10
EPH Aliphatic (>C12-C16)	CE068	mg/kg	16	19	5	10	23	36
EPH Aliphatic (>C16-C35)	CE068	mg/kg	103	81	24	49	101	156
EPH Aliphatic (>C35-C44)	CE068	mg/kg	42	19	11	14	29	38
Subcontracted analysis								
Asbestos (qualitative)	$	-	NAD	NAD	NAD	NAD	NAD	NAD

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SOILS

Lab number			61237-7	61237-8	61237-9	61237-10	61237-11	61237-12
Sample id			GL SW 15/1	GL SW 15/2	GL SW 15/3	GL NW 35/1	GL NW 35/2	GL SE 40/1
Depth (m)			1.00	3.00	6.00	1.00	4.00	1.00
Date sampled			07/09/2016	07/09/2016	07/09/2016	07/09/2016	07/09/2016	08/09/2016
Test	**Method**	**Units**						
Antimony (total)	CE127 U	mg/kg Sb	1.0	0.9	0.3	0.6	0.8	6.1
Arsenic (total)	CE127 M	mg/kg As	13	13	7.0	30	14	21
Beryllium (total)	CE127 U	mg/kg Be	2.2	1.6	2.0	1.1	1.4	2.1
Boron (water soluble)	CE063 M	mg/kg B	1.2	1.9	1.2	2.2	1.6	1.4
Cadmium (total)	CE127 M	mg/kg Cd	<0.2	<0.2	<0.2	<0.2	<0.2	17.9
Chromium (III)	-	mg/kg CrIII	44	46	46	19	43	33
Chromium (VI)	CE146	mg/kg CrVI	<1	<1	<1	<1	<1	<1
Copper (total)	CE127 M	mg/kg Cu	46	62	30	48	46	65
Lead (total)	CE127 M	mg/kg Pb	44	14	20	18	25	545
Manganese (total)	CE127	mg/kg Mn	1691	293	1515	260	231	294
Mercury (total)	CE127 M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Molybdenum (total)	CE127 M	mg/kg Mo	4.1	8.9	2.6	2.7	4.2	4.7
Nickel (total)	CE127 M	mg/kg Ni	36	37	22	27	34	43
Selenium (total)	CE127 M	mg/kg Se	1.8	1.7	1.4	1.8	1.6	1.8
Zinc (total)	CE127 M	mg/kg Zn	110	42	95	43	44	19007
pH	CE004 M	units	8.5	8.3	8.1	7.9	8.0	7.9
Cyanide (total)	CE077 M	mg/kg CN	<1	<1	<1	<1	<1	<1
Phenols (total)	CE078	mg/kg PhOH	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
PAH								
Naphthalene	CE087 M	mg/kg	0.25	0.26	0.18	0.81	0.10	0.35
Acenaphthylene	CE087 M	mg/kg	0.03	0.05	0.02	<0.01	<0.01	<0.01
Acenaphthene	CE087 M	mg/kg	0.05	0.34	0.06	<0.01	0.01	<0.01
Fluorene	CE087 U	mg/kg	0.07	0.39	0.08	0.11	0.02	0.04
Phenanthrene	CE087 M	mg/kg	1.21	2.58	0.95	1.98	0.30	1.25
Anthracene	CE087 U	mg/kg	0.27	0.80	0.28	0.29	0.07	<0.02
Fluoranthene	CE087 M	mg/kg	1.55	3.37	1.76	0.27	0.10	0.13
Pyrene	CE087 M	mg/kg	1.38	2.40	1.48	0.26	0.10	0.13
Benzo(a)anthracene	CE087 U	mg/kg	0.79	2.08	1.38	0.33	0.09	0.18
Chrysene	CE087 M	mg/kg	0.94	1.48	1.09	0.36	0.11	0.23
Benzo(b)fluoranthene	CE087 M	mg/kg	1.44	2.12	1.70	0.23	0.08	0.11
Benzo(k)fluoranthene	CE087 M	mg/kg	0.54	0.80	0.66	0.04	0.03	0.03
Benzo(a)pyrene	CE087 U	mg/kg	1.02	1.50	1.28	0.10	0.05	0.05
Indeno(123cd)pyrene	CE087 M	mg/kg	1.02	1.45	1.13	0.05	0.04	0.03
Dibenz(ah)anthracene	CE087 M	mg/kg	0.22	0.35	0.26	0.04	0.02	<0.02
Benzo(ghi)perylene	CE087 M	mg/kg	0.86	1.12	0.89	0.14	0.05	0.08
PAH (total of USEPA 16)	CE087	mg/kg	11.6	21.1	13.2	5.00	1.18	2.61
TPH								
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	<1	<1	<1	<1	<1	<1

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SOILS

Lab number			61237-7	61237-8	61237-9	61237-10	61237-11	61237-12
Sample id			GL SW 15/1	GL SW 15/2	GL SW 15/3	GL NW 35/1	GL NW 35/2	GL SE 40/1
Depth (m)			1.00	3.00	6.00	1.00	4.00	1.00
Date sampled			07/09/2016	07/09/2016	07/09/2016	07/09/2016	07/09/2016	08/09/2016
Test	**Method**	**Units**						
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	4	10	5	3	<1	2
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	6	10	7	1	<1	<1
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	<1	1	<1	<1	<1	<1
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C8-C10)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EPH Aliphatic (>C10-C12)	CE068	mg/kg	5	4	5	25	5	18
EPH Aliphatic (>C12-C16)	CE068	mg/kg	19	15	24	61	10	47
EPH Aliphatic (>C16-C35)	CE068	mg/kg	190	132	647	237	46	203
EPH Aliphatic (>C35-C44)	CE068	mg/kg	81	35	1191	42	<10	96
Subcontracted analysis								
Asbestos (qualitative)	$	-	NAD	NAD	NAD	NAD	NAD	NAD

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SOILS

Lab number			61237-13	61237-14	61237-15	61237-16	61237-17	61237-18
Sample id			GL SE 40/2	GL SW 40/1	GL SW 40/2	GL NW 60/1	GL NW 60/2	GL SE 65/1
Depth (m)			4.00	1.00	5.00	1.00	3.00	1.00
Date sampled			08/09/2016	07/09/2016	07/09/2016	07/09/2016	07/09/2016	08/09/2016
Test	**Method**	**Units**						
Antimony (total)	CE127 U	mg/kg Sb	1.1	0.8	0.9	0.4	0.5	0.7
Arsenic (total)	CE127 M	mg/kg As	18	13	13	7.9	11	11
Beryllium (total)	CE127 U	mg/kg Be	1.5	2.0	1.5	1.2	1.1	1.7
Boron (water soluble)	CE063 M	mg/kg B	1.6	1.3	1.3	1.8	1.4	1.3
Cadmium (total)	CE127 M	mg/kg Cd	0.4	<0.2	<0.2	<0.2	<0.2	0.4
Chromium (III)	-	mg/kg CrIII	28	58	49	20	12	43
Chromium (VI)	CE146	mg/kg CrVI	<1	<1	<1	<1	<1	<1
Copper (total)	CE127 M	mg/kg Cu	42	38	42	40	42	50
Lead (total)	CE127 M	mg/kg Pb	25	20	23	17	15	25
Manganese (total)	CE127	mg/kg Mn	845	399	271	129	177	479
Mercury (total)	CE127 M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Molybdenum (total)	CE127 M	mg/kg Mo	4.3	7.0	5.0	1.8	1.1	4.2
Nickel (total)	CE127 M	mg/kg Ni	46	44	34	18	18	38
Selenium (total)	CE127 M	mg/kg Se	1.7	1.7	1.4	1.5	1.3	1.6
Zinc (total)	CE127 M	mg/kg Zn	350	56	58	31	42	941
pH	CE004 M	units	8.0	8.3	8.3	8.2	8.1	8.3
Cyanide (total)	CE077 M	mg/kg CN	<1	<1	<1	<1	<1	<1
Phenols (total)	CE078	mg/kg PhOH	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
PAH								
Naphthalene	CE087 M	mg/kg	0.23	0.20	0.06	0.14	0.58	0.13
Acenaphthylene	CE087 M	mg/kg	<0.01	0.03	0.01	<0.01	<0.01	<0.01
Acenaphthene	CE087 M	mg/kg	0.02	0.01	<0.01	<0.01	<0.01	0.01
Fluorene	CE087 U	mg/kg	0.04	0.05	0.01	0.14	0.05	0.03
Phenanthrene	CE087 M	mg/kg	0.41	0.76	0.21	0.53	2.21	0.37
Anthracene	CE087 U	mg/kg	0.09	0.24	0.08	<0.02	<0.02	0.11
Fluoranthene	CE087 M	mg/kg	0.07	0.81	0.31	0.07	0.22	0.37
Pyrene	CE087 M	mg/kg	0.06	0.69	0.31	0.10	0.20	0.36
Benzo(a)anthracene	CE087 U	mg/kg	0.11	0.42	0.22	0.18	0.31	0.13
Chrysene	CE087 M	mg/kg	0.09	0.35	0.19	0.19	0.39	0.29
Benzo(b)fluoranthene	CE087 M	mg/kg	0.06	0.43	0.31	0.09	0.16	0.46
Benzo(k)fluoranthene	CE087 M	mg/kg	<0.02	0.20	0.14	<0.02	0.05	0.14
Benzo(a)pyrene	CE087 U	mg/kg	0.03	0.39	0.19	<0.02	0.03	0.31
Indeno(123cd)pyrene	CE087 M	mg/kg	<0.02	0.45	0.36	<0.02	0.04	0.28
Dibenz(ah)anthracene	CE087 M	mg/kg	<0.02	0.07	0.05	0.03	0.04	0.07
Benzo(ghi)perylene	CE087 M	mg/kg	0.05	0.42	0.35	0.08	0.12	0.24
PAH (total of USEPA 16)	CE087	mg/kg	1.25	5.52	2.81	1.54	4.41	3.29
TPH								
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	<1	<1	<1	<1	<1	<1

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SOILS

Lab number			61237-13	61237-14	61237-15	61237-16	61237-17	61237-18
Sample id			GL SE 40/2	GL SW 40/1	GL SW 40/2	GL NW 60/1	GL NW 60/2	GL SE 65/1
Depth (m)			4.00	1.00	5.00	1.00	3.00	1.00
Date sampled			08/09/2016	07/09/2016	07/09/2016	07/09/2016	07/09/2016	08/09/2016
Test	**Method**	**Units**						
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	<1	3	<1	<1	3	1
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	<1	2	1	<1	<1	2
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C8-C10)	CE067	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1	<0.1
EPH Aliphatic (>C10-C12)	CE068	mg/kg	4	<4	<4	6	20	4
EPH Aliphatic (>C12-C16)	CE068	mg/kg	10	5	5	16	50	14
EPH Aliphatic (>C16-C35)	CE068	mg/kg	62	29	34	142	146	310
EPH Aliphatic (>C35-C44)	CE068	mg/kg	22	<10	<10	92	17	235
Subcontracted analysis								
Asbestos (qualitative)	$	-	NAD	NAD	NAD	NAD	NAD	NAD

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SOILS

Lab number			61237-19	61237-20	61237-21	61237-22	61237-23	61237-24
Sample id			GL SE 65/2	GL SW 65/1	GL SW 65/2	GL NW 85/1	GL SE 90/1	GL SW 90/1
Depth (m)			3.00	1.00	3.00	1.00	1.00	1.00
Date sampled			08/09/2016	07/09/2016	08/09/2016	09/09/2016	10/09/2016	07/09/2016
Test	**Method**	**Units**						
Antimony (total)	CE127 U	mg/kg Sb	0.8	2.7	2.6	0.9	2.6	9.8
Arsenic (total)	CE127 M	mg/kg As	16	25	26	12	22	52
Beryllium (total)	CE127 U	mg/kg Be	1.6	2.8	1.8	1.7	2.2	2.6
Boron (water soluble)	CE063 M	mg/kg B	1.5	1.9	2.2	1.9	1.7	1.6
Cadmium (total)	CE127 M	mg/kg Cd	<0.2	0.6	0.3	<0.2	0.5	26.4
Chromium (III)	-	mg/kg CrIII	27	43	37	24	58	57
Chromium (VI)	CE146	mg/kg CrVI	<1	<1	<1	<1	<1	<1
Copper (total)	CE127 M	mg/kg Cu	53	87	89	57	60	107
Lead (total)	CE127 M	mg/kg Pb	20	117	50	23	36	797
Manganese (total)	CE127	mg/kg Mn	294	276	209	200	550	437
Mercury (total)	CE127 M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Molybdenum (total)	CE127 M	mg/kg Mo	3.8	8.8	7.9	2.8	7.4	14
Nickel (total)	CE127 M	mg/kg Ni	30	52	45	28	47	61
Selenium (total)	CE127 M	mg/kg Se	2.1	2.1	1.6	1.8	1.8	2.4
Zinc (total)	CE127 M	mg/kg Zn	48	905	136	35	888	34205
pH	CE004 M	units	7.4	8.4	8.6	7.6	7.6	7.7
Cyanide (total)	CE077 M	mg/kg CN	<1	<1	<1	<1	<1	<1
Phenols (total)	CE078	mg/kg PhOH	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
PAH								
Naphthalene	CE087 M	mg/kg	0.07	0.24	0.15	0.81	0.05	0.29
Acenaphthylene	CE087 M	mg/kg	<0.01	<0.01	0.03	<0.01	<0.01	<0.01
Acenaphthene	CE087 M	mg/kg	<0.01	0.02	0.02	<0.01	<0.01	0.03
Fluorene	CE087 U	mg/kg	0.02	0.04	0.05	0.07	0.02	0.03
Phenanthrene	CE087 M	mg/kg	0.24	0.58	0.44	2.27	0.17	0.59
Anthracene	CE087 U	mg/kg	0.07	0.14	0.13	0.39	0.05	0.16
Fluoranthene	CE087 M	mg/kg	0.21	0.23	0.24	0.49	0.16	0.60
Pyrene	CE087 M	mg/kg	0.20	0.22	0.25	0.41	0.14	0.54
Benzo(a)anthracene	CE087 U	mg/kg	0.17	0.24	0.12	0.49	0.14	0.41
Chrysene	CE087 M	mg/kg	0.21	0.23	0.31	0.47	0.14	0.37
Benzo(b)fluoranthene	CE087 M	mg/kg	0.17	0.24	0.47	0.33	0.17	0.34
Benzo(k)fluoranthene	CE087 M	mg/kg	0.09	0.08	0.21	0.12	0.05	0.18
Benzo(a)pyrene	CE087 U	mg/kg	0.12	0.19	0.43	0.15	0.14	0.28
Indeno(123cd)pyrene	CE087 M	mg/kg	0.06	0.18	0.58	0.09	0.11	0.22
Dibenz(ah)anthracene	CE087 M	mg/kg	0.03	0.05	0.13	0.04	0.03	0.05
Benzo(ghi)perylene	CE087 M	mg/kg	0.08	0.17	0.58	0.17	0.11	0.19
PAH (total of USEPA 16)	CE087	mg/kg	1.76	2.86	4.14	6.30	1.46	4.30
TPH								
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	<1	<1	<1	<1	<1	<1

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SOILS

Lab number			61237-19	61237-20	61237-21	61237-22	61237-23	61237-24
Sample id			GL SE 65/2	GL SW 65/1	GL SW 65/2	GL NW 85/1	GL SE 90/1	GL SW 90/1
Depth (m)			3.00	1.00	3.00	1.00	1.00	1.00
Date sampled			08/09/2016	07/09/2016	08/09/2016	09/09/2016	10/09/2016	07/09/2016
Test	**Method**	**Units**						
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	<1	1	1	4	<1	2
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	<1	1	2	2	<1	2
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C8-C10)	CE067	mg/kg	0.1	0.2	<0.1	0.1	0.2	<0.1
EPH Aliphatic (>C10-C12)	CE068	mg/kg	<4	4	<4	12	<4	4
EPH Aliphatic (>C12-C16)	CE068	mg/kg	5	10	5	35	<4	4
EPH Aliphatic (>C16-C35)	CE068	mg/kg	39	73	78	127	88	59
EPH Aliphatic (>C35-C44)	CE068	mg/kg	18	27	56	18	120	20
Subcontracted analysis								
Asbestos (qualitative)	$	-	NAD	NAD	NAD	NAD	NAD	NAD

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PREPARED LEACHATES

Lab number			61237-1L	61237-2L	61237-3L	61237-4L	61237-5L	61237-6L
Sample id			GL NW 15/1	GL NW 15/2	GL NW 15/3	GL SE 15/1	GL SE 15/2	GL SE 15/3
Depth (m)			1.00	3.00	6.00	1.00	4.00	6.00
Test	**Method**	**Units**						
Arsenic (dissolved)	CE128 U	µg/l As	3.41	6.35	4.33	4.18	0.40	1.95
Cadmium (dissolved)	CE128 U	µg/l Cd	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07
Chromium III (dissolved)	-	µg/l CrIII	<0.2	<0.2	0.3	<0.2	<0.2	<0.2
Chromium VI (dissolved)	CE050 U	µg/l CrVI	<10	<10	<10	<10	<10	<10
Copper (dissolved)	CE128 U	µg/l Cu	1.5	1.3	2.9	2.0	0.4	2.1
Lead (dissolved)	CE128 U	µg/l Pb	<0.2	<0.2	0.5	1.3	<0.2	8.8
Mercury (dissolved)	CE128 U	µg/l Hg	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Nickel (dissolved)	CE128 U	µg/l Ni	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Selenium (dissolved)	CE128 U	µg/l Se	0.56	1.29	0.26	0.34	0.78	0.35
Zinc (dissolved)	CE128 U	µg/l Zn	<1	<1	<1	10	<1	<1
Chloride	CE049 U	mg/l Cl	1	1.3	<1	1.2	<1	<1
Fluoride	CE049 U	mg/l F	0.2	0.3	0.2	0.2	<0.1	0.1
Cyanide (total)	CE147	µg/l CN	<20	<20	<20	<20	<20	<20
Phenols (total)	CE148	µg/l PhOH	<10	<10	<10	<10	<10	<10
PAH								
Naphthalene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(123cd)pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenz(ah)anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PAH (total of USEPA 16)	CE051	µg/l	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
TPH								
VPH Aromatic (>EC5-EC7)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aromatic (>EC7-EC8)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aromatic (>EC8-EC10)	CE067	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC10-EC12)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC12-EC16)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC16-EC21)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC21-EC35)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC35-EC44)	CE161	µg/l	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C5-C6)	CE067	µg/l	<1	<1	<1	<1	<1	<1

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PREPARED LEACHATES

Lab number			61237-1L	61237-2L	61237-3L	61237-4L	61237-5L	61237-6L
Sample id			GL NW 15/1	GL NW 15/2	GL NW 15/3	GL SE 15/1	GL SE 15/2	GL SE 15/3
Depth (m)			1.00	3.00	6.00	1.00	4.00	6.00
Test	**Method**	**Units**						
VPH Aliphatic (>C6-C8)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C8-C10)	CE067	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C10-C12)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C12-C16)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C16-C35)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C35-C44)	CE161	µg/l	<1	<1	<1	<1	<1	<1

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PREPARED LEACHATES

Lab number			61237-7L	61237-8L	61237-9L	61237-10L	61237-11L	61237-12L
Sample id			GL SW 15/1	GL SW 15/2	GL SW 15/3	GL NW 35/1	GL NW 35/2	GL SE 40/1
Depth (m)			1.00	3.00	6.00	1.00	4.00	1.00
Test	**Method**	**Units**						
Arsenic (dissolved)	CE128 U	µg/l As	4.47	2.75	3.20	3.47	4.65	3.96
Cadmium (dissolved)	CE128 U	µg/l Cd	<0.07	<0.07	<0.07	<0.07	<0.07	0.08
Chromium III (dissolved)	-	µg/l CrIII	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chromium VI (dissolved)	CE050 U	µg/l CrVI	<10	<10	<10	<10	<10	<10
Copper (dissolved)	CE128 U	µg/l Cu	3.3	1.4	1.3	2.6	2.6	2.7
Lead (dissolved)	CE128 U	µg/l Pb	4.2	<0.2	<0.2	0.3	0.5	1.2
Mercury (dissolved)	CE128 U	µg/l Hg	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Nickel (dissolved)	CE128 U	µg/l Ni	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Selenium (dissolved)	CE128 U	µg/l Se	0.32	0.38	0.28	0.29	0.21	0.09
Zinc (dissolved)	CE128 U	µg/l Zn	<1	<1	<1	<1	<1	60
Chloride	CE049 U	mg/l Cl	<1	1.1	<1	<1	<1	<1
Fluoride	CE049 U	mg/l F	0.1	0.1	<0.1	0.2	0.2	0.1
Cyanide (total)	CE147	µg/l CN	<20	<20	<20	<20	<20	<20
Phenols (total)	CE148	µg/l PhOH	<10	<10	<10	<10	<10	<10
PAH								
Naphthalene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(123cd)pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenz(ah)anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PAH (total of USEPA 16)	CE051	µg/l	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
TPH								
VPH Aromatic (>EC5-EC7)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aromatic (>EC7-EC8)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aromatic (>EC8-EC10)	CE067	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC10-EC12)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC12-EC16)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC16-EC21)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC21-EC35)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC35-EC44)	CE161	µg/l	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C5-C6)	CE067	µg/l	<1	<1	<1	<1	<1	<1

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PREPARED LEACHATES

Lab number			61237-7L	61237-8L	61237-9L	61237-10L	61237-11L	61237-12L
Sample id			GL SW 15/1	GL SW 15/2	GL SW 15/3	GL NW 35/1	GL NW 35/2	GL SE 40/1
Depth (m)			1.00	3.00	6.00	1.00	4.00	1.00
Test	**Method**	**Units**						
VPH Aliphatic (>C6-C8)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C8-C10)	CE067	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C10-C12)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C12-C16)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C16-C35)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C35-C44)	CE161	µg/l	<1	<1	<1	<1	<1	<1

Chemtech Environmental Limited

PREPARED LEACHATES

Lab number			61237-13L	61237-14L	61237-15L	61237-16L	61237-17L	61237-18L
Sample id			GL SE 40/2	GL SW 40/1	GL SW 40/2	GL NW 60/1	GL NW 60/2	GL SE 65/1
Depth (m)			4.00	1.00	5.00	1.00	3.00	1.00
Test	**Method**	**Units**						
Arsenic (dissolved)	CE128 U	µg/l As	5.29	2.93	5.28	1.07	1.63	4.46
Cadmium (dissolved)	CE128 U	µg/l Cd	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07
Chromium III (dissolved)	-	µg/l CrIII	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chromium VI (dissolved)	CE050 U	µg/l CrVI	<10	<10	<10	<10	<10	<10
Copper (dissolved)	CE128 U	µg/l Cu	2.8	1.3	0.9	2.1	2.4	2.6
Lead (dissolved)	CE128 U	µg/l Pb	0.6	<0.2	<0.2	<0.2	<0.2	0.4
Mercury (dissolved)	CE128 U	µg/l Hg	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Nickel (dissolved)	CE128 U	µg/l Ni	0.8	<0.5	<0.5	<0.5	<0.5	<0.5
Selenium (dissolved)	CE128 U	µg/l Se	0.65	0.28	0.25	0.20	0.17	0.37
Zinc (dissolved)	CE128 U	µg/l Zn	2	<1	<1	<1	<1	<1
Chloride	CE049 U	mg/l Cl	<1	<1	<1	<1	<1	<1
Fluoride	CE049 U	mg/l F	0.4	0.2	0.1	0.1	0.1	0.2
Cyanide (total)	CE147	µg/l CN	<20	<20	<20	<20	<20	<20
Phenols (total)	CE148	µg/l PhOH	<10	<10	<10	<10	<10	<10
PAH								
Naphthalene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	CE051	µg/l	<0.1	0.2	<0.1	<0.1	<0.1	<0.1
Fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	CE051	µg/l	<0.1	0.2	<0.1	<0.1	<0.1	<0.1
Chrysene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(123cd)pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenz(ah)anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PAH (total of USEPA 16)	CE051	µg/l	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
TPH								
VPH Aromatic (>EC5-EC7)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aromatic (>EC7-EC8)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aromatic (>EC8-EC10)	CE067	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC10-EC12)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC12-EC16)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC16-EC21)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC21-EC35)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC35-EC44)	CE161	µg/l	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C5-C6)	CE067	µg/l	<1	<1	<1	<1	<1	<1

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PREPARED LEACHATES

Lab number			61237-13L	61237-14L	61237-15L	61237-16L	61237-17L	61237-18L
Sample id			GL SE 40/2	GL SW 40/1	GL SW 40/2	GL NW 60/1	GL NW 60/2	GL SE 65/1
Depth (m)			4.00	1.00	5.00	1.00	3.00	1.00
Test	**Method**	**Units**						
VPH Aliphatic (>C6-C8)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C8-C10)	CE067	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C10-C12)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C12-C16)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C16-C35)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C35-C44)	CE161	µg/l	<1	<1	<1	<1	<1	<1

Chemtech Environmental Limited

PREPARED LEACHATES

Lab number			61237-19L	61237-20L	61237-21L	61237-22L	61237-23L	61237-24L
Sample id			GL SE 65/2	GL SW 65/1	GL SW 65/2	GL NW 85/1	GL SE 90/1	GL SW 90/1
Depth (m)			3.00	1.00	3.00	1.00	1.00	1.00
Test	**Method**	**Units**						
Arsenic (dissolved)	CE128 U	µg/l As	2.49	7.01	14.99	5.20	1.93	10.88
Cadmium (dissolved)	CE128 U	µg/l Cd	<0.07	<0.07	<0.07	<0.07	<0.07	0.59
Chromium III (dissolved)	-	µg/l CrIII	<0.2	<0.2	0.2	0.2	0.3	<0.2
Chromium VI (dissolved)	CE050 U	µg/l CrVI	<10	<10	<10	<10	<10	<10
Copper (dissolved)	CE128 U	µg/l Cu	3.4	2.4	3.9	4.7	6.4	3.9
Lead (dissolved)	CE128 U	µg/l Pb	0.6	0.5	2.6	1.0	0.9	1.2
Mercury (dissolved)	CE128 U	µg/l Hg	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Nickel (dissolved)	CE128 U	µg/l Ni	<0.5	<0.5	<0.5	0.9	0.6	<0.5
Selenium (dissolved)	CE128 U	µg/l Se	0.36	0.48	0.41	0.30	0.39	<0.07
Zinc (dissolved)	CE128 U	µg/l Zn	<1	<1	<1	<1	<1	216
Chloride	CE049 U	mg/l Cl	<1	<1	1.1	<1	<1	<1
Fluoride	CE049 U	mg/l F	0.1	0.2	0.1	0.1	0.3	0.1
Cyanide (total)	CE147	µg/l CN	<20	<20	<20	<20	<20	<20
Phenols (total)	CE148	µg/l PhOH	<10	<10	<10	<10	<10	<10
PAH								
Naphthalene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(123cd)pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenz(ah)anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PAH (total of USEPA 16)	CE051	µg/l	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
TPH								
VPH Aromatic (>EC5-EC7)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aromatic (>EC7-EC8)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aromatic (>EC8-EC10)	CE067	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC10-EC12)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC12-EC16)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC16-EC21)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC21-EC35)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC35-EC44)	CE161	µg/l	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C5-C6)	CE067	µg/l	<1	<1	<1	<1	<1	<1

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PREPARED LEACHATES

Lab number			61237-19L	61237-20L	61237-21L	61237-22L	61237-23L	61237-24L
Sample id			GL SE 65/2	GL SW 65/1	GL SW 65/2	GL NW 85/1	GL SE 90/1	GL SW 90/1
Depth (m)			3.00	1.00	3.00	1.00	1.00	1.00
Test	**Method**	**Units**						
VPH Aliphatic (>C6-C8)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C8-C10)	CE067	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C10-C12)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C12-C16)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C16-C35)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C35-C44)	CE161	µg/l	<1	<1	<1	<1	<1	<1

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE127	Antimony (total)	Aqua regia digest, ICP-MS	Dry	U	0.2	mg/kg Sb
CE127	Arsenic (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg As
CE127	Beryllium (total)	Aqua regia digest, ICP-MS	Dry	U	1	mg/kg Be
CE063	Boron (water soluble)	Hot water extract, ICP-OES	Dry	M	0.5	mg/kg B
CE127	Cadmium (total)	Aqua regia digest, ICP-MS	Dry	M	0.2	mg/kg Cd
-	Chromium (III)	Calculation: Cr (total) - Cr (VI)	Dry		1	mg/kg CrIII
CE146	Chromium (VI)	Acid extraction, Colorimetry	Dry		1	mg/kg CrVI
CE127	Copper (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cu
CE127	Lead (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Pb
CE127	Manganese (total)	Aqua regia digest, ICP-MS	Dry		1	mg/kg Mn
CE127	Mercury (total)	Aqua regia digest, ICP-MS	Dry	M	0.5	mg/kg Hg
CE127	Molybdenum (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Mo
CE127	Nickel (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Ni
CE127	Selenium (total)	Aqua regia digest, ICP-MS	Dry	M	0.3	mg/kg Se
CE127	Zinc (total)	Aqua regia digest, ICP-MS	Dry	M	5	mg/kg Zn
CE004	pH	Based on BS 1377, pH Meter	Wet	M	-	units
CE077	Cyanide (total)	Extraction, Continuous Flow Colorimetry	Wet	M	1	mg/kg CN
CE078	Phenols (total)	Extraction, Continuous Flow Colorimetry	Wet		0.5	mg/kg PhOH
CE087	Naphthalene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Acenaphthylene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Acenaphthene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Fluorene	Solvent extraction, GC-MS	Wet	U	0.01	mg/kg
CE087	Phenanthrene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Anthracene	Solvent extraction, GC-MS	Wet	U	0.02	mg/kg
CE087	Fluoranthene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Pyrene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Benzo(a)anthracene	Solvent extraction, GC-MS	Wet	U	0.02	mg/kg
CE087	Chrysene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Benzo(b)fluoranthene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Benzo(k)fluoranthene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Benzo(a)pyrene	Solvent extraction, GC-MS	Wet	U	0.02	mg/kg
CE087	Indeno(123cd)pyrene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Dibenz(ah)anthracene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Benzo(ghi)perylene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	PAH (total of USEPA 16)	Solvent extraction, GC-MS	Wet		0.27	mg/kg
CE067	VPH Aromatic (>EC5-EC7)	Headspace GC-FID	Wet		0.01	mg/kg
CE067	VPH Aromatic (>EC7-EC8)	Headspace GC-FID	Wet		0.01	mg/kg
CE067	VPH Aromatic (>EC8-EC10)	Headspace GC-FID	Wet		0.01	mg/kg
CE068	EPH Aromatic (>EC10-EC12)	Solvent extraction, GC-FID	Wet		1	mg/kg
CE068	EPH Aromatic (>EC12-EC16)	Solvent extraction, GC-FID	Wet		1	mg/kg
CE068	EPH Aromatic (>EC16-EC21)	Solvent extraction, GC-FID	Wet		1	mg/kg
CE068	EPH Aromatic (>EC21-EC35)	Solvent extraction, GC-FID	Wet		1	mg/kg
CE068	EPH Aromatic (>EC35-EC44)	Solvent extraction, GC-FID	Wet		1	mg/kg

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE067	VPH Aliphatic (>C5-C6)	Headspace GC-FID	Wet		0.1	mg/kg
CE067	VPH Aliphatic (>C6-C8)	Headspace GC-FID	Wet		0.1	mg/kg
CE067	VPH Aliphatic (>C8-C10)	Headspace GC-FID	Wet		0.1	mg/kg
CE068	EPH Aliphatic (>C10-C12)	Solvent extraction, GC-FID	Wet		4	mg/kg
CE068	EPH Aliphatic (>C12-C16)	Solvent extraction, GC-FID	Wet		4	mg/kg
CE068	EPH Aliphatic (>C16-C35)	Solvent extraction, GC-FID	Wet		4	mg/kg
CE068	EPH Aliphatic (>C35-C44)	Solvent extraction, GC-FID	Wet		10	mg/kg
$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-

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METHOD DETAILS

METHOD	PREPARED LEACHATES	METHOD SUMMARY	STATUS	LOD	UNITS
CE001	Leachate preparation (10:1 single-stage)	BS12457-2		-	-
CE128	Arsenic (dissolved)	ICP-MS	U	0.06	µg/l As
CE128	Cadmium (dissolved)	ICP-MS	U	0.07	µg/l Cd
-	Chromium III (dissolved)	Calculation: Cr (total) - Cr (VI)		10	µg/l CrIII
CE050	Chromium VI (dissolved)	Colorimetry	U	10	µg/l CrVI
CE128	Copper (dissolved)	ICP-MS	U	0.4	µg/l Cu
CE128	Lead (dissolved)	ICP-MS	U	0.2	µg/l Pb
CE128	Mercury (dissolved)	ICP-MS	U	0.008	µg/l Hg
CE128	Nickel (dissolved)	ICP-MS	U	0.5	µg/l Ni
CE128	Selenium (dissolved)	ICP-MS	U	0.07	µg/l Se
CE128	Zinc (dissolved)	ICP-MS	U	1	µg/l Zn
CE049	Chloride	Ion Chromatography	U	1	mg/l Cl
CE049	Fluoride	Ion Chromatography	U	0.2	mg/l F
CE147	Cyanide (total)	Continuous Flow Colorimetry		20	µg/l CN
CE148	Phenols (total)	Continuous Flow Colorimetry		10	µg/l PhOH
CE051	PAH (speciated)	Solvent extraction, GC-MS		0.1	µg/l
CE051	PAH (total of USEPA 16)	Solvent extraction, GC-MS		1.6	µg/l
CE067	VPH Aromatic (>EC5-EC7)	Headspace GC-FID		1	µg/l
CE067	VPH Aromatic (>EC7-EC8)	Headspace GC-FID		1	µg/l
CE067	VPH Aromatic (>EC8-EC10)	Headspace GC-FID		1	µg/l
CE161	EPH Aromatic (>EC10-EC12)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC12-EC16)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC16-EC21)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC21-EC35)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC35-EC44)	Solvent extraction, GC-FID		1	µg/l
CE067	VPH Aliphatic (>C5-C6)	Headspace GC-FID		1	µg/l
CE067	VPH Aliphatic (>C6-C8)	Headspace GC-FID		1	µg/l
CE067	VPH Aliphatic (>C8-C10)	Headspace GC-FID		1	µg/l
CE161	EPH Aliphatic (>C10-C12)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aliphatic (>C12-C16)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aliphatic (>C16-C35)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aliphatic (>C35-C44)	Solvent extraction, GC-FID		1	µg/l

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DEVIATING SAMPLE INFORMATION

Comments
Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.
For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.
Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
IT	Sample not cooled
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
61237-1	GL NW 15/1	1.00	N	
61237-2	GL NW 15/2	3.00	N	
61237-3	GL NW 15/3	6.00	N	
61237-4	GL SE 15/1	1.00	N	
61237-5	GL SE 15/2	4.00	N	
61237-6	GL SE 15/3	6.00	N	
61237-7	GL SW 15/1	1.00	N	
61237-8	GL SW 15/2	3.00	N	
61237-9	GL SW 15/3	6.00	N	
61237-10	GL NW 35/1	1.00	N	
61237-11	GL NW 35/2	4.00	N	
61237-12	GL SE 40/1	1.00	N	
61237-13	GL SE 40/2	4.00	N	
61237-14	GL SW 40/1	1.00	N	
61237-15	GL SW 40/2	5.00	N	
61237-16	GL NW 60/1	1.00	N	
61237-17	GL NW 60/2	3.00	N	
61237-18	GL SE 65/1	1.00	N	
61237-19	GL SE 65/2	3.00	N	
61237-20	GL SW 65/1	1.00	N	
61237-21	GL SW 65/2	3.00	N	
61237-22	GL NW 85/1	1.00	N	
61237-23	GL SE 90/1	1.00	N	
61237-24	GL SW 90/1	1.00	N	

Annex D
Ecovigour Hawes Lane Soil and Leachate Test Results

2531

ANALYTICAL TEST REPORT

Contract no: 61281

Contract name: Green Lane Bridge

Client reference: -

Clients name: Eco Vigour

Clients address: Hardwick Farm
5 Lanes, Caerwent
Monmouthshire
NP25 5PH

Samples received: 14 September 2016

Analysis started: 15 September 2016

Analysis completed 21 September 2016

Report issued: 21 September 2016

Notes:
Opinions and interpretations expressed herein are outside the UKAS accreditation scope.
Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.
Methods, procedures and performance data are available on request.
Results reported herein relate only to the material supplied to the laboratory.
This report shall not be reproduced except in full, withour prior written approval.
Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

Key:
U UKAS accredited test
M MCERTS & UKAS accredited test
$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing
NAD No Asbestos Detected

Approved by:
[redacted]
Dave Bowerbank
Customer Services Co-ordinator

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

All results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.
Analytical results are inclusive of stones.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
61281-1	HL/NW/15/1	1.00	Sand with Shale	-	-	8.2
61281-2	HL/SE/15/1	1.00	Sand with Shale, Slag & Coal	-	-	9.2
61281-3	HL/SW/15/1	1.00	Sand with Shale, Slag & Coal	-	-	6.1
61281-4	HL/NW/15/2	3.00	Sand with Shale	-	-	7.9
61281-5	HL/SE/15/2	4.00	Sand with Shale	-	-	10.7
61281-6	HL/SW/15/2	3.00	Sand with Shale & Coal	-	-	7.8
61281-7	HL/NW15/3	6.00	Sand with Slag & Shale	-	-	13.4
61281-8	HL/SE/15/3	6.00	Sand with Shale	-	-	10.7
61281-9	HL/NE/20/1	1.00	Sand with Shale	-	-	10.1
61281-10	HL/NE/20/2	3.00	Sand with Shale	-	-	9.7
61281-11	HL/NE/20/3	6.00	Sand with Shale	-	-	8.6
61281-12	HL/NW/40/1	1.00	Coal	-	-	6.0
61281-13	HL/SE/40/1	1.00	Clay	-	-	8.2
61281-14	HL/NW/40/2	4.00	Sand with Slag & Coal	-	-	7.3
61281-15	HL/SE/40/2	4.00	Sandy Clay with Shale & Coal	-	-	12.1
61281-16	HL/NE/50/1	1.00	Coal	-	-	3.8
61281-17	HL/SW/50/1	1.00	Sand with Shale	-	-	9.2
61281-18	HL/NE/50/2	3.00	Coal	-	-	5.6
61281-19	HL/SW/50/2	3.00	Sand with Coal & Shale	-	-	6.3
61281-20	HL/NW/65/1	1.00	Clay & Sand with Coal	-	-	11.2
61281-21	HL/SE/65/1	1.00	Clay & Sand with Slag	-	-	10.9
61281-22	HL/NW/65/2	3.00	Sand with Coal & Shale	-	-	8.6
61281-23	HL/SE/65/2	2.00	Clay with Mudstone	-	-	7.3
61281-24	HL/NE/80/1	1.00	Sand & Clay with Slag	-	-	13.6
61281-25	HL/SW/80/1	1.00	Sand with Shale	-	-	6.8
61281-26	HL/NE/80/2	2.00	Sand with Slag & Coal	-	-	9.9
61281-27	HL/SW/80/2	3.00	Sand with Shale & Slag	-	-	4.8
61281-28	HL/SW/80/3	6.00	Sand with Slag	-	-	5.0
61281-29	HL/NW/90/1	1.00	Sand with Slag	-	-	10.2
61281-30	NL/SE/90/1	1.00	Sand with Slag	-	-	14.8

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SOILS

Lab number			61281-1	61281-2	61281-3	61281-4	61281-5	61281-6
Sample id			HL/NW/15/1	HL/SE/15/1	HL/SW/15/1	HL/NW/15/2	HL/SE/15/2	HL/SW/15/2
Depth (m)			1.00	1.00	1.00	3.00	4.00	3.00
Date sampled			09/09/2016	09/09/2016	09/09/2016	09/09/2016	09/09/2016	09/09/2016
Test	**Method**	**Units**						
Antimony (total)	CE127 U	mg/kg Sb	1.7	1.3	0.9	0.8	2.3	<0.2
Arsenic (total)	CE127 M	mg/kg As	22	16	15	11	22	14
Beryllium (total)	CE127 U	mg/kg Be	2.1	1.8	1.2	1.6	1.9	1.0
Boron (water soluble)	CE063 M	mg/kg B	0.6	1.4	1.6	1.4	1.0	1.6
Cadmium (total)	CE127 M	mg/kg Cd	0.2	0.4	<0.2	<0.2	2.5	<0.2
Chromium (total)	CE127 M	mg/kg Cr	53	42	22	52	54	20
Chromium (III)	-	mg/kg CrIII	53	42	22	52	54	20
Chromium (VI)	CE146	mg/kg CrVI	<1	<1	<1	<1	<1	<1
Copper (total)	CE127 M	mg/kg Cu	388	46	56	38	49	37
Lead (total)	CE127 M	mg/kg Pb	58	36	23	19	62	19
Manganese (total)	CE127	mg/kg Mn	454	332	242	241	1300	148
Mercury (total)	CE127 M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Molybdenum (total)	CE127 M	mg/kg Mo	4.1	3.6	2.2	3.9	5.4	1.0
Nickel (total)	CE127 M	mg/kg Ni	49	36	38	30	39	34
Selenium (total)	CE127 M	mg/kg Se	1.7	1.6	1.3	1.3	1.5	1.0
Zinc (total)	CE127 M	mg/kg Zn	106	305	60	57	3226	100
pH	CE004 M	units	8.4	7.8	8.3	7.9	7.3	8.0
Cyanide (total)	CE077 M	mg/kg CN	<1	<1	<1	<1	<1	<1
Phenols (total)	CE078	mg/kg PhOH	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
PAH								
Naphthalene	CE087 M	mg/kg	<0.01	0.20	0.62	0.06	0.04	0.83
Acenaphthylene	CE087 M	mg/kg	<0.01	<0.01	0.08	0.01	<0.01	<0.01
Acenaphthene	CE087 M	mg/kg	<0.01	0.02	0.03	0.03	<0.01	0.03
Fluorene	CE087 U	mg/kg	<0.01	0.09	0.10	0.04	<0.01	<0.01
Phenanthrene	CE087 M	mg/kg	<0.02	1.12	2.71	0.46	0.12	2.47
Anthracene	CE087 U	mg/kg	<0.02	<0.02	0.45	0.13	<0.02	0.23
Fluoranthene	CE087 M	mg/kg	<0.02	0.43	2.21	1.21	0.07	0.43
Pyrene	CE087 M	mg/kg	<0.02	0.34	1.83	0.96	0.06	0.47
Benzo(a)anthracene	CE087 U	mg/kg	<0.02	0.19	0.84	0.81	0.03	0.16
Chrysene	CE087 M	mg/kg	<0.01	0.32	0.82	0.71	0.05	0.41
Benzo(b)fluoranthene	CE087 M	mg/kg	<0.02	0.28	0.82	1.09	0.06	0.21
Benzo(k)fluoranthene	CE087 M	mg/kg	<0.02	0.07	0.31	0.41	<0.02	0.03
Benzo(a)pyrene	CE087 U	mg/kg	<0.02	0.17	0.59	0.80	0.03	0.07
Indeno(123cd)pyrene	CE087 M	mg/kg	<0.02	0.11	0.36	0.67	0.04	0.04
Dibenz(ah)anthracene	CE087 M	mg/kg	<0.02	0.05	0.11	0.20	<0.02	0.04
Benzo(ghi)perylene	CE087 M	mg/kg	<0.02	0.16	0.42	0.68	0.03	0.12
PAH (total of USEPA 16)	CE087	mg/kg	<0.27	3.55	12.3	8.26	0.53	5.54
TPH								
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

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SOILS

Lab number			61281-1	61281-2	61281-3	61281-4	61281-5	61281-6
Sample id			HL/NW/15/1	HL/SE/15/1	HL/SW/15/1	HL/NW/15/2	HL/SE/15/2	HL/SW/15/2
Depth (m)			1.00	1.00	1.00	3.00	4.00	3.00
Date sampled			09/09/2016	09/09/2016	09/09/2016	09/09/2016	09/09/2016	09/09/2016
Test	**Method**	**Units**						
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	<1	<1	1	<1	<1	1
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	<1	2	8	3	<1	5
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	<1	1	4	6	1	2
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	<1	<1	<1	1	2	<1
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C8-C10)	CE067	mg/kg	<0.1	<0.1	<0.1	0.2	0.2	<0.1
EPH Aliphatic (>C10-C12)	CE068	mg/kg	<4	<4	13	<4	<4	18
EPH Aliphatic (>C12-C16)	CE068	mg/kg	<4	<4	39	<4	<4	55
EPH Aliphatic (>C16-C35)	CE068	mg/kg	<10	<10	134	141	85	204
EPH Aliphatic (>C35-C44)	CE068	mg/kg	<10	<10	14	65	134	34
Subcontracted analysis								
Asbestos (qualitative)	$	-	NAD	NAD	NAD	NAD	NAD	NAD

Chemtech Environmental Limited

SOILS

Lab number			61281-7	61281-8	61281-9	61281-10	61281-11	61281-12
Sample id			HL/NW15/3	HL/SE/15/3	HL/NE/20/1	HL/NE/20/2	HL/NE/20/3	HL/NW/40/1
Depth (m)			6.00	6.00	1.00	3.00	6.00	1.00
Date sampled			09/09/2016	09/09/2016	09/09/2016	09/09/2016	09/09/2016	09/09/2016
Test	**Method**	**Units**						
Antimony (total)	CE127 U	mg/kg Sb	1.2	1.1	1.2	1.1	5.8	0.5
Arsenic (total)	CE127 M	mg/kg As	12	16	17	14	45	8.0
Beryllium (total)	CE127 U	mg/kg Be	1.6	1.7	1.7	1.6	1.1	<1
Boron (water soluble)	CE063 M	mg/kg B	1.3	1.1	1.9	1.5	1.4	1.6
Cadmium (total)	CE127 M	mg/kg Cd	0.4	1.0	<0.2	<0.2	0.3	<0.2
Chromium (total)	CE127 M	mg/kg Cr	34	51	49	47	48	17
Chromium (III)	-	mg/kg CrIII	34	51	49	47	48	17
Chromium (VI)	CE146	mg/kg CrVI	<1	<1	<1	<1	<1	<1
Copper (total)	CE127 M	mg/kg Cu	35	41	52	48	164	55
Lead (total)	CE127 M	mg/kg Pb	25	54	30	25	144	16
Manganese (total)	CE127	mg/kg Mn	423	389	356	448	1702	124
Mercury (total)	CE127 M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Molybdenum (total)	CE127 M	mg/kg Mo	2.8	4.4	4.4	4.0	5.5	1.5
Nickel (total)	CE127 M	mg/kg Ni	31	38	37	37	34	12
Selenium (total)	CE127 M	mg/kg Se	1.2	1.6	1.8	1.5	1.9	1.3
Zinc (total)	CE127 M	mg/kg Zn	154	1463	124	51	113	11
pH	CE004 M	units	7.4	7.0	8.3	7.6	7.1	7.5
Cyanide (total)	CE077 M	mg/kg CN	<1	<1	<1	<1	<1	<1
Phenols (total)	CE078	mg/kg PhOH	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
PAH								
Naphthalene	CE087 M	mg/kg	0.09	0.16	0.95	0.98	3.04	0.37
Acenaphthylene	CE087 M	mg/kg	<0.01	<0.01	0.21	0.06	0.52	<0.01
Acenaphthene	CE087 M	mg/kg	<0.01	<0.01	0.21	0.21	0.29	0.03
Fluorene	CE087 U	mg/kg	0.03	0.03	0.46	0.22	0.45	0.11
Phenanthrene	CE087 M	mg/kg	0.26	0.44	4.40	3.29	19.31	0.91
Anthracene	CE087 U	mg/kg	<0.02	0.04	1.02	0.74	4.98	0.23
Fluoranthene	CE087 M	mg/kg	0.21	0.10	4.05	5.70	21.37	0.28
Pyrene	CE087 M	mg/kg	0.17	0.09	3.33	4.50	15.18	0.31
Benzo(a)anthracene	CE087 U	mg/kg	0.14	0.05	1.92	3.41	8.81	0.22
Chrysene	CE087 M	mg/kg	0.16	0.09	1.50	3.01	7.16	0.32
Benzo(b)fluoranthene	CE087 M	mg/kg	0.21	0.07	2.07	3.54	7.87	0.20
Benzo(k)fluoranthene	CE087 M	mg/kg	0.07	0.02	0.88	1.43	3.18	0.06
Benzo(a)pyrene	CE087 U	mg/kg	0.13	0.04	1.65	2.73	5.76	0.18
Indeno(123cd)pyrene	CE087 M	mg/kg	0.12	0.04	1.21	1.84	4.02	0.13
Dibenz(ah)anthracene	CE087 M	mg/kg	0.03	<0.02	0.32	0.59	1.17	0.07
Benzo(ghi)perylene	CE087 M	mg/kg	0.11	0.05	1.17	1.84	3.62	0.33
PAH (total of USEPA 16)	CE087	mg/kg	1.74	1.23	25.4	34.1	107	3.75
TPH								
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Chemtech Environmental Limited

SOILS

Lab number			61281-7	61281-8	61281-9	61281-10	61281-11	61281-12
Sample id			HL/NW15/3	HL/SE/15/3	HL/NE/20/1	HL/NE/20/2	HL/NE/20/3	HL/NW/40/1
Depth (m)			6.00	6.00	1.00	3.00	6.00	1.00
Date sampled			09/09/2016	09/09/2016	09/09/2016	09/09/2016	09/09/2016	09/09/2016
Test	**Method**	**Units**						
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	<1	<1	<1	1	3	<1
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	<1	<1	1	<1	4	<1
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	<1	1	14	14	63	2
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	2	2	10	17	39	2
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	<1	<1	2	2	5	1
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C8-C10)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	0.3	0.3
EPH Aliphatic (>C10-C12)	CE068	mg/kg	<4	<4	8	<4	6	<4
EPH Aliphatic (>C12-C16)	CE068	mg/kg	<4	10	33	12	23	10
EPH Aliphatic (>C16-C35)	CE068	mg/kg	22	55	233	102	141	153
EPH Aliphatic (>C35-C44)	CE068	mg/kg	<10	<10	36	19	35	109
Subcontracted analysis								
Asbestos (qualitative)	$	-	NAD	NAD	NAD	NAD	NAD	NAD

Chemtech Environmental Limited

SOILS

Lab number			61281-13	61281-14	61281-15	61281-16	61281-17	61281-18
Sample id			HL/SE/40/1	HL/NW/40/2	HL/SE/40/2	HL/NE/50/1	HL/SW/50/1	HL/NE/50/2
Depth (m)			1.00	4.00	4.00	1.00	1.00	3.00
Date sampled			09/09/2016	09/09/2016	09/09/2016	09/09/2016	09/09/2016	09/09/2016
Test	**Method**	**Units**						
Antimony (total)	CE127 U	mg/kg Sb	0.4	<0.2	0.8	0.4	1.2	0.4
Arsenic (total)	CE127 M	mg/kg As	3.2	3.4	11	4.6	20	17
Beryllium (total)	CE127 U	mg/kg Be	<1	<1	1.0	<1	2.3	<1
Boron (water soluble)	CE063 M	mg/kg B	0.5	1.3	0.8	1.7	1.5	1.5
Cadmium (total)	CE127 M	mg/kg Cd	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chromium (total)	CE127 M	mg/kg Cr	51	7.4	41	13	45	11
Chromium (III)	-	mg/kg CrIII	51	7.4	41	13	45	11
Chromium (VI)	CE146	mg/kg CrVI	<1	<1	<1	<1	<1	<1
Copper (total)	CE127 M	mg/kg Cu	14	37	51	38	56	38
Lead (total)	CE127 M	mg/kg Pb	12	15	22	16	40	18
Manganese (total)	CE127	mg/kg Mn	951	257	609	96	257	69
Mercury (total)	CE127 M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Molybdenum (total)	CE127 M	mg/kg Mo	1.0	<1	3.4	<1	4.6	1.2
Nickel (total)	CE127 M	mg/kg Ni	46	16	38	21	39	15
Selenium (total)	CE127 M	mg/kg Se	0.9	0.8	1.2	1.5	2.2	2.2
Zinc (total)	CE127 M	mg/kg Zn	61	28	64	12	35	9.3
pH	CE004 M	units	7.6	8.3	7.0	8.1	8.5	7.8
Cyanide (total)	CE077 M	mg/kg CN	<1	<1	<1	<1	<1	<1
Phenols (total)	CE078	mg/kg PhOH	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
PAH								
Naphthalene	CE087 M	mg/kg	<0.01	0.35	0.05	0.24	0.39	0.28
Acenaphthylene	CE087 M	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	CE087 M	mg/kg	<0.01	0.05	0.01	<0.01	<0.01	0.01
Fluorene	CE087 U	mg/kg	<0.01	0.10	0.02	0.07	0.05	0.11
Phenanthrene	CE087 M	mg/kg	0.04	0.84	0.33	0.42	1.14	0.65
Anthracene	CE087 U	mg/kg	<0.02	<0.02	0.05	<0.02	<0.02	<0.02
Fluoranthene	CE087 M	mg/kg	0.05	0.59	0.36	0.06	0.16	0.08
Pyrene	CE087 M	mg/kg	0.04	0.49	0.29	0.07	0.15	0.10
Benzo(a)anthracene	CE087 U	mg/kg	0.03	0.30	0.22	0.03	0.07	0.06
Chrysene	CE087 M	mg/kg	0.03	0.35	0.25	0.12	0.20	0.19
Benzo(b)fluoranthene	CE087 M	mg/kg	0.04	0.43	0.34	0.06	0.10	0.10
Benzo(k)fluoranthene	CE087 M	mg/kg	<0.02	0.15	0.13	<0.02	<0.02	<0.02
Benzo(a)pyrene	CE087 U	mg/kg	0.03	0.30	0.25	0.03	0.04	0.04
Indeno(123cd)pyrene	CE087 M	mg/kg	0.03	0.25	0.21	<0.02	0.03	<0.02
Dibenz(ah)anthracene	CE087 M	mg/kg	<0.02	0.06	0.07	<0.02	0.02	0.03
Benzo(ghi)perylene	CE087 M	mg/kg	0.03	0.27	0.23	0.05	0.08	0.08
PAH (total of USEPA 16)	CE087	mg/kg	0.32	4.52	2.81	1.15	2.44	1.73
TPH								
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

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SOILS

Lab number			61281-13	61281-14	61281-15	61281-16	61281-17	61281-18
Sample id			HL/SE/40/1	HL/NW/40/2	HL/SE/40/2	HL/NE/50/1	HL/SW/50/1	HL/NE/50/2
Depth (m)			1.00	4.00	4.00	1.00	1.00	3.00
Date sampled			09/09/2016	09/09/2016	09/09/2016	09/09/2016	09/09/2016	09/09/2016
Test	**Method**	**Units**						
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	<1	2	1	<1	2	1
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	1	3	3	2	2	2
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	<1	1	1	<1	<1	1
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C8-C10)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EPH Aliphatic (>C10-C12)	CE068	mg/kg	<4	5	<4	<4	8	7
EPH Aliphatic (>C12-C16)	CE068	mg/kg	<4	15	<4	9	24	16
EPH Aliphatic (>C16-C35)	CE068	mg/kg	15	97	50	47	95	98
EPH Aliphatic (>C35-C44)	CE068	mg/kg	13	31	39	14	17	41
Subcontracted analysis								
Asbestos (qualitative)	$	-	NAD	NAD	NAD	NAD	NAD	NAD

Chemtech Environmental Limited

SOILS

Lab number			61281-19	61281-20	61281-21	61281-22	61281-23	61281-24
Sample id			HL/SW/50/2	HL/NW/65/1	HL/SE/65/1	HL/NW/65/2	HL/SE/65/2	HL/NE/80/1
Depth (m)			3.00	1.00	1.00	3.00	2.00	1.00
Date sampled			09/09/2016	09/09/2016	09/09/2016	09/09/2016	09/09/2016	09/09/2016
Test	**Method**	**Units**						
Antimony (total)	CE127 U	mg/kg Sb	0.6	0.5	1.0	0.2	0.5	1.1
Arsenic (total)	CE127 M	mg/kg As	24	7.7	7.1	3.9	3.3	16
Beryllium (total)	CE127 U	mg/kg Be	1.2	1.1	1.6	1.1	1.4	2.6
Boron (water soluble)	CE063 M	mg/kg B	1.8	0.8	1.1	1.1	0.6	1.5
Cadmium (total)	CE127 M	mg/kg Cd	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chromium (total)	CE127 M	mg/kg Cr	17	34	44	13	46	43
Chromium (III)	-	mg/kg CrIII	17	34	44	13	46	43
Chromium (VI)	CE146	mg/kg CrVI	<1	<1	<1	<1	<1	<1
Copper (total)	CE127 M	mg/kg Cu	47	27	28	34	17	73
Lead (total)	CE127 M	mg/kg Pb	20	16	34	16	15	7.1
Manganese (total)	CE127	mg/kg Mn	186	642	371	194	355	316
Mercury (total)	CE127 M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Molybdenum (total)	CE127 M	mg/kg Mo	2.0	1.8	2.8	1.0	1.3	10.9
Nickel (total)	CE127 M	mg/kg Ni	28	44	46	25	52	50
Selenium (total)	CE127 M	mg/kg Se	1.4	1.0	1.0	0.6	0.8	2.0
Zinc (total)	CE127 M	mg/kg Zn	42	64	86	36	58	19
pH	CE004 M	units	8.3	7.9	7.7	7.7	7.4	8.0
Cyanide (total)	CE077 M	mg/kg CN	<1	<1	<1	<1	<1	<1
Phenols (total)	CE078	mg/kg PhOH	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
PAH								
Naphthalene	CE087 M	mg/kg	0.28	0.25	0.19	0.24	0.02	0.04
Acenaphthylene	CE087 M	mg/kg	<0.01	<0.01	0.02	<0.01	<0.01	0.01
Acenaphthene	CE087 M	mg/kg	0.01	0.01	0.13	0.01	<0.01	0.03
Fluorene	CE087 U	mg/kg	0.04	0.09	0.12	0.05	<0.01	0.03
Phenanthrene	CE087 M	mg/kg	0.74	0.69	1.42	0.58	0.08	0.23
Anthracene	CE087 U	mg/kg	<0.02	<0.02	0.29	<0.02	<0.02	0.08
Fluoranthene	CE087 M	mg/kg	0.14	0.19	2.37	0.10	0.09	0.70
Pyrene	CE087 M	mg/kg	0.12	0.16	1.91	0.09	0.07	0.57
Benzo(a)anthracene	CE087 U	mg/kg	0.06	0.11	1.59	0.04	0.04	0.50
Chrysene	CE087 M	mg/kg	0.13	0.22	1.42	0.11	0.05	0.43
Benzo(b)fluoranthene	CE087 M	mg/kg	0.08	0.18	2.03	0.09	0.06	0.62
Benzo(k)fluoranthene	CE087 M	mg/kg	<0.02	0.04	0.82	<0.02	0.02	0.26
Benzo(a)pyrene	CE087 U	mg/kg	0.05	0.08	1.60	0.03	0.05	0.47
Indeno(123cd)pyrene	CE087 M	mg/kg	0.05	0.07	1.51	0.03	0.05	0.36
Dibenz(ah)anthracene	CE087 M	mg/kg	<0.02	0.04	0.41	<0.02	<0.02	0.10
Benzo(ghi)perylene	CE087 M	mg/kg	0.08	0.12	1.35	0.05	0.06	0.35
PAH (total of USEPA 16)	CE087	mg/kg	1.77	2.24	17.2	1.42	0.59	4.79
TPH								
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

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SOILS

Lab number			61281-19	61281-20	61281-21	61281-22	61281-23	61281-24
Sample id			HL/SW/50/2	HL/NW/65/1	HL/SE/65/1	HL/NW/65/2	HL/SE/65/2	HL/NE/80/1
Depth (m)			3.00	1.00	1.00	3.00	2.00	1.00
Date sampled			09/09/2016	09/09/2016	09/09/2016	09/09/2016	09/09/2016	09/09/2016
Test	**Method**	**Units**						
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	<1	<1	1	<1	<1	<1
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	1	1	6	1	<1	2
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	1	2	9	2	<1	3
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	<1	1	2	1	<1	1
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C8-C10)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EPH Aliphatic (>C10-C12)	CE068	mg/kg	9	8	<4	6	<4	<4
EPH Aliphatic (>C12-C16)	CE068	mg/kg	23	22	5	17	<4	<4
EPH Aliphatic (>C16-C35)	CE068	mg/kg	75	114	89	91	<10	38
EPH Aliphatic (>C35-C44)	CE068	mg/kg	11	42	43	36	<10	11
Subcontracted analysis								
Asbestos (qualitative)	$	-	NAD	NAD	NAD	NAD	NAD	NAD

Chemtech Environmental Limited

SOILS

Lab number			61281-25	61281-26	61281-27	61281-28	61281-29	61281-30
Sample id			HL/SW/80/1	HL/NE/80/2	HL/SW/80/2	HL/SW/80/3	HL/NW/90/1	NL/SE/90/1
Depth (m)			1.00	2.00	3.00	6.00	1.00	1.00
Date sampled			09/09/2016	09/09/2016	09/09/2016	09/09/2016	09/09/2016	09/09/2016
Test	**Method**	**Units**						
Antimony (total)	CE127 U	mg/kg Sb	0.3	<0.2	0.8	0.4	1.1	3.1
Arsenic (total)	CE127 M	mg/kg As	10	9.0	8.4	4.8	11	29
Beryllium (total)	CE127 U	mg/kg Be	1.8	1.9	1.9	2.3	1.9	1.9
Boron (water soluble)	CE063 M	mg/kg B	1.9	1.8	1.2	1.3	1.2	1.8
Cadmium (total)	CE127 M	mg/kg Cd	<0.2	0.2	<0.2	<0.2	0.3	0.7
Chromium (total)	CE127 M	mg/kg Cr	27	22	32	36	34	46
Chromium (III)	-	mg/kg CrIII	27	22	32	36	34	46
Chromium (VI)	CE146	mg/kg CrVI	<1	<1	<1	<1	<1	<1
Copper (total)	CE127 M	mg/kg Cu	39	86	51	57	65	129
Lead (total)	CE127 M	mg/kg Pb	28	36	18	14	42	145
Manganese (total)	CE127	mg/kg Mn	188	298	269	851	819	776
Mercury (total)	CE127 M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Molybdenum (total)	CE127 M	mg/kg Mo	2.2	1.9	3.2	3.3	3.4	7.9
Nickel (total)	CE127 M	mg/kg Ni	27	39	29	38	48	41
Selenium (total)	CE127 M	mg/kg Se	0.9	1.1	1.6	1.3	1.4	1.4
Zinc (total)	CE127 M	mg/kg Zn	39	70	32	37	126	232
pH	CE004 M	units	7.8	7.8	7.7	7.3	7.8	7.7
Cyanide (total)	CE077 M	mg/kg CN	<1	<1	<1	<1	<1	<1
Phenols (total)	CE078	mg/kg PhOH	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
PAH								
Naphthalene	CE087 M	mg/kg	0.87	0.12	0.18	0.16	0.22	0.07
Acenaphthylene	CE087 M	mg/kg	<0.01	0.02	<0.01	<0.01	0.16	0.06
Acenaphthene	CE087 M	mg/kg	0.06	0.04	0.01	0.01	1.54	0.32
Fluorene	CE087 U	mg/kg	0.10	0.07	0.05	0.03	1.43	0.28
Phenanthrene	CE087 M	mg/kg	2.40	0.80	0.56	0.34	13.70	3.39
Anthracene	CE087 U	mg/kg	0.26	0.19	<0.02	0.05	2.56	0.59
Fluoranthene	CE087 M	mg/kg	0.41	0.93	0.15	0.07	28.00	7.55
Pyrene	CE087 M	mg/kg	0.36	0.73	0.13	0.06	21.32	5.65
Benzo(a)anthracene	CE087 U	mg/kg	0.17	0.49	0.09	0.03	13.03	3.70
Chrysene	CE087 M	mg/kg	0.39	0.52	0.14	0.07	13.62	3.73
Benzo(b)fluoranthene	CE087 M	mg/kg	0.24	0.83	0.15	0.05	17.94	7.12
Benzo(k)fluoranthene	CE087 M	mg/kg	0.05	0.31	0.04	<0.02	6.65	2.68
Benzo(a)pyrene	CE087 U	mg/kg	0.11	0.61	0.09	0.03	12.97	5.16
Indeno(123cd)pyrene	CE087 M	mg/kg	0.08	0.42	0.07	0.02	11.25	3.96
Dibenz(ah)anthracene	CE087 M	mg/kg	0.05	0.11	<0.02	<0.02	3.02	1.10
Benzo(ghi)perylene	CE087 M	mg/kg	0.15	0.40	0.08	0.04	9.65	3.58
PAH (total of USEPA 16)	CE087	mg/kg	5.69	6.60	1.74	0.95	157	48.9
TPH								
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

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SOILS

Lab number			61281-25	61281-26	61281-27	61281-28	61281-29	61281-30
Sample id			HL/SW/80/1	HL/NE/80/2	HL/SW/80/2	HL/SW/80/3	HL/NW/90/1	NL/SE/90/1
Depth (m)			1.00	2.00	3.00	6.00	1.00	1.00
Date sampled			09/09/2016	09/09/2016	09/09/2016	09/09/2016	09/09/2016	09/09/2016
Test	**Method**	**Units**						
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	1	<1	<1	<1	3	1
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	4	3	2	<1	69	18
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	2	4	2	1	83	29
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	<1	1	<1	<1	16	6
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C8-C10)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EPH Aliphatic (>C10-C12)	CE068	mg/kg	27	5	7	<4	4	<4
EPH Aliphatic (>C12-C16)	CE068	mg/kg	70	15	16	10	21	12
EPH Aliphatic (>C16-C35)	CE068	mg/kg	219	108	63	41	571	373
EPH Aliphatic (>C35-C44)	CE068	mg/kg	31	40	19	12	237	277
Subcontracted analysis								
Asbestos (qualitative)	$	-	NAD	NAD	NAD	NAD	NAD	NAD

Chemtech Environmental Limited

PREPARED LEACHATES

Lab number			61281-1L	61281-2L	61281-3L	61281-4L	61281-5L	61281-6L
Sample id			HL/NW/15/1	HL/SE/15/1	HL/SW/15/1	HL/NW/15/2	HL/SE/15/2	HL/SW/15/2
Depth (m)			1.00	1.00	1.00	3.00	4.00	3.00
Test	**Method**	**Units**						
Arsenic (dissolved)	CE128 U	µg/l As	14.70	6.28	14.34	9.80	8.40	5.41
Cadmium (dissolved)	CE128 U	µg/l Cd	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07
Chromium (dissolved)	CE128 U	µg/l Cr	0.3	0.3	0.4	0.9	0.6	<0.2
Chromium III (dissolved)	-	µg/l CrIII	<10	<10	<10	<10	<10	<10
Chromium VI (dissolved)	CE050 U	µg/l CrVI	<10	<10	<10	<10	<10	<10
Copper (dissolved)	CE128 U	µg/l Cu	1.9	5.6	4.4	2.2	3.0	2.0
Lead (dissolved)	CE128 U	µg/l Pb	0.3	0.6	1.3	0.7	0.6	0.3
Mercury (dissolved)	CE128 U	µg/l Hg	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Nickel (dissolved)	CE128 U	µg/l Ni	<0.5	0.8	1.5	0.9	0.8	0.5
Selenium (dissolved)	CE128 U	µg/l Se	0.28	0.20	0.27	0.31	0.11	0.25
Zinc (dissolved)	CE128 U	µg/l Zn	65	62	9	5	38	<1
Chloride	CE049 U	mg/l Cl	1.1	<1	<1	1.1	<1	<1
Fluoride	CE049 U	mg/l F	0.5	0.2	0.2	0.2	0.3	0.2
Cyanide (total)	CE147	µg/l CN	<20	<20	<20	<20	<20	<20
Phenols (total)	CE148	µg/l PhOH	<10	<10	<10	<10	<10	<10
PAH								
Naphthalene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(123cd)pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenz(ah)anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PAH (total of USEPA 16)	CE051	µg/l	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
TPH								
VPH Aromatic (>EC5-EC7)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aromatic (>EC7-EC8)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aromatic (>EC8-EC10)	CE067	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC10-EC12)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC12-EC16)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC16-EC21)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC21-EC35)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC35-EC44)	CE161	µg/l	<1	<1	<1	<1	<1	<1

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PREPARED LEACHATES

Lab number			61281-1L	61281-2L	61281-3L	61281-4L	61281-5L	61281-6L
Sample id			HL/NW/15/1	HL/SE/15/1	HL/SW/15/1	HL/NW/15/2	HL/SE/15/2	HL/SW/15/2
Depth (m)			1.00	1.00	1.00	3.00	4.00	3.00
Test	**Method**	**Units**						
VPH Aliphatic (>C5-C6)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C6-C8)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C8-C10)	CE067	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C10-C12)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C12-C16)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C16-C35)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C35-C44)	CE161	µg/l	<1	<1	<1	<1	<1	<1

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PREPARED LEACHATES

Lab number			61281-7L	61281-8L	61281-9L	61281-10L	61281-11L	61281-12L
Sample id			HL/NW15/3	HL/SE/15/3	HL/NE/20/1	HL/NE/20/2	HL/NE/20/3	HL/NW/40/1
Depth (m)			6.00	6.00	1.00	3.00	6.00	1.00
Test	**Method**	**Units**						
Arsenic (dissolved)	CE128 U	µg/l As	2.81	5.22	5.35	4.40	2.37	0.75
Cadmium (dissolved)	CE128 U	µg/l Cd	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07
Chromium (dissolved)	CE128 U	µg/l Cr	<0.2	<0.2	0.5	<0.2	<0.2	<0.2
Chromium III (dissolved)	-	µg/l CrIII	<10	<10	<10	<10	<10	<10
Chromium VI (dissolved)	CE050 U	µg/l CrVI	<10	<10	<10	<10	<10	<10
Copper (dissolved)	CE128 U	µg/l Cu	3.4	3.0	2.3	1.7	4.3	2.4
Lead (dissolved)	CE128 U	µg/l Pb	<0.2	<0.2	0.4	0.3	0.5	<0.2
Mercury (dissolved)	CE128 U	µg/l Hg	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Nickel (dissolved)	CE128 U	µg/l Ni	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Selenium (dissolved)	CE128 U	µg/l Se	0.25	0.10	0.29	0.24	0.22	0.39
Zinc (dissolved)	CE128 U	µg/l Zn	<1	45	14	<1	<1	<1
Chloride	CE049 U	mg/l Cl	1.0	<1	<1	<1	<1	<1
Fluoride	CE049 U	mg/l F	0.2	0.2	0.4	0.2	0.1	<0.1
Cyanide (total)	CE147	µg/l CN	<20	<20	<20	<20	<20	<20
Phenols (total)	CE148	µg/l PhOH	<10	<10	<10	<10	<10	<10
PAH								
Naphthalene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(123cd)pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenz(ah)anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PAH (total of USEPA 16)	CE051	µg/l	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
TPH								
VPH Aromatic (>EC5-EC7)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aromatic (>EC7-EC8)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aromatic (>EC8-EC10)	CE067	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC10-EC12)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC12-EC16)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC16-EC21)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC21-EC35)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC35-EC44)	CE161	µg/l	<1	<1	<1	<1	<1	<1

Chemtech Environmental Limited

PREPARED LEACHATES

Lab number			61281-7L	61281-8L	61281-9L	61281-10L	61281-11L	61281-12L
Sample id			HL/NW15/3	HL/SE/15/3	HL/NE/20/1	HL/NE/20/2	HL/NE/20/3	HL/NW/40/1
Depth (m)			6.00	6.00	1.00	3.00	6.00	1.00
Test	**Method**	**Units**						
VPH Aliphatic (>C5-C6)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C6-C8)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C8-C10)	CE067	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C10-C12)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C12-C16)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C16-C35)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C35-C44)	CE161	µg/l	<1	<1	<1	<1	<1	<1

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PREPARED LEACHATES

Lab number			61281-13L	61281-14L	61281-15L	61281-16L	61281-17L	61281-18L
Sample id			HL/SE/40/1	HL/NW/40/2	HL/SE/40/2	HL/NE/50/1	HL/SW/50/1	HL/NE/50/2
Depth (m)			1.00	4.00	4.00	1.00	1.00	3.00
Test	**Method**	**Units**						
Arsenic (dissolved)	CE128 U	µg/l As	0.16	4.10	0.78	0.07	3.25	2.79
Cadmium (dissolved)	CE128 U	µg/l Cd	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07
Chromium (dissolved)	CE128 U	µg/l Cr	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chromium III (dissolved)	-	µg/l CrIII	<10	<10	<10	<10	<10	<10
Chromium VI (dissolved)	CE050 U	µg/l CrVI	<10	<10	<10	<10	<10	<10
Copper (dissolved)	CE128 U	µg/l Cu	0.5	3.1	2.5	1.1	2.1	2.8
Lead (dissolved)	CE128 U	µg/l Pb	<0.2	0.5	<0.2	<0.2	<0.2	0.2
Mercury (dissolved)	CE128 U	µg/l Hg	<0.008	0.011	<0.008	<0.008	<0.008	<0.008
Nickel (dissolved)	CE128 U	µg/l Ni	<0.5	<0.5	<0.5	<0.5	<0.5	0.8
Selenium (dissolved)	CE128 U	µg/l Se	0.13	0.47	0.19	0.73	0.46	0.31
Zinc (dissolved)	CE128 U	µg/l Zn	<1	<1	<1	<1	<1	<1
Chloride	CE049 U	mg/l Cl	<1	<1	<1	<1	<1	<1
Fluoride	CE049 U	mg/l F	0.5	0.1	0.4	0.1	0.3	0.1
Cyanide (total)	CE147	µg/l CN	<20	<20	<20	24	<20	<20
Phenols (total)	CE148	µg/l PhOH	<10	<10	<10	<10	<10	<10
PAH								
Naphthalene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(123cd)pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenz(ah)anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PAH (total of USEPA 16)	CE051	µg/l	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
TPH								
VPH Aromatic (>EC5-EC7)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aromatic (>EC7-EC8)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aromatic (>EC8-EC10)	CE067	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC10-EC12)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC12-EC16)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC16-EC21)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC21-EC35)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC35-EC44)	CE161	µg/l	<1	<1	<1	<1	<1	<1

Chemtech Environmental Limited

PREPARED LEACHATES

Lab number			61281-13L	61281-14L	61281-15L	61281-16L	61281-17L	61281-18L
Sample id			HL/SE/40/1	HL/NW/40/2	HL/SE/40/2	HL/NE/50/1	HL/SW/50/1	HL/NE/50/2
Depth (m)			1.00	4.00	4.00	1.00	1.00	3.00
Test	**Method**	**Units**						
VPH Aliphatic (>C5-C6)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C6-C8)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C8-C10)	CE067	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C10-C12)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C12-C16)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C16-C35)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C35-C44)	CE161	µg/l	<1	<1	<1	<1	<1	<1

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PREPARED LEACHATES

Lab number			61281-19L	61281-20L	61281-21L	61281-22L	61281-23L	61281-24L
Sample id			HL/SW/50/2	HL/NW/65/1	HL/SE/65/1	HL/NW/65/2	HL/SE/65/2	HL/NE/80/1
Depth (m)			3.00	1.00	1.00	3.00	2.00	1.00
Test	**Method**	**Units**						
Arsenic (dissolved)	CE128 U	µg/l As	5.46	0.92	1.33	0.67	0.42	4.48
Cadmium (dissolved)	CE128 U	µg/l Cd	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07
Chromium (dissolved)	CE128 U	µg/l Cr	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chromium III (dissolved)	-	µg/l CrIII	<10	<10	<10	<10	<10	<10
Chromium VI (dissolved)	CE050 U	µg/l CrVI	<10	<10	<10	<10	<10	<10
Copper (dissolved)	CE128 U	µg/l Cu	2.4	2.7	2.1	2.9	1.3	2.4
Lead (dissolved)	CE128 U	µg/l Pb	0.3	<0.2	<0.2	<0.2	<0.2	<0.2
Mercury (dissolved)	CE128 U	µg/l Hg	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Nickel (dissolved)	CE128 U	µg/l Ni	0.9	0.6	<0.5	<0.5	<0.5	0.6
Selenium (dissolved)	CE128 U	µg/l Se	0.51	0.17	0.20	0.19	0.16	0.41
Zinc (dissolved)	CE128 U	µg/l Zn	<1	12	<1	<1	<1	<1
Chloride	CE049 U	mg/l Cl	<1	<1	<1	1.3	<1	<1
Fluoride	CE049 U	mg/l F	0.1	0.2	0.3	0.2	0.2	0.2
Cyanide (total)	CE147	µg/l CN	<20	<20	<20	<20	<20	<20
Phenols (total)	CE148	µg/l PhOH	<10	<10	<10	<10	<10	<10
PAH								
Naphthalene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(123cd)pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenz(ah)anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PAH (total of USEPA 16)	CE051	µg/l	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
TPH								
VPH Aromatic (>EC5-EC7)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aromatic (>EC7-EC8)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aromatic (>EC8-EC10)	CE067	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC10-EC12)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC12-EC16)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC16-EC21)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC21-EC35)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC35-EC44)	CE161	µg/l	<1	<1	<1	<1	<1	<1

Chemtech Environmental Limited

PREPARED LEACHATES

Lab number			61281-19L	61281-20L	61281-21L	61281-22L	61281-23L	61281-24L
Sample id			HL/SW/50/2	HL/NW/65/1	HL/SE/65/1	HL/NW/65/2	HL/SE/65/2	HL/NE/80/1
Depth (m)			3.00	1.00	1.00	3.00	2.00	1.00
Test	**Method**	**Units**						
VPH Aliphatic (>C5-C6)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C6-C8)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C8-C10)	CE067	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C10-C12)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C12-C16)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C16-C35)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C35-C44)	CE161	µg/l	<1	<1	<1	<1	<1	<1

Chemtech Environmental Limited

PREPARED LEACHATES

Lab number			61281-25L	61281-26L	61281-27L	61281-28L	61281-29L	61281-30L
Sample id			HL/SW/80/1	HL/NE/80/2	HL/SW/80/2	HL/SW/80/3	HL/NW/90/1	NL/SE/90/1
Depth (m)			1.00	2.00	3.00	6.00	1.00	1.00
Test	**Method**	**Units**						
Arsenic (dissolved)	CE128 U	µg/l As	5.66	4.06	2.71	1.46	3.85	5.26
Cadmium (dissolved)	CE128 U	µg/l Cd	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07
Chromium (dissolved)	CE128 U	µg/l Cr	0.4	<0.2	<0.2	<0.2	<0.2	<0.2
Chromium III (dissolved)	-	µg/l CrIII	<10	<10	<10	<10	<10	<10
Chromium VI (dissolved)	CE050 U	µg/l CrVI	<10	<10	<10	<10	<10	<10
Copper (dissolved)	CE128 U	µg/l Cu	3.3	6.8	3.7	1.8	4.4	6.3
Lead (dissolved)	CE128 U	µg/l Pb	0.7	0.5	0.2	<0.2	<0.2	0.4
Mercury (dissolved)	CE128 U	µg/l Hg	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Nickel (dissolved)	CE128 U	µg/l Ni	1.2	1.4	0.7	<0.5	0.7	<0.5
Selenium (dissolved)	CE128 U	µg/l Se	0.51	0.28	0.34	0.26	0.48	0.21
Zinc (dissolved)	CE128 U	µg/l Zn	<1	<1	<1	<1	<1	<1
Chloride	CE049 U	mg/l Cl	<1	<1	<1	<1	1.3	<1
Fluoride	CE049 U	mg/l F	0.3	0.3	0.2	<0.1	0.3	0.1
Cyanide (total)	CE147	µg/l CN	<20	<20	<20	<20	<20	<20
Phenols (total)	CE148	µg/l PhOH	<10	<10	<10	<10	<10	<10
PAH								
Naphthalene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	0.2	<0.1
Anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	0.7	<0.1
Pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	0.6	<0.1
Benzo(a)anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	0.4	<0.1
Chrysene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	0.4	<0.1
Benzo(b)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	0.5	<0.1
Benzo(k)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	0.2	<0.1
Benzo(a)pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(123cd)pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenz(ah)anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	0.3	<0.1
PAH (total of USEPA 16)	CE051	µg/l	<1.6	<1.6	<1.6	<1.6	3.1	<1.6
TPH								
VPH Aromatic (>EC5-EC7)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aromatic (>EC7-EC8)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aromatic (>EC8-EC10)	CE067	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC10-EC12)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC12-EC16)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC16-EC21)	CE161	µg/l	<1	<1	<1	<1	1	<1
EPH Aromatic (>EC21-EC35)	CE161	µg/l	<1	<1	<1	<1	1	<1
EPH Aromatic (>EC35-EC44)	CE161	µg/l	<1	<1	<1	<1	<1	<1

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PREPARED LEACHATES

Lab number			61281-25L	61281-26L	61281-27L	61281-28L	61281-29L	61281-30L
Sample id			HL/SW/80/1	HL/NE/80/2	HL/SW/80/2	HL/SW/80/3	HL/NW/90/1	NL/SE/90/1
Depth (m)			1.00	2.00	3.00	6.00	1.00	1.00
Test	**Method**	**Units**						
VPH Aliphatic (>C5-C6)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C6-C8)	CE067	µg/l	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C8-C10)	CE067	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C10-C12)	CE161	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C12-C16)	CE161	µg/l	<1	<1	<1	<1	1	<1
EPH Aliphatic (>C16-C35)	CE161	µg/l	<1	<1	<1	<1	4	<1
EPH Aliphatic (>C35-C44)	CE161	µg/l	<1	<1	<1	<1	<1	<1

Chemtech Environmental Limited

METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE127	Antimony (total)	Aqua regia digest, ICP-MS	Dry	U	0.2	mg/kg Sb
CE127	Arsenic (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg As
CE127	Beryllium (total)	Aqua regia digest, ICP-MS	Dry	U	1	mg/kg Be
CE063	Boron (water soluble)	Hot water extract, ICP-OES	Dry	M	0.5	mg/kg B
CE127	Cadmium (total)	Aqua regia digest, ICP-MS	Dry	M	0.2	mg/kg Cd
CE127	Chromium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cr
-	Chromium (III)	Calculation: Cr (total) - Cr (VI)	Dry		1	mg/kg CrIII
CE146	Chromium (VI)	Acid extraction, Colorimetry	Dry		1	mg/kg CrVI
CE127	Copper (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cu
CE127	Lead (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Pb
CE127	Manganese (total)	Aqua regia digest, ICP-MS	Dry		1	mg/kg Mn
CE127	Mercury (total)	Aqua regia digest, ICP-MS	Dry	M	0.5	mg/kg Hg
CE127	Molybdenum (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Mo
CE127	Nickel (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Ni
CE127	Selenium (total)	Aqua regia digest, ICP-MS	Dry	M	0.3	mg/kg Se
CE127	Zinc (total)	Aqua regia digest, ICP-MS	Dry	M	5	mg/kg Zn
CE004	pH	Based on BS 1377, pH Meter	Wet	M	-	units
CE077	Cyanide (total)	Extraction, Continuous Flow Colorimetry	Wet	M	1	mg/kg CN
CE078	Phenols (total)	Extraction, Continuous Flow Colorimetry	Wet		0.5	mg/kg PhOH
CE087	Naphthalene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Acenaphthylene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Acenaphthene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Fluorene	Solvent extraction, GC-MS	Wet	U	0.01	mg/kg
CE087	Phenanthrene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Anthracene	Solvent extraction, GC-MS	Wet	U	0.02	mg/kg
CE087	Fluoranthene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Pyrene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Benzo(a)anthracene	Solvent extraction, GC-MS	Wet	U	0.02	mg/kg
CE087	Chrysene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Benzo(b)fluoranthene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Benzo(k)fluoranthene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Benzo(a)pyrene	Solvent extraction, GC-MS	Wet	U	0.02	mg/kg
CE087	Indeno(123cd)pyrene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Dibenz(ah)anthracene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Benzo(ghi)perylene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	PAH (total of USEPA 16)	Solvent extraction, GC-MS	Wet		0.27	mg/kg
CE067	VPH Aromatic (>EC5-EC7)	Headspace GC-FID	Wet		0.01	mg/kg
CE067	VPH Aromatic (>EC7-EC8)	Headspace GC-FID	Wet		0.01	mg/kg
CE067	VPH Aromatic (>EC8-EC10)	Headspace GC-FID	Wet		0.01	mg/kg
CE068	EPH Aromatic (>EC10-EC12)	Solvent extraction, GC-FID	Wet		1	mg/kg
CE068	EPH Aromatic (>EC12-EC16)	Solvent extraction, GC-FID	Wet		1	mg/kg
CE068	EPH Aromatic (>EC16-EC21)	Solvent extraction, GC-FID	Wet		1	mg/kg
CE068	EPH Aromatic (>EC21-EC35)	Solvent extraction, GC-FID	Wet		1	mg/kg

Chemtech Environmental Limited

METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE068	EPH Aromatic (>EC35-EC44)	Solvent extraction, GC-FID	Wet		1	mg/kg
CE067	VPH Aliphatic (>C5-C6)	Headspace GC-FID	Wet		0.1	mg/kg
CE067	VPH Aliphatic (>C6-C8)	Headspace GC-FID	Wet		0.1	mg/kg
CE067	VPH Aliphatic (>C8-C10)	Headspace GC-FID	Wet		0.1	mg/kg
CE068	EPH Aliphatic (>C10-C12)	Solvent extraction, GC-FID	Wet		4	mg/kg
CE068	EPH Aliphatic (>C12-C16)	Solvent extraction, GC-FID	Wet		4	mg/kg
CE068	EPH Aliphatic (>C16-C35)	Solvent extraction, GC-FID	Wet		4	mg/kg
CE068	EPH Aliphatic (>C35-C44)	Solvent extraction, GC-FID	Wet		10	mg/kg
$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-

Chemtech Environmental Limited

METHOD DETAILS

METHOD	PREPARED LEACHATES	METHOD SUMMARY	STATUS	LOD	UNITS
CE001	Leachate preparation (10:1 single-stage)	BS12457-2		-	-
CE128	Arsenic (dissolved)	ICP-MS	U	0.06	µg/l As
CE128	Cadmium (dissolved)	ICP-MS	U	0.07	µg/l Cd
CE128	Chromium (dissolved)	ICP-MS	U	0.2	µg/l Cr
-	Chromium III (dissolved)	Calculation: Cr (total) - Cr (VI)		10	µg/l CrIII
CE050	Chromium VI (dissolved)	Colorimetry	U	10	µg/l CrVI
CE128	Copper (dissolved)	ICP-MS	U	0.4	µg/l Cu
CE128	Lead (dissolved)	ICP-MS	U	0.2	µg/l Pb
CE128	Mercury (dissolved)	ICP-MS	U	0.008	µg/l Hg
CE128	Nickel (dissolved)	ICP-MS	U	0.5	µg/l Ni
CE128	Selenium (dissolved)	ICP-MS	U	0.07	µg/l Se
CE128	Zinc (dissolved)	ICP-MS	U	1	µg/l Zn
CE049	Chloride	Ion Chromatography	U	1	mg/l Cl
CE049	Fluoride	Ion Chromatography	U	0.2	mg/l F
CE147	Cyanide (total)	Continuous Flow Colorimetry		20	µg/l CN
CE148	Phenols (total)	Continuous Flow Colorimetry		10	µg/l PhOH
CE051	PAH (speciated)	Solvent extraction, GC-MS		0.1	µg/l
CE051	PAH (total of USEPA 16)	Solvent extraction, GC-MS		1.6	µg/l
CE067	VPH Aromatic (>EC5-EC7)	Headspace GC-FID		1	µg/l
CE067	VPH Aromatic (>EC7-EC8)	Headspace GC-FID		1	µg/l
CE067	VPH Aromatic (>EC8-EC10)	Headspace GC-FID		1	µg/l
CE161	EPH Aromatic (>EC10-EC12)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC12-EC16)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC16-EC21)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC21-EC35)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC35-EC44)	Solvent extraction, GC-FID		1	µg/l
CE067	VPH Aliphatic (>C5-C6)	Headspace GC-FID		1	µg/l
CE067	VPH Aliphatic (>C6-C8)	Headspace GC-FID		1	µg/l
CE067	VPH Aliphatic (>C8-C10)	Headspace GC-FID		1	µg/l
CE161	EPH Aliphatic (>C10-C12)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aliphatic (>C12-C16)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aliphatic (>C16-C35)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aliphatic (>C35-C44)	Solvent extraction, GC-FID		1	µg/l

Chemtech Environmental Limited

DEVIATING SAMPLE INFORMATION

Comments
Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.
For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.
Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
IT	Sample not cooled
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
61281-1	HL/NW/15/1	1.00	N	
61281-2	HL/SE/15/1	1.00	N	
61281-3	HL/SW/15/1	1.00	N	
61281-4	HL/NW/15/2	3.00	N	
61281-5	HL/SE/15/2	4.00	N	
61281-6	HL/SW/15/2	3.00	N	
61281-7	HL/NW15/3	6.00	N	
61281-8	HL/SE/15/3	6.00	N	
61281-9	HL/NE/20/1	1.00	N	
61281-10	HL/NE/20/2	3.00	N	
61281-11	HL/NE/20/3	6.00	N	
61281-12	HL/NW/40/1	1.00	N	
61281-13	HL/SE/40/1	1.00	N	
61281-14	HL/NW/40/2	4.00	N	
61281-15	HL/SE/40/2	4.00	N	
61281-16	HL/NE/50/1	1.00	N	
61281-17	HL/SW/50/1	1.00	N	
61281-18	HL/NE/50/2	3.00	N	
61281-19	HL/SW/50/2	3.00	N	
61281-20	HL/NW/65/1	1.00	N	
61281-21	HL/SE/65/1	1.00	N	
61281-22	HL/NW/65/2	3.00	N	
61281-23	HL/SE/65/2	2.00	N	
61281-24	HL/NE/80/1	1.00	N	
61281-25	HL/SW/80/1	1.00	N	
61281-26	HL/NE/80/2	2.00	N	
61281-27	HL/SW/80/2	3.00	N	
61281-28	HL/SW/80/3	6.00	N	
61281-29	HL/NW/90/1	1.00	N	

Chemtech Environmental Limited

DEVIATING SAMPLE INFORMATION

Comments
Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.
For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.
Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
IT	Sample not cooled
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
61281-30	NL/SE/90/1	1.00	N	

Annex E
Terra Firma Stockpile and Hawes Lane and Green Lane Source Soil and Leachate Test Results

Derwentside Environmental Testing Services

Certificate of Analysis

Certificate Number 16-80775-1

25-Oct-16

Client Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference 16-80775-1

Client Reference 12032/GLHL

Order No 12032/GLHL

Contract Title H.Rd (Herbert Road)

Description 14 Soil samples, 14 Leachate samples.

Date Received 10-Oct-16

Date Started 10-Oct-16

Date Completed 25-Oct-16

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

Notes **This report supersedes 16-80775. Extra testing**

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

Approved By [redacted]

Rob Brown
Business Manager

MCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

UKAS TESTING 2139

Summary of Chemical Analysis
Matrix Descriptions

Our Ref 16-80775-1
Client Ref 12032/GLHL
Contract Title H.Rd (Herbert Road)

Sample ID	Lab No	Completed	Matrix Description
SP S1	1064955	18/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick)
SP S2	1064956	18/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick)
SP S3	1064957	18/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick)
SP S4	1064958	18/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick)
SP S5	1064959	18/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick)
SP S6	1064960	18/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick)
SP S7	1064961	18/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick)
SP S8	1064962	18/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick)
SP S9	1064963	18/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick)
SP S10	1064964	18/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick)
SP S11	1064965	18/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick)
SP S12	1064966	18/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick)
SP S13	1064967	18/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick)
SP S14	1064968	18/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick)

Summary of Chemical Analysis
Soil Samples

Our Ref 16-80775-1
Client Ref 12032/GLHL
Contract Title H.Rd (Herbert Road)

			Lab No	1064955	1064956	1064957	1064958	1064959	1064960
			Sample ID	SP S1	SP S2	SP S3	SP S4	SP S5	SP S6
			Depth						
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	06/10/16	06/10/16	06/10/16	06/10/16	06/10/16	06/10/16
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Asbestos Quantification	DETSC 1102	0							
Preparation									
Moisture Content	DETSC 1004*	0.1	%	9.7	8.2	8.3	13	11	7.9
Metals									
Antimony	DETSC 2301*	1	mg/kg	2.6	1.7	1.5	1.7	1.3	1.6
Arsenic	DETSC 2301#	0.2	mg/kg	14	11	8.1	14	19	12
Beryllium	DETSC 2301#	0.2	mg/kg	1.0	1.1	0.7	1.2	1.2	1.2
Boron, Water Soluble	DETSC 2123#	0.2	mg/kg	0.8	0.8	0.9	1.5	1.2	1.3
Cadmium	DETSC 2301#	0.1	mg/kg	0.2	0.2	0.1	0.1	< 0.1	0.2
Chromium	DETSC 2301#	0.15	mg/kg	13	15	15	16	19	19
Chromium III	DETSC 2301*	0.15	mg/kg	13	15	15	16	19	19
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	42	47	37	47	39	34
Lead	DETSC 2301#	0.3	mg/kg	38	33	20	22	28	22
Manganese	DETSC 2301#	20	mg/kg	520	790	430	730	300	1500
Mercury	DETSC 2325#	0.05	mg/kg	0.12	0.06	0.14	0.05	< 0.05	< 0.05
Molybdenum	DETSC 2301#	0.4	mg/kg	2.4	2.1	1.1	2.4	3.2	2.3
Nickel	DETSC 2301#	1	mg/kg	26	33	24	28	25	24
Selenium	DETSC 2301#	0.5	mg/kg	1.2	1.1	0.6	1.1	0.6	0.7
Zinc	DETSC 2301#	1	mg/kg	63	120	53	45	33	180
Inorganics									
pH	DETSC 2008#			8.4	8.0	8.1	8.3	8.5	9.7
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.1	0.2	0.1	< 0.1	< 0.1	0.1
Cyanide, Complex	DETSC 2130*	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Organic matter	DETSC 2002#	0.1	%	14	8.4	8.7	6.9	1.8	7.6
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.13	0.08	0.10	0.23	0.27	0.15
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	11	1.7	1.7	< 0.6	< 0.6	< 0.6

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 16-80775-1
Client Ref 12032/GLHL
Contract Title H.Rd (Herbert Road)

			Lab No	1064955	1064956	1064957	1064958	1064959	1064960
			Sample ID	SP S1	SP S2	SP S3	SP S4	SP S5	SP S6
			Depth						
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	06/10/16	06/10/16	06/10/16	06/10/16	06/10/16	06/10/16
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	41	3.7	4.8	< 1.4	< 1.4	< 1.4
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	51	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	51	< 10	< 10	< 10	< 10	< 10
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	0.06	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.04
Acenaphthene	DETSC 3303#	0.03	mg/kg	0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.04
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.36	0.19	0.14	0.09	0.06	0.32
Anthracene	DETSC 3303	0.03	mg/kg	0.09	0.06	< 0.03	< 0.03	< 0.03	0.13
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.72	0.33	0.22	0.08	0.09	0.74
Pyrene	DETSC 3303#	0.03	mg/kg	0.61	0.31	0.19	0.08	0.08	0.70
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.35	0.17	0.11	0.04	0.06	0.50
Chrysene	DETSC 3303	0.03	mg/kg	0.42	0.19	0.13	0.07	0.07	0.55
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.52	0.22	0.14	0.08	0.09	0.73
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.16	0.08	0.05	< 0.03	0.03	0.26
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.31	0.13	0.08	0.04	0.05	0.43
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.20	0.10	0.07	0.04	0.05	0.25
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	0.06	< 0.03	< 0.03	< 0.03	< 0.03	0.08
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.23	0.12	< 0.03	0.04	0.06	0.27
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	4.2	1.9	1.1	0.57	0.62	5.0
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

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Summary of Chemical Analysis
Soil Samples

Our Ref 16-80775-1
Client Ref 12032/GLHL
Contract Title H.Rd (Herbert Road)

			Lab No	1064961	1064962	1064963	1064964	1064965	1064966
			Sample ID	SP S7	SP S8	SP S9	SP S10	SP S11	SP S12
			Depth						
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	06/10/16	06/10/16	06/10/16	06/10/16	06/10/16	06/10/16
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Asbestos Quantification	DETSC 1102	0		Y					
Preparation									
Moisture Content	DETSC 1004*	0.1	%	8.6	11	9.3	8.8	32	11
Metals									
Antimony	DETSC 2301*	1	mg/kg	< 1.0	16	3.2	2.3	2.6	2.1
Arsenic	DETSC 2301#	0.2	mg/kg	10	26	35	17	20	13
Beryllium	DETSC 2301#	0.2	mg/kg	1.0	1.8	2.0	1.7	1.1	1.2
Boron, Water Soluble	DETSC 2123#	0.2	mg/kg	1.1	1.5	1.7	1.1	1.0	1.1
Cadmium	DETSC 2301#	0.1	mg/kg	0.2	0.6	0.7	0.2	0.2	0.1
Chromium	DETSC 2301#	0.15	mg/kg	9.2	18	19	26	17	20
Chromium III	DETSC 2301*	0.15	mg/kg	9.2	18	19	26	17	20
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	41	120	90	49	61	47
Lead	DETSC 2301#	0.3	mg/kg	34	1700	110	66	73	42
Manganese	DETSC 2301#	20	mg/kg	300	430	440	750	710	990
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	0.06	0.07	< 0.05	0.52	0.08
Molybdenum	DETSC 2301#	0.4	mg/kg	2.6	6.2	6.9	3.6	3.0	2.9
Nickel	DETSC 2301#	1	mg/kg	29	44	49	40	28	29
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	1.4	0.6	1.1	0.9	< 0.5
Zinc	DETSC 2301#	1	mg/kg	110	1400	94	130	150	240
Inorganics									
pH	DETSC 2008#			8.1	7.9	8.1	8.3	8.2	7.9
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.1	0.1	0.1	0.2	0.2	0.2
Cyanide, Complex	DETSC 2130*	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2	0.2	< 0.2
Organic matter	DETSC 2002#	0.1	%	8.7	15	9.4	7.7	12	9.6
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.09	0.16	0.28	0.07	0.16	0.12
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	25	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	< 3.4	19	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	25	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6	1.6	1.2

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Summary of Chemical Analysis
Soil Samples

Our Ref 16-80775-1
Client Ref 12032/GLHL
Contract Title H.Rd (Herbert Road)

			Lab No	1064961	1064962	1064963	1064964	1064965	1064966
			Sample ID	SP S7	SP S8	SP S9	SP S10	SP S11	SP S12
			Depth						
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	06/10/16	06/10/16	06/10/16	06/10/16	06/10/16	06/10/16
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4	6.4	4.1
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	< 10	25	< 10	< 10	< 10	< 10
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	0.07	0.05	< 0.03	0.04	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	0.04	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	0.03	< 0.03	0.04	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.13	0.21	0.22	0.18	0.44	0.17
Anthracene	DETSC 3303	0.03	mg/kg	0.09	0.07	0.03	0.05	0.11	0.05
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.39	0.48	0.20	0.30	0.88	0.35
Pyrene	DETSC 3303#	0.03	mg/kg	0.55	0.42	0.20	0.28	0.75	0.30
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.22	0.21	0.10	0.16	0.44	0.16
Chrysene	DETSC 3303	0.03	mg/kg	0.23	0.22	0.12	0.17	0.49	0.19
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.43	0.22	0.13	0.21	0.59	0.24
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.15	0.08	0.04	0.08	0.21	0.08
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.26	0.14	0.08	0.14	0.37	0.15
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.18	0.09	0.05	0.10	0.21	0.09
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	0.04	< 0.03	< 0.03	< 0.03	0.07	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.22	0.10	0.05	0.12	0.25	0.11
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	2.9	2.3	1.3	1.8	5.0	1.9
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	0.7	0.5	< 0.3	< 0.3	< 0.3

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Summary of Chemical Analysis
Soil Samples

Our Ref 16-80775-1
Client Ref 12032/GLHL
Contract Title H.Rd (Herbert Road)

			Lab No	1064967	1064968
			Sample ID	SP S13	SP S14
			Depth		
			Other ID		
			Sample Type	SOIL	SOIL
			Sampling Date	06/10/16	06/10/16
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Asbestos Quantification	DETSC 1102	0			
Preparation					
Moisture Content	DETSC 1004*	0.1	%	9.1	10
Metals					
Antimony	DETSC 2301*	1	mg/kg	2.6	1.5
Arsenic	DETSC 2301#	0.2	mg/kg	16	9.6
Beryllium	DETSC 2301#	0.2	mg/kg	1.1	0.8
Boron, Water Soluble	DETSC 2123#	0.2	mg/kg	1.0	1.0
Cadmium	DETSC 2301#	0.1	mg/kg	0.1	0.2
Chromium	DETSC 2301#	0.15	mg/kg	15	16
Chromium III	DETSC 2301*	0.15	mg/kg	15	16
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	49	30
Lead	DETSC 2301#	0.3	mg/kg	46	23
Manganese	DETSC 2301#	20	mg/kg	660	500
Mercury	DETSC 2325#	0.05	mg/kg	0.09	0.05
Molybdenum	DETSC 2301#	0.4	mg/kg	2.7	2.0
Nickel	DETSC 2301#	1	mg/kg	30	24
Selenium	DETSC 2301#	0.5	mg/kg	1.7	< 0.5
Zinc	DETSC 2301#	1	mg/kg	110	78
Inorganics					
pH	DETSC 2008#			8.1	7.9
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.2	0.2
Cyanide, Complex	DETSC 2130*	0.2	mg/kg	< 0.2	0.2
Organic matter	DETSC 2002#	0.1	%	7.9	4.6
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.17	0.13
Petroleum Hydrocarbons					
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	1.3	3.1

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Summary of Chemical Analysis
Soil Samples

Our Ref 16-80775-1
Client Ref 12032/GLHL
Contract Title H.Rd (Herbert Road)

			Lab No	1064967	1064968
			Sample ID	SP S13	SP S14
			Depth		
			Other ID		
			Sample Type	SOIL	SOIL
			Sampling Date	06/10/16	06/10/16
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	3.4	9.2
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	12
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	< 10	12
PAHs					
Naphthalene	DETSC 3303#	0.03	mg/kg	0.08	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.32	0.25
Anthracene	DETSC 3303	0.03	mg/kg	0.07	0.07
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.55	0.51
Pyrene	DETSC 3303#	0.03	mg/kg	0.47	0.45
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.21	0.25
Chrysene	DETSC 3303	0.03	mg/kg	0.24	0.30
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.30	0.37
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.09	0.12
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.16	0.21
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.11	0.14
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	0.05
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.12	0.16
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	2.7	2.9
Phenols					
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3

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Summary of Chemical Analysis
Leachate Samples

Our Ref 16-80775-1
Client Ref 12032/GLHL
Contract Title H.Rd (Herbert Road)

			Lab No	1064969	1064970	1064971	1064972	1064973	1064974
			Sample ID	SP S1	SP S2	SP S3	SP S4	SP S5	SP S6
			Depth						
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	06/10/16	06/10/16	06/10/16	06/10/16	06/10/16	06/10/16
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Preparation									
NRA Leachate Preparation	DETS 036*			Y	Y	Y	Y	Y	Y
Metals									
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	1.3	2.1	0.61	3.3	4.8	2.9
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	0.28	0.39	< 0.25	0.31	0.56	0.36
Chromium III, Dissolved	DETSC 2302*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.0	1.3	0.7	0.6	0.7	0.9
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.66	0.69	0.34	0.43	0.47	0.48
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	0.6	0.7	< 0.5	0.5	0.7	0.6
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.76	0.57	1.2	0.74	0.68	0.75
Zinc, Dissolved	DETSC 2306	1.3	ug/l	7.0	4.3	1.9	< 1.3	6.8	2.8
Inorganics									
pH	DETSC 2008			7.2	6.9	7.0	7.4	7.2	7.5
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	1.2	1.1	4.2	1.5	1.3	1.3
Fluoride	DETSC 2055	0.1	mg/l	0.83	0.82	0.94	0.89	0.89	0.98
Sulphate as SO4	DETSC 2055	0.1	mg/l	3.8	2.4	16	3.4	2.4	7.3
Total Organic Carbon	DETSC 2085	1	mg/l	2.4	6.0	4.0	2.2	1.6	5.7
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	1.3	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	2.7	3.3	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	1.4	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
PAHs									
Naphthalene	DETSC 3304	0.01	ug/l	0.09	0.09	0.11	0.06	0.07	0.07
Acenaphthylene	DETSC 3304	0.01	ug/l	0.02	0.03	0.02	< 0.01	0.02	0.02

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 16-80775-1
Client Ref 12032/GLHL
Contract Title H.Rd (Herbert Road)

			Lab No	1064969	1064970	1064971	1064972	1064973	1064974
			Sample ID	SP S1	SP S2	SP S3	SP S4	SP S5	SP S6
			Depth						
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	06/10/16	06/10/16	06/10/16	06/10/16	06/10/16	06/10/16
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	0.06	< 0.01
Fluorene	DETSC 3304	0.01	ug/l	0.06	0.03	0.07	< 0.01	0.02	0.03
Phenanthrene	DETSC 3304	0.01	ug/l	0.28	0.26	0.32	0.10	0.18	0.15
Anthracene	DETSC 3304	0.01	ug/l	0.05	0.05	0.04	0.02	0.03	0.04
Fluoranthene	DETSC 3304	0.01	ug/l	0.29	0.25	0.25	0.07	0.13	0.27
Pyrene	DETSC 3304	0.01	ug/l	0.22	0.24	0.18	0.06	0.11	0.26
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	0.12	0.15	0.11	0.02	0.06	0.17
Chrysene	DETSC 3304	0.01	ug/l	0.24	0.26	0.23	0.05	0.14	0.32
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	0.29	0.33	0.24	< 0.01	0.25	0.48
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	0.09	0.12	0.07	< 0.01	0.06	0.16
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	0.16	0.17	0.12	< 0.01	0.06	0.28
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	0.16	0.38	0.15	< 0.01	0.17	0.30
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	0.21	0.41	0.15	< 0.01	0.17	0.36
PAH Total	DETSC 3304	0.04	ug/l	2.3	2.8	2.1	0.37	1.5	2.9
Phenols									
Phenol	*	0.5	ug/l	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 16-80775-1
Client Ref 12032/GLHL
Contract Title H.Rd (Herbert Road)

			Lab No	1064975	1064976	1064977	1064978	1064979	1064980
			Sample ID	SP S7	SP S8	SP S9	SP S10	SP S11	SP S12
			Depth						
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	06/10/16	06/10/16	06/10/16	06/10/16	06/10/16	06/10/16
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Preparation									
NRA Leachate Preparation	DETS 036*			Y	Y	Y	Y	Y	Y
Metals									
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	2.9	2.8	3.3	2.1	1.4	1.6
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	0.32	< 0.25	< 0.25	0.28	< 0.25	< 0.25
Chromium III, Dissolved	DETSC 2302*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.2	1.6	1.0	1.0	1.7	1.2
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.65	2.9	1.4	0.69	0.93	0.56
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	0.6	< 0.5	< 0.5	< 0.5	0.5	0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.82	1.5	2.1	0.39	1.8	0.66
Zinc, Dissolved	DETSC 2306	1.3	ug/l	9.2	6.1	1.7	3.4	3.0	5.3
Inorganics									
pH	DETSC 2008			7.2	7.2	7.2	7.0	7.2	7.2
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	3.5	2.7	6.1	1.1	2.0	2.2
Fluoride	DETSC 2055	0.1	mg/l	0.88	0.88	0.97	0.95	0.91	0.92
Sulphate as SO4	DETSC 2055	0.1	mg/l	7.4	14	20	2.3	15	9.9
Total Organic Carbon	DETSC 2085	1	mg/l	3.7	1.9	3.8	4.0	5.9	5.8
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.8
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
PAHs									
Naphthalene	DETSC 3304	0.01	ug/l	0.09	0.05	0.06	0.10	0.15	0.08
Acenaphthylene	DETSC 3304	0.01	ug/l	0.03	< 0.01	< 0.01	0.03	0.05	< 0.01

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 16-80775-1
Client Ref 12032/GLHL
Contract Title H.Rd (Herbert Road)

			Lab No	1064975	1064976	1064977	1064978	1064979	1064980
			Sample ID	SP S7	SP S8	SP S9	SP S10	SP S11	SP S12
			Depth						
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	06/10/16	06/10/16	06/10/16	06/10/16	06/10/16	06/10/16
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.04	< 0.01	< 0.01	< 0.01
Fluorene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.05	< 0.01	0.07	< 0.01
Phenanthrene	DETSC 3304	0.01	ug/l	0.21	0.09	0.15	0.29	0.56	0.22
Anthracene	DETSC 3304	0.01	ug/l	0.04	0.01	0.02	0.05	0.11	0.04
Fluoranthene	DETSC 3304	0.01	ug/l	0.33	0.07	0.07	0.33	0.68	0.23
Pyrene	DETSC 3304	0.01	ug/l	0.33	0.05	0.06	0.26	0.55	0.19
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	0.16	0.02	0.03	0.16	0.36	0.12
Chrysene	DETSC 3304	0.01	ug/l	0.30	0.04	0.06	0.28	0.67	0.23
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	0.43	< 0.01	< 0.01	0.30	0.75	0.27
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	0.16	< 0.01	< 0.01	0.13	0.26	0.12
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	0.23	< 0.01	< 0.01	0.16	0.40	0.11
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	0.34	0.02	< 0.01	0.29	0.38	0.19
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	0.43	0.06	< 0.01	0.35	0.47	0.20
PAH Total	DETSC 3304	0.04	ug/l	3.1	0.41	0.53	2.8	5.5	2.0
Phenols									
Phenol	*	0.5	ug/l	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 16-80775-1
Client Ref 12032/GLHL
Contract Title H.Rd (Herbert Road)

			Lab No	1064981	1064982
			Sample ID	SP S13	SP S14
			Depth		
			Other ID		
			Sample Type	LEACHATE	LEACHATE
			Sampling Date	06/10/16	06/10/16
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Preparation					
NRA Leachate Preparation	DETS 036*			Y	Y
Metals					
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	1.6	1.6
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	0.29	0.32
Chromium III, Dissolved	DETSC 2302*	1	ug/l	< 1.0	< 1.0
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.1	1.0
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.69	0.57
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.67	0.75
Zinc, Dissolved	DETSC 2306	1.3	ug/l	2.4	2.3
Inorganics					
pH	DETSC 2008			7.5	7.3
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	1.6	2.0
Fluoride	DETSC 2055	0.1	mg/l	1.1	0.92
Sulphate as SO4	DETSC 2055	0.1	mg/l	7.6	9.4
Total Organic Carbon	DETSC 2085	1	mg/l	6.1	3.0
Petroleum Hydrocarbons					
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	4.1	2.6
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	< 10	< 10
PAHs					
Naphthalene	DETSC 3304	0.01	ug/l	0.22	0.12
Acenaphthylene	DETSC 3304	0.01	ug/l	0.09	0.05

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 16-80775-1
Client Ref 12032/GLHL
Contract Title H.Rd (Herbert Road)

			Lab No	1064981	1064982
			Sample ID	SP S13	SP S14
			Depth		
			Other ID		
			Sample Type	LEACHATE	LEACHATE
			Sampling Date	06/10/16	06/10/16
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	0.21
Fluorene	DETSC 3304	0.01	ug/l	0.10	0.17
Phenanthrene	DETSC 3304	0.01	ug/l	0.85	2.2
Anthracene	DETSC 3304	0.01	ug/l	0.19	0.75
Fluoranthene	DETSC 3304	0.01	ug/l	1.1	3.4
Pyrene	DETSC 3304	0.01	ug/l	1.0	3.6
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	0.62	0.95
Chrysene	DETSC 3304	0.01	ug/l	0.97	2.4
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	1.0	2.6
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	0.42	0.43
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	0.60	0.98
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	0.89	0.75
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	0.29	0.13
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	0.99	0.84
PAH Total	DETSC 3304	0.04	ug/l	9.4	19
Phenols					
Phenol	*	0.5	ug/l	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 16-80775-1
Client Ref 12032/GLHL
Contract Title H.Rd (Herbert Road)

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1064955	SP S1	SOIL	NAD	none	Steven Lambert
1064956	SP S2	SOIL	NAD	none	Steven Lambert
1064957	SP S3	SOIL	NAD	none	Steven Lambert
1064958	SP S4	SOIL	NAD	none	Steven Lambert
1064959	SP S5	SOIL	NAD	none	Steven Lambert
1064960	SP S6	SOIL	NAD	none	Steven Lambert
1064961	SP S7	SOIL	Chrysotile	Chrysotile present in loose bundle	Steven Lambert
1064962	SP S8	SOIL	NAD	none	Steven Lambert
1064963	SP S9	SOIL	NAD	none	Steven Lambert
1064964	SP S10	SOIL	NAD	none	Steven Lambert
1064965	SP S11	SOIL	NAD	none	Steven Lambert
1064966	SP S12	SOIL	NAD	none	Steven Lambert
1064967	SP S13	SOIL	NAD	none	Steven Lambert
1064968	SP S14	SOIL	NAD	none	Steven Lambert

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * -not included in laboratory scope of accreditation.

Summary of Asbestos Quantification Analysis
Soil Samples

Our Ref 16-80775-1
Client Ref 12032/GLHL
Contract Title H.Rd (Herbert Road)

Lab No	1064961
Sample ID	SP S7
Depth	
Other ID	
Sample Type	SOIL
Sampling Date	06/10/16
Sampling Time	

Test	Method	Units	
Total Mass% Asbestos (a+b+c)	DETSC 1102	Mass %	**< 0.001**
Gravimetric Quantification (a)	DETSC 1102	Mass %	na
Detailed Gravimetric Quantification (b)	DETSC 1102	Mass %	<0.001
Quantification by PCOM (c)	DETSC 1102	Mass %	na
Potentially Respirable Fibres (d)	DETSC 1102	Fibres/g	na
Breakdown of Gravimetric Analysis (a)			
Mass of Sample		g	1009.10
ACMs present*		type	
Mass of ACM in sample		g	
% ACM by mass		%	
% asbestos in ACM		%	
% asbestos in sample		%	
Breakdown of Detailed Gravimetric Analysis (b)			
% Amphibole bundles in sample		Mass %	na
% Chrysotile bundles in sample		Mass %	<0.001
Breakdown of PCOM Analysis (c)			
% Amphibole fibres in sample		Mass %	na
% Chrysotile fibres in sample		Mass %	na
Breakdown of Potentially Respirable Fibre Analysis (d)			
Amphibole fibres		Fibres/g	na
Chrysotile fibres		Fibres/g	na

* Denotes test or material description outside of UKAS accreditation.
% asbestos in Asbestos Containing Materials (ACMs) is determined by
by reference to HSG 264.
Recommended sample size for quantification is approximately 1kg
# denotes deviating sample

Information in Support of the Analytical Results

Our Ref 16-80775-1
Client Ref 12032/GLHL
Contract H.Rd (Herbert Road)

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1064955	SP S1 SOIL	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064956	SP S2 SOIL	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064957	SP S3 SOIL	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064958	SP S4 SOIL	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064959	SP S5 SOIL	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064960	SP S6 SOIL	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064961	SP S7 SOIL	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064962	SP S8 SOIL	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064963	SP S9 SOIL	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064964	SP S10 SOIL	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064965	SP S11 SOIL	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064966	SP S12 SOIL	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064967	SP S13 SOIL	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064968	SP S14 SOIL	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064969	SP S1 LEACHATE	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064970	SP S2 LEACHATE	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064971	SP S3 LEACHATE	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064972	SP S4 LEACHATE	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064973	SP S5 LEACHATE	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064974	SP S6 LEACHATE	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064975	SP S7 LEACHATE	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064976	SP S8 LEACHATE	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064977	SP S9 LEACHATE	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064978	SP S10 LEACHATE	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064979	SP S11 LEACHATE	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064980	SP S12 LEACHATE	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064981	SP S13 LEACHATE	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1064982	SP S14 LEACHATE	06/10/16	GJ 250ml x2, GV x2, PT 1L x2		

Key: G-Glass P-Plastic J-Jar V-Vial T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO4	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO4	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETSC2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

Derwentside Environmental Testing Services

Certificate of Analysis

Certificate Number 16-81431

25-Oct-16

Client Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference 16-81431

Client Reference 12032

Order No (not supplied)

Contract Title H.Rd (Herbert Road)

Description 8 Soil samples, 8 Leachate samples.

Date Received 18-Oct-16

Date Started 18-Oct-16

Date Completed 25-Oct-16

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

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

Approved By [redacted]

Rob Brown
Business Manager

MCERTS
THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

UKAS TESTING
2139

Summary of Chemical Analysis
Matrix Descriptions

Our Ref 16-81431
Client Ref 12032
Contract Title H.Rd (Herbert Road)

Sample ID	Lab No	Completed	Matrix Description
SP S16	1069409	25/10/2016	Brown gravelly, sandy CLAY
SP S17	1069410	25/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick)
SP S18	1069411	25/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick)
SP S19	1069412	25/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick)
SP S20	1069413	25/10/2016	Brown gravelly, sandy CLAY (Made ground - brick)
SP S21	1069414	25/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick)
SP S22	1069415	25/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick)
SP S23	1069416	25/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick)

Summary of Chemical Analysis
Soil Samples

Our Ref 16-81431
Client Ref 12032
Contract Title H.Rd (Herbert Road)

			Lab No	1069409	1069410	1069411	1069412	1069413	1069414
			Sample ID	SP S16	SP S17	SP S18	SP S19	SP S20	SP S21
			Depth						
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	30/09/16	30/09/16	30/09/16	30/09/16	30/09/16	30/09/16
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Preparation									
Moisture Content	DETSC 1004*	0.1	%	9.6	14	9.9	8.2	7.3	11
Metals									
Antimony	DETSC 2301*	1	mg/kg	1.3	1.9	< 1.0	1.3	1.2	1.6
Arsenic	DETSC 2301#	0.2	mg/kg	3.4	19	4.8	13	5.6	18
Beryllium	DETSC 2301#	0.2	mg/kg	0.6	1.1	0.6	1.4	0.8	1.6
Boron, Water Soluble	DETSC 2123#	0.2	mg/kg	< 0.2	0.8	1.2	1.7	< 0.2	1.4
Cadmium	DETSC 2301#	0.1	mg/kg	0.1	1.1	0.2	0.7	0.1	0.3
Chromium	DETSC 2301#	0.15	mg/kg	29	17	7.9	15	25	17
Chromium III	DETSC 2301*	0.15	mg/kg	29	17	7.9	15	25	17
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	11	48	31	52	19	71
Lead	DETSC 2301#	0.3	mg/kg	11	40	38	26	13	280
Manganese	DETSC 2301#	20	mg/kg	1000	430	540	380	670	410
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	0.06	0.06	< 0.05	< 0.05	0.09
Molybdenum	DETSC 2301#	0.4	mg/kg	< 0.4	3.7	0.7	2.8	0.8	3.6
Nickel	DETSC 2301#	1	mg/kg	33	27	12	37	35	43
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	0.8	0.9	< 0.5	< 0.5	0.8
Zinc	DETSC 2301#	1	mg/kg	50	2000	70	560	74	150
Inorganics									
pH	DETSC 2008#			7.8	8.1	8.2	8.6	7.7	7.7
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cyanide, Complex	DETSC 2130*	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Organic matter	DETSC 2002#	0.1	%	0.4	6.0	5.9	6.3	1.6	8.3
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.16	0.21	0.16	0.15	0.10	0.38
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	3.1	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	65	< 3.4	8.9	< 3.4	< 3.4
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	< 3.4	21	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	68	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	3.3	5.1	1.9	2.2	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	22	150	33	30	< 1.4	< 1.4

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 16-81431
Client Ref 12032
Contract Title H.Rd (Herbert Road)

			Lab No	1069409	1069410	1069411	1069412	1069413	1069414
			Sample ID	SP S16	SP S17	SP S18	SP S19	SP S20	SP S21
			Depth						
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	30/09/16	30/09/16	30/09/16	30/09/16	30/09/16	30/09/16
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	< 1.4	44	9.9	7.3	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	26	160	35	32	< 10	< 10
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	26	220	35	41	< 10	< 10
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	0.04	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.25	0.13	0.14	0.09	0.04	0.12
Anthracene	DETSC 3303	0.03	mg/kg	0.05	< 0.03	0.03	< 0.03	< 0.03	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.59	0.34	0.36	0.13	0.06	0.16
Pyrene	DETSC 3303#	0.03	mg/kg	0.50	0.34	0.33	0.13	0.06	0.15
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.34	0.19	0.17	0.08	0.03	0.10
Chrysene	DETSC 3303	0.03	mg/kg	0.39	0.30	0.23	0.13	0.04	0.12
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.40	0.39	0.29	0.12	0.06	0.13
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.14	0.12	0.09	0.04	< 0.03	0.04
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.21	0.23	0.16	0.08	0.03	0.08
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.13	0.15	0.11	0.06	< 0.03	0.05
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	0.04	0.04	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.12	0.20	0.12	0.06	< 0.03	0.07
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	3.2	2.4	2.0	0.91	0.32	1.0
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 16-81431
Client Ref 12032
Contract Title H.Rd (Herbert Road)

			Lab No	1069415	1069416
			Sample ID	SP S22	SP S23
			Depth		
			Other ID		
			Sample Type	SOIL	SOIL
			Sampling Date	30/09/16	30/09/16
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Preparation					
Moisture Content	DETSC 1004*	0.1	%	7.6	10
Metals					
Antimony	DETSC 2301*	1	mg/kg	< 1.0	1.6
Arsenic	DETSC 2301#	0.2	mg/kg	5.7	14
Beryllium	DETSC 2301#	0.2	mg/kg	1.1	0.9
Boron, Water Soluble	DETSC 2123#	0.2	mg/kg	2.4	1.2
Cadmium	DETSC 2301#	0.1	mg/kg	< 0.1	0.4
Chromium	DETSC 2301#	0.15	mg/kg	8.4	13
Chromium III	DETSC 2301*	0.15	mg/kg	8.4	13
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	36	46
Lead	DETSC 2301#	0.3	mg/kg	22	20
Manganese	DETSC 2301#	20	mg/kg	460	350
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05
Molybdenum	DETSC 2301#	0.4	mg/kg	1.2	7.0
Nickel	DETSC 2301#	1	mg/kg	19	30
Selenium	DETSC 2301#	0.5	mg/kg	0.6	0.7
Zinc	DETSC 2301#	1	mg/kg	49	510
Inorganics					
pH	DETSC 2008#			8.4	8.0
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1
Cyanide, Complex	DETSC 2130*	0.2	mg/kg	< 0.2	< 0.2
Organic matter	DETSC 2002#	0.1	%	9.5	5.4
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.16	0.18
Petroleum Hydrocarbons					
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	4.0
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	33
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	< 3.4	7.1
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	37
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 16-81431
Client Ref 12032
Contract Title H.Rd (Herbert Road)

			Lab No	1069415	1069416
			Sample ID	SP S22	SP S23
			Depth		
			Other ID		
			Sample Type	SOIL	SOIL
			Sampling Date	30/09/16	30/09/16
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	< 10	37
PAHs					
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	0.19
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	0.04
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.16	0.72
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	0.09
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.03	0.46
Pyrene	DETSC 3303#	0.03	mg/kg	0.04	0.44
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	0.21
Chrysene	DETSC 3303	0.03	mg/kg	0.08	0.33
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	0.31
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	0.10
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.19
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.11
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	0.20
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	0.30	3.4
Phenols					
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 16-81431
Client Ref 12032
Contract Title H.Rd (Herbert Road)

			Lab No	1069417	1069418	1069419	1069420	1069421	1069422
			Sample ID	SP S16	SP S17	SP S18	SP S19	SP S20	SP S21
			Depth						
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	30/09/16	30/09/16	30/09/16	30/09/16	30/09/16	30/09/16
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Preparation									
Leachate 10:1	DETS 036*			Y	Y	Y	Y	Y	Y
Metals									
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	< 0.16	< 0.16	< 0.16	9.2	1.2	5.3
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25	< 0.25	0.41	< 0.25	< 0.25
Chromium III, Dissolved	DETSC 2302*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	< 0.4	< 0.4	0.6	0.7	< 0.4	< 0.4
Lead, Dissolved	DETSC 2306	0.09	ug/l	< 0.09	0.15	0.25	0.72	0.14	0.49
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	< 0.5	< 0.5	0.6	< 0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	0.39	1.1	3.5	1.9	2.1
Zinc, Dissolved	DETSC 2306	1.3	ug/l	< 1.3	8.1	< 1.3	7.7	< 1.3	3.2
Inorganics									
pH	DETSC 2008			7.1	7.0	7.0	6.8	6.6	6.8
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	1.3	2.0	2.1	1.7	1.1	1.1
Fluoride	DETSC 2055	0.1	mg/l	< 0.10	< 0.10	0.10	< 0.10	< 0.10	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	3.3	11	27	9.9	5.8	39
Total Organic Carbon	DETSC 2085	1	mg/l	1.9	3.1	10	4.3	2.0	1.2
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	2.6	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
PAHs									
Naphthalene	DETSC 3304	0.01	ug/l	0.03	0.03	0.14	0.06	0.03	0.03
Acenaphthylene	DETSC 3304	0.01	ug/l	0.01	0.01	0.02	< 0.01	< 0.01	< 0.01

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 16-81431
Client Ref 12032
Contract Title H.Rd (Herbert Road)

			Lab No	1069417	1069418	1069419	1069420	1069421	1069422
			Sample ID	SP S16	SP S17	SP S18	SP S19	SP S20	SP S21
			Depth						
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	30/09/16	30/09/16	30/09/16	30/09/16	30/09/16	30/09/16
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Acenaphthene	DETSC 3304	0.01	ug/l	0.03	0.01	0.07	< 0.01	< 0.01	< 0.01
Fluorene	DETSC 3304	0.01	ug/l	0.02	< 0.01	0.09	0.03	< 0.01	< 0.01
Phenanthrene	DETSC 3304	0.01	ug/l	0.04	0.10	0.49	0.19	0.06	0.05
Anthracene	DETSC 3304	0.01	ug/l	0.02	0.02	0.08	0.02	< 0.01	< 0.01
Fluoranthene	DETSC 3304	0.01	ug/l	0.11	0.09	0.31	0.10	0.04	0.04
Pyrene	DETSC 3304	0.01	ug/l	0.10	0.08	0.25	0.09	0.04	0.03
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	0.09	0.05	0.13	0.03	0.02	0.02
Chrysene	DETSC 3304	0.01	ug/l	0.18	0.14	0.40	0.13	0.06	0.04
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	0.27	0.27	0.38	0.11	< 0.01	< 0.01
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	0.09	0.13	0.05	< 0.01	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	0.18	0.21	0.21	0.09	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	0.17	0.27	0.25	0.12	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	0.05	0.11	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	0.17	0.42	0.34	0.19	< 0.01	< 0.01
PAH Total	DETSC 3304	0.04	ug/l	1.5	1.9	3.3	1.2	0.24	0.21
Phenols									
Phenol	*	0.5	ug/l	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 16-81431
Client Ref 12032
Contract Title H.Rd (Herbert Road)

			Lab No	1069423	1069424
			Sample ID	SP S22	SP S23
			Depth		
			Other ID		
			Sample Type	LEACHATE	LEACHATE
			Sampling Date	30/09/16	30/09/16
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Preparation					
Leachate 10:1	DETS 036*			Y	Y
Metals					
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	0.86	1.8
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25
Chromium III, Dissolved	DETSC 2302*	1	ug/l	< 1.0	< 1.0
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	< 0.4	0.5
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.30	0.26
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	2.6	1.4
Zinc, Dissolved	DETSC 2306	1.3	ug/l	< 1.3	5.0
Inorganics					
pH	DETSC 2008			6.7	6.8
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	1.4	1.7
Fluoride	DETSC 2055	0.1	mg/l	< 0.10	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	9.7	16
Total Organic Carbon	DETSC 2085	1	mg/l	12	1.9
Petroleum Hydrocarbons					
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	< 10	< 10
PAHs					
Naphthalene	DETSC 3304	0.01	ug/l	0.16	0.04
Acenaphthylene	DETSC 3304	0.01	ug/l	0.02	< 0.01

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 16-81431
Client Ref 12032
Contract Title H.Rd (Herbert Road)

			Lab No	1069423	1069424
			Sample ID	SP S22	SP S23
			Depth		
			Other ID		
			Sample Type	LEACHATE	LEACHATE
			Sampling Date	30/09/16	30/09/16
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Acenaphthene	DETSC 3304	0.01	ug/l	0.06	< 0.01
Fluorene	DETSC 3304	0.01	ug/l	0.09	< 0.01
Phenanthrene	DETSC 3304	0.01	ug/l	0.56	0.09
Anthracene	DETSC 3304	0.01	ug/l	0.04	< 0.01
Fluoranthene	DETSC 3304	0.01	ug/l	0.16	0.07
Pyrene	DETSC 3304	0.01	ug/l	0.14	0.06
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	0.06	0.04
Chrysene	DETSC 3304	0.01	ug/l	0.33	0.09
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	0.15	< 0.01
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	0.03	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	0.35	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	0.08	0.08
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	0.19	0.07
PAH Total	DETSC 3304	0.04	ug/l	2.4	0.53
Phenols					
Phenol	*	0.5	ug/l	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 16-81431
Client Ref 12032
Contract Title H.Rd (Herbert Road)

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1069409	SP S16	SOIL	NAD	none	Andrew Little
1069410	SP S17	SOIL	NAD	none	Andrew Little
1069411	SP S18	SOIL	NAD	none	Andrew Little
1069412	SP S19	SOIL	NAD	none	Andrew Little
1069413	SP S20	SOIL	NAD	none	Andrew Little
1069414	SP S21	SOIL	NAD	none	Andrew Little
1069415	SP S22	SOIL	NAD	none	Andrew Little
1069416	SP S23	SOIL	NAD	none	Andrew Little

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 16-81431
Client Ref 12032
Contract H.Rd (Herbert Road)

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1069409	SP S16 SOIL	30/09/16	GJ 250ml x2, GV x2, PT 1L x2	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH MS (14 days), pH + Conductivity (7 days)	
1069410	SP S17 SOIL	30/09/16	GJ 250ml x2, GV x2, PT 1L x2	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH MS (14 days), pH + Conductivity (7 days)	
1069411	SP S18 SOIL	30/09/16	GJ 250ml x2, GV x2, PT 1L x2	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH MS (14 days), pH + Conductivity (7 days)	
1069412	SP S19 SOIL	30/09/16	GJ 250ml x2, GV x2, PT 1L x2	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH MS (14 days), pH + Conductivity (7 days)	
1069413	SP S20 SOIL	30/09/16	GJ 250ml x2, GV x2, PT 1L x2	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH MS (14 days), pH + Conductivity (7 days)	
1069414	SP S21 SOIL	30/09/16	GJ 250ml x2, GV x2, PT 1L x2	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH MS (14 days), pH + Conductivity (7 days)	
1069415	SP S22 SOIL	30/09/16	GJ 250ml x2, GV x2, PT 1L x2	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH MS (14 days), pH + Conductivity (7 days)	
1069416	SP S23 SOIL	30/09/16	GJ 250ml x2, GV x2, PT 1L x2	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH MS (14 days), pH + Conductivity (7 days)	
1069417	SP S16 LEACHATE	30/09/16	GJ 250ml x2, GV x2, PT 1L x2		
1069418	SP S17 LEACHATE	30/09/16	GJ 250ml x2, GV x2, PT 1L x2		
1069419	SP S18 LEACHATE	30/09/16	GJ 250ml x2, GV x2, PT 1L x2		
1069420	SP S19 LEACHATE	30/09/16	GJ 250ml x2, GV x2, PT 1L x2		
1069421	SP S20 LEACHATE	30/09/16	GJ 250ml x2, GV x2, PT 1L x2		
1069422	SP S21 LEACHATE	30/09/16	GJ 250ml x2, GV x2, PT 1L x2		
1069423	SP S22 LEACHATE	30/09/16	GJ 250ml x2, GV x2, PT 1L x2		
1069424	SP S23 LEACHATE	30/09/16	GJ 250ml x2, GV x2, PT 1L x2		

Key: G-Glass P-Plastic J-Jar V-Vial T-Tub

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

Information in Support of the Analytical Results

Our Ref 16-81431
Client Ref 12032
Contract H.Rd (Herbert Road)

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.
Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.
The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-
Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO4	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO4	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETSC2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

Derwentside Environmental Testing Services

Certificate of Analysis

Certificate Number 16-81290

24-Oct-16

Client Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference 16-81290

Client Reference 12032/GL

Order No 12032/GLHL

Contract Title GL (S) Green Lane South

Description 4 Soil samples, 4 Leachate samples.

Date Received 17-Oct-16

Date Started 17-Oct-16

Date Completed 24-Oct-16

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

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

Approved By [redacted]

Rob Brown
Business Manager

MCERTS
THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

UKAS TESTING
2139

Summary of Chemical Analysis
Matrix Descriptions

Our Ref 16-81290
Client Ref 12032/GL
Contract Title GL (S) Green Lane South

Sample ID	Lab No	Completed	Matrix Description
S1	1068546	24/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick,,slag)
S2	1068547	24/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick,,slag)
S3	1068548	24/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick,,slag)
S4	1068549	24/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick,,slag)

Summary of Chemical Analysis
Soil Samples

Our Ref 16-81290
Client Ref 12032/GL
Contract Title GL (S) Green Lane South

			Lab No	1068546	1068547	1068548	1068549
			Sample ID	S1	S2	S3	S4
			Depth				
			Other ID				
			Sample Type	SOIL	SOIL	SOIL	SOIL
			Sampling Date	14/10/16	14/10/16	14/10/16	14/10/16
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Preparation							
Moisture Content	DETSC 1004*	0.1	%	7.4	5.9	9.0	8.9
Metals							
Antimony	DETSC 2301*	1	mg/kg	< 1.0	1.6	< 1.0	1.2
Arsenic	DETSC 2301#	0.2	mg/kg	8.0	14	9.1	17
Beryllium	DETSC 2301#	0.2	mg/kg	2.0	1.1	1.0	1.0
Boron, Water Soluble	DETSC 2123#	0.2	mg/kg	1.0	2.3	1.0	0.7
Cadmium	DETSC 2301#	0.1	mg/kg	0.1	< 0.1	< 0.1	0.4
Chromium	DETSC 2301#	0.15	mg/kg	8.8	11	13	16
Chromium III	DETSC 2301*	0.15	mg/kg	8.8	11	13	16
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	46	35	32	120
Lead	DETSC 2301#	0.3	mg/kg	23	20	17	29
Manganese	DETSC 2301#	20	mg/kg	1300	2500	290	350
Mercury	DETSC 2325#	0.05	mg/kg	0.06	0.13	< 0.05	0.07
Molybdenum	DETSC 2301#	0.4	mg/kg	1.4	1.3	1.5	2.8
Nickel	DETSC 2301#	1	mg/kg	32	51	25	30
Selenium	DETSC 2301#	0.5	mg/kg	1.1	< 0.5	< 0.5	0.7
Zinc	DETSC 2301#	1	mg/kg	66	81	41	710
Inorganics							
pH	DETSC 2008#			8.7	8.1	8.4	6.7
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Cyanide, Complex	DETSC 2130*	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Organic matter	DETSC 2002#	0.1	%	2.5	11	1.7	8.3
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.20	0.21	0.09	0.24
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	0.03	< 0.01	0.05	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	0.02	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	2.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	40
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	< 3.4	< 3.4	< 3.4	11
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	43
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 16-81290
Client Ref 12032/GL
Contract Title GL (S) Green Lane South

			Lab No	1068546	1068547	1068548	1068549
			Sample ID	S1	S2	S3	S4
			Depth				
			Other ID				
			Sample Type	SOIL	SOIL	SOIL	SOIL
			Sampling Date	14/10/16	14/10/16	14/10/16	14/10/16
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	43
PAHs							
Naphthalene	DETSC 3303#	0.03	mg/kg	0.07	0.05	0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.15	0.24	0.12	0.10
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.14	0.09	0.11	0.25
Pyrene	DETSC 3303#	0.03	mg/kg	0.13	0.08	0.09	0.23
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.08	0.05	0.07	0.13
Chrysene	DETSC 3303	0.03	mg/kg	0.11	0.11	0.09	0.18
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.11	0.07	0.09	0.22
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.03	0.08
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.05	< 0.03	0.04	0.13
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.04	< 0.03	0.04	0.10
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.04	0.04	0.04	0.13
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	0.93	0.75	0.75	1.5
Phenols							
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	0.4	< 0.3	< 0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 16-81290
Client Ref 12032/GL
Contract Title GL (S) Green Lane South

	Lab No	1068550	1068551	1068552	1068553
	Sample ID	S1	S2	S3	S4
	Depth				
	Other ID				
	Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE
	Sampling Date	14/10/16	14/10/16	14/10/16	14/10/16
	Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Preparation							
Leachate 10:1	DETS 036*			Y	Y	Y	Y
Metals							
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	1.0	0.88	1.6	0.38
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25	< 0.25	< 0.25
Chromium III, Dissolved	DETSC 2302*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	0.7	< 0.4	0.5	< 0.4
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.39	< 0.09	0.18	0.21
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	1.0	< 0.5	0.8	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.46	2.3	0.68	0.32
Zinc, Dissolved	DETSC 2306	1.3	ug/l	< 1.3	< 1.3	< 1.3	3.2
Inorganics							
pH	DETSC 2008			7.0	6.7	7.2	7.1
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	0.93	0.75	1.1	3.6
Fluoride	DETSC 2055	0.1	mg/l	< 0.10	< 0.10	< 0.10	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	4.9	55	7.1	8.5
Total Organic Carbon	DETSC 2085	1	mg/l	1.6	1.4	1.2	1.4
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10
PAHs							
Naphthalene	DETSC 3304	0.01	ug/l	0.34	0.76	0.26	0.07
Acenaphthylene	DETSC 3304	0.01	ug/l	0.03	0.07	< 0.01	0.01

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 16-81290
Client Ref 12032/GL
Contract Title GL (S) Green Lane South

			Lab No	1068550	1068551	1068552	1068553
			Sample ID	S1	S2	S3	S4
			Depth				
			Other ID				
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	14/10/16	14/10/16	14/10/16	14/10/16
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	0.13	0.11	< 0.01
Fluorene	DETSC 3304	0.01	ug/l	0.13	0.36	0.11	< 0.01
Phenanthrene	DETSC 3304	0.01	ug/l	0.74	10	0.76	0.17
Anthracene	DETSC 3304	0.01	ug/l	0.07	0.22	0.08	0.03
Fluoranthene	DETSC 3304	0.01	ug/l	0.34	1.1	0.36	0.16
Pyrene	DETSC 3304	0.01	ug/l	0.33	0.84	0.33	0.13
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	0.18	0.36	0.19	0.07
Chrysene	DETSC 3304	0.01	ug/l	0.48	0.92	0.38	0.23
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	0.41	0.49	0.31	0.33
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	0.13	0.14	0.09	0.08
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	0.19	0.37	0.13	0.11
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	0.32	0.20	0.20	0.30
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	0.79	0.61	0.39	0.47
PAH Total	DETSC 3304	0.04	ug/l	4.5	17	3.7	2.2
Phenols							
Phenol	*	0.5	ug/l	< 0.50	< 0.50	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 16-81290
Client Ref 12032/GL
Contract Title GL (S) Green Lane South

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1068546	S1	SOIL	NAD	none	Colin Patrick
1068547	S2	SOIL	NAD	none	Colin Patrick
1068548	S3	SOIL	NAD	none	Colin Patrick
1068549	S4	SOIL	NAD	none	Colin Patrick

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 16-81290
Client Ref 12032/GL
Contract GL (S) Green Lane South

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1068546	S1 SOIL	14/10/16	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
1068547	S2 SOIL	14/10/16	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
1068548	S3 SOIL	14/10/16	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
1068549	S4 SOIL	14/10/16	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
1068550	S1 LEACHATE	14/10/16	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
1068551	S2 LEACHATE	14/10/16	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
1068552	S3 LEACHATE	14/10/16	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
1068553	S4 LEACHATE	14/10/16	GJ 250ml x2, GJ 60ml x2, PT 1L x2		

Key: G-Glass P-Plastic J-Jar T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO4	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO4	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETSC2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

Certificate of Analysis

Certificate Number 16-81288

24-Oct-16

Client Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference 16-81288

Client Reference 12032/HLN

Order No 12032/GLHL

Contract Title HL (N) Hawes Lane North

Description 4 Soil samples, 4 Leachate samples.

Date Received 17-Oct-16

Date Started 17-Oct-16

Date Completed 24-Oct-16

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

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

Approved By [redacted]

Rob Brown
Business Manager

2139

Summary of Chemical Analysis
Matrix Descriptions

Our Ref 16-81288
Client Ref 12032/HLN
Contract Title HL (N) Hawes Lane North

Sample ID	Lab No	Completed	Matrix Description
S1	1068530	24/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick,,slag)
S2	1068531	24/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick,,slag)
S3	1068532	24/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick,,slag)
S4	1068533	24/10/2016	Dark brown gravelly, sandy CLAY (Made ground - brick slag)

Summary of Chemical Analysis
Soil Samples

Our Ref 16-81288
Client Ref 12032/HLN
Contract Title HL (N) Hawes Lane North

			Lab No	1068530	1068531	1068532	1068533
			Sample ID	S1	S2	S3	S4
			Depth				
			Other ID				
			Sample Type	SOIL	SOIL	SOIL	SOIL
			Sampling Date	14/10/16	14/10/16	14/10/16	14/10/16
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Preparation							
Moisture Content	DETSC 1004*	0.1	%	8.9	9.1	8.3	7.9
Metals							
Antimony	DETSC 2301*	1	mg/kg	< 1.0	1.3	< 1.0	< 1.0
Arsenic	DETSC 2301#	0.2	mg/kg	8.2	5.0	11	11
Beryllium	DETSC 2301#	0.2	mg/kg	0.7	0.8	0.7	0.8
Boron, Water Soluble	DETSC 2123#	0.2	mg/kg	0.9	0.8	1.3	1.0
Cadmium	DETSC 2301#	0.1	mg/kg	< 0.1	< 0.1	0.1	0.1
Chromium	DETSC 2301#	0.15	mg/kg	20	26	9.3	13
Chromium III	DETSC 2301*	0.15	mg/kg	20	26	9.3	13
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	25	25	42	41
Lead	DETSC 2301#	0.3	mg/kg	15	16	20	22
Manganese	DETSC 2301#	20	mg/kg	510	900	280	360
Mercury	DETSC 2325#	0.05	mg/kg	0.07	0.06	0.08	0.13
Molybdenum	DETSC 2301#	0.4	mg/kg	0.7	0.7	1.9	1.2
Nickel	DETSC 2301#	1	mg/kg	29	34	22	25
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	44	55	34	53
Inorganics							
pH	DETSC 2008#			7.5	7.4	7.8	7.6
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Cyanide, Complex	DETSC 2130*	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Organic matter	DETSC 2002#	0.1	%	4.5	6.6	17	20
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.15	0.12	0.12	0.21

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 16-81288
Client Ref 12032/HLN
Contract Title HL (N) Hawes Lane North

			Lab No	1068530	1068531	1068532	1068533
			Sample ID	S1	S2	S3	S4
			Depth				
			Other ID				
			Sample Type	SOIL	SOIL	SOIL	SOIL
			Sampling Date	14/10/16	14/10/16	14/10/16	14/10/16
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	0.03	< 0.01	< 0.01	0.04
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	0.8	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	1.9	< 1.4
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10
PAHs							
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.05	0.07
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.07	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	0.05	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.11	0.06	0.54	0.17
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	0.11	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.11	0.07	0.86	0.14
Pyrene	DETSC 3303#	0.03	mg/kg	0.10	0.06	0.67	0.14
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.05	0.03	0.37	0.08
Chrysene	DETSC 3303	0.03	mg/kg	0.05	0.04	0.42	0.12
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.07	0.04	0.46	0.10
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.16	0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.03	< 0.03	0.26	0.04
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.16	0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.04	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.16	0.04
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	0.53	0.30	4.4	0.97
Phenols							
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 16-81288
Client Ref 12032/HLN
Contract Title HL (N) Hawes Lane North

			Lab No	1068534	1068535	1068536	1068537
			Sample ID	S1	S2	S3	S4
			Depth				
			Other ID				
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	14/10/16	14/10/16	14/10/16	14/10/16
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Preparation							
Leachate 10:1	DETS 036*			Y	Y	Y	Y
Metals							
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	0.27	< 0.16	0.45	0.19
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25	< 0.25	< 0.25
Chromium III, Dissolved	DETSC 2302*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	< 0.4	0.5	0.7	0.6
Lead, Dissolved	DETSC 2306	0.09	ug/l	< 0.09	< 0.09	0.16	< 0.09
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	< 0.5	< 0.5	2.4
Selenium, Dissolved	DETSC 2306	0.25	ug/l	1.4	1.2	1.1	2.4
Zinc, Dissolved	DETSC 2306	1.3	ug/l	2.0	2.5	1.3	16
Inorganics							
pH	DETSC 2008			6.2	6.2	6.6	6.5
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	2.0	1.2	2.2	2.3
Fluoride	DETSC 2055	0.1	mg/l	< 0.10	< 0.10	< 0.10	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	12	11	17	22
Total Organic Carbon	DETSC 2085	1	mg/l	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 16-81288
Client Ref 12032/HLN
Contract Title HL (N) Hawes Lane North

			Lab No	1068534	1068535	1068536	1068537
			Sample ID	S1	S2	S3	S4
			Depth				
			Other ID				
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	14/10/16	14/10/16	14/10/16	14/10/16
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
PAHs							
Naphthalene	DETSC 3304	0.01	ug/l	0.04	0.04	0.03	0.05
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	DETSC 3304	0.01	ug/l	0.06	0.06	0.06	0.10
Anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.02
Fluoranthene	DETSC 3304	0.01	ug/l	0.04	0.04	0.04	0.04
Pyrene	DETSC 3304	0.01	ug/l	0.03	0.03	0.03	0.03
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
PAH Total	DETSC 3304	0.04	ug/l	0.18	0.16	0.17	0.24
Phenols							
Phenol	*	0.5	ug/l	< 0.50	< 0.50	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 16-81288
Client Ref 12032/HLN
Contract Title HL (N) Hawes Lane North

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1068530	S1	SOIL	NAD	none	Colin Patrick
1068531	S2	SOIL	NAD	none	Colin Patrick
1068532	S3	SOIL	NAD	none	Colin Patrick
1068533	S4	SOIL	NAD	none	Colin Patrick

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 16-81288
Client Ref 12032/HLN
Contract HL (N) Hawes Lane North

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1068530	S1 SOIL	14/10/16	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
1068531	S2 SOIL	14/10/16	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
1068532	S3 SOIL	14/10/16	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
1068533	S4 SOIL	14/10/16	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
1068534	S1 LEACHATE	14/10/16	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
1068535	S2 LEACHATE	14/10/16	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
1068536	S3 LEACHATE	14/10/16	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
1068537	S4 LEACHATE	14/10/16	GJ 250ml x2, GJ 60ml x2, PT 1L x2		

Key: G-Glass P-Plastic J-Jar T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO4	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO4	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETSC2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

Certificate of Analysis

Certificate Number 16-81362

24-Oct-16

Client Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference 16-81362

Client Reference 12032/HLS

Order No 12032/GLHL

Contract Title HL (S) Hawes Lane South

Description 4 Soil samples, 4 Leachate samples.

Date Received 17-Oct-16

Date Started 17-Oct-16

Date Completed 24-Oct-16

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

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

Approved By [redacted]

Rob Brown
Business Manager

2139

Summary of Chemical Analysis
Matrix Descriptions

Our Ref 16-81362
Client Ref 12032/HLS
Contract Title HL (S) Hawes Lane South

Sample ID	Lab No	Completed	Matrix Description
S1	1068956	24/10/2016	Dark brown gravelly, sandy CLAY
S2	1068957	24/10/2016	Dark brown gravelly, sandy CLAY
S3	1068958	24/10/2016	Dark brown gravelly, sandy CLAY
S4	1068959	24/10/2016	Dark brown gravelly, sandy CLAY

Summary of Chemical Analysis
Soil Samples

Our Ref 16-81362
Client Ref 12032/HLS
Contract Title HL (S) Hawes Lane South

			Lab No	1068956	1068957	1068958	1068959
			Sample ID	S1	S2	S3	S4
			Depth				
			Other ID				
			Sample Type	SOIL	SOIL	SOIL	SOIL
			Sampling Date	14/10/16	14/10/16	14/10/16	14/10/16
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Preparation							
Moisture Content	DETSC 1004*	0.1	%	10	8.6	11	8.8
Metals							
Antimony	DETSC 2301*	1	mg/kg	1.2	< 1.0	1.1	< 1.0
Arsenic	DETSC 2301#	0.2	mg/kg	4.6	3.3	6.8	4.5
Beryllium	DETSC 2301#	0.2	mg/kg	0.9	0.8	0.9	0.7
Boron, Water Soluble	DETSC 2123#	0.2	mg/kg	0.5	0.3	0.8	0.4
Cadmium	DETSC 2301#	0.1	mg/kg	0.2	0.2	0.3	0.3
Chromium	DETSC 2301#	0.15	mg/kg	25	16	22	16
Chromium III	DETSC 2301*	0.15	mg/kg	25	16	22	16
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	15	9.9	29	14
Lead	DETSC 2301#	0.3	mg/kg	16	12	21	19
Manganese	DETSC 2301#	20	mg/kg	970	630	800	720
Mercury	DETSC 2325#	0.05	mg/kg	3.2	< 0.05	< 0.05	0.07
Molybdenum	DETSC 2301#	0.4	mg/kg	0.9	0.4	1.6	0.6
Nickel	DETSC 2301#	1	mg/kg	30	17	30	16
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	61	38	99	62
Inorganics							
pH	DETSC 2008#			8.3	8.3	7.9	8.3
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Cyanide, Complex	DETSC 2130*	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Organic matter	DETSC 2002#	0.1	%	1.2	1.5	2.5	1.9
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.18	0.36	0.09	0.14
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	6.5	24	6.4	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	19	88	17	< 3.4
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	< 3.4	10	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	26	110	23	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	8.1
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	4.8	23	5.1	80
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	47	170	44	360

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 16-81362
Client Ref 12032/HLS
Contract Title HL (S) Hawes Lane South

			Lab No	1068956	1068957	1068958	1068959
			Sample ID	S1	S2	S3	S4
			Depth				
			Other ID				
			Sample Type	SOIL	SOIL	SOIL	SOIL
			Sampling Date	14/10/16	14/10/16	14/10/16	14/10/16
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	< 1.4	13	< 1.4	27
Aromatic C5-C35	DETSC 3072*	10	mg/kg	51	190	49	450
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	77	300	72	450
PAHs							
Naphthalene	DETSC 3303#	0.03	mg/kg	0.03	0.08	0.16	0.07
Acenaphthylene	DETSC 3303#	0.03	mg/kg	0.13	0.21	0.07	0.11
Acenaphthene	DETSC 3303#	0.03	mg/kg	0.13	0.37	0.78	0.42
Fluorene	DETSC 3303	0.03	mg/kg	0.15	0.49	0.74	0.39
Phenanthrene	DETSC 3303#	0.03	mg/kg	1.1	3.2	4.0	2.4
Anthracene	DETSC 3303	0.03	mg/kg	0.51	1.4	1.1	0.80
Fluoranthene	DETSC 3303#	0.03	mg/kg	4.3	10	6.3	7.2
Pyrene	DETSC 3303#	0.03	mg/kg	3.7	8.2	4.8	6.0
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	3.2	6.8	2.7	4.4
Chrysene	DETSC 3303	0.03	mg/kg	3.2	6.7	2.7	4.4
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	4.4	9.0	3.4	6.0
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	1.5	3.0	1.1	1.9
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	2.7	5.6	2.0	3.7
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	1.3	2.6	1.1	1.7
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	0.48	1.0	0.34	0.64
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	1.2	2.5	1.0	1.7
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	28	61	32	42
Phenols							
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 16-81362
Client Ref 12032/HLS
Contract Title HL (S) Hawes Lane South

			Lab No	1068960	1068961	1068962	1068963
			Sample ID	S1	S2	S3	S4
			Depth				
			Other ID				
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	14/10/16	14/10/16	14/10/16	14/10/16
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Preparation							
Leachate 10:1	DETS 036*			Y	Y	Y	Y
Metals							
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	0.32	0.18	0.41	0.51
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25	< 0.25	< 0.25
Chromium III, Dissolved	DETSC 2302*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	< 0.4	< 0.4	0.7	0.5
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.15	0.10	0.27	0.19
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	< 0.5	< 0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.54	0.33	0.25	< 0.25
Zinc, Dissolved	DETSC 2306	1.3	ug/l	< 1.3	< 1.3	< 1.3	< 1.3
Inorganics							
pH	DETSC 2008			7.0	6.9	6.9	7.7
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	1.2	0.66	0.78	0.88
Fluoride	DETSC 2055	0.1	mg/l	< 0.10	< 0.10	< 0.10	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	3.8	1.4	2.0	2.7
Total Organic Carbon	DETSC 2085	1	mg/l	1.2	1.1	2.1	1.5
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	7.3
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	80
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	87
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	< 10	< 10	< 10	87
PAHs							
Naphthalene	DETSC 3304	0.01	ug/l	0.05	0.04	0.03	0.12
Acenaphthylene	DETSC 3304	0.01	ug/l	0.09	0.07	0.03	0.34

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 16-81362
Client Ref 12032/HLS
Contract Title HL (S) Hawes Lane South

			Lab No	1068960	1068961	1068962	1068963
			Sample ID	S1	S2	S3	S4
			Depth				
			Other ID				
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	14/10/16	14/10/16	14/10/16	14/10/16
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Acenaphthene	DETSC 3304	0.01	ug/l	0.05	0.03	0.02	0.10
Fluorene	DETSC 3304	0.01	ug/l	0.05	0.03	0.02	0.11
Phenanthrene	DETSC 3304	0.01	ug/l	0.22	0.17	0.08	0.78
Anthracene	DETSC 3304	0.01	ug/l	0.15	0.11	0.04	0.65
Fluoranthene	DETSC 3304	0.01	ug/l	1.1	0.86	0.31	2.6
Pyrene	DETSC 3304	0.01	ug/l	0.98	0.79	0.28	2.9
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	0.93	0.76	0.22	2.3
Chrysene	DETSC 3304	0.01	ug/l	0.40	0.44	0.18	6.2
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	3.7	2.2	0.77	10
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	0.65	0.75	0.26	4.5
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	2.0	1.6	0.53	7.0
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	2.0	1.4	0.49	6.2
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	0.52	0.41	0.18	2.4
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	2.9	1.6	0.51	6.7
PAH Total	DETSC 3304	0.04	ug/l	16	11	4.0	53
Phenols							
Phenol	*	0.5	ug/l	< 0.50	< 0.50	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 16-81362
Client Ref 12032/HLS
Contract Title HL (S) Hawes Lane South

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1068956	S1	SOIL	NAD	none	Colin Patrick
1068957	S2	SOIL	NAD	none	Colin Patrick
1068958	S3	SOIL	NAD	none	Colin Patrick
1068959	S4	SOIL	NAD	none	Colin Patrick

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 16-81362
Client Ref 12032/HLS
Contract HL (S) Hawes Lane South

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1068956	S1 SOIL	14/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1068957	S2 SOIL	14/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1068958	S3 SOIL	14/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1068959	S4 SOIL	14/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1068960	S1 LEACHATE	14/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1068961	S2 LEACHATE	14/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1068962	S3 LEACHATE	14/10/16	GJ 250ml x2, GV x2, PT 1L x2		
1068963	S4 LEACHATE	14/10/16	GJ 250ml x2, GV x2, PT 1L x2		

Key: G-Glass P-Plastic J-Jar V-Vial T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO4	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO4	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETSC2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

Annex F
Soil Test Results – Exceedence Summary Tables

Table 1 Green Lane and Hawes Lane Soils Contaminants of Concern			
Soils			
Chemical	**Guideline (mg/kg)**	**Exceedance (mg/kg)**	**Location**
Asbestos	Chrysotile bundle of fibres <0.001% total mass		TFW SP S7
Arsenic	32	52 35 45	SW 90/1 1.0m TFW SP S9 NE 20/3 6.0m
Beryllium	1.7	2.3 2.9 2.2 2.0 2.1 2.0 2.8 1.8 2.2 2.6 2.1 1.8 1.9 2.3 2.6 1.8 1.9 1.9 2.3 1.9 1.9 1.8 2.0 2.0	NW 15/3 6.0m SE 15/2 4.0m SW 15/1 1.0m SW 15/3 6.0m SE 40/1 1.0m SW 40/1 1.0m SW 65/1 1.0m SW 65/2 3.0m SE 90/1 1.0m SW 90/1 1.0m NW 15/1 1.0m SE 15/1 1.0m SE 15/2 4.0m SW 50/1 1.0m NE 80/1 1.0m SW 80/1 1.0m NE 80/2 2.0m SW 80/2 3.0m SW 80/3 6.0m NW 90/1 1.0m SE 90/1 1.0m TFW SP S8 TFW SP S9 TFW GLS S1
Lead	310	516 545 797 1700	SE 15/3 6.0m SE 40/1 1.0m SW 90/1 1.0m TFW SP S8
Cadmium	10	17.9 26.4	SE 40/1 1.0m SW 90/1 1.0m
Dibenzo(ah)anthracene	0.31 – 0.32	0.35 0.59 1.17 3.02 1.10 0.48 1.0 0.34 0.64	SW 15/2 3.0m NE 20/2 3.0m NE 20/3 6.0m NW 90/1 1.0m SE 90/1 1.0m TFW HLS S1 TFW HLS S2 TFW HLS S3 TFW HLS S4
Benzo(b)fluoranthene	3.9 – 4.0	7.87 18.94 7.12 4.4 9.0 6.0	NE 20/3 6.0m NW 90/1 1.0m SE 90/1 1.0m TFW HLS S1 TFW HLS S2 TFW HLS S4
Benzo(a)pyrene	3.2	5.76 12.97 5.16 5.6 3.7	NE 20/3 6.0m NW 90/1 1.0m SE 90/1 1.0m TFW HLS S2 TFW HLS S4

Table 2 Green Lane and Hawes Lane Leachates Contaminants of Concern

Leachates

Chemical	Guideline (ug/l)	Exceedance (ug/l)	Location
Cadmium	0.2	0.59	SW 90/1 1.0m
Copper	3.67	3.9 4.7 6.4 3.9 5.6 4.4 4.3 6.8 4.4 6.3	SW 65/2 3.0m NW 85/1 1.0m SE 90/1 1.0m SW 90/1 1.0m SE 15/1 1.0m SW 15/1 1.0m NE 20/3 6.0m NE 80/2 2.0m NW 90/1 1.0m SE 90/1 1.0m
Lead	1.2	4.2 1.3 8.8 2.6 1.3 2.9 1.4	SW 15/1 1.0m SE 15/1 1.0m SE 15/3 6.0m SW 65/2 3.0m SW 15/1 1.0m TFW SP S8 TFW SP S9
Zinc	9.0	60 10 216 65 62 38 45 14 12 9.2 16	SE 40/1 1.0m SE 15/1 1.0m SE 90/1 1.0m NW 15/1 1.0m SE 15/1 1.0m SE 15/2 4.0m SE 15/3 6.0m NE 20/1 1.0m NW 65/1 1.0m TFW SP S7 TFW HLN S4
Cyanide	1.0	24	NE 50/1 1.0m
Anthracene	0.1	0.2 0.11 0.19 0.22 0.15 0.11 0.65	SW 40/1 1.0m TFW SP S11 TFW SP S13 TFW GLS S2 TFW HLS S1 TFW HLS S2 TFW HLS S4
Benzo(a)pyrene	0.00017	0.16 0.17 0.12 0.06 0.28 0.23 0.16 0.40 0.11 0.60 0.98 0.18 0.21 0.21 0.09 0.35 0.19 0.37 0.13 0.11 2.0 1.6 0.53 7.0	TFW SP S1 TFW SP S2 TFW SP S3 TFW SP S5 TFW SP S6 TFW SP S7 TFW SP S10 TFW SP S11 TFW SP S12 TFW SP S13 TFW SP S14 TFW SP S15 TFW SP S16 TFW SP S17 TFW SP S18 TFW SP S21 TFW GLS S1 TFW GLS S2 TFW GLS S3 TFW GLS S4 TFW HLS S1 TFW HLS S2 TFW HLS S3 TFW HLS S4

Table 2 (Continued) **Green Lane and Hawes Lane Leachates Contaminants of Concern**

Leachates			
Chemical	**Guideline (ug/l)**	**Exceedance (ug/l)**	**Location**
Benzo(b)fluoranthene	0.017	0.5	NW 90/1 1.0m
		0.29	TFW SP S1
		0.33	TFW SP S2
		0.24	TFW SP S3
		0.25	TFW SP S5
		0.48	TFW SP S6
		0.43	TFW SP S7
		0.3	TFW SP S10
		0.75	TFW SP S11
		0.27	TFW SP S12
		1.0	TFW SP S13
		2.6	TFW SP S14
		0.27	TFW SP S15
		0.27	TFW SP S16
		0.38	TFW SP S17
		0.11	TFW SP S18
		0.15	TFW SP S21
		0.41	TFW GLS S1
		0.49	TFW GLS S2
		0.31	TFW GLS S3
		0.33	TFW GLS S4
		3.7	TFW HLS S1
		2.2	TFW HLS S2
		0.77	TFW HLS S3
		10	TFW HLS S4
Benzo(k)fluoranthene	0.017	0.2	NW 90/1 1.0m
		0.09	TFW SP S1
		0.12	TFW SP S2
		0.07	TFW SP S3
		0.06	TFW SP S5
		0.16	TFW SP S6
		0.16	TFW SP S7
		0.13	TFW SP S10
		0.26	TFW SP S11
		0.12	TFW SP S12
		0.42	TFW SP S13
		0.43	TFW SP S14
		0.09	TFW SP S16
		0.13	TFW SP S17
		0.05	TFW SP S18
		0.03	TFW SP S21
		0.13	TFW GLS S1
		0.14	TFW GLS S2
		0.09	TFW GLS S3
		0.08	TFW GLS S4
		0.65	TFW HLS S1
		0.75	TFW HLS S2
		0.26	TFW HLS S3
		4.5	TFW HLS S4

Table 2 (Continued) **Green Lane and Hawes Lane Leachates Contaminants of Concern**

Leachates			
Chemical	**Guideline (ug/l)**	**Exceedance (ug/l)**	**Location**
Fluoranthene	0.0063	0.7	NW 90/1 1.0m
		0.29	TFW SP S1
		0.25	TFW SP S2
		0.25	TFW SP S3
		0.07	TFW SP S4
		0.13	TFW SP S5
		0.27	TFW SP S6
		0.33	TFW SP S7
		0.07	TFW SP S8
		0.07	TFW SP S9
		0.33	TFW SP S10
		0.68	TFW SP S11
		0.23	TFW SP S12
		1.1	TFW SP S13
		3.4	TFW SP S14
		0.11	TFW SP S15
		0.09	TFW SP S16
		0.31	TFW SP S17
		0.1	TFW SP S18
		0.04	TFW SP S19
		0.04	TFW SP S20
		0.16	TFW SP S21
		0.07	TFW SP S22
		0.34	TFW GLS S1
		1.1	TFW GLS S2
		0.36	TFW GLS S3
		0.16	TFW GLS S4
		1.1	TFW HLS S1
		0.86	TFW HLS S2
		0.1	TFW HLS S3
		2.6	TFW HLS S4
		0.04	TFW HLN S1
		0.04	TFW HLN S2
		0.04	TFW HLN S3
		0.04	TFW HLN S4
Benzo(ghi)perylene	0.0082	0.3	NW 90/1 1.0m
		0.21	TFW SP S1
		0.41	TFW SP S2
		0.15	TFW SP S3
		0.17	TFW SP S5
		0.36	TFW SP S6
		0.43	TFW SP S7
		0.06	TFW SP S8
		0.35	TFW SP S10
		0.47	TFW SP S11
		0.2	TFW SP S12
		0.99	TFW SP S13
		0.84	TFW SP S14
		0.17	TFW SP S15
		0.42	TFW SP S16
		0.34	TFW SP S17
		0.19	TFW SP S18
		0.19	TFW SP S21
		0.07	TFW SP S22
		0.79	TFW GLS S1
		0.61	TFW GLS S2
		0.39	TFW GLS S3
		0.47	TFW GLS S4
		2.9	TFW HLS S1
		1.6	TFW HLS S2
		0.51	TFW HLS S3
		6.7	TFW HLS S4

Annex F
Remedial Targets Methodology Worksheets

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions)

Details to be completed for each assessment				
Site Name:	Herbert Road			
Site Address:				
Completed by:	[redacted]			
Date:	28.10.2016		Version:	1
Contaminant	Anthracene			
Target Concentration (C_T)	0.0001	mg/l	Origin of C_T:	Water Framework Directive

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Anthracene**		
Target concentration	C_T	**0.0001**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_W	4.70E-01	fraction	SR3
Air filled soil porosity	θa	1.20E-01	fraction	SR3
Bulk density of soil zone material	ρ	2.09E+00	g/cm^3	SR3
Henry's Law constant	H	1.60E-03	dimensionless	*EA 2003*
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	3.40E-02	fraction	Soil Laboratory Chemical Testing
Organic carbon partition coefficient	Koc	2.95E+04	l/kg	*EA 2003*
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**1.00E+03**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.
The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**1.00E-01**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.0001	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Herbert Road
Completed by:	
Date:	28.10.2016
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Anthracene**		from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	**C_T**	**0.0001**	**mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	1.79E-03	m/d	**met office - cardiff monitoring station**	
Area of contaminant source	A	1.80E+04	m^2		Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.50E+02	m	**Minimum value**	
Saturated aquifer thickness	da	5.00E-01	m	**0.5m assumed of 3.8m made ground thickness**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	8.64E-02	m/d	**Primarily well compacted clay soil**	
Hydraulic gradient of water table	i	6.25E-04	fraction	**10cm over 100m (assumed)**	
Width of contaminant source perpendicular to groundwater flow	w	1.20E+02	m		Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**Unknown**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Specify**			
Enter mixing zone thickness	Mz	5.00E-01	m		
Calculated mixing zone thickness	Mz		m		

Calculated Parameters

Dilution Factor	**DF**	**1.00E+00**		
Level 2 Remedial Target		**1.00E-04**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		1.00E-01	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	7.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		7.00E+00	mg/l	0

Site being assessed:	Herbert Road
Completed by:	[redacted]
Date:	28.10.2016
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Input Parameters	Variable	Value	Unit	Source
Contaminant		Anthracene		from Level 1
Target Concentration	C_T	0.0001	mg/l	from Level 1
Dilution Factor	DF	1.00E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to pollutants in all phases (e.g. field derived value

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil leachate concentration as mg/l		
Enter soil leachate concentration		0.00065	mg/l	
Half life for degradation of contaminant in water	$t_{1/2}$	3.65E+03	days	*Surampalli et al*
Calculated decay rate	λ	1.90E-04	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	1.20E+02	m	from Level 2
Plume thickness in aquifer at source	Sy	5.00E-01	m	from Level 2
Bulk density of aquifer materials	ρ	2.09E+00	g/cm^3	*Geotech Testing*
Effective porosity of aquifer	n	5.90E-01	fraction	*SR3*
Hydraulic gradient	i	6.22E+00	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	8.64E-02	m/d	from Level 2
Distance to compliance point	x	1.00E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	1.00E+03	l/kg	*see options*
Longitudinal dispersivity	ax	1.000	m	*see options*
Transverse dispersivity	az	0.100	m	*see options*
Vertical dispersivity	ay	0.010	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters	Variable		
Groundwater flow velocity	v	9.10E-01	m/d
Retardation factor	Rf	3.56E+03	fraction
Decay rate used	λ	1.90E-04	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	6.22E+00	fraction
Rate of contaminant flow due to retardation	u	2.56E-04	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	5.17E-03	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**1.93E+02**	**fraction**
Soil leachate concentration	Co	6.50E-04	

Remedial Targets

Level 3 Remedial Target		**1.93E-02**	**mg/l**	For comparison with measured pore water concentration.
Ogata Banks		**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
		1.94E+01	**mg/kg**	For comparison with measured soil concentration. This
Distance to compliance point		**10**	**m**	assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	**5.17E-03**	**fraction**	Ogata Banks

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer — foc — 3.40E-02 — fraction
Organic carbon partition coefficient — Koc — 2.95E+04 — l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species — $K_{oc,n}$ — l/kg
Sorption coefficient for ionised species — $K_{oc,i}$ — l/kg
pH value — pH
Acid dissociation constant — pKa
Fraction of organic carbon in aquifer — foc — fraction

Soil water partition coefficient — Kd — 1.00E+03 — l/kg

Define dispersivity (click brown cell and use pull down list)

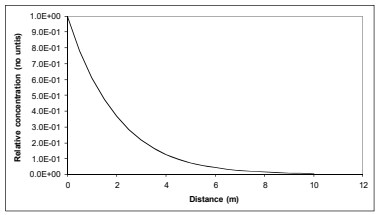
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	1.00E+00	8.30E-01	m
Transverse dispersivity	**az**	0.00E+00	1.00E-01	8.30E-02	m
Vertical dispersivity	**ay**	0.00E+00	1.00E-02	8.30E-03	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}X)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed: Herbert Road
Completed by: [redacted]
Date: 28.10.2016
Version: 1

Calculated (relative) concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	6.50E-04
0.5	7.80E-01	5.07E-04
1.0	6.09E-01	3.96E-04
1.5	4.73E-01	3.08E-04
2.0	3.66E-01	2.38E-04
2.5	2.82E-01	1.83E-04
3.0	2.17E-01	1.41E-04
3.5	1.66E-01	1.08E-04
4.0	1.27E-01	8.25E-05
4.5	9.71E-02	6.31E-05
5.0	7.43E-02	4.83E-05
5.5	5.68E-02	3.69E-05
6.0	4.34E-02	2.82E-05
6.5	3.32E-02	2.16E-05
7.0	2.54E-02	1.65E-05
7.5	1.95E-02	1.27E-05
8.0	1.49E-02	9.70E-06
8.5	1.14E-02	7.44E-06
9.0	8.78E-03	5.71E-06
9.5	6.74E-03	4.38E-06
10.0	5.17E-03	3.36E-06

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions)

Details to be completed for each assessment				
Site Name:	Herbert Road			
Site Address:				
Completed by:	[redacted]			
Date:	28.10.2016		Version:	1
Contaminant	Benzo(b)fluoranthene			
Target Concentration (C_T)	0.000017	mg/l	Origin of C_T:	Water Framework Directive

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
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The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Benzo(b)fluoranthene**		
Target concentration	C_T	**0.000017**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_W	4.70E-01	fraction	SR3
Air filled soil porosity	θa	1.20E-01	fraction	SR3
Bulk density of soil zone material	ρ	2.09E+00	g/cm^3	SR3
Henry's Law constant	H	1.75E-04	dimensionless	*EA 2003*
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	1.07E-01	fraction	Laboratory Soil Chemical Testing
Organic carbon partition coefficient	Koc	5.50E+05	l/kg	*EA 2003*
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**5.88E+04**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.
The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**1.00E+00**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.000017	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Herbert Road
Completed by:	
Date:	28.10.2016
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Benzo(b)fluoranthene**		from Level 1
Target concentration	C_T	**0.000017**	**mg/l**	from Level 1

This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	1.79E-03	m/d	**met office - cardiff monitoring station**	
Area of contaminant source	A	1.80E+04	m^2		Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.50E+02	m		
Saturated aquifer thickness	da	5.00E-01	m	**0.5m assumed of 3.8m made ground thickness**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	8.64E-02	m/d	**Primarily well compacted clay soil**	
Hydraulic gradient of water table	i	6.25E-04	fraction	**10cm over 100m (assumed)**	
Width of contaminant source perpendicular to groundwater flow	w	1.20E+02	m		Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**Unknown**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Specify**			
Enter mixing zone thickness	Mz	5.00E-01	m		
Calculated mixing zone thickness	Mz		m		

Calculated Parameters

Dilution Factor	**DF**	**1.00E+00**		
Level 2 Remedial Target		**1.70E-05**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		1.00E+00	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	7.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		7.00E+00	mg/l	0

Site being assessed:	Herbert Road
Completed by:	[redacted]
Date:	28.10.2016
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Input Parameters

	Variable	Value	Unit	Source
Contaminant		Benzo(b)fluoranthene		from Level 1
Target Concentration	C_T	0.000017	mg/l	from Level 1
Dilution Factor	DF	1.00E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to pollutants in all phases (e.g. field derived value

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil leachate concentration as mg/l		
Enter soil leachate concentration		0.01	mg/l	
Half life for degradation of contaminant in water	$t_{1/2}$	3.65E+03	days	*Surampalli et al*
Calculated decay rate	λ	1.90E-04	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	1.20E+02	m	from Level 2
Plume thickness in aquifer at source	Sy	5.00E-01	m	from Level 2
Bulk density of aquifer materials	ρ	2.09E+00	g/cm^3	*Geotech Testing*
Effective porosity of aquifer	n	5.90E-01	fraction	
Hydraulic gradient	i	6.22E+00	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	8.64E-02	m/d	from Level 2
Distance to compliance point	x	1.00E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	5.88E+04	l/kg	*see options*
Longitudinal dispersivity	ax	1.000	m	*see options*
Transverse dispersivity	az	0.100	m	*see options*
Vertical dispersivity	ay	0.010	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters

	Variable		
Groundwater flow velocity	v	9.10E-01	m/d
Retardation factor	Rf	2.08E+05	fraction
Decay rate used	λ	1.90E-04	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	6.22E+00	fraction
Rate of contaminant flow due to retardation	u	4.37E-06	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	2.12E-27	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**4.71E+26**	**fraction**
Soil leachate concentration	Co	1.00E-02	

Remedial Targets

Level 3 Remedial Target		**8.00E+21**	**mg/l**	For comparison with measured pore water concentration.
Ogata Banks		**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
		4.71E+26	**mg/kg**	For comparison with measured soil concentration. This
Distance to compliance point		**10**	**m**	assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	**2.12E-27**	**fraction**	Ogata Banks

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — [redacted] l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	1.07E-01	fraction
Organic carbon partition coefficient	Koc	5.50E+05	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$	[redacted]	l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction

Soil water partition coefficient — Kd — 5.88E+04 — l/kg

Define dispersivity (click brown cell and use pull down list)

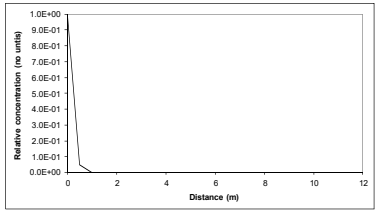
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	1.00E+00	8.30E-01	m
Transverse dispersivity	**az**	0.00E+00	1.00E-01	8.30E-02	m
Vertical dispersivity	**ay**	0.00E+00	1.00E-02	8.30E-03	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}X)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Herbert Road
Completed by:	[redacted]
Date:	28.10.2016
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Relative concentration	Concentration
	(No units)	mg/l
0	1.0E+00	1.00E-02
0.5	4.71E-02	4.71E-04
1.0	2.22E-03	2.22E-05
1.5	1.04E-04	1.04E-06
2.0	4.86E-06	4.86E-08
2.5	2.26E-07	2.26E-09
3.0	1.05E-08	1.05E-10
3.5	4.84E-10	4.84E-12
4.0	2.23E-11	2.23E-13
4.5	1.03E-12	1.03E-14
5.0	4.76E-14	4.76E-16
5.5	2.20E-15	2.20E-17
6.0	1.01E-16	1.01E-18
6.5	4.68E-18	4.68E-20
7.0	2.16E-19	2.16E-21
7.5	1.00E-20	1.00E-22
8.0	4.62E-22	4.62E-24
8.5	2.14E-23	2.14E-25
9.0	9.90E-25	9.90E-27
9.5	4.59E-26	4.59E-28
10.0	2.12E-27	2.12E-29

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions)

Details to be completed for each assessment				
Site Name:	Herbert Road			
Site Address:				
Completed by:	[redacted]			
Date:	28.10.2016		Version:	1
Contaminant	Benzo(k)fluoranthene			
Target Concentration (C_T)	0.000017	mg/l	Origin of C_T:	Water Framework Directive

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Benzo(k)fluoranthene**	
Target concentration	C_T	**0.000017**	**mg/l**

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_W	4.70E-01	fraction	SR3
Air filled soil porosity	θa	1.20E-01	fraction	SR3
Bulk density of soil zone material	ρ	2.09E+00	g/cm^3	SR3
Henry's Law constant	H	3.40E-05	dimensionless	*EA 2003*
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	1.07E-01	fraction	Soil Chemical Testing
Organic carbon partition coefficient	Koc	1.23E+06	l/kg	*EA 2003*
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**1.32E+05**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.
The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**2.24E+00**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.000017	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Herbert Road
Completed by:	[redacted]
Date:	28.10.2016
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Benzo(k)fluoranthene**		from Level 1
Target concentration	**C_T**	**0.000017**	**mg/l**	from Level 1

This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	1.79E-03	m/d	**met office - cardiff monitoring station**	
Area of contaminant source	A	1.80E+04	m^2		Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.50E+02	m		
Saturated aquifer thickness	da	5.00E-01	m	**0.5m assumed of 3.8m made ground thickness**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	8.64E-02	m/d	**Primarily well compacted clay soil**	
Hydraulic gradient of water table	i	6.25E-04	fraction	**10cm over 100m (assumed)**	
Width of contaminant source perpendicular to groundwater flow	w	1.20E+02	m		Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**Unknown**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Specify**			
Enter mixing zone thickness	Mz	5.00E-01	m		
Calculated mixing zone thickness	Mz		m		

Calculated Parameters

Dilution Factor	**DF**	**1.00E+00**		
Level 2 Remedial Target		**1.70E-05**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		2.24E+00	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	7.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		7.00E+00	mg/l	0

Site being assessed:	Herbert Road
Completed by:	[redacted]
Date:	28.10.2016
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Input Parameters

	Variable	Value	Unit	Source
Contaminant		Benzo(k)fluoranthene		from Level 1
Target Concentration	C_T	0.000017	mg/l	from Level 1
Dilution Factor	DF	1.00E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to pollutants in all phases (e.g. field derived value

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil leachate concentration as mg/l		
Enter soil leachate concentration		0.0045	mg/l	
Half life for degradation of contaminant in water	$t_{1/2}$	3.65E+03	days	*Surampalli et al*
Calculated decay rate	λ	1.90E-04	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	1.20E+02	m	from Level 2
Plume thickness in aquifer at source	Sy	5.00E-01	m	from Level 2
Bulk density of aquifer materials	ρ	2.09E+00	g/cm^3	*Geotech Testing*
Effective porosity of aquifer	n	5.90E-01	fraction	
Hydraulic gradient	i	6.22E+00	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	8.64E-02	m/d	from Level 2
Distance to compliance point	x	1.00E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	1.32E+05	l/kg	*see options*
Longitudinal dispersivity	ax	1.000	m	*see options*
Transverse dispersivity	az	0.100	m	*see options*
Vertical dispersivity	ay	0.010	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters

	Variable		
Groundwater flow velocity	v	9.10E-01	m/d
Retardation factor	Rf	4.66E+05	fraction
Decay rate used	λ	1.90E-04	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	6.22E+00	fraction
Rate of contaminant flow due to retardation	u	1.95E-06	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	1.41E-41	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**7.12E+40**	**fraction**
Soil leachate concentration	Co	4.50E-03	

Remedial Targets

Level 3 Remedial Target		**1.21E+36**	**mg/l**	For comparison with measured pore water concentration.
Ogata Banks		**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
		1.59E+41	**mg/kg**	For comparison with measured soil concentration. This
Distance to compliance point		**10**	**m**	assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Ratio of Compliance Point to Source Concentration	**C_{ED}/C_0**	**1.41E-41**	**fraction**	Ogata Banks

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — [redacted] l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	1.07E-01	fraction
Organic carbon partition coefficient	Koc	1.23E+06	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$	[redacted]	l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction

Soil water partition coefficient — Kd — 1.32E+05 — l/kg

Define dispersivity (click brown cell and use pull down list)

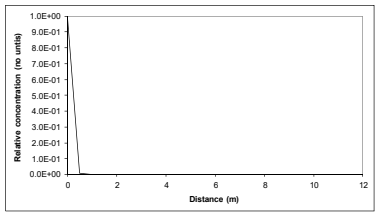
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	1.00E+00	8.30E-01	m
Transverse dispersivity	**az**	0.00E+00	1.00E-01	8.30E-02	m
Vertical dispersivity	**ay**	0.00E+00	1.00E-02	8.30E-03	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}X)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Herbert Road
Completed by:	[redacted]
Date:	28.10.2016
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	4.50E-03
0.5	9.21E-03	4.14E-05
1.0	8.47E-05	3.81E-07
1.5	7.77E-07	3.50E-09
2.0	7.09E-09	3.19E-11
2.5	6.44E-11	2.90E-13
3.0	5.83E-13	2.62E-15
3.5	5.27E-15	2.37E-17
4.0	4.76E-17	2.14E-19
4.5	4.29E-19	1.93E-21
5.0	3.87E-21	1.74E-23
5.5	3.49E-23	1.57E-25
6.0	3.15E-25	1.42E-27
6.5	2.84E-27	1.28E-29
7.0	2.57E-29	1.16E-31
7.5	2.32E-31	1.04E-33
8.0	2.10E-33	9.43E-36
8.5	1.90E-35	8.53E-38
9.0	1.71E-37	7.72E-40
9.5	1.55E-39	6.98E-42
10.0	1.41E-41	6.32E-44

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions)

Details to be completed for each assessment				
Site Name:	Herbert Road			
Site Address:				
Completed by:	[redacted]			
Date:	31.10.2016		Version:	1
Contaminant	Cadmium			
Target Concentration (C_T)	0.0002	mg/l	Origin of C_T:	Water Framework Directive

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
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Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

User specified value for partition coefficient

Contaminant		**Cadmium**		
Target concentration	C_T	**0.0002**	**mg/l**	
Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_W	4.70E-01	fraction	SR3
Air filled soil porosity	θa	1.20E-01	fraction	SR3
Bulk density of soil zone material	ρ	2.09E+00	g/cm^3	SR3
Henry's Law constant	H	0.00E+00	dimensionless	
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd	3.20E+01	l/kg	*USEPA - Risk Screening Envionmental Indicators Model*
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc		fraction	
Organic carbon partition coefficient	Koc		l/kg	
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**3.20E+01**	**l/kg**	*Specified value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.
The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**6.44E-03**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.0002	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Herbert Road
Completed by:	[redacted]
Date:	31.10.2016
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Cadmium**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	**C_T**	**0.0002** **mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	1.79E-03	m/d	**met office - cardiff monitoring station**	
Area of contaminant source	A	1.80E+04	m^2		Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.50E+02	m		
Saturated aquifer thickness	da	5.00E-01	m	**0.5m assumed of 3.8m made ground thickness**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	8.64E-02	m/d	**Primarily well compacted clay soil**	
Hydraulic gradient of water table	i	6.25E-04	fraction	**10cm over 100m (assumed)**	
Width of contaminant source perpendicular to groundwater flow	w	1.20E+02	m		Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**Unknown**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Specify**			
Enter mixing zone thickness	Mz	5.00E-01	m		
Calculated mixing zone thickness	Mz		m		

Calculated Parameters

Dilution Factor	**DF**	**1.00E+00**		
Level 2 Remedial Target		**2.00E-04**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		6.45E-03	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	7.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		7.00E+00	mg/l	0

Site being assessed:	Herbert Road
Completed by:	[redacted]
Date:	31.10.2016
Version:	1

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions)

Details to be completed for each assessment

Site Name:	**Herbert Road**			
Site Address:				
Completed by:	[redacted]			
Date:	**31.10.2016**		**Version:**	**1**
Contaminant	**Copper**			
Target Concentration (C_T)	**0.00367**	**mg/l**	**Origin of C_T:**	**Water Framework Directive**

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

User specified value for partition coefficient

Contaminant		**Copper**		
Target concentration	C_T	**0.00367**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_W	4.70E-01	fraction	SR3
Air filled soil porosity	θa	1.20E-01	fraction	SR3
Bulk density of soil zone material	ρ	2.09E+00	g/cm^3	SR3
Henry's Law constant	H	0.00E+00	dimensionless	
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd	1.50E+02	l/kg	*USEPA - Risk Screening Envionmental Indicators Model*
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc		fraction	
Organic carbon partition coefficient	Koc		l/kg	
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.
The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Soil water partition coefficient used in Level Assessment	**Kd**	**1.50E+02**	**l/kg**	*Specified value*

Level 1 Remedial Target

Level 1 Remedial Target	**5.51E-01**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.00367	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Herbert Road
Completed by:	[redacted]
Date:	31.10.2016
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Copper**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	**C_T**	**0.00367** **mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	1.79E-03	m/d	**met office - cardiff monitoring station**	
Area of contaminant source	A	1.80E+04	m^2		Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.50E+02	m		
Saturated aquifer thickness	da	5.00E-01	m	**0.5m assumed of 3.8m made ground thickness**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	8.64E-02	m/d	**Primarily well compacted clay soil**	
Hydraulic gradient of water table	i	6.25E-04	fraction	**10cm over 100m (assumed)**	
Width of contaminant source perpendicular to groundwater flow	w	1.20E+02	m		Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**Unknown**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Specify**			
Enter mixing zone thickness	Mz	5.00E-01	m		
Calculated mixing zone thickness	Mz		m		

Calculated Parameters

Dilution Factor	**DF**	**1.00E+00**		
Level 2 Remedial Target		**3.67E-03**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		5.51E-01	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	7.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		7.00E+00	mg/l	0

Site being assessed:	Herbert Road
Completed by:	[redacted]
Date:	31.10.2016
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Input Parameters	Variable	Value	Unit	Source
Contaminant		Copper		from Level 1
Target Concentration	C_T	0.00367	mg/l	from Level 1
Dilution Factor	DF	1.00E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to pollutants in all phases (e.g. field derived value

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil leachate concentration as mg/l		
Enter soil leachate concentration		0.0068	mg/l	
Half life for degradation of contaminant in water	$t_{1/2}$	9.00E+99	days	*Surampalli et al*
Calculated decay rate	λ	7.70E-101	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	1.20E+02	m	from Level 2
Plume thickness in aquifer at source	Sy	5.00E-01	m	from Level 2
Bulk density of aquifer materials	ρ	2.09E+00	g/cm^3	*Geotech Testing*
Effective porosity of aquifer	n	5.90E-01	fraction	
Hydraulic gradient	i	6.22E+00	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	8.64E-02	m/d	from Level 2
Distance to compliance point	x	1.00E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	1.50E+02	l/kg	*see options*
Longitudinal dispersivity	ax	1.000	m	*see options*
Transverse dispersivity	az	0.100	m	*see options*
Vertical dispersivity	ay	0.010	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters	Variable		
Groundwater flow velocity	v	9.10E-01	m/d
Retardation factor	Rf	5.32E+02	fraction
Decay rate used	λ	7.70E-101	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	6.22E+00	fraction
Rate of contaminant flow due to retardation	u	1.71E-03	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	7.36E-01	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**1.36E+00**	**fraction**
Soil leachate concentration	Co	6.80E-03	

Remedial Targets

Level 3 Remedial Target		**4.98E-03**	**mg/l**	For comparison with measured pore water concentration.
Ogata Banks		**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
		7.49E-01	**mg/kg**	For comparison with measured soil concentration. This
Distance to compliance point		**10**	**m**	assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	**7.36E-01**	**fraction**	Ogata Banks

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

User specified value for partition coefficient

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — 1.50E+02 l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer — foc — fraction

Organic carbon partition coefficient — Koc — 1.40E+01 l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species — $K_{oc,n}$ — l/kg

Sorption coefficient for ionised species — $K_{oc,i}$ — l/kg

pH value — pH

Acid dissociation constant — pKa

Fraction of organic carbon in aquifer — foc — fraction

Soil water partition coefficient — Kd — 1.50E+02 — l/kg

Define dispersivity (click brown cell and use pull down list)

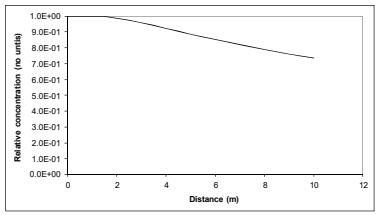
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	1.00E+00	8.30E-01	m
Transverse dispersivity	**az**	0.00E+00	1.00E-01	8.30E-02	m
Vertical dispersivity	**ay**	0.00E+00	1.00E-02	8.30E-03	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Herbert Road
Completed by:	
Date:	31.10.2016
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	6.80E-03
0.5	1.00E+00	6.80E-03
1.0	1.00E+00	6.80E-03
1.5	9.96E-01	6.77E-03
2.0	9.88E-01	6.71E-03
2.5	9.75E-01	6.63E-03
3.0	9.59E-01	6.52E-03
3.5	9.41E-01	6.40E-03
4.0	9.23E-01	6.28E-03
4.5	9.04E-01	6.15E-03
5.0	8.86E-01	6.03E-03
5.5	8.68E-01	5.90E-03
6.0	8.51E-01	5.79E-03
6.5	8.34E-01	5.67E-03
7.0	8.19E-01	5.57E-03
7.5	8.03E-01	5.46E-03
8.0	7.89E-01	5.36E-03
8.5	7.75E-01	5.27E-03
9.0	7.61E-01	5.18E-03
9.5	7.49E-01	5.09E-03
10.0	7.36E-01	5.01E-03

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions)

Details to be completed for each assessment

Site Name:	**Herbert Road**			
Site Address:				
Completed by:	[redacted]			
Date:	**28.10.2016**		**Version:**	**1**
Contaminant	**Fluoranthene**			
Target Concentration (C_T)	**0.0000063**	**mg/l**	**Origin of C_T:**	**Water Framework Directive**

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Fluoranthene**	
Target concentration	C_T	**0.0000063**	**mg/l**

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_W	4.70E-01	fraction	SR3
Air filled soil porosity	θa	1.20E-01	fraction	SR3
Bulk density of soil zone material	ρ	2.09E+00	g/cm^3	SR3
Henry's Law constant	H	4.20E-04	dimensionless	*EA 2003*
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	1.70E-02	fraction	Laboratory Soil Chemical Testing
Organic carbon partition coefficient	Koc	1.07E+05	l/kg	*EA 2003*
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**1.82E+03**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.
The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**1.15E-02**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.0000063	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Herbert Road
Completed by:	
Date:	28.10.2016
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Fluoranthene**		from Level 1
Target concentration	C_T	**0.0000063**	**mg/l**	from Level 1

This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	1.79E-03	m/d	**met office - cardiff monitoring station**	
Area of contaminant source	A	1.80E+04	m^2		Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.50E+02	m		
Saturated aquifer thickness	da	5.00E-01	m	**0.5m assumed of 3.8m made ground thickness**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	8.64E-02	m/d	**Primarily well compacted clay soil**	
Hydraulic gradient of water table	i	6.25E-04	fraction	**10cm over 100m (assumed)**	
Width of contaminant source perpendicular to groundwater flow	w	1.20E+02	m		Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**Unknown**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Specify**			
Enter mixing zone thickness	Mz	5.00E-01	m		
Calculated mixing zone thickness	Mz		m		

Calculated Parameters

Dilution Factor	**DF**	**1.00E+00**		
Level 2 Remedial Target		**6.30E-06**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		1.15E-02	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	7.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		7.00E+00	mg/l	0

Site being assessed:	Herbert Road
Completed by:	[redacted]
Date:	28.10.2016
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Input Parameters	Variable	Value	Unit	Source
Contaminant		Fluoranthene		from Level 1
Target Concentration	C_T	0.0000063	mg/l	from Level 1
Dilution Factor	DF	1.00E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to pollutants in all phases (e.g. field derived value

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil leachate concentration as mg/l		
Enter soil leachate concentration		0.0034	mg/l	
Half life for degradation of contaminant in water	$t_{1/2}$	3.65E+03	days	*Surampalli et al*
Calculated decay rate	λ	1.90E-04	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	1.20E+02	m	from Level 2
Plume thickness in aquifer at source	Sy	5.00E-01	m	from Level 2
Bulk density of aquifer materials	ρ	2.09E+00	g/cm^3	*Geotech Testing*
Effective porosity of aquifer	n	5.90E-01	fraction	
Hydraulic gradient	i	6.22E+00	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	8.64E-02	m/d	from Level 2
Distance to compliance point	x	1.00E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	1.82E+03	l/kg	*see options*
Longitudinal dispersivity	ax	1.000	m	*see options*
Transverse dispersivity	az	0.100	m	*see options*
Vertical dispersivity	ay	0.010	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters	Variable		
Groundwater flow velocity	v	9.10E-01	m/d
Retardation factor	Rf	6.44E+03	fraction
Decay rate used	λ	1.90E-04	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	6.22E+00	fraction
Rate of contaminant flow due to retardation	u	1.41E-04	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	3.59E-04	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**2.79E+03**	**fraction**
Soil leachate concentration	Co	3.40E-03	

Remedial Targets

Level 3 Remedial Target		**1.76E-02**	**mg/l**	For comparison with measured pore water concentration.
Ogata Banks		**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
		3.20E+01	**mg/kg**	For comparison with measured soil concentration. This
Distance to compliance point		**10**	**m**	assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	**3.59E-04**	**fraction**	Ogata Banks

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — [redacted] l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer — foc — 1.70E-02 — fraction
Organic carbon partition coefficient — Koc — 1.07E+05 — l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species — $K_{oc,n}$ — [redacted] l/kg
Sorption coefficient for ionised species — $K_{oc,i}$ — [redacted] l/kg
pH value — pH — [redacted]
Acid dissociation constant — pKa — [redacted]
Fraction of organic carbon in aquifer — foc — [redacted] fraction

Soil water partition coefficient — Kd — 1.82E+03 — l/kg

Define dispersivity (click brown cell and use pull down list)

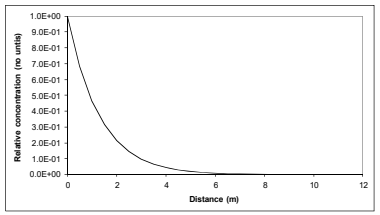
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	1.00E+00	8.30E-01	m
Transverse dispersivity	**az**	0.00E+00	1.00E-01	8.30E-02	m
Vertical dispersivity	**ay**	0.00E+00	1.00E-02	8.30E-03	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}X)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Herbert Road
Completed by:	[redacted]
Date:	28.10.2016
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	3.40E-03
0.5	6.83E-01	2.32E-03
1.0	4.66E-01	1.58E-03
1.5	3.17E-01	1.08E-03
2.0	2.15E-01	7.30E-04
2.5	1.45E-01	4.92E-04
3.0	9.73E-02	3.31E-04
3.5	6.52E-02	2.22E-04
4.0	4.37E-02	1.48E-04
4.5	2.92E-02	9.94E-05
5.0	1.96E-02	6.65E-05
5.5	1.31E-02	4.45E-05
6.0	8.76E-03	2.98E-05
6.5	5.87E-03	1.99E-05
7.0	3.93E-03	1.34E-05
7.5	2.63E-03	8.95E-06
8.0	1.77E-03	6.00E-06
8.5	1.18E-03	4.03E-06
9.0	7.95E-04	2.70E-06
9.5	5.34E-04	1.81E-06
10.0	3.59E-04	1.22E-06

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions)

Details to be completed for each assessment				
Site Name:	Herbert Road			
Site Address:				
Completed by:	[redacted]			
Date:	31.10.2016		Version:	1
Contaminant	Lead			
Target Concentration (C_T)	0.0012	mg/l	Origin of C_T:	Water Framework Directive

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

User specified value for partition coefficient

Contaminant		**Lead**		
Target concentration	C_T	**0.0012**	**mg/l**	
Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_W	4.70E-01	fraction	SR3
Air filled soil porosity	θa	1.20E-01	fraction	SR3
Bulk density of soil zone material	ρ	2.09E+00	g/cm^3	SR3
Henry's Law constant	H	0.00E+00	dimensionless	
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd	5.80E+02	l/kg	*USEPA - Risk Screening Envionmental Indicators Model*
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc		fraction	
Organic carbon partition coefficient	Koc		l/kg	
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**5.80E+02**	**l/kg**	*Specified value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.
The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**6.96E-01**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.0012	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Herbert Road
Completed by:	[redacted]
Date:	31.10.2016
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Lead**		from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	**C_T**	**0.0012**	**mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	1.79E-03	m/d	**met office - cardiff monitoring station**	
Area of contaminant source	A	1.80E+04	m^2		Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.50E+02	m		
Saturated aquifer thickness	da	5.00E-01	m	**0.5m assumed of 3.8m made ground thickness**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	8.64E-02	m/d	**Primarily well compacted clay soil**	
Hydraulic gradient of water table	i	6.25E-04	fraction	**10cm over 100m (assumed)**	
Width of contaminant source perpendicular to groundwater flow	w	1.20E+02	m		Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**Unknown**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Specify**			
Enter mixing zone thickness	Mz	5.00E-01	m		
Calculated mixing zone thickness	Mz		m		

Calculated Parameters

Dilution Factor	**DF**	**1.00E+00**		
Level 2 Remedial Target		**1.20E-03**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		6.96E-01	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	7.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		7.00E+00	mg/l	0

Site being assessed:	Herbert Road
Completed by:	[redacted]
Date:	31.10.2016
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Input Parameters

	Variable	Value	Unit	Source
Contaminant		Lead		from Level 1
Target Concentration	C_T	0.0012	mg/l	from Level 1
Dilution Factor	DF	1.00E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to pollutants in all phases (e.g. field derived value

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil leachate concentration as mg/l		
Enter soil leachate concentration		0.0088	mg/l	
Half life for degradation of contaminant in water	$t_{1/2}$	9.00E+99	days	*Surampalli et al*
Calculated decay rate	λ	7.70E-101	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	1.20E+02	m	from Level 2
Plume thickness in aquifer at source	Sy	5.00E-01	m	from Level 2
Bulk density of aquifer materials	ρ	2.09E+00	g/cm^3	*Geotech Testing*
Effective porosity of aquifer	n	5.90E-01	fraction	
Hydraulic gradient	i	6.22E+00	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	8.64E-02	m/d	from Level 2
Distance to compliance point	x	1.00E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	5.80E+02	l/kg	*see options*
Longitudinal dispersivity	ax	1.000	m	*see options*
Transverse dispersivity	az	0.100	m	*see options*
Vertical dispersivity	ay	0.010	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters

	Variable		
Groundwater flow velocity	v	9.10E-01	m/d
Retardation factor	Rf	2.06E+03	fraction
Decay rate used	λ	7.70E-101	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	6.22E+00	fraction
Rate of contaminant flow due to retardation	u	4.43E-04	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	7.36E-01	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**1.36E+00**	**fraction**
Soil leachate concentration	Co	8.80E-03	

Remedial Targets

Level 3 Remedial Target		**1.63E-03**	**mg/l**	For comparison with measured pore water concentration.
Ogata Banks		**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
		9.46E-01	**mg/kg**	For comparison with measured soil concentration. This
Distance to compliance point		**10**	**m**	assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	**7.36E-01**	**fraction**	Ogata Banks

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

User specified value for partition coefficient

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — 5.80E+02 l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer — foc — fraction
Organic carbon partition coefficient — Koc — 1.40E+01 l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species — $K_{oc,n}$ — l/kg
Sorption coefficient for ionised species — $K_{oc,i}$ — l/kg
pH value — pH
Acid dissociation constant — pKa
Fraction of organic carbon in aquifer — foc — fraction

Soil water partition coefficient	Kd	5.80E+02	l/kg

Define dispersivity (click brown cell and use pull down list)

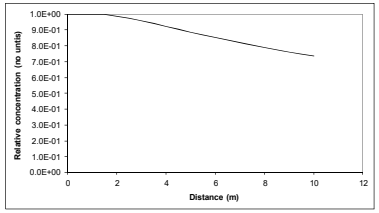
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	1.00E+00	8.30E-01	m
Transverse dispersivity	**az**	0.00E+00	1.00E-01	8.30E-02	m
Vertical dispersivity	**ay**	0.00E+00	1.00E-02	8.30E-03	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}X)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Herbert Road
Completed by:	
Date:	31.10.2016
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	8.80E-03
0.5	1.00E+00	8.80E-03
1.0	1.00E+00	8.80E-03
1.5	9.96E-01	8.76E-03
2.0	9.88E-01	8.69E-03
2.5	9.75E-01	8.58E-03
3.0	9.59E-01	8.44E-03
3.5	9.41E-01	8.28E-03
4.0	9.23E-01	8.12E-03
4.5	9.04E-01	7.96E-03
5.0	8.86E-01	7.80E-03
5.5	8.68E-01	7.64E-03
6.0	8.51E-01	7.49E-03
6.5	8.34E-01	7.34E-03
7.0	8.19E-01	7.20E-03
7.5	8.03E-01	7.07E-03
8.0	7.89E-01	6.94E-03
8.5	7.75E-01	6.82E-03
9.0	7.61E-01	6.70E-03
9.5	7.49E-01	6.59E-03
10.0	7.36E-01	6.48E-03

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions)

Details to be completed for each assessment				
Site Name:	Herbert Road			
Site Address:				
Completed by:	[redacted]			
Date:	31.10.2016		Version:	1
Contaminant	Zinc			
Target Concentration (C_T)	0.009	mg/l	Origin of C_T:	Water Framework Directive

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

User specified value for partition coefficient

Contaminant		**Zinc**		
Target concentration	C_T	**0.009**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_W	4.70E-01	fraction	SR3
Air filled soil porosity	θa	1.20E-01	fraction	SR3
Bulk density of soil zone material	ρ	2.09E+00	g/cm^3	SR3
Henry's Law constant	H	0.00E+00	dimensionless	
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd	3.10E+01	l/kg	*USEPA - Risk Screening Envionmental Indicators Model*
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc		fraction	
Organic carbon partition coefficient	Koc		l/kg	
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Soil water partition coefficient used in Level Assessment	**Kd**	**3.10E+01**	**l/kg**	*Specified value*

Level 1 Remedial Target

Level 1 Remedial Target	**2.81E-01**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.009	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Herbert Road
Completed by:	[redacted]
Date:	31.10.2016
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Zinc**		from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	**C_T**	**0.009**	**mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	1.79E-03	m/d	**met office - cardiff monitoring station**	
Area of contaminant source	A	1.80E+04	m^2		Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.50E+02	m		
Saturated aquifer thickness	da	5.00E-01	m	**0.5m assumed of 3.8m made ground thickness**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	8.64E-02	m/d	**Primarily well compacted clay soil**	
Hydraulic gradient of water table	i	6.25E-04	fraction	**10cm over 100m (assumed)**	
Width of contaminant source perpendicular to groundwater flow	w	1.20E+02	m		Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**Unknown**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Specify**			
Enter mixing zone thickness	Mz	5.00E-01	m		
Calculated mixing zone thickness	Mz		m		

Calculated Parameters

Dilution Factor	**DF**	**1.00E+00**		
Level 2 Remedial Target		**9.00E-03**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		2.81E-01	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	7.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		7.00E+00	mg/l	0

Site being assessed:	Herbert Road
Completed by:	[redacted]
Date:	31.10.2016
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Input Parameters

	Variable	Value	Unit	Source
Contaminant		Zinc		from Level 1
Target Concentration	C_T	0.009	mg/l	from Level 1
Dilution Factor	DF	1.00E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to pollutants in all phases (e.g. field derived value

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil leachate concentration as mg/l		
Enter soil leachate concentration		0.216	mg/l	
Half life for degradation of contaminant in water	$t_{1/2}$	9.00E+99	days	*Surampalli et al*
Calculated decay rate	λ	7.70E-101	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	1.20E+02	m	from Level 2
Plume thickness in aquifer at source	Sy	5.00E-01	m	from Level 2
Bulk density of aquifer materials	ρ	2.09E+00	g/cm^3	*Geotech Testing*
Effective porosity of aquifer	n	5.90E-01	fraction	
Hydraulic gradient	i	6.22E+00	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	8.64E-02	m/d	from Level 2
Distance to compliance point	x	1.00E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	3.10E+01	l/kg	*see options*
Longitudinal dispersivity	ax	1.000	m	*see options*
Transverse dispersivity	az	0.100	m	*see options*
Vertical dispersivity	ay	0.010	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters

	Variable		
Groundwater flow velocity	v	9.10E-01	m/d
Retardation factor	Rf	1.11E+02	fraction
Decay rate used	λ	7.70E-101	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	6.22E+00	fraction
Rate of contaminant flow due to retardation	u	8.21E-03	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	7.36E-01	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**1.36E+00**	**fraction**
Soil leachate concentration	Co	2.16E-01	

Remedial Targets

Level 3 Remedial Target		**1.22E-02**	**mg/l**	For comparison with measured pore water concentration.
Ogata Banks		**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
		3.82E-01	**mg/kg**	For comparison with measured soil concentration. This
Distance to compliance point		**10**	**m**	assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	**7.36E-01**	**fraction**	Ogata Banks

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

User specified value for partition coefficient

Entry if specify partition coefficient (option)

Soil water partition coefficient	Kd	3.10E+01	l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc		fraction
Organic carbon partition coefficient	Koc	1.40E+01	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction

Soil water partition coefficient	Kd	3.10E+01	l/kg

Define dispersivity (click brown cell and use pull down list)

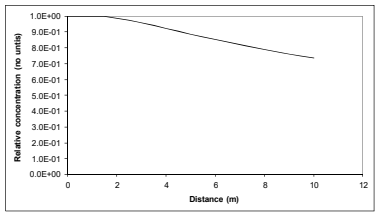
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	1.00E+00	8.30E-01	m
Transverse dispersivity	**az**	0.00E+00	1.00E-01	8.30E-02	m
Vertical dispersivity	**ay**	0.00E+00	1.00E-02	8.30E-03	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}X)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Herbert Road
Completed by:	
Date:	31.10.2016
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	2.16E-01
0.5	1.00E+00	2.16E-01
1.0	1.00E+00	2.16E-01
1.5	9.96E-01	2.15E-01
2.0	9.88E-01	2.13E-01
2.5	9.75E-01	2.11E-01
3.0	9.59E-01	2.07E-01
3.5	9.41E-01	2.03E-01
4.0	9.23E-01	1.99E-01
4.5	9.04E-01	1.95E-01
5.0	8.86E-01	1.91E-01
5.5	8.68E-01	1.88E-01
6.0	8.51E-01	1.84E-01
6.5	8.34E-01	1.80E-01
7.0	8.19E-01	1.77E-01
7.5	8.03E-01	1.73E-01
8.0	7.89E-01	1.70E-01
8.5	7.75E-01	1.67E-01
9.0	7.61E-01	1.64E-01
9.5	7.49E-01	1.62E-01
10.0	7.36E-01	1.59E-01

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions)

Details to be completed for each assessment				
Site Name:	Herbert Road			
Site Address:				
Completed by:	[redacted]			
Date:	28.10.2016		Version:	1
Contaminant	Benzo(a)pyrene			
Target Concentration (C_T)	0.00000017	mg/l	Origin of C_T:	Water Framework Directive

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Benzo(a)pyrene**	
Target concentration	C_T	**0.00000017**	**mg/l**

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_W	4.70E-01	fraction	SR3
Air filled soil porosity	θa	1.20E-01	fraction	SR3
Bulk density of soil zone material	ρ	2.09E+00	g/cm^3	SR3
Henry's Law constant	H	1.86E-05	dimensionless	*EA 2003*
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	3.60E-02	fraction	Laboratory Soil Chemical Testing
Organic carbon partition coefficient	Koc	1.02E+06	l/kg	*EA 2003*
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**3.68E+04**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.
The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**6.26E-03**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.00000017	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Herbert Road
Completed by:	
Date:	28.10.2016
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Benzo(a)pyrene**		from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	**C_T**	**0.00000017**	**mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	1.79E-03	m/d	**met office - cardiff monitoring station**	
Area of contaminant source	A	1.80E+04	m^2		Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.50E+02	m		
Saturated aquifer thickness	da	5.00E-01	m	**0.5m assumed of 3.8m made ground thickness**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	8.64E-02	m/d	**Primarily well compacted clay soil**	
Hydraulic gradient of water table	i	6.25E-04	fraction	**10cm over 100m (assumed)**	
Width of contaminant source perpendicular to groundwater flow	w	1.20E+02	m		Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**Unknown**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Specify**			
Enter mixing zone thickness	Mz	5.00E-01	m		
Calculated mixing zone thickness	Mz	[redacted]	m		

Calculated Parameters

Dilution Factor	**DF**	**1.00E+00**		
Level 2 Remedial Target		**1.70E-07**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		6.26E-03	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	7.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		7.00E+00	mg/l	0

Site being assessed:	Herbert Road
Completed by:	[redacted]
Date:	28.10.2016
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Input Parameters	Variable	Value	Unit	Source
Contaminant		Benzo(a)pyrene		from Level 1
Target Concentration	C_T	0.00000017	mg/l	from Level 1
Dilution Factor	DF	1.00E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to pollutants in all phases (e.g. field derived value

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil leachate concentration as mg/l		
Enter soil leachate concentration		0.007	mg/l	
Half life for degradation of contaminant in water	$t_{1/2}$	3.65E+03	days	*Surampalli et al*
Calculated decay rate	λ	1.90E-04	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	1.20E+02	m	from Level 2
Plume thickness in aquifer at source	Sy	5.00E-01	m	from Level 2
Bulk density of aquifer materials	ρ	2.09E+00	g/cm^3	*Geotech Testing*
Effective porosity of aquifer	n	5.90E-01	fraction	*SR3*
Hydraulic gradient	i	6.22E+00	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	8.64E-02	m/d	from Level 2
Distance to compliance point	x	1.00E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	3.68E+04	l/kg	*see options*
Longitudinal dispersivity	ax	1.000	m	*see options*
Transverse dispersivity	az	0.100	m	*see options*
Vertical dispersivity	ay	0.010	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters	Variable		
Groundwater flow velocity	v	9.10E-01	m/d
Retardation factor	Rf	1.30E+05	fraction
Decay rate used	λ	1.90E-04	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	6.22E+00	fraction
Rate of contaminant flow due to retardation	u	6.98E-06	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	1.88E-21	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**5.32E+20**	**fraction**
Soil leachate concentration	Co	7.00E-03	

Remedial Targets

Level 3 Remedial Target		**9.04E+13**	**mg/l**	For comparison with measured pore water concentration.
Ogata Banks		**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
		3.33E+18	**mg/kg**	For comparison with measured soil concentration. This
Distance to compliance point		**10**	**m**	assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	**1.88E-21**	**fraction**	Ogata Banks

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer — foc — 3.60E-02 — fraction
Organic carbon partition coefficient — Koc — 1.02E+06 — l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species — $K_{oc,n}$ — l/kg
Sorption coefficient for ionised species — $K_{oc,i}$ — l/kg
pH value — pH
Acid dissociation constant — pKa
Fraction of organic carbon in aquifer — foc — fraction

Soil water partition coefficient — Kd — 3.68E+04 — l/kg

Define dispersivity (click brown cell and use pull down list)

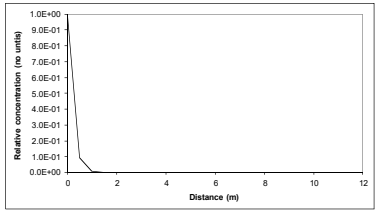
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	1.00E+00	8.30E-01	m
Transverse dispersivity	**az**	0.00E+00	1.00E-01	8.30E-02	m
Vertical dispersivity	**ay**	0.00E+00	1.00E-02	8.30E-03	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}X)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Herbert Road
Completed by:	
Date:	28.10.2016
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Relative concentration	Concentration
	(No units)	mg/l
0	1.0E+00	7.00E-03
0.5	9.34E-02	6.54E-04
1.0	8.72E-03	6.10E-05
1.5	8.12E-04	5.68E-06
2.0	7.52E-05	5.26E-07
2.5	6.93E-06	4.85E-08
3.0	6.37E-07	4.46E-09
3.5	5.84E-08	4.09E-10
4.0	5.35E-09	3.74E-11
4.5	4.89E-10	3.43E-12
5.0	4.48E-11	3.13E-13
5.5	4.10E-12	2.87E-14
6.0	3.75E-13	2.63E-15
6.5	3.44E-14	2.41E-16
7.0	3.15E-15	2.20E-17
7.5	2.89E-16	2.02E-18
8.0	2.65E-17	1.85E-19
8.5	2.43E-18	1.70E-20
9.0	2.23E-19	1.56E-21
9.5	2.05E-20	1.43E-22
10.0	1.88E-21	1.32E-23

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions)

Details to be completed for each assessment

Site Name:	**Herbert Road**			
Site Address:				
Completed by:	[redacted]			
Date:	**28.10.2016**		**Version:**	**1**
Contaminant	**Benzo(ghi)perylene**			
Target Concentration (C_T)	**0.0000082**	**mg/l**	**Origin of C_T:**	**Water Framework Directive**

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Benzo(ghi)perylene**		
Target concentration	C_T	**0.0000082**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_W	4.70E-01	fraction	SR3
Air filled soil porosity	θa	1.20E-01	fraction	SR3
Bulk density of soil zone material	ρ	2.09E+00	g/cm^3	SR3
Henry's Law constant	H	3.03E-05	dimensionless	*EA 2003*
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	1.72E-01	fraction	Laboratory Soil Chemical Testing
Organic carbon partition coefficient	Koc	4.07E+05	l/kg	*EA 2003*
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**7.01E+04**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.
The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**5.75E-01**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.0000082	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Herbert Road
Completed by:	
Date:	28.10.2016
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Benzo(ghi)perylene**		from Level 1
Target concentration	**C_T**	**0.0000082**	**mg/l**	from Level 1

This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	1.79E-03	m/d	**met office - cardiff monitoring station**	
Area of contaminant source	A	1.80E+04	m^2		Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.50E+02	m		
Saturated aquifer thickness	da	5.00E-01	m	**0.5m assumed of 3.8m made ground thickness**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	8.64E-02	m/d	**Primarily well compacted clay soil**	
Hydraulic gradient of water table	i	6.25E-04	fraction	**10cm over 100m (assumed)**	
Width of contaminant source perpendicular to groundwater flow	w	1.20E+02	m		Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**Unknown**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Specify**			
Enter mixing zone thickness	Mz	5.00E-01	m		
Calculated mixing zone thickness	Mz	[redacted]	m		

Calculated Parameters

Dilution Factor	**DF**	**1.00E+00**		
Level 2 Remedial Target		**8.20E-06**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentra**
		or		
		5.75E-01	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	7.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		7.00E+00	mg/l	0

Site being assessed:	Herbert Road
Completed by:	[redacted]
Date:	28.10.2016
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Input Parameters	Variable	Value	Unit	Source
Contaminant		Benzo(ghi)perylene		from Level 1
Target Concentration	C_T	0.0000082	mg/l	from Level 1
Dilution Factor	DF	1.00E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to pollutants in all phases (e.g. field derived value

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil leachate concentration as mg/l		
Enter soil leachate concentration		0.0067	mg/l	
Half life for degradation of contaminant in water	$t_{1/2}$	3.65E+03	days	*Surampalli et al*
Calculated decay rate	λ	1.90E-04	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	1.20E+02	m	from Level 2
Plume thickness in aquifer at source	Sy	5.00E-01	m	from Level 2
Bulk density of aquifer materials	ρ	2.09E+00	g/cm^3	*Geotech Testing*
Effective porosity of aquifer	n	5.90E-01	fraction	
Hydraulic gradient	i	6.22E+00	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	8.64E-02	m/d	from Level 2
Distance to compliance point	x	1.00E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	7.01E+04	l/kg	*see options*
Longitudinal dispersivity	ax	1.000	m	*see options*
Transverse dispersivity	az	0.100	m	*see options*
Vertical dispersivity	ay	0.010	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters	Variable		
Groundwater flow velocity	v	9.10E-01	m/d
Retardation factor	Rf	2.48E+05	fraction
Decay rate used	λ	1.90E-04	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	6.22E+00	fraction
Rate of contaminant flow due to retardation	u	3.67E-06	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	5.14E-30	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**1.94E+29**	**fraction**
Soil leachate concentration	Co	6.70E-03	

Remedial Targets

Level 3 Remedial Target		**1.59E+24**	**mg/l**	For comparison with measured pore water concentration.
Ogata Banks		**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
		1.12E+29	**mg/kg**	For comparison with measured soil concentration. This
Distance to compliance point		**10**	**m**	assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	**5.14E-30**	**fraction**	Ogata Banks

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — [redacted] l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer — foc — 1.72E-01 — fraction
Organic carbon partition coefficient — Koc — 4.07E+05 — l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species — $K_{oc,n}$ — [redacted] l/kg
Sorption coefficient for ionised species — $K_{oc,i}$ — [redacted] l/kg
pH value — pH — [redacted]
Acid dissociation constant — pKa — [redacted]
Fraction of organic carbon in aquifer — foc — [redacted] fraction

Soil water partition coefficient — Kd — 7.01E+04 — l/kg

Define dispersivity (click brown cell and use pull down list)

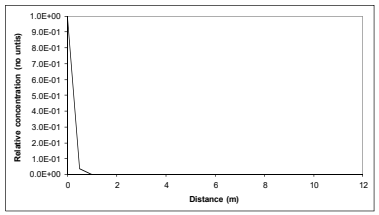
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	1.00E+00	8.30E-01	m
Transverse dispersivity	**az**	0.00E+00	1.00E-01	8.30E-02	m
Vertical dispersivity	**ay**	0.00E+00	1.00E-02	8.30E-03	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}X)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Herbert Road
Completed by:	[redacted]
Date:	28.10.2016
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Relative concentration	Concentration
	(No units)	mg/l
0	1.0E+00	6.70E-03
0.5	3.48E-02	2.33E-04
1.0	1.21E-03	8.13E-06
1.5	4.22E-05	2.82E-07
2.0	1.46E-06	9.76E-09
2.5	5.01E-08	3.36E-10
3.0	1.72E-09	1.15E-11
3.5	5.88E-11	3.94E-13
4.0	2.01E-12	1.35E-14
4.5	6.86E-14	4.59E-16
5.0	2.34E-15	1.57E-17
5.5	8.00E-17	5.36E-19
6.0	2.73E-18	1.83E-20
6.5	9.33E-20	6.25E-22
7.0	3.19E-21	2.14E-23
7.5	1.09E-22	7.31E-25
8.0	3.73E-24	2.50E-26
8.5	1.28E-25	8.56E-28
9.0	4.38E-27	2.93E-29
9.5	1.50E-28	1.00E-30
10.0	5.14E-30	3.44E-32

ANNEX G
Neal Soils - Risk Assessment Correspondence

Our Ref: RH/12032/Let38

Your Ref:

Contact: Ruth Howells

Terra Firma (Wales) Ltd.
Consulting Geotechnical & Geo-Environmental Engineers
Site Investigation Contractors

5 Deryn Court, Wharfedale Road,
Pentwyn, Cardiff CF23 7HA
Tel: 029 2073 5354 Fax: 029 2073 5433
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www.terrafirmawales.co.uk

19th May 2017

Natural Resources Wales
Rivers House
St Mellons Business Park
Fortran Road
Cardiff
CF3 0EY

For the attn. of Mr Matthew Llewhellin

Dear Matthew

INTENDED FILL SOILS: HERBERT ROAD, NEWPORT

Intended fill to be imported for use as a piling mat has been sampled at source (Neal Soils) and tested.

A proposed volume of 5000m^3 will be imported. In accordance with the Terra Firma (Wales) Limited Remediation Strategy this would equated to 24 representative samples requiring analysis.

To date 20 samples have been tested (which assumed at the time that a greater volume would be imported), so testing once imported would be carried out in due course.

When the results are compared to generic assessment criteria (or 0.01ug/l target concentration for petroleum hydrocarbons) several PAH species were exceeded in soil, and in leachate one exceedence of chromium VI and Aliphatic C26-21 fraction were noted, as well as elevations in several PAH species.

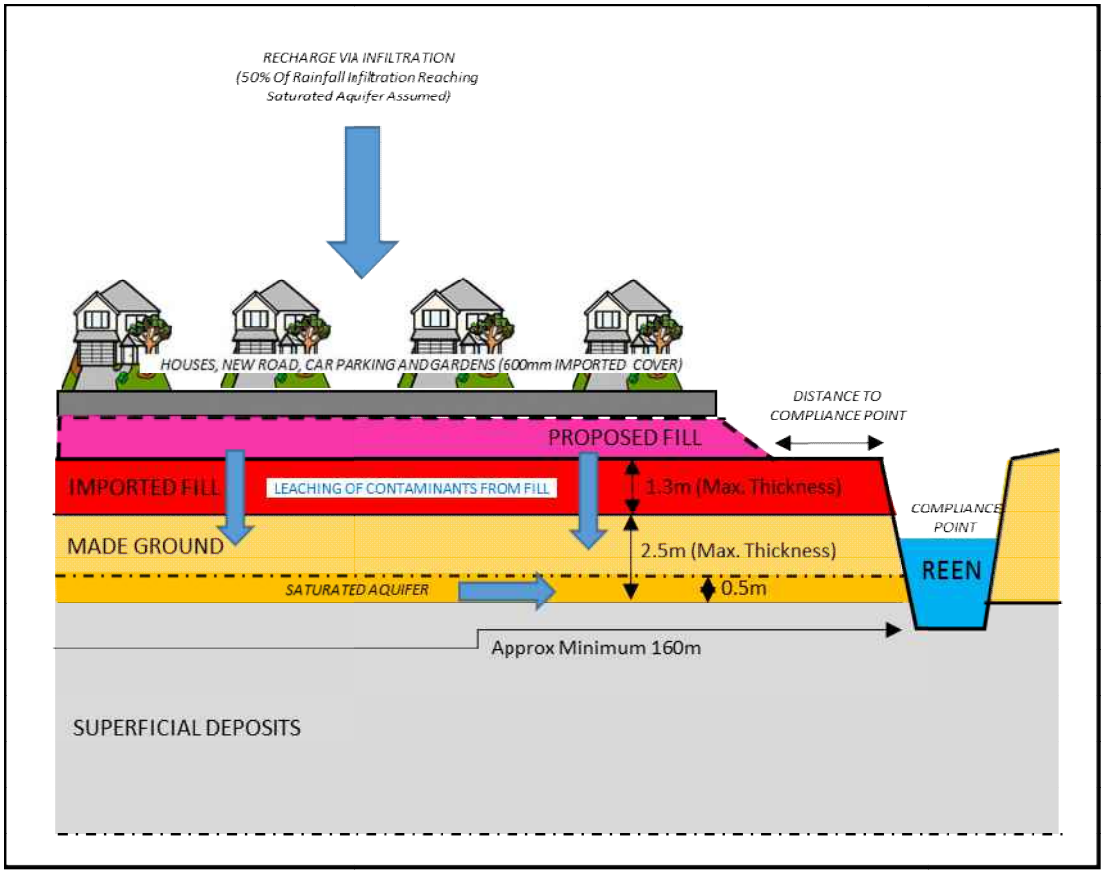
The test results are enclosed. Those substances present in exceedence are highlighted in red, with the guidelines shown in yellow.

Site specific criteria were derived for leachate exceedences using the Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination (Level 3).

The scenario in the assessment was identical to that used previously for assessment of soils sourced from Green Land and Hawes Lane (see TFW Risk Assessment Report – Proposed Fill For Importation 12032/RA1, dated November 2016).

The reen was set as the compliance point, at a distance of 10m from any fill imported. This was chosen because a new road and footpath is to run alongside the new reen, which will be at least 10m wide and be constructed of clean imported quarry stone from current to proposed ground level.

Table 1 below details the input parameters used in the Remedial Targets Methodology assessment.



The model simplifies actual hydrogeological regime, and the model assumptions are:

- The aquifer is homogenous and isotropic
- Flow is laminar in one direction, with a constant velocity
- Contaminant and aquifer physiochemical properties are constant
- Darcy's Law is valid
- No dispersion other than that specified occurs

Table 1 Input Parameters			
Parameter		**Value**	**Source**
Level 2 Soil			
Inf	**Infiltration**	**0.000179m/d**	Average infiltration for 2015 (0.00358m/d) taken from Cardiff monitoring station (closest to Newport) Value amended to assume 50% of rainfall reaches saturated zone
A	**Area of Contaminant Source**	**18000m^2**	Fill to be placed a suggested distance of 10m from the reen
L	**Length of Contaminant Source**	**150m**	Minimum length of site (north to south) and takes into account 10m distance between proposed contaminated fill and the reen (compliance point)
da	**Saturated Aquifer Thickness**	**0.5m**	Little to negligible groundwater anticipated due to heavy compaction of fill imported to date, which can be expected to have very low porosity.
K	**Hydraulic conductivity of aquifer in which dilution occurs**	**0.0864m/d**	Assumes a conservative infiltration rate of 1 x 10^{-6} m/s for the well compacted imported fill
I	**Hydraulic gradient of water table**	**0.000625**	Assumes 160m site length (north to south) and 0.1m drop in water level towards the reen
w	**Width of contaminant source perpendicular to groundwater flow**	**120m**	Width of site (east to west)
Cu	**Background concentration of contaminant of groundwater beneath site**	**0**	Not data available for groundwater in made ground (none identified during previous site investigation work)
Mz	**Mixing Zone Thickness**	**0.5m**	Same as saturated aquifer thickness
Level 3 Soil			
-	**Soil Leachate Concentration**	Maximum recorded value for each substance quoted	
T½	**Half Life for Degradation of Contaminant in Water**	For organic substances data obtained from Surampelli et al	
Sz	**Width of Aquifer Plume at Source**	**120m**	Width of site (east to west)
Sy	**Plume thickness at Source**	**0.5m**	From Level 2
p	**Bulk Density of Aquifer Material**	**2.09 g/cm^3**	Based on geotechnical tests undertaken on imported fill
n	**Effective Porosity of Aquifer**	**0.59 (fraction)**	SR3 Updated Technical Background to the CLEA model, Table 4.4. Clay soil type used for imported fill.
i	**Hydraulic Gradient**	**-**	From level 2 (adjusted by model)
K	**Hydraulic Conductivity of Saturated Aquifer**	**0.0864**	From level 2
koc	**Organic Carbon Partition Coefficient (non-polar organic)**	**Substance specific**	EA (2003) – Environment Agency Technical Report P5-079/TR1
foc	**Fraction of organic carbon (non-polar organic)**	**0.0078**	Average value calculated from laboratory test results (where exceedences recorded)

In the absence of fraction of organic carbon (foc) values for the aquifer results used are those of the intended imported fill. For comparison each chemical assessment was repeated using foc values for the Green Lane/Hawes Lane fill (which will site directly below this material) but the calculated remedial targets were less conservative.

The Remedial Targets Methodology worksheets are enclosed.

The Level 3 remedial target concentrations calculated, which assume a 10m distance between the fill if placed on site to the compliance point (the reen), are compared to laboratory leachate tests results in **Table 2.**

Table 2 Calculated Remedial Target at 10m Compliance Point and Comparison to Leachate Results

Chemical	Number of Samples exceeding Generic Criteria	Level 3 Target Concentration 10m Compliance Point (ug/l)	Maximum Recorded Concentration (ug/l)	No. of Samples Exceeded
Chromium VI	1	0.815	9.0	1
Anthracene	2	0.599	0.16	0
Fluoranthene	20	0.638	0.39	0
Benzo(b)fluoranthene	1	16600	0.07	0
Benzo(k)fluoranthene	1	9.11×10^{7}	0.02	0
Benzo(a)pyrene	1	0.0914	0.05	0
Benzo(ghi)perylene	1	752	0.06	0
Aliphatic C16 – C21	1	4.47×10^{48}	11	0

As noted in the previous Risk Assessment Report the reen is the only receptor deemed to be at risk from any leachable contaminants and it is similarly considered here that the risk to the reen through groundwater flow is very low given that only one exceedence of chromium VI was identified.

However, as recommended previously, to check that there are no adverse effects on the water quality of the reen from the fill regular sampling and testing of the reen waters should be carried out. It is proposed that this should be carried out for 3 months following placement of the fill/piling mat.

The above assumes that the results from further testing of these materials (once imported) are acceptable.

I 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 me.

Yours sincerely
for: Terra Firma (Wales) Ltd

[redacted]

Mrs Ruth Howells

Our Ref: RH/12032/Let43

Your Ref:

Contact: Ruth Howells

Terra Firma (Wales) Ltd.
Consulting Geotechnical & Geo-Environmental Engineers
Site Investigation Contractors

5 Deryn Court, Wharfedale Road,
Pentwyn, Cardiff CF23 7HA
Tel: 029 2073 5354 Fax: 029 2073 5433
Email: info@terrafirmawales.co.uk
www.terrafirmawales.co.uk

24th August 2017

Natural Resources Wales
Rivers House
St Mellons Business Park
Fortran Road
Cardiff
CF3 0EY

For the attn. of Mr Matt Llewhellin

Dear Matt

HERBERT ROAD, NEWPORT: IMPORTED PILING MAT MATERIAL, MAIN SITE AREA

Further to my letter of the 19th May 2017 I confirm that the piling mat material has now been imported on to the main part of the site (Phases 3, 4 and part of Phase 2).

To summarise, a volume of 5000m^3 of crushed material was sourced from Neal Soils for use as the piling mat. The piling mat will permanently remain on site.

Twenty representative samples were taken at source (Neal Soils) and 10 further samples were taken from across the site following import and placement. On-site samples were taken from the surface.

Test result certificates are provided in **Annex A**.

Leachate results were first compared with generic assessment criteria. Those found to be in exceedence were then assessed using site specific criteria derived from the Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination (Level 3).

The scenario in the assessment was identical to that used previously for assessment of soils sourced from Green Land and Hawes Lane (see TFW Risk Assessment Report – Proposed Fill For Importation 12032/RA1, dated November 2016).

The Level 3 remedial target concentrations calculated assume a 10m distance between the fill to the compliance point (the reen)

Input parameters used are detailed in my letter of the 19th May 2017.

The table below summarises the results.

Calculated Remedial Target at 10m Compliance Point and Comparison to Leachate Results					
Chemical	**Generic Assessment Criteria**	**Maximum Recorded Concentration (ug/l)**	**Number of Samples exceeding Generic Criteria**	**Level 3 Target Concentration 10m Compliance Point (ug/l)**	**No. of Samples Exceeding Level 3 target Concentration**
Chromium VI	0.6	9.0 (LOD 7.0ug/l)	1	0.815	**1**
Chromium III	4.7	6.3	5	6.83	0
Copper	1.0	2.3	23	8.05	0
Anthracene	0.1	0.21	3	0.599	0
Fluoranthene	0.0063	0.95	21	0.638	**1**
Benzo(b)fluoranthene	0.017	0.64	2	16600	0
Benzo(k)fluoranthene	0.017	0.25	2	9.11×10^{7}	0
Benzo(a)pyrene	0.00017	0.54	2	0.0914	**1**
Benzo(ghi)perylene	0.0082	0.42	2	752	0
Aliphatic C16 – C21	10 (applied target concentration)	11	1	4.47×10^{48}	0
Aliphatic C21 – C35		29	2	No impact	0
Aromatic C21 – C35		64	2	77.2	0

Remedial Targets Methodology calculation sheets may be found in **Annex B**.

It can seen from the above table that only three substances were identified as presenting a potential risk to the drainage reen. However, the risks are considered very low and therefore the piling mat materials are considered suitable for use. However, to be sure that there are no adverse effects on the water quality of the reen monthly sampling and testing of the reen waters is currently on-going.

I 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 me.

Yours sincerely
for: Terra Firma (Wales) Ltd

[redacted]

Mrs Ruth Howells

Annex A
Laboratory Chemical Test Results

Certificate of Analysis

Certificate Number	17-99136-2
	18-May-17
Client	Terra Firma (Wales) Ltd 5 Deryn Court Wharfdale Road Pentwyn Cardiff CF23 7HB
Our Reference	17-99136-2
Client Reference	12032
Order No	12032NS
Contract Title	Herbert Road
Description	20 Soil samples, 20 Leachate samples.
Date Received	Tuesday, May 9, 2017
Date Started	Tuesday, May 9, 2017
Date Completed	Thursday, May 18, 2017
Test Procedures	Identified by prefix DETSn (details on request).
Notes	**This report supersedes 17-99136. Extra testing** Opinions and interpretations are outside the scope of UKAS accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. Observations and interpretations are outside the scope of ISO 17025. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By [redacted]

Adam Fenwick
Contracts Manager

2139

Summary of Chemical Analysis
Matrix Descriptions

Our Ref 17-99136-2
Client Ref 12032
Contract Title Herbert Road

Sample ID	Lab No	Completed	Matrix Description
S1	1169919	17-May-17	Brown gravelly SAND (Made ground - brick) including odd rootlets
S2	1169920	17-May-17	Brown gravelly SAND (Made ground - brick)
S3	1169921	17-May-17	Brown gravelly SAND (Made ground - brick, metal)
S4	1169922	17-May-17	Brown gravelly SAND (Made ground - brick, metal)
S5	1169923	17-May-17	Brown gravelly SAND (Made ground - brick, glass)
S6	1169924	17-May-17	Brown gravelly SAND (Made ground - brick) including odd rootlets
S7	1169925	17-May-17	Brown gravelly SAND (Made ground - brick)
S8	1169926	17-May-17	Brown gravelly SAND (Made ground - brick, glass) including odd rootlets
S9	1169927	17-May-17	Brown gravelly SAND (Made ground - brick) including odd rootlets
S10	1169928	17-May-17	Brown gravelly SAND (Made ground - brick) including odd rootlets
S11	1169929	17-May-17	Brown gravelly SAND (Made ground - brick) including odd rootlets
S12	1169930	17-May-17	Brown gravelly SAND (Made ground - brick) including odd rootlets
S13	1169931	17-May-17	Brown gravelly SAND (Made ground - brick) including odd rootlets
S14	1169932	17-May-17	Brown gravelly SAND (Made ground - brick) including odd rootlets
S15	1169933	17-May-17	Brown gravelly SAND (Made ground - brick)
S16	1169934	17-May-17	Brown gravelly SAND (Made ground - plastic, brick)
S17	1169935	17-May-17	Brown gravelly SAND (Made ground - brick, slag)
S18	1169936	17-May-17	Brown gravelly SAND (Made ground - brick, slag) including odd rootlets
S19	1169937	17-May-17	Brown gravelly SAND (Made ground - brick, slag)
S20	1169938	17-May-17	Brown gravelly SAND (Made ground - brick, slag)

Summary of Chemical Analysis
Soil Samples

Our Ref 17-99136-2
Client Ref 12032
Contract Title Herbert Road

	Lab No	1169919	1169920	1169921	1169922	1169923	1169924
	Sample ID	S1	S2	S3	S4	S5	S6
	Depth						
	Other ID						
	Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampling Date	08-May-17	08-May-17	08-May-17	08-May-17	08-May-17	08-May-17
	Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Preparation							
Moisture Content	DETSC 1004	0.1	%	5.0	5.4	2.6	5.9	6.4	1.7
Metals							
Antimony	DETSC 2301*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	DETSC 2301#	0.2	mg/kg	4.5	5.4	5.3	4.7	5.6	3.1
Beryllium	DETSC 2301#	0.2	mg/kg	0.3	0.2	0.2	0.3	0.3	< 0.2
Boron, Water Soluble	DETSC 2123#	0.2	mg/kg	1.1	0.2	0.7	1.3	0.7	0.4
Cadmium	DETSC 2301#	0.1	mg/kg	0.1	0.2	0.2	0.3	0.4	< 0.1
Chromium	DETSC 2301#	0.15	mg/kg	15	13	10	9.8	13	6.7
Chromium III	DETSC 2301*	0.15	mg/kg	15	13	10	9.8	13	6.7
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	11	11	10	8.8	11	7.4
Lead	DETSC 2301#	0.3	mg/kg	12	40	12	11	24	8.3
Manganese	DETSC 2301#	20	mg/kg	470	610	320	290	380	200
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Molybdenum	DETSC 2301#	0.4	mg/kg	0.9	0.7	0.8	0.7	0.9	0.6
Nickel	DETSC 2301#	1	mg/kg	7.0	7.6	6.7	6.5	7.1	5.1
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	0.6	< 0.5
Zinc	DETSC 2301#	1	mg/kg	39	45	31	29	51	22
Inorganics							
pH	DETSC 2008#			12.0	11.6	12.1	12.1	12.0	12.0
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cyanide, Complex	DETSC 2130*	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
FOC	DETSC 2002	0.001		0.005	0.002	0.003	0.001	0.004	0.002
Organic matter	DETSC 2002#	0.1	%	0.8	0.4	0.5	0.2	0.7	0.4
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.45	1.0	0.49	0.58	0.62	0.64
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	3.1	< 1.2	2.0	< 1.2	4.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	11	< 1.5	11	6.1	15
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	85	28	77	40	110
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	< 3.4	20	8.9	18	12	47
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	100	28	90	47	130
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	4.0	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	10	2.1	< 0.5	3.0	3.0	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	36	12	5.2	13	13	11

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 17-99136-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	1169919	1169920	1169921	1169922	1169923	1169924
			Sample ID	S1	S2	S3	S4	S5	S6
			Depth						
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	08-May-17	08-May-17	08-May-17	08-May-17	08-May-17	08-May-17
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	120	87	43	83	48	42
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	6.4	27	13	27	15	11
Aromatic C5-C35	DETSC 3072*	10	mg/kg	170	100	48	99	64	53
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	170	200	76	190	110	180
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	0.12	0.09	< 0.03	0.05	0.10	0.10
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.05
Acenaphthene	DETSC 3303#	0.03	mg/kg	0.15	0.19	< 0.03	0.16	0.29	0.71
Fluorene	DETSC 3303	0.03	mg/kg	0.10	0.14	< 0.03	0.11	0.22	0.44
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.67	0.94	0.05	0.75	1.6	4.3
Anthracene	DETSC 3303	0.03	mg/kg	0.13	0.21	< 0.03	0.16	0.55	1.2
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.72	1.2	0.07	0.74	2.1	5.6
Pyrene	DETSC 3303#	0.03	mg/kg	0.56	0.86	0.06	0.55	1.7	4.7
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.35	0.53	0.03	0.39	0.81	2.1
Chrysene	DETSC 3303	0.03	mg/kg	0.40	0.57	0.04	0.41	0.84	2.0
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.48	0.70	0.04	0.50	1.2	3.0
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.18	0.26	< 0.03	0.14	0.36	1.3
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.34	0.47	0.03	0.32	0.80	2.4
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.17	0.25	< 0.03	0.16	0.40	1.2
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	0.08	0.12	< 0.03	0.08	0.17	0.37
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.21	0.28	< 0.03	0.19	0.49	1.5
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	4.7	6.8	0.33	4.7	12	31
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	0.5	< 0.3	< 0.3	< 0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 17-99136-2
Client Ref 12032
Contract Title Herbert Road

				Lab No	1169925	1169926	1169927	1169928	1169929	1169930
				Sample ID	S7	S8	S9	S10	S11	S12
				Depth						
				Other ID						
				Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Sampling Date	08-May-17	08-May-17	08-May-17	08-May-17	08-May-17	08-May-17
				Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**							
Preparation										
Moisture Content	DETSC 1004	0.1	%	5.0	4.6	4.8	6.4	2.8	2.3
Metals										
Antimony	DETSC 2301*	1	mg/kg	< 1.0	< 1.0	1.5	< 1.0	< 1.0	< 1.0
Arsenic	DETSC 2301#	0.2	mg/kg	4.0	7.0	6.2	5.8	6.1	6.4
Beryllium	DETSC 2301#	0.2	mg/kg	0.4	0.4	0.5	0.3	0.3	0.2
Boron, Water Soluble	DETSC 2123#	0.2	mg/kg	< 0.2	0.5	0.6	0.8	0.6	0.8
Cadmium	DETSC 2301#	0.1	mg/kg	0.2	0.6	0.3	0.4	0.2	0.3
Chromium	DETSC 2301#	0.15	mg/kg	22	13	12	11	9.1	9.8
Chromium III	DETSC 2301*	0.15	mg/kg	22	13	12	11	9.1	9.8
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	6.5	13	15	12	7.8	11
Lead	DETSC 2301#	0.3	mg/kg	8.8	17	18	18	9.3	12
Manganese	DETSC 2301#	20	mg/kg	720	400	530	390	460	470
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Molybdenum	DETSC 2301#	0.4	mg/kg	0.6	0.8	0.9	0.8	0.7	0.8
Nickel	DETSC 2301#	1	mg/kg	6.8	7.7	7.5	8.0	6.0	6.3
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	24	67	55	43	34	45
Inorganics										
pH	DETSC 2008#			12.2	12.0	11.9	11.8	12.1	12.1
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	0.1	< 0.1	< 0.1	< 0.1
Cyanide, Complex	DETSC 2130*	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
FOC	DETSC 2002	0.001		0.005	0.007	0.008	0.009	0.010	0.008
Organic matter	DETSC 2002#	0.1	%	0.9	1.3	1.4	1.6	1.7	1.3
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.35	0.52	0.44	0.67	0.42	0.51
Petroleum Hydrocarbons										
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	6.2	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	2.0	< 1.2	5.8	4.6	8.1	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	6.6	5.5	17	12	12	4.0
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	68	67	220	140	190	77
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	22	16	98	62	75	27
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	77	72	250	160	210	81
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	1.5	1.0	9.2	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	7.5	4.9	42	6.1	4.6	2.0

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Summary of Chemical Analysis
Soil Samples

Our Ref 17-99136-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	1169925	1169926	1169927	1169928	1169929	1169930
			Sample ID	S7	S8	S9	S10	S11	S12
			Depth						
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	08-May-17	08-May-17	08-May-17	08-May-17	08-May-17	08-May-17
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	28	27	140	42	43	19
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	6.8	7.7	48	20	20	8.2
Aromatic C5-C35	DETSC 3072*	10	mg/kg	37	33	190	48	48	21
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	110	110	440	200	260	100
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	0.08	0.04	< 0.03	0.09	0.06	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	0.21	0.09	1.4	0.22	0.13	0.07
Fluorene	DETSC 3303	0.03	mg/kg	0.12	0.06	0.56	0.15	0.11	0.05
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.76	0.48	6.2	0.99	0.71	0.32
Anthracene	DETSC 3303	0.03	mg/kg	0.15	0.10	6.2	0.24	0.16	0.05
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.87	0.60	6.6	1.3	0.84	0.34
Pyrene	DETSC 3303#	0.03	mg/kg	0.64	0.46	4.9	1.1	0.64	0.25
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.42	0.29	2.6	0.56	0.43	0.15
Chrysene	DETSC 3303	0.03	mg/kg	0.43	0.29	2.5	0.57	0.47	0.19
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.62	0.40	3.4	0.74	0.63	0.31
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.23	0.12	1.2	0.28	0.25	0.27
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.40	0.27	2.3	0.55	0.40	0.11
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.23	0.15	1.1	0.26	0.19	0.09
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	0.11	0.07	0.47	0.13	0.09	0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.26	0.17	1.3	0.33	0.22	0.10
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	5.5	3.6	41	7.5	5.3	2.3
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	0.7	< 0.3	< 0.3	< 0.3	0.4	< 0.3

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Summary of Chemical Analysis
Soil Samples

Our Ref 17-99136-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	1169931	1169932	1169933	1169934	1169935	1169936
			Sample ID	S13	S14	S15	S16	S17	S18
			Depth						
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	08-May-17	08-May-17	08-May-17	08-May-17	08-May-17	08-May-17
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Preparation									
Moisture Content	DETSC 1004	0.1	%	3.7	4.0	5.5	3.5	2.8	2.4
Metals									
Antimony	DETSC 2301*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	DETSC 2301#	0.2	mg/kg	5.8	5.7	5.3	4.9	5.2	4.1
Beryllium	DETSC 2301#	0.2	mg/kg	0.3	0.4	0.3	0.2	0.3	0.4
Boron, Water Soluble	DETSC 2123#	0.2	mg/kg	0.9	0.5	0.7	0.6	0.8	0.5
Cadmium	DETSC 2301#	0.1	mg/kg	0.3	0.2	0.6	0.2	0.3	0.2
Chromium	DETSC 2301#	0.15	mg/kg	14	11	12	11	8.4	7.5
Chromium III	DETSC 2301*	0.15	mg/kg	14	11	12	11	8.4	7.5
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	17	11	11	12	9.5	6.1
Lead	DETSC 2301#	0.3	mg/kg	25	12	17	15	13	11
Manganese	DETSC 2301#	20	mg/kg	480	450	390	460	400	530
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Molybdenum	DETSC 2301#	0.4	mg/kg	1.0	0.7	0.7	0.8	0.8	0.5
Nickel	DETSC 2301#	1	mg/kg	7.3	6.3	8.6	6.3	6.1	4.9
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	0.6	< 0.5	< 0.5	0.6
Zinc	DETSC 2301#	1	mg/kg	50	32	42	35	36	25
Inorganics									
pH	DETSC 2008#			11.7	11.9	11.8	11.9	12.3	12.3
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cyanide, Complex	DETSC 2130*	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
FOC	DETSC 2002	0.001		0.008	0.009	0.009	0.014	0.012	0.015
Organic matter	DETSC 2002#	0.1	%	1.3	1.6	1.5	2.4	2.1	2.6
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.45	0.47	0.70	0.33	0.61	0.36
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	4.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	5.1	21	3.4	< 1.2	6.4	3.3
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	20	11	14	5.2	14	8.9
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	120	140	180	65	110	78
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	40	100	80	33	37	30
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	140	180	200	70	130	91
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	2.5	6.7	1.2	0.7	14	5.4
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	16	15	8.8	5.2	68	30

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Summary of Chemical Analysis
Soil Samples

Our Ref 17-99136-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	1169931	1169932	1169933	1169934	1169935	1169936
			Sample ID	S13	S14	S15	S16	S17	S18
			Depth						
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	08-May-17	08-May-17	08-May-17	08-May-17	08-May-17	08-May-17
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	46	110	51	28	170	130
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	14	68	25	15	42	46
Aromatic C5-C35	DETSC 3072*	10	mg/kg	64	130	61	34	250	160
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	210	310	260	100	380	250
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	1.2	0.33	0.05	0.06	0.11	< 0.30
Acenaphthylene	DETSC 3303#	0.03	mg/kg	0.03	< 0.30	< 0.03	< 0.03	0.04	< 0.30
Acenaphthene	DETSC 3303#	0.03	mg/kg	0.77	1.7	0.16	0.35	0.75	0.92
Fluorene	DETSC 3303	0.03	mg/kg	0.44	0.98	0.10	0.23	0.42	0.69
Phenanthrene	DETSC 3303#	0.03	mg/kg	3.7	8.4	0.80	2.3	3.4	10
Anthracene	DETSC 3303	0.03	mg/kg	1.0	8.6	0.19	0.60	1.0	1.9
Fluoranthene	DETSC 3303#	0.03	mg/kg	5.8	12	1.1	2.9	4.7	17
Pyrene	DETSC 3303#	0.03	mg/kg	5.0	11	0.91	2.4	4.0	13
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	2.0	4.1	0.46	0.88	1.5	7.7
Chrysene	DETSC 3303	0.03	mg/kg	1.9	3.9	0.46	0.85	1.5	7.0
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	2.6	6.2	0.66	1.1	2.1	12
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	1.0	1.8	0.21	0.43	0.66	3.7
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	1.9	4.5	0.40	0.78	1.5	6.6
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	1.0	2.4	0.24	0.44	0.87	3.9
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	0.27	0.78	0.10	0.13	0.27	1.8
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	1.3	2.8	0.31	0.53	1.1	4.6
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	30	70	6.2	14	24	< 90.51
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	0.3	< 0.3	< 0.3	< 0.3	< 0.3

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Summary of Chemical Analysis
Soil Samples

Our Ref 17-99136-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	1169937	1169938
			Sample ID	S19	S20
			Depth		
			Other ID		
			Sample Type	SOIL	SOIL
			Sampling Date	08-May-17	08-May-17
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Preparation					
Moisture Content	DETSC 1004	0.1	%	3.9	< 0.10
Metals					
Antimony	DETSC 2301*	1	mg/kg	< 1.0	< 1.0
Arsenic	DETSC 2301#	0.2	mg/kg	5.1	4.2
Beryllium	DETSC 2301#	0.2	mg/kg	0.3	0.2
Boron, Water Soluble	DETSC 2123#	0.2	mg/kg	1.1	0.6
Cadmium	DETSC 2301#	0.1	mg/kg	0.2	0.2
Chromium	DETSC 2301#	0.15	mg/kg	12	9.2
Chromium III	DETSC 2301*	0.15	mg/kg	12	9.2
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	9.1	8.8
Lead	DETSC 2301#	0.3	mg/kg	12	15
Manganese	DETSC 2301#	20	mg/kg	470	400
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05
Molybdenum	DETSC 2301#	0.4	mg/kg	1.1	0.7
Nickel	DETSC 2301#	1	mg/kg	7.0	5.5
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	34	34
Inorganics					
pH	DETSC 2008#			12.1	11.9
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1
Cyanide, Complex	DETSC 2130*	0.2	mg/kg	< 0.2	< 0.2
FOC	DETSC 2002	0.001		0.004	0.013
Organic matter	DETSC 2002#	0.1	%	0.7	2.2
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.47	0.41
Petroleum Hydrocarbons					
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	3.6
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	39	32
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	16	11
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	39	36
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	1.1	7.6

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Summary of Chemical Analysis
Soil Samples

Our Ref 17-99136-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	1169937	1169938
			Sample ID	S19	S20
			Depth		
			Other ID		
			Sample Type	SOIL	SOIL
			Sampling Date	08-May-17	08-May-17
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	45	44
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	22	19
Aromatic C5-C35	DETSC 3072*	10	mg/kg	46	52
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	85	88
PAHs					
Naphthalene	DETSC 3303#	0.03	mg/kg	0.04	0.08
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	0.48
Fluorene	DETSC 3303	0.03	mg/kg	0.03	0.32
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.21	2.7
Anthracene	DETSC 3303	0.03	mg/kg	0.05	0.84
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.25	4.1
Pyrene	DETSC 3303#	0.03	mg/kg	0.19	3.5
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.11	1.4
Chrysene	DETSC 3303	0.03	mg/kg	0.11	1.3
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.13	1.9
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.05	0.68
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.08	1.3
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.05	0.73
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	0.23
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.06	0.89
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	1.4	20
Phenols					
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 17-99136-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	1169939	1169940	1169941	1169942	1169943	1169944
			Sample ID	S1	S2	S3	S4	S5	S6
			Depth						
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	08-May-17	08-May-17	08-May-17	08-May-17	08-May-17	08-May-17
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Preparation									
NRA Leachate Preparation	DETS 036*			Y	Y	Y	Y	Y	Y
Metals									
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	0.53	0.56	0.41	0.58	0.56	0.52
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	2.5	2.9	0.89	1.7	3.9	1.9
Chromium III, Dissolved	DETSC 2302*	1	ug/l	1.3	1.5	< 1.0	1.6	2.3	< 1.0
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.2	1.6	0.7	0.8	1.7	1.0
Lead, Dissolved	DETSC 2306	0.09	ug/l	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	< 0.5	< 0.5	0.8	0.6	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.38	0.42	< 0.25	< 0.25	0.30	< 0.25
Zinc, Dissolved	DETSC 2306	1.3	ug/l	< 1.3	< 1.3	< 1.3	1.7	< 1.3	< 1.3
Inorganics									
pH	DETSC 2008			10.4	10.8	9.9	10.9	10.8	10.7
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	2.6	3.7	2.2	4.1	3.4	2.2
Fluoride	DETSC 2055	0.1	mg/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	11	16	9.8	16	21	16
Total Organic Carbon	DETSC 2085	1	mg/l	3.3	4.9	2.0	8.5	4.3	6.5
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	6.5	< 1.0	< 1.0	< 1.0	< 1.0	11
Aliphatic C21-C35	DETSC 3072*	1	ug/l	2.8	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	12
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	12
PAHs									
Naphthalene	DETSC 3304	0.01	ug/l	0.04	0.09	0.15	0.10	0.11	0.42
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.02	< 0.01	0.03	0.03

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 17-99136-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	1169939	1169940	1169941	1169942	1169943	1169944
			Sample ID	S1	S2	S3	S4	S5	S6
			Depth						
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	08-May-17	08-May-17	08-May-17	08-May-17	08-May-17	08-May-17
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Acenaphthene	DETSC 3304	0.01	ug/l	0.10	0.15	0.17	0.24	0.28	0.32
Fluorene	DETSC 3304	0.01	ug/l	0.05	0.07	0.15	0.12	0.14	0.22
Phenanthrene	DETSC 3304	0.01	ug/l	0.13	0.21	0.22	0.29	0.26	0.43
Anthracene	DETSC 3304	0.01	ug/l	0.02	0.03	0.04	0.04	0.05	0.07
Fluoranthene	DETSC 3304	0.01	ug/l	0.06	0.07	0.07	0.09	0.10	0.11
Pyrene	DETSC 3304	0.01	ug/l	0.04	0.05	0.04	0.05	0.07	0.06
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
PAH Total	DETSC 3304	0.04	ug/l	0.44	0.66	0.87	0.92	1.0	1.7
Phenols									
Phenol	*	0.5	ug/l	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 17-99136-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	1169945	1169946	1169947	1169948	1169949	1169950
			Sample ID	S7	S8	S9	S10	S11	S12
			Depth						
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	08-May-17	08-May-17	08-May-17	08-May-17	08-May-17	08-May-17
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Preparation									
NRA Leachate Preparation	DETS 036*			Y	Y	Y	Y	Y	Y
Metals									
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	0.72	0.74	0.97	0.73	0.42	0.54
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	1.8	1.9	3.8	3.2	1.6	2.2
Chromium III, Dissolved	DETSC 2302*	1	ug/l	< 1.0	< 1.0	< 1.0	1.0	< 1.0	< 1.0
Chromium, Hexavalent	DETSC 2203	7	ug/l	9.0	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.1	1.3	2.3	1.7	1.1	1.3
Lead, Dissolved	DETSC 2306	0.09	ug/l	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Mercury, Dissolved	DETSC 2306	0.01	ug/l	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	2.1	1.2	1.0	0.74	0.48	0.44
Zinc, Dissolved	DETSC 2306	1.3	ug/l	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3
Inorganics									
pH	DETSC 2008			11.3	11.0	10.9	10.7	11.0	10.9
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	2.2	2.4	3.9	3.4	1.9	2.3
Fluoride	DETSC 2055	0.1	mg/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	8.2	12	21	23	6.3	13
Total Organic Carbon	DETSC 2085	1	mg/l	5.3	3.6	6.1	6.6	8.1	4.3
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	5.1	8.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
PAHs									
Naphthalene	DETSC 3304	0.01	ug/l	0.06	0.05	0.17	0.28	0.03	0.03
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.01	0.01	< 0.01	< 0.01

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 17-99136-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	1169945	1169946	1169947	1169948	1169949	1169950
			Sample ID	S7	S8	S9	S10	S11	S12
			Depth						
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	08-May-17	08-May-17	08-May-17	08-May-17	08-May-17	08-May-17
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Acenaphthene	DETSC 3304	0.01	ug/l	0.14	0.16	0.46	0.26	< 0.01	0.08
Fluorene	DETSC 3304	0.01	ug/l	0.06	0.07	0.19	0.15	< 0.01	0.05
Phenanthrene	DETSC 3304	0.01	ug/l	0.18	0.21	0.56	0.28	0.07	0.16
Anthracene	DETSC 3304	0.01	ug/l	0.03	0.03	0.09	0.04	0.01	0.02
Fluoranthene	DETSC 3304	0.01	ug/l	0.08	0.10	0.18	0.08	0.04	0.06
Pyrene	DETSC 3304	0.01	ug/l	0.05	0.06	0.12	0.05	0.03	0.04
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01
Chrysene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.03	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
PAH Total	DETSC 3304	0.04	ug/l	0.60	0.68	1.8	1.2	0.18	0.43
Phenols									
Phenol	*	0.5	ug/l	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 17-99136-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	1169951	1169952	1169953	1169954	1169955	1169956
			Sample ID	S13	S14	S15	S16	S17	S18
			Depth						
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	08-May-17	08-May-17	08-May-17	08-May-17	08-May-17	08-May-17
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Preparation									
NRA Leachate Preparation	DETS 036*			Y	Y	Y	Y	Y	Y
Metals									
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	0.51	0.53	0.64	0.46	0.42	0.36
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	2.5	1.6	1.6	2.1	1.7	1.1
Chromium III, Dissolved	DETSC 2302*	1	ug/l	1.3	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.0	1.6	1.3	1.4	1.4	1.0
Lead, Dissolved	DETSC 2306	0.09	ug/l	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.45	0.33	0.35	0.33	0.29	< 0.25
Zinc, Dissolved	DETSC 2306	1.3	ug/l	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3
Inorganics									
pH	DETSC 2008			11.2	11.1	10.5	10.8	10.7	11.0
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	3.9	2.0	2.5	2.6	2.0	2.2
Fluoride	DETSC 2055	0.1	mg/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	15	9.1	9.8	11	8.5	10
Total Organic Carbon	DETSC 2085	1	mg/l	7.2	3.0	2.1	5.6	7.2	4.9
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
PAHs									
Naphthalene	DETSC 3304	0.01	ug/l	0.11	0.23	0.11	0.43	0.23	0.07
Acenaphthylene	DETSC 3304	0.01	ug/l	0.01	0.02	0.01	0.01	0.02	< 0.01

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 17-99136-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	1169951	1169952	1169953	1169954	1169955	1169956
			Sample ID	S13	S14	S15	S16	S17	S18
			Depth						
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	08-May-17	08-May-17	08-May-17	08-May-17	08-May-17	08-May-17
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Acenaphthene	DETSC 3304	0.01	ug/l	0.27	0.45	0.22	0.30	0.55	0.24
Fluorene	DETSC 3304	0.01	ug/l	0.12	0.15	0.09	0.21	0.18	0.10
Phenanthrene	DETSC 3304	0.01	ug/l	0.37	0.72	0.27	0.51	0.55	0.32
Anthracene	DETSC 3304	0.01	ug/l	0.08	0.16	0.05	0.08	0.12	0.07
Fluoranthene	DETSC 3304	0.01	ug/l	0.16	0.39	0.12	0.12	0.29	0.15
Pyrene	DETSC 3304	0.01	ug/l	0.11	0.25	0.08	0.07	0.21	0.11
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	0.02	0.03	< 0.01	< 0.01	0.05	0.02
Chrysene	DETSC 3304	0.01	ug/l	0.02	0.04	< 0.01	< 0.01	0.06	0.03
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	0.07	< 0.01
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	0.05	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	0.06	< 0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	0.06	< 0.01
PAH Total	DETSC 3304	0.04	ug/l	1.3	2.5	0.97	1.7	2.5	1.1
Phenols									
Phenol	*	0.5	ug/l	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 17-99136-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	1169957	1169958
			Sample ID	S19	S20
			Depth		
			Other ID		
			Sample Type	LEACHATE	LEACHATE
			Sampling Date	08-May-17	08-May-17
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Preparation					
NRA Leachate Preparation	DETS 036*			Y	Y
Metals					
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	0.44	0.54
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	1.4	1.5
Chromium III, Dissolved	DETSC 2302*	1	ug/l	1.1	1.4
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	0.6	0.8
Lead, Dissolved	DETSC 2306	0.09	ug/l	< 0.09	< 0.09
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.29	< 0.25
Zinc, Dissolved	DETSC 2306	1.3	ug/l	< 1.3	< 1.3
Inorganics					
pH	DETSC 2008			10.4	10.4
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	2.8	2.8
Fluoride	DETSC 2055	0.1	mg/l	< 0.10	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	6.9	7.4
Total Organic Carbon	DETSC 2085	1	mg/l	8.4	4.7
Petroleum Hydrocarbons					
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	< 10	< 10
PAHs					
Naphthalene	DETSC 3304	0.01	ug/l	0.06	0.08
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 17-99136-2
Client Ref 12032
Contract Title Herbert Road

			Lab No	1169957	1169958
			Sample ID	S19	S20
			Depth		
			Other ID		
			Sample Type	LEACHATE	LEACHATE
			Sampling Date	08-May-17	08-May-17
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Acenaphthene	DETSC 3304	0.01	ug/l	0.04	0.13
Fluorene	DETSC 3304	0.01	ug/l	0.02	0.06
Phenanthrene	DETSC 3304	0.01	ug/l	0.09	0.19
Anthracene	DETSC 3304	0.01	ug/l	0.01	0.04
Fluoranthene	DETSC 3304	0.01	ug/l	0.03	0.10
Pyrene	DETSC 3304	0.01	ug/l	0.02	0.06
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	< 0.01	0.02
Chrysene	DETSC 3304	0.01	ug/l	< 0.01	0.02
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	< 0.01	< 0.01
PAH Total	DETSC 3304	0.04	ug/l	0.27	0.70
Phenols					
Phenol	*	0.5	ug/l	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 17-99136-2
Client Ref 12032
Contract Title Herbert Road

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1169919	S1	SOIL	NAD	none	Steven Lambert
1169920	S2	SOIL	NAD	none	Steven Lambert
1169921	S3	SOIL	NAD	none	Steven Lambert
1169922	S4	SOIL	NAD	none	Steven Lambert
1169923	S5	SOIL	NAD	none	Steven Lambert
1169924	S6	SOIL	NAD	none	Steven Lambert
1169925	S7	SOIL	NAD	none	Steven Lambert
1169926	S8	SOIL	NAD	none	Steven Lambert
1169927	S9	SOIL	NAD	none	Steven Lambert
1169928	S10	SOIL	NAD	none	Steven Lambert
1169929	S11	SOIL	NAD	none	Steven Lambert
1169930	S12	SOIL	NAD	none	Steven Lambert
1169931	S13	SOIL	NAD	none	Steven Lambert
1169932	S14	SOIL	NAD	none	Steven Lambert
1169933	S15	SOIL	NAD	none	Steven Lambert
1169934	S16	SOIL	NAD	none	Steven Lambert
1169935	S17	SOIL	NAD	none	Steven Lambert
1169936	S18	SOIL	NAD	none	Steven Lambert
1169937	S19	SOIL	NAD	none	Steven Lambert
1169938	S20	SOIL	NAD	none	Steven Lambert

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 17-99136-2
Client Ref 12032
Contract Herbert Road

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1169919	S1 SOIL	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169920	S2 SOIL	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169921	S3 SOIL	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169922	S4 SOIL	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169923	S5 SOIL	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169924	S6 SOIL	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169925	S7 SOIL	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169926	S8 SOIL	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169927	S9 SOIL	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169928	S10 SOIL	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169929	S11 SOIL	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169930	S12 SOIL	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169931	S13 SOIL	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169932	S14 SOIL	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169933	S15 SOIL	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169934	S16 SOIL	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169935	S17 SOIL	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169936	S18 SOIL	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169937	S19 SOIL	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169938	S20 SOIL	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169939	S1 LEACHATE	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169940	S2 LEACHATE	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169941	S3 LEACHATE	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169942	S4 LEACHATE	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169943	S5 LEACHATE	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169944	S6 LEACHATE	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169945	S7 LEACHATE	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169946	S8 LEACHATE	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169947	S9 LEACHATE	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169948	S10 LEACHATE	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169949	S11 LEACHATE	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169950	S12 LEACHATE	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169951	S13 LEACHATE	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169952	S14 LEACHATE	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169953	S15 LEACHATE	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169954	S16 LEACHATE	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169955	S17 LEACHATE	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169956	S18 LEACHATE	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169957	S19 LEACHATE	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		
1169958	S20 LEACHATE	08-05-17	GJ 250ml, GJ 60ml, PT 1L x2		

Key: G-Glass P-Plastic J-Jar T-Tub

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

Information in Support of the Analytical Results

Our Ref 17-99136-2
Client Ref 12032
Contract Herbert Road

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.
Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.
The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-
Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO4	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO4	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETSC2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

Certificate of Analysis

Certificate Number	17-04852-1	19-Jul-17
Client	Terra Firma (Wales) Ltd 5 Deryn Court Wharfdale Road Pentwyn Cardiff CF23 7HB	
Our Reference	17-04852-1	
Client Reference	12302	
Order No	12032NSI	
Contract Title	HERBERT ROAD	
Description	6 Soil samples, 6 Leachate samples.	
Date Received	10-Jul-17	
Date Started	10-Jul-17	
Date Completed	19-Jul-17	
Test Procedures	Identified by prefix DETSn (details on request).	
Notes	**This report supersedes 17-04852, extra testing.** Opinions and interpretations are outside the laboratory's scope of ISO 10725 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.	

Approved By [redacted]

Adam Fenwick
Contracts Manager

2139

Summary of Chemical Analysis
Matrix Descriptions

Our Ref 17-04852-1
Client Ref 12302
Contract Title HERBERT ROAD

Sample ID	Lab No	Completed	Matrix Description
S1	1201981	18/07/2017	Brown very clayey, sandy, CLAY (Made ground - brick, ceramic)
S2	1201982	18/07/2017	Brown very clayey, gravelly SAND (Made ground - brick, ceramic)
S3	1201983	18/07/2017	Brown clayey, sandy GRAVEL (Made ground - brick) (sample matrix outside MCERTS scope of accreditation)
S4	1201984	18/07/2017	Brown, clayey, gravelly and SAND including odd rootlets (Made ground - plastic, brick)
S5	1201985	18/07/2017	Brown clayey, sandy GRAVEL including odd rootlets (Made ground - brick) (sample matrix outside MCERTS scope of accreditation)
S6	1201986	18/07/2017	Brown, clayey, gravelly and SAND including odd rootlets (Made ground - brick, sponge)

Summary of Chemical Analysis
Soil Samples

Our Ref 17-04852-1
Client Ref 12302
Contract Title HERBERT ROAD

			Lab No	1201981	1201982	1201983	1201984	1201985	1201986
			Sample ID	S1	S2	S3	S4	S5	S6
			Depth						
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	07/07/17	07/07/17	07/07/17	07/07/17	07/07/17	07/07/17
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Preparation									
Moisture Content	DETSC 1004	0.1	%	3.3	5.0	6.4	6.1	3.9	2.4
Metals									
Antimony	DETSC 2301*	1	mg/kg	1.4	< 1.0	22	1.3	6.4	< 1.0
Arsenic	DETSC 2301#	0.2	mg/kg	6.6	6.2	7.3	8.3	5.3	5.1
Beryllium	DETSC 2301#	0.2	mg/kg	< 0.2	0.4	0.4	0.5	0.3	0.3
Boron, Water Soluble	DETSC 2123#	0.2	mg/kg	0.9	0.5	< 0.2	1.0	0.2	0.3
Cadmium	DETSC 2301#	0.1	mg/kg	0.2	0.4	0.7	0.4	0.2	0.2
Chromium	DETSC 2301#	0.15	mg/kg	24	22	18	14	16	34
Chromium III	DETSC 2301*	0.15	mg/kg	24	22	18	14	16	34
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	18	46	22	15	11	14
Lead	DETSC 2301#	0.3	mg/kg	21	270	2300	23	630	16
Manganese	DETSC 2301#	20	mg/kg	540	510	550	380	360	790
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	0.05	0.08	< 0.05	< 0.05	< 0.05
Molybdenum	DETSC 2301#	0.4	mg/kg	1.1	0.7	1.2	0.9	0.8	1.0
Nickel	DETSC 2301#	1	mg/kg	8.3	13	10	9.8	7.3	5.8
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	60	130	86	150	41	43
Inorganics									
pH	DETSC 2008#			12.5	11.6	12.1	11.3	12.2	12.4
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	0.2	< 0.1	< 0.1	< 0.1	< 0.1
Cyanide, Complex	DETSC 2130*	0.2	mg/kg	< 0.2	0.2	< 0.2	< 0.2	< 0.2	< 0.2
Organic matter	DETSC 2002#	0.1	%	0.9	2.1	2.4	1.5	1.6	1.0
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.35	0.65	0.74	2.2	1.1	0.45
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	1.5	< 1.5	< 1.5	2.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	4.0	5.4	1.6	< 1.2	5.6
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	16	25	8.0	2.0	9.1
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	7.1	440	190	100	56	120
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	< 3.4	150	54	37	25	52
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	460	220	110	60	130
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	1.2
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	2.0	1.5	2.5	< 0.5	2.0
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	2.3	4.2	4.4	< 0.6	4.0
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	61	38	30	< 1.4	26

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 17-04852-1
Client Ref 12302
Contract Title HERBERT ROAD

			Lab No	1201981	1201982	1201983	1201984	1201985	1201986
			Sample ID	S1	S2	S3	S4	S5	S6
			Depth						
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	07/07/17	07/07/17	07/07/17	07/07/17	07/07/17	07/07/17
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	< 1.4	19	11	6.1	< 1.4	6.0
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	66	44	37	< 10	34
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	< 10	520	260	150	60	170
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	0.37	0.25	< 0.03	0.10	0.22
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	0.07	0.04	< 0.03	0.04	0.07
Acenaphthene	DETSC 3303#	0.03	mg/kg	0.15	0.69	0.33	0.07	0.10	0.31
Fluorene	DETSC 3303	0.03	mg/kg	0.10	0.75	0.30	< 0.03	0.08	0.26
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.81	5.4	1.7	0.81	0.87	2.3
Anthracene	DETSC 3303	0.03	mg/kg	0.19	1.1	0.41	0.26	0.17	2.3
Fluoranthene	DETSC 3303#	0.03	mg/kg	1.0	5.9	1.9	1.5	0.97	2.9
Pyrene	DETSC 3303#	0.03	mg/kg	0.83	4.4	1.5	1.2	0.74	2.3
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.38	2.2	0.86	0.46	0.40	1.2
Chrysene	DETSC 3303	0.03	mg/kg	0.37	1.9	0.92	0.44	0.48	1.1
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.48	2.2	1.1	0.48	0.62	1.5
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.13	0.84	0.35	0.16	0.21	0.51
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.32	1.4	0.67	0.34	0.35	1.1
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.20	0.73	0.40	0.19	0.22	0.54
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	0.07	0.32	0.20	0.07	0.08	0.21
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.25	0.79	0.44	0.21	0.24	0.62
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	5.3	29	11	6.2	5.7	18
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 17-04852-1
Client Ref 12302
Contract Title HERBERT ROAD

			Lab No	1201987	1201988	1201989	1201990	1201991	1201992
			Sample ID	S1	S2	S3	S4	S5	S6
			Depth						
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	07/07/17	07/07/17	07/07/17	07/07/17	07/07/17	07/07/17
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Preparation									
Leachate 10:1	DETS 036*			Y	Y	Y	Y	Y	Y
NRA Leachate Preparation	DETS 036*			Y	Y	Y	Y	Y	Y
Metals									
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	1.1	0.96	1.2	0.85	0.45	0.44
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	4.9	4.7	7.7	6.9	13	8.1
Chromium III, Dissolved	DETSC 2302*	1	ug/l	2.9	< 1.0	5.6	4.7	6.1	6.3
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	12	11	3.7	2.5	4.0	4.0
Lead, Dissolved	DETSC 2306	0.09	ug/l	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Mercury, Dissolved	DETSC 2306	0.01	ug/l	0.02	0.01	0.01	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	0.8	0.9	< 0.5	0.8	0.9	0.8
Selenium, Dissolved	DETSC 2306	0.25	ug/l	1.1	1.1	0.86	0.72	0.56	0.53
Zinc, Dissolved	DETSC 2306	1.3	ug/l	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3
Inorganics									
pH	DETSC 2008			11.5	10.2	10.9	9.9	11.5	11.3
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	7.4	11	13	6.6	10	8.5
Fluoride	DETSC 2055	0.1	mg/l	< 0.10	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	12	93	91	190	120	52
Total Organic Carbon	DETSC 2033	2	mg/l	8.1	5.2	5.2	5.7	6.2	6.1
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	2.9	2.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	1.3	< 1.0	6.7	4.6	< 1.0	4.6
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	9.7	< 1.0	< 1.0	1.6
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	20	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	1.5	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	4.6	2.3	1.8	< 1.0	1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	3.1	4.1	3.3	< 1.0	1.6
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	20	3.4	2.1	9.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	29	10	< 10	10	< 10
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	< 10	30	30	15	10	10
PAHs									
Naphthalene	DETSC 3304	0.01	ug/l	0.20	0.28	0.19	0.02	0.14	0.33

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 17-04852-1
Client Ref 12302
Contract Title HERBERT ROAD

			Lab No	1201987	1201988	1201989	1201990	1201991	1201992
			Sample ID	S1	S2	S3	S4	S5	S6
			Depth						
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	07/07/17	07/07/17	07/07/17	07/07/17	07/07/17	07/07/17
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Acenaphthylene	DETSC 3304	0.01	ug/l	0.05	0.01	0.03	< 0.01	0.04	0.03
Acenaphthene	DETSC 3304	0.01	ug/l	0.32	0.07	0.11	< 0.01	0.05	0.11
Fluorene	DETSC 3304	0.01	ug/l	0.14	0.04	0.07	< 0.01	0.01	0.05
Phenanthrene	DETSC 3304	0.01	ug/l	0.70	0.06	0.07	0.04	0.06	0.13
Anthracene	DETSC 3304	0.01	ug/l	0.21	0.02	0.02	0.02	< 0.01	0.02
Fluoranthene	DETSC 3304	0.01	ug/l	0.95	0.03	0.03	0.04	0.02	0.06
Pyrene	DETSC 3304	0.01	ug/l	0.81	0.02	0.02	0.03	0.02	0.04
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	0.46	0.01	0.01	< 0.01	< 0.01	0.02
Chrysene	DETSC 3304	0.01	ug/l	0.48	0.01	< 0.01	< 0.01	< 0.01	0.02
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	0.64	< 0.01	< 0.01	< 0.01	< 0.01	0.02
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	0.25	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	0.54	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	0.42	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	0.09	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	0.42	< 0.01	< 0.01	< 0.01	< 0.01	0.02
PAH Total	DETSC 3304	0.04	ug/l	6.7	0.56	0.57	0.14	0.35	0.86
Phenols									
Phenol	*	0.5	ug/l	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 17-04852-1
Client Ref 12302
Contract Title HERBERT ROAD

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1201981	S1	SOIL	NAD	none	Paul Dunn
1201982	S2	SOIL	Chrysotile Amosite	Chrysotile and Amosite Present in Board Fragment within Soil	Paul Dunn
1201983	S3	SOIL	NAD	none	Paul Dunn
1201984	S4	SOIL	NAD	none	Bill French
1201985	S5	SOIL	NAD	none	Bill French
1201986	S6	SOIL	NAD	none	Bill French

Analysis was carried out at our Lanarkshire laboratory. DETS Newhouse Laboratory (BioCity Scotland, Room 1217, Block 41, Bo'Ness Road, Newhouse, Lanarkshire, ML1 5UH.) Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * -not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 17-04852-1
Client Ref 12302
Contract HERBERT ROAD

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1201981	S1 SOIL	07/07/17	GJ 250ml x2, GJ 60ml, PT 1L x2		
1201982	S2 SOIL	07/07/17	GJ 250ml x2, GJ 60ml, PT 1L x2		
1201983	S3 SOIL	07/07/17	GJ 250ml x2, GJ 60ml, PT 1L x2		
1201984	S4 SOIL	07/07/17	GJ 250ml x2, GJ 60ml, PT 1L x2		
1201985	S5 SOIL	07/07/17	GJ 250ml x2, GJ 60ml, PT 1L x2		
1201986	S6 SOIL	07/07/17	GJ 250ml x2, GJ 60ml, PT 1L x2		
1201987	S1 LEACHATE	07/07/17	GJ 250ml x2, GJ 60ml, PT 1L x2		
1201988	S2 LEACHATE	07/07/17	GJ 250ml x2, GJ 60ml, PT 1L x2		
1201989	S3 LEACHATE	07/07/17	GJ 250ml x2, GJ 60ml, PT 1L x2		
1201990	S4 LEACHATE	07/07/17	GJ 250ml x2, GJ 60ml, PT 1L x2		
1201991	S5 LEACHATE	07/07/17	GJ 250ml x2, GJ 60ml, PT 1L x2		
1201992	S6 LEACHATE	07/07/17	GJ 250ml x2, GJ 60ml, PT 1L x2		

Key: G-Glass P-Plastic J-Jar T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO4	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO4	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETSC2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

Certificate of Analysis

Certificate Number	17-07210
	11-Aug-17
Client	Terra Firma (Wales) Ltd 5 Deryn Court Wharfdale Road Pentwyn Cardiff CF23 7HB
Our Reference	17-07210
Client Reference	12032
Order No	12032NSI
Contract Title	H.Rd(Herbert Road)
Description	4 Soil samples, 4 Leachate samples.
Date Received	05-Aug-17
Date Started	05-Aug-17
Date Completed	11-Aug-17
Test Procedures	Identified by prefix DETSn (details on request).
Notes	Opinions and interpretations are outside the laboratory's scope of ISO 10725 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By [redacted]

Adam Fenwick
Contracts Manager

mCERTS
THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

UKAS TESTING
2139

Summary of Chemical Analysis
Matrix Descriptions

Our Ref 17-07210
Client Ref 12032
Contract Title H.Rd(Herbert Road)

Sample ID	Lab No	Completed	Matrix Description
S7	1214168	11/08/2017	Dark brown very clayey, gravelly SAND (Made ground - brick)
S8	1214169	11/08/2017	Dark brown very clayey, gravelly SAND including odd rootlets (Possible made ground - brick)
S9	1214170	11/08/2017	Dark brown very clayey, gravelly SAND (Possible made ground - brick)
S10	1214171	11/08/2017	Dark brown very clayey, gravelly SAND (Possible made ground - brick)

Summary of Chemical Analysis
Soil Samples

Our Ref 17-07210
Client Ref 12032
Contract Title H.Rd(Herbert Road)

			Lab No	1214168	1214169	1214170	1214171
			Sample ID	S7	S8	S9	S10
			Depth				
			Other ID				
			Sample Type	SOIL	SOIL	SOIL	SOIL
			Sampling Date	04/08/17	04/08/17	04/08/17	04/08/17
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Preparation							
Moisture Content	DETSC 1004	0.1	%	13	12	13	11
Metals							
Antimony	DETSC 2301*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0
Arsenic	DETSC 2301#	0.2	mg/kg	4.4	22	3.7	5.2
Beryllium	DETSC 2301#	0.2	mg/kg	< 0.2	0.2	0.2	< 0.2
Boron, Water Soluble	DETSC 2123#	0.2	mg/kg	1.1	1.7	0.8	0.8
Cadmium	DETSC 2301#	0.1	mg/kg	0.2	0.3	0.2	0.2
Chromium	DETSC 2301#	0.15	mg/kg	12	13	10	12
Chromium III	DETSC 2301*	0.15	mg/kg	12	13	10	12
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	10	12	12	9.6
Lead	DETSC 2301#	0.3	mg/kg	14	23	14	14
Manganese	DETSC 2301#	20	mg/kg	300	330	280	420
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Molybdenum	DETSC 2301#	0.4	mg/kg	0.7	0.8	0.6	0.7
Nickel	DETSC 2301#	1	mg/kg	5.9	6.7	6.1	6.2
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	32	43	40	46
Inorganics							
pH	DETSC 2008#			12.2	11.8	11.9	12.1
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Cyanide, Complex	DETSC 2130*	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Organic matter	DETSC 2002#	0.1	%	0.9	2.1	0.9	1.0
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.25	0.39	0.23	0.28
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	2.0	1.7	2.3	3.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	7.6	14	13	9.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	37	230	220	45
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	23	120	130	15
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	47	250	230	58
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	5.4
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	0.9	85
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	36	41	270

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 17-07210
Client Ref 12032
Contract Title H.Rd(Herbert Road)

			Lab No	1214168	1214169	1214170	1214171
			Sample ID	S7	S8	S9	S10
			Depth				
			Other ID				
			Sample Type	SOIL	SOIL	SOIL	SOIL
			Sampling Date	04/08/17	04/08/17	04/08/17	04/08/17
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	< 1.4	8.2	9.0	13
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	37	42	360
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	47	280	270	420
PAHs							
Naphthalene	DETSC 3303#	0.03	mg/kg	0.13	0.06	0.10	0.07
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	0.11	0.08	0.18	0.10
Fluorene	DETSC 3303	0.03	mg/kg	0.10	0.07	0.14	0.10
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.69	0.50	1.2	0.58
Anthracene	DETSC 3303	0.03	mg/kg	0.18	0.16	0.35	0.15
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.82	1.0	1.9	0.90
Pyrene	DETSC 3303#	0.03	mg/kg	0.67	0.77	1.5	0.65
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.36	0.49	0.80	0.51
Chrysene	DETSC 3303	0.03	mg/kg	0.32	0.49	0.80	0.49
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.50	0.67	1.1	0.70
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.17	0.24	0.34	0.23
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.32	0.40	0.66	0.40
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.20	0.34	0.22
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	0.07	0.11	0.07
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	0.24	0.40	0.23
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	4.4	5.4	9.9	5.4
Phenols							
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 17-07210
Client Ref 12032
Contract Title H.Rd(Herbert Road)

			Lab No	1214172	1214173	1214174	1214175
			Sample ID	S7	S8	S9	S10
			Depth				
			Other ID				
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	04/08/17	04/08/17	04/08/17	04/08/17
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Preparation							
Leachate 10:1	DETS 036*			Y	Y	Y	Y
Metals							
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	0.64	0.85	0.61	0.47
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	5.3	4.0	4.3	5.1
Chromium III, Dissolved	DETSC 2302*	1	ug/l	5.3	4.0	4.3	5.1
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.6	2.0	2.1	5.5
Lead, Dissolved	DETSC 2306	0.09	ug/l	< 0.09	< 0.09	< 0.09	< 0.09
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	0.01	0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	< 0.5	0.5	1.1
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.88	0.74	0.48	0.99
Zinc, Dissolved	DETSC 2306	1.3	ug/l	< 1.3	< 1.3	< 1.3	< 1.3
Inorganics							
pH	DETSC 2008			11.2	10.5	11.1	11.4
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40
Chloride	DETSC 2055	0.1	mg/l	4.4	5.5	6.8	7.9
Fluoride	DETSC 2055	0.1	mg/l	< 0.10	< 0.10	< 0.10	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	16	25	18	14
Total Organic Carbon	DETSC 2085	1	mg/l	3.1	4.0	3.3	4.6
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	1.5	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	1.4	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	29	17
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	32	17
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	1.0	5.9
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	60	64
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	62	70
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	< 10	< 10	94	87
PAHs							
Naphthalene	DETSC 3304	0.01	ug/l	0.04	0.02	0.04	0.10
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.01	< 0.01

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 17-07210
Client Ref 12032
Contract Title H.Rd(Herbert Road)

			Lab No	1214172	1214173	1214174	1214175
			Sample ID	S7	S8	S9	S10
			Depth				
			Other ID				
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	04/08/17	04/08/17	04/08/17	04/08/17
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Acenaphthene	DETSC 3304	0.01	ug/l	0.03	0.03	0.05	0.07
Fluorene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.02	0.02
Phenanthrene	DETSC 3304	0.01	ug/l	0.02	0.03	0.02	0.03
Anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	0.02	0.01	0.02
Pyrene	DETSC 3304	0.01	ug/l	< 0.01	0.02	0.01	0.01
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	0.02	< 0.01	0.01
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	< 0.01	0.01	< 0.01	0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	< 0.01	0.01	< 0.01	0.01
PAH Total	DETSC 3304	0.04	ug/l	0.09	0.16	0.16	0.31
Phenols							
Phenol	*	0.5	ug/l	< 0.50	< 0.50	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 17-07210
Client Ref 12032
Contract Title H.Rd(Herbert Road)

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1214168	S7	SOIL	NAD	none	Colin Patrick
1214169	S8	SOIL	NAD	none	Colin Patrick
1214170	S9	SOIL	NAD	none	Colin Patrick
1214171	S10	SOIL	NAD	none	Colin Patrick

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 17-07210
Client Ref 12032
Contract H.Rd(Herbert Road)

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1214168	S7 SOIL	04/08/17	GJ 250ml x2, GJ 60ml, PT 1L x3		
1214169	S8 SOIL	04/08/17	GJ 250ml x2, GJ 60ml, PT 1L x3		
1214170	S9 SOIL	04/08/17	GJ 250ml x2, GJ 60ml, PT 1L x3		
1214171	S10 SOIL	04/08/17	GJ 250ml x2, GJ 60ml, PT 1L x3		
1214172	S7 LEACHATE	04/08/17	GJ 250ml x2, GJ 60ml, PT 1L x3		
1214173	S8 LEACHATE	04/08/17	GJ 250ml x2, GJ 60ml, PT 1L x3		
1214174	S9 LEACHATE	04/08/17	GJ 250ml x2, GJ 60ml, PT 1L x3		
1214175	S10 LEACHATE	04/08/17	GJ 250ml x2, GJ 60ml, PT 1L x3		

Key: G-Glass P-Plastic J-Jar T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO4	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO4	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETSC2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

Annex B
Remedial Targets Methodology
Calculation Sheets

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions)

Details to be completed for each assessment				
Site Name:	Herbert Road - Neal Soils			
Site Address:				
Completed by:	Ruth Howells			
Date:	19.05.2017		Version:	1
Contaminant	Cu			
Target Concentration (C_T)	0.005928	mg/l	Origin of C_T:	Water Framework Directive

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

User specified value for partition coefficient

Contaminant		**Cu**		
Target concentration	C_T	**0.005928**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_W	4.70E-01	fraction	SR3
Air filled soil porosity	θa	1.20E-01	fraction	SR3
Bulk density of soil zone material	ρ	2.09E+00	g/cm^3	SR3
Henry's Law constant	H		dimensionless	
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd	1.50E+02	l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc		fraction	Soil Laboratory Chemical Testing
Organic carbon partition coefficient	Koc		l/kg	*EA 2003*
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Soil water partition coefficient used in Level Assessment	**Kd**	**1.50E+02**	**l/kg**	*Specified value*

Level 1 Remedial Target

Level 1 Remedial Target	**8.91E-01**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.005928	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Cu**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	**C_T**	**0.005928** **mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	1.79E-03	m/d	**met office - cardiff monitoring station**	
Area of contaminant source	A	1.80E+04	m^2		Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.50E+02	m	**Minimum value**	
Saturated aquifer thickness	da	5.00E-01	m	**0.5m assumed of 3.8m made ground thickness**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	8.64E-02	m/d	**Primarily well compacted clay soil**	
Hydraulic gradient of water table	i	6.25E-04	fraction	**10cm over 100m (assumed)**	
Width of contaminant source perpendicular to groundwater flow	w	1.20E+02	m		Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**Unknown**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Specify**			
Enter mixing zone thickness	Mz	5.00E-01	m		
Calculated mixing zone thickness	Mz		m		

Calculated Parameters

Dilution Factor	**DF**	**1.00E+00**		
Level 2 Remedial Target		**5.93E-03**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentrati**
		or		
		8.91E-01	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	7.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		7.00E+00	mg/l	0

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Environment Agency

Input Parameters

Variable	Value	Unit	Source
Contaminant	Cu		from Level 1
Target Concentration C_T	0.005928	mg/l	from Level 1
Dilution Factor DF	1.00E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to pollutants in all phases (e.g. field derived value,)

Variable	Value	Unit	Source of parameter value
Enter source concentration	Soil leachate concentration as mg/l		
Enter soil leachate concentration	0.0063	mg/l	
Half life for degradation of contaminant in water $t_{1/2}$	9.90E+100	days	*Surampalli et al*
Calculated decay rate λ	7.00E-102	$days^{-1}$	calculated
Width of plume in aquifer at source Sz	1.20E+02	m	from Level 2
Plume thickness in aquifer at source Sy	5.00E-01	m	from Level 2
Bulk density of aquifer materials ρ	2.09E+00	g/cm^3	*Geotech Testing*
Effective porosity of aquifer n	5.90E-01	fraction	*SR3*
Hydraulic gradient i	6.22E+00	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer K	8.64E-02	m/d	from Level 2
Distance to compliance point x	1.00E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction z		m	
Distance (depth) to compliance point perpendicular to flow direction y		m	
Time since pollutant entered groundwater t	1.00E+99	days	*time variant options only*
Parameters values determined from options			
Partition coefficient Kd	1.50E+02	l/kg	*see options*
Longitudinal dispersivity ax	1.000	m	*see options*
Transverse dispersivity az	0.100	m	*see options*
Vertical dispersivity ay	0.010	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters

Variable		
Groundwater flow velocity v	9.10E-01	m/d
Retardation factor Rf	5.32E+02	fraction
Decay rate used λ	7.00E-102	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient i	6.22E+00	fraction
Rate of contaminant flow due to retardation u	1.71E-03	m/d
Ratio of Compliance Point to Source Concentration C_{ED}/C_0	7.36E-01	fraction
Attenuation factor (C_0/C_{ED}) AF	**1.36E+00**	**fraction**
Soil leachate concentration Co	6.30E-03	

Remedial Targets

Level 3 Remedial Target	**8.05E-03**	**mg/l**	For comparison with measured pore water concentration.
Ogata Banks	**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
	1.21E+00	**mg/kg**	For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Distance to compliance point	**10**	**m**	
Ratio of Compliance Point to Source Concentration C_{ED}/C_0	**7.36E-01**	**fraction**	Ogata Banks

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

User specified value for partition coefficient

Entry if specify partition coefficient (option)

Soil water partition coefficient Kd 1.50E+02 l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer foc — fraction
Organic carbon partition coefficient Koc 1.40E+01 l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species $K_{oc,n}$ — l/kg
Sorption coefficient for ionised species $K_{oc,i}$ — l/kg
pH value pH
Acid dissociation constant pKa
Fraction of organic carbon in aquifer foc — fraction

Soil water partition coefficient Kd 1.50E+02 l/kg

Define dispersivity (click brown cell and use pull down list)

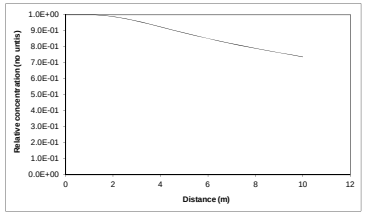
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	1.00E+00	8.30E-01	m
Transverse dispersivity	**az**	0.00E+00	1.00E-01	8.30E-02	m
Vertical dispersivity	**ay**	0.00E+00	1.00E-02	8.30E-03	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	6.30E-03
0.5	1.00E+00	6.30E-03
1.0	1.00E+00	6.30E-03
1.5	9.96E-01	6.27E-03
2.0	9.88E-01	6.22E-03
2.5	9.75E-01	6.14E-03
3.0	9.59E-01	6.04E-03
3.5	9.41E-01	5.93E-03
4.0	9.23E-01	5.81E-03
4.5	9.04E-01	5.70E-03
5.0	8.86E-01	5.58E-03
5.5	8.68E-01	5.47E-03
6.0	8.51E-01	5.36E-03
6.5	8.34E-01	5.26E-03
7.0	8.19E-01	5.16E-03
7.5	8.03E-01	5.06E-03
8.0	7.89E-01	4.97E-03
8.5	7.75E-01	4.88E-03
9.0	7.61E-01	4.80E-03
9.5	7.49E-01	4.72E-03
10.0	7.36E-01	4.64E-03

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions)

Details to be completed for each assessment				
Site Name:	Herbert Road - Neal Soils			
Site Address:				
Completed by:	Ruth Howells			
Date:	19.05.2017		Version:	1
Contaminant	Ali C16 - C21			
Target Concentration (C_T)	0.01	mg/l	Origin of C_T:	Water Framework Directive

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Ali C16 - C21**	
Target concentration	C_T	**0.01**	**mg/l**

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_W	4.70E-01	fraction	SR3
Air filled soil porosity	θa	1.20E-01	fraction	SR3
Bulk density of soil zone material	ρ	2.09E+00	g/cm^3	SR3
Henry's Law constant	H	8.50E+01	dimensionless	*TPHCWG*
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	7.80E-03	fraction	Soil Laboratory Chemical Testing
Organic carbon partition coefficient	Koc	6.39E+07	l/kg	*TPHCWG*
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**4.98E+05**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**4.98E+03**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.01	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Ali C16 - C21**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	**C_T**	**0.01** **mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	1.79E-03	m/d	**met office - cardiff monitoring station**	
Area of contaminant source	A	1.80E+04	m^2		Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.50E+02	m	**Minimum value**	
Saturated aquifer thickness	da	5.00E-01	m	**0.5m assumed of 3.8m made ground thickness**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	8.64E-02	m/d	**Primarily well compacted clay soil**	
Hydraulic gradient of water table	i	6.25E-04	fraction	**10cm over 100m (assumed)**	
Width of contaminant source perpendicular to groundwater flow	w	1.20E+02	m		Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**Unknown**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Specify**			
Enter mixing zone thickness	Mz	5.00E-01	m		
Calculated mixing zone thickness	Mz		m		

Calculated Parameters

Dilution Factor	**DF**	**1.00E+00**		
Level 2 Remedial Target		**1.00E-02**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentrati**
		or		
		4.98E+03	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	7.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		7.00E+00	mg/l	0

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Input Parameters	Variable	Value	Unit	Source
Contaminant		Ali C16 - C21		from Level 1
Target Concentration	C_T	0.01	mg/l	from Level 1
Dilution Factor	DF	1.00E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to pollutants in all phases (e.g. field derived value, t

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil leachate concentration as mg/l		
Enter soil leachate concentration		0.0011	mg/l	
Half life for degradation of contaminant in water	$t_{1/2}$	9.15E+03	days	*Canada Guideline and Correction Factor*
Calculated decay rate	λ	7.58E-05	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	1.20E+02	m	from Level 2
Plume thickness in aquifer at source	Sy	5.00E-01	m	from Level 2
Bulk density of aquifer materials	ρ	2.09E+00	g/cm^3	*Geotech Testing*
Effective porosity of aquifer	n	5.90E-01	fraction	*SR3*
Hydraulic gradient	i	6.22E+00	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	8.64E-02	m/d	from Level 2
Distance to compliance point	x	1.00E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	4.98E+05	l/kg	*see options*
Longitudinal dispersivity	ax	1.000	m	*see options*
Transverse dispersivity	az	0.100	m	*see options*
Vertical dispersivity	ay	0.010	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters	Variable		
Groundwater flow velocity	v	9.10E-01	m/d
Retardation factor	Rf	1.77E+06	fraction
Decay rate used	λ	7.58E-05	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	6.22E+00	fraction
Rate of contaminant flow due to retardation	u	5.16E-07	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	2.24E-51	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**4.47E+50**	**fraction**
Soil leachate concentration	Co	1.10E-03	

Remedial Targets

Level 3 Remedial Target	**4.47E+48**	**mg/l**	For comparison with measured pore water concentration.
Ogata Banks	**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
	2.23E+54	**mg/kg**	For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Distance to compliance point	**10**	**m**	
Ratio of Compliance Point to Source Concentration	**2.24E-51**	**fraction**	Ogata Banks

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	7.80E-03	fraction
Organic carbon partition coefficient	Koc	6.39E+07	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	4.98E+05	l/kg

Define dispersivity (click brown cell and use pull down list)

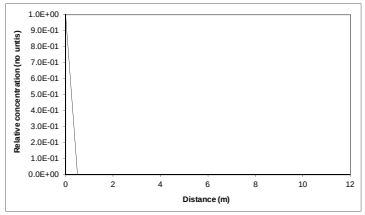
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	1.00E+00	8.30E-01	m
Transverse dispersivity	**az**	0.00E+00	1.00E-01	8.30E-02	m
Vertical dispersivity	**ay**	0.00E+00	1.00E-02	8.30E-03	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	1.10E-03
0.5	2.98E-03	3.28E-06
1.0	8.87E-06	9.76E-09
1.5	2.63E-08	2.90E-11
2.0	7.78E-11	8.56E-14
2.5	2.29E-13	2.52E-16
3.0	6.71E-16	7.38E-19
3.5	1.96E-18	2.16E-21
4.0	5.73E-21	6.30E-24
4.5	1.67E-23	1.84E-26
5.0	4.89E-26	5.37E-29
5.5	1.43E-28	1.57E-31
6.0	4.17E-31	4.58E-34
6.5	1.22E-33	1.34E-36
7.0	3.56E-36	3.91E-39
7.5	1.04E-38	1.14E-41
8.0	3.04E-41	3.35E-44
8.5	8.90E-44	9.79E-47
9.0	2.61E-46	2.87E-49
9.5	7.64E-49	8.40E-52
10.0	2.24E-51	2.46E-54

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

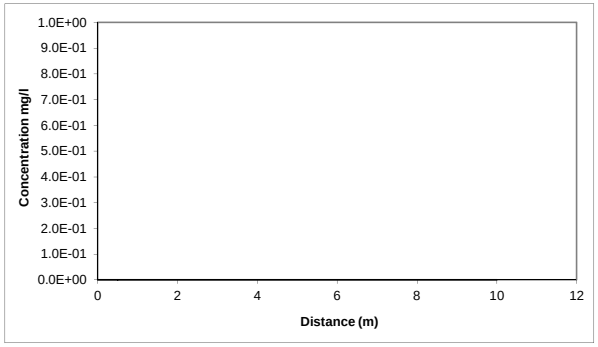
Only input required is Soil Contaminant Concentration

	Input Parameters			
	Soil contaminant concentration	C_0	0.00E+00	mg/kg
Level 1 Parameters				
	Water filled soil porosity	θ_w	4.70E-01	fraction
	Air filled soil porosity	θa	1.20E-01	fraction
	Bulk density	ρ	2.09E+00	g/cm^3
	Henry's Law constant	H	8.50E+01	dimensionless
	Soil water partition coefficient used in Level Assessment	Kd	4.98E+05	l/kg
	Factor (partitioning between soil and water)		4.98E+05	dimensionless
Level 2 Parameters	**Dilution Factor**	DF	1.00E+00	
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	4.47E+50	

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
0.50	0.00E+00
1.00	0.00E+00
1.50	0.00E+00
2.00	0.00E+00
2.50	0.00E+00
3.00	0.00E+00
3.50	0.00E+00
4.00	0.00E+00
4.50	0.00E+00
5.00	0.00E+00
5.50	0.00E+00
6.00	0.00E+00
6.50	0.00E+00
7.00	0.00E+00
7.50	0.00E+00
8.00	0.00E+00
8.50	0.00E+00
9.00	0.00E+00
9.50	0.00E+00
10.00	0.00E+00

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions)

Details to be completed for each assessment				
Site Name:	Herbert Road - Neal Soils			
Site Address:				
Completed by:	Ruth Howells			
Date:	19.05.2017		Version:	1
Contaminant	Ali C21 - C35			
Target Concentration (C_T)	0.01	mg/l	Origin of C_T:	Water Framework Directive

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Ali C21 - C35**		
Target concentration	C_T	**0.01**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_W	4.70E-01	fraction	SR3
Air filled soil porosity	θa	1.20E-01	fraction	SR3
Bulk density of soil zone material	ρ	2.09E+00	g/cm^3	SR3
Henry's Law constant	H	9.15E+03	dimensionless	*TPHCWG*
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	7.80E-03	fraction	Soil Laboratory Chemical Testing
Organic carbon partition coefficient	Koc	2.54E+09	l/kg	*TPHCWG*
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**1.98E+07**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**1.98E+05**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.01	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Ali C21 - C35**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	**C_T**	**0.01** **mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	1.79E-03	m/d	**met office - cardiff monitoring station**	
Area of contaminant source	A	1.80E+04	m^2		Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.50E+02	m	**Minimum value**	
Saturated aquifer thickness	da	5.00E-01	m	**0.5m assumed of 3.8m made ground thickness**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	8.64E-02	m/d	**Primarily well compacted clay soil**	
Hydraulic gradient of water table	i	6.25E-04	fraction	**10cm over 100m (assumed)**	
Width of contaminant source perpendicular to groundwater flow	w	1.20E+02	m		Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**Unknown**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Specify**			
Enter mixing zone thickness	Mz	5.00E-01	m		
Calculated mixing zone thickness	Mz		m		

Calculated Parameters

Dilution Factor	**DF**	**1.00E+00**		
Level 2 Remedial Target		**1.00E-02**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentrati**
		or		
		1.98E+05	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	7.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		7.00E+00	mg/l	0

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Environment Agency

Input Parameters

Input Parameters	Variable	Value	Unit	Source
Contaminant		Ali C21 - C35		from Level 1
Target Concentration	C_T	0.01	mg/l	from Level 1
Dilution Factor	DF	1.00E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to pollutants in all phases (e.g. field derived value, l

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil leachate concentration as mg/l		
Enter soil leachate concentration		0.0011	mg/l	
Half life for degradation of contaminant in water	$t_{1/2}$	9.15E+03	days	*Canada Guideline and Correction Factor*
Calculated decay rate	λ	7.58E-05	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	1.20E+02	m	from Level 2
Plume thickness in aquifer at source	Sy	5.00E-01	m	from Level 2
Bulk density of aquifer materials	ρ	2.09E+00	g/cm^3	*Geotech Testing*
Effective porosity of aquifer	n	5.90E-01	fraction	*SR3*
Hydraulic gradient	i	6.22E+00	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	8.64E-02	m/d	from Level 2
Distance to compliance point	x	1.00E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	1.98E+07	l/kg	*see options*
Longitudinal dispersivity	ax	1.000	m	*see options*
Transverse dispersivity	az	0.100	m	*see options*
Vertical dispersivity	ay	0.010	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters

Calculated Parameters	Variable		
Groundwater flow velocity	v	9.10E-01	m/d
Retardation factor	Rf	7.02E+07	fraction
Decay rate used	λ	7.58E-05	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	6.22E+00	fraction
Rate of contaminant flow due to retardation	u	1.30E-08	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	0.00E+00	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**>breakthrough at co**	**fraction**
Soil leachate concentration	Co	1.10E-03	

Remedial Targets

Level 3 Remedial Target		**No impact**	**mg/l**	For comparison with measured pore water concentration.
Ogata Banks		**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
		No impact	**mg/kg**	For comparison with measured soil concentration. This
Distance to compliance point		**10**	**m**	assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	**0.00E+00**	**fraction**	Ogata Banks

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	7.80E-03	fraction
Organic carbon partition coefficient	Koc	2.54E+09	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	1.98E+07	l/kg

Define dispersivity (click brown cell and use pull down list)

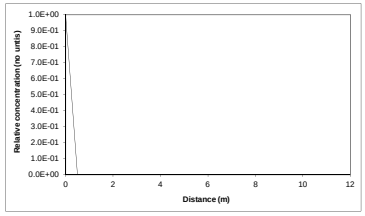
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	1.00E+00	8.30E-01	m
Transverse dispersivity	**az**	0.00E+00	1.00E-01	8.30E-02	m
Vertical dispersivity	**ay**	0.00E+00	1.00E-02	8.30E-03	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	1.10E-03
0.5	3.26E-17	3.58E-20
1.0	1.06E-33	1.17E-36
1.5	3.44E-50	3.79E-53
2.0	1.11E-66	1.22E-69
2.5	3.58E-83	3.93E-86
3.0	1.15E-99	1.26E-102
3.5	3.67E-116	4.03E-119
4.0	1.17E-132	1.29E-135
4.5	3.74E-149	4.11E-152
5.0	1.19E-165	1.31E-168
5.5	3.81E-182	4.19E-185
6.0	1.22E-198	1.34E-201
6.5	3.89E-215	4.27E-218
7.0	1.24E-231	1.37E-234
7.5	3.97E-248	4.37E-251
8.0	1.27E-264	1.40E-267
8.5	4.06E-281	4.47E-284
9.0	1.30E-297	1.43E-300
9.5	0.00E+00	0.00E+00
10.0	0.00E+00	0.00E+00

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

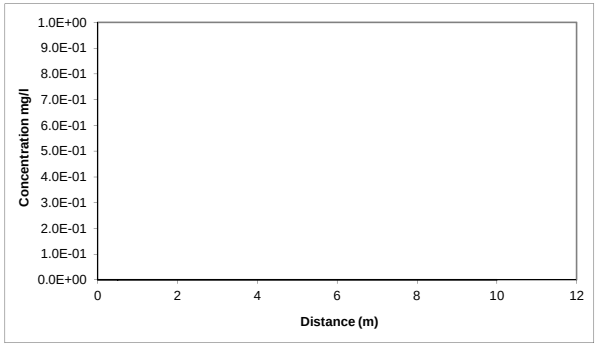
Only input required is Soil Contaminant Concentration

	Input Parameters			
	Soil contaminant concentration	C_0	0.00E+00	mg/kg
Level 1 Parameters				
	Water filled soil porosity	θ_w	4.70E-01	fraction
	Air filled soil porosity	θa	1.20E-01	fraction
	Bulk density	ρ	2.09E+00	g/cm^3
	Henry's Law constant	H	9.15E+03	dimensionless
	Soil water partition coefficient used in Level Assessment	Kd	1.98E+07	l/kg
	Factor (partitioning between soil and water)		1.98E+07	dimensionless
Level 2 Parameters	**Dilution Factor**	DF	1.00E+00	
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	eakthrough at	compliance point

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	#VALUE!	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
0.50	0.00E+00
1.00	0.00E+00
1.50	0.00E+00
2.00	0.00E+00
2.50	0.00E+00
3.00	0.00E+00
3.50	0.00E+00
4.00	0.00E+00
4.50	0.00E+00
5.00	0.00E+00
5.50	0.00E+00
6.00	0.00E+00
6.50	0.00E+00
7.00	0.00E+00
7.50	0.00E+00
8.00	0.00E+00
8.50	0.00E+00
9.00	0.00E+00
9.50	0.00E+00
10.00	0.00E+00

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions)

Details to be completed for each assessment				
Site Name:	Herbert Road - Neal Soils			
Site Address:				
Completed by:	Ruth Howells			
Date:	19.05.2017		Version:	1
Contaminant	Anthracene			
Target Concentration (C_T)	0.0001	mg/l	Origin of C_T:	Water Framework Directive

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Anthracene**		
Target concentration	C_T	**0.0001**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_W	4.70E-01	fraction	SR3
Air filled soil porosity	θa	1.20E-01	fraction	SR3
Bulk density of soil zone material	ρ	2.09E+00	g/cm^3	SR3
Henry's Law constant	H	1.60E-03	dimensionless	*EA 2003*
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	1.50E-02	fraction	Soil Laboratory Chemical Testing
Organic carbon partition coefficient	Koc	2.95E+04	l/kg	*EA 2003*
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	

Soil water partition coefficient used in Level Assessment	**Kd**	**4.43E+02**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**4.43E-02**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.0001	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Anthracene**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	C_T	**0.0001** mg/l	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	Variable	Value	Unit	Source of parameter value	
Standard entry					
Infiltration	Inf	1.79E-03	m/d	**met office - cardiff monitoring station**	
Area of contaminant source	A	1.80E+04	m^2		Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.50E+02	m	**Minimum value**	
Saturated aquifer thickness	da	5.00E-01	m	**0.5m assumed of 3.8m made ground thickness**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	8.64E-02	m/d	**Primarily well compacted clay soil**	
Hydraulic gradient of water table	i	6.25E-04	fraction	**10cm over 100m (assumed)**	
Width of contaminant source perpendicular to groundwater flow	w	1.20E+02	m		Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**Unknown**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Specify**			
Enter mixing zone thickness	Mz	5.00E-01	m		
Calculated mixing zone thickness	Mz		m		

Calculated Parameters

Dilution Factor	**DF**	**1.00E+00**		
Level 2 Remedial Target		**1.00E-04**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentrati**
		or		
		4.43E-02	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	7.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		7.00E+00	mg/l	0

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Input Parameters	Variable	Value	Unit	Source
Contaminant		Anthracene		from Level 1
Target Concentration	C_T	0.0001	mg/l	from Level 1
Dilution Factor	DF	1.00E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to pollutants in all phases (e.g. field derived value,)

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil leachate concentration as mg/l		
Enter soil leachate concentration		0.00016	mg/l	
Half life for degradation of contaminant in water	$t_{1/2}$	3.65E+03	days	*Surampalli et al*
Calculated decay rate	λ	1.90E-04	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	1.20E+02	m	from Level 2
Plume thickness in aquifer at source	Sy	5.00E-01	m	from Level 2
Bulk density of aquifer materials	ρ	2.09E+00	g/cm^3	*Geotech Testing*
Effective porosity of aquifer	n	5.90E-01	fraction	*SR3*
Hydraulic gradient	i	6.22E+00	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	8.64E-02	m/d	from Level 2
Distance to compliance point	x	1.00E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	2.30E+02	l/kg	*see options*
Longitudinal dispersivity	ax	1.000	m	*see options*
Transverse dispersivity	az	0.100	m	*see options*
Vertical dispersivity	ay	0.010	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters	Variable		
Groundwater flow velocity	v	9.10E-01	m/d
Retardation factor	Rf	8.16E+02	fraction
Decay rate used	λ	1.90E-04	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	6.22E+00	fraction
Rate of contaminant flow due to retardation	u	1.11E-03	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	1.67E-01	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**5.98E+00**	**fraction**
Soil leachate concentration	Co	1.60E-04	

Remedial Targets

Level 3 Remedial Target		**5.99E-04**	**mg/l**	For comparison with measured pore water concentration.
Ogata Banks		**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
		2.65E-01	**mg/kg**	For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Distance to compliance point		**10**	**m**	
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	**1.67E-01**	**fraction**	Ogata Banks

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	7.80E-03	fraction
Organic carbon partition coefficient	Koc	2.95E+04	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	2.30E+02	l/kg

Define dispersivity (click brown cell and use pull down list)

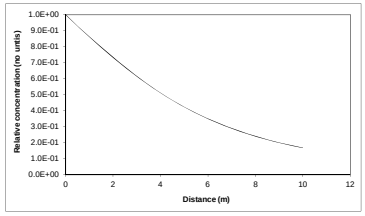
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	1.00E+00	8.30E-01	m
Transverse dispersivity	**az**	0.00E+00	1.00E-01	8.30E-02	m
Vertical dispersivity	**ay**	0.00E+00	1.00E-02	8.30E-03	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	1.60E-04
0.5	9.29E-01	1.49E-04
1.0	8.62E-01	1.38E-04
1.5	7.97E-01	1.28E-04
2.0	7.34E-01	1.17E-04
2.5	6.73E-01	1.08E-04
3.0	6.14E-01	9.83E-05
3.5	5.60E-01	8.96E-05
4.0	5.10E-01	8.16E-05
4.5	4.64E-01	7.42E-05
5.0	4.22E-01	6.75E-05
5.5	3.84E-01	6.14E-05
6.0	3.50E-01	5.59E-05
6.5	3.18E-01	5.09E-05
7.0	2.90E-01	4.64E-05
7.5	2.64E-01	4.22E-05
8.0	2.41E-01	3.85E-05
8.5	2.20E-01	3.51E-05
9.0	2.00E-01	3.21E-05
9.5	1.83E-01	2.93E-05
10.0	1.67E-01	2.67E-05

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

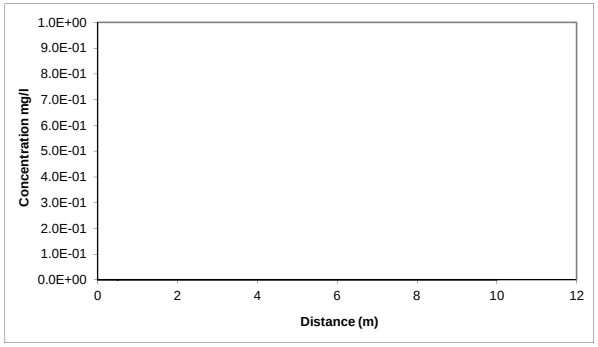
Only input required is Soil Contaminant Concentration

	Input Parameters			
	Soil contaminant concentration	C_0	0.00E+00	mg/kg
Level 1 Parameters				
	Water filled soil porosity	θ_w	4.70E-01	fraction
	Air filled soil porosity	θa	1.20E-01	fraction
	Bulk density	ρ	2.09E+00	g/cm^3
	Henry's Law constant	H	1.60E-03	dimensionless
	Soil water partition coefficient used in Level Assessment	Kd	4.43E+02	l/kg
	Factor (partitioning between soil and water)		4.43E+02	dimensionless
Level 2 Parameters	**Dilution Factor**	DF	1.00E+00	
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	5.98E+00	

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
0.50	0.00E+00
1.00	0.00E+00
1.50	0.00E+00
2.00	0.00E+00
2.50	0.00E+00
3.00	0.00E+00
3.50	0.00E+00
4.00	0.00E+00
4.50	0.00E+00
5.00	0.00E+00
5.50	0.00E+00
6.00	0.00E+00
6.50	0.00E+00
7.00	0.00E+00
7.50	0.00E+00
8.00	0.00E+00
8.50	0.00E+00
9.00	0.00E+00
9.50	0.00E+00
10.00	0.00E+00

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions)

Details to be completed for each assessment				
Site Name:	Herbert Road - Neal Soils			
Site Address:				
Completed by:	Ruth Howells			
Date:	19.05.2017		Version:	1
Contaminant	Aro C21 - C35			
Target Concentration (C_T)	0.01	mg/l	Origin of C_T:	Water Framework Directive

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Aro C21 - C35**		
Target concentration	C_T	**0.01**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_W	4.70E-01	fraction	SR3
Air filled soil porosity	θa	1.20E-01	fraction	SR3
Bulk density of soil zone material	ρ	2.09E+00	g/cm^3	SR3
Henry's Law constant	H	1.70E-05	dimensionless	*TPHCWG*
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	7.80E-03	fraction	Soil Laboratory Chemical Testing
Organic carbon partition coefficient	Koc	1.26E+05	l/kg	*TPHCWG*
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**9.83E+02**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**9.83E+00**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.01	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Aro C21 - C35**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	**C_T**	**0.01** **mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	1.79E-03	m/d	**met office - cardiff monitoring station**	
Area of contaminant source	A	1.80E+04	m^2		Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.50E+02	m	**Minimum value**	
Saturated aquifer thickness	da	5.00E-01	m	**0.5m assumed of 3.8m made ground thickness**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	8.64E-02	m/d	**Primarily well compacted clay soil**	
Hydraulic gradient of water table	i	6.25E-04	fraction	**10cm over 100m (assumed)**	
Width of contaminant source perpendicular to groundwater flow	w	1.20E+02	m		Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**Unknown**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Specify**			
Enter mixing zone thickness	Mz	5.00E-01	m		
Calculated mixing zone thickness	Mz		m		

Calculated Parameters

Dilution Factor	**DF**	**1.00E+00**		
Level 2 Remedial Target		**1.00E-02**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentrati**
		or		
		9.83E+00	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	7.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		7.00E+00	mg/l	0

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Environment Agency

Input Parameters

Variable	Value	Unit	Source
Contaminant	Aro C21 - C35		from Level 1
Target Concentration	C_T 0.01	mg/l	from Level 1
Dilution Factor	DF 1.00E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: **Apply degradation rate to pollutants in all phases (e.g. field derived value, l**

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil leachate concentration as mg/l		
Enter soil leachate concentration		0.0011	mg/l	
Half life for degradation of contaminant in water	$t_{1/2}$	1.30E+04	days	*Canada Guideline and Correction Factor*
Calculated decay rate	λ	5.33E-05	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	1.20E+02	m	from Level 2
Plume thickness in aquifer at source	Sy	5.00E-01	m	from Level 2
Bulk density of aquifer materials	ρ	2.09E+00	g/cm^3	*Geotech Testing*
Effective porosity of aquifer	n	5.90E-01	fraction	*SR3*
Hydraulic gradient	i	6.22E+00	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	8.64E-02	m/d	from Level 2
Distance to compliance point	x	1.00E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	9.83E+02	l/kg	*see options*
Longitudinal dispersivity	ax	1.000	m	*see options*
Transverse dispersivity	az	0.100	m	*see options*
Vertical dispersivity	ay	0.010	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters

Variable		
Groundwater flow velocity	v	9.10E-01 m/d
Retardation factor	Rf	3.48E+03 fraction
Decay rate used	λ	5.33E-05 d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	6.22E+00 fraction
Rate of contaminant flow due to retardation	u	2.61E-04 m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	1.30E-01 fraction
Attenuation factor (C_0/C_{ED})	**AF**	**7.72E+00 fraction**
Soil leachate concentration	Co	1.10E-03

Remedial Targets

Level 3 Remedial Target		**7.72E-02**	**mg/l**	For comparison with measured pore water concentration.
Ogata Banks		**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
		7.59E+01	**mg/kg**	For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Distance to compliance point		**10**	**m**	
Ratio of Compliance Point to Source Concentration	**C_{ED}/C_0**	**1.30E-01**	**fraction**	Ogata Banks

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	7.80E-03	fraction
Organic carbon partition coefficient	Koc	1.26E+05	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction

Soil water partition coefficient — Kd — 9.83E+02 — l/kg

Define dispersivity (click brown cell and use pull down list)

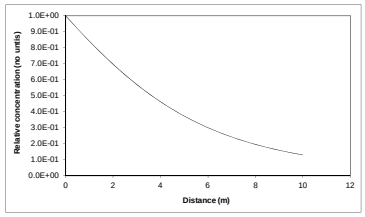
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	1.00E+00	8.30E-01	m
Transverse dispersivity	**az**	0.00E+00	1.00E-01	8.30E-02	m
Vertical dispersivity	**ay**	0.00E+00	1.00E-02	8.30E-03	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	1.10E-03
0.5	9.17E-01	1.01E-03
1.0	8.40E-01	9.24E-04
1.5	7.68E-01	8.44E-04
2.0	6.98E-01	7.67E-04
2.5	6.31E-01	6.94E-04
3.0	5.69E-01	6.26E-04
3.5	5.12E-01	5.63E-04
4.0	4.61E-01	5.07E-04
4.5	4.14E-01	4.55E-04
5.0	3.72E-01	4.09E-04
5.5	3.34E-01	3.67E-04
6.0	3.00E-01	3.30E-04
6.5	2.70E-01	2.97E-04
7.0	2.43E-01	2.67E-04
7.5	2.18E-01	2.40E-04
8.0	1.96E-01	2.16E-04
8.5	1.77E-01	1.95E-04
9.0	1.59E-01	1.75E-04
9.5	1.44E-01	1.58E-04
10.0	1.30E-01	1.42E-04

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

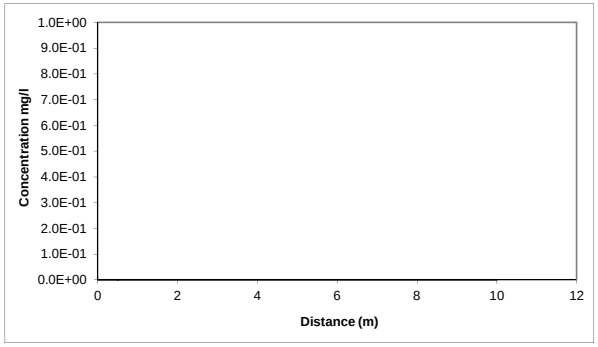
Only input required is Soil Contaminant Concentration

	Input Parameters			
	Soil contaminant concentration	C_0	0.00E+00	mg/kg
Level 1 Parameters				
	Water filled soil porosity	θ_w	4.70E-01	fraction
	Air filled soil porosity	θa	1.20E-01	fraction
	Bulk density	ρ	2.09E+00	g/cm^3
	Henry's Law constant	H	1.70E-05	dimensionless
	Soil water partition coefficient used in Level Assessment	Kd	9.83E+02	l/kg
	Factor (partitioning between soil and water)		9.83E+02	dimensionless
Level 2 Parameters	**Dilution Factor**	DF	1.00E+00	
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	7.72E+00	

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
0.50	0.00E+00
1.00	0.00E+00
1.50	0.00E+00
2.00	0.00E+00
2.50	0.00E+00
3.00	0.00E+00
3.50	0.00E+00
4.00	0.00E+00
4.50	0.00E+00
5.00	0.00E+00
5.50	0.00E+00
6.00	0.00E+00
6.50	0.00E+00
7.00	0.00E+00
7.50	0.00E+00
8.00	0.00E+00
8.50	0.00E+00
9.00	0.00E+00
9.50	0.00E+00
10.00	0.00E+00

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions)

Details to be completed for each assessment				
Site Name:	Herbert Road - Neal Soils			
Site Address:				
Completed by:	Ruth Howells			
Date:	19.05.2017		Version:	1
Contaminant	Benzo(a)pyrene			
Target Concentration (C_T)	0.00000017	mg/l	Origin of C_T:	Water Framework Directive

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Benzo(a)pyrene**		
Target concentration	C_T	**0.00000017**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_W	4.70E-01	fraction	SR3
Air filled soil porosity	θa	1.20E-01	fraction	SR3
Bulk density of soil zone material	ρ	2.09E+00	g/cm^3	SR3
Henry's Law constant	H	1.86E-05	dimensionless	*EA 2003*
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	7.80E-03	fraction	Laboratory Soil Chemical Testing
Organic carbon partition coefficient	Koc	1.02E+06	l/kg	*EA 2003*
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**7.98E+03**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**1.36E-03**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.00000017	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Benzo(a)pyrene**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	**C_T**	**0.00000017** **mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	1.79E-03	m/d	**met office - cardiff monitoring station**	
Area of contaminant source	A	1.80E+04	m^2		Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.50E+02	m		
Saturated aquifer thickness	da	5.00E-01	m	**0.5m assumed of 3.8m made ground thickness**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	8.64E-02	m/d	**Primarily well compacted clay soil**	
Hydraulic gradient of water table	i	6.25E-04	fraction	**10cm over 100m (assumed)**	
Width of contaminant source perpendicular to groundwater flow	w	1.20E+02	m		Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**Unknown**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Specify**			
Enter mixing zone thickness	Mz	5.00E-01	m		
Calculated mixing zone thickness	Mz		m		

Calculated Parameters

Dilution Factor	**DF**	**1.00E+00**		
Level 2 Remedial Target		**1.70E-07**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentrati**
		or		
		1.36E-03	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	7.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		7.00E+00	mg/l	0

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Environment Agency

Input Parameters	Variable	Value	Unit	Source
Contaminant		Benzo(a)pyrene		from Level 1
Target Concentration	C_T	0.00000017	mg/l	from Level 1
Dilution Factor	DF	1.00E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to pollutants in all phases (e.g. field derived value,)

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil leachate concentration as mg/l		
Enter soil leachate concentration		0.00005	mg/l	
Half life for degradation of contaminant in water	$t_{1/2}$	3.65E+03	days	*Surampalli et al*
Calculated decay rate	λ	1.90E-04	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	1.20E+02	m	from Level 2
Plume thickness in aquifer at source	Sy	5.00E-01	m	from Level 2
Bulk density of aquifer materials	ρ	2.09E+00	g/cm^3	*Geotech Testing*
Effective porosity of aquifer	n	5.90E-01	fraction	*SR3*
Hydraulic gradient	i	6.22E+00	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	8.64E-02	m/d	from Level 2
Distance to compliance point	x	1.00E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	7.98E+03	l/kg	*see options*
Longitudinal dispersivity	ax	1.000	m	*see options*
Transverse dispersivity	az	0.100	m	*see options*
Vertical dispersivity	ay	0.010	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters	Variable		
Groundwater flow velocity	v	9.10E-01	m/d
Retardation factor	Rf	2.83E+04	fraction
Decay rate used	λ	1.90E-04	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	6.22E+00	fraction
Rate of contaminant flow due to retardation	u	3.22E-05	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	1.86E-09	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**5.38E+08**	**fraction**
Soil leachate concentration	Co	5.00E-05	

Remedial Targets

Level 3 Remedial Target		**9.14E+01**	**mg/l**	For comparison with measured pore water concentration.
Ogata Banks		**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
		7.30E+05	**mg/kg**	For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Distance to compliance point		**10**	**m**	
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	**1.86E-09**	**fraction**	Ogata Banks

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	7.80E-03	fraction
Organic carbon partition coefficient	Koc	1.02E+06	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	7.98E+03	l/kg

Define dispersivity (click brown cell and use pull down list)

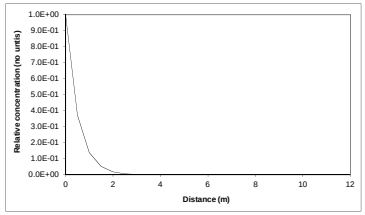
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	1.00E+00	8.30E-01	m
Transverse dispersivity	**az**	0.00E+00	1.00E-01	8.30E-02	m
Vertical dispersivity	**ay**	0.00E+00	1.00E-02	8.30E-03	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
version:	1

Calculated (relative) concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	5.00E-05
0.5	3.72E-01	1.86E-05
1.0	1.38E-01	6.90E-06
1.5	5.11E-02	2.56E-06
2.0	1.88E-02	9.42E-07
2.5	6.91E-03	3.45E-07
3.0	2.53E-03	1.26E-07
3.5	9.21E-04	4.61E-08
4.0	3.36E-04	1.68E-08
4.5	1.22E-04	6.11E-09
5.0	4.45E-05	2.23E-09
5.5	1.62E-05	8.11E-10
6.0	5.91E-06	2.95E-10
6.5	2.15E-06	1.08E-10
7.0	7.85E-07	3.92E-11
7.5	2.86E-07	1.43E-11
8.0	1.04E-07	5.22E-12
8.5	3.81E-08	1.91E-12
9.0	1.39E-08	6.96E-13
9.5	5.09E-09	2.54E-13
10.0	1.86E-09	9.30E-14

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

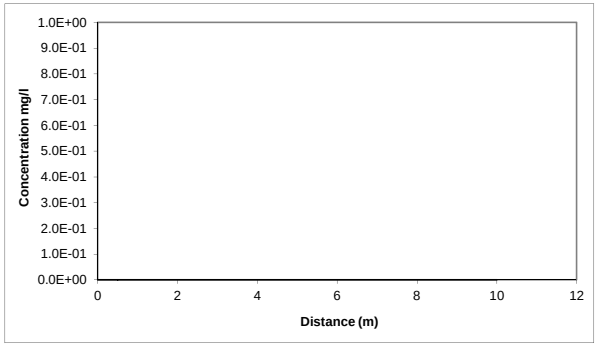
Only input required is Soil Contaminant Concentration

	Input Parameters			
	Soil contaminant concentration	C_0	0.00E+00	mg/kg
Level 1 Parameters				
	Water filled soil porosity	θ_w	4.70E-01	fraction
	Air filled soil porosity	θa	1.20E-01	fraction
	Bulk density	ρ	2.09E+00	g/cm^3
	Henry's Law constant	H	1.86E-05	dimensionless
	Soil water partition coefficient used in Level Assessment	Kd	7.98E+03	l/kg
	Factor (partitioning between soil and water)		7.98E+03	dimensionless
Level 2 Parameters	**Dilution Factor**	DF	1.00E+00	
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	5.38E+08	

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
0.50	0.00E+00
1.00	0.00E+00
1.50	0.00E+00
2.00	0.00E+00
2.50	0.00E+00
3.00	0.00E+00
3.50	0.00E+00
4.00	0.00E+00
4.50	0.00E+00
5.00	0.00E+00
5.50	0.00E+00
6.00	0.00E+00
6.50	0.00E+00
7.00	0.00E+00
7.50	0.00E+00
8.00	0.00E+00
8.50	0.00E+00
9.00	0.00E+00
9.50	0.00E+00
10.00	0.00E+00

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions)

Details to be completed for each assessment				
Site Name:	Herbert Road - Neal Soils			
Site Address:				
Completed by:	Ruth Howells			
Date:	19.05.2017		Version:	1
Contaminant	Benzo(b)fluoranthene			
Target Concentration (C_T)	0.000017	mg/l	Origin of C_T:	Water Framework Directive

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Benzo(b)fluoranthene**		
Target concentration	C_T	**0.000017**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_W	4.70E-01	fraction	SR3
Air filled soil porosity	θa	1.20E-01	fraction	SR3
Bulk density of soil zone material	ρ	2.09E+00	g/cm^3	SR3
Henry's Law constant	H	1.75E-04	dimensionless	*EA 2003*
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	7.80E-03	fraction	Laboratory Soil Chemical Testing
Organic carbon partition coefficient	Koc	5.50E+05	l/kg	*EA 2003*
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**4.29E+03**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**7.29E-02**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.000017	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Benzo(b)fluoranthene**		from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	**C_T**	**0.000017**	**mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	1.79E-03	m/d	**met office - cardiff monitoring station**	
Area of contaminant source	A	1.80E+04	m^2		Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.50E+02	m		
Saturated aquifer thickness	da	5.00E-01	m	**0.5m assumed of 3.8m made ground thickness**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	8.64E-02	m/d	**Primarily well compacted clay soil**	
Hydraulic gradient of water table	i	6.25E-04	fraction	**10cm over 100m (assumed)**	
Width of contaminant source perpendicular to groundwater flow	w	1.20E+02	m		Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**Unknown**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Specify**			
Enter mixing zone thickness	Mz	5.00E-01	m		
Calculated mixing zone thickness	Mz		m		

Calculated Parameters

Dilution Factor	**DF**	**1.00E+00**		
Level 2 Remedial Target		**1.70E-05**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentrati**
		or		
		7.29E-02	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	7.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		7.00E+00	mg/l	0

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Input Parameters	Variable	Value	Unit	Source
Contaminant		Benzo(b)fluoranthene		from Level 1
Target Concentration	C_T	0.000017	mg/l	from Level 1
Dilution Factor	DF	1.00E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to pollutants in all phases (e.g. field derived value,)

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil leachate concentration as mg/l		
Enter soil leachate concentration		0.00007	mg/l	
Half life for degradation of contaminant in water	$t_{1/2}$	3.65E+03	days	*Surampalli et al*
Calculated decay rate	λ	1.90E-04	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	1.20E+02	m	from Level 2
Plume thickness in aquifer at source	Sy	5.00E-01	m	from Level 2
Bulk density of aquifer materials	ρ	2.09E+00	g/cm^3	*Geotech Testing*
Effective porosity of aquifer	n	5.90E-01	fraction	
Hydraulic gradient	i	6.22E+00	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	8.64E-02	m/d	from Level 2
Distance to compliance point	x	1.00E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	4.29E+03	l/kg	*see options*
Longitudinal dispersivity	ax	1.000	m	*see options*
Transverse dispersivity	az	0.100	m	*see options*
Vertical dispersivity	ay	0.010	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters	Variable		
Groundwater flow velocity	v	9.10E-01	m/d
Retardation factor	Rf	1.52E+04	fraction
Decay rate used	λ	1.90E-04	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	6.22E+00	fraction
Rate of contaminant flow due to retardation	u	5.99E-05	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	1.02E-06	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**9.78E+05**	**fraction**
Soil leachate concentration	Co	7.00E-05	

Remedial Targets

Level 3 Remedial Target		**1.66E+01**	**mg/l**	For comparison with measured pore water concentration.
Ogata Banks		**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
		7.13E+04	**mg/kg**	For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Distance to compliance point		**10**	**m**	
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	**1.02E-06**	**fraction**	Ogata Banks

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	7.80E-03	fraction
Organic carbon partition coefficient	Koc	5.50E+05	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction

Soil water partition coefficient — Kd — 4.29E+03 — l/kg

Define dispersivity (click brown cell and use pull down list)

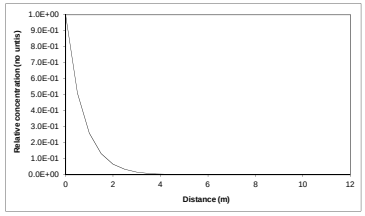
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	1.00E+00	8.30E-01	m
Transverse dispersivity	**az**	0.00E+00	1.00E-01	8.30E-02	m
Vertical dispersivity	**ay**	0.00E+00	1.00E-02	8.30E-03	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	7.00E-05
0.5	5.09E-01	3.57E-05
1.0	2.59E-01	1.82E-05
1.5	1.32E-01	9.22E-06
2.0	6.65E-02	4.66E-06
2.5	3.35E-02	2.34E-06
3.0	1.68E-02	1.17E-06
3.5	8.38E-03	5.87E-07
4.0	4.19E-03	2.93E-07
4.5	2.09E-03	1.46E-07
5.0	1.04E-03	7.31E-08
5.5	5.21E-04	3.65E-08
6.0	2.60E-04	1.82E-08
6.5	1.30E-04	9.10E-09
7.0	6.50E-05	4.55E-09
7.5	3.25E-05	2.27E-09
8.0	1.62E-05	1.14E-09
8.5	8.13E-06	5.69E-10
9.0	4.07E-06	2.85E-10
9.5	2.04E-06	1.43E-10
10.0	1.02E-06	7.15E-11

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

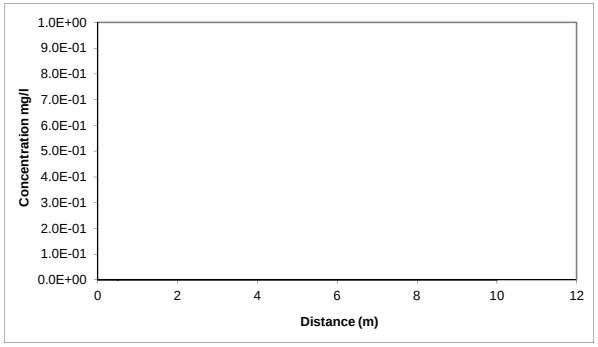
Only input required is Soil Contaminant Concentration

	Input Parameters			
	Soil contaminant concentration	C_0	0.00E+00	mg/kg
Level 1 Parameters				
	Water filled soil porosity	θ_w	4.70E-01	fraction
	Air filled soil porosity	θa	1.20E-01	fraction
	Bulk density	ρ	2.09E+00	g/cm^3
	Henry's Law constant	H	1.75E-04	dimensionless
	Soil water partition coefficient used in Level Assessment	Kd	4.29E+03	l/kg
	Factor (partitioning between soil and water)		4.29E+03	dimensionless
Level 2 Parameters	**Dilution Factor**	DF	1.00E+00	
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	9.78E+05	

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
0.50	0.00E+00
1.00	0.00E+00
1.50	0.00E+00
2.00	0.00E+00
2.50	0.00E+00
3.00	0.00E+00
3.50	0.00E+00
4.00	0.00E+00
4.50	0.00E+00
5.00	0.00E+00
5.50	0.00E+00
6.00	0.00E+00
6.50	0.00E+00
7.00	0.00E+00
7.50	0.00E+00
8.00	0.00E+00
8.50	0.00E+00
9.00	0.00E+00
9.50	0.00E+00
10.00	0.00E+00

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions)

Details to be completed for each assessment				
Site Name:	Herbert Road - Neal Soils			
Site Address:				
Completed by:	Ruth Howells			
Date:	19.05.2017		Version:	1
Contaminant	Benzo(ghi)perylene			
Target Concentration (C_T)	0.0000082	mg/l	Origin of C_T:	Water Framework Directive

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Benzo(ghi)perylene**		
Target concentration	C_T	**0.0000082**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_W	4.70E-01	fraction	SR3
Air filled soil porosity	θa	1.20E-01	fraction	SR3
Bulk density of soil zone material	ρ	2.09E+00	g/cm^3	SR3
Henry's Law constant	H	3.03E-05	dimensionless	*EA 2003*
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	7.80E-03	fraction	Laboratory Soil Chemical Testing
Organic carbon partition coefficient	Koc	4.07E+05	l/kg	*EA 2003*
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**3.18E+03**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**2.61E-02**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.0000082	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Benzo(ghi)perylene**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	**C_T**	**0.0000082** **mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	1.79E-03	m/d	**met office - cardiff monitoring station**	
Area of contaminant source	A	1.80E+04	m^2		Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.50E+02	m		
Saturated aquifer thickness	da	5.00E-01	m	**0.5m assumed of 3.8m made ground thickness**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	8.64E-02	m/d	**Primarily well compacted clay soil**	
Hydraulic gradient of water table	i	6.25E-04	fraction	**10cm over 100m (assumed)**	
Width of contaminant source perpendicular to groundwater flow	w	1.20E+02	m		Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**Unknown**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Specify**			
Enter mixing zone thickness	Mz	5.00E-01	m		
Calculated mixing zone thickness	Mz		m		

Calculated Parameters

Dilution Factor	**DF**	**1.00E+00**		
Level 2 Remedial Target		**8.20E-06**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentrati**
		or		
		2.61E-02	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	7.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		7.00E+00	mg/l	0

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Input Parameters	Variable	Value	Unit	Source
Contaminant		Benzo(ghi)perylene		from Level 1
Target Concentration	C_T	0.0000082	mg/l	from Level 1
Dilution Factor	DF	1.00E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to pollutants in all phases (e.g. field derived value,)

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil leachate concentration as mg/l		
Enter soil leachate concentration		0.00006	mg/l	
Half life for degradation of contaminant in water	$t_{1/2}$	3.65E+03	days	*Surampalli et al*
Calculated decay rate	λ	1.90E-04	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	1.20E+02	m	from Level 2
Plume thickness in aquifer at source	Sy	5.00E-01	m	from Level 2
Bulk density of aquifer materials	ρ	2.09E+00	g/cm^3	*Geotech Testing*
Effective porosity of aquifer	n	5.90E-01	fraction	
Hydraulic gradient	i	6.22E+00	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	8.64E-02	m/d	from Level 2
Distance to compliance point	x	1.00E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	3.18E+03	l/kg	*see options*
Longitudinal dispersivity	ax	1.000	m	*see options*
Transverse dispersivity	az	0.100	m	*see options*
Vertical dispersivity	ay	0.010	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters	Variable		
Groundwater flow velocity	v	9.10E-01	m/d
Retardation factor	Rf	1.13E+04	fraction
Decay rate used	λ	1.90E-04	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	6.22E+00	fraction
Rate of contaminant flow due to retardation	u	8.09E-05	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	1.09E-05	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**9.17E+04**	**fraction**
Soil leachate concentration	Co	6.00E-05	

Remedial Targets

Level 3 Remedial Target		**7.52E-01**	**mg/l**	For comparison with measured pore water concentration.
Ogata Banks		**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
		2.39E+03	**mg/kg**	For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Distance to compliance point		**10**	**m**	
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	**1.09E-05**	**fraction**	Ogata Banks

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	7.80E-03	fraction
Organic carbon partition coefficient	Koc	4.07E+05	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	3.18E+03	l/kg

Define dispersivity (click brown cell and use pull down list)

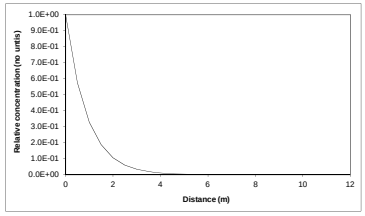
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	1.00E+00	8.30E-01	m
Transverse dispersivity	**az**	0.00E+00	1.00E-01	8.30E-02	m
Vertical dispersivity	**ay**	0.00E+00	1.00E-02	8.30E-03	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	6.00E-05
0.5	5.74E-01	3.44E-05
1.0	3.29E-01	1.97E-05
1.5	1.88E-01	1.13E-05
2.0	1.07E-01	6.41E-06
2.5	6.05E-02	3.63E-06
3.0	3.41E-02	2.05E-06
3.5	1.92E-02	1.15E-06
4.0	1.08E-02	6.48E-07
4.5	6.07E-03	3.64E-07
5.0	3.41E-03	2.05E-07
5.5	1.92E-03	1.15E-07
6.0	1.08E-03	6.46E-08
6.5	6.06E-04	3.63E-08
7.0	3.41E-04	2.04E-08
7.5	1.92E-04	1.15E-08
8.0	1.08E-04	6.48E-09
8.5	6.08E-05	3.65E-09
9.0	3.43E-05	2.06E-09
9.5	1.93E-05	1.16E-09
10.0	1.09E-05	6.55E-10

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

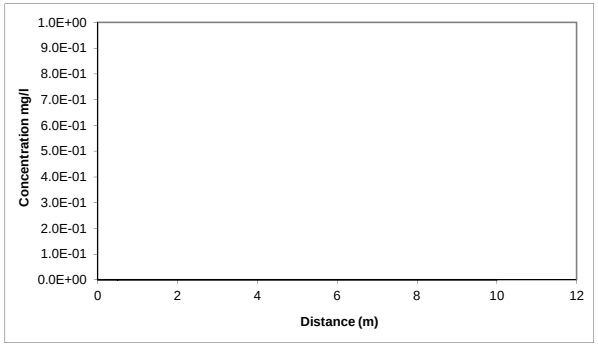
Only input required is Soil Contaminant Concentration

	Input Parameters			
	Soil contaminant concentration	C_0	0.00E+00	mg/kg
Level 1 Parameters				
	Water filled soil porosity	θ_w	4.70E-01	fraction
	Air filled soil porosity	θa	1.20E-01	fraction
	Bulk density	ρ	2.09E+00	g/cm^3
	Henry's Law constant	H	3.03E-05	dimensionless
	Soil water partition coefficient used in Level Assessment	Kd	3.18E+03	l/kg
	Factor (partitioning between soil and water)		3.18E+03	dimensionless
Level 2 Parameters	**Dilution Factor**	DF	1.00E+00	
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	9.17E+04	

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
0.50	0.00E+00
1.00	0.00E+00
1.50	0.00E+00
2.00	0.00E+00
2.50	0.00E+00
3.00	0.00E+00
3.50	0.00E+00
4.00	0.00E+00
4.50	0.00E+00
5.00	0.00E+00
5.50	0.00E+00
6.00	0.00E+00
6.50	0.00E+00
7.00	0.00E+00
7.50	0.00E+00
8.00	0.00E+00
8.50	0.00E+00
9.00	0.00E+00
9.50	0.00E+00
10.00	0.00E+00

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions)

Details to be completed for each assessment				
Site Name:	Herbert Road - neal Soils			
Site Address:				
Completed by:	Ruth Howells			
Date:	19.05.2017		Version:	1
Contaminant	Benzo(k)fluoranthene			
Target Concentration (C_T)	0.000017	mg/l	Origin of C_T:	Water Framework Directive

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Benzo(k)fluoranthene**		
Target concentration	C_T	**0.000017**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_W	4.70E-01	fraction	SR3
Air filled soil porosity	θa	1.20E-01	fraction	SR3
Bulk density of soil zone material	ρ	2.09E+00	g/cm^3	SR3
Henry's Law constant	H	3.40E-05	dimensionless	*EA 2003*
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	7.80E-03	fraction	Soil Chemical Testing
Organic carbon partition coefficient	Koc	1.23E+06	l/kg	*EA 2003*
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**9.60E+03**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**1.63E-01**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.000017	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Herbert Road - neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Benzo(k)fluoranthene**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	**C_T**	**0.000017** **mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	1.79E-03	m/d	**met office - cardiff monitoring station**	
Area of contaminant source	A	1.80E+04	m^2		Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.50E+02	m		
Saturated aquifer thickness	da	5.00E-01	m	**0.5m assumed of 3.8m made ground thickness**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	8.64E-02	m/d	**Primarily well compacted clay soil**	
Hydraulic gradient of water table	i	6.25E-04	fraction	**10cm over 100m (assumed)**	
Width of contaminant source perpendicular to groundwater flow	w	1.20E+02	m		Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**Unknown**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Specify**			
Enter mixing zone thickness	Mz	5.00E-01	m		
Calculated mixing zone thickness	Mz		m		

Calculated Parameters

Dilution Factor	**DF**	**1.00E+00**		
Level 2 Remedial Target		**1.70E-05**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentrati**
		or		
		1.63E-01	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	7.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		7.00E+00	mg/l	0

Site being assessed:	Herbert Road - neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Input Parameters	Variable	Value	Unit	Source
Contaminant		Benzo(k)fluoranthene		from Level 1
Target Concentration	C_T	0.000017	mg/l	from Level 1
Dilution Factor	DF	1.00E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to pollutants in all phases (e.g. field derived value,)

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil leachate concentration as mg/l		
Enter soil leachate concentration		0.00002	mg/l	
Half life for degradation of contaminant in water	$t_{1/2}$	3.65E+03	days	*Surampalli et al*
Calculated decay rate	λ	1.90E-04	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	1.20E+02	m	from Level 2
Plume thickness in aquifer at source	Sy	5.00E-01	m	from Level 2
Bulk density of aquifer materials	ρ	2.09E+00	g/cm^3	*Geotech Testing*
Effective porosity of aquifer	n	5.90E-01	fraction	
Hydraulic gradient	i	6.22E+00	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	8.64E-02	m/d	from Level 2
Distance to compliance point	x	1.00E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	9.60E+03	l/kg	*see options*
Longitudinal dispersivity	ax	1.000	m	*see options*
Transverse dispersivity	az	0.100	m	*see options*
Vertical dispersivity	ay	0.010	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters	Variable		
Groundwater flow velocity	v	9.10E-01	m/d
Retardation factor	Rf	3.40E+04	fraction
Decay rate used	λ	1.90E-04	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	6.22E+00	fraction
Rate of contaminant flow due to retardation	u	2.68E-05	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	1.87E-10	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**5.36E+09**	**fraction**
Soil leachate concentration	Co	2.00E-05	

Remedial Targets

Level 3 Remedial Target		**9.11E+04**	**mg/l**	For comparison with measured pore water concentration.
Ogata Banks		**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
		8.74E+08	**mg/kg**	For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Distance to compliance point		**10**	**m**	
Ratio of Compliance Point to Source Concentration	**C_{ED}/C_0**	**1.87E-10**	**fraction**	Ogata Banks

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	7.80E-03	fraction
Organic carbon partition coefficient	Koc	1.23E+06	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction

Soil water partition coefficient — Kd — 9.60E+03 — l/kg

Define dispersivity (click brown cell and use pull down list)

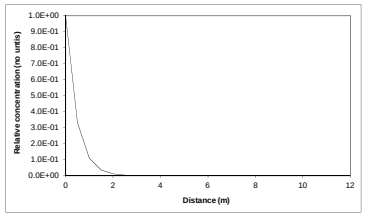
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	1.00E+00	8.30E-01	m
Transverse dispersivity	**az**	0.00E+00	1.00E-01	8.30E-02	m
Vertical dispersivity	**ay**	0.00E+00	1.00E-02	8.30E-03	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Herbert Road - neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	2.00E-05
0.5	3.31E-01	6.62E-06
1.0	1.10E-01	2.19E-06
1.5	3.62E-02	7.24E-07
2.0	1.19E-02	2.38E-07
2.5	3.89E-03	7.78E-08
3.0	1.27E-03	2.53E-08
3.5	4.12E-04	8.24E-09
4.0	1.34E-04	2.68E-09
4.5	4.35E-05	8.69E-10
5.0	1.41E-05	2.82E-10
5.5	4.58E-06	9.16E-11
6.0	1.49E-06	2.97E-11
6.5	4.83E-07	9.66E-12
7.0	1.57E-07	3.14E-12
7.5	5.10E-08	1.02E-12
8.0	1.66E-08	3.32E-13
8.5	5.40E-09	1.08E-13
9.0	1.76E-09	3.52E-14
9.5	5.73E-10	1.15E-14
10.0	1.87E-10	3.73E-15

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

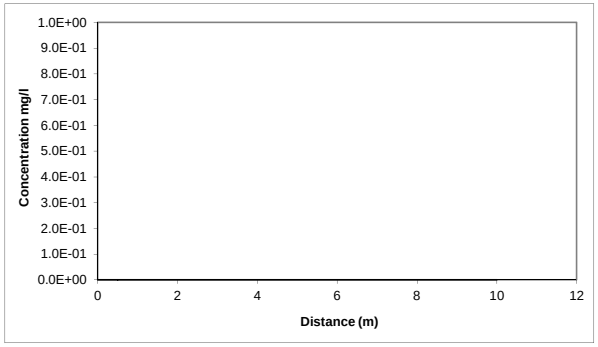
Only input required is Soil Contaminant Concentration

	Input Parameters			
	Soil contaminant concentration	C_0	0.00E+00	mg/kg
Level 1 Parameters				
	Water filled soil porosity	θ_w	4.70E-01	fraction
	Air filled soil porosity	θa	1.20E-01	fraction
	Bulk density	ρ	2.09E+00	g/cm^3
	Henry's Law constant	H	3.40E-05	dimensionless
	Soil water partition coefficient used in Level Assessment	Kd	9.60E+03	l/kg
	Factor (partitioning between soil and water)		9.60E+03	dimensionless
Level 2 Parameters	**Dilution Factor**	DF	1.00E+00	
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	5.36E+09	

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
0.50	0.00E+00
1.00	0.00E+00
1.50	0.00E+00
2.00	0.00E+00
2.50	0.00E+00
3.00	0.00E+00
3.50	0.00E+00
4.00	0.00E+00
4.50	0.00E+00
5.00	0.00E+00
5.50	0.00E+00
6.00	0.00E+00
6.50	0.00E+00
7.00	0.00E+00
7.50	0.00E+00
8.00	0.00E+00
8.50	0.00E+00
9.00	0.00E+00
9.50	0.00E+00
10.00	0.00E+00

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions)

Details to be completed for each assessment				
Site Name:	Herbert Road - Neal Soils			
Site Address:				
Completed by:	Ruth Howells			
Date:	19.05.2017		Version:	1
Contaminant	Cr III			
Target Concentration (C_T)	0.0047	mg/l	Origin of C_T:	Water Framework Directive

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

User specified value for partition coefficient

Contaminant		**Cr III**		
Target concentration	C_T	**0.0047**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_W	4.70E-01	fraction	SR3
Air filled soil porosity	θa	1.20E-01	fraction	SR3
Bulk density of soil zone material	ρ	2.09E+00	g/cm^3	SR3
Henry's Law constant	H		dimensionless	
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd	3.40E+02	l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc		fraction	Soil Laboratory Chemical Testing
Organic carbon partition coefficient	Koc		l/kg	*EA 2003*
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Soil water partition coefficient used in Level Assessment	**Kd**	**3.40E+02**	**l/kg**	*Specified value*

Level 1 Remedial Target

Level 1 Remedial Target	**1.60E+00**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.0047	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Cr III**		from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	C_T	**0.0047**	**mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	1.79E-03	m/d	**met office - cardiff monitoring station**	
Area of contaminant source	A	1.80E+04	m^2		Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.50E+02	m	**Minimum value**	
Saturated aquifer thickness	da	5.00E-01	m	**0.5m assumed of 3.8m made ground thickness**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	8.64E-02	m/d	**Primarily well compacted clay soil**	
Hydraulic gradient of water table	i	6.25E-04	fraction	**10cm over 100m (assumed)**	
Width of contaminant source perpendicular to groundwater flow	w	1.20E+02	m		Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**Unknown**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Specify**			
Enter mixing zone thickness	Mz	5.00E-01	m		
Calculated mixing zone thickness	Mz		m		

Calculated Parameters

Dilution Factor	**DF**	**1.00E+00**		
Level 2 Remedial Target		**4.70E-03**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentrati**
		or		
		1.60E+00	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	7.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		7.00E+00	mg/l	0

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Input Parameters	Variable	Value	Unit	Source
Contaminant		Cr III		from Level 1
Target Concentration	C_T	0.0047	mg/l	from Level 1
Dilution Factor	DF	1.00E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to pollutants in all phases (e.g. field derived value,)

	Variable	Value	Unit	Source of parameter value
Enter source concentration		Soil leachate concentration as mg/l		
Enter soil leachate concentration		0.0063	mg/l	
Half life for degradation of contaminant in water	$t_{1/2}$	9.90E+100	days	*Surampalli et al*
Calculated decay rate	λ	7.00E-102	$days^{-1}$	calculated
Width of plume in aquifer at source	Sz	1.20E+02	m	from Level 2
Plume thickness in aquifer at source	Sy	5.00E-01	m	from Level 2
Bulk density of aquifer materials	ρ	2.09E+00	g/cm^3	*Geotech Testing*
Effective porosity of aquifer	n	5.90E-01	fraction	*SR3*
Hydraulic gradient	i	6.22E+00	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer	K	8.64E-02	m/d	from Level 2
Distance to compliance point	x	1.00E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z		m	
Distance (depth) to compliance point perpendicular to flow direction	y		m	
Time since pollutant entered groundwater	t	1.00E+99	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	3.40E+02	l/kg	*see options*
Longitudinal dispersivity	ax	1.000	m	*see options*
Transverse dispersivity	az	0.100	m	*see options*
Vertical dispersivity	ay	0.010	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters	Variable		
Groundwater flow velocity	v	9.10E-01	m/d
Retardation factor	Rf	1.21E+03	fraction
Decay rate used	λ	7.00E-102	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	6.22E+00	fraction
Rate of contaminant flow due to retardation	u	7.55E-04	m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	7.36E-01	fraction
Attenuation factor (C_0/C_{ED})	**AF**	**1.36E+00**	**fraction**
Soil leachate concentration	Co	6.30E-03	

Remedial Targets

Level 3 Remedial Target		**6.38E-03**	**mg/l**	For comparison with measured pore water concentration.
Ogata Banks		**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
		2.17E+00	**mg/kg**	For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Distance to compliance point		**10**	**m**	
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	**7.36E-01**	**fraction**	Ogata Banks

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

User specified value for partition coefficient

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd	3.40E+02	l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc		fraction
Organic carbon partition coefficient	Koc	1.40E+01	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction

Soil water partition coefficient	Kd	3.40E+02	l/kg

Define dispersivity (click brown cell and use pull down list)

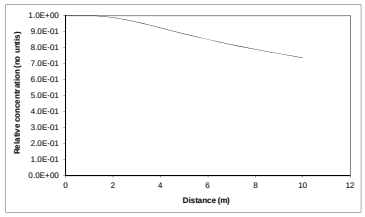
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	1.00E+00	8.30E-01	m
Transverse dispersivity	**az**	0.00E+00	1.00E-01	8.30E-02	m
Vertical dispersivity	**ay**	0.00E+00	1.00E-02	8.30E-03	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	6.30E-03
0.5	1.00E+00	6.30E-03
1.0	1.00E+00	6.30E-03
1.5	9.96E-01	6.27E-03
2.0	9.88E-01	6.22E-03
2.5	9.75E-01	6.14E-03
3.0	9.59E-01	6.04E-03
3.5	9.41E-01	5.93E-03
4.0	9.23E-01	5.81E-03
4.5	9.04E-01	5.70E-03
5.0	8.86E-01	5.58E-03
5.5	8.68E-01	5.47E-03
6.0	8.51E-01	5.36E-03
6.5	8.34E-01	5.26E-03
7.0	8.19E-01	5.16E-03
7.5	8.03E-01	5.06E-03
8.0	7.89E-01	4.97E-03
8.5	7.75E-01	4.88E-03
9.0	7.61E-01	4.80E-03
9.5	7.49E-01	4.72E-03
10.0	7.36E-01	4.64E-03

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

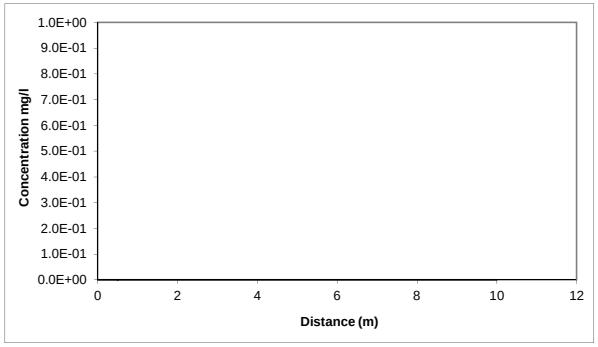
Only input required is Soil Contaminant Concentration

	Input Parameters			
	Soil contaminant concentration	C_0	0.00E+00	mg/kg
Level 1 Parameters				
	Water filled soil porosity	θ_w	4.70E-01	fraction
	Air filled soil porosity	θa	1.20E-01	fraction
	Bulk density	ρ	2.09E+00	g/cm^3
	Henry's Law constant	H	0.00E+00	dimensionless
	Soil water partition coefficient used in Level Assessment	Kd	3.40E+02	l/kg
	Factor (partitioning between soil and water)		3.40E+02	dimensionless
Level 2 Parameters	**Dilution Factor**	DF	1.00E+00	
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	1.36E+00	

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
0.50	0.00E+00
1.00	0.00E+00
1.50	0.00E+00
2.00	0.00E+00
2.50	0.00E+00
3.00	0.00E+00
3.50	0.00E+00
4.00	0.00E+00
4.50	0.00E+00
5.00	0.00E+00
5.50	0.00E+00
6.00	0.00E+00
6.50	0.00E+00
7.00	0.00E+00
7.50	0.00E+00
8.00	0.00E+00
8.50	0.00E+00
9.00	0.00E+00
9.50	0.00E+00
10.00	0.00E+00

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions)

Details to be completed for each assessment				
Site Name:	Herbert Road - Neal Soils			
Site Address:				
Completed by:	Ruth Howells			
Date:	19.05.2017		Version:	1
Contaminant	Cr VI			
Target Concentration (C_T)	0.0006	mg/l	Origin of C_T:	Water Framework Directive

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
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It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

User specified value for partition coefficient

Contaminant		**Cr VI**		
Target concentration	C_T	**0.0006**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_W	4.70E-01	fraction	SR3
Air filled soil porosity	θa	1.20E-01	fraction	SR3
Bulk density of soil zone material	ρ	2.09E+00	g/cm^3	SR3
Henry's Law constant	H		dimensionless	
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd	3.40E+02	l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc		fraction	Soil Laboratory Chemical Testing
Organic carbon partition coefficient	Koc		l/kg	*EA 2003*
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Soil water partition coefficient used in Level Assessment	**Kd**	**3.40E+02**	**l/kg**	*Specified value*

Level 1 Remedial Target

Level 1 Remedial Target	**2.04E-01**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.0006	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Cr VI**	from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	**C_T**	**0.0006** **mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	1.79E-03	m/d	**met office - cardiff monitoring station**	
Area of contaminant source	A	1.80E+04	m^2		Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.50E+02	m	**Minimum value**	
Saturated aquifer thickness	da	5.00E-01	m	**0.5m assumed of 3.8m made ground thickness**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	8.64E-02	m/d	**Primarily well compacted clay soil**	
Hydraulic gradient of water table	i	6.25E-04	fraction	**10cm over 100m (assumed)**	
Width of contaminant source perpendicular to groundwater flow	w	1.20E+02	m		Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**Unknown**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Specify**			
Enter mixing zone thickness	Mz	5.00E-01	m		
Calculated mixing zone thickness	Mz		m		

Calculated Parameters

Dilution Factor	**DF**	**1.00E+00**		
Level 2 Remedial Target		**6.00E-04**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentrati**
		or		
		2.04E-01	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	7.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		7.00E+00	mg/l	0

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Environment Agency

Input Parameters

Variable	Value	Unit	Source
Contaminant	Cr VI		from Level 1
Target Concentration C_T	0.0006	mg/l	from Level 1
Dilution Factor DF	1.00E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to pollutants in all phases (e.g. field derived value,)

Variable	Value	Unit	Source of parameter value
Enter source concentration	Soil leachate concentration as mg/l		
Enter soil leachate concentration	0.009	mg/l	
Half life for degradation of contaminant in water $t_{1/2}$	9.90E+100	days	*Surampalli et al*
Calculated decay rate λ	7.00E-102	$days^{-1}$	calculated
Width of plume in aquifer at source Sz	1.20E+02	m	from Level 2
Plume thickness in aquifer at source Sy	5.00E-01	m	from Level 2
Bulk density of aquifer materials ρ	2.09E+00	g/cm^3	*Geotech Testing*
Effective porosity of aquifer n	5.90E-01	fraction	*SR3*
Hydraulic gradient i	6.22E+00	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer K	8.64E-02	m/d	from Level 2
Distance to compliance point x	1.00E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction z		m	
Distance (depth) to compliance point perpendicular to flow direction y		m	
Time since pollutant entered groundwater t	1.00E+99	days	*time variant options only*
Parameters values determined from options			
Partition coefficient Kd	3.40E+02	l/kg	*see options*
Longitudinal dispersivity ax	1.000	m	*see options*
Transverse dispersivity az	0.100	m	*see options*
Vertical dispersivity ay	0.010	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters

Variable		
Groundwater flow velocity v	9.10E-01	m/d
Retardation factor Rf	1.21E+03	fraction
Decay rate used λ	7.00E-102	d^{-1}
Hydraulic gradient used in aquifer flow down-gradient i	6.22E+00	fraction
Rate of contaminant flow due to retardation u	7.55E-04	m/d
Ratio of Compliance Point to Source Concentration C_{ED}/C_0	7.36E-01	fraction
Attenuation factor (C_0/C_{ED}) AF	**1.36E+00**	**fraction**
Soil leachate concentration Co	9.00E-03	

Remedial Targets

Level 3 Remedial Target	**8.15E-04**	**mg/l**	For comparison with measured pore water concentration.
Ogata Banks	**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
	2.77E-01	**mg/kg**	For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Distance to compliance point	**10**	**m**	
Ratio of Compliance Point to Source Concentration C_{ED}/C_0	**7.36E-01**	**fraction**	Ogata Banks

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

User specified value for partition coefficient

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd	3.40E+02	l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc		fraction
Organic carbon partition coefficient	Koc	1.40E+01	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction

Soil water partition coefficient	Kd	3.40E+02	l/kg

Define dispersivity (click brown cell and use pull down list)

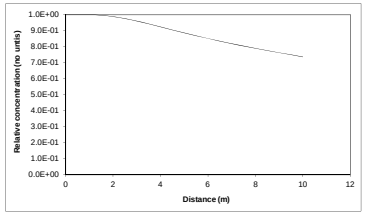
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	1.00E+00	8.30E-01	m
Transverse dispersivity	**az**	0.00E+00	1.00E-01	8.30E-02	m
Vertical dispersivity	**ay**	0.00E+00	1.00E-02	8.30E-03	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	9.00E-03
0.5	1.00E+00	9.00E-03
1.0	1.00E+00	9.00E-03
1.5	9.96E-01	8.96E-03
2.0	9.88E-01	8.89E-03
2.5	9.75E-01	8.77E-03
3.0	9.59E-01	8.63E-03
3.5	9.41E-01	8.47E-03
4.0	9.23E-01	8.31E-03
4.5	9.04E-01	8.14E-03
5.0	8.86E-01	7.97E-03
5.5	8.68E-01	7.81E-03
6.0	8.51E-01	7.66E-03
6.5	8.34E-01	7.51E-03
7.0	8.19E-01	7.37E-03
7.5	8.03E-01	7.23E-03
8.0	7.89E-01	7.10E-03
8.5	7.75E-01	6.97E-03
9.0	7.61E-01	6.85E-03
9.5	7.49E-01	6.74E-03
10.0	7.36E-01	6.63E-03

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

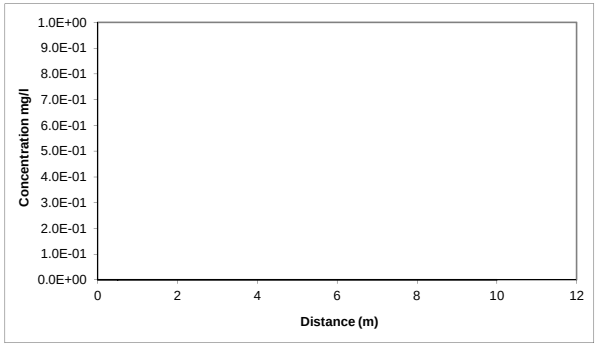
Only input required is Soil Contaminant Concentration

	Input Parameters			
	Soil contaminant concentration	C_0	0.00E+00	mg/kg
Level 1 Parameters				
	Water filled soil porosity	θ_w	4.70E-01	fraction
	Air filled soil porosity	θa	1.20E-01	fraction
	Bulk density	ρ	2.09E+00	g/cm^3
	Henry's Law constant	H	0.00E+00	dimensionless
	Soil water partition coefficient used in Level Assessment	Kd	3.40E+02	l/kg
	Factor (partitioning between soil and water)		3.40E+02	dimensionless
Level 2 Parameters	**Dilution Factor**	DF	1.00E+00	
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	1.36E+00	

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
0.50	0.00E+00
1.00	0.00E+00
1.50	0.00E+00
2.00	0.00E+00
2.50	0.00E+00
3.00	0.00E+00
3.50	0.00E+00
4.00	0.00E+00
4.50	0.00E+00
5.00	0.00E+00
5.50	0.00E+00
6.00	0.00E+00
6.50	0.00E+00
7.00	0.00E+00
7.50	0.00E+00
8.00	0.00E+00
8.50	0.00E+00
9.00	0.00E+00
9.50	0.00E+00
10.00	0.00E+00

Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.2

First released: 2006. Version 3.2: January 2013

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions)

Details to be completed for each assessment				
Site Name:	Herbert Road - Neal Soils			
Site Address:				
Completed by:	Ruth Howells			
Date:	19.05.2017		Version:	1
Contaminant	Fluoranthene			
Target Concentration (C_T)	0.0000063	mg/l	Origin of C_T:	Water Framework Directive

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparision with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).
Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.
Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.
Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.
Data carried forward from an earlier worksheet are identified by a light green background
It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

Remedial Targets Worksheet , Release 3.2

Level 1 - Soil

Select the method of calculating the soil water Partition Co-efficient by using the pull down menu below

Calculate for non-polar organic chemicals

Contaminant		**Fluoranthene**		
Target concentration	C_T	**0.0000063**	**mg/l**	

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**
Standard entry				
Water filled soil porosity	θ_W	4.70E-01	fraction	SR3
Air filled soil porosity	θa	1.20E-01	fraction	SR3
Bulk density of soil zone material	ρ	2.09E+00	g/cm^3	SR3
Henry's Law constant	H	4.20E-04	dimensionless	*EA 2003*
Entry if specify partition coefficient (option)				
Soil water partition coefficient	Kd		l/kg	
Entry for non-polar organic chemicals (option)				
Fraction of organic carbon (in soil)	foc	7.80E-03	fraction	Laboratory Soil Chemical Testing
Organic carbon partition coefficient	Koc	1.07E+05	l/kg	*EA 2003*
Entry for ionic organic chemicals (option)				
Sorption coefficient for neutral species	$K_{oc,n}$		l/kg	
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg	
pH value	pH		pH units	
Acid dissociation constant	pKa			
Fraction of organic carbon (in soil)	foc		fraction	
Soil water partition coefficient used in Level Assessment	**Kd**	**8.35E+02**	**l/kg**	*Calculated value*

This sheet calculates the Level 1 remedial target for soils(mg/kg) based on a selected target concentration and theoretical calculation of soil water partitioning. Three options are included for determining the partition coefficient.

The measured soil concentration as mg/kg should be compared with the Level 1 remedial target to determine the need for further action.

Level 1 Remedial Target

Level 1 Remedial Target	**5.26E-03**	**mg/kg**	**(for comparison with soil analyses)**
	or		
	0.0000063	**mg/l**	**(for comparison with leachate test results)**

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 2 - Soil

Contaminant		**Fluoranthene**		from Level 1	This sheet calculates the Level 2 remedial target for soils (mg/kg) or for pore water (mg/l).
Target concentration	**C_T**	**0.0000063**	**mg/l**	from Level 1	

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 2 remedial target to determine the need for further action. Equations presented in 'Hydrogeological risk assessment for land contamiantion' (Environment Agency 2006)

Input Parameters	**Variable**	**Value**	**Unit**	**Source of parameter value**	
Standard entry					
Infiltration	Inf	1.79E-03	m/d	**met office - cardiff monitoring station**	
Area of contaminant source	A	1.80E+04	m^2		Not used in calculation
Entry for groundwater flow below site					
Length of contaminant source in direction of groundwater flow	L	1.50E+02	m		
Saturated aquifer thickness	da	5.00E-01	m	**0.5m assumed of 3.8m made ground thickness**	
Hydraulic Conductivity of aquifer in which dilution occurs	K	8.64E-02	m/d	**Primarily well compacted clay soil**	
Hydraulic gradient of water table	i	6.25E-04	fraction	**10cm over 100m (assumed)**	
Width of contaminant source perpendicular to groundwater flow	w	1.20E+02	m		Not used in calculation
Background concentration of contaminant in groundwater beneath site	Cu	0.00E+00	mg/l	**Unknown**	
Define mixing zone depth by specifying or calculating depth (using pull down list)		**Specify**			
Enter mixing zone thickness	Mz	5.00E-01	m		
Calculated mixing zone thickness	Mz		m		

Calculated Parameters

Dilution Factor	**DF**	**1.00E+00**		
Level 2 Remedial Target		**6.30E-06**	**mg/l**	**For comparison with measured pore water concentration. This assumes Level 1 Remedial Target is based on Target Concentrati**
		or		
		5.26E-03	**mg/kg**	**For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water**

Additional option

Calculation of impact on receptor

Concentration of contaminant in contaminated discharge (entering receptor)	Cc	7.00E+00	mg/l	
Calculated concentration within receptor (dilution only)		7.00E+00	mg/l	0

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Remedial Targets Worksheet , Release 3.2

Level 3 - Soil

See Note

Environment Agency

Input Parameters

Variable	Value	Unit	Source
Contaminant	Fluoranthene		from Level 1
Target Concentration	C_T 0.0000063	mg/l	from Level 1
Dilution Factor	DF 1.00E+00		from Level 2

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to pollutants in all phases (e.g. field derived value,)

Variable	Value	Unit	Source of parameter value
Enter source concentration	Soil leachate concentration as mg/l		
Enter soil leachate concentration	0.00039	mg/l	
Half life for degradation of contaminant in water ($t_{1/2}$)	3.65E+03	days	*Surampalli et al*
Calculated decay rate (λ)	1.90E-04	$days^{-1}$	calculated
Width of plume in aquifer at source (Sz)	1.20E+02	m	from Level 2
Plume thickness in aquifer at source (Sy)	5.00E-01	m	from Level 2
Bulk density of aquifer materials (ρ)	2.09E+00	g/cm^3	*Geotech Testing*
Effective porosity of aquifer (n)	5.90E-01	fraction	
Hydraulic gradient (i)	6.22E+00	fraction	from Level 2 (adjusted)
Hydraulic conductivity of saturated aquifer (K)	8.64E-02	m/d	from Level 2
Distance to compliance point (x)	1.00E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction (z)		m	
Distance (depth) to compliance point perpendicular to flow direction (y)		m	
Time since pollutant entered groundwater (t)	1.00E+99	days	*time variant options only*
Parameters values determined from options			
Partition coefficient (Kd)	8.35E+02	l/kg	*see options*
Longitudinal dispersivity (ax)	1.000	m	*see options*
Transverse dispersivity (az)	0.100	m	*see options*
Vertical dispersivity (ay)	0.010	m	*see options*

Parameter values should be checked against Level 1 and 2

Calculated Parameters

Variable		
Groundwater flow velocity	v	9.10E-01 m/d
Retardation factor	Rf	2.96E+03 fraction
Decay rate used	λ	1.90E-04 d^{-1}
Hydraulic gradient used in aquifer flow down-gradient	i	6.22E+00 fraction
Rate of contaminant flow due to retardation	u	3.08E-04 m/d
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0	9.88E-03 fraction
Attenuation factor (C_0/C_{ED})	**AF**	**1.01E+02 fraction**
Soil leachate concentration	Co	3.90E-04

Remedial Targets

Level 3 Remedial Target	**6.38E-04**	**mg/l**	For comparison with measured pore water concentration.
Ogata Banks	**or**		This assumes Level 1 Remedial Target is based on Target Concentration.
	5.32E-01	**mg/kg**	For comparison with measured soil concentration. This assumes Level 1 Remedial Target calculated from soil-water partitioning equation.
Distance to compliance point	**10**	**m**	
Ratio of Compliance Point to Source Concentration	C_{ED}/C_0 **9.88E-03**	**fraction**	Ogata Banks

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99

Enter method of defining partition co-efficient (using pull down list)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	7.80E-03	fraction
Organic carbon partition coefficient	Koc	1.07E+05	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
Acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	8.35E+02	l/kg

Define dispersivity (click brown cell and use pull down list)

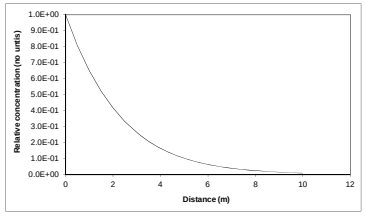
Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value	Xu & Eckstein	
Longitudinal dispersivity	**ax**	0.00E+00	1.00E+00	8.30E-01	m
Transverse dispersivity	**az**	0.00E+00	1.00E-01	8.30E-02	m
Vertical dispersivity	**ay**	0.00E+00	1.00E-02	8.30E-03	m

Note values of dispersivity must be > 0

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed

Note
This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O_2, NO_3, SO_4 etc than an alternative solution should be used



Note: 'Relative concentration' is the ratio of calculated concentation at a given position compared to the source concentration. The calculations assume plume disperses from the top of the aquifer. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

This sheet calculates the Level 3 remedial target for soils(mg/kg) or for pore water (mg/l), based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.By setting a long travel time (e.g. 9E99) it will give the steady state solution, which should always be used when calculating remedial targets.

The measured soil concentration as mg/kg or pore water concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

Site being assessed:	Herbert Road - Neal Soils
Completed by:	Ruth Howells
Date:	19.05.2017
Version:	1

Calculated (relative) concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Relative concentration (No units)	Concentration mg/l
0	1.0E+00	3.90E-04
0.5	8.06E-01	3.14E-04
1.0	6.50E-01	2.53E-04
1.5	5.22E-01	2.03E-04
2.0	4.17E-01	1.63E-04
2.5	3.32E-01	1.29E-04
3.0	2.63E-01	1.03E-04
3.5	2.08E-01	8.12E-05
4.0	1.65E-01	6.42E-05
4.5	1.30E-01	5.07E-05
5.0	1.03E-01	4.00E-05
5.5	8.11E-02	3.16E-05
6.0	6.41E-02	2.50E-05
6.5	5.06E-02	1.97E-05
7.0	4.00E-02	1.56E-05
7.5	3.17E-02	1.23E-05
8.0	2.51E-02	9.77E-06
8.5	1.98E-02	7.74E-06
9.0	1.57E-02	6.13E-06
9.5	1.25E-02	4.86E-06
10.0	9.88E-03	3.85E-06

Remedial Targets Worksheet , Release 3.2

Calculation of contaminant concentration in groundwater from a soil source

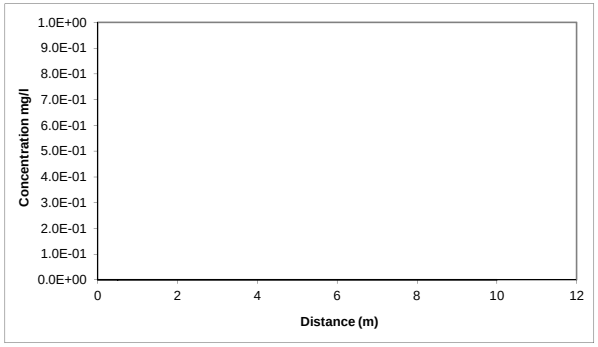
Only input required is Soil Contaminant Concentration

	Input Parameters			
	Soil contaminant concentration	C_0	0.00E+00	mg/kg
Level 1 Parameters				
	Water filled soil porosity	θ_w	4.70E-01	fraction
	Air filled soil porosity	θa	1.20E-01	fraction
	Bulk density	ρ	2.09E+00	g/cm^3
	Henry's Law constant	H	4.20E-04	dimensionless
	Soil water partition coefficient used in Level Assessment	Kd	8.35E+02	l/kg
	Factor (partitioning between soil and water)		8.35E+02	dimensionless
Level 2 Parameters	**Dilution Factor**	DF	1.00E+00	
Level 3 Parameters	**Attenuation factor (C_O/C_{ED})**	AF	1.01E+02	

Predicted concentrations at compliance point

Level 1	C	0.00E+00	mg/l	No dilution or attenuation
Level 2	C	0.00E+00	mg/l	Dilution taken into account
Level 3	C	0.00E+00	mg/l	Dilution and attenuation taken into account

Predicted concentrations between source and compliance point - Level 3



Distance m	Concentration mg/l
0.00	0.00E+00
0.50	0.00E+00
1.00	0.00E+00
1.50	0.00E+00
2.00	0.00E+00
2.50	0.00E+00
3.00	0.00E+00
3.50	0.00E+00
4.00	0.00E+00
4.50	0.00E+00
5.00	0.00E+00
5.50	0.00E+00
6.00	0.00E+00
6.50	0.00E+00
7.00	0.00E+00
7.50	0.00E+00
8.00	0.00E+00
8.50	0.00E+00
9.00	0.00E+00
9.50	0.00E+00
10.00	0.00E+00

ANNEX H
Soil and Leachate Test Results Chemical Summary Tables

LOWER HALF OF RIVERSEE LIMITED STOCKPILE

Table 1 Summary of Soil Chemical Test Results Standard Suite					
Substance	**SGV/GAC** (mg/kg)	**Source**	**Measured Concentrations of Tested Substances** (mg/kg)		**Number of Exceedences**
			Minimum	**Maximum**	
Antimony	-	-	1.5	3.5	-
Arsenic	32	CLEA	4.2	23	0
Beryllium	1.7	CIEH	0.4	1.8	1
Boron	11000	CIEH	0.5	2.7	0
Cadmium	10	CLEA	0.3	3.0	0
Chromium III	910	CIEH	16	130	0
Chromium VI	6	CIEH	<1.0	<1.0	0
Copper	7100	CIEH	1	65	0
Lead	320	C4SL	20	330	1
Manganese	-	-	460	2000	-
Mercury	170	CLEA	<0.05	0.66	0
Molybdenum	-	-	0.6	4.9	-
Nickel	180	CIEH	14	44	0
Selenium	350	CLEA	<0.5	1.0	0
Zinc	40000	CIEH	52	190	0
Cyanide	8	CLEA	<0.1	0.5	0
Phenols	420	CLEA	<0.3	0.8	0
Sulphate	-	-	600	4100	-
Organic Matter	-	-	0.5	10	-
pH	-	-	7.6	11.5	-

Table 2 Summary of Soil Chemical Test Results
Speciated Polyaromatic Hydrocarbons

Substance	GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of Exceedences
			Minimum	Maximum	
Naphthalene	2.3	CIEH	<0.03	1.3	0
Acenaphthylene	2900	CIEH	<0.03	<0.03	0
Acenaphthene	3000	CIEH	<0.03	0.22	0
Fluorene	2800	CIEH	<0.03	0.18	0
Phenanthrene	1300	CIEH	<0.03	1.4	0
Anthracene	31000	CIEH	<0.03	0.34	0
Fluoranthene	1500	CIEH	<0.03	2.1	0
Pyrene	3700	CIEH	<0.03	1.8	0
Benzo(a)anthracene	11	CIEH	<0.03	0.82	0
Chrysene	30	CIEH	<0.03	0.92	0
Benzo(b)fluoranthene	3.9	CIEH	<0.03	0.94	0
Benzo(k)fluoranthene	110	CIEH	<0.03	0.31	0
Benzo(a)pyrene	3.2	CIEH	<0.03	0.69	0
Indeno(123cd)pyrene	0.31	CIEH	<0.03	0.32	0
Dibenzo(ah)anthracene	46	CIEH	<0.03	0.1	0
Benzo(ghi)perylene	360	CIEH	<0.03	0.37	0

Table 3 Summary of Soil Chemical Test Results
Petroleum Hydrocarbons

Substance	GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of Exceedences
			Minimum	Maximum	
Aliphatic EC >5-6	42	CIEH	<0.01	0.22	0
Aliphatic EC >6-8	100	CIEH	<0.01	0.26	0
Aliphatic EC >8-10	27	CIEH	<0.01	0.14	0
Aliphatic EC >10-12	130	CIEH	<1.5	1.8	0
Aliphatic EC >12-16	1100	CIEH	<1.2	8.8	0
Aliphatic EC >16-21	65000	CIEH	<1.5	13	0
Aliphatic EC >21-35	65000	CIEH	<3.4	140	0
Aromatic EC >5-7	370	CIEH	<0.01	0.01	0
Aromatic EC >7-8	860	CIEH	<0.01	0.03	0
Aromatic EC >8-10	47	CIEH	<0.01	0.15	0
Aromatic EC >10-12	250	CIEH	<0.9	<0.9	0
Aromatic EC >12-16	1800	CIEH	<05	3.1	0
Aromatic EC >16-21	1900	CIEH	<0.6	22	0
Aromatic EC >21-35	1900	CIEH	<1.4	290	0

Table 4 Summary of Soil Chemical Test Results Asbestos (Where Detected)

Sample Location	Asbestos Type	Form	Total Mass in Soil (%)	Sample Location	Asbestos Type	Form	Total Mass in Soil (%)
TP1 3.00m	Chrysotile	Chrysotile present as fibre bundles	<0.001	TP8 2.50m	Chrysotile	Chrysotile present as fibre bundles	<0.001
TP2 2.00m	Chrysotile	Chrysotile present as small fibre bundles	<0.001	TP9 0.30m	Chrysotile Amosite	Chrysotile present as fibre bundles Amosite also present as small bundle	<0.001
TP2 2.90m	Chrysotile	Chrysotile present as fibre bundles	<0.001	TP9 1.60m	Chrysotile	Chrysotile present as fibre bundles	0.002
TP4 0.50m	Chrysotile	Chrysotile present as fibre bundles	<0.001	TP10 0.50m	Amosite	Amosite present as small fibre bundle	<0.001
TP4 2.00m	Chrysotile	Chrysotile present as fibre bundles	<0.001	TP10 2.20m	Chrysotile	Chrysotile present as fibre bundles	<0.001
TP4 3.00m	Chrysotile	Chrysotile present as small fibre bundle	<0.001	TP11 0.50m	Chrysotile	Chrysotile present as small fibre bundle	<0.001
TP5 3.00m	Chrysotile	Chrysotile present as fibre bundles	0.005	TP12 2.00	Chrysotile	small bundle of Chrysotile	0.001
TP6 2.00m	Chrysotile	Chrysotile present as fibre bundles	<0.001	TP14 2.00	Chrysotile	small bundle of Chrysotile	0.001
TP6 3.00m	Chrysotile	Chrysotile present as fibre bundles	0.003	TP15 2.20	Chrysotile	small bundle of Chrysotile	<0.001
TP7 0.30m	Chrysotile	Chrysotile present as fibre bundles	<0.001	TP18 0.50	Chrysotile	small bundle of Chrysotile	<0.001
TP7 0.60m	Chrysotile	Chrysotile present as small fibre bundle	<0.001				

Table 5 Summary of Leachate Chemical Test Results Standard Suite and Speciated PAH					
Substance	**Threshold** (ug/l)	**Source**	**Measured Concentrations of Tested Substances** (ug/l)		**Number of Exceedences**
			Minimum	**Maximum**	
Arsenic	25	WFD	0.7	7.5	0
Cadmium	0.2	WFD	<0.03	0.47	**1**
Chromium III	4.7	WFD	<1.0	2.4	0
Chromium VI	3.4	WFD	<3.0	<3.0	0
Copper	3.76	WFD	1.1	92	**23**
Lead	1.2	WFD	<0.09	3.3	**9**
Mercury	0.07	WFD	<0.01	0.03	0
Nickel	8.6	WFD	0.6	2.2	0
Selenium	10	WFD	0.44	0.67	0
Zinc	9.0	WFD	1.25	6.2	0
Cyanide	1.0	WFD	<40	<40	Below laboratory detection limit
Phenols	7.7	WFD	0.5	1.8	0
Sulphate	250000	DWD	2000	51000	0
pH	-	-	7.1	10.7	0
Naphthalene	2.0	WFD	<0.01	4.0	**1**
Acenaphthylene	-	-	<0.01	<0.01	1 Above Laboratory Detection Limit
Acenaphthene	-	-	<0.01	0.02	7 Above Laboratory Detection Limit
Fluorene	-	-	<0.01	0.1	6 Above Laboratory Detection Limit
Phenanthrene	-	-	<0.01	0.58	33 Above Laboratory Detection Limit
Anthracene	0.1	WFD	<0.01	0.02	0
Fluoranthene	0.0063	WFD	<0.01	4.5	All exceeded – Laboratory detection limit above threshold value
Pyrene	-	-	<0.01	3.9	37 Above Laboratory Detection Limit
Benzo(a)anthracene	-	-	<0.01	0.25	25 Above Laboratory Detection Limit
Chrysene	-	-	<0.01	0.2	27 Above Laboratory Detection Limit
Benzo(b)fluoranthene	0.017	WFD	<0.01	0.25	**28**
Benzo(k)fluoranthene	0.017	WFD	<0.01	0.02	0
Benzo(a)pyrene	0.00017	WFD	<0.01	0.17	All exceeded – Laboratory detection limit above threshold value
Indeno(123cd)pyrene	-	-	<0.01	0.04	1 Above Laboratory Detection Limit
Dibenzo(ah)anthracene	0.0082	WFD	<0.01	0.19	All exceeded – Laboratory detection limit above threshold value
Benzo(ghi)perylene	-	-	<0.01	<0.01	-

Table 6 Summary of Leachate Chemical Test Results Petroleum Hydrocarbons

Substance	Threshold (ug/l)	Source	Measured Concentrations of Tested Substances (ug/l)		Number of Exceedences
			Minimum	Maximum	
Aliphatic EC >5-6	-	-	<0.1	<0.1	0
Aliphatic EC >6-8	-	-	<0.1	<0.1	0
Aliphatic EC >8-10	-	-	<0.1	<0.1	0
Aliphatic EC >10-12	-	-	<1.0	<1.0	0
Aliphatic EC >12-16	-	-	<1.0	<1.0	0
Aliphatic EC >16-21	-	-	<1.0	0.067	3 Above Laboratory Detection Limit
Aliphatic EC >21-35	-	-	<1.0	<1.0	0
Aromatic EC >5-7	-	-	<0.1	<0.1	0
Aromatic EC >7-8	-	-	<0.1	<0.1	0
Aromatic EC >8-10	-	-	<0.1	<0.1	0
Aromatic EC >10-12	-	-	<1.0	<1.0	0
Aromatic EC >12-16	-	-	<1.0	<1.0	0
Aromatic EC >16-21	-	-	<1.0	0.0061	1 Above Laboratory Detection Limit
Aromatic EC >21-35	-	-	<1.0	<1.0	0

UPPER HALF OF RIVERSEE LIMITED STOCKPILE

Table 1 Summary of Soil Chemical Test Results Standard Suite					
Substance	**SGV/GAC** (mg/kg)	**Source**	**Measured Concentrations of Tested Substances** (mg/kg)		**Number of Exceedences**
			Minimum	**Maximum**	
Antimony	-	-	<1.0	15	-
Arsenic	32	CLEA	<0.1	19	0
Beryllium	1.7	CIEH	0.6	1.1	0
Boron	11000	CIEH	1.0	1.6	0
Cadmium	10	CLEA	<0.1	2.1	0
Chromium III	910	CIEH	<0.15	53	0
Chromium VI	6	CIEH	<1.0	<1.0	0
Copper	7100	CIEH	<0.2	140	0
Lead	320	C4SL	<0.3	130	0
Manganese	-	-	540	1300	-
Mercury	170	CLEA	<0.05	0.27	0
Molybdenum	-	-	0.5	1.4	-
Nickel	180	CIEH	<1.0	53	0
Selenium	350	CLEA	<0.1	43	0
Zinc	40000	CIEH	<1.0	1200	0
Cyanide	8	CLEA	<0.1	0.2	0
Phenols	420	CLEA	<0.3	2.2	0
Sulphate	-	-	600	2700	-
Organic Matter	-	-	0.7	9.7	-
pH	-	-	8.0	11.5	-

Table 2 Summary of Soil Chemical Test Results
Speciated Polyaromatic Hydrocarbons

Substance	GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of Exceedences
			Minimum	Maximum	
Naphthalene	2.3	CIEH	<0.03	<0.03	0
Acenaphthylene	2900	CIEH	<0.03	<0.03	0
Acenaphthene	3000	CIEH	<0.03	<0.03	0
Fluorene	2800	CIEH	<0.03	0.04	0
Phenanthrene	1300	CIEH	<0.03	0.5	0
Anthracene	31000	CIEH	<0.03	0.1	0
Fluoranthene	1500	CIEH	<0.03	1.2	0
Pyrene	3700	CIEH	<0.03	0.86	0
Benzo(a)anthracene	11	CIEH	<0.03	0.38	0
Chrysene	30	CIEH	<0.03	0.41	0
Benzo(b)fluoranthene	3.9	CIEH	<0.03	0.31	0
Benzo(k)fluoranthene	110	CIEH	<0.03	0.13	0
Benzo(a)pyrene	3.2	CIEH	<0.03	0.22	0
Indeno(123cd)pyrene	0.31	CIEH	<0.03	0.11	0
Dibenzo(ah)anthracene	46	CIEH	<0.03	<0.03	0
Benzo(ghi)perylene	360	CIEH	<0.03	0.1	0

Table 3 Summary of Soil Chemical Test Results Petroleum Hydrocarbons

Substance	GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of Exceedences
			Minimum	Maximum	
Aliphatic EC >5-6	42	CIEH	<0.01	<0.01	0
Aliphatic EC >6-8	100	CIEH	<0.01	<0.01	0
Aliphatic EC >8-10	27	CIEH	<0.01	<0.01	0
Aliphatic EC >10-12	130	CIEH	<1.5	<1.5	0
Aliphatic EC >12-16	1100	CIEH	<1.2	7.1	0
Aliphatic EC >16-21	65000	CIEH	<1.5	15	0
Aliphatic EC >21-35	65000	CIEH	<3.4	150	0
Aromatic EC >5-7	370	CIEH	<0.01	<0.01	0
Aromatic EC >7-8	860	CIEH	<0.01	0.01	0
Aromatic EC >8-10	47	CIEH	<0.01	0.12	0
Aromatic EC >10-12	250	CIEH	<0.9	<0.9	0
Aromatic EC >12-16	1800	CIEH	<05	<0.5	0
Aromatic EC >16-21	1900	CIEH	<0.6	14	0
Aromatic EC >21-35	1900	CIEH	<1.4	260	0

Table 4 Summary of Soil Chemical Test Results Asbestos (Where Detected)

Sample Location	Asbestos Type	Form	Total Mass in Soil (%)	Sample Location	Asbestos Type	Form	Total Mass in Soil (%)
S6	Chrysotile	Clumps of fibres	0.001	S17	Chrysotile	Clumps of fibres	<0.001
S7	Chrysotile	Bundle of fibres	<0.001	S18	Chrysotile	Clumps of fibres	<0.001
S11	Chrysotile	Bundles of fibres	<0.001	S19	Chrysotile	Free fibres	<0.001
S12	Amosite	Free fibres	<0.001	S20	Chrysotile	Bundles of fibres	<0.001
S13	Amosite Chrysotile	Clumps of fibres	0.024	S21	Chrysotile	Bundles of fibres	<0.001
S14	Chrysotile	Clumps of fibres	<0.001	S22	Chrysotile	Bundles of fibres	<0.001
S15	Chrysotile	Clumps of fibres	<0.001	S23	Chrysotile	Free fibres	<0.001
S16	Chrysotile	Bundles of fibres	<0.001	S25	Chrysotile	Bundles of fibres	<0.001
S16	Chrysotile	Cement fragment	<0.001	S32	Chrysotile	Bundles of fibres	<0.001

Table 5 Summary of Leachate Chemical Test Results Standard Suite and Speciated PAH

Substance	Threshold (ug/l)	Source	Measured Concentrations of Tested Substances (ug/l)		Number of Exceedences
			Minimum	Maximum	
Arsenic	25	WFD	0.3	6.5	0
Cadmium	0.2	WFD	<0.03	<0.03	0
Chromium III	4.7	WFD	<1.0	3.1	0
Chromium VI	3.4	WFD	<3.0	<10	0
Copper	3.76	WFD	0.8	11	**5**
Lead	1.2	WFD	<0.9	1.0	0
Mercury	0.07	WFD	<0.01	<0.01	0
Nickel	8.6	WFD	<0.5	2.5	0
Selenium	10	WFD	<0.25	1.8	0
Zinc	9.0	WFD	<1.25	3.89	0
Cyanide	1.0	WFD	<40	<40	Below laboratory detection limit
Phenols	7.7	WFD	<0.5	<0.5	0
Sulphate	250000	DWD	4400	15000	0
pH	-	-	6.5	10.1	0
Naphthalene	2.0	WFD	<0.01	0.02	0
Acenaphthylene	-	-	<0.01	<0.01	Below Laboratory Detection Limit
Acenaphthene	-	-	<0.01	<0.01	
Fluorene	-	-	<0.01	<0.01	
Phenanthrene	-	-	<0.01	<0.01	
Anthracene	0.1	WFD	<0.01	<0.01	0
Fluoranthene	0.0063	WFD	<0.01	<0.01	Below Laboratory Detection Limit
Pyrene	-	-	<0.01	<0.01	
Benzo(a)anthracene	-	-	<0.01	<0.01	
Chrysene	-	-	<0.01	<0.01	
Benzo(b)fluoranthene	0.017	WFD	<0.01	<0.01	0
Benzo(k)fluoranthene	0.017	WFD	<0.01	<0.01	0
Benzo(a)pyrene	0.00017	WFD	<0.01	<0.01	Below Laboratory Detection Limit
Indeno(123cd)pyrene	-	-	<0.01	<0.01	
Dibenzo(ah)anthracene	0.0082	WFD	<0.01	<0.01	
Benzo(ghi)perylene	-	-	<0.01	<0.01	

Table 6 Summary of Leachate Chemical Test Results Petroleum Hydrocarbons

Substance	Threshold (ug/l)	Source	Measured Concentrations of Tested Substances (ug/l)		Number of Exceedences
			Minimum	Maximum	
Aliphatic EC >5-6	-	-	<0.1	<0.1	0
Aliphatic EC >6-8	-	-	<0.1	<0.1	0
Aliphatic EC >8-10	-	-	<0.1	<0.1	0
Aliphatic EC >10-12	-	-	<1.0	<1.0	0
Aliphatic EC >12-16	-	-	<1.0	<1.0	0
Aliphatic EC >16-21	-	-	<1.0	<1.0	0
Aliphatic EC >21-35	-	-	<1.0	<1.0	0
Aromatic EC >5-7	-	-	<0.1	<0.1	0
Aromatic EC >7-8	-	-	<0.1	<0.1	0
Aromatic EC >8-10	-	-	<0.1	<0.1	0
Aromatic EC >10-12	-	-	<1.0	<1.0	0
Aromatic EC >12-16	-	-	<1.0	<1.0	0
Aromatic EC >16-21	-	-	<1.0	<1.0	0
Aromatic EC >21-35	-	-	<1.0	<1.0	0

CITIVISION SOURCE SOIL (TOTAL VOLUME)

Table 1 Summary of Soil Chemical Test Results Standard Suite					
Substance	**SGV/GAC** (mg/kg)	**Source**	**Measured Concentrations of Tested Substances** (mg/kg)		**Number of Exceedences**
			Minimum	**Maximum**	
Antimony	-	-	1.6	3.5	-
Arsenic	32	CLEA	7.0	16	0
Beryllium	1.7	CIEH	0.4	0.6	0
Boron	11000	CIEH	1.6	2.7	0
Cadmium	10	CLEA	0.7	1.2	0
Chromium III	910	CIEH	45	150	0
Chromium VI	6	CIEH	<1.0	<1.0	0
Copper	7100	CIEH	21	34	0
Lead	320	C4SL	59	5000	1
Manganese	-	-	980	2200	-
Mercury	170	CLEA	<0.05	0.16	0
Molybdenum	-	-	1.0	1.6	-
Nickel	180	CIEH	11	17	0
Selenium	350	CLEA	<0.5	2.2	0
Zinc	40000	CIEH	110	140	0
Cyanide	8	CLEA	0.5	0.7	0
Phenols	420	CLEA	<0.3	<0.3	0
Sulphate	-	-	2100	2300	-
Organic Matter	-	-	1.8	2.6	-
pH	-	-	11.2	11.7	-

Table 2 Summary of Soil Chemical Test Results
Speciated Polyaromatic Hydrocarbons

Substance	GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of Exceedences
			Minimum	Maximum	
Naphthalene	2.3	CIEH	<0.03	0.04	0
Acenaphthylene	2900	CIEH	<0.03	0.03	0
Acenaphthene	3000	CIEH	<0.03	0.07	0
Fluorene	2800	CIEH	<0.03	0.05	0
Phenanthrene	1300	CIEH	<0.03	0.46	0
Anthracene	31000	CIEH	<0.03	0.12	0
Fluoranthene	1500	CIEH	<0.03	1.0	0
Pyrene	3700	CIEH	<0.03	0.91	0
Benzo(a)anthracene	11	CIEH	<0.03	0.41	0
Chrysene	30	CIEH	<0.03	0.53	0
Benzo(b)fluoranthene	3.9	CIEH	<0.03	0.63	0
Benzo(k)fluoranthene	110	CIEH	<0.03	0.21	0
Benzo(a)pyrene	3.2	CIEH	<0.03	0.34	0
Indeno(123cd)pyrene	0.31	CIEH	<0.03	0.23	0
Dibenzo(ah)anthracene	46	CIEH	<0.03	0.05	0
Benzo(ghi)perylene	360	CIEH	<0.03	0.24	0

Table 3 Summary of Soil Chemical Test Results Petroleum Hydrocarbons

Substance	GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of Exceedences
			Minimum	Maximum	
Aliphatic EC >5-6	42	CIEH	<0.01	<0.01	0
Aliphatic EC >6-8	100	CIEH	<0.01	<0.01	0
Aliphatic EC >8-10	27	CIEH	<0.01	<0.01	0
Aliphatic EC >10-12	130	CIEH	<1.5	<1.5	0
Aliphatic EC >12-16	1100	CIEH	<1.2	<1.2	0
Aliphatic EC >16-21	65000	CIEH	<1.5	<1.5	0
Aliphatic EC >21-35	65000	CIEH	37	63	0
Aromatic EC >5-7	370	CIEH	<0.01	<0.01	0
Aromatic EC >7-8	860	CIEH	<0.01	<0.01	0
Aromatic EC >8-10	47	CIEH	<0.01	<0.01	0
Aromatic EC >10-12	250	CIEH	<0.9	<0.9	0
Aromatic EC >12-16	1800	CIEH	<05	<05	0
Aromatic EC >16-21	1900	CIEH	11	13	0
Aromatic EC >21-35	1900	CIEH	84	130	0

Table 4 Summary of Soil Chemical Test Results Asbestos (Where Detected)

Sample Location	Asbestos Type	Form	Total Mass in Soil (%)
S1	Chrysotile	Bundles of fibres	0.003
S2	Chrysotile	Bundles of fibres	0.002

Table 5 Summary of Leachate Chemical Test Results Standard Suite and Speciated PAH

Substance	Threshold (ug/l)	Source	Measured Concentrations of Tested Substances (ug/l)		Number of Exceedences
			Minimum	Maximum	
Arsenic	25	WFD	2.0	4.0	0
Cadmium	0.2	WFD	<0.03	<0.03	0
Chromium III	4.7	WFD	<1.0	1.4	0
Chromium VI	3.4	WFD	<3.0	<3.0	0
Copper	3.76	WFD	1.0	2.8	0
Lead	1.2	WFD	0.29	0.39	0
Mercury	0.07	WFD	<0.01	0.01	0
Nickel	8.6	WFD	<0.5	<0.5	0
Selenium	10	WFD	<0.25	0.47	0
Zinc	9.0	WFD	<1.25	1.73	0
Cyanide	1.0	WFD	<40	<40	Below laboratory detection limit
Phenols	7.7	WFD	<0.5	<0.5	0
Sulphate	250000	DWD	7100	23000	0
pH	-	-	7.3	7.6	0
Naphthalene	2.0	WFD	<0.01	<0.01	0
Acenaphthylene	-	-	<0.01	<0.01	Below laboratory detection limit
Acenaphthene	-	-	<0.01	0.07	1 Above Laboratory Detection Limit
Fluorene	-	-	<0.01	<0.01	Below laboratory detection limit
Phenanthrene	-	-	<0.01	<0.01	
Anthracene	0.1	WFD	<0.01	<0.01	0
Fluoranthene	0.0063	WFD	<0.01	0.14	Below laboratory detection limit
Pyrene	-	-	<0.01	0.13	
Benzo(a)anthracene	-	-	<0.01	<0.01	
Chrysene	-	-	<0.01	<0.01	
Benzo(b)fluoranthene	0.017	WFD	<0.01	<0.01	0
Benzo(k)fluoranthene	0.017	WFD	<0.01	<0.01	0
Benzo(a)pyrene	0.00017	WFD	<0.01	<0.01	Below laboratory detection limit
Indeno(123cd)pyrene	-	-	<0.01	<0.01	
Dibenzo(ah)anthracene	0.0082	WFD	<0.01	<0.01	
Benzo(ghi)perylene	-	-	<0.01	<0.01	

Table 6 Summary of Leachate Chemical Test Results Petroleum Hydrocarbons

Substance	Threshold (ug/l)	Source	Measured Concentrations of Tested Substances (ug/l)		Number of Exceedences
			Minimum	Maximum	
Aliphatic EC >5-6	-	-	<0.1	<0.1	0
Aliphatic EC >6-8	-	-	<0.1	<0.1	0
Aliphatic EC >8-10	-	-	<0.1	<0.1	0
Aliphatic EC >10-12	-	-	<1.0	2.0	2 Above Laboratory Detection Limit
Aliphatic EC >12-16	-	-	7.3	19	2 Above Laboratory Detection Limit
Aliphatic EC >16-21	-	-	<1.0	29	1 Above Laboratory Detection Limit
Aliphatic EC >21-35	-	-	<1.0	4.9	1 Above Laboratory Detection Limit
Aromatic EC >5-7	-	-	<0.1	<0.1	0
Aromatic EC >7-8	-	-	<0.1	<0.1	0
Aromatic EC >8-10	-	-	<0.1	<0.1	0
Aromatic EC >10-12	-	-	<1.0	<1.0	0
Aromatic EC >12-16	-	-	<1.0	8.2	1 Above Laboratory Detection Limit
Aromatic EC >16-21	-	-	<1.0	8.1	1 Above Laboratory Detection Limit
Aromatic EC >21-35	-	-	<1.0	<1.0	0

SOIL SOURCED FROM NORTH OF REEN

Table 1 Summary of Soil Chemical Test Results Standard Suite					
Substance	**SGV/GAC** (mg/kg)	**Source**	**Measured Concentrations of Tested Substances** (mg/kg)		**Number of Exceedences**
			Minimum	**Maximum**	
Antimony	-	-	1.2	2.4	-
Arsenic	32	CLEA	9.4	14	0
Beryllium	1.7	CIEH	0.5	0.7	0
Boron	11000	CIEH	<0.2	07	0
Cadmium	10	CLEA	0.2	2.1	0
Chromium III	910	CIEH	17	45	0
Chromium VI	6	CIEH	<1.0	2.8	0
Copper	7100	CIEH	17	40	0
Lead	320	C4SL	20	77	0
Manganese	-	-	<0.05	0.14	-
Mercury	170	CLEA	770	1200	0
Molybdenum	-	-	0.4	1.1	-
Nickel	180	CIEH	24	37	0
Selenium	350	CLEA	<0.5	0.7	0
Zinc	40000	CIEH	96	120	0
Cyanide	8	CLEA	<0.1	0.3	0
Phenols	420	CLEA	<0.3	<0.3	0
Sulphate	-	-	400	1300	-
Organic Matter	-	-	1.2	2.5	-
pH	-	-	8.5	10.3	-
Asbestos	-	-	Not detected		-

Table 2 Summary of Soil Chemical Test Results
Speciated Polyaromatic Hydrocarbons

Substance	GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of Exceedences
			Minimum	Maximum	
Naphthalene	2.3	CIEH	<0.03	<0.03	0
Acenaphthylene	2900	CIEH	<0.03	<0.03	0
Acenaphthene	3000	CIEH	<0.03	<0.03	0
Fluorene	2800	CIEH	<0.03	<0.03	0
Phenanthrene	1300	CIEH	<0.03	0.21	0
Anthracene	31000	CIEH	<0.03	0.05	0
Fluoranthene	1500	CIEH	<0.03	0.43	0
Pyrene	3700	CIEH	<0.03	0.4	0
Benzo(a)anthracene	11	CIEH	<0.03	0.24	0
Chrysene	30	CIEH	<0.03	0.27	0
Benzo(b)fluoranthene	3.9	CIEH	<0.03	0.38	0
Benzo(k)fluoranthene	110	CIEH	<0.03	0.11	0
Benzo(a)pyrene	3.2	CIEH	<0.03	0.27	0
Indeno(123cd)pyrene	0.31	CIEH	<0.03	0.12	0
Dibenzo(ah)anthracene	46	CIEH	<0.03	0.03	0
Benzo(ghi)perylene	360	CIEH	<0.03	0.16	0

Table 3 Summary of Soil Chemical Test Results
Petroleum Hydrocarbons

Substance	GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of Exceedences
			Minimum	Maximum	
Aliphatic EC >5-6	42	CIEH	<0.01	<0.01	0
Aliphatic EC >6-8	100	CIEH	<0.01	<0.01	0
Aliphatic EC >8-10	27	CIEH	<0.01	<0.01	0
Aliphatic EC >10-12	130	CIEH	<1.5	<1.5	0
Aliphatic EC >12-16	1100	CIEH	<1.2	<1.2	0
Aliphatic EC >16-21	65000	CIEH	<1.5	<1.5	0
Aliphatic EC >21-35	65000	CIEH	<3.4	63	0
Aromatic EC >5-7	370	CIEH	<0.01	<0.01	0
Aromatic EC >7-8	860	CIEH	<0.01	<0.01	0
Aromatic EC >8-10	47	CIEH	<0.01	<0.01	0
Aromatic EC >10-12	250	CIEH	<0.9	<0.9	0
Aromatic EC >12-16	1800	CIEH	<0.5	<0.5	0
Aromatic EC >16-21	1900	CIEH	<0.6	<0.6	0
Aromatic EC >21-35	1900	CIEH	<1.4	21	0

Table 4 Summary of Leachate Chemical Test Results Standard Suite and Speciated PAH					
Substance	**Threshold** (ug/l)	**Source**	**Measured Concentrations of Tested Substances** (ug/l)		**Number of Exceedences**
			Minimum	**Maximum**	
Arsenic	25	WFD	<0.16	2.1	0
Cadmium	0.2	WFD	<0.03	<0.03	0
Chromium III	4.7	WFD	<1.0	1.9	0
Chromium VI	3.4	WFD	<7.0	<7.0	0
Copper	3.76	WFD	<0.4	1.6	0
Lead	1.2	WFD	0.09	1.1	0
Mercury	0.07	WFD	<0.01	<0.01	0
Nickel	8.6	WFD	<0.5	0.9	0
Selenium	10	WFD	<0.25	0.31	0
Zinc	9.0	WFD	<1.3	2.0	0
Cyanide	1.0	WFD	<40	<40	Below laboratory detection limit
Phenols	7.7	WFD	<0.5	<0.5	0
Sulphate	250000	DWD	8900	17000	0
pH	-	-	8.2	8.5	0
Naphthalene	2.0	WFD	0.24	0.47	0
Acenaphthylene	-	-	0.01	0.06	6 Above Laboratory Detection Limit
Acenaphthene	-	-	0.05	0.08	
Fluorene	-	-	0.02	0.04	
Phenanthrene	-	-	0.21	0.41	
Anthracene	0.1	WFD	0.03	0.1	0
Fluoranthene	0.0063	WFD	0.17	0.55	**6**
Pyrene	-	-	0.13	0.49	6 Above Laboratory Detection Limit
Benzo(a)anthracene	-	-	0.13	0.38	
Chrysene	-	-	0.18	0.59	
Benzo(b)fluoranthene	0.017	WFD	0.16	0.73	**6**
Benzo(k)fluoranthene	0.017	WFD	0.04	0.29	**6**
Benzo(a)pyrene	0.00017	WFD	0.08	0.45	**6**
Indeno(123cd)pyrene	-	-	0.13	0.52	6 Above Laboratory Detection Limit
Dibenzo(ah)anthracene	-	-	0.06	0.21	
Benzo(ghi)perylene	0.0082	WFD	0.17	0.66	6

Table 5 Summary of Leachate Chemical Test Results Petroleum Hydrocarbons

Substance	Threshold (ug/l)	Source	Measured Concentrations of Tested Substances (ug/l)		Number of Exceedences
			Minimum	Maximum	
Aliphatic EC >5-6	-	-	<0.1	<0.1	0
Aliphatic EC >6-8	-	-	<0.1	<0.1	0
Aliphatic EC >8-10	-	-	<0.1	<0.1	0
Aliphatic EC >10-12	-	-	<1.0	<1.0	0
Aliphatic EC >12-16	-	-	<1.0	<1.0	0
Aliphatic EC >16-21	-	-	<1.0	<1.0	0
Aliphatic EC >21-35	-	-	<1.0	<1.0	0
Aromatic EC >5-7	-	-	<0.1	<0.1	0
Aromatic EC >7-8	-	-	<0.1	<0.1	0
Aromatic EC >8-10	-	-	<0.1	<0.1	0
Aromatic EC >10-12	-	-	<1.0	<1.0	0
Aromatic EC >12-16	-	-	<1.0	<1.0	0
Aromatic EC >16-21	-	-	<1.0	<1.0	0
Aromatic EC >21-35	-	-	<1.0	<1.0	0

ANNEX I
Copies of Correspondence

Our Ref: RL/12032
Your Ref:
Contact: Ruth Howells

Terra Firma (Wales) Ltd.
Consulting Geotechnical & Geo-Environmental Engineers
Site Investigation Contractors

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22nd June 2015

Riversee Limited
Orchard House
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Newport
NP26 3BS

For the attention of Mr Darran Watts

Dear Darran

CHEMICAL TESTING: STOCKPILED MATERIAL INTENDED AS ENGINEERED FILL

1.0 Introduction

Riversee Limited is proposing to undertake earthworks on a proposed development site off Herbert Road, Newport, where the site is to be raised by up to 1.6m, taking it to a level of 8.8m AOD.

Riversee Limited currently has a large stockpile and adjacent smaller stockpile of material intended for use as engineered fill. The stockpiles are understood to total 22,000m^3 in volume.

Terra Firma (Wales) Limited was commissioned by Riversee Limited to undertake sampling and chemical testing of this material to assess its suitability for use.

This has been carried out in accordance with Terra Firma (Wales) Limited's Remediation Strategy prepared for the site, which specifies that for each 250m^3 (per source) that 1 representative sample be taken for screening. This strategy was agreed with Newport City Council. The stockpile is made up of several indistinguishable sources, and has therefore been treated as a singular source.

A series of 13 trial holes were excavated into the top of the main stockpile to a depth of 3m. Samples were taken at varying depths. The remainder (bottom) of the main stockpile, and the smaller stockpile, will be sampled and tested in due course, once the 3m cover has been removed.

The trial pits/soils were logged and a total of 36 samples were taken (equating to an estimated 9000m^3 of soil).

2.0 Soil Test Results

The soils were submitted to the laboratories of Derwentside Environmental Testing Services for testing. All results are summarised in the following tables, and have been compared to regulatory residential soil guidelines (without plant uptake).

Chemical test certificates can are enclosed.

Table 2.1 Summary of Soil Chemical Test Results Standard Suite

Substance	Threshold (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of Exceedences
			Minimum	Maximum	
Arsenic	32	CLEA SGV	<0.2	19	0
Cadmium	10	CLEA SGV	<0.1	2.1	0
Chromium III	910	CIEH C4UL	<0.15	53	0
Chromium VI	6.0	CIEH C4UL	<1.0	<1.0	0
Copper	2400	CIEH C4UL	<0.2	140	0
Lead	200	C4SL	<0.3	130	0
Mercury	170	CLEA SGV	<0.05	0.27	0
Nickel	130	CLEA SGV	<1.0	53	0
Selenium	350	CLEA SGV	<0.5	43	0
Zinc	3700	CIEH C4UL	<1.0	1200	0
Cyanide	8.0	CLEA SGV	<0.1	0.2	0
Organic matter	-	-	0.7	9.7	-
Sulphate	2400	BRE	600	2700	-
pH	-	-	8.0	11.5	-
Phenol	420	CLEA SGV	<0.3	2.2	0
Total PAH	-	CLEA SGV	<0.1	4.3	*

Notes:

- * See speciated PAH results (see Table 2.2)

2.0 Soil Test Results (Continued)

Table 2.2 Summary of Soil Test Results Speciated PAH					
Substance	**Threshold (mg/kg)**	**Source**	**Measured Concentrations of Tested Substances (mg/kg)**		**Number of Exceedences**
			Minimum	**Maximum**	
Naphthalene	2.3	CIEH C4UL	<0.03	<0.03	0
Acenaphthylene	2900	CIEH C4UL	<0.03	<0.03	0
Acenapthene	3000	CIEH C4UL	<0.03	<0.03	0
Fluorene	2800	CIEH C4UL	<0.03	0.04	0
Phenanthrene	1300	CIEH C4UL	<0.03	0.5	0
Anthracene	31000	CIEH C4UL	<0.03	0.1	0
Fluoranthene	1500	CIEH C4UL	<0.03	1.2	0
Pyrene	3700	CIEH C4UL	<0.03	0.86	0
Benzo(a)anthracene	11	CIEH C4UL	<0.03	0.38	0
Chrysene	30	CIEH C4UL	<0.03	0.41	0
Benzo(b)fluoranthene	3.9	CIEH C4UL	<0.03	0.31	0
Benzo(k)fluoranthene	110	CIEH C4UL	<0.03	0.13	0
Benzo(a)pyrene	3.2	CIEH C4UL	<0.03	0.22	0
Benzo(ghi)perylene	45	CIEH C4UL	<0.03	0.11	0
Dibenzo(ah)anthracene	0.31	CIEH C4UL	<0.03	<0.03	0
Indeno(123cd)pyrene	360	CIEH C4UL	<0.03	0.1	0

Notes:

- GAC based on 1% soil organic matter content (SOM)

2.0 Soil Test Results (Continued)

Table 2.3 Summary of Soil Chemical Test Results Petroleum Hydrocarbons					
Substance	**Threshold (mg/kg)**	**Source**	**Measured Concentrations of Tested Substances (mg/kg)**		**Number of exceedences**
			Minimum	**Maximum**	
PH- Aliphatic					
>C5-C6	42	CIEH C4UL	<0.01	<0.01	0
>C6-C8	100	CIEH C4UL	<0.01	<0.01	0
>C8-C10	27	CIEH C4UL	<0.01	<0.01	0
>C10-C12	130	CIEH C4UL	<1.5	<1.5	0
>C12-C16	1100	CIEH C4UL	<1.2	7.1	0
>C16-C21^	65000	CIEH C4UL	<1.5	15	0
>C21-C35^	65000	CIEH C4UL	<3.4	150	0
PH- Aromatic					
>C5-C7	370	CIEH C4UL	<0.01	<0.01	0
>C7-C8	860	CIEH C4UL	<0.01	0.01	0
>C8-C10	47	CIEH C4UL	<0.01	0.12	0
>C10-C12	250	CIEH C4UL	<0.9	<0.9	0
>C12-C16	1800	CIEH C4UL	<0.5	<0.5	0
>C16-C21	1900	CIEH C4UL	<0.6	14	0
>C21-C35	1900	CIEH C4UL	<1.4	260	0

Notes:

- GAC based on 1% soil organic matter content (SOM)

2.0 Soil Test Results (Continued)

All samples were screened for asbestos. The results are as follows:

Table 2.4 Summary of Soil Chemical Test Results Asbestos

Sample Location	Asbestos Type	Form	Total Mass in Soil (%)
S1	NAD	-	-
S2	NAD	-	-
S3	NAD	-	-
S4	NAD	-	-
S5	NAD	-	-
S6	Chrysotile	Clumps of fibres	0.001
S7	Chrysotile	Bundle of fibres	<0.001
S8	NAD	-	-
S9	NAD	-	-
S10	NAD	-	-
S11	Chrysotile	Bundles of fibres	<0.001
S12	Amosite	Free fibres	<0.001
S13	Amosite Chrysotile	Clumps of fibres	0.024
S14	Chrysotile	Clumps of fibres	<0.001
S15	Chrysotile	Clumps of fibres	<0.001
S16	Chrysotile	Bundles of fibres	<0.001
S16	Chrysotile	Cement fragment	<0.001
S17	Chrysotile	Clumps of fibres	<0.001
S18	Chrysotile	Clumps of fibres	<0.001
S19	Chrysotile	Free fibres	<0.001
S20	Chrysotile	Bundles of fibres	<0.001
S21	Chrysotile	Bundles of fibres	<0.001
S22	Chrysotile	Bundles of fibres	<0.001
S23	Chrysotile	Free fibres	<0.001
S24	NAD	-	-
S25	Chrysotile	Bundles of fibres	<0.001
S26	NAD	-	-
S27	NAD	-	-
S28	NAD	-	-
S29	NAD	-	-
S30	NAD	-	-
S31	NAD	-	-
S32	Chrysotile	Bundles of fibres	<0.001
S33	NAD	-	-
S34	NAD	-	-
S35	NAD	-	-
S36	NAD	-	-

Notes:

- NAD – No Asbestos Detected

3.0 Soil Leachate Results

All 36 samples were subject to leachate analysis in accordance with BS:EN:12457 for a standard suite, speciated PAH and petroleum hydrocarbons to ensure that the soils do not present a risk to groundwater or the River Usk.

Table 2.5
Summary of Leachate Chemical Test Results
Standard Suite

Substance	Threshold (mg/l)	Source	Measured Concentrations of Tested Substances (mg/l)		Number of Exceedences
			Minimum	Maximum	
Arsenic	0.05	WFD	0.0003	0.0065	0
Cadmium*	0.00008 – 0.00025	WFD	<0.00003	<0.00003	BLDL
Chromium III	0.0047	WFD	<0.001	0.0031	0
Chromium VI	0.0034	WFD	<0.003	<0.01	BLDL
Copper*	0.001 – 0.028	WFD	0.0008	0.011	++
Lead	0.0072	WFD	<0.0009	0.001	0
Mercury	0.0005	WFD	<0.00001	<0.00001	0
Nickel	0.02	WFD	<0.0005	0.0025	0
Selenium	0.01	DWD	<0.00025	0.0018	0
Zinc*	0.008 – 0.125	WFD	<0.00125	0.00389	0
Cyanide	0.001	WFD	<0.04	<0.04	0
Sulphate	250	DWD	4.4	15	0
Total Phenol	0.0077	WFD	<0.0005	<0.0005	0
pH	-	-	6.5	10.1	-
Total PAH	-	-	<0.0002	0.0019	-
Chloride	250	DWD	0.69	3.9	0

Notes:

- *Threshold dependant on hardness
- BLDL - Below Laboratory Detection Limit
- ++ 29 samples above lower threshold. Zero samples above upper threshold.

Table 2.6 Summary of Leachate Chemical Test Results Speciated PAH and Petroleum Hydrocarbons					
Substance	**Threshold (mg/l)**	**Source**	**Measured Concentrations of Tested Substances (mg/l)**		**Number of Exceedences**
			Minimum	**Maximum**	
PAH					
Naphthalene	0.0024	WFD	<0.00001	0.00002	0
Acenaphthylene	-	-	<0.00001	<0.00001	BLDL
Acenapthene	-	-	<0.00001	<0.00001	BLDL
Fluorene	-	-	<0.00001	<0.00001	BLDL
Phenanthrene	-	-	<0.00001	<0.00001	-
Anthracene	0.0001	WFD	<0.00001	<0.00001	0
Fluoranthene	0.0001	WFD	<0.00001	<0.00001	0
Pyrene	-	-	<0.00001	<0.00001	BLDL
Benzo(a)anthracene	-	-	<0.00001	<0.00001	BLDL
Chrysene	-	-	<0.00001	<0.00001	BLDL
Benzo(b)fluoranthene	0.00003	WFD	<0.00001	<0.00001	0
Benzo(k)fluoranthene	0.00003	WFD	<0.00001	<0.00001	0
Benzo(a)pyrene	0.00005	WFD	<0.00001	<0.00001	0
Dibenzo(ah)anthracene	-	-	<0.00001	<0.00001	BLDL
Benzo(ghi)perylene	0.000002	WFD	<0.00001	<0.00001	0
Indeno(123cd)pyrene	0.00002	WFD	<0.00001	<0.00001	0
Petroleum Hydrocarbons					
PH- Aliphatic					
>C5-C6	-	-	<0.0001	<0.0001	BLDL
>C6-C8	-	-	<0.0001	<0.0001	BLDL
>C8-C10	-	-	<0.0001	<0.0001	BLDL
>C10-C12	-	-	<0.001	<0.001	BLDL
>C12-C16	-	-	<0.001	<0.001	BLDL
>C16-C21	-	-	<0.001	<0.001	BLDL
>C21-C35	-	-	<0.001	<0.001	BLDL
PH- Aromatic					
>C5-C7	0.01*	WFD	<0.0001	<0.0001	0
>C7-C8	0.05**	WFD	<0.0001	<0.0001	0
>C8-C10	0.03***	WFD	<0.0001	<0.0001	0
>C10-C12	-	-	<0.001	<0.001	BLDL
>C12-C16	-	-	<0.001	<0.001	BLDL
>C16-C21	-	-	<0.001	<0.001	BLDL
>C21-C35	-	-	<0.001	<0.001	BLDL

Notes:

- BLDL - Below Laboratory Detection Limit
- * Threshold for benzene
- ** Threshold for toluene
- ***Threshold for Xylene
- BLDL - Below Laboratory Detection Limit

4.0 Conclusions

All substances tested for in soil were found to be below their respective regulatory guidelines.

Asbestos was identified in numerous soil samples.

All substances were found to be non-leachable (below the limits of laboratory detection) or leachable to acceptable levels.

The soils are considered to be suitable for use as engineered fill provided the appropriate bespoke permit is granted from the NRW with regards to asbestos and capping of the fill with a geotextile membrane and 300mm clean cover is implemented as specified in the Remediation Strategy for the site.

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: Terra Firma (Wales) Ltd

Mrs Ruth Howells

From: ruth@terrafirmawales.co.uk [mailto:ruth@terrafirmawales.co.uk]
Sent: 22 June 2015 16:37
To: JBale@cardiff.gov.uk; Geraint Nicholas Roberts
Subject: Re: 15/0408 - Herbert Road - proposed engineered fill (bottom half of stockpile)

Hi Geraint

Please find attached for approval (Planning Condition 20) my letter confirming that the top half of the stockpile intended as engineered fill is suitable for use (provided the NRW grant the anticipated permit regarding the asbestos).

Kind Regards

Ruth Howells
M.Geol

Geotechnical and Geo-environmental Engineer
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terrafirma

Our Ref: RL/12032

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6th August 2015

Riversee Limited
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Newport
NP26 3BS

For the attention of Mr Darran Watts

Dear Darran

CHEMICAL TESTING: STOCKPILED MATERIAL INTENDED AS ENGINEERED FILL – LOWER HALF OF STOCKPILE

1.0 Introduction

Riversee Limited is proposing to undertake earthworks on a proposed development site off Herbert Road, Newport, where the site is to be raised by up to 1.6m, taking it to a level of 8.8m AOD.

Riversee Limited currently has a large stockpile intended for use as engineered fill. The stockpile is an estimated 23,000m^3 in volume.

Terra Firma (Wales) Limited was commissioned by Riversee Limited to undertake sampling and chemical testing of this material to assess its suitability for use.

The upper half of the stockpile (9000m^3) has previously been sampled and tested.

This letter details testing of the remaining 14,000m^3 or material. The lower half of the stockpile is up to 3m in thickness and nineteen trial holes were excavated through the stockpile to obtain samples from varying depths. Sampling was carried out in two stages, on the 8th and 13th July 2015.

This has been carried out in accordance with Terra Firma (Wales) Limited's Remediation Strategy prepared for the site, which specifies that for each 250m^3 (per source) that 1 representative sample be taken for screening. This strategy was agreed with Newport City Council. The stockpile is made up of several indistinguishable sources, and has therefore been treated as a singular source.

Fifty-six samples were taken in total.

2.0 Soil Test Results

The soils were submitted to the laboratories of Derwentside Environmental Testing Services for testing. All results are summarised in the following tables, and have been compared to regulatory residential soil guidelines (without plant uptake).

Chemical test certificates can are enclosed.

Table 2.1 Summary of Soil Chemical Test Results Standard Suite

Substance	Threshold (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of Exceedences
			Minimum	Maximum	
Arsenic	32	CLEA SGV	4.2	23	0
Cadmium	10	CLEA SGV	0.3	3.0	0
Chromium III	910	CIEH C4UL	16	130	0
Chromium VI	6.0	CIEH C4UL	<1.0	<1.0	0
Copper	7100	CIEH C4UL	11	65	0
Lead	310	C4SL	20	330	1
Mercury	170	CLEA SGV	<0.05	0.66	0
Nickel	130	CLEA SGV	14	44	0
Selenium	350	CLEA SGV	<0.5	1.0	0
Zinc	40000	CIEH C4UL	52	190	0
Cyanide	8.0	CLEA SGV	<0.1	0.5	0
Organic matter	-	-	0.5	10	-
Sulphate	2400	BRE	600	4100	5
pH	-	-	7.6	11.5	-
Phenol	420	CLEA SGV	<0.3	0.8	0
Total PAH	-	CLEA SGV	<0.1	11	*

Notes:

- * See speciated PAH results (see Table 2.2)

2.0 Soil Test Results (Continued)

Table 2.2 Summary of Soil Test Results Speciated PAH					
Substance	**Threshold (mg/kg)**	**Source**	**Measured Concentrations of Tested Substances (mg/kg)**		**Number of Exceedences**
			Minimum	**Maximum**	
Naphthalene	2.3	CIEH C4UL	<0.03	1.3	0
Acenaphthylene	2900	CIEH C4UL	<0.03	<0.03	0
Acenapthene	3000	CIEH C4UL	<0.03	0.22	0
Fluorene	2800	CIEH C4UL	<0.03	0.18	0
Phenanthrene	1300	CIEH C4UL	<0.03	1.4	0
Anthracene	31000	CIEH C4UL	<0.03	0.34	0
Fluoranthene	1500	CIEH C4UL	<0.03	2.1	0
Pyrene	3700	CIEH C4UL	<0.03	1.8	0
Benzo(a)anthracene	11	CIEH C4UL	<0.03	0.82	0
Chrysene	30	CIEH C4UL	<0.03	0.92	0
Benzo(b)fluoranthene	3.9	CIEH C4UL	<0.03	0.94	0
Benzo(k)fluoranthene	110	CIEH C4UL	<0.03	0.31	0
Benzo(a)pyrene	3.2	CIEH C4UL	<0.03	0.69	0
Indeno(123cd)pyrene	45	CIEH C4UL	<0.03	0.32	0
Dibenzo(ah)anthracene	0.31	CIEH C4UL	<0.03	0.1	0
Benzo(ghi)perylene	360	CIEH C4UL	<0.03	0.37	0

Notes:

- GAC based on 1% soil organic matter content (SOM)

2.0 Soil Test Results (Continued)

Table 2.3 Summary of Soil Chemical Test Results Petroleum Hydrocarbons

Substance	Threshold (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of exceedences
			Minimum	Maximum	
PH- Aliphatic					
>C5-C6	42	CIEH C4UL	<0.01	0.22	0
>C6-C8	100	CIEH C4UL	<0.01	0.26	0
>C8-C10	27	CIEH C4UL	<0.01	0.14	0
>C10-C12	130	CIEH C4UL	<1.5	1.8	0
>C12-C16	1100	CIEH C4UL	<1.2	8.8	0
>C16-C21^	65000	CIEH C4UL	<1.5	13	0
>C21-C35^	65000	CIEH C4UL	<3.4	140	0
PH- Aromatic					
>C5-C7	370	CIEH C4UL	<0.01	0.01	0
>C7-C8	860	CIEH C4UL	<0.01	0.03	0
>C8-C10	47	CIEH C4UL	<0.01	0.15	0
>C10-C12	250	CIEH C4UL	<0.9	<0.9	0
>C12-C16	1800	CIEH C4UL	<0.5	3.1	0
>C16-C21	1900	CIEH C4UL	<0.6	22	0
>C21-C35	1900	CIEH C4UL	<1.4	290	0

Notes:

- GAC based on 1% soil organic matter content (SOM)

2.0 Soil Test Results (Continued)

All samples were screened for asbestos. The results are as follows:

Table 2.4 Summary of Soil Chemical Test Results Asbestos

Sample Location	Asbestos Type	Form	Total Mass in Soil (%)
TP1 1.00m	NAD	-	-
TP1 2.00m	NAD	-	-
TP1 3.00m	Chrysotile	Chrysotile present as fibre bundles	<0.001
TP2 1.00m	NAD	-	-
TP2 2.00m	Chrysotile	Chrysotile present as small fibre bundles	<0.001
TP2 2.90m	Chrysotile	Chrysotile present as fibre bundles	<0.001
TP3 0.50m	NAD	-	-
TP3 1.50m	NAD	-	-
TP3 3.50m	NAD	-	-
TP4 0.50m	Chrysotile	Chrysotile present as fibre bundles	<0.001
TP4 2.00m	Chrysotile	Chrysotile present as fibre bundles	<0.001
TP4 3.00m	Chrysotile	Chrysotile present as small fibre bundle	<0.001
TP5 1.00m	NAD	-	-
TP5 2.00m	NAD	-	-
TP5 3.00m	Chrysotile	Chrysotile present as fibre bundles	0.005
TP6 0.50m	NAD	-	-
TP6 2.00m	Chrysotile	Chrysotile present as fibre bundles	<0.001
TP6 3.00m	Chrysotile	Chrysotile present as fibre bundles	0.003
TP7 0.30m	Chrysotile	Chrysotile present as fibre bundles	<0.001
TP7 0.60m	Chrysotile	Chrysotile present as small fibre bundle	<0.001
TP7 2.00m	NAD	-	-
TP8 0.50m	NAD	-	-
TP8 2.00m	NAD	-	-
TP8 2.50m	Chrysotile	Chrysotile present as fibre bundles	<0.001
TP9 0.30m	Chrysotile Amosite	Chrysotile present as fibre bundles Amosite also present as small bundle	<0.001
TP9 1.00m	NAD	-	-
TP9 1.60m	Chrysotile	Chrysotile present as fibre bundles	0.002
TP10 0.50m	Amosite	Amosite present as small fibre bundle	<0.001
TP10 1.40m	NAD	-	-
TP10 2.20m	Chrysotile	Chrysotile present as fibre bundles	<0.001
TP11 0.50m	Chrysotile	Chrysotile present as small fibre bundle	<0.001
TP11 1.00m	NAD	-	-
TP12 1.00	NAD	none	-
TP12 2.00	Chrysotile	small bundle of Chrysotile	0.001
TP12 3.00	NAD	-	-
TP13 1.00	NAD	-	-
TP13 2.00	NAD	-	-
TP13 3.00	NAD	-	-

Table 2B (Continued) Summary of Soil Chemical Test Results Asbestos			
TP14 1.00	NAD	-	-
TP14 2.00	Chrysotile	small bundle of Chrysotile	0.001
TP14 3.00	NAD	-	-
TP15 0.30	NAD	-	-
TP15 1.00	NAD	-	-
TP15 2.20	Chrysotile	small bundle of Chrysotile	<0.001
TP16 0.50	NAD	-	-
TP16 1.50	NAD	-	-
TP16 2.50	NAD	-	-
TP17 0.50	NAD	-	-
TP17 1.50	NAD	-	-
TP17 2.50	NAD	-	-
TP18 0.50	Chrysotile	small bundle of Chrysotile	<0.001
TP18 1.50	NAD	-	-
TP18 2.50	NAD	-	-
TP19 0.50	NAD	-	-
TP19 1.50	NAD	-	-
TP19 2.50	NAD	-	-

3.0 Soil Leachate Results

All 56 samples were subject to leachate analysis in accordance with BS:EN:12457 for a standard suite, speciated PAH and petroleum hydrocarbons to ensure that the soils do not present a risk to groundwater or the River Usk.

Table 2.5
Summary of Leachate Chemical Test Results
Standard Suite

Substance	Threshold (mg/l)	Source	Measured Concentrations of Tested Substances (mg/l)		Number of Exceedences
			Minimum	Maximum	
Arsenic	0.05	WFD	0.0007	0.0075	0
Cadmium*	0.00008 – 0.00025	WFD	<0.00003	0.00047	1
Chromium III	0.0047	WFD	<0.001	0.0024	0
Chromium VI	0.0034	WFD	<0.003	<0.003	0
Copper*	0.001 – 0.028	WFD	0.0011	0.092	++
Lead	0.0072	WFD	<0.00009	0.0033	0
Mercury	0.0005	WFD	<0.00001	0.00003	0
Nickel	0.02	WFD	0.0006	0.0022	0
Selenium	0.01	DWD	0.00044	0.00067	0
Zinc*	0.008 – 0.125	WFD	<0.00125	0.0062	0
Cyanide	0.001	WFD	<0.04	<0.04	BLDL
Sulphate	250	DWD	2.0	51	0
Total Phenol	0.0077	WFD	<0.0005	0.0018	0
pH	-	-	7.1	10.7	-
Total PAH	-	-	<0.0002	0.011	-
Chloride	250	DWD	0.57	130	0

Notes:

- *Threshold dependant on hardness
- BLDL - Below Laboratory Detection Limit
- ++ 53 samples above lower threshold. Zero samples above upper threshold.

Table 2.6
Summary of Leachate Chemical Test Results
Speciated PAH and Petroleum Hydrocarbons

Substance	Threshold (mg/l)	Source	Measured Concentrations of Tested Substances (mg/l)		Number of Exceedences
			Minimum	Maximum	
PAH					
Naphthalene	0.0012	WFD	<0.00001	0.004	1
Acenaphthylene	-	-	<0.00001	<0.00001	1 ALDL
Acenapthene	-	-	<0.00001	0.00002	7 ALDL
Fluorene	-	-	<0.00001	0.0001	6 ALDL
Phenanthrene	-	-	<0.00001	0.00058	33 ALDL
Anthracene	0.0001	WFD	<0.00001	0.00002	0
Fluoranthene	0.0001	WFD	<0.00001	0.0045	6
Pyrene	-	-	<0.00001	0.0039	37 ALDL
Benzo(a)anthracene	-	-	<0.00001	0.00025	25 ALDL
Chrysene	-	-	<0.00001	0.0002	27 ALDL
Benzo(b)fluoranthene	0.00003	WFD	<0.00001	0.00025	14
Benzo(k)fluoranthene	0.00003	WFD	<0.00001	0.00002	5
Benzo(a)pyrene	0.00005	WFD	<0.00001	0.00017	6
Dibenzo(ah)anthracene	-	-	<0.00001	0.00004	6 ALDL
Benzo(ghi)perylene	0.000002	WFD	<0.00001	0.00019	22
Indeno(123cd)pyrene	0.00002	WFD	<0.00001	<0.00001	11
Petroleum Hydrocarbons					
PH- Aliphatic					
>C5-C6	-	-	<0.0001	<0.0001	BLDL
>C6-C8	-	-	<0.0001	<0.0001	BLDL
>C8-C10	-	-	<0.0001	<0.0001	**1 ALDL**
>C10-C12	-	-	<0.001	<0.001	BLDL
>C12-C16	-	-	<0.001	<0.001	BLDL
>C16-C21	-	-	<0.001	0.067	**3 ALDL**
>C21-C35	-	-	<0.001	<0.001	BLDL
PH- Aromatic					
>C5-C7	0.008*	WFD	<0.0001	<0.0001	0
>C7-C8	0.04**	WFD	<0.0001	<0.0001	0
>C8-C10	0.03***	WFD	<0.0001	<0.0001	0
>C10-C12	-	-	<0.001	<0.001	BLDL
>C12-C16	-	-	<0.001	<0.001	BLDL
>C16-C21	-	-	<0.001	0.0061	**1 ALDL**
>C21-C35	-	-	<0.001	<0.001	BLDL

Notes:

- BLDL - Below Laboratory Detection Limit
- ALDL – Above Laboratory Detection Limit
- * Threshold for benzene
- ** Threshold for toluene
- ***Threshold for Xylene

4.0 Conclusions

One sample, taken form TP4 (3.0m) was found to have a lead content of 330mg/kg, exceeding the threshold of 300mg/kg. However, given the depth that this soil will be buried at depth and capped with at least 1.3m of imported fill prior to residential development, the lead is not considered to pose a risk to the human health of site end users. Also, the lead was not found to be leachable to unacceptable levels.

Five samples had an elevated sulphate content. However, this would not pose a risk to human health, especially as it is to be buried at depth. The sulphate content should be taken into account when determining the class of any concrete used on site that may extend into or through the fill.

Asbestos was identified in numerous soil samples. Those substances found to exceed their detection limit are detail in Table 2.7 below.

Table 2.7
Substances Present Above Threshold Levels or Laboratory Detection Limit in Leachate

Substance	Location	Depth Sampled in Stockpile (m)	Recorded Concentration (mg/l	Guideline Value (mg/l)
PH Aliphatic C16-C21	TP12	1.0	0.0014	Results above laboratory detection limit. No guideline available
	TP17	1.5	0.004	
	TP18	1.5	0.0067	
PH Aliphatic C8-C10	TP6	0.5	0.0006	
PH Aromatic C16-C21	TP18	1.5	0.0061	
Cadmium	TP4	3.0	0.00047	0.00025 Upper threshold limit
Naphthalene	TP16	2.5	0.004	0.0012
Fluoranthene	TP13	3.0	0.00056	0.0001
	TP16	2.5	0.0045	
	TP18	1.5	0.00011	
	TP3	3.5	0.00011	
	TP5	3.0	0.0001	
	TP9	0.3	0.00031	
Benzo(k)fluoranthene	TP1	2.0	0.00004	0.00003
	TP3	1.5	0.00004	
	TP3	3.5	0.00005	
	TP4	3.0	0.00005	
	TP9	0.3	0.00009	

Table 2.7 (Continued)
Substances Present Above Threshold Levels or Laboratory Detection Limit in Leachate

Indeno(123cd)pyrene	TP1	2.0	0.00009	0.00002
	TP1	3.0	0.00006	
	TP3	1.5	0.00003	
	TP4	2.0	0.00003	
	TP5	1.0	0.00004	
	TP5	2.0	0.00004	
	TP5	3.0	0.00006	
	TP6	2.0	0.00007	
	TP6	3.0	0.00006	
	TP9	0.3	0.00016	
	TP10	1.4	0.00006	
Benzo(b)fluoranthene	TP1	2.0	0.00012	0.00003
	TP1	3.0	0.00009	
	TP2	2.9	0.00004	
	TP3	1.5	0.00007	
	TP3	3.0	0.0007	
	TP4	2.0	0.00005	
	TP4	3.0	0.00013	
	TP5	1.0	0.00005	
	TP5	2.0	0.00006	
	TP5	3.0	0.00009	
	TP6	2.0	0.0001	
	TP6	3.0	0.00008	
	TP9	0.3	0.00025	
	TP10	1.4	0.00007	

Table 2.7 (Continued) Substances Present Above Threshold Levels or Laboratory Detection Limit in Leachate				
Benzo(a)pyrene	TP1	2.0	0.00011	0.00005
	TP1	3.0	0.00006	
	TP3	3.5	0.00011	
	TP4	3.0	0.0001	
	TP6	2.0	0.00006	
	TP9	0.3	0.00017	
Benzo(ghi)perylene	TP1	1.0	0.00005	0.000002
	TP1	2.0	0.0002	
	TP1	3.0	0.00008	
	TP2	1.0	0.00002	
	TP2	2.9	0.00004	
	TP3	1.5	0.00003	
	TP3	3.5	0.00022	
	TP4	0.5	0.00002	
	TP4	2.0	0.00004	
	TP4	3.0	0.00021	
	TP5	1.0	0.00005	
	TP5	2.0	0.00004	
	TP5	3.0	0.00008	
	TP6	0.5	0.00002	
	TP6	2.0	0.00007	
	TP6	3.0	0.00006	
	TP7	0.3	0.00002	
	TP8	0.5	0.00002	
	TP8	2.5	0.00002	
	TP9	0.3	0.00019	
	TP10	1.4	0.00007	
	TP10	2.2	0.00002	

It is considered that the result for naphthalene is marginal and will not present any risks to the aquatic environment.

Results that exceed laboratory detection limits are similarly considered marginal and such levels would soon be rendered negligible through any effects of dilution and attenuation.

The soils are considered to be suitable for use as engineered fill provided the NRW find the results acceptable and that the fill is capped with a geotextile membrane and 300mm clean cover is implemented as specified in the Remediation Strategy.

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: Terra Firma (Wales) Ltd

Mrs Ruth Howells

Hi Geraint

Please find attached our letter report following testing of the lower part or the stockpile being used as engineered fill.

Also attached is our Remediation Strategy where Section 3.2.1 has been amended slightly in accordance with the results.

Copies have been sent directly to Jason Bale already.

Kind Regards

Ruth Howells
M.Geol

Geotechnical and Geo-environmental Engineer
Terra Firma (Wales) Limited
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Cyfoeth Naturiol Cymru
Natural Resources Wales

Ein cyf/Our ref: SE/2015/119016/03-L01

Eich cyf/Your ref: CONEX/15/0977

Rivers House, St Mellons Business Park, St Mellons, Cardiff, CF3 0EY

Ebost/Email: andrew.hurst@naturalresourceswales.gov.uk

Ffôn/Phone: 03000 653074

Geraint Roberts
Newport City Council
Regeneration, Investment & Housing
Civic Centre
Godfrey Road
Newport
NP20 4UR

14 August 2015

Annwyl Mr Roberts/Dear Mr Roberts

PARTIAL DISCHARGE OF CONDITIONS 05 (REMEDIATION STRATEGY TO SAFEGUARD THE AQUATIC ENVIRONMENT) AND 06 (REMEDIATION STRATEGY TO SAFEGUARD RESIDENTIAL AMENITIES) OF PLANNING PERMISSION 00/0768 FOR REPLACEMENT PRIMARY SCHOOL, ALL WEATHER PITCH, SOFT AND HARD PLAY AREAS AND RESIDENTIAL DEVELOPMENT (IN RELATION TO THE RESIDENTIAL AREA ONLY AND AMENDMENT TO APPROVAL 15/0408) AT LAND TO SOUTH OF AND INCLUDING GLEBELANDS STADIUM, BANK STREET, NEWPORT

Thank you for consulting Cyfoeth Naturiol Cymru/Natural Resources Wales about the above, with additional information which was received on 11 August 2015.

We have reviewed the following updated information submitted in support of this application:

- Stockpiled Chemical Summary, Terra Firma, 6th August 2015, Ref: RL/12032

It is recognised that comparing leachate data to EQS is conservative in terms of assessing whether the material is 'suitable for use'. The statement in Section 4.0 *'results that exceed laboratory detection limits are similarly considered marginal and such levels would soon be rendered negligible through any effects of dilution and attenuation'* is acknowledged. However, the results indicate several exceedences of around 2 orders of magnitude (above the EQS) for Benzo(ghi)perylene, yet this is not mentioned specifically in the text. Whilst, again we recognise that comparison to EQS is conservative and not site specific, further information in terms of the ultimate destination of the stockpiled material (in relation to the sensitive River USK SAC and direct pathway reen) would help further assess the risk posed by these exceedences.

Additionally, the exceedence in relation to lead in soil is noted. We would advise that the

opinion of the local authority (as regulator for human health) is sought in relation to this matter.

We trust our advice is clear. If you have any queries, please do not hesitate to get in touch.

Yn gywir/Yours faithfully

Andrew Hurst
Development Planning Assistant
Cyfoeth Naturiol Cymru/Natural Resources Wales
Ffôn/Tel: (03000) 653074

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RH/12032/let20

19th August 2015

Natural Resources Wales
Rivers House
St Mellons Business Park
Fortran Road
Cardiff
CF3 0EY

For the attn. of Mr Matthew Llewhellin

Dear Matthew

STOCKPILE CHEMICAL SUMMARY: HERBERT ROAD, NEWPORT

I write in reference to correspondence between Mr Andrew Hurst and Mr Geraint Roberts of Newport City Council (Ref: SE/2015/119016/03-L01) dated 14th August 2015, and our telephone conversation yesterday.

I note your reference to the leachate levels of benzo(ghi)perylene and the occurrence of some concentrations of this substance reaching 2 orders of magnitude above the threshold level of 0.000002mg/l.

This magnitude of exceedence was found at four locations, TP1 (2.0m), TP3 (3.5m), TP4 (3.0m) and TP9 (0.3m).

When looking at the sampling locations within the stockpile, TP1, TP3 and TP4 are seen to be adjacent to one another, excavated within the far southern end of the stockpile. TP9 located at the northern end of the stockpile, and the sample was taken from the top soil horizon on the stockpile, which itself reached only 0.4m in thickness. This soil type was not noted in the six surrounding locations and can therefore be considered localised.

When considering the speciated PAH results, the reen that runs along the northern edge of the fill area is deemed to be a potential receptor. The reen flows into the River Usk, and similarly is a potential receptor via this route.

The groundwater beneath the site does not have continuity with the River Usk so this also is not considered a potentially contaminative pathway.

Although the risk to the reen and River Usk are deemed low as the effects of dilution would be significant, it is proposed that the risk be managed by control of where the fill materials from the lower half of the stockpile are deposited on site.

The site is roughly rectangular in shape and measures approximately 200m in length (north to south). I would suggest that materials from the bottom half of the stockpile be placed no closer than 50m from the proposed final reen location (it is understood that the reen is to be widened in places).

Following placement a minimum of 500mm imported soil (source yet to be confirmed) will be placed over the stockpile sourced soils that once compacted will act to limit the infiltration of any water to the stockpile sourced soils.

I 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 me.

Yours sincerely
for: Terra Firma (Wales) Ltd

Mrs Ruth Howells

From: ruth@terrafirmawales.co.uk [mailto:ruth@terrafirmawales.co.uk]
Sent: 13 October 2015 13:14
To: Bale, Jason
Subject: herbert road - imported soil lead exceedence

Hi Jason

I have had some test results for soils at Herbert Road sourced from a Taylor Wimpey Aberbargoed site – please see attached.

As you will see, there is one exceedence of lead (5000mg/kg). All other soil results are fine. Given that this will be capped with at least 0.5m further fill and the lead is not leachable to unacceptable levels, may this soil be permitted to remain?

Thanks

Ruth Howells
M.Geol

Geotechnical and Geo-environmental Engineer
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From: Bale, Jason
Sent: Thursday, October 15, 2015 11:41 AM
To: mailto:ruth@terrafirmawales.co.uk
Subject: RE: herbert road - imported soil lead exceedence

Hi Ruth,
Have you checked with the lab to ascertain if that result has been reported correctly, as it does not seem to be consistent with the other results?
Whilst I appreciate that the soil will be covered by further imported material and the leachate results does not suggest any concerns, I would have concerns in accepting soils with such high values, as ultimately you are introducing contamination to site. The value of 5000 mg/kg is of is over 2 x times the C4SL for **commercial use (2300 mg/kg),** and is over 20 x times the principal NBC concentration of 230 mg/kg.

Best regards
Jason

Jason Bale BSc MIEnvSc
Group Leader/Arweinydd Grwp
Pollution Control Division/Rheoli Llygredd
Shared Regulatory Service|Gwasanaethau Rheoliadol a Rennir
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From: ruth@terrafirmawales.co.uk [mailto:ruth@terrafirmawales.co.uk]
Sent: 27 October 2015 14:29
To: Llewhellin, Matthew
Subject: Herbert Road - short leachate result query

Hi Matthew

In the results of one soil source brought on to site the petroleum hydrocarbon leachate test results are above the limits of detection but there are no guideline values. Just wondered how you would view these and whether you could advise if you find this material acceptable? Please note the asbestos in it, which I have discussed with Jason Bale at Cardiff Council, who is reluctant to accept the soil (asbestos quantification results are being scheduled today), though perhaps may do if the top 300mm of Riversee material (above the geotextile barrier) is increased to 600mm.

The material is already laid on site (the client had already brought it on to site before we were notified) so I am keen to prevent its removal if possible.

I would appreciate a quick response if at all possible – if you deem the leachate results inacceptable then I will cancel the asbestos quantification tests.

Kind Regards

Ruth Howells
M.Geol

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(12th November)

Hi Ruth,

Apologies for the delay on this.

I note the low concentrations of TPH referred to in the leachate analysis which seem mainly related to longer chain length aliphatic fractions. In the absence of an EQS we tend to use 10ug/l as a screening value i.e. for the purposes of progressing to the next tier within the RTM (p20) methodology etc (to assess risk). However, we are talking about very low levels here based on the lab analysis you provided and therefore I think pursuing the Remedial targets methodology (p20) or DQRA route in this instance would be a bit of an academic exercise. It would be helpful for our records if you could provide some brief qualitative justification as to why the concentrations are not likely to pose a risk to controlled waters and are therefore suitable for use. Please feel free to call me if you need to discuss.

Please note that I have not touched on the issues related to asbestos (that you are discussing with Jason Bale).

Kind Regards

Matt
Matt Llewhellin MSc BSc(Hons)
Arbenigwr Technegol/Technical Specialist (Contaminated Land)
Geowyddor/Geoscience
Cyfoeth Naturiol Cymru/Natural Resources Wales
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Ein diben yw sicrhau bod adnoddau naturiol Cymru yn cael eu cynnal, eu gwella a'u defnyddio yn gynaliadwy, yn awr ac yn y dyfodol.
Our purpose is to ensure that the natural resources of Wales are sustainably maintained, enhanced and used, now and in the future.

------See TFW letter 18th November

(17th Nov 2015)

Hi Jason

Further to our recent discussions about the Herbert Road imported engineered fill please find attached the asbestos quantification results.

To refresh your memory, soils from citivision (a Taylor Wimpey site in Newport) were brought on to site on two occasions. Whether the two batches were from the same area on the Taylor Wimpey site I don't know, but believe not otherwise the second batch would have been brought in as part of the first.

The results from the first batch (see 46635 attached – labelled as Aberbargoed but this is incorrect) had one exceedence of lead (as you commented on below – the labs confirmed that there was no mistake with the results). The second batch (see 47308 attached) has asbestos in both samples. The quantification shows a low % of fibres present.

I know that to keep both of these soil types on site is far from ideal, and normally the client wouldhave to remove the materials. However, in the best interest of my client, I would like prevent removal if possible (assuming the NRW are happy with leachate results which I am to address shortly) given the costs involved in hiring plant and disposal.

As previously discussed with yourself, a barrier and 300mm capping layer will comprise the top of the fill at this stage, prior to further raising of levels (by about 1m) by the later developer following a period of settlement (likely to take around a year). During this settlement period the site will be fenced off, as it is now, from off-site users. The nearest adjacent site users are pedestrians using the footpath between the site and the river.

Currently, I would say at least 500mm is still required on site to attain the fill level intended prior to the settlement period (to include the recommended 300mm). This is now not likely to occur until after Christmas.

If you do not consider that another approx minimum 200mm fill with overlying top 300mm layer and geotextile barrier (plus the additional 1m of cover at a later date) satisfactory then may I suggest that the barrier be laid at the base of the top 500mm of fill?

Also, I best mention the materials brought on to site from north of the reen that has been used as engineered fill. I found the old validation report and the results for imported capping materials north of the reen, but it was not clear which results specifically were for this fill - there were two sources used, one source used north of the reen, one elsewhere. A few results were not great so due to the uncertainty I told the client that the material should be tested to your specification even if it was largely stone type fill.

Please give me a call if you need clarification on anything.

Many Thanks

Ruth Howells
M.Geol

Geotechnical and Geo-environmental Engineer
Terra Firma (Wales) Limited
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terrafirma

Our Ref: RH/12032/let21

Your Ref:

Contact:

Terra Firma (Wales) Ltd.
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Site Investigation Contractors

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18th November 2015

Natural Resources Wales
Rivers House
St Mellons Business Park
Fortran Road
Cardiff
CF3 0EY

For the attn. of Mr Matthew Llewhellin

Dear Matthew

IMPORTED CITIVISION FILL: HERBERT ROAD, NEWPORT

Further to our recent correspondence regarding petroleum hydrocarbon leachate results for samples of imported fill soil I confirm the following:

Engineered fill of a maximum volume of 250m^3 was brought on to site from the nearby Taylor Wimpey Citivision site in Newport. Whilst stockpiled the fill was sampled by a Terra Firma engineer.

The samples were submitted for laboratory analysis and tested according to the Terra Firma Remediation Strategy Report for a range of substances. Leachate tests were carried out according to BS:EN:12457.

Please find the test results enclosed.

For one of the two samples the concentration of the aliphatic petroleum hydrocarbon fraction for band C12-C16 was 19ug/l (0.019mg/l), and for aliphatic band C16 – C21 29ug/l (0.029mg/l).

No guideline exists for comparison but if the NRW suggested 10ug/l screening value is applied then both these results are found to be in exceedence.

Potential receptors to the leachable petroleum hydrocarbons are the drainage reen along the northern edge of the fill area, the River Usk and groundwater. The reen flows into the River Usk.

The fill has been placed roughly 40m west of the River Usk and 50m south of the reen.

The potential receptors are considered to be at negligible risk for a number of reasons.

1. The recorded levels, although elevated, are still very low and would soon be rendered insignificant through the effects of dilution before reaching a potential receptor.
2. The volume of this fill imported is small and the other representative sample did not exhibit elevated levels of petroleum hydrocarbons.
3. The fill overlies at least 500mm of imported well compacted engineered clay fill which is largely impermeable due to the compaction.
4. No surface run-off from the site to the River Usk can occur due to the embankment between the site and the River Usk (along which a footpath runs).
5. Below the engineered fill and in-situ made ground alluvium is present. The underlying bands of alluvium are largely impermeable, limiting the migration of perched groundwater to the deeper groundwater environment. Groundwater beneath the site has been confirmed to not be in hydraulic conductivity with the River Usk.
6. The Citivision made ground is itself to be overlain (probably in the new year now) by approximately 500mm further well compacted fill. This should effectively form a barrier to much or all percolating waters, significantly reducing the probability that the leachable petroleum hydrocarbons will mobilise.

I trust the above provides adequate explanation as to why there are not considered to be any significant risks to controlled waters and justification for retaining the fill soils on site.

I 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 me.

Yours sincerely
for: Terra Firma (Wales) Ltd

[redacted]

Mrs Ruth Howells

From: Geraint Nicholas Roberts
Sent: Wednesday, November 25, 2015 3:05 PM
To: ruth@terrafirmawales.co.uk
Subject: RE: NRW Planning Response CONEX/15/0977

Dear Ruth

I still have this application before me. As it stands CNC/NRW are not recommending that the condition is discharged. The last thing I have on my file is a copy letter you sent to Mat Llewhelin at CNC/NRW on the 19/08/2015. No information has been formally put to me addressing CNC/NRW's concerns since that date.

Since I have heard nothing from you or from CNC/NRW. In the light of the uncertainty over the suitability of the stockpiled material I would have little choice other than to refuse the application as it stands.

As such if the application isn't withdrawn or substantial evidence produced to show the matter is being progressed I will proceed to refuse the application after 02/12/2015.

Please contact me as necessary.

Geraint N. Roberts
Prif Swyddog Cynllunio / Principal Planning Officer
Tim yr Dwyrain / East Team
Adfywio, Buddsoddi aThai / Regeneration, Investment and Housing
01633 210094

From: ruth@terrafirmawales.co.uk [mailto:ruth@terrafirmawales.co.uk]
Sent: 26 November 2015 09:54
To: Llewhellin, Matthew
Subject: Fw: NRW Planning Response CONEX/15/0977

Hi Matthew

Following my phone call please see below the recent email from Geraint Roberts. I am concerned as the stockpile soils are, as you know, already down (in accordance with proposals in my letter of the 19th) and his proposal to refuse the application.

I have attached the original NRW letter from Andrew Hurst to which I was responding to on the 19th August.

I am out of the office now until tomorrow afternoon. If you have any questions please call me on my mobile.

Many Thanks

Ruth Howells
M.Geol

Geotechnical and Geo-environmental Engineer
Terra Firma (Wales) Limited
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Sent: 26 November 2015 10:35
To: Hurst, Andrew <Andrew.Hurst@cyfoethnaturiolcymru.gov.uk>
Subject: FW: NRW Planning Response CONEX/15/0977

Hi Andrew,
Please see email from Ruth Howells at Terra Firma below. She submitted a letter and further info in response to our letter SE/2015/119016-3 to me and cc'd you in on the 19th of August (I'll forward that separately now). I'd agreed informally with her that I was happy with what was in her letter of the 19th of August but I'm not sure I ever responded formally through planning liaison (well it doesn't look like it based on Geraint Robert's email below). Are you able to discuss with Geraint and tell him that we will respond (no objection to partial discharge of condition 5 – based on additional info).
thanks
Ruth/

Ein cyf/Our ref: SE/2015/119016/03-L02

Eich cyf/Your ref: CONEX/15/0977

Rivers House, St Mellons Business Park, St Mellons, Cardiff, CF3 0EY

Ebost/Email: andrew.hurst@naturalresourceswales.gov.uk

Ffôn/Phone: 03000 653074

Geraint Roberts
Newport City Council
Regeneration, Investment & Housing
Civic Centre
Godfrey Road
Newport
NP20 4UR

2 December 2015

Annwyl Mr Roberts/Dear Mr Roberts

PARTIAL DISCHARGE OF CONDITIONS 05 (REMEDIATION STRATEGY TO SAFEGUARD THE AQUATIC ENVIRONMENT) AND 06 (REMEDIATION STRATEGY TO SAFEGUARD RESIDENTIAL AMENITIES) OF PLANNING PERMISSION 00/0768 FOR REPLACEMENT PRIMARY SCHOOL, ALL WEATHER PITCH, SOFT AND HARD PLAY AREAS AND RESIDENTIAL DEVELOPMENT (IN RELATION TO THE RESIDENTIAL AREA ONLY AND AMENDMENT TO APPROVAL 15/0408) AT LAND TO SOUTH OF AND INCLUDING GLEBELANDS STADIUM, BANK STREET, NEWPORT

Thank you for consulting Cyfoeth Naturiol Cymru/Natural Resources Wales about the above, with additional information which was received on 19th August 2015.

We note that the additional information has been submitted in relation to our previous response – our reference SE/2015/119016/03, your reference CONEX/15/0977, dated 19th August 2015.

We have reviewed the following additional information submitted in support of this application:

- Stockpile Chemical Summary: Herbert Road, Newport, Letter to Matt Llewhellin, Natural Resources Wales, Ref RH/12032/let20, dated 19th August 2015.

Having reviewed the additional information as submitted above we have no objection to the partial discharge of condition 05 (Remediation Strategy to safeguard the aquatic environment) and 06 (Remediation Strategy to safeguard residential amenities).

We trust our advice is clear. If you have any queries, please do not hesitate to get in touch.

Yn gywir/Yours faithfully

Andrew Hurst
Development Planning Assistant
Cyfoeth Naturiol Cymru/Natural Resources Wales
Ffôn/Tel: (03000) 653074

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andrew.hurst@cyfoethnaturiolcymru.gov.uk andrew.hurst@naturalresourceswales.gov.uk

Gwefan/Website:
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Hello Ruth

Please see the attached.

Notwithstanding CNC/NRW's lack of objection we have concerns over the proposal.

In essence parts of the stockpile will not be placed within 50m of the reen. However in practical terms we would not know which parts of the stockpile (we presume the southern end as opposed to the 'lower half') had been deposited in what part of the site from simple observation.

Also it isn't clear if the geotextile membrane would still be installed under your revised proposal.

Permission 00/0768 does have a contamination remediation verification condition attached (condition 7).

Potentially this would be a mechanism by which you could demonstrate compliance with your proposed strategy but this seems likely to involve a sampling regime post deposition of material. It may be useful if your client starts to consider how any approved strategy will be verified as completed at an early stage and potentially build that verification strategy into this submission?

Alternatively you might simply agree to deposit none of the stockpile within 50m of the reen. This is something we could check by direct observation once we were notified the stockpile had been moved onto the site? Again this could be built into any strategy

In conclusion at the moment we don't think we can agree the discharge of the conditions as sought.

Please get back to me by 02.12.2015 in the first instance if you wish to discuss any of the above observations.

Geraint N. Roberts
Prif Swyddog Cynllunio / Principal Planning Officer
Tim yr Dwyrain / East Team
Adfywio, Buddsoddi aThai / Regeneration, Investment and Housing
01633 210094

Our Ref: RH/12032/let22

Your Ref:

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10th December 2015

Via Email

Principal Planning Officer
East Team
Regeneration, Investment and Housing

For the attn. of Mr Geraint N. Roberts

Dear Geraint

CONEX 15/0977: Land South of Glan Usk School (Glebelands)

In response to your email dated 2nd December 2015 and our subsequent conversation, I confirm that the parts of the stockpile (lower half) found to have levels of leachable PAH (as detailed in my letter to Matthew Llewhellin of the NRW on 19th August 2015) were placed on site towards the end of August 2015.

My letter to the NRW proposed that the affected two areas of the stockpile identified should be placed on site at a distance at least 50m from the drainage reen. Due to time constraints the client brought this material on to site before receiving a response and approval from the NRW.

Terra Firma (Wales) Limited was employed full time on site during the earthworks so far completed. I can confirm that the affected stockpile areas were segregated and laid in the southeast quadrant of the development site. This area lies at least 100m from the reen to the north.

At present the fill works on site are on hold and are anticipated to resume around April 2016, when the weather improves.

The entire stockpile has now been placed on site. In addition to this soils sourced from a Taylor Wimpey Newport Citivision site have been brought in on two occasions. The client has also stripped off soils from the part of the site that lies north of the reen and used this as engineered fill. All appropriate testing has been completed and reported to Jason Bale at Cardiff City Council for approval.

There are a few outstanding issues (two occurrences of asbestos fibres and a soil exceedence of lead) that are to be addressed and I am currently awaiting a response from Jason on instruction on how to proceed.

Once the earthworks resume Terra Firma will again be employed to:

1. Document the source and volume of imported materials

2. Sample and test all intended imported materials and to determine their suitability

3. Provide Jason Bale and the NRW with soil test results if they do not meet the standards outlined in the Terra Firma Remediation Strategy Report and discuss whether soils may be permitted for use

4. Retain a full time presence during import of soils and placement on site. Where soils are laid and from which source (if applicable) will be documented daily. This will be illustrated on plans where necessary. The thickness of any fill placed will also be noted, but this is limited due to engineering specifications. The intended location of imported fill on site will not be known until it arrives or just before, and it will depend on the volume of each source and which areas of the site are ready to receive fill (dependant on the weather and in-situ geotechnical testing).

5. The geotextile barrier is still intended to be laid below the top 300mm of imported fill. The 300mm thickness is subject to change (i.e. 300mm thickness may be increased) depending on the requirements of Jason Bale.

6. Placement of the membrane will be carried out whilst Terra Firma are on site and will be documented through photographs

7. Regular photographs will be taken during all the fill works

8. Following completion of the fill works (i.e. to a level of 8.95m AOD) Terra Firma will compile an Earthworks Validation Report. This is required for both geotechnical and geo-environmental verification and will demonstrate that the proposals made in our Remediation Strategy Report have been carried out appropriately (with the exception of flux box monitoring and garden capping – to be reported separately in due course). It will detail all imported soil details (source, chemical test certificates, council/NRW correspondence etc) and where specific soils were laid, supported by drawings and photographs.

9. The Earthworks Validation Report will also include the results and assessment of groundwater samples taken. One round was carried out prior to filling as specified in the Remediation Strategy. The strategy also specifies that if earthworks are not complete within the intended time (approximately 2 months - which they weren't) then the second and third post-earthworks groundwater sampling and testing should follow at 5 and 6 months, respectively, from the start date of the earthworks. The second round will be completed in January 2016, and the third round in February 2016. Once the earthworks are complete (which should be in the summer of 2016) then we will advise the client that a further two monitoring rounds will be necessary.

I 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 me.

Yours sincerely
for: Terra Firma (Wales) Ltd

[redacted]

Mrs Ruth Howells

From: Bale, Jason
Sent: Friday, January 22, 2016 12:18 PM
To: mailto:ruth@terrafirmawales.co.uk
Cc: 'Peter Mackintosh'
Subject: RE: Herbert Road

Hi Ruth
My sincere apologies, I did mean to respond to you on this previously.. My new role means I have less time these days for CL issues, so this has been the reason for the delay in the response.

I had spoken to Peter Mackintosh at Newport as he is the new Senior Scientific Officer for them and is responsible for CL issues. We were both of the agreement that the likely risk exposure from the asbestos was likely to be low, given the additional surcharging and capping works that would be required, and thus from an end of use scenario the material was possibly ok to stay on site.

However, we would request that you advise your client further in terms of future importation that materials are sourced and sampled prior to importation, and that it would be unacceptable for future imported materials to contain asbestos.

I have copied Peter into this email, as ultimately he will be taking this site forward with Newport as Cardiff were only covering whilst they filled the vacant post.

I trust that this is acceptable with you and please do not hesitate to contact me if you wish to discuss further.
Best regards
Jason
Jason Bale BSc MIEnvSc
Team Manager - Environment / Amgylchedd Rheolwr Tîm
Shared Regulatory Service|Gwasanaethau Rheoliadol a Rennir
Bridgend, Cardiff & the Vale of Glamorgan| Pen-y-Bont ar Ogwr, Caerdydd ar Bro Morgannwg
Tel/ Ffôn: 02920 871 896

19

24.10.2016

Hi Ruth,

In reviewing the risk assessment I am generally happy that the material is unlikely to cause a significant risk to human health (future site users) provided the approach outline in section 5.1.2 is fulfilled. However, for completeness I would ask that you include a gas risk assessment of the imported material to further site users/property with comments upon the organic content.

As previously stated, I strongly recommend you have conformation from NRW that the material is acceptable before it is placed on site.

Kind regards,

Pete

20

From: ruth@terrafirmawales.co.uk [mailto:ruth@terrafirmawales.co.uk]
Sent: 04 November 2016 15:44
To: Llewhellin, Matthew <Matthew.Llewhellin@cyfoethnaturiolcymru.gov.uk>
Subject: Re: herbert road - final risk assessment report

Hi Matthew

Following your comments last week please find attached my revised risk assessment report for review. This now includes assessment with target concentrations derived using the remedial targets methodology. Any questions please just give me a call.

Kind Regards

Ruth Howells
M.Geol

Geotechnical and Geo-environmental Engineer
Terra Firma (Wales) Limited

Hi Ruth,

I have reviewed your submitted risk assessment including the derived site specific levels and can confirm that I have no further concerns. As discussed before, my comments are only in relation to potential risks to controlled waters . For comments in relation to permit compliance you would need to speak to the department who issued the permit in 2015.

Kind Regards

Matt

Matt Llewhellin MSc BSc(Hons)
Arbenigwr Technegol/Technical Specialist (Contaminated Land)
Geowyddor/Geoscience
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Ein diben yw sicrhau bod adnoddau naturiol Cymru yn cael eu cynnal, eu gwella a'u defnyddio yn gynaliadwy, yn awr ac yn y dyfodol.
Our purpose is to ensure that the natural resources of Wales are sustainably maintained, enhanced and used, now and in the future.

ANNEX J
Compaction Specification Reports

COMPACTION SPECIFICATION

Top Half of Engineered Fill Source
Stockpile Herbert Road
Newport

Prepared for:
Riversee Limited

July 2015

Report No. 12032/CS1

REPORT TITLE	**:**	**Compaction Specification: Top Half of Engineered Fill Source Stockpile, Herbert Road, Newport**
REPORT STATUS	**:**	**Final**
JOB NUMBER	**:**	**12032/CS1**
DATE	**:**	**July 2015**
PREPARED BY	**:**	[redacted] **..** **(Mrs R. Howells)**
REVIEWED BY	**:**	[redacted] **..** **(Miss L. Dow)**
APPROVED BY	**:**	[redacted] **(Dr G. C. Lake)**

Executive Summary

Riversee Limited is proposing to undertake earthworks on a proposed development site off Herbert Road, Newport, where the site is to be raised by up to 1.6m, taking it to a level of 8.8m AOD.

Proposed engineered fill materials are stockpiled on a nearby site on Herbert Road.

Samples of the upper top half of the stockpile was sampled by Terra Firma.

These samples taken were submitted to Geo Site and Testing Services Limited in Llanelli in order to assess their optimum moisture content/maximum dry density and to undertake grading analyses.

The initial moisture content of the soils was found to be between 15 and 26% with an optimum moisture content of between 9.5 and 14%.

In order for there to be tolerable settlements from the placed fill materials, it needs to be compacted at or close to 95% of its Optimum Moisture Content/Maximum Dry Density. Drying of the soils is likely to be required to achieve this.

In order to meet the above criterion it is clear that the materials will need to be dried.

Grading analysis results have been used to classify the soils as selected stony cohesive material (Type 2C and 6F2).

The materials should be laid and compacted in layers as given by the Specification Works for Highways 600.

TABLE OF CONTENTS

Section 1 Introduction

1.1 Limitations and Exceptions

Section 2 Soil Property Testing

2.1 Soil Sampling
2.2 Optimum Moisture Content/Maximum Dry Density
2.3 Grading Analysis Results
2.4 Compaction Specification

Section 3 Conclusions as to the Suitability of the Materials as Site Fill

Tables

Table 2.1 Sample Descriptions
Table 2.2 Optimum Moisture Content/Maximum Dry Density Test Results
Table 2.3 Grading Analysis Results and Soil Classification
Table 2.4 Compaction Specification - Method 2
Table 2.5 Compaction Specification - Method 6

Annexes

Annex A Grading Analysis and Optimum Moisture Content and Maximum Dry Density Test Results

SECTION 1 Introduction

Riversee Limited is proposing to undertake earthworks on a proposed development site off Herbert Road, Newport, where the site is to be raised by up to 1.6m, taking it to a level of 8.8m AOD.

The ground is to be brought up in layers, in accordance with the Department of Transport Specification for Highway Works, prior to construction and the importation of inert materials in landscaped areas.

Proposed engineered fill materials are stockpiled on a nearby site on Herbert Road.

Terra Firma (Wales) Limited has been commissioned by Riversee Limited to undertake sampling and testing of off-site stockpiled soil to assess its suitability as fill.

This report details the compaction specification for soils in the upper half of the stockpile only.

1.1 Limitations and Exceptions

The compaction specification report has been prepared for the sole internal reliance of Riversee Limited and its design and construction team. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Terra Firma (Wales) Limited. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The report represents the findings and opinions of experienced geo-environmental and geo-technical consultants. Terra Firma (Wales) Limited does not provide legal advice and the advice of lawyers may also be required.

SECTION 2 Soil Property Testing

2.1 Soil Sampling

Terra Firma (Wales) Limited attended the stockpile site on 11th February 2015 in order to obtain samples for geotechnical testing.

Eight representative samples were taken and submitted to Geo Site and Testing Services Limited in Llanelli in order to assess their optimum moisture content/maximum dry density and to undertake grading analyses.

The table below summarises the samples taken.

Table 2.1 Sample Descriptions

Sample	Depth in Stockpile (m)	Description
S1	1.7	Grey brown sandy gravelly cobbly clay
S2	1.0	Brown gravelly cobbly clay mixed with grey gravelly cobbly clay
S3	0.5	Grey sandy gravelly cobbly clay
S4	1.5	Brown gravelly cobbly clay mixed with grey gravelly cobbly clay
S5	0.5	Grey brown gravelly cobbly clay with pockets of red clay
S6	1.7	Grey clay mixed with red sandy clay
S7	3.0	Red sand, gravel and cobble
S8	0.5	Grey brown gravelly cobbly clay with pockets of red clay

2.2 Optimum Moisture Content/Maximum Dry Density

The results of the optimum moisture content and maximum dry density tests are detailed in the table below.

These tests were conducted in accordance with BS 1377: Part 4: 1990.

Table 2.2 Optimum Moisture Content/Maximum Dry Density Test Results

Sample	Initial Moisture Content (%)	Optimum Moisture Content (%)	Maximum Dry Density(mg/m^3)
S1	20	10	1.90
S2	22	10	1.95
S3	22	9.7	1.93
S4	15	12	1.89
S5	20	9.5	1.93
S6	21	10	1.90
S7	16	14	1.84
S8	26	10	1.88

The suitable fill materials should be placed at or close to i.e. 95% of their optimum moisture content/maximum dry density and compacted in layers as per the requirements of the Specification for Highway Works.

The test certificates are given in **Annex A.**

2.3 Grading Analysis

The eight samples were tested in the laboratory by dry and wet sieving analysis to determine their grading characteristics. These tests were conducted in accordance with BS1377: Part 2, Clause 9.2: 1990.

The test certificates are presented in **Annex A.**

Based upon the soil property test results, and referring to Table 6/1: Acceptable Earthworks Materials: Classification and Compaction Requirements and Table 6/2: Grading Requirements for Acceptable Earthworks Materials, of the 'Specification for Highway Works, Series 600', the samples can be classified as summarised in the table below.

Table 2.3 Grading Analysis Results and Soil Classification

Sample	Type (Table 6/2)	Classification (Table 6/1)	Compaction Method
S1	6F2	Selected Granular Material	Method 6
S2	2C	Stony Cohesive Material	Method 2
S3			
S4			
S5			
S6			
S7			
S8			

2.4 Compaction Specification

Compaction should be undertaken in accordance with the appropriate methodology as given in of Table 6/4 of the Specification for Highway Works, Series 600, as summarised in **Tables 2.4 and 2.5.**

Details for just a smoothed wheeled roller and vibratory roller are provided. If an alternative roller is proposed then Table 6/4 should be consulted.

Table 2.4 Compaction Specification - Method 2

Type of Compaction Plant	Mass per Metre Width of Roll (kg)	Maximum depth of Compacted Layer (mm)	Number of Passes
Smoothed Wheeled Roller	2100 – 2700 2700 – 5400 >5400	125 125 150	10 8 8
Vibratory Roller	270 – 450 450 – 700 700 – 1300 1300 – 1800 1800 – 2300 2300 – 2900 2900 – 3600 3600 – 4300 4300 – 5000 >5000	75 75 125 150 150 175 200 225 250 275	16 12 10 8 4 4 4 4 4 4

Table 2.5 Compaction Specification - Method 6

Type of Compaction Plant	Mass per Metre Width of Roll (kg)	Number of Passes		
		110mm layer	150mm layer	250mm layer
Smoothed Wheeled Roller	2100 – 2700 2700 – 5400 >5400	Unsuitable 16 8	Unsuitable Unsuitable 16	Unsuitable Unsuitable Unsuitable
Vibratory Roller	270 – 450 450 – 700 700 – 1300 1300 – 1800 1800 – 2300 2300 – 2900 2900 – 3600 3600 – 4300 4300 – 5000 >5000	Unsuitable Unsuitable 16 6 4 3 3 2 2 2	Unsuitable Unsuitable Unsuitable 16 6 5 5 4 4 3	Unsuitable Unsuitable Unsuitable Unsuitable 12 11 10 8 7 6

2.4 Compaction Specification (Continued)

Compaction should be undertaken in accordance with Table 6/1 and 6/4, as soon as practicable after deposition.

Where combinations of different types or categories of plant are used, the depth of the layer should be for the type of plant requiring the least depth of layer, and the number of passes should be that for the type of plant requiring the greatest number of passes.

Earthmoving plants are not recommended for use as compaction plant, nor are lighter categories of plants used to provide preliminary compaction to assist the use of heavier plant.

The soils should be sorted and all deleterious material, such as timber and plastic removed.

All roots and tree roots should be excavated and removed.

The stability of excavations or fills should not be compromised by the location of stock piled materials or use of plant or location of temporary buildings/structures.

All earthworks must be kept free of water including arranging for the rapid removal of water, water shed onto the earthworks and water entering the earthworks from any source.

Fill materials especially cohesive (silt and clay) fill should not be deposited and compacted during wet weather, where an increase in moisture content will increase the liquid limit of the soil.

The initial moisture content of the soil was found to be double the optimum moisture content in some instances, indicating that the clay soils will need to be dried out prior to filling to achieve adequate compaction.

All exposed fill surfaces must be adequately weather proofed during inclement weather or at the end of the working day/compaction process. Any exposed cohesive fill that becomes wet and slurrified due to water ingress or weather erosion must be stripped off, spread into thin layers and aerated. The fill should then be re-compacted.

Plant movement across compaction layers should be restricted to that plant necessary for its deposition, spreading and compaction.

Fill areas should be constructed evenly over their full width and their fullest possible extent and the contractor should control and direct constructional plant and other traffic uniformly over them. Damage by construction plant should be made good with material having the same characteristics and strength as the material had before it was damaged.

Embankments and other areas of unsupported fills should not be constructed with steeper side slopes than the materials effective shear strength, with exception to allowing the adequate compaction at the edges before trimming back, within the minimum period necessary for the safety of the works.

2.4 **Compaction Specification** (Continued)

Where fill is to be placed against a natural slope, or sloping earthworks face including embankments, cuttings and other fills and excavations, such faces should be appropriately benched immediately before placing the subsequent fill.

In-situ density tests (sand replacement method) should be undertaken to ensure the compaction process is performing satisfactory during the enabling works. In-situ testing should be undertaken at an appropriate spacing to reflect the adequacy of the compaction process beneath the entire development area.

It is also recommended that a number of in-situ plate load tests be performed mid way through the earthworks and at the final finished site level beneath the access road.

The earthworks should be supervised by a suitable engineer.

The tests should be conducted in accordance with BS 1377: Part 9: 1990 under the supervision of a qualified geotechnical engineer.

Should the in-situ testing show densities which indicate that the compaction process is inadequate, the deposited material must be excavated and re-laid.

Allowances should also be made for the removal of soft spots and their replacement with imported suitable selected inert granular materials or suitable inert site won materials.

SECTION 3 Conclusions as to the Suitability of the Materials as Site Fill

In order for there to be tolerable settlements from the placed fill materials, they need to be compacted at or close to their optimum moisture content and maximum dry density (95%). This will ensure that a minimum 95% compaction will be achieved.

In order to meet the above criterion it is clear that the materials will need to be dried. This can be achieved by excavating and allowing the materials to dry naturally.

Once the given moisture content has been achieved then the materials may be used as structural fill. The materials have been graded according to the Specification Works for Highways 600 and should be laid and compacted in layers by referring to the Specification as described in Section 2.4.

A programme of in-situ density testing should also be carried out during fill works in order to confirm the effectiveness of the compaction procedure.

ANNEX A
Grading Analysis and Proctor Test Results

Laboratory Report

2788

GEO Site & Testing Services Ltd

Contract Number: 25872

Client's Reference: **TBC**

Report Date: **25-02-2015**

Client **Terrafirma Wales Ltd**
5 Deryn Court
Wharfedale Road
Pentwyn
Cardiff
CF23 7HB

Contract Title: **Herbert Road, Newport**

For the attention of: **Ruth Liley**

Date Received: **12-02-2015**

Date Commenced: **12-02-2015**

Date Completed: **25-02-2015**

Test Description	Qty
PSD Wet Sieve method 1377 : 1990 Part 2 : 9.2 - * UKAS	8
Dry Den/MC (2.5kg Rammer Method 1 Litre Mould) 1377 : 1990 Part 4 : 3.3 - * UKAS	8

Notes: **Observations and Interpretations are outside the UKAS Accreditation**
*** - denotes test included in laboratory scope of accreditation**
 # - denotes test carried out by approved contractor
@ - denotes non accredited tests

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Approved Signatories:
Alex Wynn (Associate Director) - Benjamin Sharp (Contracts Manager) - D V Edwards (Managing Director)
Emma Williams (Office Manager) - Paul Evans (Quality/Technical Manager)

GEO Site & Testing Services Ltd
Unit 4, Heol Aur, Dafen Ind Estate, Dafen, Llanelli, Carmarthenshire SA14 8QN
Tel: 01554 784040 Fax: 01554 784041 info@geo.uk.com geo.uk.com

Test Report: **Particle Size Distribution Test**

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:

Location: **Herbert Road**

Contract Number: **25872-120215**

Hole Number:

Sample Number: **1**

Depth from (m):

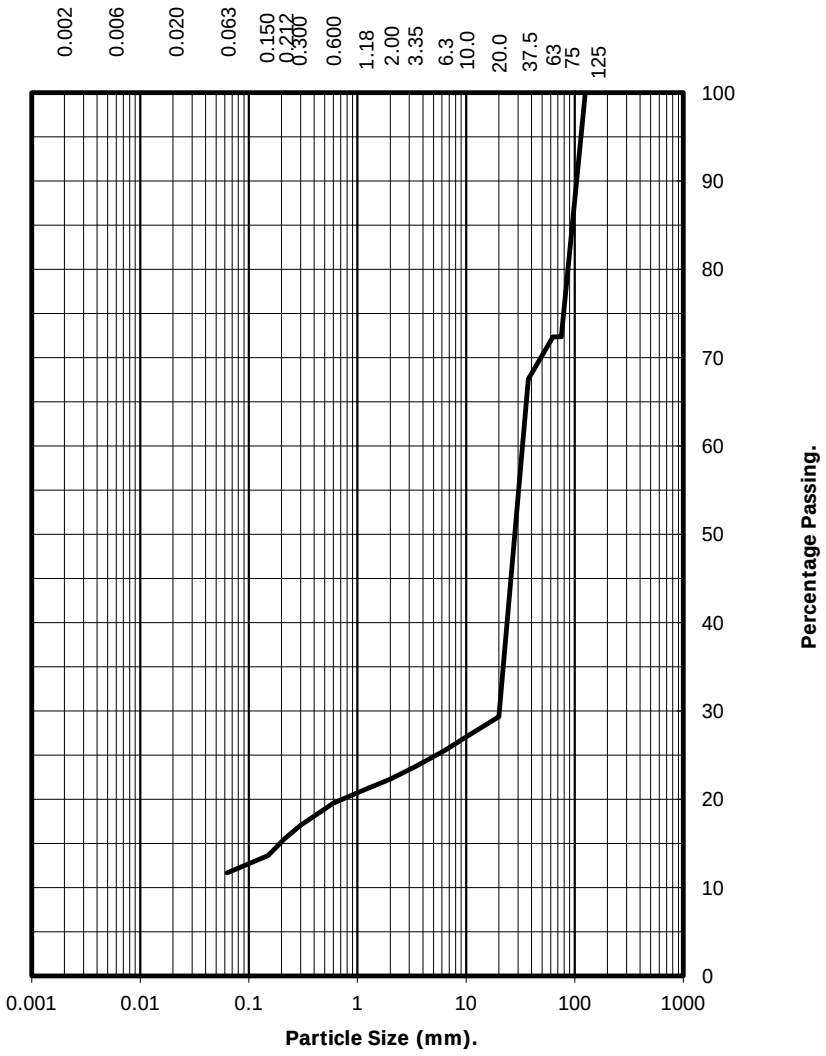
Depth to (m):

Sample Type: **B**

Description: **Brown/grey silty clayey sandy GRAVEL (fine-coarse) with many cobbles**

BS Test Sieve	Percentage Passing
125	100
75	72
63	72
37.5	68
20	29
10	27
6.3	25
3.35	24
2.00	22
1.18	21
0.60	20
0.300	17
0.212	16
0.150	14
0.063	12

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	12	**10**	**50**	**28**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

[redacted]

Date: 25.2.15

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Test Report: **Particle Size Distribution Test**

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:

Location: **Herbert Road**

Contract Number: **25872-120215**

Hole Number:

Sample Number: **2**

Depth from (m):

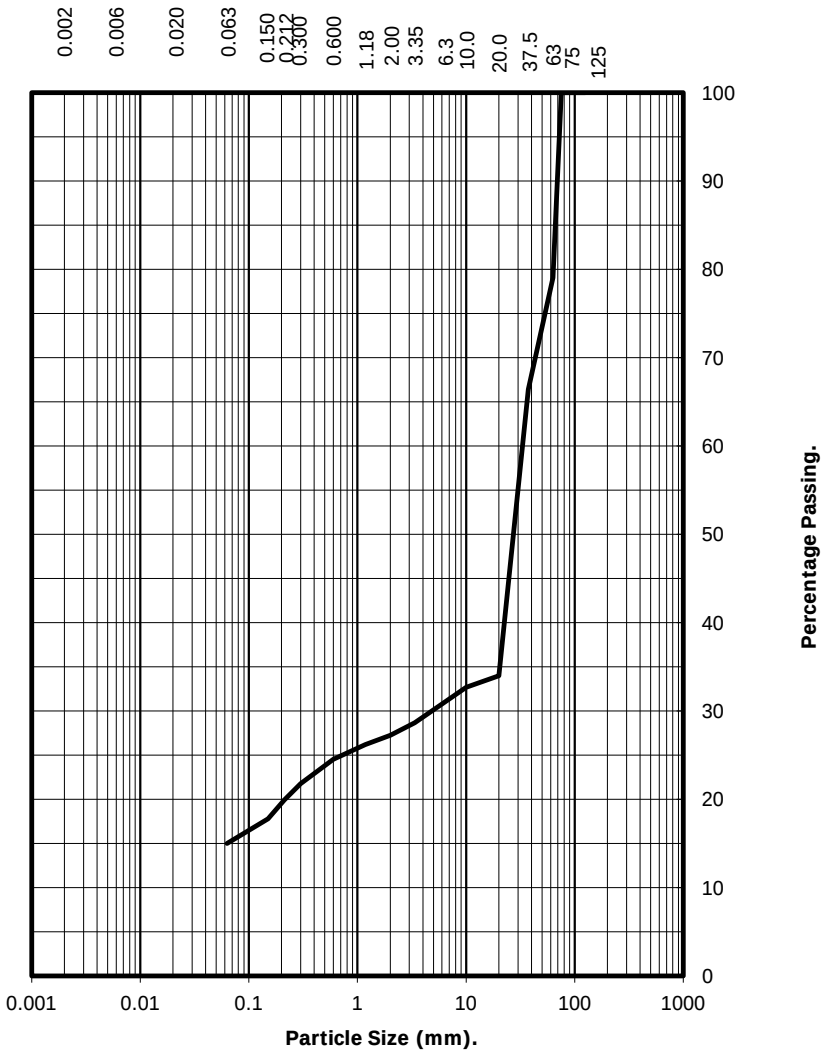
Depth to (m):

Sample Type: **B**

Description: **Brown/grey silty clayey sandy GRAVEL (fine-coarse) with many cobbles**

BS Test Sieve	Percentage Passing
125	100
75	100
63	79
37.5	66
20	34
10	33
6.3	31
3.35	29
2.00	27
1.18	26
0.60	25
0.300	22
0.212	20
0.150	18
0.063	15

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	15	**12**	**52**	**21**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

[redacted]

Date: 25.2.15

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Test Report: **Particle Size Distribution Test**

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:

Location: **Herbert Road**

Contract Number: **25872-120215**

Hole Number:

Sample Number: **3**

Depth from (m):

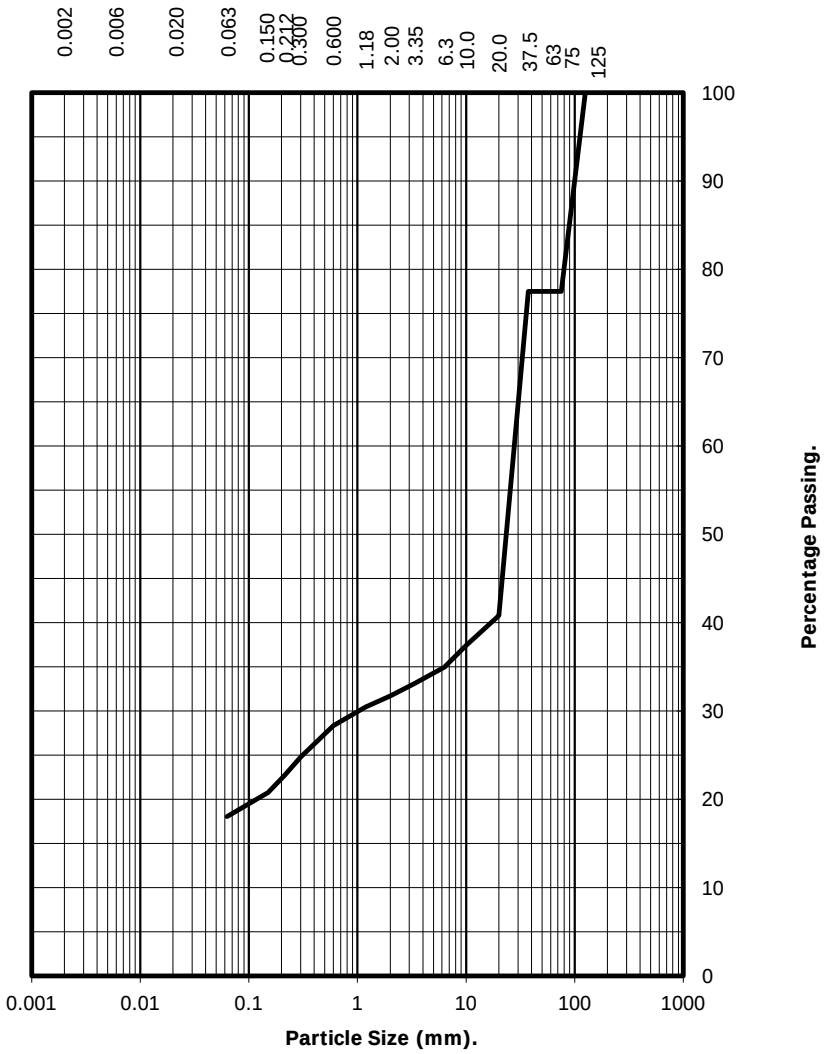
Depth to (m):

Sample Type: **B**

Description: **Brown/grey silty clayey sandy GRAVEL (fine-coarse) with many cobbles**

BS Test Sieve	Percentage Passing
125	100
75	77
63	77
37.5	77
20	41
10	37
6.3	35
3.35	33
2.00	32
1.18	30
0.60	28
0.300	25
0.212	23
0.150	21
0.063	18

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	18	**14**	**45**	**23**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

[redacted]

Date: 25.2.15

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Test Report: **Particle Size Distribution Test**

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:

Location: **Herbert Road**

Contract Number: **25872-120215**

Hole Number:

Sample Number: **4**

Depth from (m):

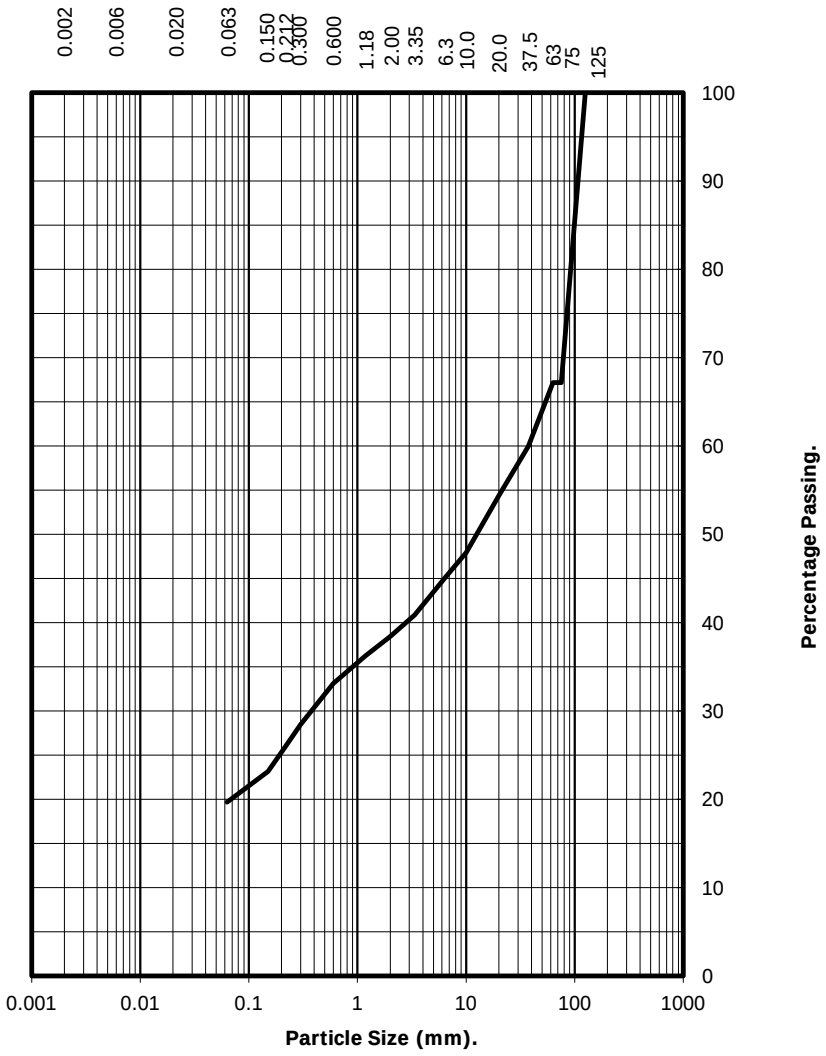
Depth to (m):

Sample Type: **B**

Description: **Brown silty clayey sandy GRAVEL (fine-coarse) with many cobbles**

BS Test Sieve	Percentage Passing
125	100
75	67
63	67
37.5	60
20	54
10	48
6.3	45
3.35	41
2.00	38
1.18	36
0.60	33
0.300	28
0.212	26
0.150	23
0.063	20

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	20	**18**	**29**	**33**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

[redacted]

Date: 25.2.15

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Test Report: **Particle Size Distribution Test**

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:

Location: **Herbert Road**

Contract Number: **25872-120215**

Hole Number:

Sample Number: **5**

Depth from (m):

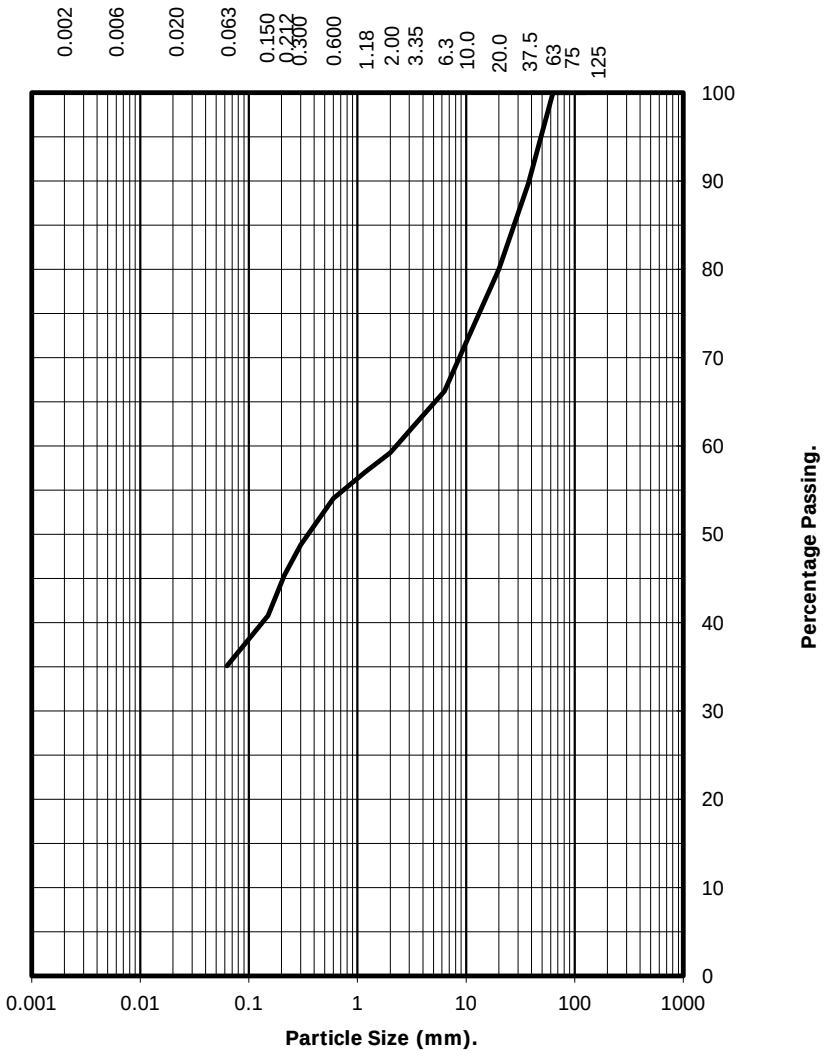
Depth to (m):

Sample Type: **B**

Description: **Brown silty clayey sandy GRAVEL (fine-coarse)**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	90
20	80
10	72
6.3	66
3.35	62
2.00	59
1.18	57
0.60	54
0.300	49
0.212	45
0.150	41
0.063	35

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	35	**24**	**41**	**0**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

[redacted]

Date: 25.2.15

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Test Report: **Particle Size Distribution Test**

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:

Location: **Herbert Road**

Contract Number: **25872-120215**

Hole Number:

Sample Number: **6**

Depth from (m):

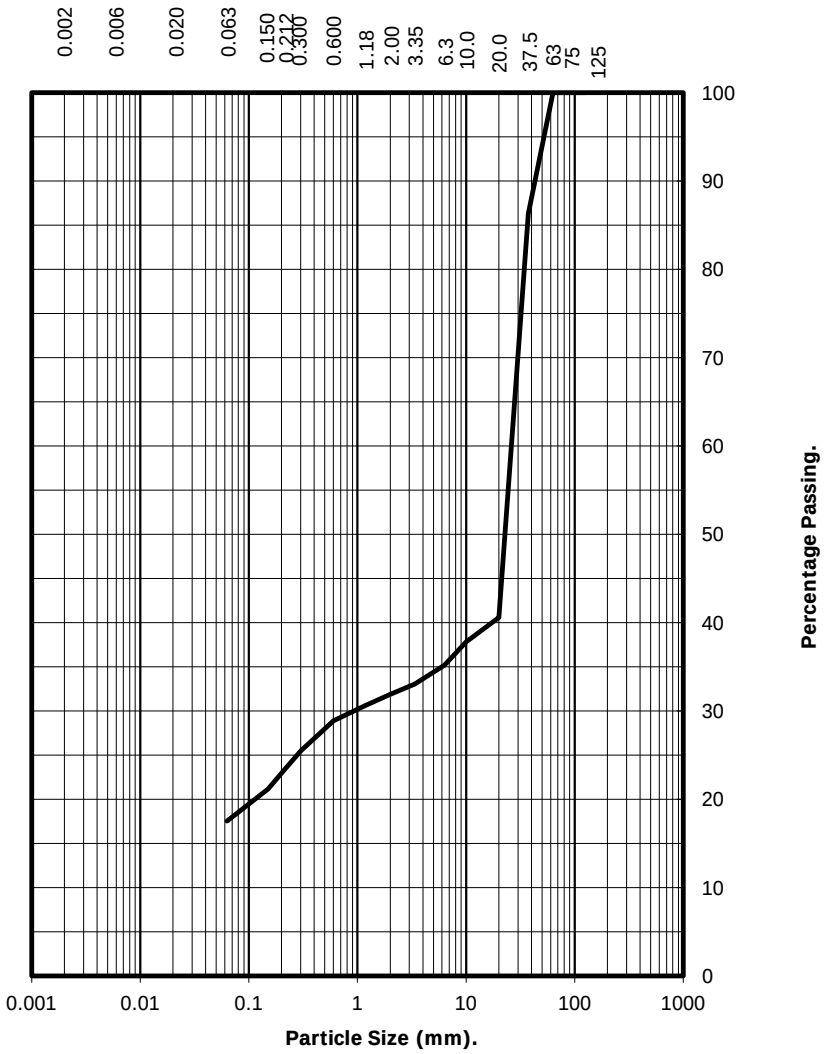
Depth to (m):

Sample Type: **B**

Description: **Brown silty clayey sandy GRAVEL (fine-coarse)**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	86
20	41
10	38
6.3	35
3.35	33
2.00	32
1.18	31
0.60	29
0.300	25
0.212	23
0.150	21
0.063	18

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	18	**14**	**68**	**0**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

[redacted]

Date: 25.2.15

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Test Report: **Particle Size Distribution Test**

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:

Location: **Herbert Road**

Contract Number: **25872-120215**

Hole Number:

Sample Number: **7**

Depth from (m):

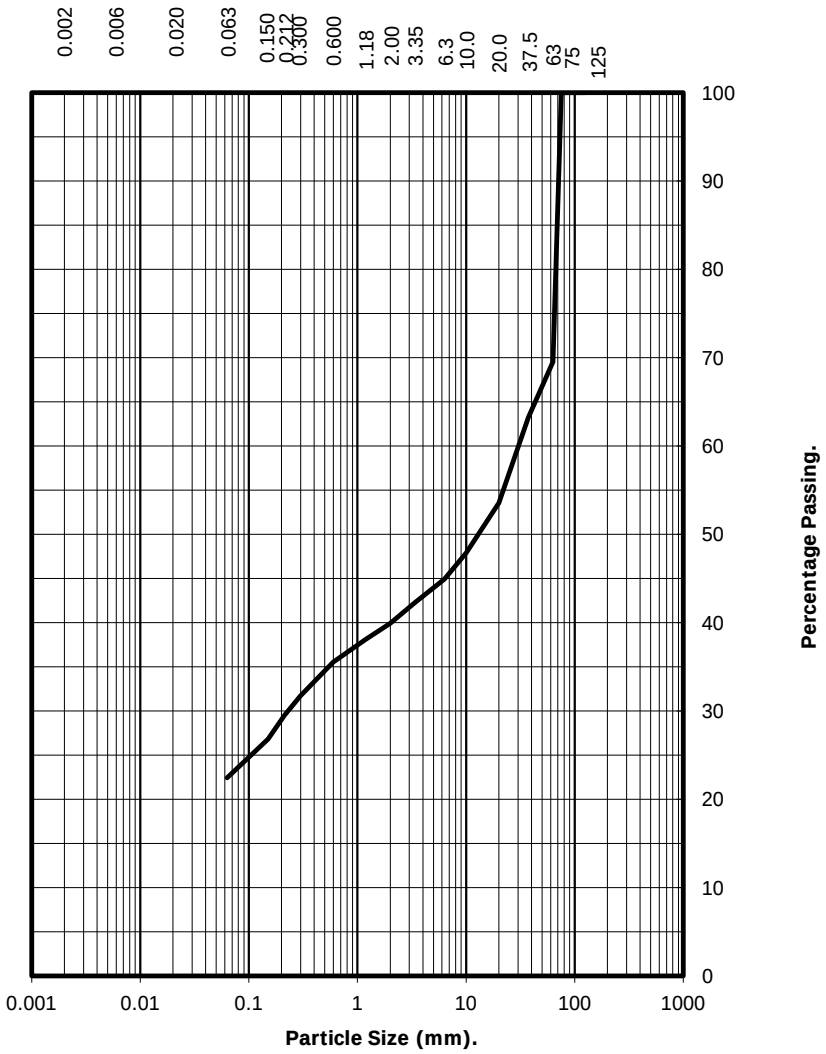
Depth to (m):

Sample Type: **B**

Description: **Brown silty clayey sandy GRAVEL (fine-coarse) with many cobbles**

BS Test Sieve	Percentage Passing
125	100
75	100
63	70
37.5	63
20	54
10	48
6.3	45
3.35	42
2.00	40
1.18	38
0.60	36
0.300	32
0.212	30
0.150	27
0.063	22

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	22	**18**	**30**	**30**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

[redacted]

Date: 25.2.15

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Test Report: **Particle Size Distribution Test**

BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:

Location: **Herbert Road**

Contract Number: **25872-120215**

Hole Number:

Sample Number: **8**

Depth from (m):

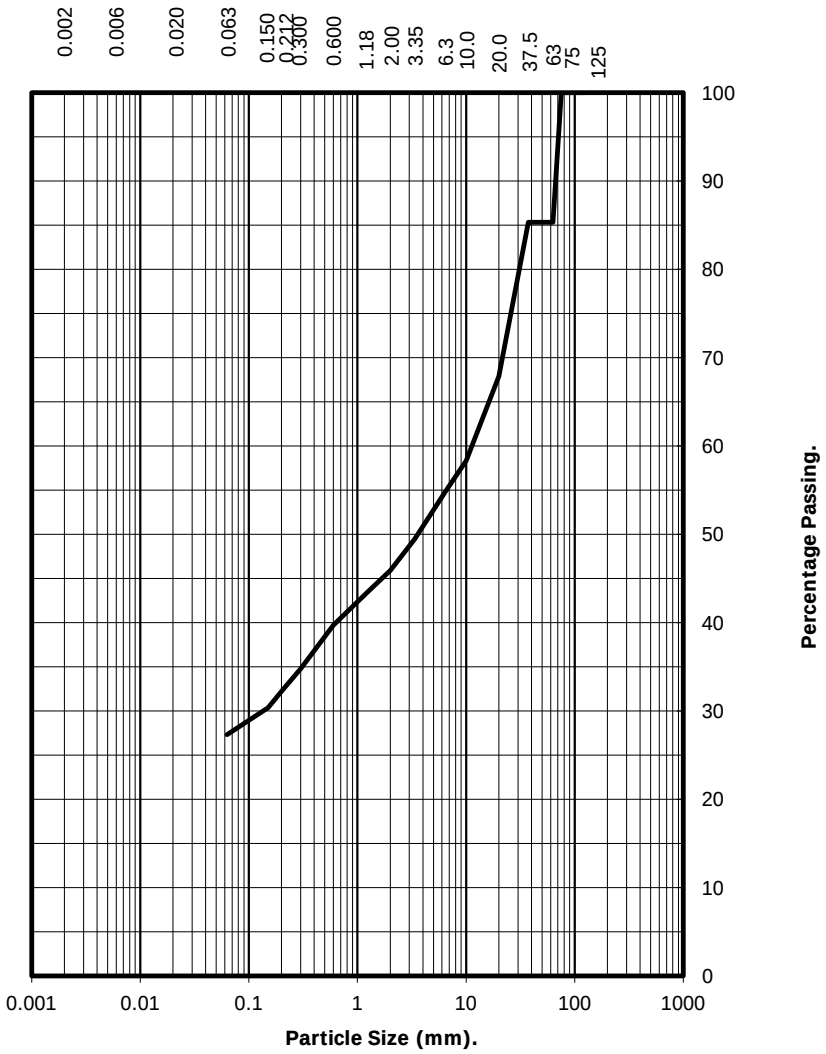
Depth to (m):

Sample Type: **B**

Description: **Brown silty clayey sandy GRAVEL (fine-coarse) with many cobbles**

BS Test Sieve	Percentage Passing
125	100
75	100
63	85
37.5	85
20	68
10	58
6.3	55
3.35	49
2.00	46
1.18	43
0.60	40
0.300	35
0.212	33
0.150	30
0.063	27

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	27	**19**	**39**	**15**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

[redacted]

Date: 25.2.15

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Dry Density / Moisture Content Relationship

BS 1377:Part 4:1990

Client ref:

Location: **Herbert Road**

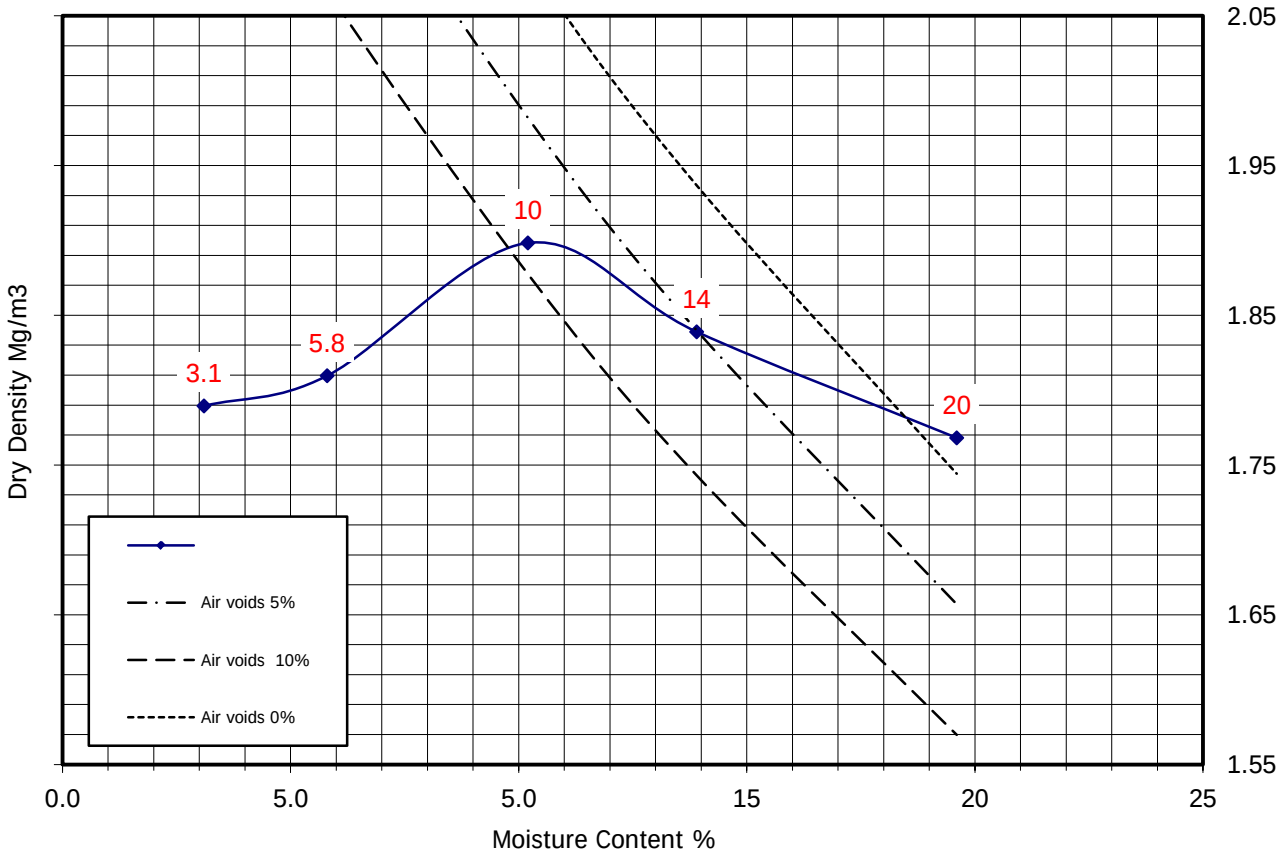
Contract Number: **25872-120215**

Hole Number:

Sample Number: **1**

Depth (m):

Sample Type: **B**



Compaction Point:	1	2	3	4	5
Moisture Content:	3.1	5.8	10	14	20
Bulk Density (Mg/m^3):	1.84	1.91	2.09	2.09	2.11
Dry Density (Mg/m^3):	1.79	1.81	1.90	1.84	1.77

Initial Moisture Content:	**20**	Method of Compaction:	**2.5kg Rammer**
Particle Density (Mg/m^3):	**2.65 Assumed**	Material Retained on 37.5 mm Test Sieve (%):	**32**
Maximum Dry Density (mg/m^3):	**1.90**	Material Retained on 20.0 mm Test Sieve (%):	**71**
Optimum Moisture Content (%):	**10**	Sample Preparation Clause:	**3.2.4.1**

Remarks:

GSTL
GEO Site & Testing Services Limited

Checked By:
Jonathan Tatam
[redacted]

Approved By:
Paul Evans
[redacted]

Date Approved: 25.2.15

UKAS TESTING
2788

Dry Density / Moisture Content Relationship

BS 1377:Part 4:1990

Client ref:

Location: **Herbert Road**

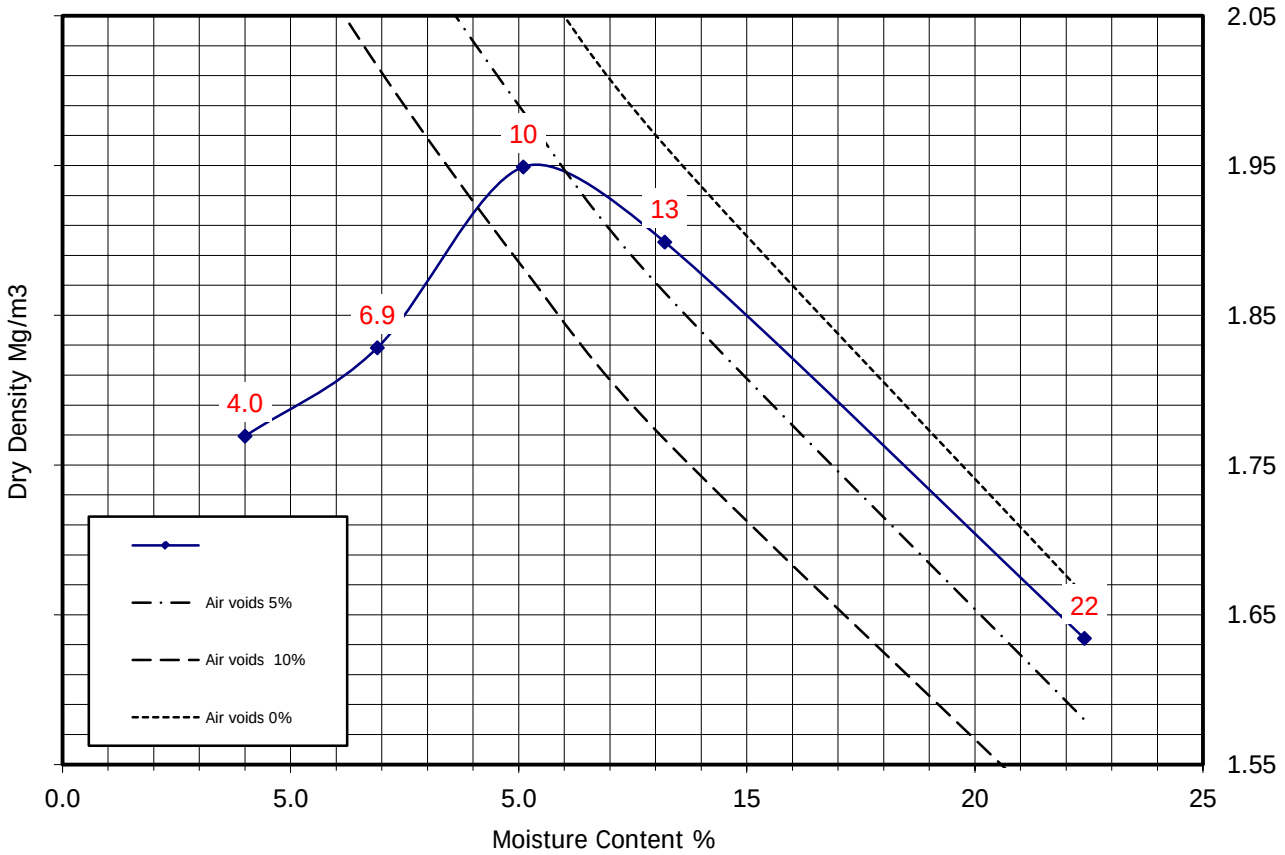
Contract Number: **25872-120215**

Hole Number:

Sample Number: **2**

Depth (m):

Sample Type: **B**



Compaction Point:	1	2	3	4	5
Moisture Content:	4.0	6.9	10	13	22
Bulk Density (Mg/m^3):	1.84	1.95	2.15	2.15	2.00
Dry Density (Mg/m^3):	1.77	1.83	1.95	1.90	1.63

Initial Moisture Content:	**22**	Method of Compaction:	**2.5kg Rammer**
Particle Density (Mg/m^3):	**2.65 Assumed**	Material Retained on 37.5 mm Test Sieve (%):	**34**
Maximum Dry Density (mg/m^3):	**1.95**	Material Retained on 20.0 mm Test Sieve (%):	**66**
Optimum Moisture Content (%):	**10**	Sample Preparation Clause:	**3.2.4.1**

Remarks:

GSTL
GEO Site & Testing Services Limited

Checked By:
Jonathan Tatam
[redacted]

Approved By:
Paul Evans
[redacted]

Date Approved: 25.2.15

UKAS TESTING
2788

Dry Density / Moisture Content Relationship

BS 1377:Part 4:1990

Client ref:

Location: **Herbert Road**

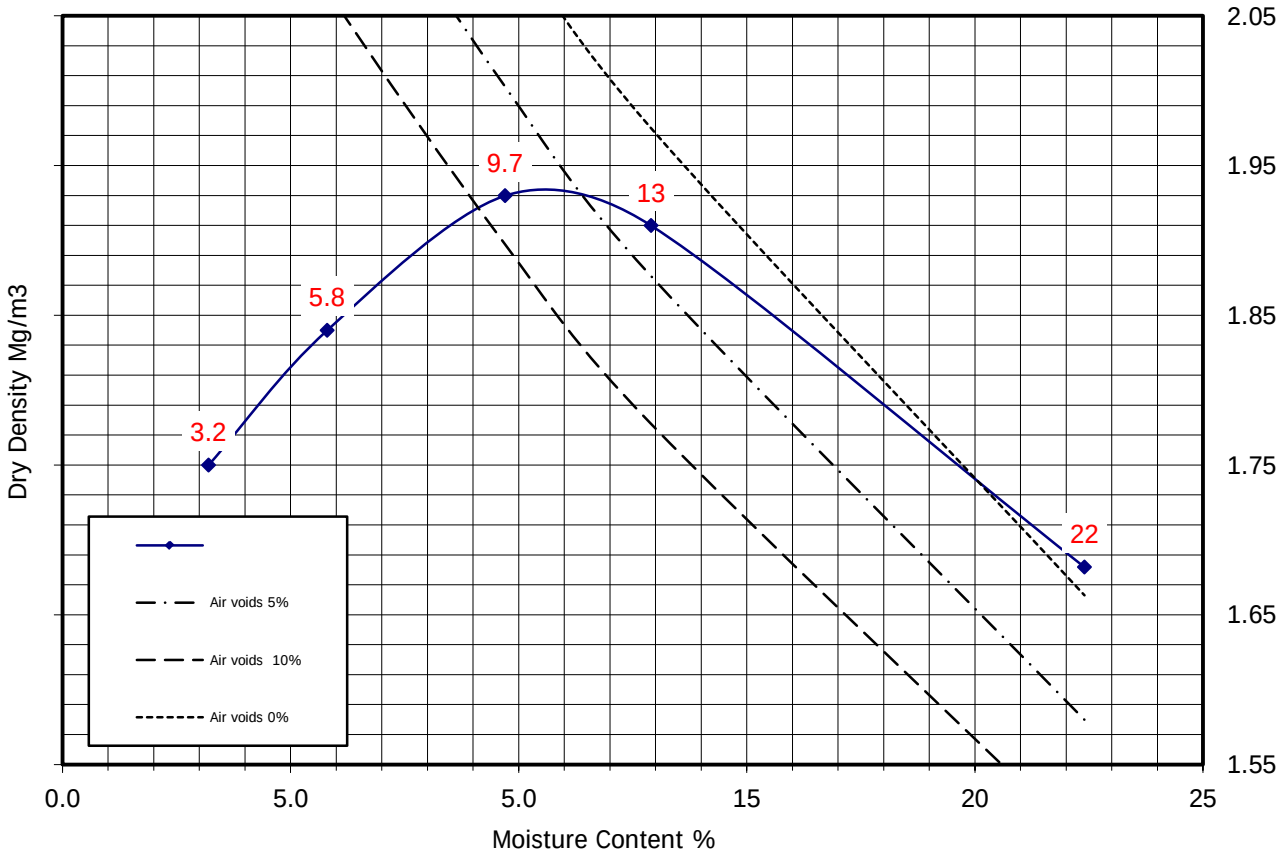
Contract Number: **25872-120215**

Hole Number:

Sample Number: **3**

Depth (m):

Sample Type: **B**



Compaction Point:	1	2	3	4	5
Moisture Content:	3.2	5.8	9.7	13	22
Bulk Density (Mg/m^3):	1.81	1.95	2.12	2.16	2.06
Dry Density (Mg/m^3):	1.75	1.84	1.93	1.91	1.68

Initial Moisture Content:	**22**	Method of Compaction:	**2.5kg Rammer**
Particle Density (Mg/m^3):	**2.65 Assumed**	Material Retained on 37.5 mm Test Sieve (%):	**23**
Maximum Dry Density (mg/m^3):	**1.93**	Material Retained on 20.0 mm Test Sieve (%):	**59**
Optimum Moisture Content (%):	**9.7**	Sample Preparation Clause:	**3.2.4.1**

Remarks:

GSTL
GEO Site & Testing Services Limited

Checked By:
Jonathan Tatam
[redacted]

Approved By:
Paul Evans
[redacted]

Date Approved: 25.2.15

UKAS TESTING
2788

Dry Density / Moisture Content Relationship

BS 1377:Part 4:1990

Client ref:

Location: **Herbert Road**

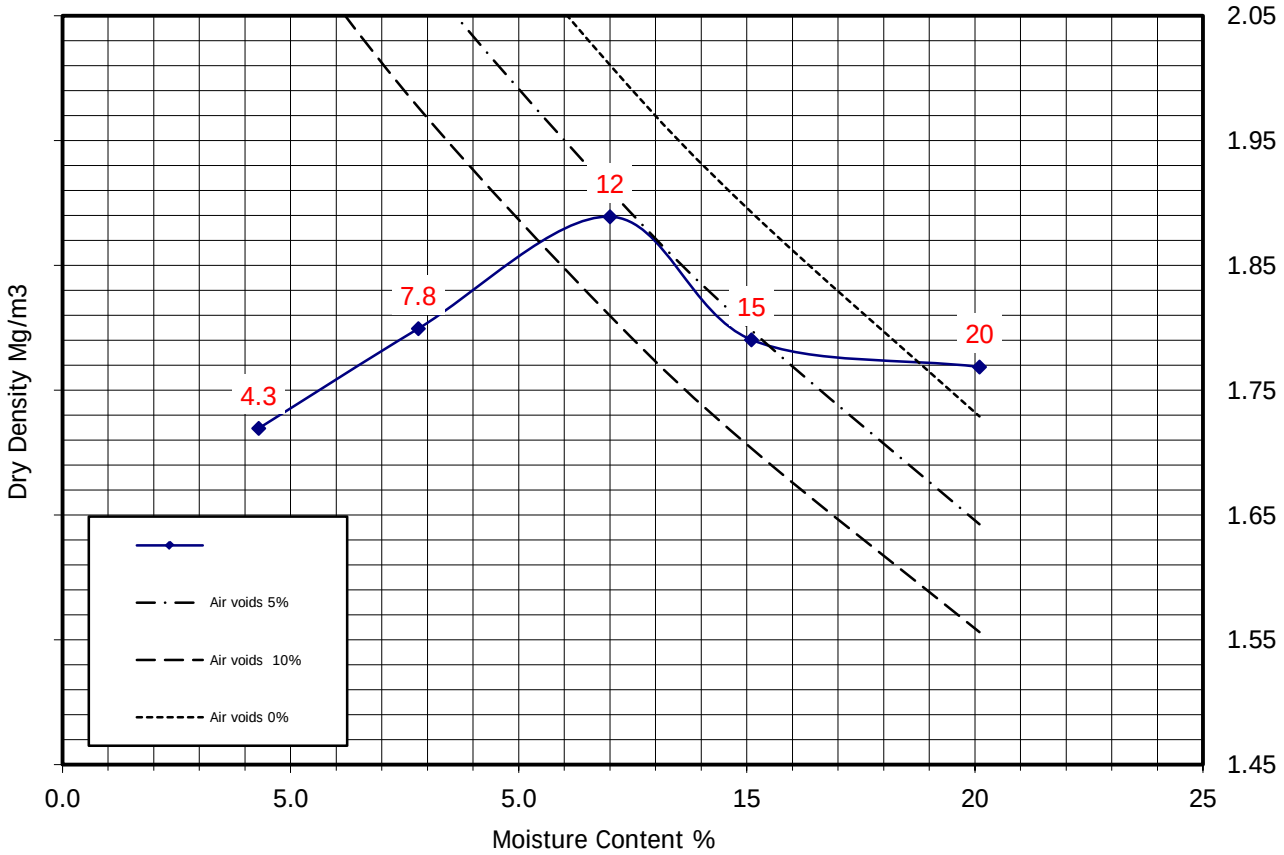
Contract Number: **25872-120215**

Hole Number:

Sample Number: **4**

Depth (m):

Sample Type: **B**



Compaction Point:	1	2	3	4	5
Moisture Content:	4.3	7.8	12	15	20
Bulk Density (Mg/m^3):	1.79	1.94	2.12	2.06	2.12
Dry Density (Mg/m^3):	1.72	1.80	1.89	1.79	1.77

Initial Moisture Content:	**15**	Method of Compaction:	**2.5kg Rammer**
Particle Density (Mg/m^3):	**2.65 Assumed**	Material Retained on 37.5 mm Test Sieve (%):	**40**
Maximum Dry Density (mg/m^3):	**1.89**	Material Retained on 20.0 mm Test Sieve (%):	**46**
Optimum Moisture Content (%):	**12**	Sample Preparation Clause:	**3.2.4.1**

Remarks:

GSTL
GEO Site & Testing Services Limited

Checked By:
Jonathan Tatam
[redacted]

Approved By:
Paul Evans
[redacted]

Date Approved: 25.2.15

UKAS TESTING
2788

Dry Density / Moisture Content Relationship

BS 1377:Part 4:1990

Client ref:

Location: **Herbert Road**

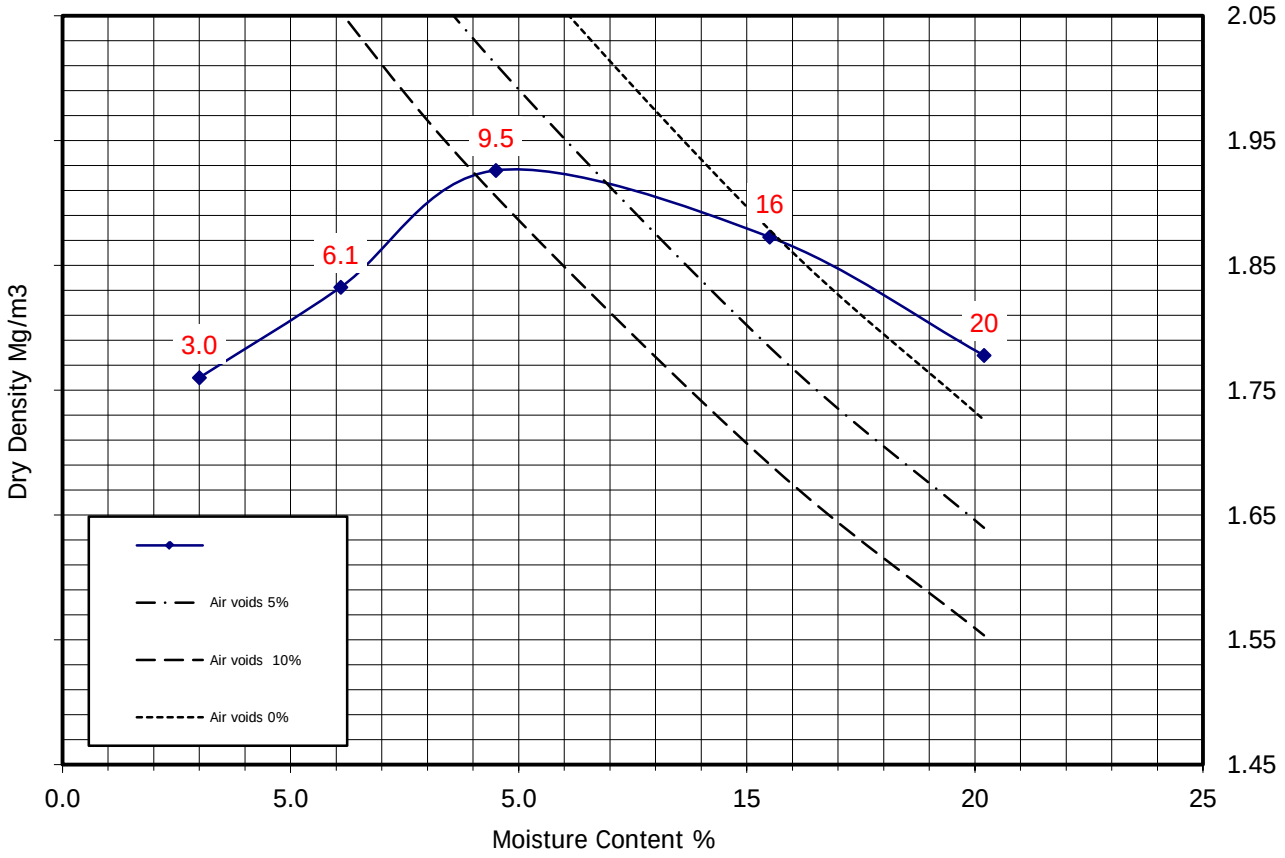
Contract Number: **25872-120215**

Hole Number:

Sample Number: **5**

Depth (m):

Sample Type: **B**



Compaction Point:	1	2	3	4	5
Moisture Content:	3.0	6.1	9.5	16	20
Bulk Density (Mg/m^3):	1.81	1.94	2.11	2.16	2.14
Dry Density (Mg/m^3):	1.76	1.83	1.93	1.87	1.78

Initial Moisture Content:	**20**	Method of Compaction:	**2.5kg Rammer**
Particle Density (Mg/m^3):	**2.65 Assumed**	Material Retained on 37.5 mm Test Sieve (%):	**10**
Maximum Dry Density (mg/m^3):	**1.93**	Material Retained on 20.0 mm Test Sieve (%):	**20**
Optimum Moisture Content (%):	**9.5**	Sample Preparation Clause:	**3.2.4.1**

Remarks:

GSTL
GEO Site & Testing Services Limited

Checked By:
Jonathan Tatam
[redacted]

Approved By:
Paul Evans
[redacted]

Date Approved: 25.2.15

UKAS TESTING
2788

Dry Density / Moisture Content Relationship

BS 1377:Part 4:1990

Client ref:

Location: **Herbert Road**

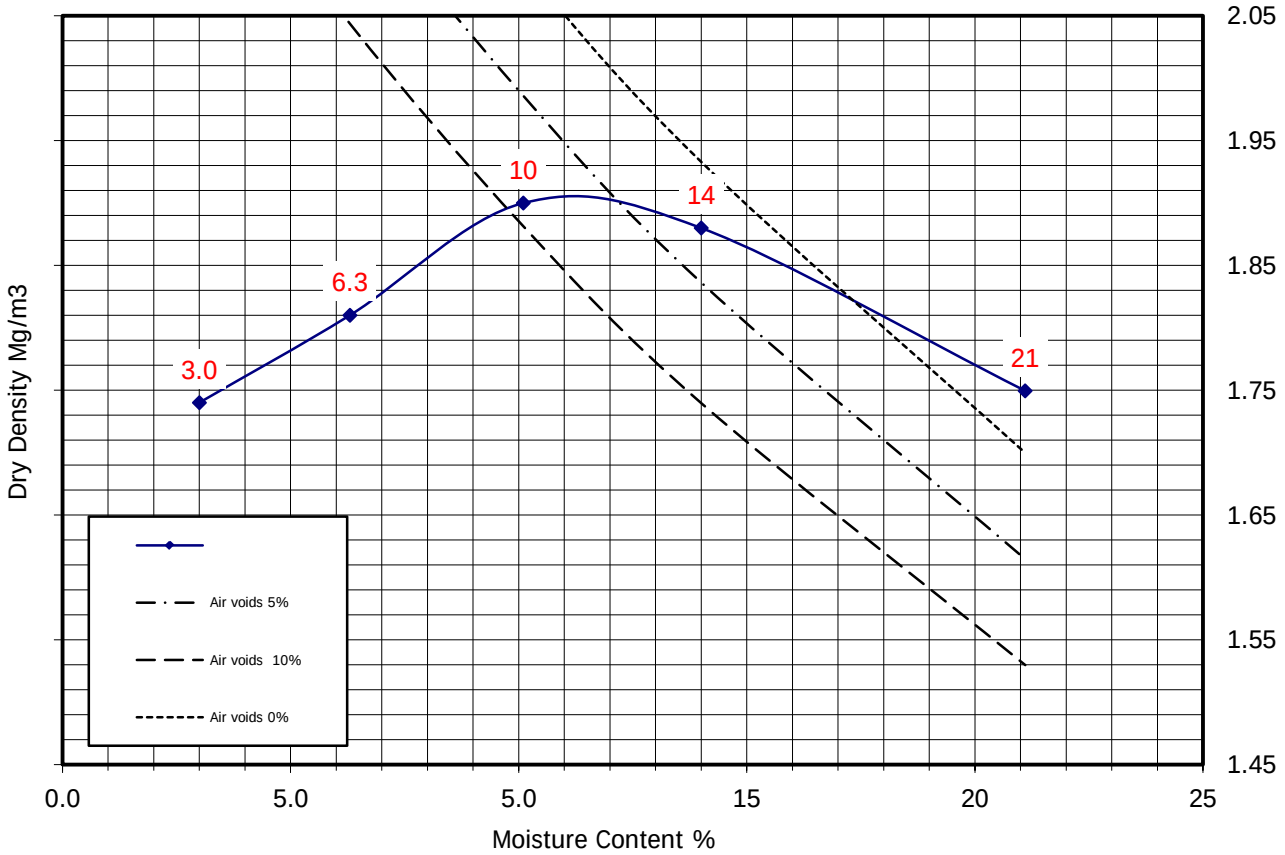
Contract Number: **25872-120215**

Hole Number:

Sample Number: **6**

Depth (m):

Sample Type: **B**



Compaction Point:	1	2	3	4	5
Moisture Content:	3.0	6.3	10	14	21
Bulk Density (Mg/m^3):	1.79	1.92	2.09	2.14	2.12
Dry Density (Mg/m^3):	1.74	1.81	1.90	1.88	1.75

Initial Moisture Content:	**21**	Method of Compaction:	**2.5kg Rammer**
Particle Density (Mg/m^3):	**2.65 Assumed**	Material Retained on 37.5 mm Test Sieve (%):	**14**
Maximum Dry Density (mg/m^3):	**1.90**	Material Retained on 20.0 mm Test Sieve (%):	**59**
Optimum Moisture Content (%):	**10**	Sample Preparation Clause:	**3.2.4.1**

Remarks:

GSTL
GEO Site & Testing Services Limited

Checked By:
Jonathan Tatam
[redacted]

Approved By:
Paul Evans
[redacted]

Date Approved: 25.2.15

UKAS TESTING
2788

Dry Density / Moisture Content Relationship

BS 1377:Part 4:1990

Client ref:

Location: **Herbert Road**

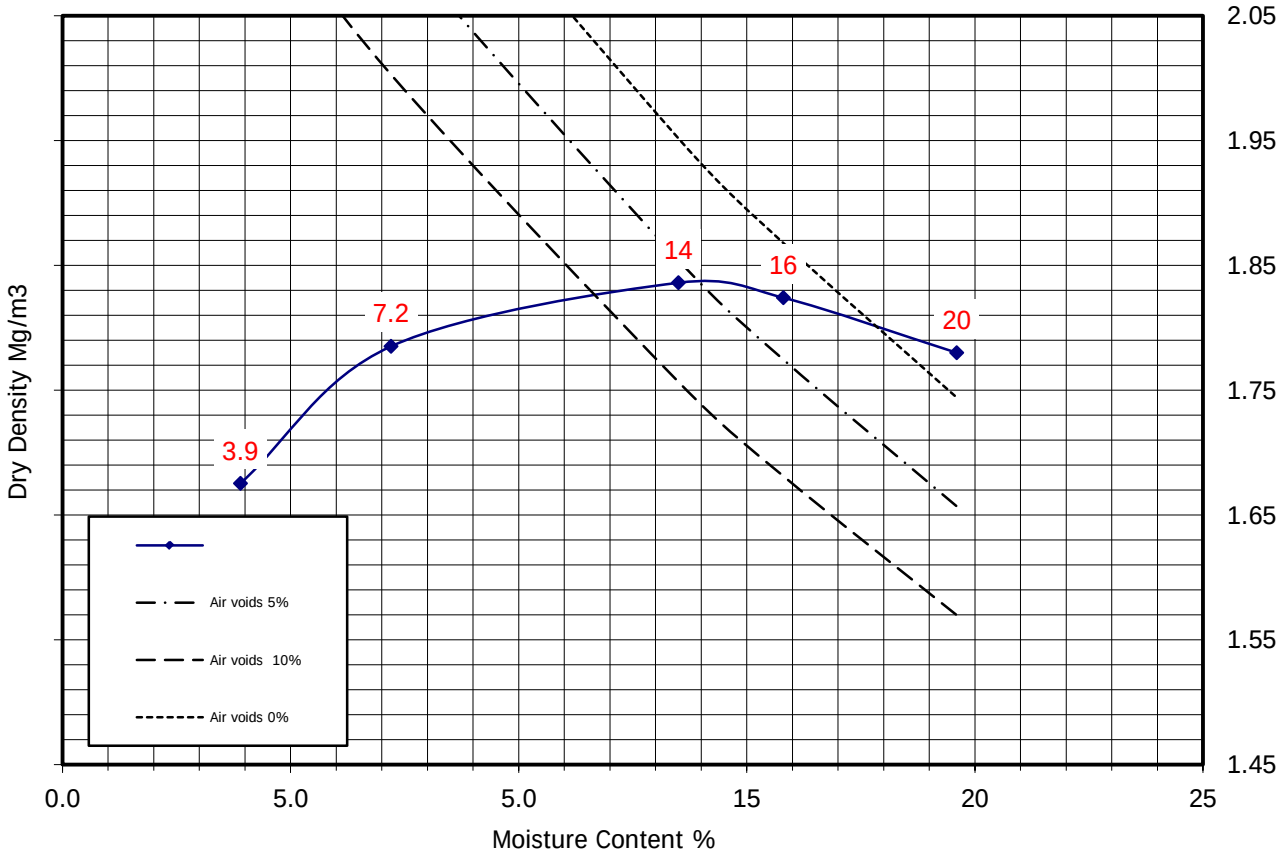
Contract Number: **25872-120215**

Hole Number:

Sample Number: **7**

Depth (m):

Sample Type: **B**



Compaction Point:	1	2	3	4	5
Moisture Content:	3.9	7.2	14	16	20
Bulk Density (Mg/m^3):	1.74	1.91	2.08	2.11	2.13
Dry Density (Mg/m^3):	1.68	1.79	1.84	1.82	1.78

Initial Moisture Content:	**16**	Method of Compaction:	**2.5kg Rammer**
Particle Density (Mg/m^3):	**2.65 Assumed**	Material Retained on 37.5 mm Test Sieve (%):	**37**
Maximum Dry Density (mg/m^3):	**1.84**	Material Retained on 20.0 mm Test Sieve (%):	**46**
Optimum Moisture Content (%):	**14**	Sample Preparation Clause:	**3.2.4.1**

Remarks:

GSTL
GEO Site & Testing Services Limited

Checked By:
Jonathan Tatam
[redacted]

Approved By:
Paul Evans
[redacted]

Date Approved: 25.2.15

UKAS TESTING
2788

Dry Density / Moisture Content Relationship

BS 1377:Part 4:1990

Client ref:

Location: **Herbert Road**

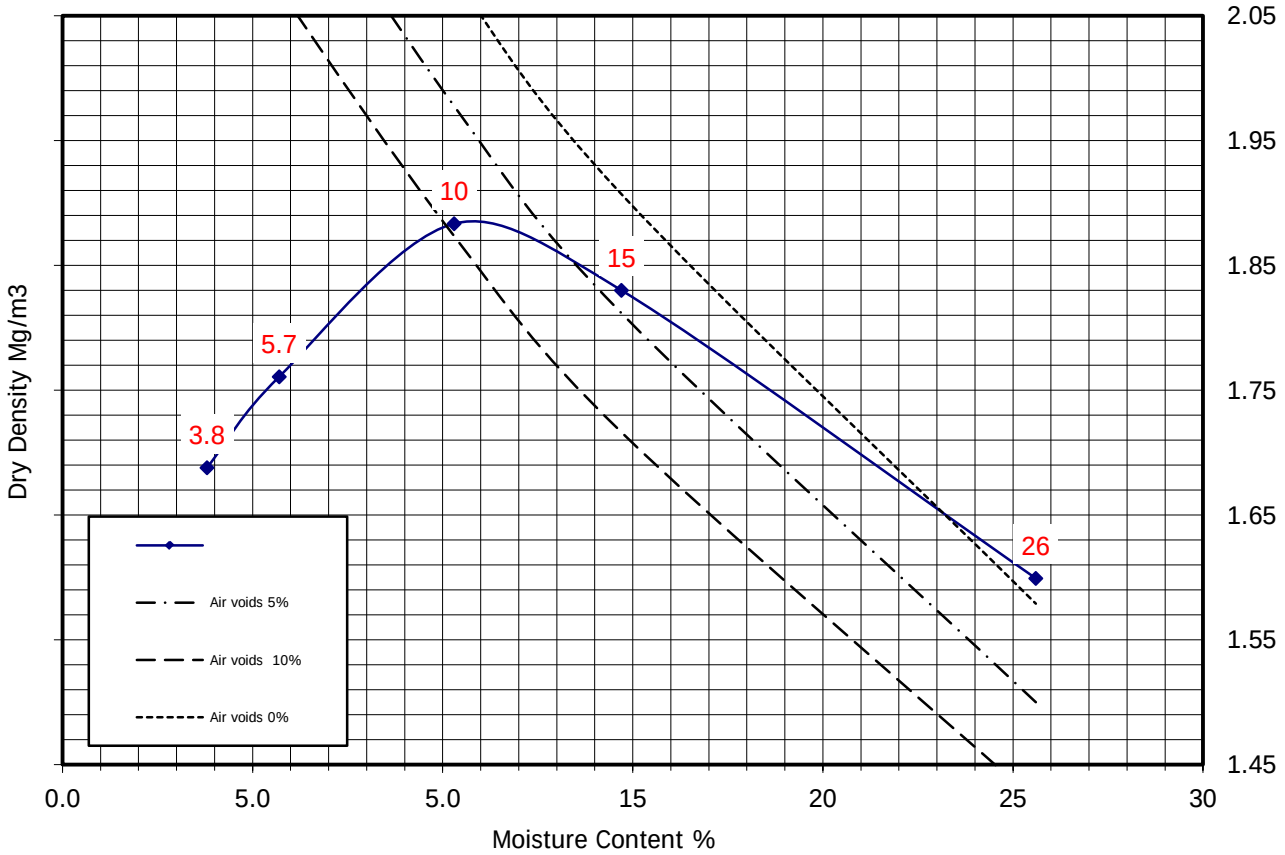
Contract Number: **25872-120215**

Hole Number:

Sample Number: **8**

Depth (m):

Sample Type: **B**



Compaction Point:	1	2	3	4	5
Moisture Content:	3.8	5.7	10	15	26
Bulk Density (Mg/m^3):	1.75	1.86	2.08	2.10	2.01
Dry Density (Mg/m^3):	1.69	1.76	1.88	1.83	1.60

Initial Moisture Content:	**26**	Method of Compaction:	**2.5kg Rammer**
Particle Density (Mg/m^3):	**2.65 Assumed**	Material Retained on 37.5 mm Test Sieve (%):	**15**
Maximum Dry Density (mg/m^3):	**1.88**	Material Retained on 20.0 mm Test Sieve (%):	**32**
Optimum Moisture Content (%):	**10**	Sample Preparation Clause:	**3.2.4.1**

Remarks:

GSTL
GEO Site & Testing Services Limited

Checked By:
Jonathan Tatam
[redacted]

Approved By:
Paul Evans
[redacted]

Date Approved: 25.2.15

UKAS TESTING
2788

COMPACTION SPECIFICATION

Lower Half of Engineered Fill Source
Stockpile Herbert Road
Newport

Prepared for:
Riversee Limited

July 2015

Report No. 12032/CS2

REPORT TITLE	**:**	**Compaction Specification: Lower Half of Engineered Fill Source Stockpile, Herbert Road, Newport**
REPORT STATUS	**:**	**Final**
JOB NUMBER	**:**	**12032/CS2**
DATE	**:**	**July 2015**
PREPARED BY	**:**	[redacted] …….. **(Mrs R. Howells)**
REVIEWED BY	**:**	[redacted] …. **(Miss L. Dow)**
APPROVED BY	**:**	[redacted] .. **(Dr G. C. Lake)**

Executive Summary

Riversee Limited is proposing to undertake earthworks on a proposed development site off Herbert Road, Newport, where the site is to be raised by up to 1.6m, taking it to a level of 8.8m AOD.

Proposed engineered fill materials are stockpiled on a nearby site on Herbert Road.

Samples of the lower top half of the stockpile was sampled by Terra Firma.

These samples taken were submitted to Geo Site and Testing Services Limited in Llanelli in order to assess their optimum moisture content/maximum dry density and to undertake grading analyses.

The initial moisture content of the soils was found to be between 17 and 29% with an optimum moisture content of between 8 and 15%.

In order for there to be tolerable settlements from the placed fill materials, it needs to be compacted at or close to 95% of its Optimum Moisture Content/Maximum Dry Density. Drying of the soils is likely to be required to achieve this.

In order to meet the above criterion it is clear that the materials will need to be dried.

Grading analysis results have been used to classify the soils as selected stony cohesive material (Type 2C, 7D, 1A and 6F2).

The materials should be laid and compacted in layers as given by the Specification Works for Highways 600.

TABLE OF CONTENTS

Section 1 Introduction

1.1 Limitations and Exceptions

Section 2 Soil Property Testing

2.1 Soil Sampling
2.2 Optimum Moisture Content/Maximum Dry Density
2.3 Grading Analysis Results
2.4 Compaction Specification

Section 3 Conclusions as to the Suitability of the Materials as Site Fill

Tables

Table 2.1 Sample Descriptions
Table 2.2 Optimum Moisture Content/Maximum Dry Density Test Results
Table 2.3 Grading Analysis Results and Soil Classification
Table 2.4 Compaction Specification - Method 2
Table 2.5 Compaction Specification - Method 6

Annexes

Annex A Grading Analysis and Optimum Moisture Content and Maximum Dry Density Test Results

SECTION 1 Introduction

Riversee Limited is proposing to undertake earthworks on a proposed development site off Herbert Road, Newport, where the site is to be raised by up to 1.6m, taking it to a level of 8.8m AOD.

The ground is to be brought up in layers, in accordance with the Department of Transport Specification for Highway Works, prior to construction and the importation of inert materials in landscaped areas.

Proposed engineered fill materials are stockpiled on a nearby site on Herbert Road.

Terra Firma (Wales) Limited has been commissioned by Riversee Limited to undertake sampling and testing of off-site stockpiled soil to assess its suitability as fill.

This report details the compaction specification for soils in the lower half of the stockpile only.

1.1 Limitations and Exceptions

The compaction specification report has been prepared for the sole internal reliance of Riversee Limited and its design and construction team. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Terra Firma (Wales) Limited. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The report represents the findings and opinions of experienced geo-environmental and geo-technical consultants. Terra Firma (Wales) Limited does not provide legal advice and the advice of lawyers may also be required.

SECTION 2 Soil Property Testing

2.1 Soil Sampling

Terra Firma (Wales) Limited visited the stockpile site on the 8th and 13th July in order to obtain samples for geotechnical testing.

Ten representative samples were taken and submitted to Geo Site and Testing Services Limited in Llanelli in order to assess their optimum moisture content/maximum dry density and to undertake grading analyses.

The table below summarises the samples taken.

Table 2.1 Sample Descriptions

Sample Location	Depth in Stockpile (m)	Description
TP1	1.0	Brown, grey and red brown mixed slightly sandy gravelly cobbly CLAY
TP1	2.0	Grey, red brown and red gravelly cobbly CLAY
TP3	3.5	Brown clayey SAND and GRAVEL and COBBLE, occasional boulder
TP4	2.0	Dark grey and brown mixed CLAY with red inclusions
TP4	3.0	Dark grey gravelly cobbly CLAY with red and brown inclusions
TP6	2.0	Dark grey sandy gravelly cobbly CLAY
TP7	2.0	Light grey brown gravelly cobbly CLAY
TP12	2.0	Grey gravelly cobbly CLAY
TP13	2.0	Grey sandy clayey GRAVEL and COBBLE
TP17	1.5	Grey and red mixed gravelly cobbly CLAY

2.2 Optimum Moisture Content/Maximum Dry Density

The results of the optimum moisture content and maximum dry density tests are detailed in the table below.

These tests were conducted in accordance with BS 1377: Part 4: 1990.

Table 2.2 Optimum Moisture Content/Maximum Dry Density Test Results

Sample Location	Depth in Stockpile (m)	Initial Moisture Content (%)	Optimum Moisture Content (%)	Maximum Dry Density(mg/m^3)
TP1	1.0	21	10	1.95
TP1	2.0	24	9.7	2.03
TP3	3.5	17	8.5	2.05
TP4	2.0	20	11	1.97
TP4	3.0	23	10	1.84
TP6	2.0	20	8.0	2.07
TP7	2.0	29	15	1.62
TP12	2.0	26	10	1.81
TP13	2.0	18	14	1.81
TP17	1.5	26	10	1.85

The suitable fill materials should be placed at or close to i.e. 95% of their optimum moisture content/maximum dry density and compacted in layers as per the requirements of the Specification for Highway Works.

The test certificates are given in **Annex A.**

2.3 Grading Analysis

The ten samples were tested in the laboratory by dry and wet sieving analysis to determine their grading characteristics. These tests were conducted in accordance with BS1377: Part 2, Clause 9.2: 1990.

The test certificates are presented in **Annex A.**

Based upon the soil property test results, and referring to Table 6/1: Acceptable Earthworks Materials: Classification and Compaction Requirements and Table 6/2: Grading Requirements for Acceptable Earthworks Materials, of the 'Specification for Highway Works, Series 600', the samples can be classified as summarised in the table below.

Table 2.3 Grading Analysis Results and Soil Classification

Sample Location	Depth in Stockpile (m)	Type (Table 6/2)	Classification (Table 6/1)	Compaction Method
TP1	1.0	7D	Selected Stony Cohesive Material	Method 2
TP6	2.0			
TP12	2.0			
TP3	3.5	6F2	Selected Granular Material	Method 6
TP4	2.0			
TP13	2.0			
TP7	2.0	2C	Stony Cohesive Material	Method 2
TP1	2.0			
TP4	3.0			
TP17	1.5			

The dark grey gravelly cobbly sampled in TP4 (3.0m) did not contain coarse enough fragments to strictly classed as Class 2C. As the volume of this soil type appears to be limited it is recommended that it is mixed with other soils classed as 2C and compacted accordingly.

Similarly, the sample from TP13 (2.0m), although not strictly 6F2, is close to conforming to 6F2 grading and therefore may be compacted as such.

2.4 Compaction Specification

Compaction should be undertaken in accordance with the appropriate methodology as given in of Table 6/4 of the Specification for Highway Works, Series 600, as summarised in **Tables 2.4 and 2.5.**

Details for just a smoothed wheeled roller and vibratory roller are provided. If an alternative roller is proposed then Table 6/4 should be consulted.

Table 2.4 Compaction Specification - Method 2

Type of Compaction Plant	Mass per Metre Width of Roll (kg)	Maximum depth of Compacted Layer (mm)	Number of Passes
Smoothed Wheeled Roller	2100 – 2700 2700 – 5400 >5400	125 125 150	10 8 8
Vibratory Roller	270 – 450 450 – 700 700 – 1300 1300 – 1800 1800 – 2300 2300 – 2900 2900 – 3600 3600 – 4300 4300 – 5000 >5000	75 75 125 150 150 175 200 225 250 275	16 12 10 8 4 4 4 4 4 4

Table 2.5 Compaction Specification - Method 6

Type of Compaction Plant	Mass per Metre Width of Roll (kg)	Number of Passes		
		110mm layer	150mm layer	250mm layer
Smoothed Wheeled Roller	2100 – 2700 2700 – 5400 >5400	Unsuitable 16 8	Unsuitable Unsuitable 16	Unsuitable Unsuitable Unsuitable
Vibratory Roller	270 – 450 450 – 700 700 – 1300 1300 – 1800 1800 – 2300 2300 – 2900 2900 – 3600 3600 – 4300 4300 – 5000 >5000	Unsuitable Unsuitable 16 6 4 3 3 2 2 2	Unsuitable Unsuitable Unsuitable 16 6 5 5 4 4 3	Unsuitable Unsuitable Unsuitable Unsuitable 12 11 10 8 7 6

2.4 Compaction Specification (Continued)

Compaction should be undertaken in accordance with Table 6/1 and 6/4.

Where combinations of different types or categories of plant are used, the depth of the layer should be for the type of plant requiring the least depth of layer, and the number of passes should be that for the type of plant requiring the greatest number of passes.

Earthmoving plants are not recommended for use as compaction plant, nor are lighter categories of plants used to provide preliminary compaction to assist the use of heavier plant.

The soils should be sorted and all deleterious material, such as timber and plastic removed.

All roots and tree roots should be excavated and removed.

The stability of excavations or fills should not be compromised by the location of stock piled materials or use of plant or location of temporary buildings/structures.

All earthworks must be kept free of water including arranging for the rapid removal of water, water shed onto the earthworks and water entering the earthworks from any source.

Fill materials especially cohesive (silt and clay) fill should not be deposited and compacted during wet weather, where an increase in moisture content will increase the liquid limit of the soil.

The initial moisture content of the soil was found to be double the optimum moisture content in some instances, indicating that the clay soils will need to be dried out prior to filling to achieve adequate compaction.

All exposed fill surfaces must be adequately weather proofed during inclement weather or at the end of the working day/compaction process. Any exposed cohesive fill that becomes wet and slurrified due to water ingress or weather erosion must be stripped off, spread into thin layers and aerated. The fill should then be re-compacted.

Plant movement across compaction layers should be restricted to that plant necessary for its deposition, spreading and compaction.

Fill areas should be constructed evenly over their full width and their fullest possible extent and the contractor should control and direct constructional plant and other traffic uniformly over them. Damage by construction plant should be made good with material having the same characteristics and strength as the material had before it was damaged.

Embankments and other areas of unsupported fills should not be constructed with steeper side slopes than the materials effective shear strength, with exception to allowing the adequate compaction at the edges before trimming back, within the minimum period necessary for the safety of the works.

2.4 Compaction Specification (Continued)

Where fill is to be placed against a natural slope, or sloping earthworks face including embankments, cuttings and other fills and excavations, such faces should be appropriately benched immediately before placing the subsequent fill.

In-situ density tests (sand replacement method) should be undertaken to ensure the compaction process is performing satisfactory during the enabling works. In-situ testing should be undertaken at an appropriate spacing to reflect the adequacy of the compaction process beneath the entire development area.

It is also recommended that a number of in-situ plate load tests be performed mid way through the earthworks and at the final finished site level beneath the access road.

The earthworks should be supervised by a suitable engineer.

The tests should be conducted in accordance with BS 1377: Part 9: 1990 under the supervision of a qualified geotechnical engineer.

Should the in-situ testing show densities which indicate that the compaction process is inadequate, the deposited material must be excavated and re-laid.

Allowances should also be made for the removal of soft spots and their replacement with imported suitable selected inert granular materials or suitable inert site won materials.

SECTION 3 Conclusions as to the Suitability of the Materials as Site Fill

In order for there to be tolerable settlements from the placed fill materials, they need to be compacted at or close to their optimum moisture content and maximum dry density (95%). This will ensure that a minimum 95% compaction will be achieved.

In order to meet the above criterion it is clear that the materials will need to be dried. This can be achieved by excavating and allowing the materials to dry naturally.

Once the given moisture content has been achieved then the materials may be used as structural fill. The materials have been graded according to the Specification Works for Highways 600 and should be laid and compacted in layers by referring to the Specification as described in Section 2.4.

A programme of in-situ density testing should also be carried out during fill works in order to confirm the effectiveness of the compaction procedure.

ANNEX A
Grading Analysis and Proctor Test Results

Laboratory Report

2788

GEO Site & Testing Services Ltd

Contract Number: 27497

Client's Reference: **12032**

Report Date: **27-07-2015**

Client **Terrafirma Wales Ltd**
5 Deryn Court
Wharfedale Road
Pentwyn
Cardiff
CF23 7HB

Contract Title: **Herbert Road, Newport**

For the attention of: **Ruth Liley**

Date Received: **10-07-2015**

Date Commenced: **10-07-2015**

Date Completed: **27-07-2015**

Test Description	Qty
PSD Wet Sieve method 1377 : 1990 Part 2 : 9.2 - * UKAS	10
Dry Den/MC (2.5kg Rammer Method 1 Litre Mould) 1377 : 1990 Part 4 : 3.3 - * UKAS	10
Disposal of Samples on Project	1

Notes: **Observations and Interpretations are outside the UKAS Accreditation**
*** - denotes test included in laboratory scope of accreditation**
 # - denotes test carried out by approved contractor
@ - denotes non accredited tests

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Approved Signatories:
Alex Wynn (Associate Director) - Benjamin Sharp (Contracts Manager) - D V Edwards (Managing Director)
Emma Sharp (Office Manager) - Paul Evans (Quality/Technical Manager)

GEO Site & Testing Services Ltd
Unit 4, Heol Aur, Dafen Ind Estate, Dafen, Llanelli, Carmarthenshire SA14 8QN
Tel: 01554 784040 Fax: 01554 784041 info@geo.uk.com geo.uk.com

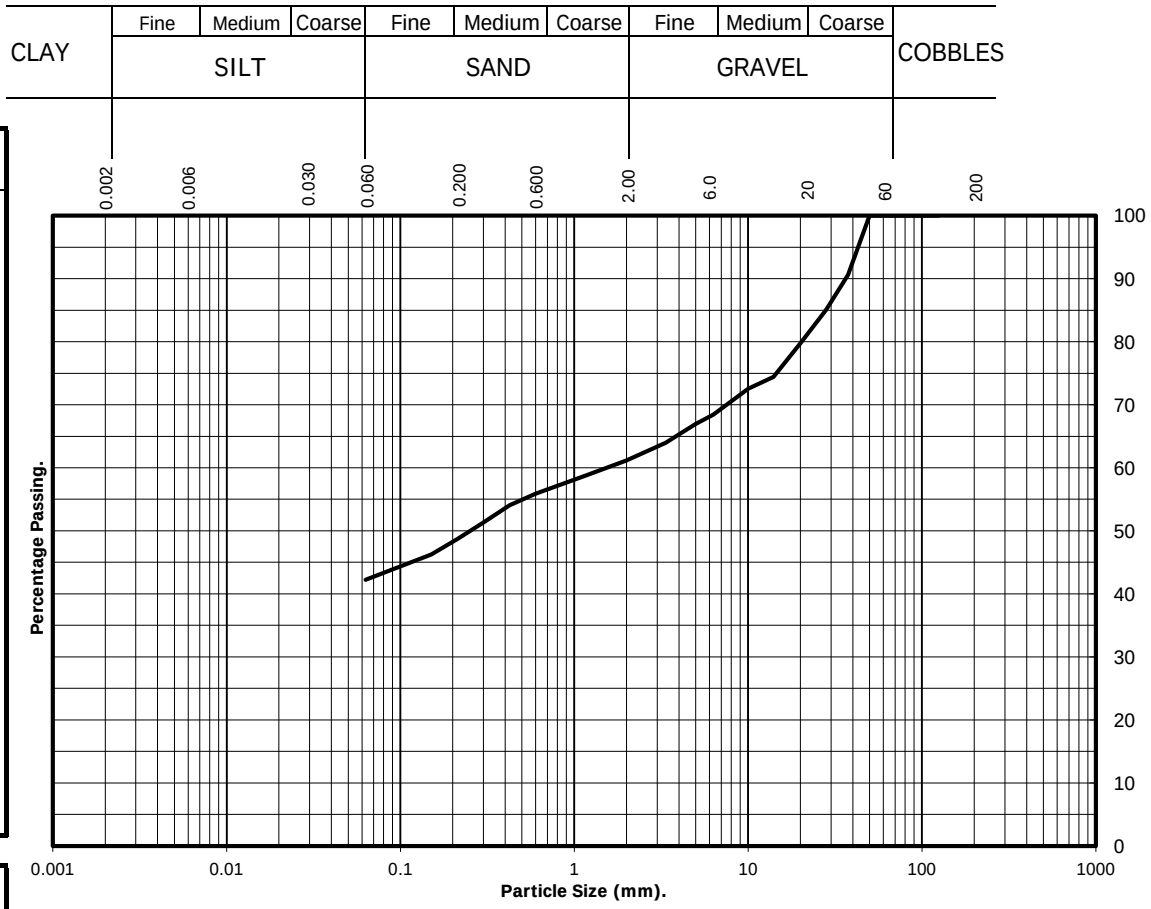
Test Report:

Particle Size Distribution Test
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Contract Number:	**27497-100715**	**Hole Number:**	**TP1**
Location:	**Herbert Road, Newport**	**Depth from (m):**	**1.00**
Client ref:	**12032**	**Depth to (m):**	
		Sample Number:	
		Sample Type:	**B**

Description: **Brown sandy gravelly (fine-coarse) silty CLAY**



BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	91
28	85
20	80
14	74
10	73
6.3	68
5.0	67
3.35	64
2.00	61
1.18	59
0.60	56
0.425	54
0.300	51
0.212	49
0.150	46
0.063	42

Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	42	19	39	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:

Jonathan Tatam (Admin/Quality Assistant)

[redacted]

Date: 27.7.15

GSTL
GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

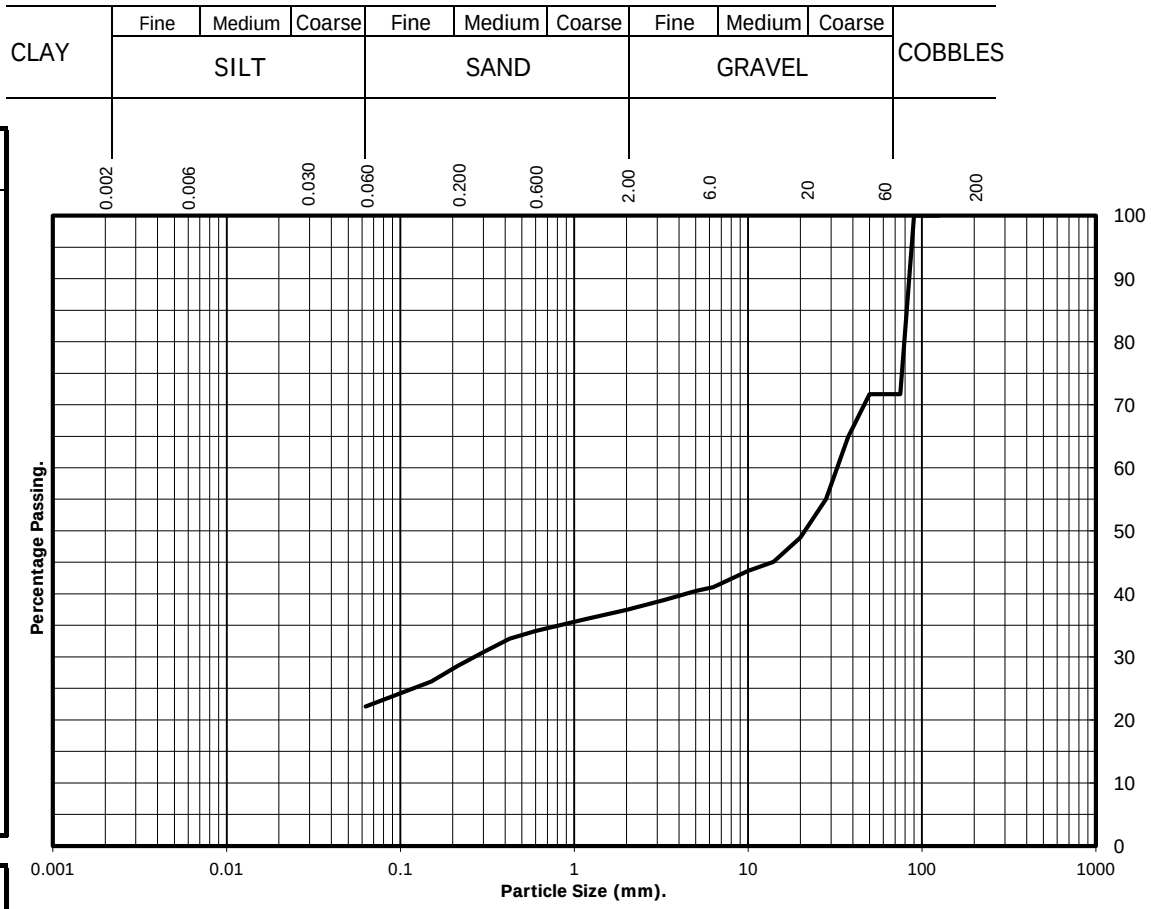
Test Report:

Particle Size Distribution Test
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Contract Number:	**27497-100715**	**Hole Number:**	**TP1**
Location:	**Herbert Road, Newport**	**Depth from (m):**	**2.00**
Client ref:	**12032**	**Depth to (m):**	
		Sample Number:	
		Sample Type:	**B**

Description: **Brown sandy silty clayey GRAVEL (fine-coarse) with many cobbles**



BS Test Sieve	% Passing
125	100
90	100
75	72
63	72
50	72
37.5	65
28	55
20	49
14	45
10	44
6.3	41
5.0	40
3.35	39
2.00	37
1.18	36
0.60	34
0.425	33
0.300	31
0.212	29
0.150	26
0.063	22

Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	22	15	35	28	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:

Jonathan Tatam (Admin/Quality Assistant)

[redacted]

Date: 27.7.15

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GEO SITE & TESTING SERVICES LTD

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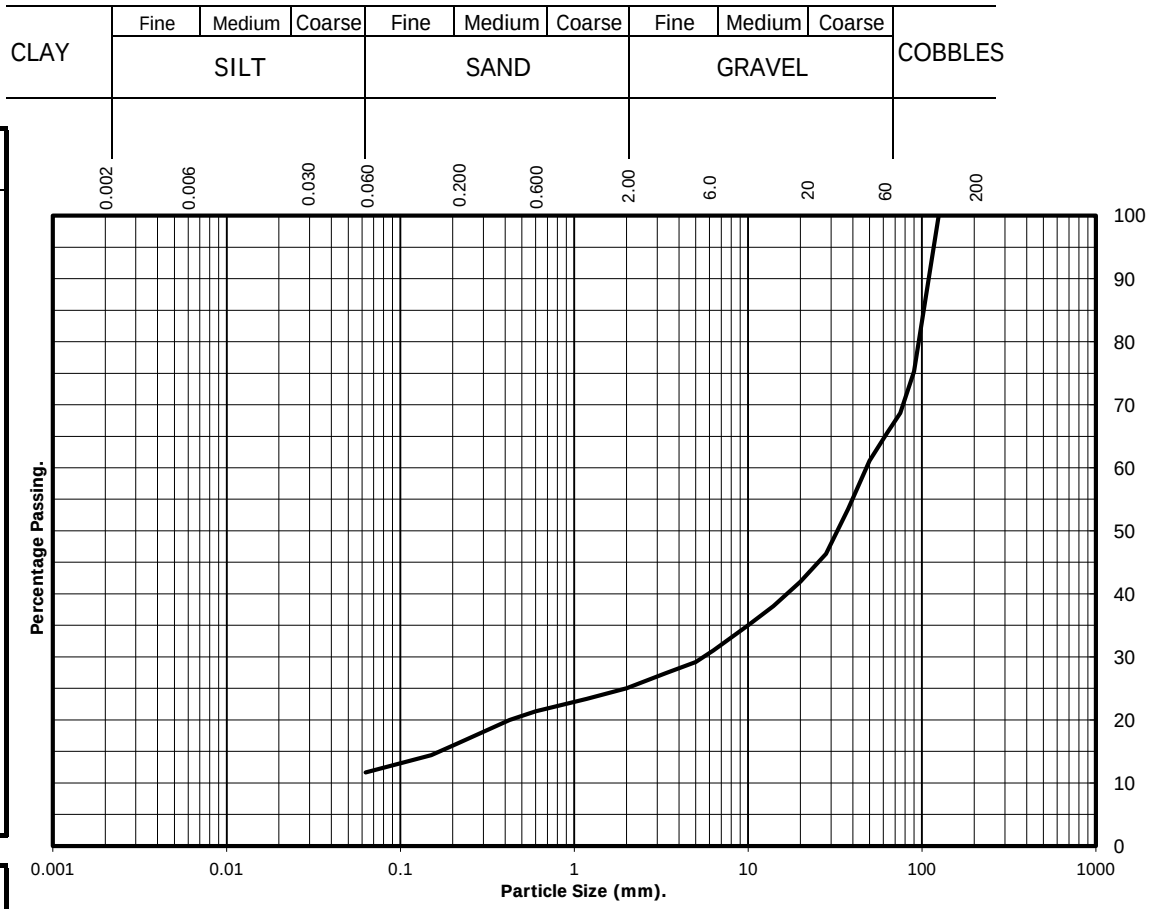
Test Report:

Particle Size Distribution Test
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Contract Number:	**27497-100715**	**Hole Number:**	**TP3**
Location:	**Herbert Road, Newport**	**Depth from (m):**	**3.50**
Client ref:	**12032**	**Depth to (m):**	
		Sample Number:	
		Sample Type:	**B**

Description: **Brown silty clayey sandy GRAVEL (fine-coarse) with many cobbles**



BS Test Sieve	% Passing
125	100
90	75
75	69
63	66
50	61
37.5	53
28	46
20	42
14	38
10	35
6.3	31
5.0	29
3.35	27
2.00	25
1.18	23
0.60	21
0.425	20
0.300	18
0.212	16
0.150	14
0.063	12

Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	12	13	41	34	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:

Jonathan Tatam (Admin/Quality Assistant)

Date: 27.7.15

GSTL
GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

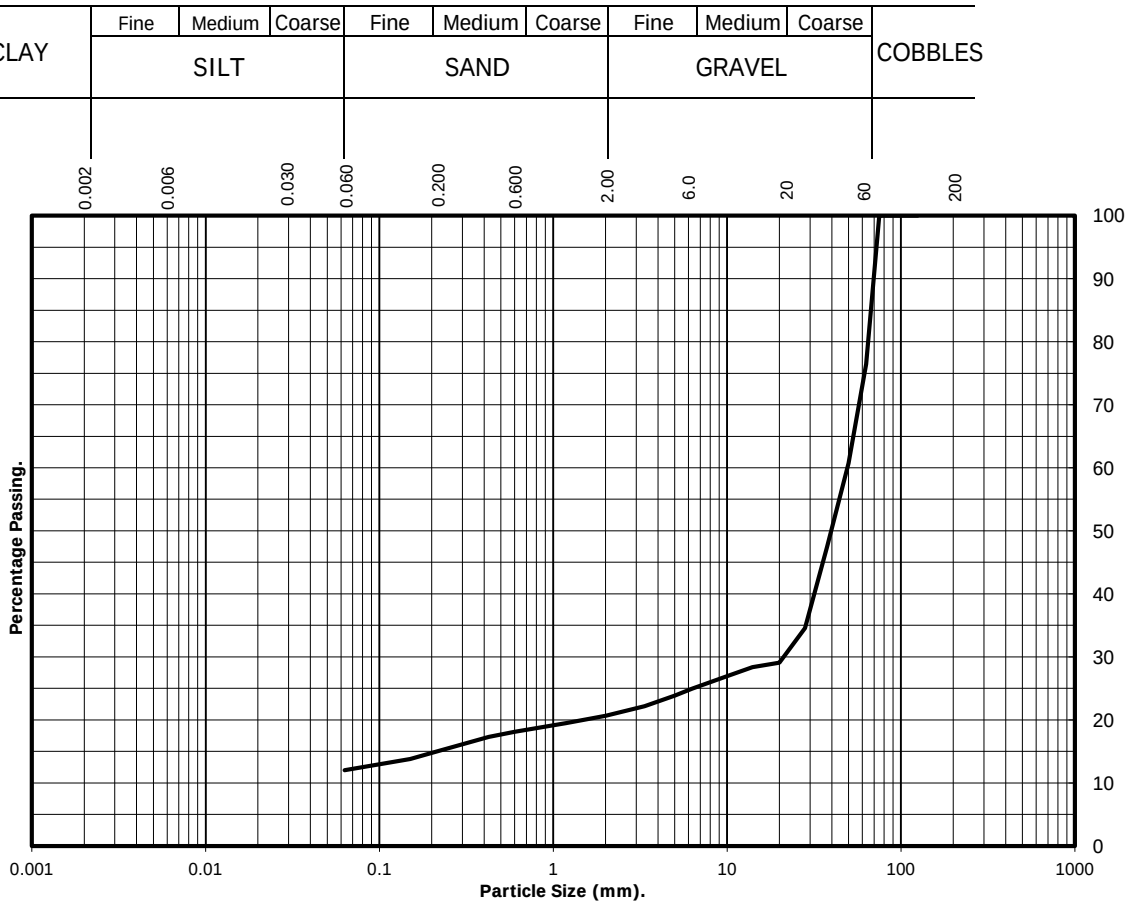
Test Report:

Particle Size Distribution Test
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Contract Number:	**27497-100715**	**Hole Number:**	**TP4**
Location:	**Herbert Road, Newport**	**Depth from (m):**	**2.00**
Client ref:	**12032**	**Depth to (m):**	
		Sample Number:	
		Sample Type:	**B**

Description: **Brown sandy silty clayey GRAVEL (fine-coarse) with many cobbles**



BS Test Sieve	% Passing
125	100
90	100
75	100
63	76
50	61
37.5	47
28	35
20	29
14	28
10	27
6.3	25
5.0	24
3.35	22
2.00	21
1.18	19
0.60	18
0.425	17
0.300	16
0.212	15
0.150	14
0.063	12

Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	12	9	55	24	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:

Jonathan Tatam (Admin/Quality Assistant)

[redacted]

Date: 27.7.15

GSTL
GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Test Report:

Particle Size Distribution Test
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Contract Number:	**27497-100715**	**Hole Number:**	**TP4**
Location:	**Herbert Road, Newport**	**Depth from (m):**	**3.00**
Client ref:	**12032**	**Depth to (m):**	
		Sample Number:	
		Sample Type:	**B**

Description: **Brown sandy silty clayey GRAVEL (fine-coarse) with many cobbles**

BS Test Sieve	% Passing
125	75
90	75
75	75
63	75
50	74
37.5	63
28	60
20	54
14	50
10	47
6.3	43
5.0	42
3.35	40
2.00	38
1.18	36
0.60	34
0.425	32
0.300	30
0.212	28
0.150	26
0.063	22

Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	22	16	37	25	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:

Jonathan Tatam (Admin/Quality Assistant)

[redacted]

Date: 27.7.15

GSTL
GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

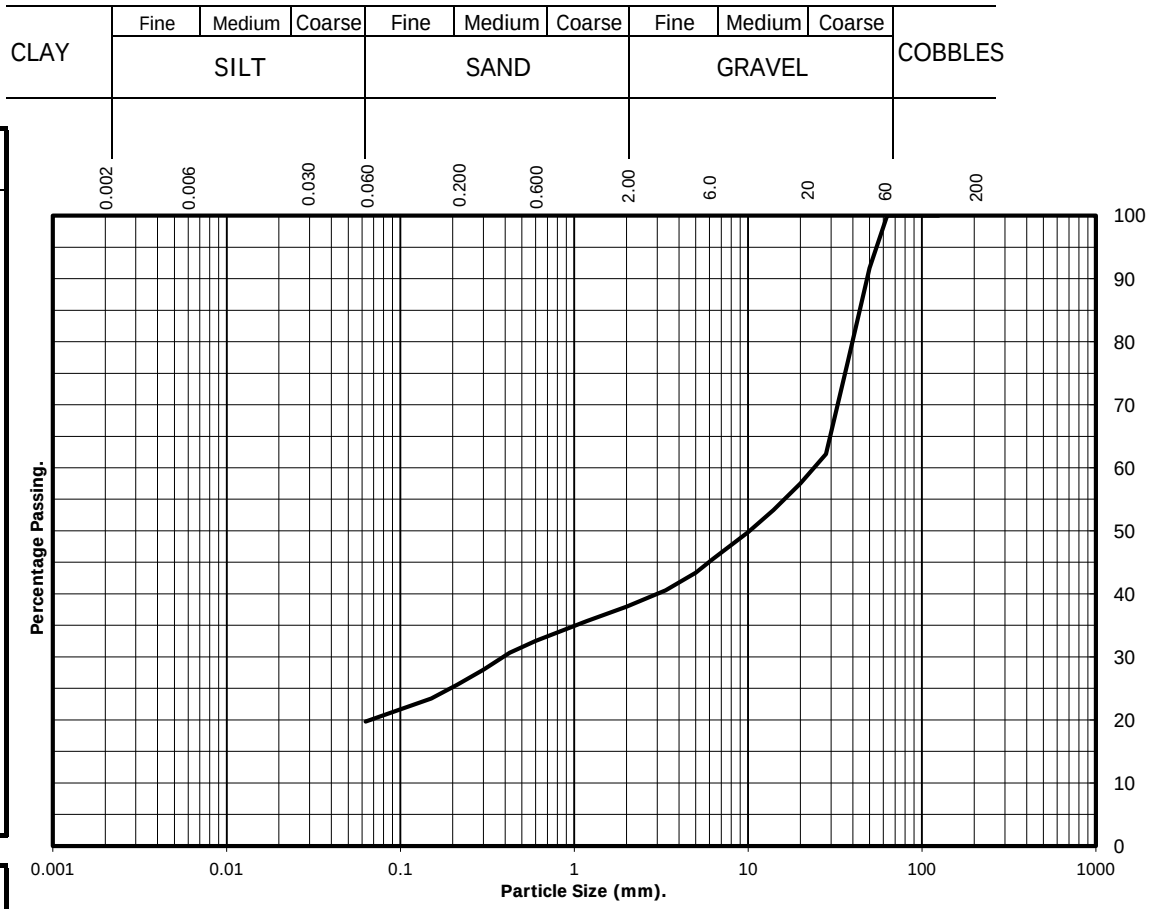
Test Report:

Particle Size Distribution Test
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Contract Number:	**27497-100715**	**Hole Number:**	**TP6**
Location:	**Herbert Road, Newport**	**Depth from (m):**	**2.00**
Client ref:	**12032**	**Depth to (m):**	
		Sample Number:	
		Sample Type:	**B**

Description: **Brown sandy silty clayey GRAVEL (fine-coarse)**



BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	92
37.5	77
28	62
20	57
14	53
10	50
6.3	46
5.0	43
3.35	41
2.00	38
1.18	36
0.60	33
0.425	31
0.300	28
0.212	26
0.150	23
0.063	20

Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	20	18	62	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:

Jonathan Tatam (Admin/Quality Assistant)

[redacted]

Date: 27.7.15

GSTL
GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

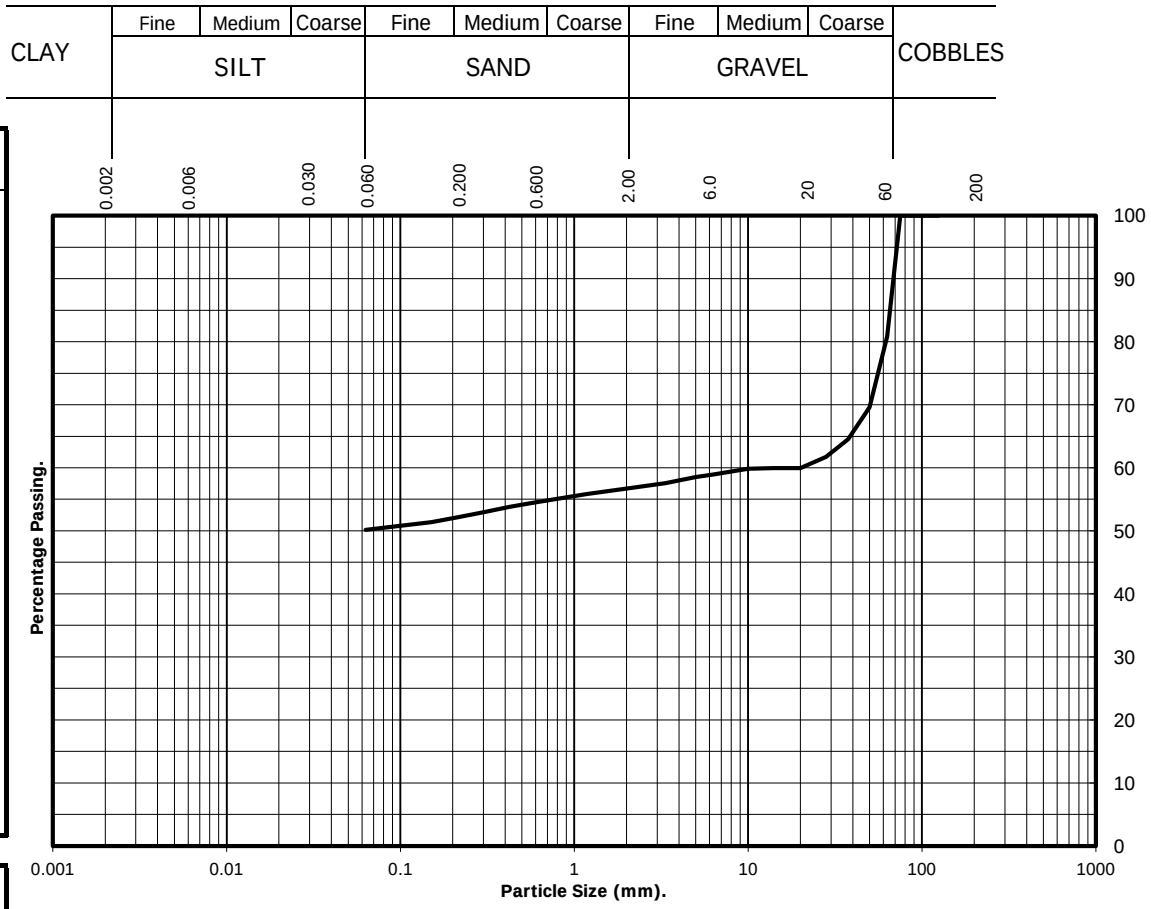
Test Report:

Particle Size Distribution Test
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Contract Number:	**27497-100715**	**Hole Number:**	**TP7**
Location:	**Herbert Road, Newport**	**Depth from (m):**	**2.00**
Client ref:	**12032**	**Depth to (m):**	
		Sample Number:	
		Sample Type:	**B**

Description: **Brown sandy gravelly (fine-coarse) silty CLAY with many cobbles**



BS Test Sieve	% Passing
125	100
90	100
75	100
63	81
50	70
37.5	65
28	62
20	60
14	60
10	60
6.3	59
5.0	59
3.35	58
2.00	57
1.18	56
0.60	55
0.425	54
0.300	53
0.212	52
0.150	51
0.063	50

Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	50	7	24	19	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:

Jonathan Tatam (Admin/Quality Assistant)

[redacted]

Date: 27.7.15

GSTL
GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

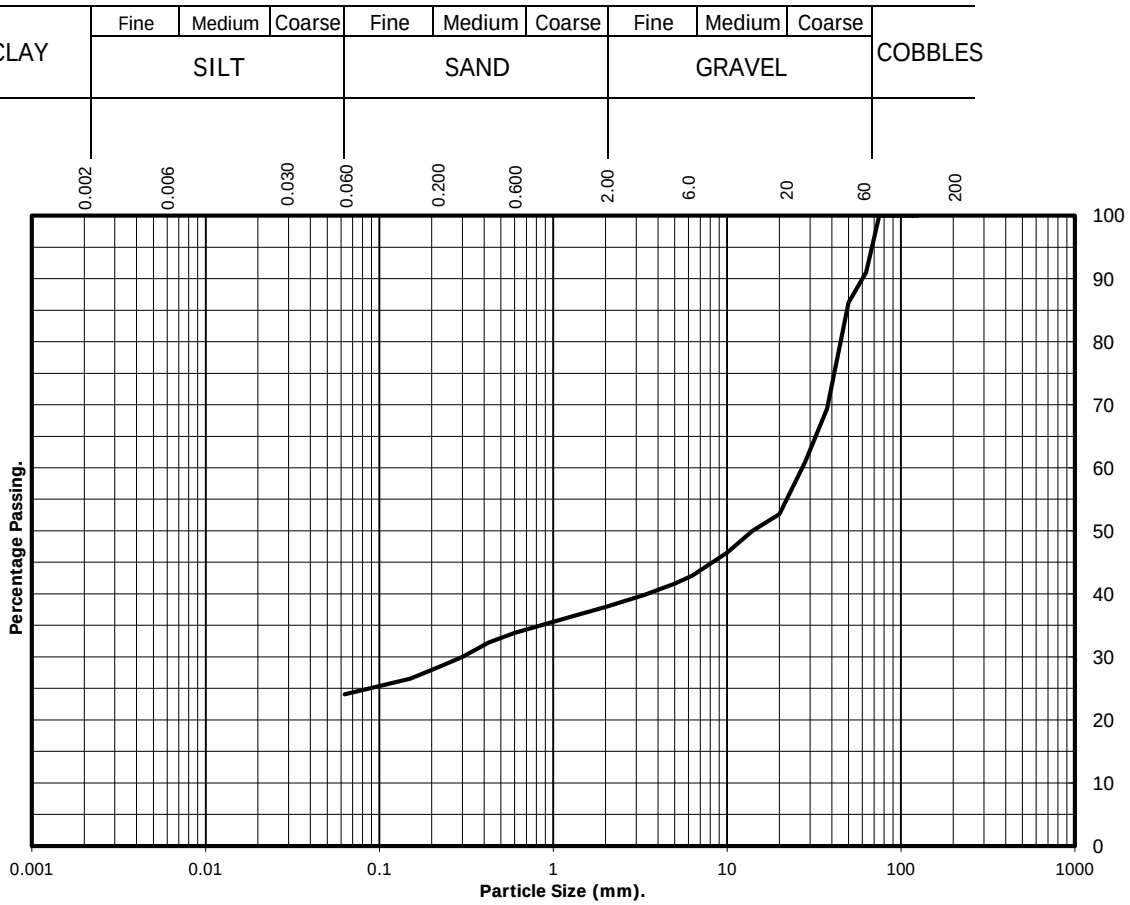
Test Report:

Particle Size Distribution Test
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Contract Number:	**27497-100715**	**Hole Number:**	**TP12**
Location:	**Herbert Road, Newport**	**Depth from (m):**	**2.00**
Client ref:	**12032**	**Depth to (m):**	
		Sample Number:	
		Sample Type:	**B**

Description: **Brown sandy silty clayey GRAVEL (fine-coarse) with cobbles**



BS Test Sieve	% Passing
125	100
90	100
75	100
63	91
50	86
37.5	69
28	61
20	53
14	50
10	47
6.3	43
5.0	42
3.35	40
2.00	38
1.18	36
0.60	34
0.425	32
0.300	30
0.212	28
0.150	27
0.063	24

Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	24	14	53	9	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:

Jonathan Tatam (Admin/Quality Assistant)

[redacted]

Date: 27.7.15

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GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

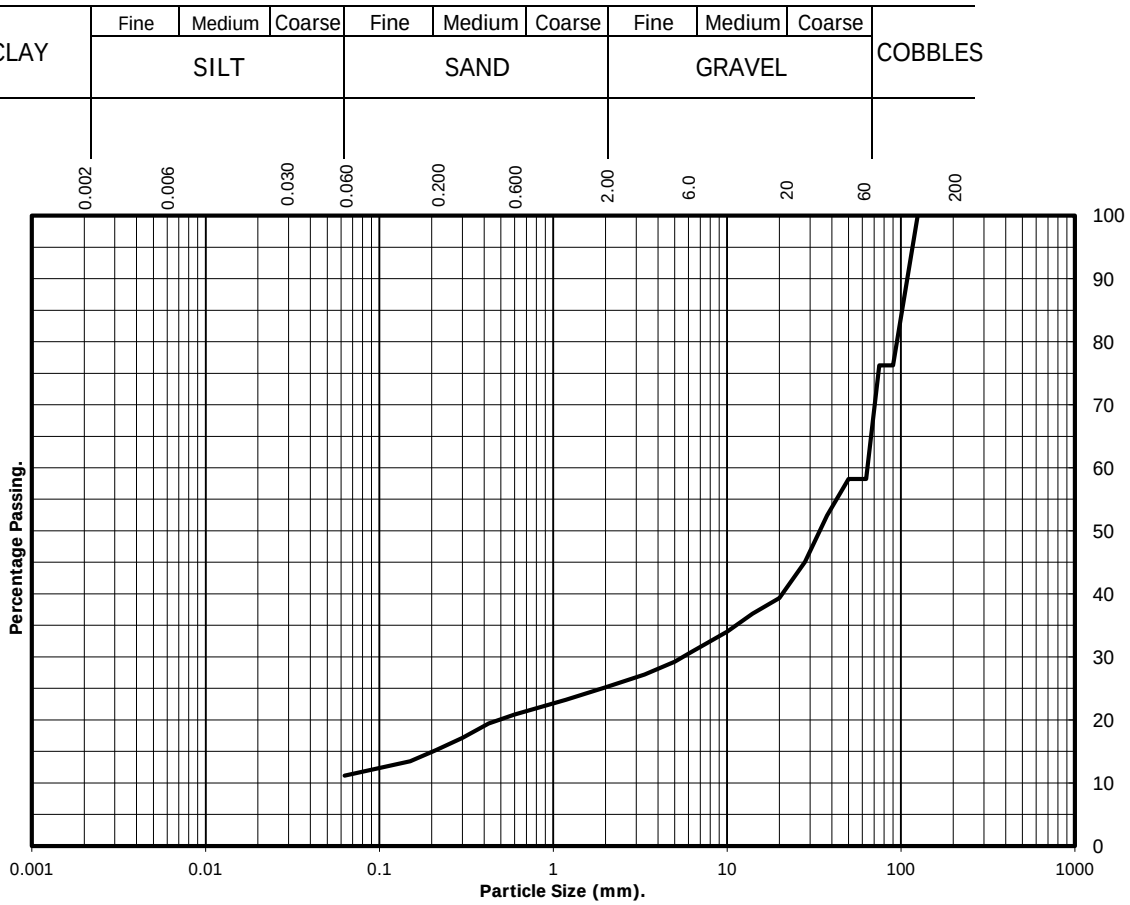
Test Report:

Particle Size Distribution Test
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Contract Number:	**27497-100715**	**Hole Number:**	**TP13**
Location:	**Herbert Road, Newport**	**Depth from (m):**	**2.00**
Client ref:	**12032**	**Depth to (m):**	
		Sample Number:	
		Sample Type:	**B**

Description: **Brown silty clayey sandy GRAVEL (fine-coarse) with many cobbles**



BS Test Sieve	% Passing
125	100
90	76
75	76
63	58
50	58
37.5	52
28	45
20	39
14	37
10	34
6.3	31
5.0	29
3.35	27
2.00	25
1.18	23
0.60	21
0.425	19
0.300	17
0.212	15
0.150	13
0.063	11

Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	11	14	33	42	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:

Jonathan Tatam (Admin/Quality Assistant)

[redacted]

Date: 27.7.15

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GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

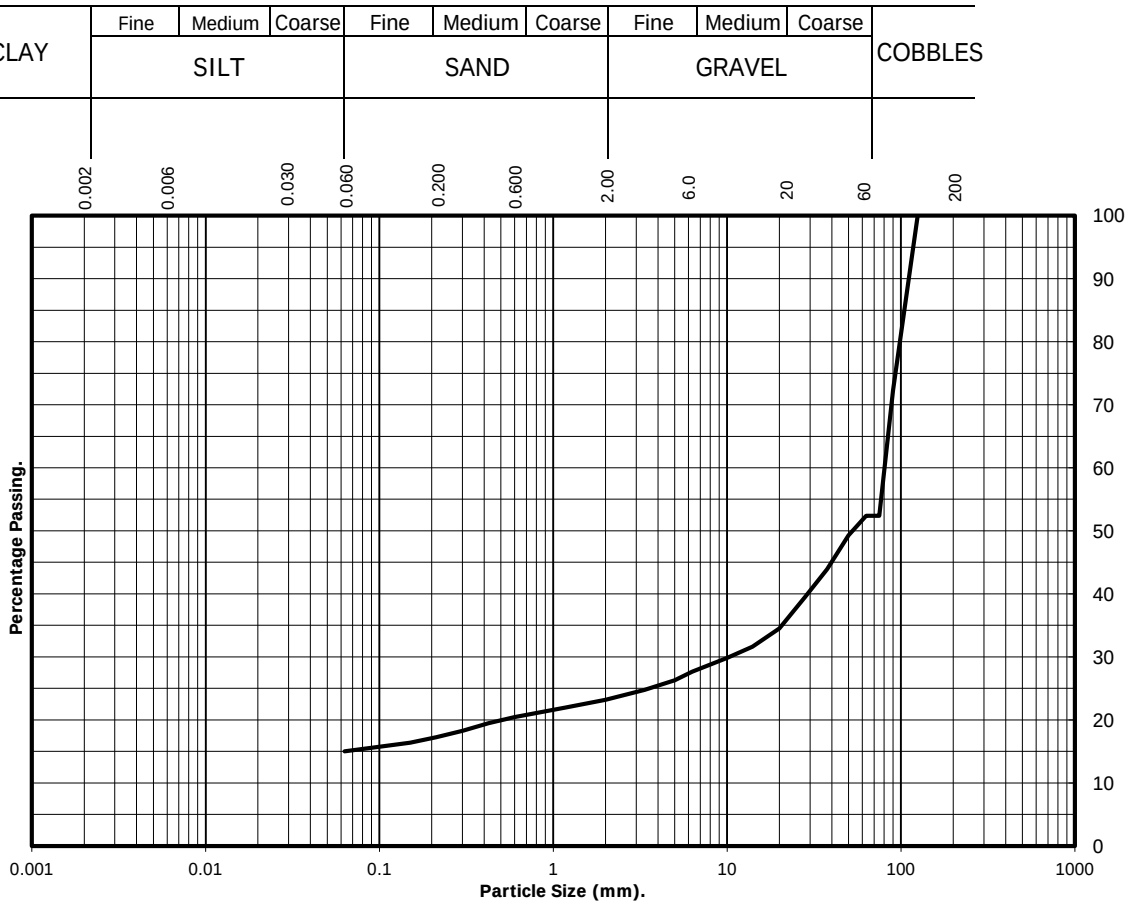
Test Report:

Particle Size Distribution Test
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Contract Number:	**27497-100715**	**Hole Number:**	**TP17**
Location:	**Herbert Road, Newport**	**Depth from (m):**	**1.50**
Client ref:	**12032**	**Depth to (m):**	
		Sample Number:	
		Sample Type:	**B**

Description: **Brown sandy silty clayey GRAVEL (fine-coarse) with many cobbles**



BS Test Sieve	% Passing
125	100
90	72
75	52
63	52
50	49
37.5	44
28	40
20	34
14	32
10	30
6.3	28
5.0	26
3.35	25
2.00	23
1.18	22
0.60	20
0.425	20
0.300	18
0.212	17
0.150	16
0.063	15

Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	15	8	29	48	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:

Jonathan Tatam (Admin/Quality Assistant)

Date: 27.7.15

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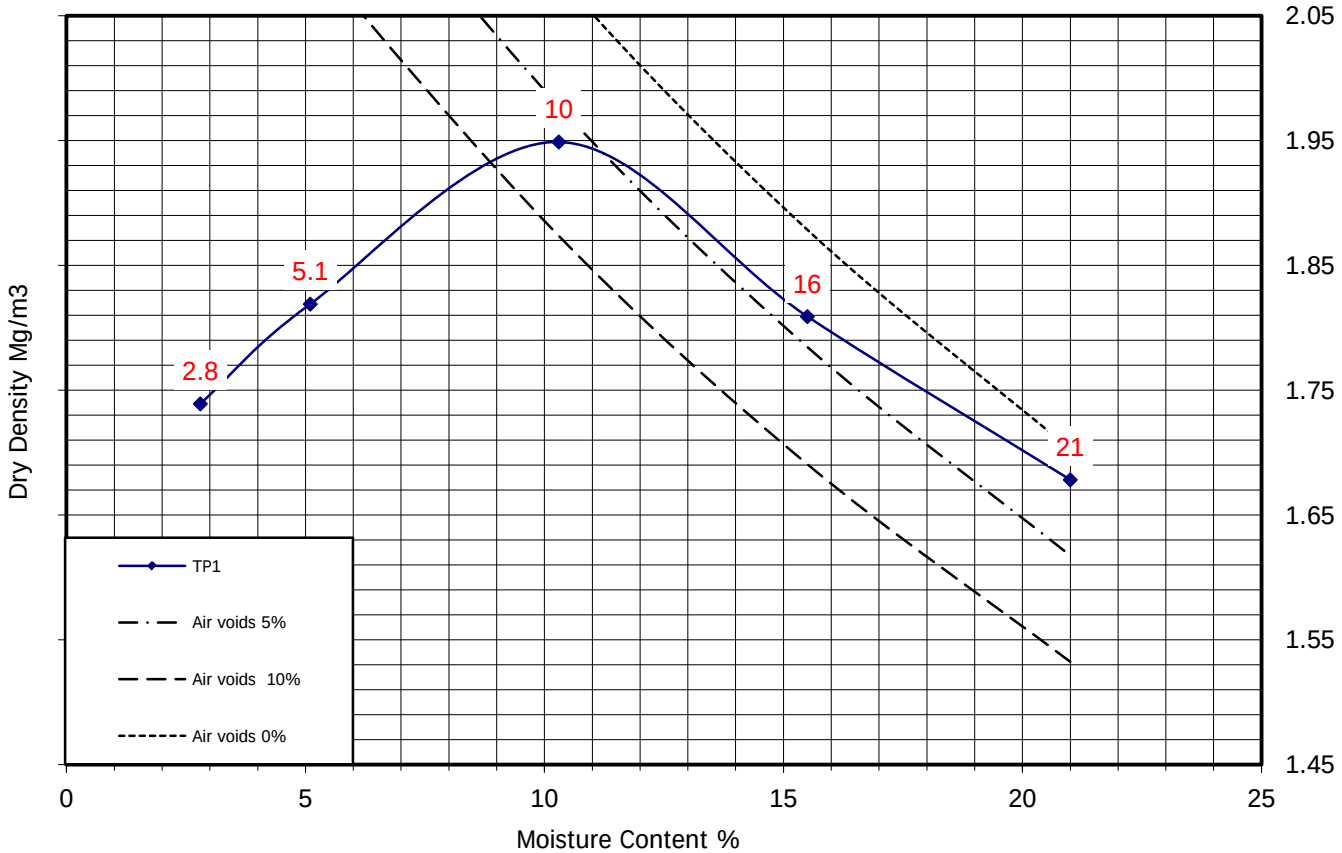
GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Dry Density / Moisture Content Relationship

BS 1377:Part 4:1990

Client ref:	**12032**
Location:	**Herbert Road, Newport**
Contract Number:	**27497-100715**
Hole Number:	**TP1**
Sample Number:	
Depth (m):	**1.00**
Sample Type:	**B**



Compaction Point:	**1**	**2**	**3**	**4**	**5**
Moisture Content:	2.8	5.1	10	16	21
Bulk Density (Mg/m^3):	1.79	1.91	2.15	2.09	2.03
Dry Density (Mg/m^3):	1.74	1.82	1.95	1.81	1.68

Initial Moisture Content:	**21**	Method of Compaction:	**2.5kg Rammer**
Particle Density (Mg/m^3):	**2.65 Assumed**	Material Retained on 37.5 mm Test Sieve (%):	**9**
Maximum Dry Density (mg/m^3):	**1.95**	Material Retained on 20.0 mm Test Sieve (%):	**20**
Optimum Moisture Content (%):	**10**	Sample Preparation Clause:	**3.2.5.2**

Remarks:

GSTL
GEO Site & Testing Services Limited

Checked By:
Jonathan Tatam
[redacted]

Approved By:
Paul Evans
[redacted]

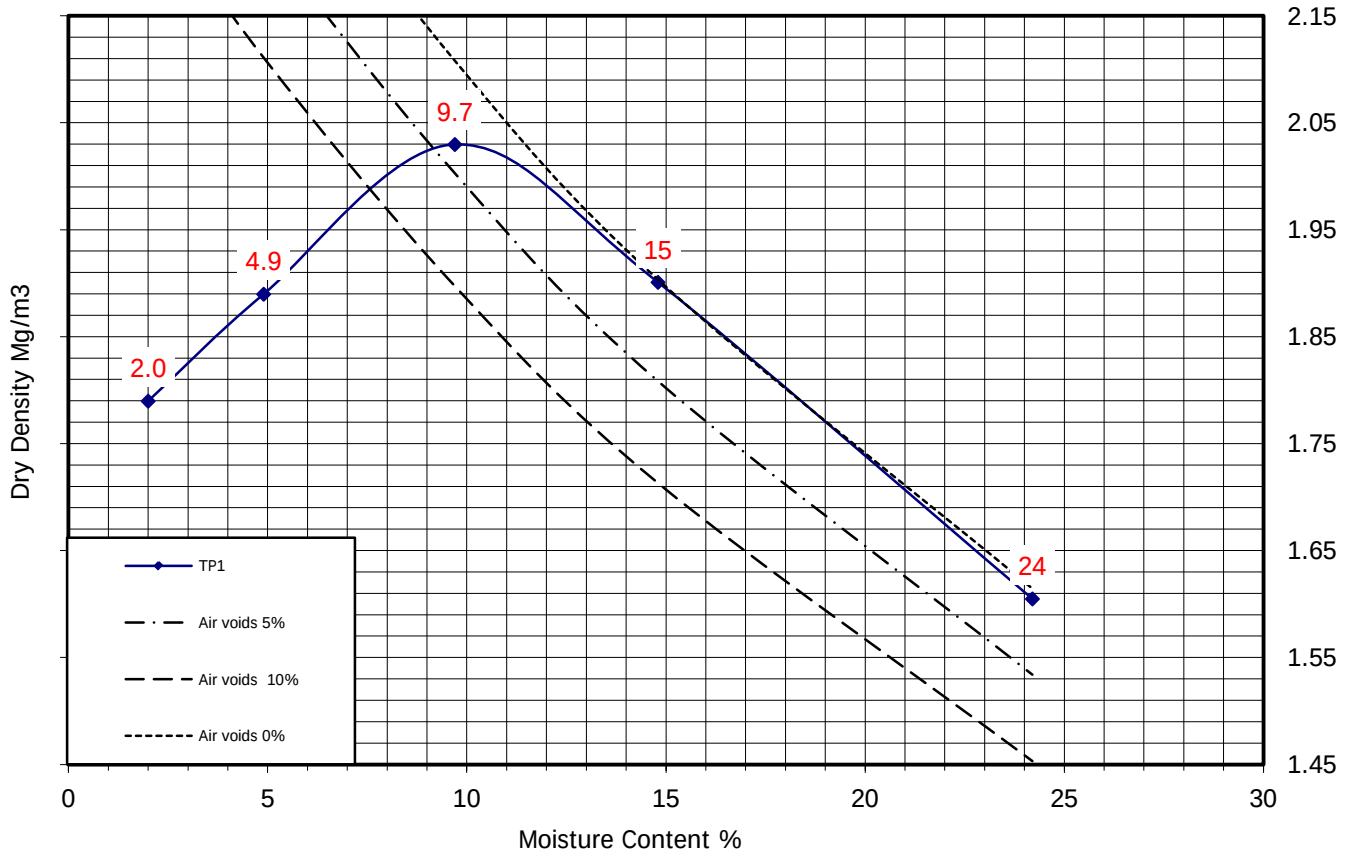
Date Approved: 27.7.15

UKAS TESTING 2788

Dry Density / Moisture Content Relationship

BS 1377:Part 4:1990

Client ref:	**12032**
Location:	**Herbert Road, Newport**
Contract Number:	**27497-100715**
Hole Number:	**TP1**
Sample Number:	
Depth (m):	**2.00**
Sample Type:	**B**



Compaction Point:	**1**	**2**	**3**	**4**	**5**
Moisture Content:	2.0	4.9	9.7	15	24
Bulk Density (Mg/m^3):	1.83	1.98	2.23	2.18	1.99
Dry Density (Mg/m^3):	1.79	1.89	2.03	1.90	1.60

Initial Moisture Content:	**24**	Method of Compaction:	**2.5kg Rammer**
Particle Density (Mg/m^3):	**2.65 Assumed**	Material Retained on 37.5 mm Test Sieve (%):	**35**
Maximum Dry Density (mg/m^3):	**2.03**	Material Retained on 20.0 mm Test Sieve (%):	**51**
Optimum Moisture Content (%):	**9.7**	Sample Preparation Clause:	**Non-Standard**

Remarks:

GSTL
GEO Site & Testing Services Limited

Checked By:
Jonathan Tatam
[redacted]

Approved By:
Paul Evans
[redacted]

Date Approved: 27.7.15

UKAS TESTING
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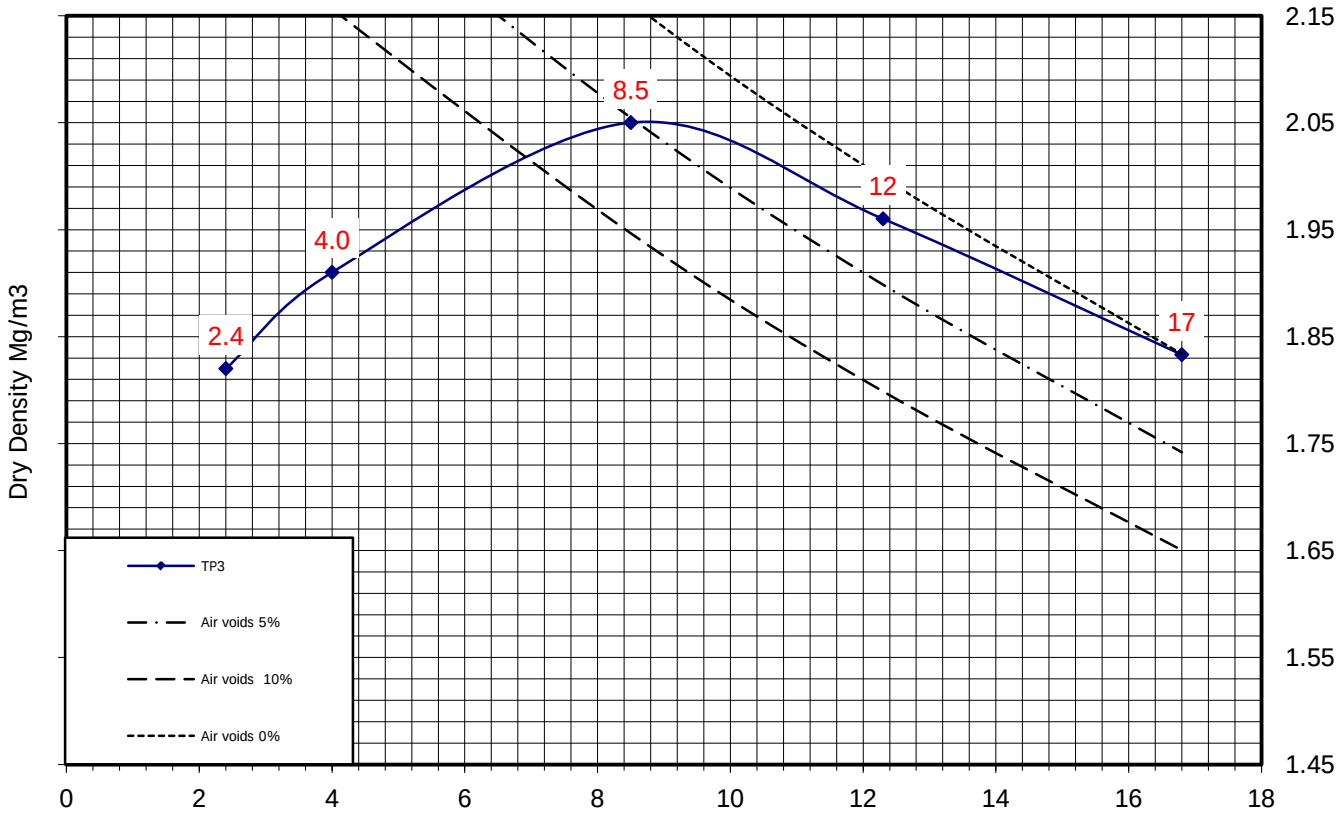
Dry Density / Moisture Content Relationship

BS 1377:Part 4:1990

Client ref:	**12032**
Location:	**Herbert Road, Newport**
Contract Number:	**27497-100715**
Hole Number:	**TP3**
Sample Number:	
Depth (m):	**3.50**
Sample Type:	**B**



Compaction Point:	**1**	**2**	**3**	**4**	**5**
Moisture Content:	2.4	4.0	8.5	12	17
Bulk Density (Mg/m^3):	1.86	1.99	2.22	2.20	2.14
Dry Density (Mg/m^3):	1.82	1.91	2.05	1.96	1.83

Initial Moisture Content:	**17**	Method of Compaction:	**2.5kg Rammer**
Particle Density (Mg/m^3):	**2.65 Assumed**	Material Retained on 37.5 mm Test Sieve (%):	**47**
Maximum Dry Density (mg/m^3):	**2.05**	Material Retained on 20.0 mm Test Sieve (%):	**58**
Optimum Moisture Content (%):	**8.5**	Sample Preparation Clause:	**Non-Standard**

Remarks:

GSTL
GEO Site & Testing Services Limited

Checked By:
Jonathan Tatam
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Approved By:
Paul Evans
[redacted]

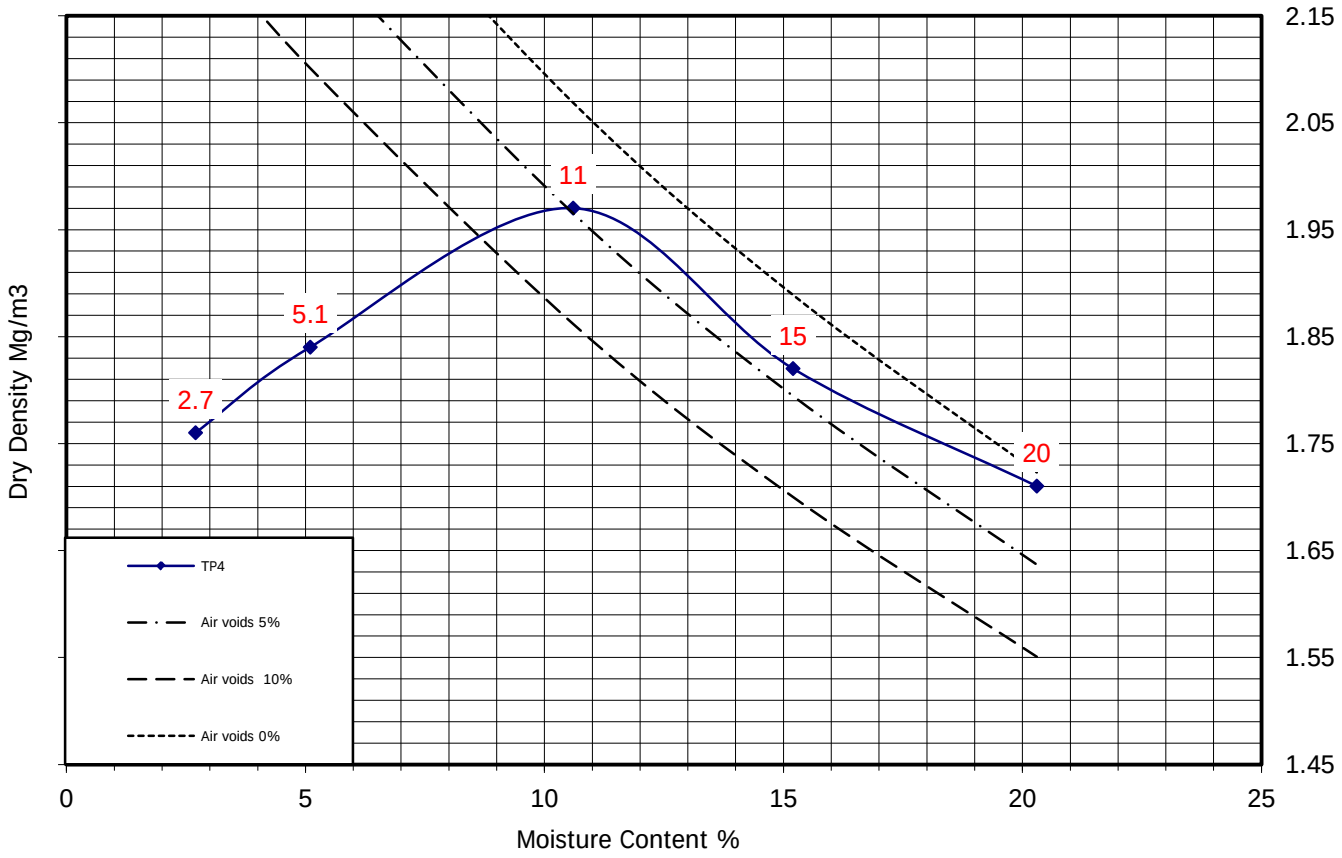
Date Approved: 27.7.15

UKAS TESTING
2788

Dry Density / Moisture Content Relationship

BS 1377:Part 4:1990

Client ref:	**12032**
Location:	**Herbert Road, Newport**
Contract Number:	**27497-100715**
Hole Number:	**TP4**
Sample Number:	
Depth (m):	**2.00**
Sample Type:	**B**



Compaction Point:	1	2	3	4	5
Moisture Content:	2.7	5.1	11	15	20
Bulk Density (Mg/m^3):	1.81	1.93	2.18	2.10	2.06
Dry Density (Mg/m^3):	1.76	1.84	1.97	1.82	1.71

Initial Moisture Content:	**20**	Method of Compaction:	**2.5kg Rammer**
Particle Density (Mg/m^3):	**2.65 Assumed**	Material Retained on 37.5 mm Test Sieve (%):	**53**
Maximum Dry Density (mg/m^3):	**1.97**	Material Retained on 20.0 mm Test Sieve (%):	**71**
Optimum Moisture Content (%):	**11**	Sample Preparation Clause:	**Non-Standard**

Remarks:

GSTL
GEO Site & Testing Services Limited

Checked By:
Jonathan Tatam
[redacted]

Approved By:
Paul Evans
[redacted]

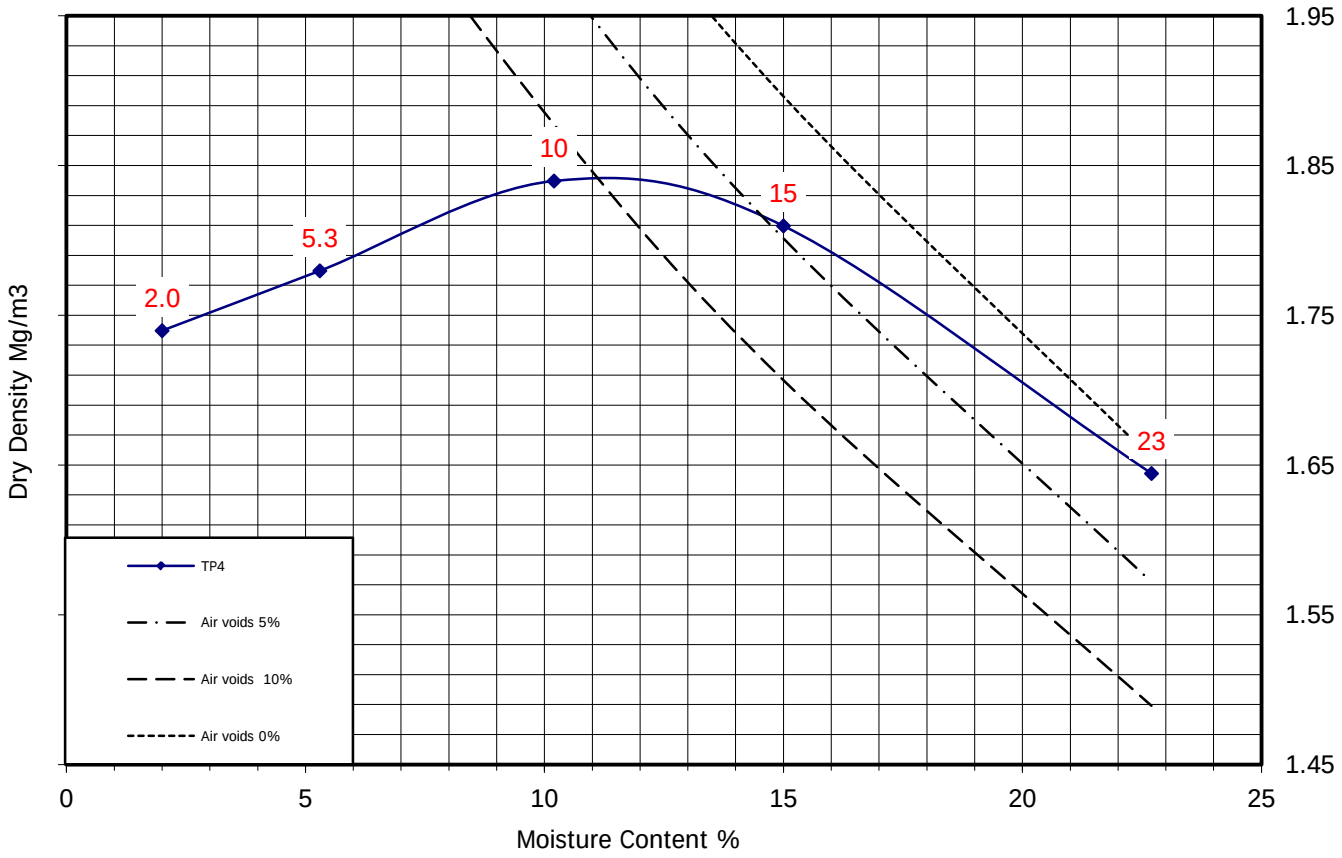
Date Approved: 27.7.15

UKAS TESTING
2788

Dry Density / Moisture Content Relationship

BS 1377:Part 4:1990

Client ref:	**12032**
Location:	**Herbert Road, Newport**
Contract Number:	**27497-100715**
Hole Number:	**TP4**
Sample Number:	
Depth (m):	**3.00**
Sample Type:	**B**



Compaction Point:	1	2	3	4	5
Moisture Content:	2.0	5.3	10	15	23
Bulk Density (Mg/m^3):	1.77	1.87	2.03	2.08	2.02
Dry Density (Mg/m^3):	1.74	1.78	1.84	1.81	1.64

Initial Moisture Content:	**23**	Method of Compaction:	**2.5kg Rammer**
Particle Density (Mg/m^3):	**2.65 Assumed**	Material Retained on 37.5 mm Test Sieve (%):	**37**
Maximum Dry Density (mg/m^3):	**1.84**	Material Retained on 20.0 mm Test Sieve (%):	**46**
Optimum Moisture Content (%):	**10**	Sample Preparation Clause:	**Non-Standard**

Remarks:

GSTL
GEO Site & Testing Services Limited

Checked By:
Jonathan Tatam
[redacted]

Approved By:
Paul Evans
[redacted]

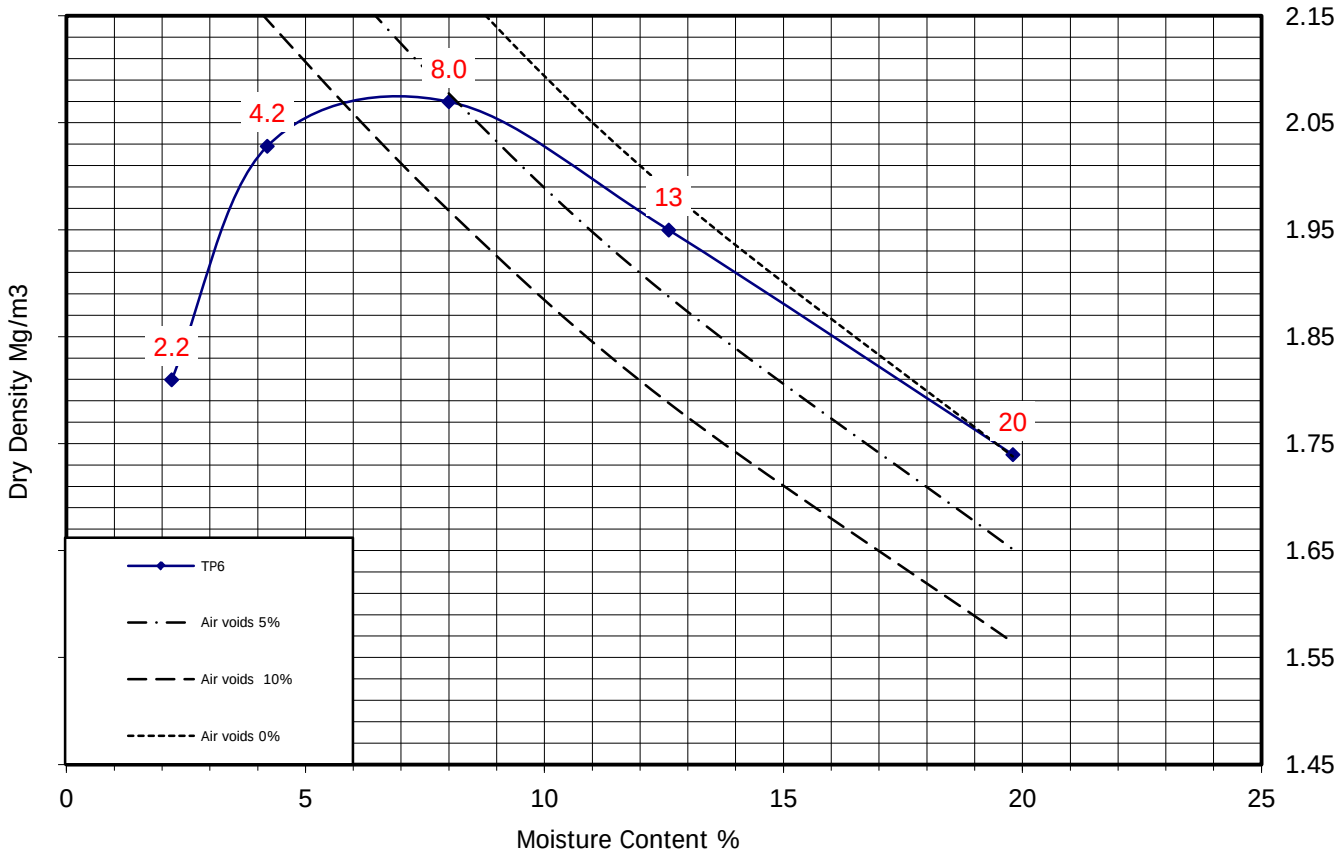
Date Approved: 27.7.15

UKAS TESTING
2788

Dry Density / Moisture Content Relationship

BS 1377:Part 4:1990

Client ref:	**12032**
Location:	**Herbert Road, Newport**
Contract Number:	**27497-100715**
Hole Number:	**TP6**
Sample Number:	
Depth (m):	**2.00**
Sample Type:	**B**



Compaction Point:	**1**	**2**	**3**	**4**	**5**
Moisture Content:	2.2	4.2	8.0	13	20
Bulk Density (Mg/m^3):	1.85	2.11	2.24	2.20	2.08
Dry Density (Mg/m^3):	1.81	2.03	2.07	1.95	1.74

Initial Moisture Content:	**20**	Method of Compaction:	**2.5kg Rammer**
Particle Density (Mg/m^3):	**2.65 Assumed**	Material Retained on 37.5 mm Test Sieve (%):	**23**
Maximum Dry Density (mg/m^3):	**2.07**	Material Retained on 20.0 mm Test Sieve (%):	**43**
Optimum Moisture Content (%):	**8.0**	Sample Preparation Clause:	**Non-Standard**

Remarks:

GSTL
GEO Site & Testing Services Limited

Checked By:
Jonathan Tatam
[redacted]

Approved By:
Paul Evans
[redacted]

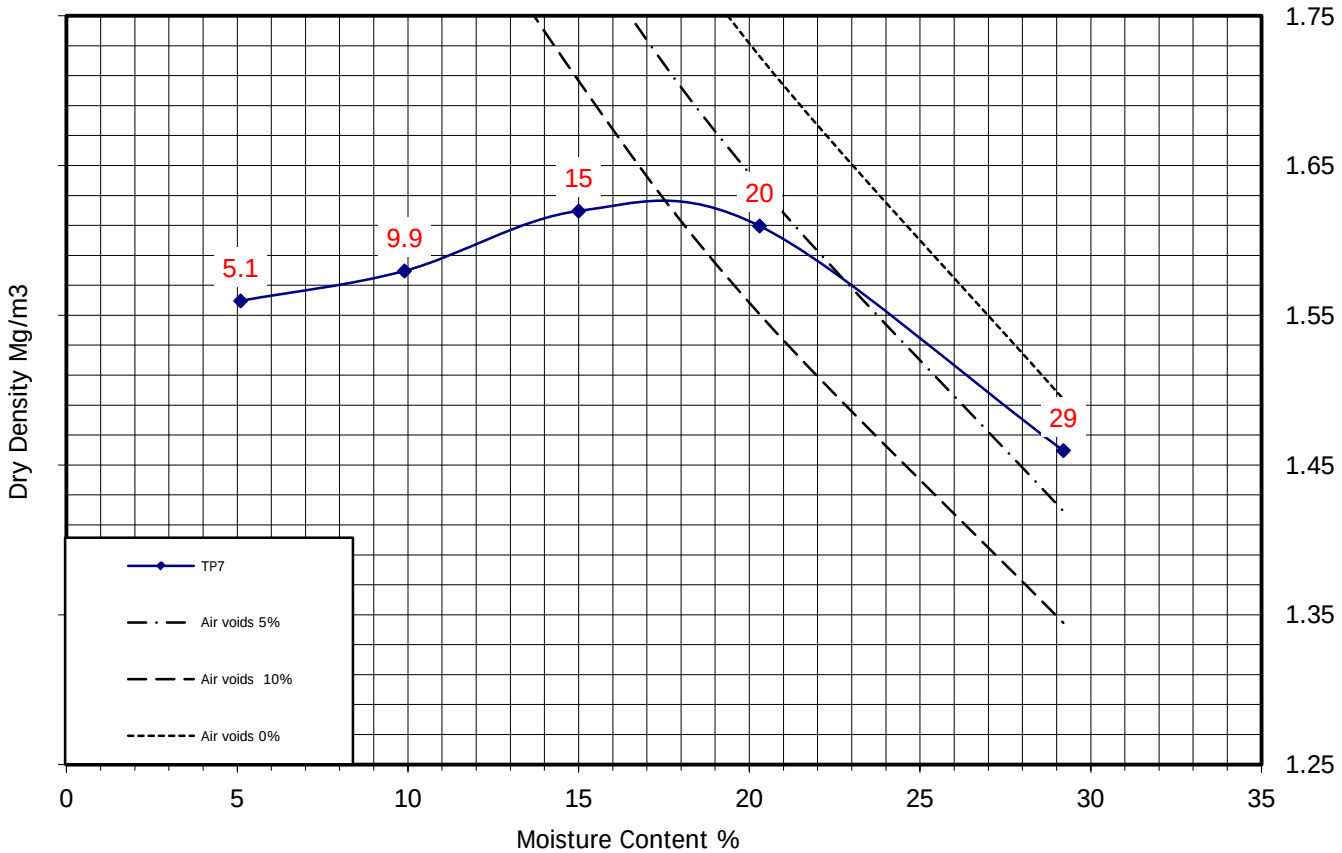
Date Approved: 27.7.15

UKAS TESTING
2788

Dry Density / Moisture Content Relationship

BS 1377:Part 4:1990

Client ref:	**12032**
Location:	**Herbert Road, Newport**
Contract Number:	**27497-100715**
Hole Number:	**TP7**
Sample Number:	
Depth (m):	**2.00**
Sample Type:	**B**



Compaction Point:	1	2	3	4	5
Moisture Content:	5.1	9.9	15	20	29
Bulk Density (Mg/m^3):	1.64	1.74	1.86	1.94	1.89
Dry Density (Mg/m^3):	1.56	1.58	1.62	1.61	1.46

Initial Moisture Content:	**29**	Method of Compaction:	**2.5kg Rammer**
Particle Density (Mg/m^3):	**2.65 Assumed**	Material Retained on 37.5 mm Test Sieve (%):	**35**
Maximum Dry Density (mg/m^3):	**1.62**	Material Retained on 20.0 mm Test Sieve (%):	**40**
Optimum Moisture Content (%):	**15**	Sample Preparation Clause:	**Non-Standard**

Remarks:

GSTL
GEO Site & Testing Services Limited

Checked By:
Jonathan Tatam
[redacted]

Approved By:
Paul Evans
[redacted]

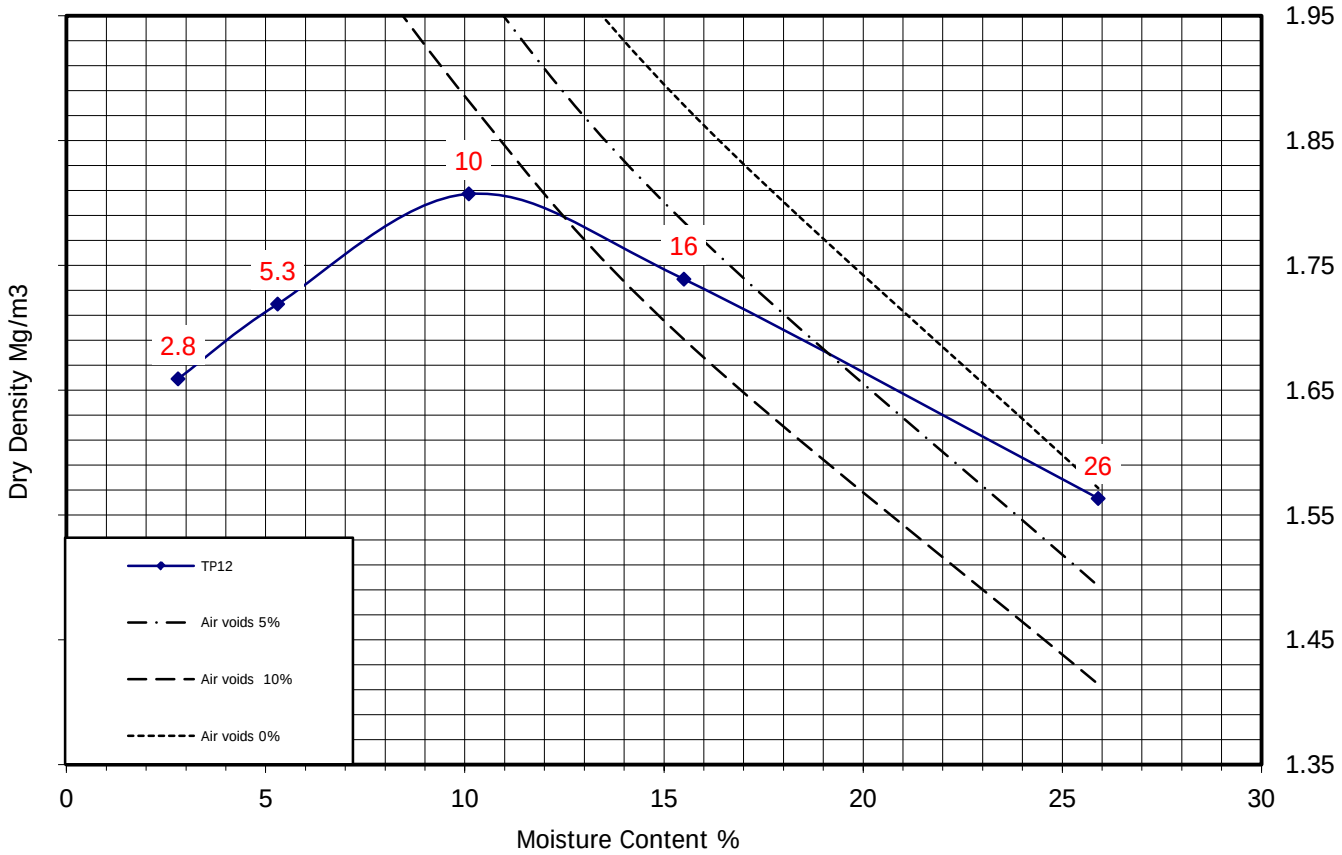
Date Approved: 27.7.15

UKAS TESTING
2788

Dry Density / Moisture Content Relationship

BS 1377:Part 4:1990

Client ref:	**12032**
Location:	**Herbert Road, Newport**
Contract Number:	**27497-100715**
Hole Number:	**TP12**
Sample Number:	
Depth (m):	**2.00**
Sample Type:	**B**



Compaction Point:	1	2	3	4	5
Moisture Content:	2.8	5.3	10	16	26
Bulk Density (Mg/m^3):	1.71	1.81	1.99	2.01	1.97
Dry Density (Mg/m^3):	1.66	1.72	1.81	1.74	1.56

Initial Moisture Content:	**26**	Method of Compaction:	**2.5kg Rammer**
Particle Density (Mg/m^3):	**2.65 Assumed**	Material Retained on 37.5 mm Test Sieve (%):	**31**
Maximum Dry Density (mg/m^3):	**1.81**	Material Retained on 20.0 mm Test Sieve (%):	**47**
Optimum Moisture Content (%):	**10**	Sample Preparation Clause:	**Non-Standard**

Remarks:

GSTL
GEO Site & Testing Services Limited

Checked By:
Jonathan Tatam
[redacted]
Date Approved: 27.7.15

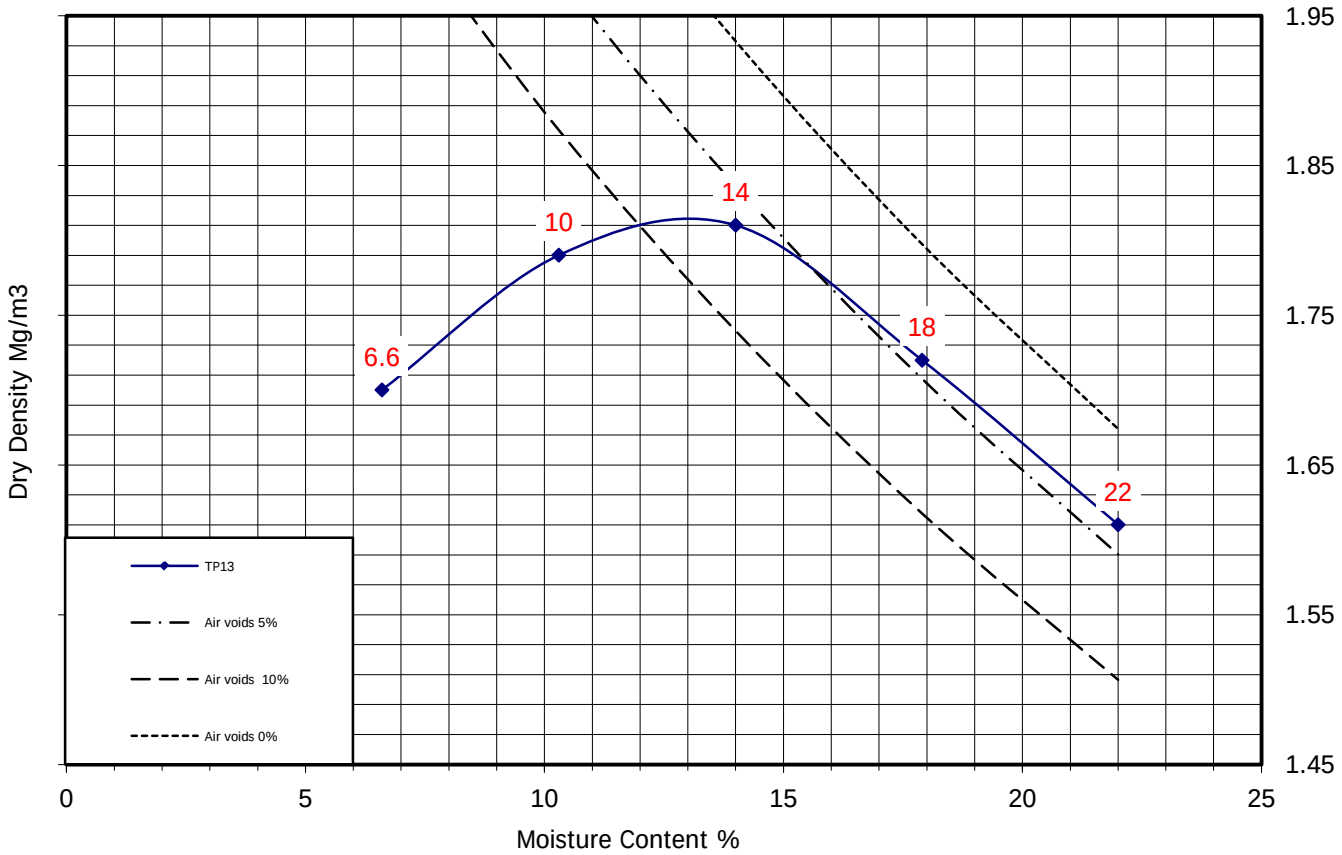
Approved By:
Paul Evans
[redacted]

UKAS TESTING
2788

Dry Density / Moisture Content Relationship

BS 1377:Part 4:1990

Client ref:	**12032**
Location:	**Herbert Road, Newport**
Contract Number:	**27497-100715**
Hole Number:	**TP13**
Sample Number:	
Depth (m):	**2.00**
Sample Type:	**B**



Compaction Point:	1	2	3	4	5
Moisture Content:	6.6	10	14	18	22
Bulk Density (Mg/m^3):	1.81	1.97	2.06	2.03	1.96
Dry Density (Mg/m^3):	1.70	1.79	1.81	1.72	1.61

Initial Moisture Content:	**18**	Method of Compaction:	**2.5kg Rammer**
Particle Density (Mg/m^3):	**2.65 Assumed**	Material Retained on 37.5 mm Test Sieve (%):	**48**
Maximum Dry Density (mg/m^3):	**1.81**	Material Retained on 20.0 mm Test Sieve (%):	**61**
Optimum Moisture Content (%):	**14**	Sample Preparation Clause:	**Non-Standard**

Remarks:

GSTL
GEO Site & Testing Services Limited

Checked By:
Jonathan Tatam
[redacted]

Approved By:
Paul Evans
[redacted]

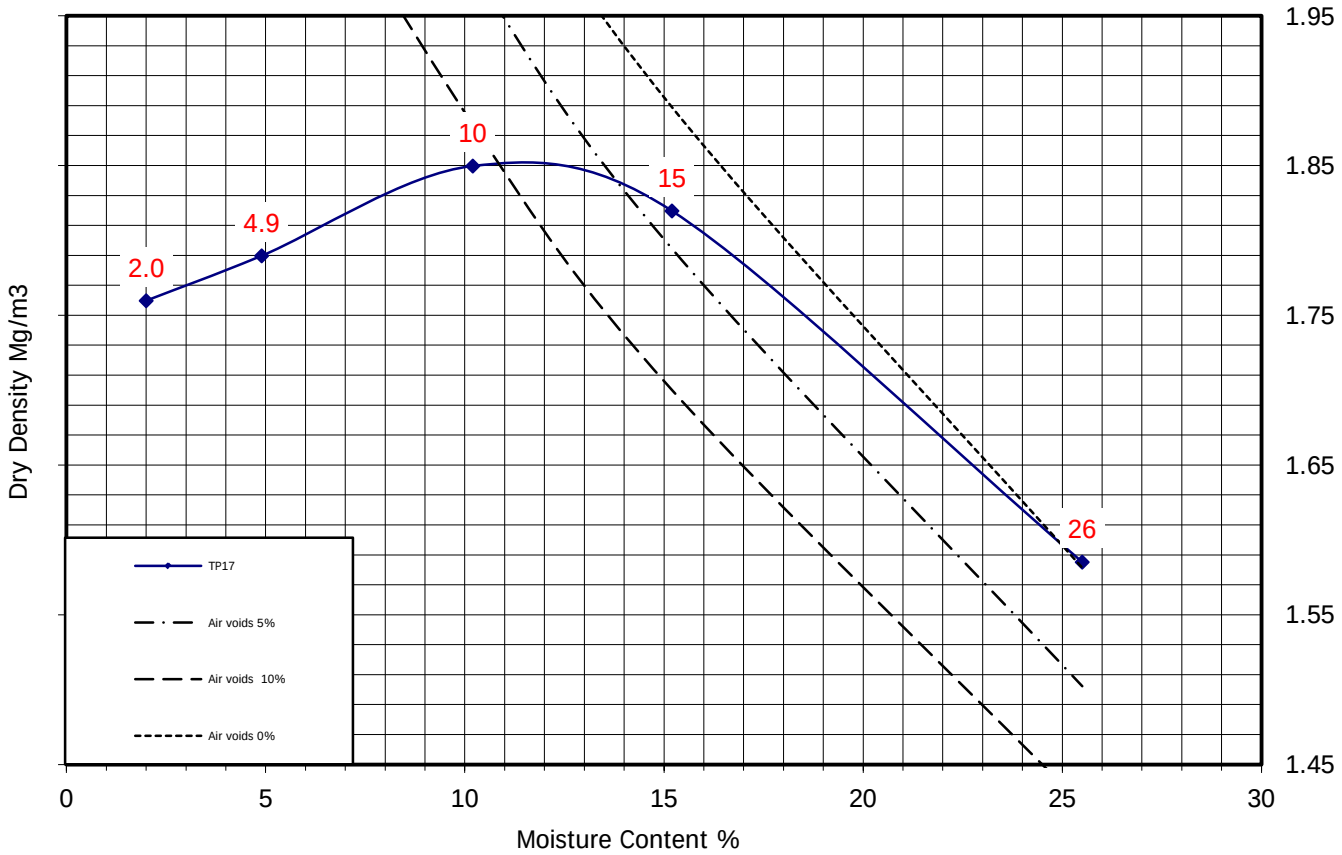
Date Approved: 27.7.15

UKAS TESTING
2788

Dry Density / Moisture Content Relationship

BS 1377:Part 4:1990

Client ref:	**12032**
Location:	**Herbert Road, Newport**
Contract Number:	**27497-100715**
Hole Number:	**TP17**
Sample Number:	
Depth (m):	**0.50**
Sample Type:	**B**



Compaction Point:	1	2	3	4	5
Moisture Content:	2.0	4.9	10	15	26
Bulk Density (Mg/m^3):	1.79	1.88	2.04	2.10	1.99
Dry Density (Mg/m^3):	1.76	1.79	1.85	1.82	1.59

Initial Moisture Content:	**26**	Method of Compaction:	**2.5kg Rammer**
Particle Density (Mg/m^3):	**2.65 Assumed**	Material Retained on 37.5 mm Test Sieve (%):	**56**
Maximum Dry Density (mg/m^3):	**1.85**	Material Retained on 20.0 mm Test Sieve (%):	**66**
Optimum Moisture Content (%):	**10**	Sample Preparation Clause:	**Non-Standard**

Remarks:

GSTL
GEO Site & Testing Services Limited

Checked By:
Jonathan Tatam
[redacted]

Approved By:
Paul Evans
[redacted]

Date Approved: 27.7.15

UKAS TESTING
2788

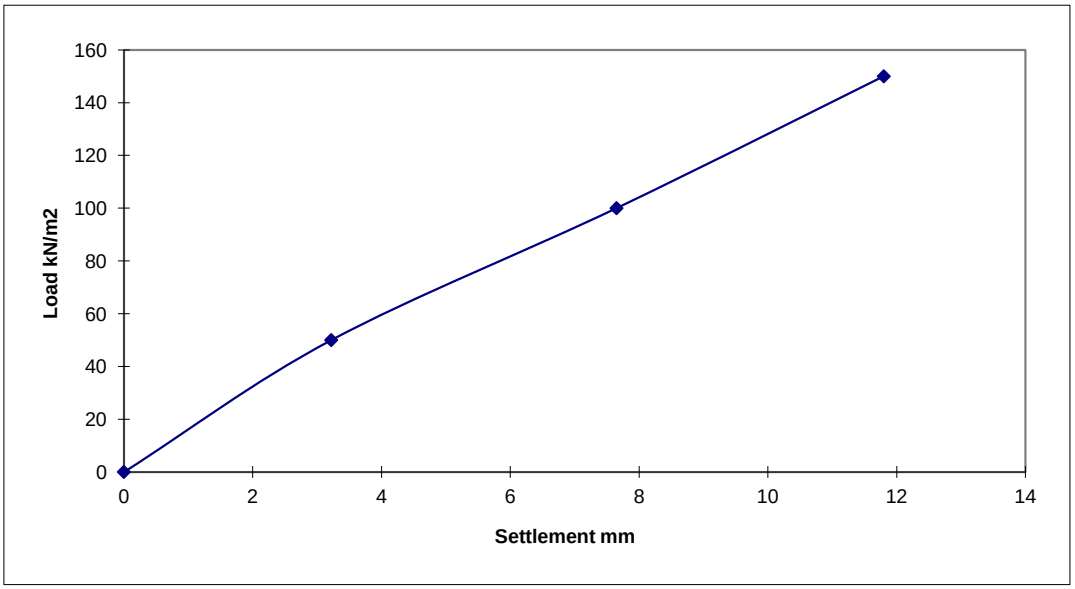
ANNEX K
Geotechnical Test Results Certificates – 24.07.2015-19.08.2015

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Test 1	Surface	600mm	Fill

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
3.22	50	5
7.65	100	10
11.80	150	21



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied for ten minutes.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

SOUTHERN GROUND TESTING

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

CONTRACT:	Date: 05.08.15
Herbert Road, Newport	Sheet 1 of 1

SOUTHERN GROUND TESTING

Plate Load Test Settlement v Time Data

Contract: Herbert Road, Newport | Date: 05.08.15

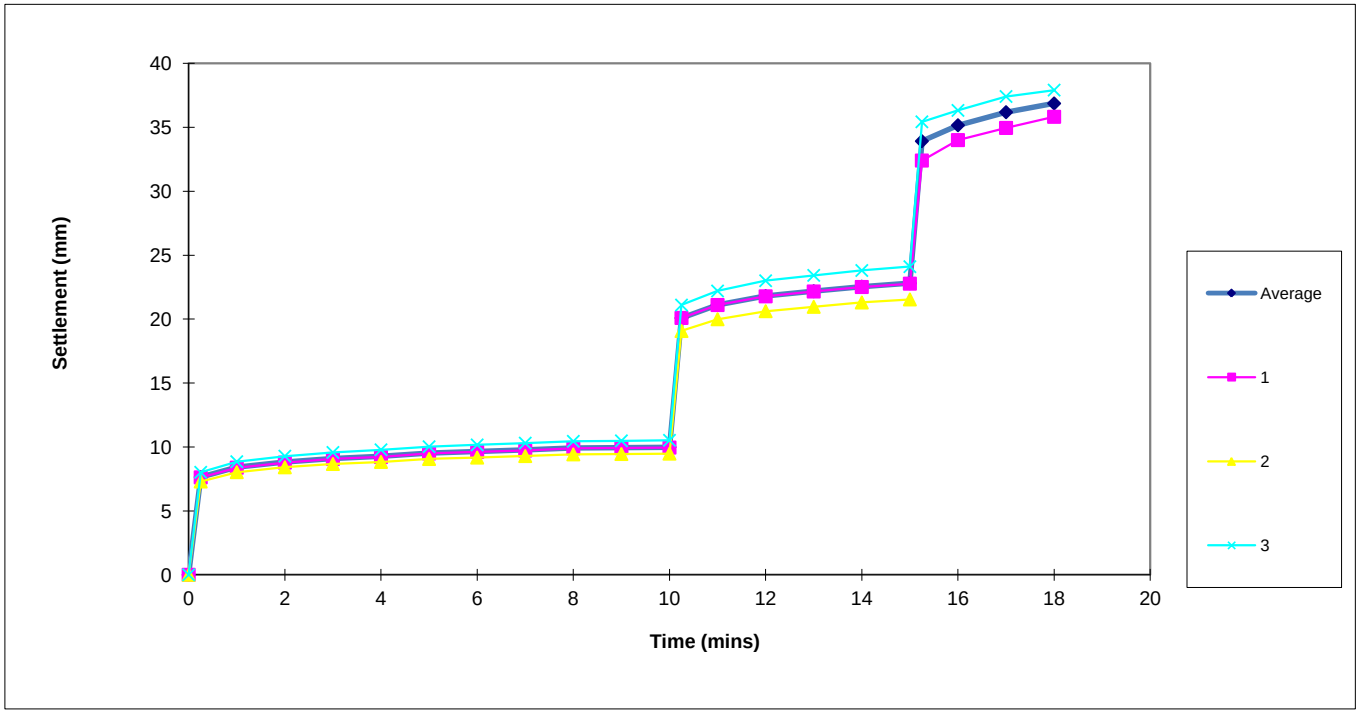
Test Reference: Test 2 | Test Depth: Surface | Plate Diameter: 600mm | Seating Load: 10kN/m^2

		Travel Gauges set on plate			
	Time (mins)	Gauge 1	Gauge 2	Gauge 3	Average Plate Settlement mm
50kN/m^2 Load	0	0	0	0	0
	0.25	7.62	7.30	8.02	7.65
	1	8.38	8.03	8.85	8.42
	2	8.78	8.41	9.28	8.82
	3	9.06	8.67	9.57	9.10
	4	9.21	8.83	9.78	9.27
	5	9.49	9.06	10.02	9.52
	6	9.61	9.17	10.16	9.65
	7	9.72	9.29	10.30	9.77
	8	9.89	9.42	10.44	9.92
	9	9.91	9.45	10.48	9.95
	10	9.95	9.48	10.52	9.98
100kN/m^2 Load	10.25	20.09	19.07	21.10	20.09
	11	21.10	19.99	22.20	21.10
	12	21.78	20.62	23.00	21.80
	13	22.16	20.96	23.42	22.18
	14	22.51	21.30	23.80	22.54
	15	22.77	21.54	24.10	22.80
150kN/m^2 Load	15.25	32.40		35.43	33.92
	16	34.00		36.32	35.16
	17	34.95		37.41	36.18
	18	35.82		37.91	36.87

SOUTHERN GROUND TESTING

Southern Ground Testing

Plate Load Test Settlement v Time Plot	Test Reference: Test 2



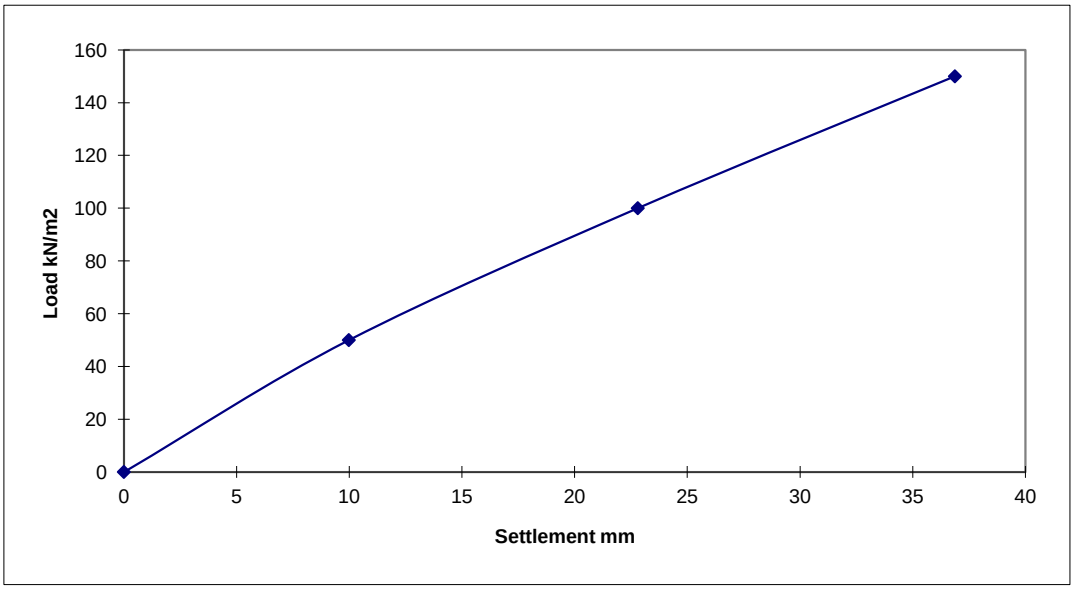
Contract:	Date:
Herbert Road, Newport	05.08.15

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Test 2	Surface	600mm	Fill

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
9.98	50	10
22.80	100	15
36.87	150	18



Notes:

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3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied for ten minutes.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

SOUTHERN GROUND TESTING

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

CONTRACT:	Date: 05.08.15
Herbert Road, Newport	Sheet 1 of 1

SOUTHERN GROUND TESTING

Plate Load Test Settlement v Time Data

Contract: Herbert Road, Newport | Date: 05.08.15

Test Reference: Test 3 | Test Depth: Surface | Plate Diameter: 600mm | Seating Load: 10kN/m^2

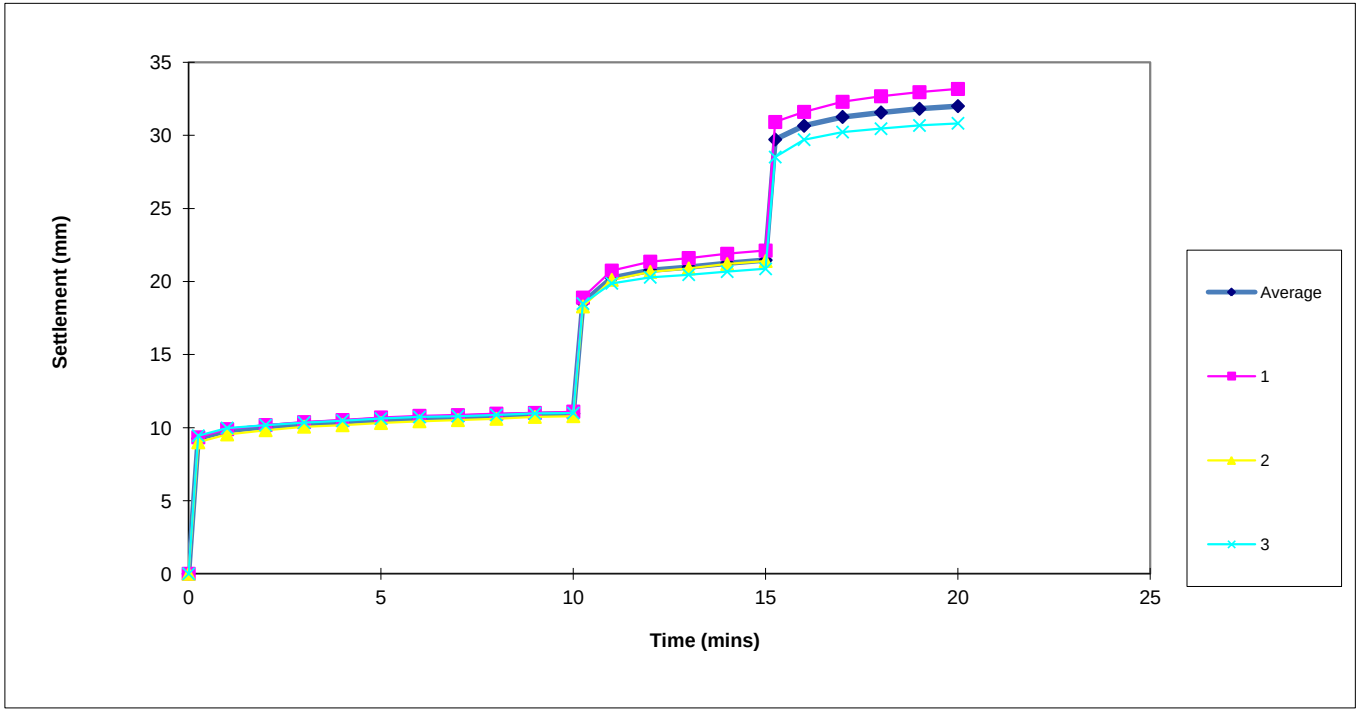
		Travel Gauges set on plate			
	Time (mins)	Gauge 1	Gauge 2	Gauge 3	Average Plate Settlement mm
50kN/m^2 Load	0	0	0	0	0
	0.25	9.34	9.00	9.45	9.26
	1	9.90	9.54	9.98	9.81
	2	10.18	9.83	10.18	10.06
	3	10.38	10.07	10.35	10.27
	4	10.52	10.17	10.48	10.39
	5	10.70	10.32	10.62	10.55
	6	10.81	10.44	10.73	10.66
	7	10.86	10.52	10.79	10.72
	8	10.96	10.61	10.87	10.81
	9	11.01	10.74	10.97	10.91
	10	11.10	10.79	11.00	10.96
100kN/m^2 Load	10.25	18.90	18.30	18.49	18.56
	11	20.75	20.12	19.88	20.25
	12	21.36	20.66	20.29	20.77
	13	21.61	20.90	20.47	20.99
	14	21.90	21.20	20.68	21.26
	15	22.12	21.41	20.87	21.47
150kN/m^2 Load	15.25	30.92		28.52	29.72
	16	31.61		29.71	30.66
	17	32.30		30.23	31.27
	18	32.68		30.46	31.57
	19	32.96		30.68	31.82
	20	33.18		30.83	32.01

SOUTHERN GROUND TESTING

Southern Ground Testing

Plate Load Test Settlement v Time Plot

Test Reference: Test 3



Contract:

Herbert Road, Newport

Date:

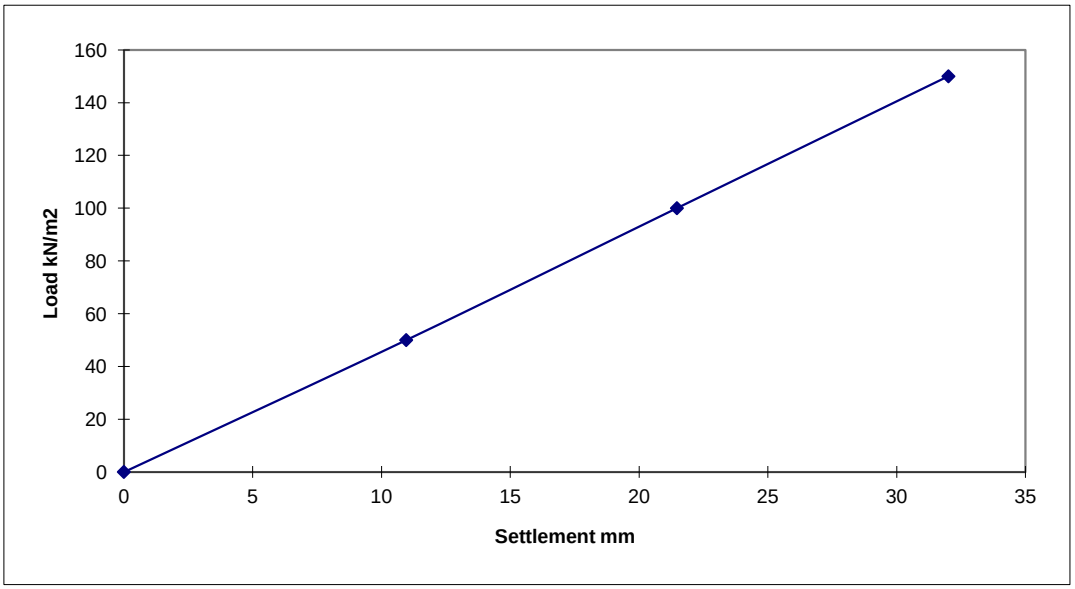
05.08.15

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Test 3	Surface	600mm	Fill

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
10.96	50	10
21.47	100	15
32.01	150	20



Notes:

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5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

SOUTHERN GROUND TESTING

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

CONTRACT:	Date: 05.08.15
Herbert Road, Newport	Sheet 1 of 1

SOUTHERN GROUND TESTING

Plate Load Test Settlement v Time Data

Contract: Herbert Road, Newport | Date: 05.08.15

Test Reference: Test 4 | Test Depth: Surface | Plate Diameter: 600mm | Seating Load: 10kN/m^2

		Travel Gauges set on plate			
	Time (mins)	Gauge 1	Gauge 2	Gauge 3	Average Plate Settlement mm
50kN/m^2	0	0	0	0	0
Load	0.25	5.23	3.86	5.72	4.94
	1	6.04	4.57	6.40	5.67
	2	6.53	5.01	6.90	6.15
	3	6.70	5.23	7.10	6.34
	4	6.90	5.46	7.31	6.56
	5	7.07	5.61	7.47	6.72
	6	7.18	5.72	7.55	6.82
	7	7.20	5.76	7.60	6.85
	8	7.33	5.90	7.70	6.98
	9	7.35	5.93	7.71	7.00
	10	7.36	5.94	7.72	7.01
100kN/m^2	10.25	14.50	12.67	15.08	14.08
Load	11	15.10	13.31	15.57	14.66
	12	15.42	13.60	15.92	14.98
	13	15.72	13.91	16.20	15.28
	14	15.88	14.09	16.37	15.45
	15	16.00	14.21	16.44	15.55
	16	16.12	14.35	16.60	15.69
	17	16.30	14.46	16.73	15.83
	18	16.34	14.52	16.79	15.88
	19	16.42	14.55	16.85	15.94
	20	16.45	14.60	16.90	15.98
150kN/m^2	20.25	21.72	20.05	22.52	21.43
Load	21	22.41	20.66	23.18	22.08
	22	22.86	21.08	23.62	22.52
	23	23.18	21.38	23.94	22.83
	24	23.48	21.70	24.26	23.15
	25	23.65	21.90	24.46	23.34
	26	23.88	22.15	24.70	23.58
	27	24.00	22.24	24.80	23.68
	28	24.10	22.35	24.95	23.80
	29	24.17	22.53	25.12	23.94
	30	24.35	22.62	25.18	24.05

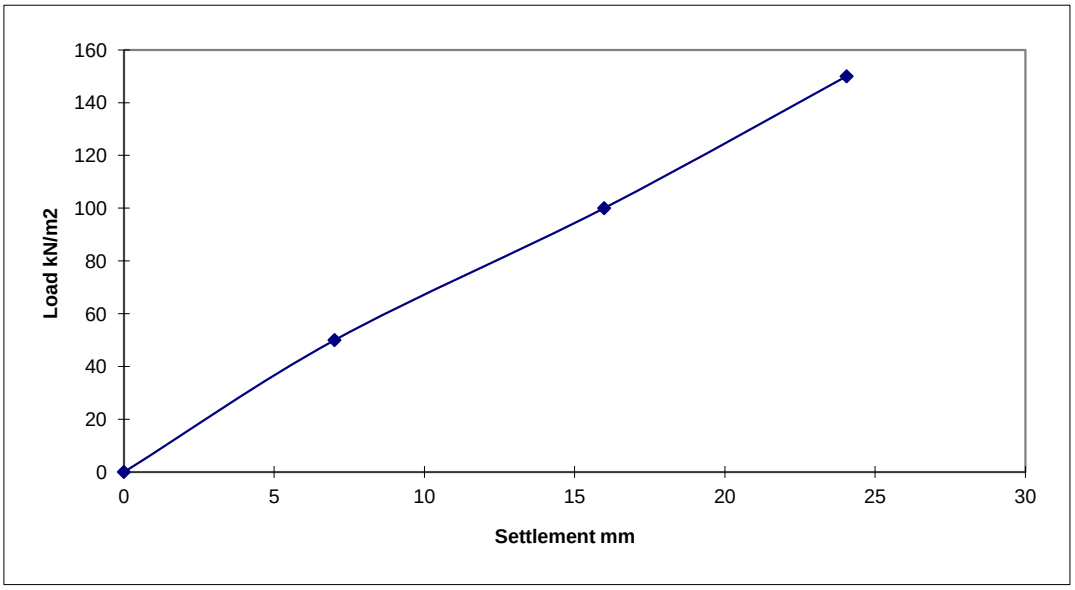
SOUTHERN GROUND TESTING

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Test 4	Surface	600mm	Fill

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
7.01	50	10
15.98	100	20
24.05	150	30



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4: Each load increment applied for ten minutes.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

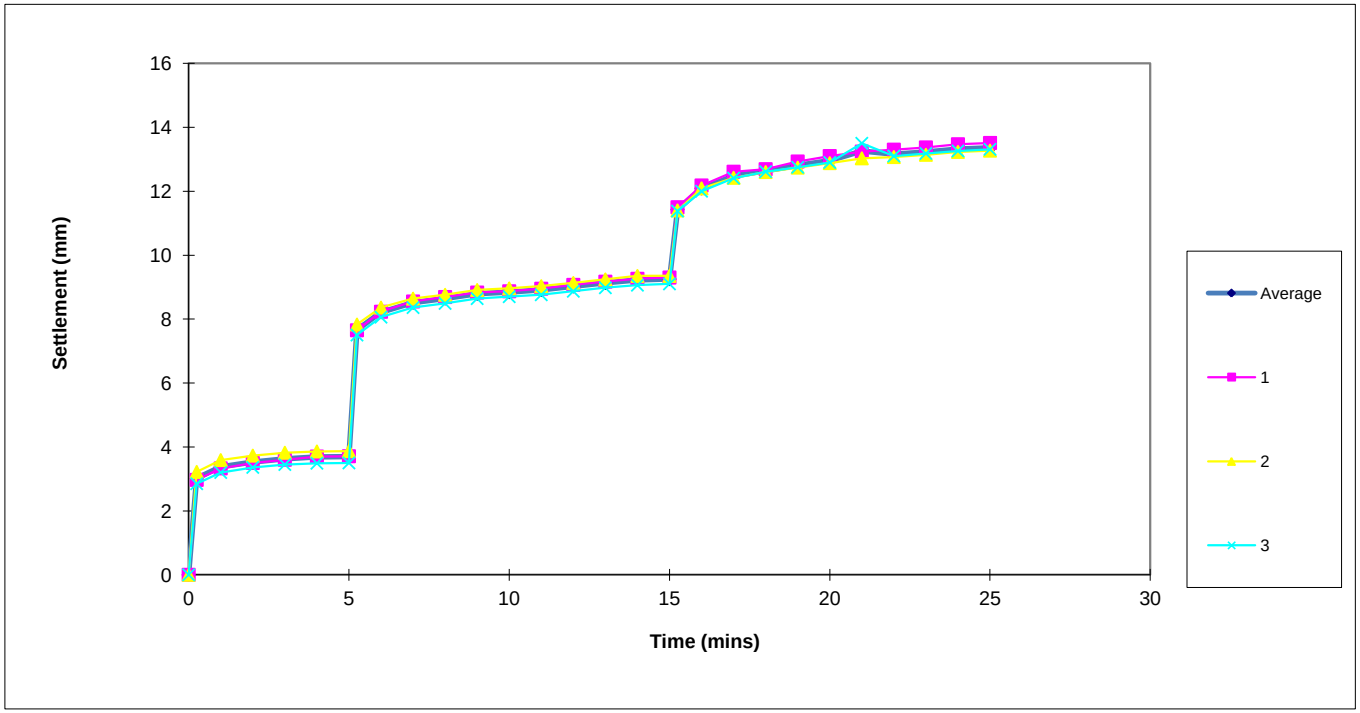
SOUTHERN GROUND TESTING

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

CONTRACT:	Date: 05.08.15
Herbert Road, Newport	Sheet 1 of 1

Southern Ground Testing

Plate Load Test Settlement v Time Plot	Test Reference: Test 5



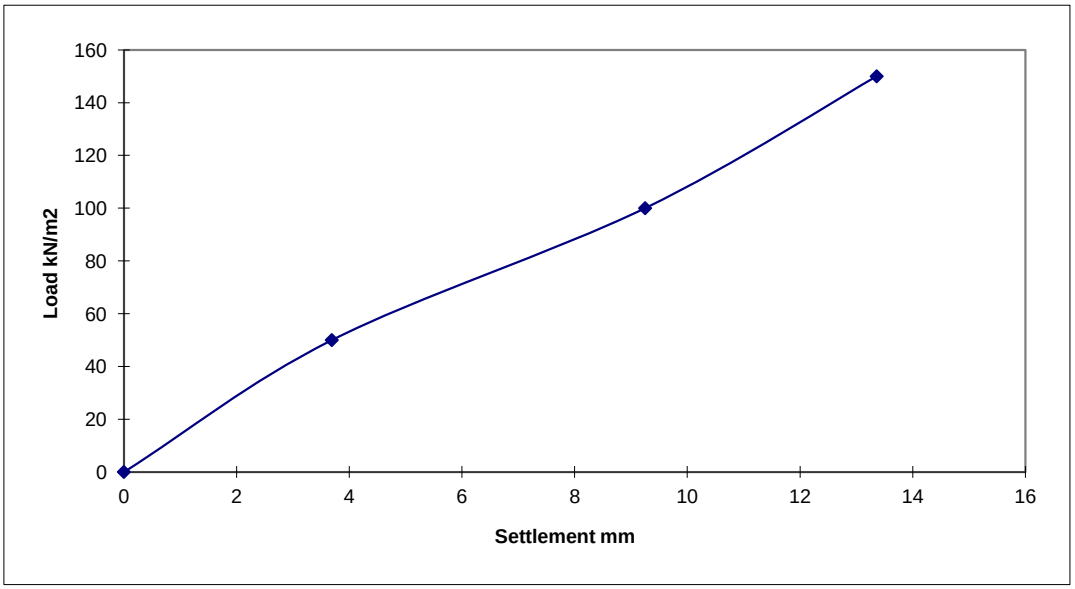
Contract:	Date:
Herbert Road, Newport	05.08.15

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Test 5	Surface	600mm	Fill

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
3.69	50	5
9.25	100	15
13.36	150	25



Notes:

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3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied for ten minutes.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

SOUTHERN GROUND TESTING

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

CONTRACT:	Date: 05.08.15
Herbert Road, Newport	Sheet 1 of 1

SOUTHERN GROUND TESTING

IN-SITU DENSITY FIELD SHEET

SOIL DESCRIPTION: Brown gravelly clay.	TEST DEPTH: GL DATE: 05.08.15 OPERATIVE: JP

1.Fill Pouring cylinder with known amount of sand.	(C1)	15000	g
2.Pour sand into excavation.			
3.Sand retained in pouring cylinder	(C2)	6900	g
4.Weight of soil from excavation	(C3)	7650	g
5.from calibration sheet, weight of sand required to fill pouring cylinder cone.	(C4)	2900	g
6.Sand required to fill excavation (C1-C2-C4)	(C5)	5200	g
7.From calibration sheet, dry density of sand	(C6)	1.55	Mg/m^3
8. Bulk density of soil. ((C3/C5))xC6)	(C7)	2.28	Mg/m^3
9. Moisture content of soil:	(C8)	18.26	%
10.Dry density of soil ((100xC7)/(100+C8))	(C9)	1.93	Mg/m^3

REMARKS:

CONTRACT: Herbert Road, Newport.

CLIENT: Terra Firma	TEST REFERENCE: SR 2

In situ density by sand replacement. BS1377 Part 9

SOUTHERN GROUND TESTING

IN-SITU DENSITY FIELD SHEET

SOIL DESCRIPTION: Brown gravelly clay.	TEST DEPTH: GL DATE: 05.08.15 OPERATIVE: JP

1.Fill Pouring cylinder with known amount of sand.	(C1)	15000	g
2.Pour sand into excavation.			
3.Sand retained in pouring cylinder	(C2)	5650	g
4.Weight of soil from excavation	(C3)	9550	g
5.from calibration sheet, weight of sand required to fill pouring cylinder cone.	(C4)	2900	g
6.Sand required to fill excavation (C1-C2-C4)	(C5)	6450	g
7.From calibration sheet, dry density of sand	(C6)	1.55	Mg/m^3
8. Bulk density of soil. ((C3/C5))xC6)	(C7)	2.29	Mg/m^3
9. Moisture content of soil:	(C8)	16.17	%
10.Dry density of soil ((100xC7)/(100+C8))	(C9)	1.98	Mg/m^3

REMARKS:

CONTRACT: Herbert Road, Newport.

CLIENT: Terra Firma	TEST REFERENCE: SR 3

In situ density by sand replacement. BS1377 Part 9

SOUTHERN GROUND TESTING

IN-SITU DENSITY FIELD SHEET

SOIL DESCRIPTION: Brown gravelly clay.	TEST DEPTH: GL DATE: 05.08.15 OPERATIVE: JP

1.Fill Pouring cylinder with known amount of sand.	(C1)	15000	g
2.Pour sand into excavation.			
3.Sand retained in pouring cylinder	(C2)	6750	g
4.Weight of soil from excavation	(C3)	7890	g
5.from calibration sheet, weight of sand required to fill pouring cylinder cone.	(C4)	2900	g
6.Sand required to fill excavation (C1-C2-C4)	(C5)	5350	g
7.From calibration sheet, dry density of sand	(C6)	1.55	Mg/m^3
8. Bulk density of soil. ((C3/C5))xC6)	(C7)	2.29	Mg/m^3
9. Moisture content of soil:	(C8)	18.40	%
10.Dry density of soil ((100xC7)/(100+C8))	(C9)	1.93	Mg/m^3

REMARKS:

CONTRACT: Herbert Road, Newport.

CLIENT: Terra Firma	TEST REFERENCE: SR 4

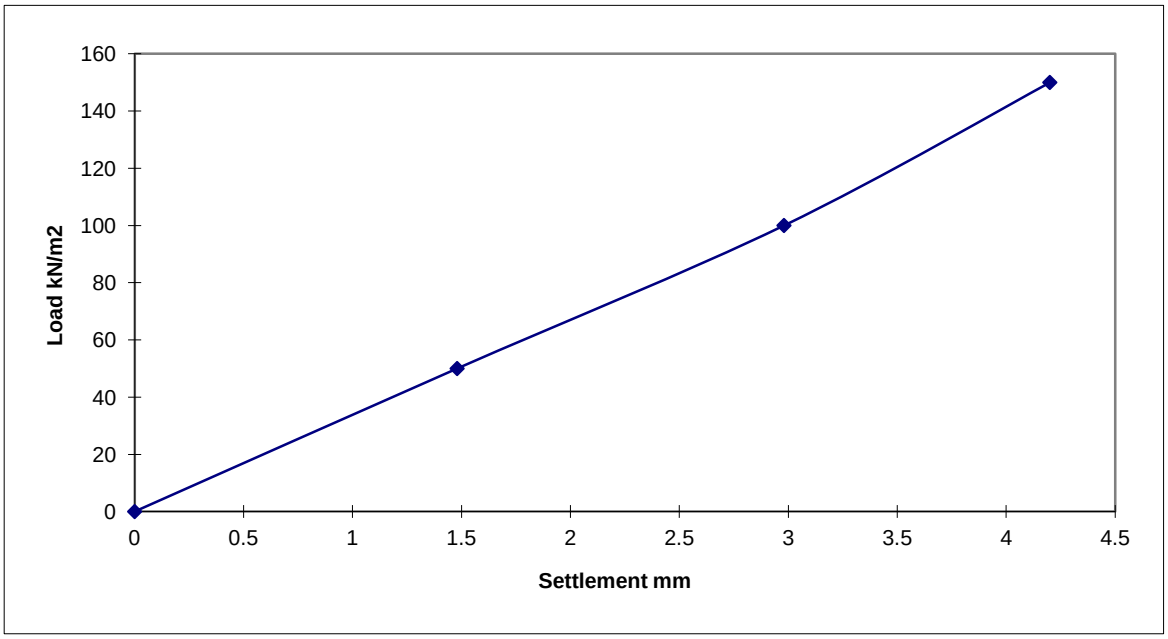
In situ density by sand replacement. BS1377 Part 9

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Plate 1	Surface	600mm	Engineered fill

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
1.48	50	3
2.98	100	6
4.20	150	13



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

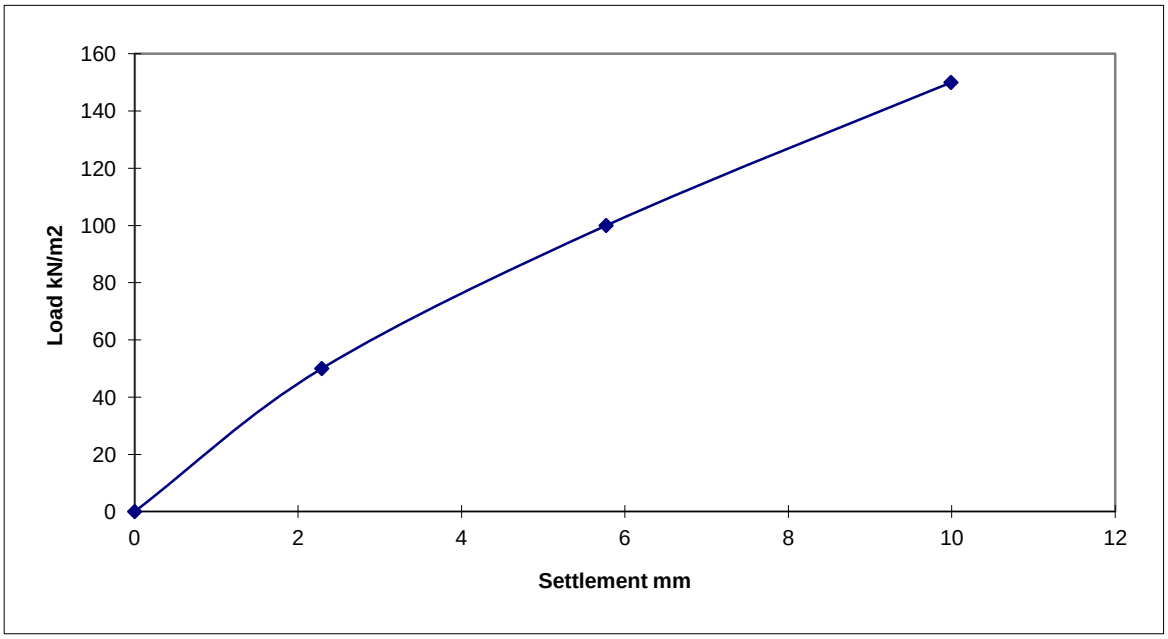
CONTRACT: Herbert Road	Date: 18.08.15 Sheet 1 of 1

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Plate 2	Surface	600mm	Engineered fill

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
2.29	50	6
5.77	100	12
9.99	150	20



Notes:

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2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

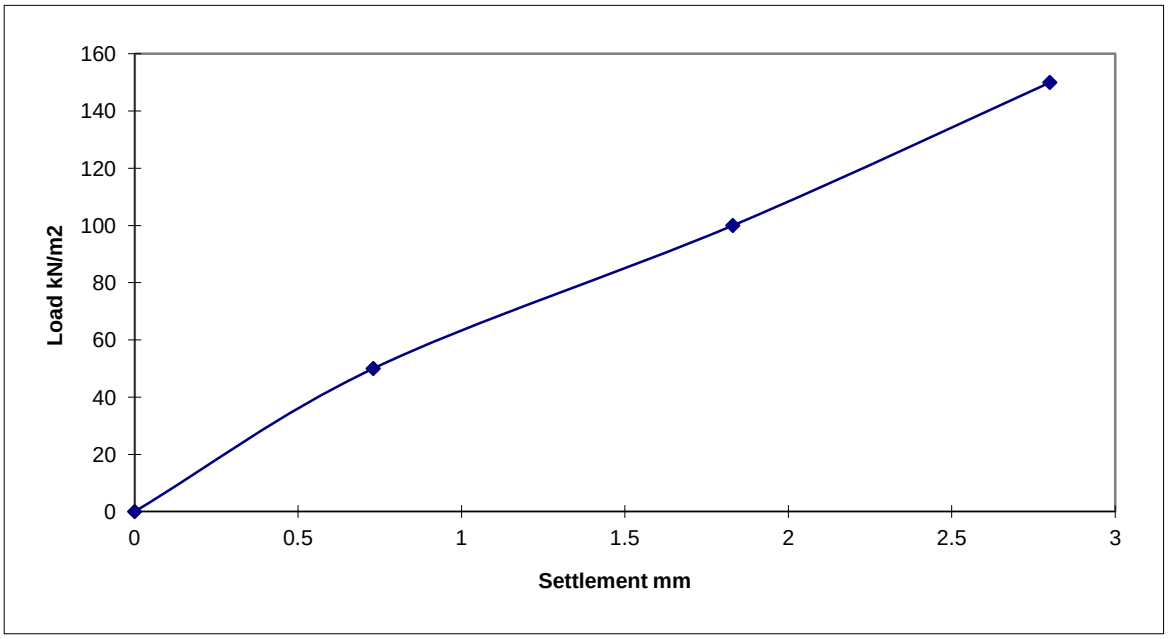
CONTRACT: Herbert Road	Date: 18.08.15 Sheet 1 of 1

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Plate 3	Surface	600mm	Engineered fill

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
0.73	50	3
1.83	100	6
2.80	150	13



Notes:

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2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

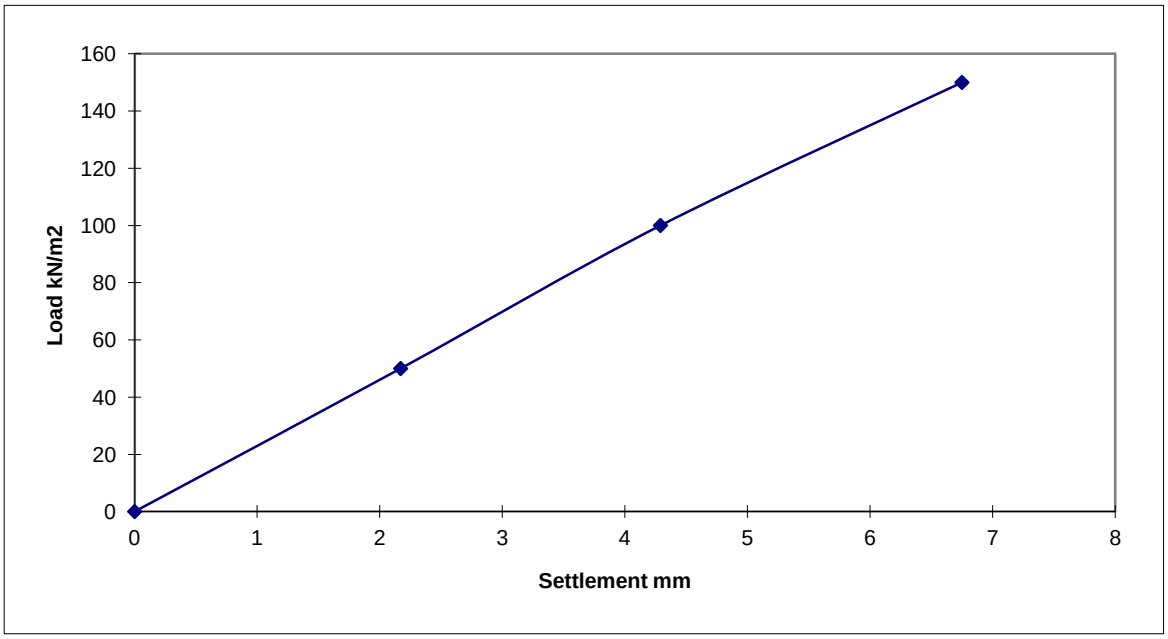
CONTRACT: Herbert Road	Date: 18.08.15 Sheet 1 of 1

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Plate 4	Surface	600mm	Engineered fill

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
2.17	50	5
4.29	100	10
6.75	150	17



Notes:

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2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

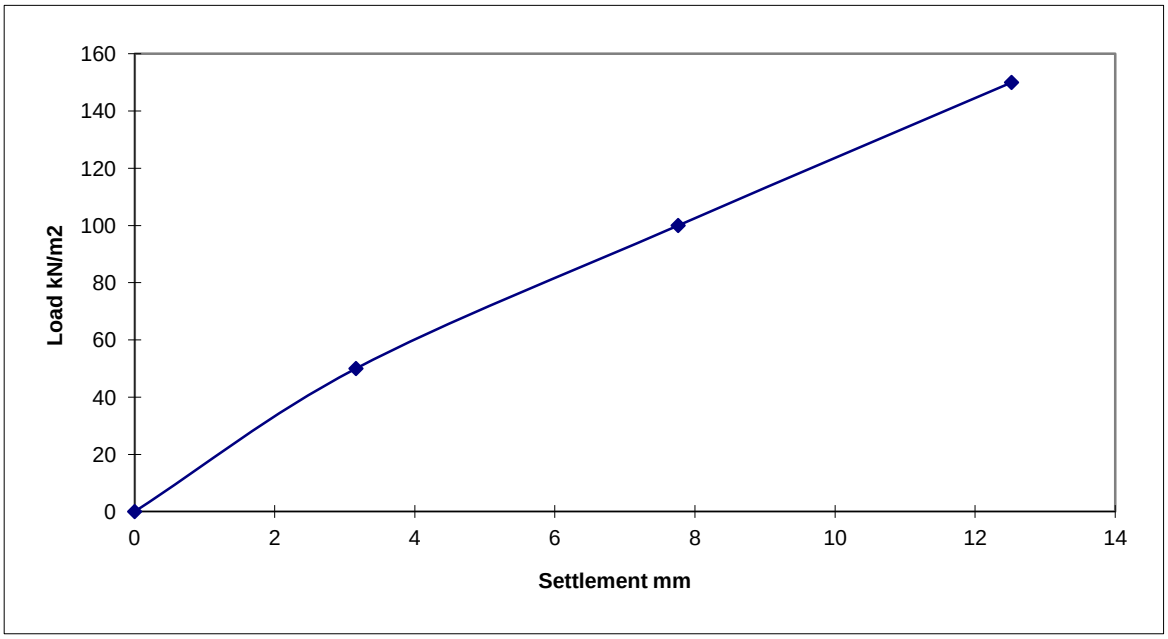
CONTRACT: Herbert Road	Date: 18.08.15 Sheet 1 of 1

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Plate 5	Surface	600mm	Engineered fill

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
3.16	50	5
7.76	100	12
12.52	150	21



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

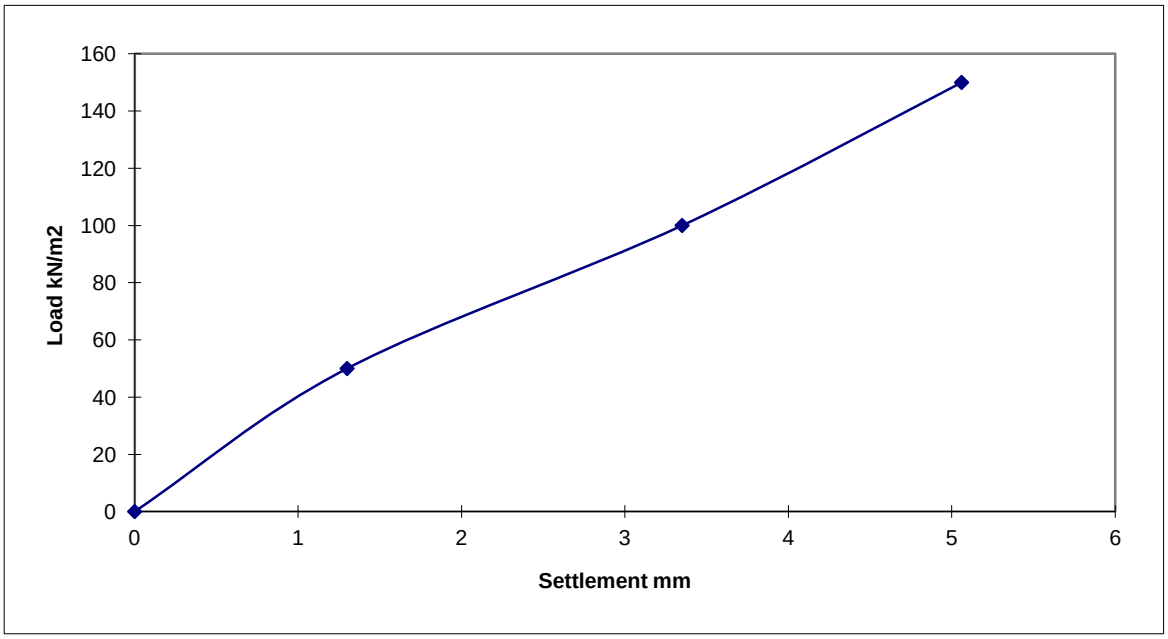
CONTRACT: Herbert Road	Date: 18.08.15 Sheet 1 of 1

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Plate 6	Surface	600mm	Engineered fill

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
1.30	50	4
3.35	100	11
5.06	150	15



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

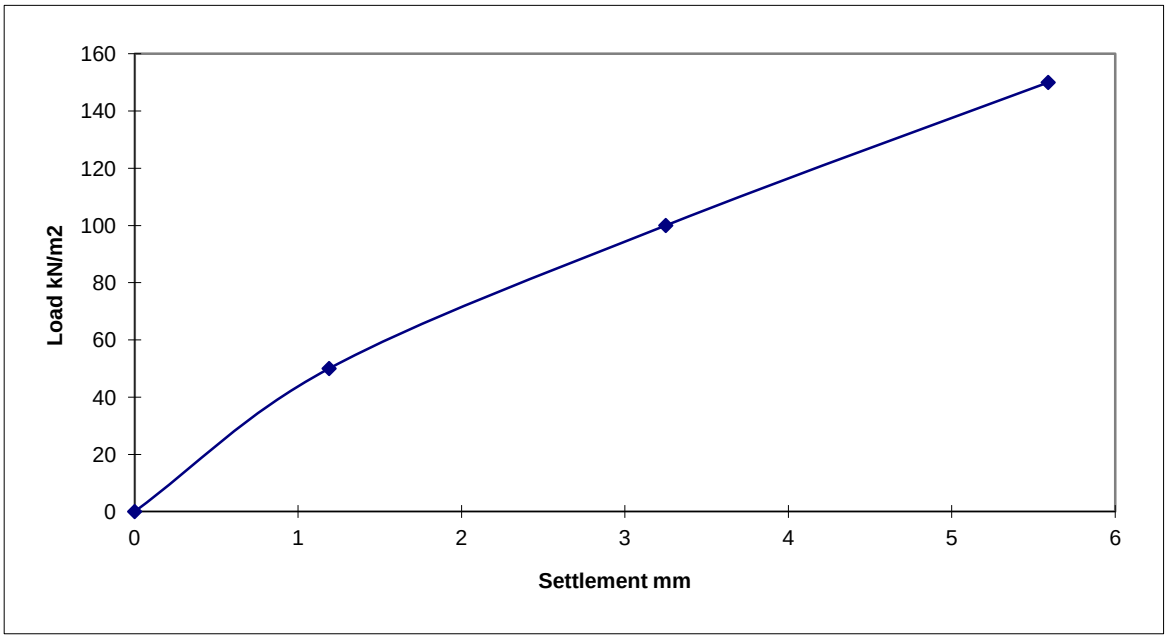
CONTRACT: Herbert Road	Date: 18.08.15 Sheet 1 of 1

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Plate 7	Surface	600mm	Engineered fill

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
1.19	50	4
3.25	100	9
5.59	150	20



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

CONTRACT: Herbert Road	Date: 18.08.15 Sheet 1 of 1

SOUTHERN GROUND TESTING

Plate Load Test Settlement v Time Data

Contract: Herbert Road, Newport | Date: 18.08.15

Test Reference: Plate 8 | Test Depth: Surface | Plate Diameter: 600mm | Seating Load: 10kN/m^2

		Travel Gauges set on plate			
	Time (mins)	Gauge 1	Gauge 2	Gauge 3	Average Plate Settlement mm
50kN/m^2 Load	0	0	0	0	0
	0.25	4.07	3.08	3.34	3.50
	1	4.37	3.26	3.58	3.74
	2	4.50	3.34	3.70	3.85
	3	4.62	3.39	3.79	3.93
	4	4.72	3.45	3.89	4.02
	5	4.83	3.51	4.02	4.12
	6	4.83	3.51	4.02	4.12
100kN/m^2 Load	6.25	7.50	6.04	7.36	6.97
	7	7.78	6.23	7.58	7.20
	8	7.95	6.37	7.76	7.36
	9	8.07	6.46	7.85	7.46
	10	8.11	6.52	7.90	7.51
	11	8.18	6.58	7.94	7.57
	12	8.19	7.05	7.96	7.73
	13	8.19	7.05	7.96	7.73
150kN/m^2 Load	13.25	10.68	8.26	9.29	9.41
	14	10.86	8.48	9.45	9.60
	15	10.90	8.59	9.48	9.66
	16	10.95	8.68	9.54	9.72
	17	10.95	8.70	9.54	9.73

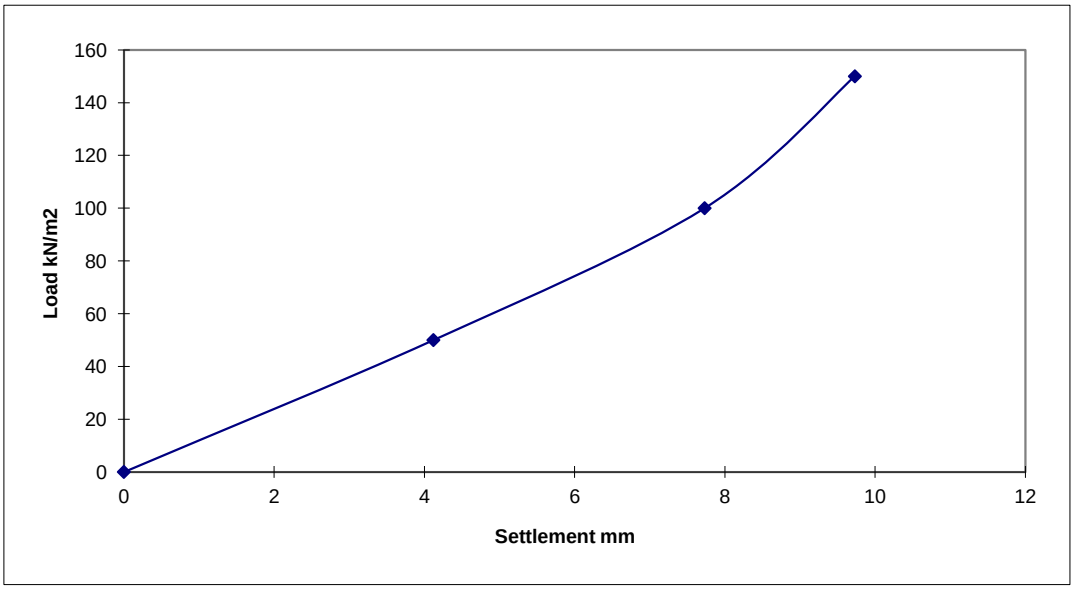
SOUTHERN GROUND TESTING

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Plate 8	Surface	600mm	Fill

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
4.12	50	5
7.73	100	13
9.73	150	17



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied for ten minutes.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

SOUTHERN GROUND TESTING

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

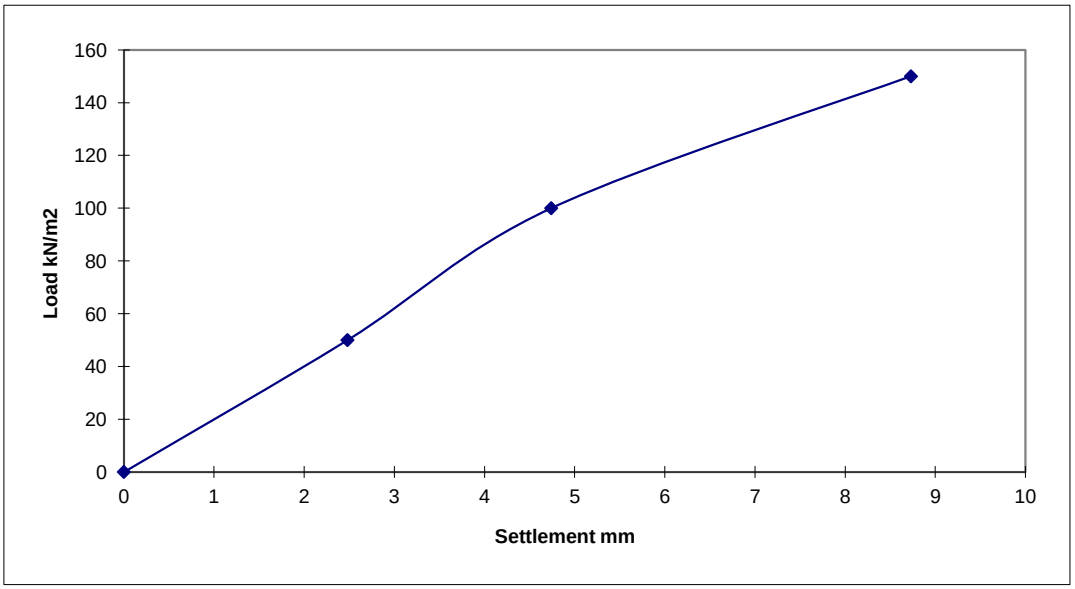
CONTRACT:	Date: 18.08.15
Herbert Road, Newport	Sheet 1 of 1

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference: Test 1	Test Depth: GL	Plate Diameter: 600mm	Soil Description: Brown gravelly clay

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
2.48	50	50
4.74	100	100
8.73	150	150



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied for ten minutes.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

SOUTHERN GROUND TESTING

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

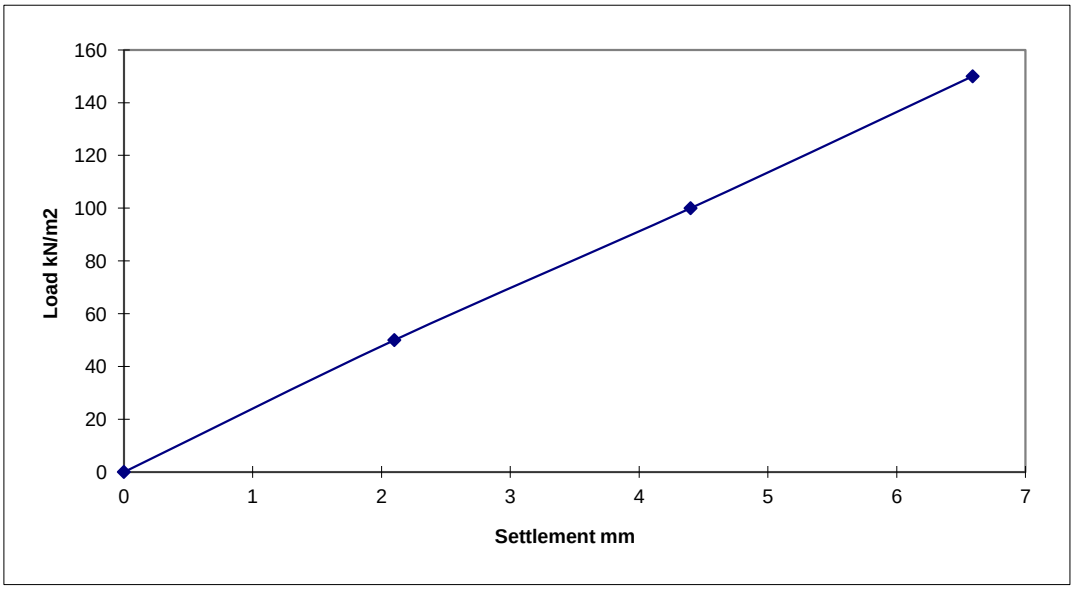
CONTRACT: Herbert Road, Newport	Date: 24.07.15 Sheet 1 of 1

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference: Test 3	Test Depth: GL	Plate Diameter: 600mm	Soil Description: Brown gravelly clay

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
2.10	50	50
4.40	100	100
6.59	150	150



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied for ten minutes.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

SOUTHERN GROUND TESTING

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

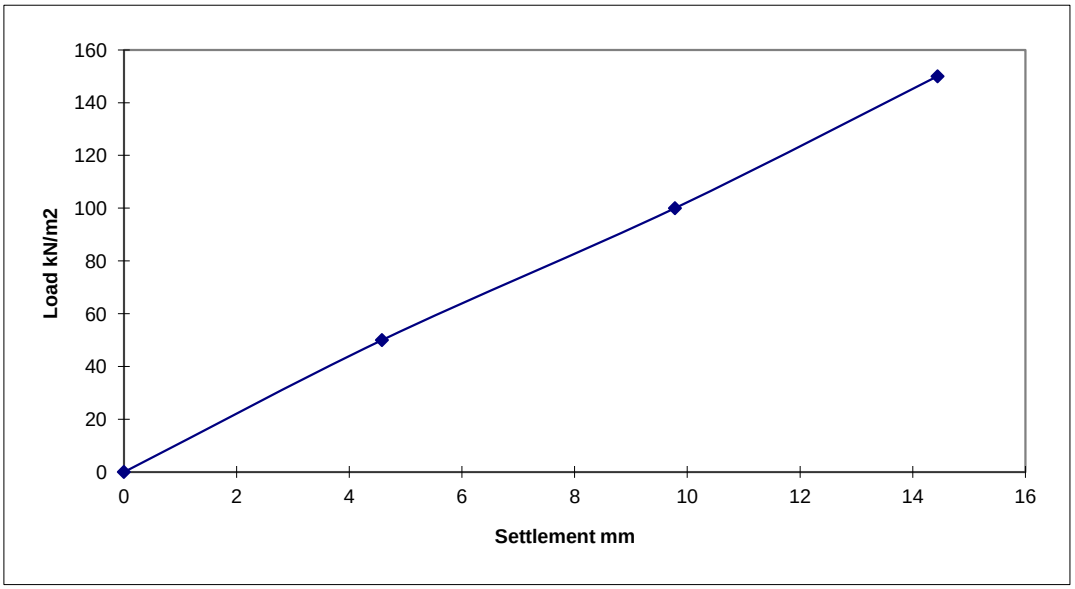
CONTRACT: Herbert Road, Newport	Date: 24.07.15 Sheet 1 of 1

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference: Test 5	Test Depth: GL	Plate Diameter: 600mm	Soil Description: Brown gravelly clay

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
4.58	50	50
9.78	100	100
14.44	150	150



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied for ten minutes.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

SOUTHERN GROUND TESTING

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

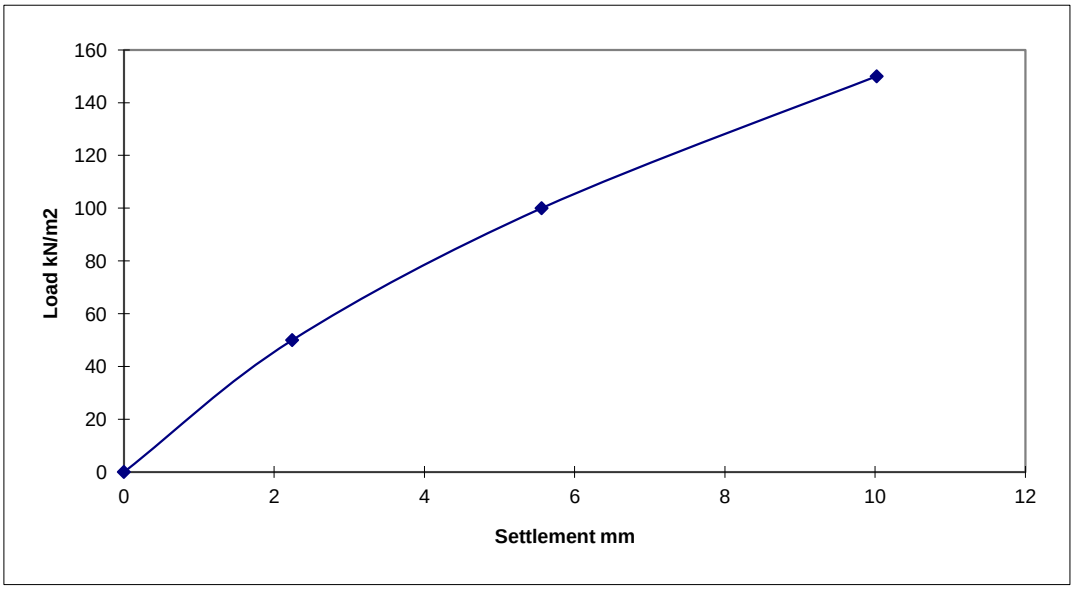
CONTRACT: Herbert Road, Newport	Date: 24.07.15 Sheet 1 of 1

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference: Test 6	Test Depth: GL	Plate Diameter: 600mm	Soil Description: Brown gravelly clay

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
2.24	50	50
5.56	100	100
10.02	150	150



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied for ten minutes.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

SOUTHERN GROUND TESTING

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

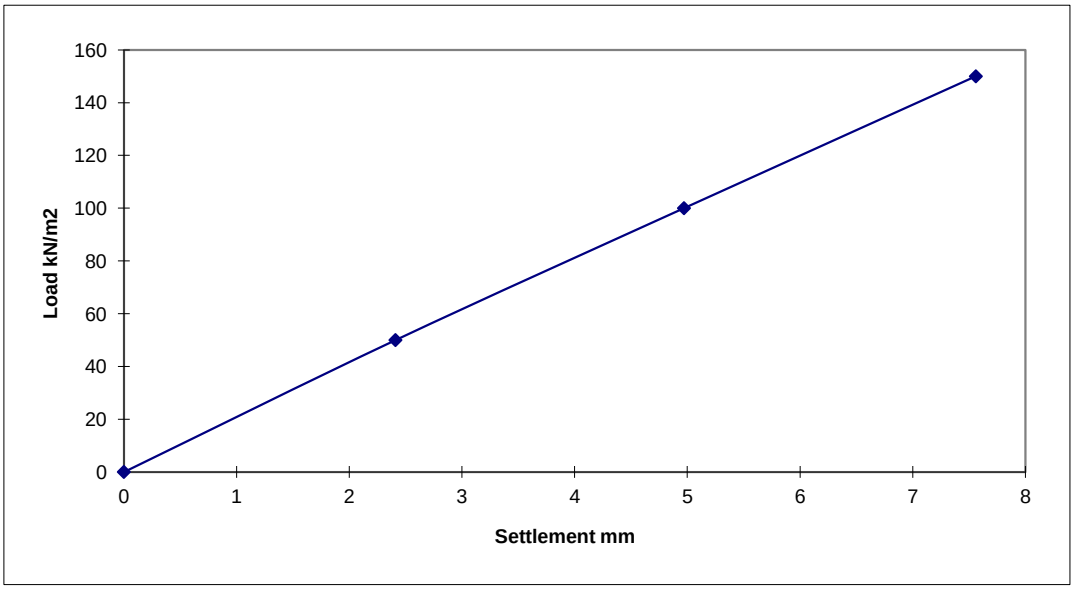
CONTRACT: Herbert Road, Newport	Date: 24.07.15 Sheet 1 of 1

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference: Test 7	Test Depth: GL	Plate Diameter: 600mm	Soil Description: Brown gravelly clay

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
2.41	50	50
4.97	100	100
7.56	150	150



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied for ten minutes.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

SOUTHERN GROUND TESTING

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

CONTRACT: Herbert Road, Newport	Date: 24.07.15 Sheet 1 of 1

SOUTHERN GROUND TESTING

IN-SITU DENSITY FIELD SHEET

SOIL DESCRIPTION: Brown gravelly clay.	TEST DEPTH: GL DATE: 24.07.15 OPERATIVE: DMc

1.Fill Pouring cylinder with known amount of sand.	(C1)	15000	g
2.Pour sand into excavation.			
3.Sand retained in pouring cylinder	(C2)	7260	g
4.Weight of soil from excavation	(C3)	6494	g
5.from calibration sheet, weight of sand required to fill pouring cylinder cone.	(C4)	2900	g
6.Sand required to fill excavation (C1-C2-C4)	(C5)	4840	g
7.From calibration sheet, dry density of sand	(C6)	1.55	Mg/m^3
8. Bulk density of soil. ((C3/C5))xC6)	(C7)	2.08	Mg/m^3
9. Moisture content of soil:	(C8)	7.89	%
10.Dry density of soil ((100xC7)/(100+C8))	(C9)	1.93	Mg/m^3

REMARKS:

CONTRACT: Herbert Road, Newport.

CLIENT: Terra Firma	TEST REFERENCE: SR 1

In situ density by sand replacement. BS1377 Part 9

SOUTHERN GROUND TESTING

IN-SITU DENSITY FIELD SHEET

SOIL DESCRIPTION: Brown gravelly clay.	TEST DEPTH: GL DATE: 24.07.15 OPERATIVE: DMc

1.Fill Pouring cylinder with known amount of sand.	(C1)	15000	g
2.Pour sand into excavation.			
3.Sand retained in pouring cylinder	(C2)	6830	g
4.Weight of soil from excavation	(C3)	6471	g
5.from calibration sheet, weight of sand required to fill pouring cylinder cone.	(C4)	2900	g
6.Sand required to fill excavation (C1-C2-C4)	(C5)	5270	g
7.From calibration sheet, dry density of sand	(C6)	1.55	Mg/m^3
8. Bulk density of soil. ((C3/C5))xC6)	(C7)	1.90	Mg/m^3
9. Moisture content of soil:	(C8)	6.52	%
10.Dry density of soil ((100xC7)/(100+C8))	(C9)	1.79	Mg/m^3

REMARKS:

CONTRACT: Herbert Road, Newport.

CLIENT: Terra Firma	TEST REFERENCE: SR 2

In situ density by sand replacement. BS1377 Part 9

SOUTHERN GROUND TESTING

IN-SITU DENSITY FIELD SHEET

SOIL DESCRIPTION: Brown gravelly clay.	TEST DEPTH: GL DATE: 24.07.15 OPERATIVE: DMc

1.Fill Pouring cylinder with known amount of sand.	(C1)	15000	g
2.Pour sand into excavation.			
3.Sand retained in pouring cylinder	(C2)	5900	g
4.Weight of soil from excavation	(C3)	7997	g
5.from calibration sheet, weight of sand required to fill pouring cylinder cone.	(C4)	2900	g
6.Sand required to fill excavation (C1-C2-C4)	(C5)	6200	g
7.From calibration sheet, dry density of sand	(C6)	1.55	Mg/m^3
8. Bulk density of soil. ((C3/C5))xC6)	(C7)	2.00	Mg/m^3
9. Moisture content of soil:	(C8)	9.75	%
10.Dry density of soil ((100xC7)/(100+C8))	(C9)	1.82	Mg/m^3

REMARKS:

CONTRACT: Herbert Road, Newport.

CLIENT: Terra Firma	TEST REFERENCE: SR 3

In situ density by sand replacement. BS1377 Part 9

SOUTHERN GROUND TESTING

IN-SITU DENSITY FIELD SHEET

SOIL DESCRIPTION: Brown gravelly clay.	TEST DEPTH: GL DATE: 24.07.15 OPERATIVE: DMc

1.Fill Pouring cylinder with known amount of sand.	(C1)	15000	g
2.Pour sand into excavation.			
3.Sand retained in pouring cylinder	(C2)	6752	g
4.Weight of soil from excavation	(C3)	6597	g
5.from calibration sheet, weight of sand required to fill pouring cylinder cone.	(C4)	2900	g
6.Sand required to fill excavation (C1-C2-C4)	(C5)	5348	g
7.From calibration sheet, dry density of sand	(C6)	1.55	Mg/m^3
8. Bulk density of soil. ((C3/C5))xC6)	(C7)	1.91	Mg/m^3
9. Moisture content of soil:	(C8)	5.78	%
10.Dry density of soil ((100xC7)/(100+C8))	(C9)	1.81	Mg/m^3

REMARKS:

CONTRACT: Herbert Road, Newport.

CLIENT: Terra Firma	TEST REFERENCE: SR 4

In situ density by sand replacement. BS1377 Part 9

SOUTHERN GROUND TESTING

IN-SITU DENSITY FIELD SHEET

SOIL DESCRIPTION: Brown gravelly clay.	TEST DEPTH: GL DATE: 24.07.15 OPERATIVE: DMc

1.Fill Pouring cylinder with known amount of sand.	(C1)	15000	g
2.Pour sand into excavation.			
3.Sand retained in pouring cylinder	(C2)	7509	g
4.Weight of soil from excavation	(C3)	6111	g
5.from calibration sheet, weight of sand required to fill pouring cylinder cone.	(C4)	2900	g
6.Sand required to fill excavation (C1-C2-C4)	(C5)	4591	g
7.From calibration sheet, dry density of sand	(C6)	1.55	Mg/m^3
8. Bulk density of soil. ((C3/C5))xC6)	(C7)	2.06	Mg/m^3
9. Moisture content of soil:	(C8)	8.40	%
10.Dry density of soil ((100xC7)/(100+C8))	(C9)	1.90	Mg/m^3

REMARKS:

CONTRACT: Herbert Road, Newport.

CLIENT: Terra Firma	TEST REFERENCE: SR 5

In situ density by sand replacement. BS1377 Part 9

SOUTHERN GROUND TESTING

IN-SITU DENSITY FIELD SHEET

SOIL DESCRIPTION: Brown gravelly clay.	TEST DEPTH: GL DATE: 24.07.15 OPERATIVE: DMc

1.Fill Pouring cylinder with known amount of sand.	(C1)	15000	g
2.Pour sand into excavation.			
3.Sand retained in pouring cylinder	(C2)	7685	g
4.Weight of soil from excavation	(C3)	6140	g
5.from calibration sheet, weight of sand required to fill pouring cylinder cone.	(C4)	2900	g
6.Sand required to fill excavation (C1-C2-C4)	(C5)	4415	g
7.From calibration sheet, dry density of sand	(C6)	1.55	Mg/m^3
8. Bulk density of soil. ((C3/C5))xC6)	(C7)	2.16	Mg/m^3
9. Moisture content of soil:	(C8)	8.90	%
10.Dry density of soil ((100xC7)/(100+C8))	(C9)	1.98	Mg/m^3

REMARKS:

CONTRACT: Herbert Road, Newport.

CLIENT: Terra Firma	TEST REFERENCE: SR 6

In situ density by sand replacement. BS1377 Part 9

SOUTHERN GROUND TESTING

IN-SITU DENSITY FIELD SHEET

SOIL DESCRIPTION: Brown gravelly clay.	TEST DEPTH: GL DATE: 24.07.15 OPERATIVE: DMc

1.Fill Pouring cylinder with known amount of sand.	(C1)	15000	g
2.Pour sand into excavation.			
3.Sand retained in pouring cylinder	(C2)	7617	g
4.Weight of soil from excavation	(C3)	5890	g
5.from calibration sheet, weight of sand required to fill pouring cylinder cone.	(C4)	2900	g
6.Sand required to fill excavation (C1-C2-C4)	(C5)	4483	g
7.From calibration sheet, dry density of sand	(C6)	1.55	Mg/m^3
8. Bulk density of soil. ((C3/C5))xC6)	(C7)	2.04	Mg/m^3
9. Moisture content of soil:	(C8)	6.06	%
10.Dry density of soil ((100xC7)/(100+C8))	(C9)	1.92	Mg/m^3

REMARKS:

CONTRACT: Herbert Road, Newport.

CLIENT: Terra Firma	TEST REFERENCE: SR 7

In situ density by sand replacement. BS1377 Part 9

ANNEX L
Geotechnical Test Results Certificates – 11.09.2015-26.05.2017

SOUTHERN GROUND TESTING

IN-SITU DENSITY FIELD SHEET

SOIL DESCRIPTION: Brown clayey gravel	TEST DEPTH: GL DATE: 14.09.15 OPERATIVE: JP

1.Fill Pouring cylinder with known amount of sand.	(C1)	15000	g
2.Pour sand into excavation.			
3.Sand retained in pouring cylinder	(C2)	6420	g
4.Weight of soil from excavation	(C3)	7600	g
5.from calibration sheet, weight of sand required to fill pouring cylinder cone.	(C4)	2900	g
6.Sand required to fill excavation (C1-C2-C4)	(C5)	5680	g
7.From calibration sheet, dry density of sand	(C6)	1.55	Mg/m^3
8. Bulk density of soil. ((C3/C5))xC6)	(C7)	2.07	Mg/m^3
9. Moisture content of soil:	(C8)	15.97	%
10.Dry density of soil ((100xC7)/(100+C8))	(C9)	1.79	Mg/m^3

REMARKS:

CONTRACT: Herbert Road, Newport.

CLIENT: Terra Firma	TEST REFERENCE: SR 1

In situ density by sand replacement. BS1377 Part 9

SOUTHERN GROUND TESTING

IN-SITU DENSITY FIELD SHEET

SOIL DESCRIPTION: Brown clayey gravel	TEST DEPTH: GL DATE: 14.09.15 OPERATIVE: JP

1.Fill Pouring cylinder with known amount of sand.	(C1)	15000	g
2.Pour sand into excavation.			
3.Sand retained in pouring cylinder	(C2)	7580	g
4.Weight of soil from excavation	(C3)	6350	g
5.from calibration sheet, weight of sand required to fill pouring cylinder cone.	(C4)	2900	g
6.Sand required to fill excavation (C1-C2-C4)	(C5)	4520	g
7.From calibration sheet, dry density of sand	(C6)	1.55	Mg/m^3
8. Bulk density of soil. ((C3/C5))xC6)	(C7)	2.18	Mg/m^3
9. Moisture content of soil:	(C8)	8.58	%
10.Dry density of soil ((100xC7)/(100+C8))	(C9)	2.01	Mg/m^3

REMARKS:

CONTRACT: Herbert Road, Newport.

CLIENT: Terra Firma	TEST REFERENCE: SR 2

In situ density by sand replacement. BS1377 Part 9

SOUTHERN GROUND TESTING

IN-SITU DENSITY FIELD SHEET

SOIL DESCRIPTION: Brown clayey gravel	TEST DEPTH: GL DATE: 14.09.15 OPERATIVE: JP

1.Fill Pouring cylinder with known amount of sand.	(C1)	15000	g
2.Pour sand into excavation.			
3.Sand retained in pouring cylinder	(C2)	6250	g
4.Weight of soil from excavation	(C3)	7950	g
5.from calibration sheet, weight of sand required to fill pouring cylinder cone.	(C4)	2900	g
6.Sand required to fill excavation (C1-C2-C4)	(C5)	5850	g
7.From calibration sheet, dry density of sand	(C6)	1.55	Mg/m^3
8. Bulk density of soil. ((C3/C5))xC6)	(C7)	2.11	Mg/m^3
9. Moisture content of soil:	(C8)	8.23	%
10.Dry density of soil ((100xC7)/(100+C8))	(C9)	1.95	Mg/m^3

REMARKS:

CONTRACT: Herbert Road, Newport.

CLIENT: Terra Firma	TEST REFERENCE: SR 3

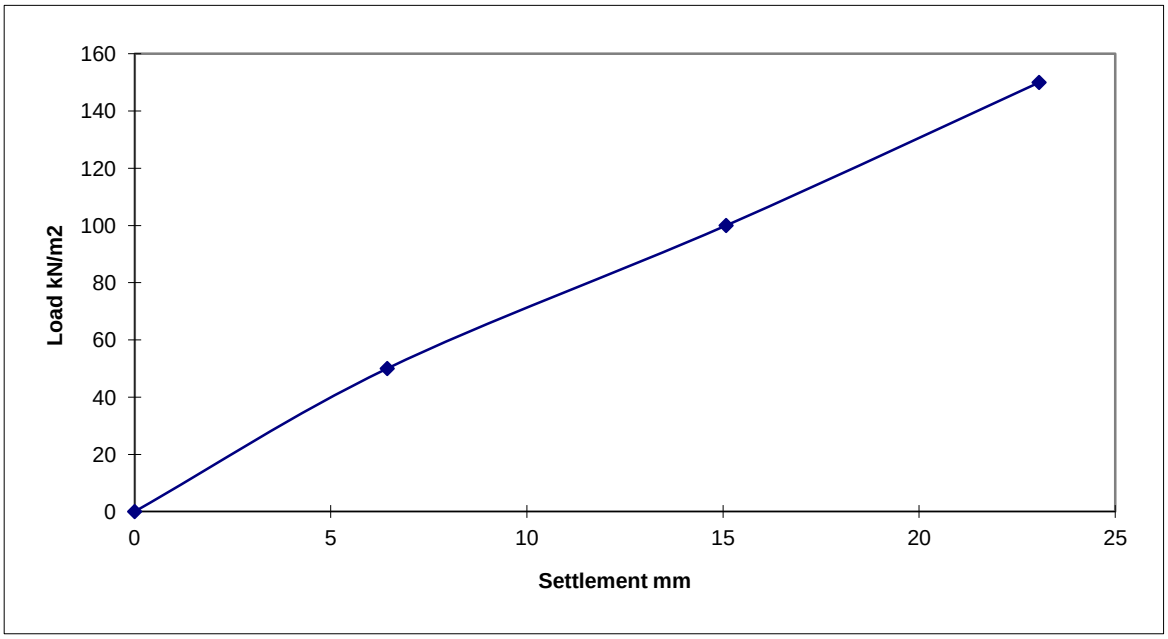
In situ density by sand replacement. BS1377 Part 9

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Plate 1	Surface	600mm	Engineered fill

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
6.44	50	12
15.08	100	24
23.06	150	36



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

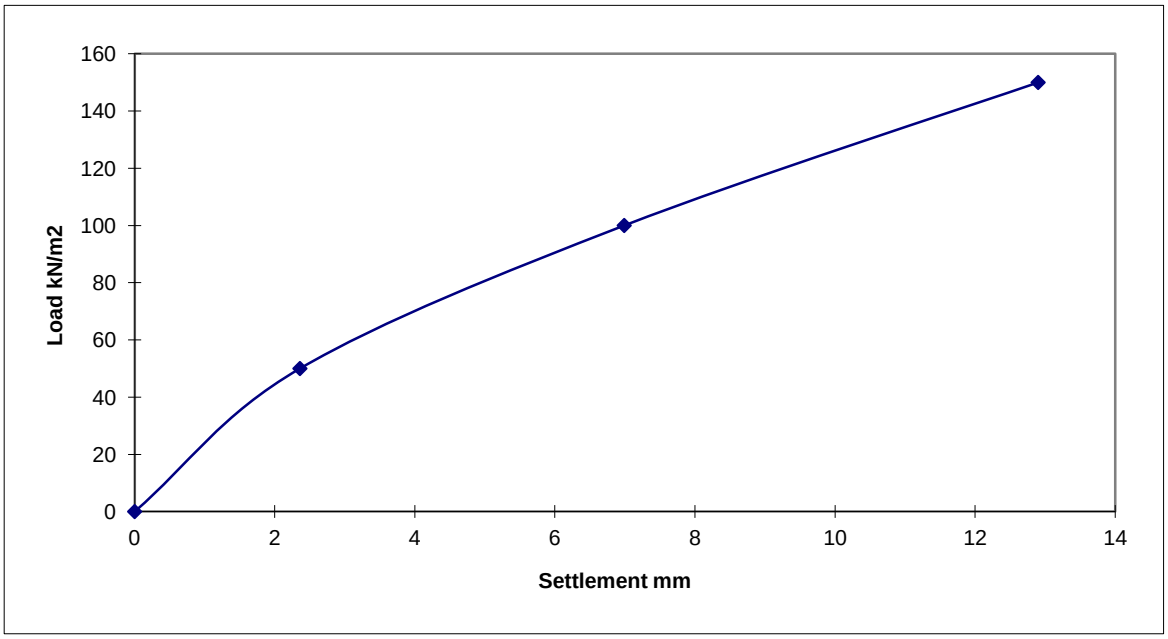
CONTRACT: Herbert Road	Date: 11.09.15 Sheet 1 of 1

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Plate 2	Surface	600mm	Engineered fill

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
2.36	50	5
6.99	100	11
12.90	150	19



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

CONTRACT: Herbert Road	Date: 11.09.15 Sheet 1 of 1

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Plate 3	Surface	600mm	Engineered fill

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
1.90	50	3
3.77	100	8
5.12	150	13

Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

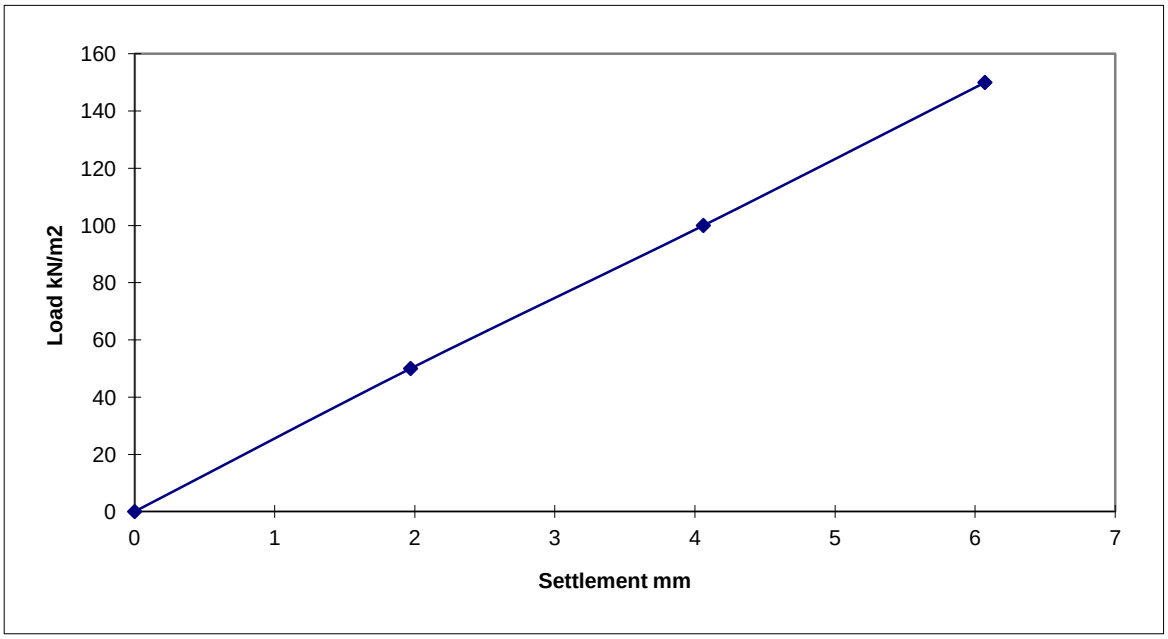
CONTRACT: Herbert Road	Date: 11.09.15 Sheet 1 of 1

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Plate 4	Surface	600mm	Engineered fill

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
1.97	50	4
4.06	100	9
6.07	150	15



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

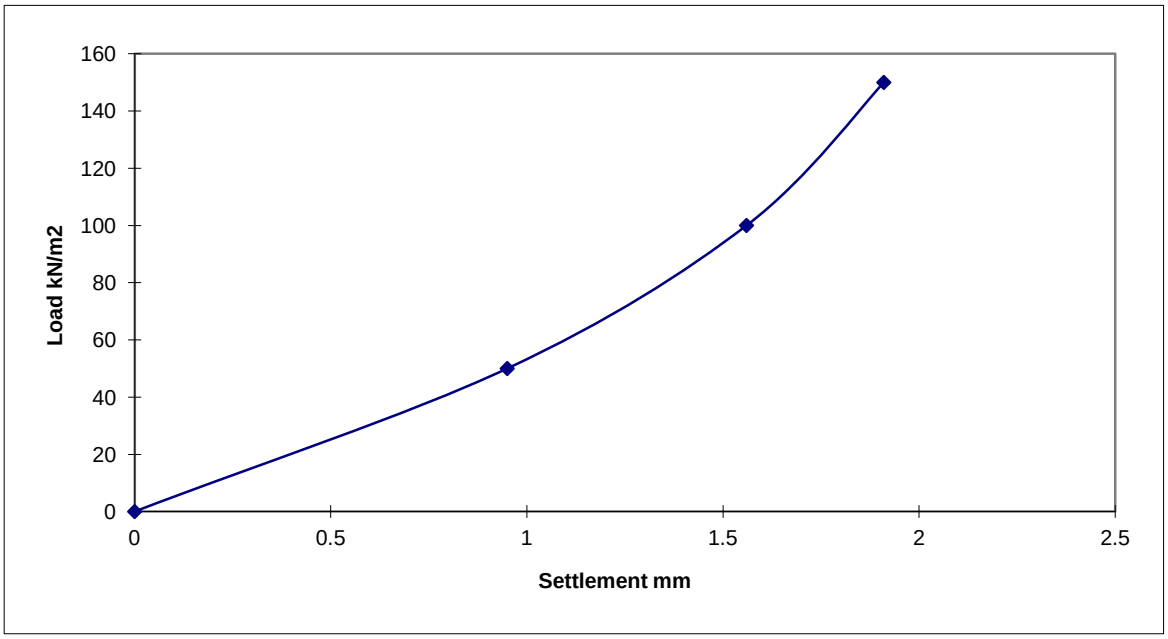
CONTRACT: Herbert Road	Date: 11.09.15 Sheet 1 of 1

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Plate 5	Surface	600mm	Engineered fill

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
0.95	50	3
1.56	100	6
1.91	150	9



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

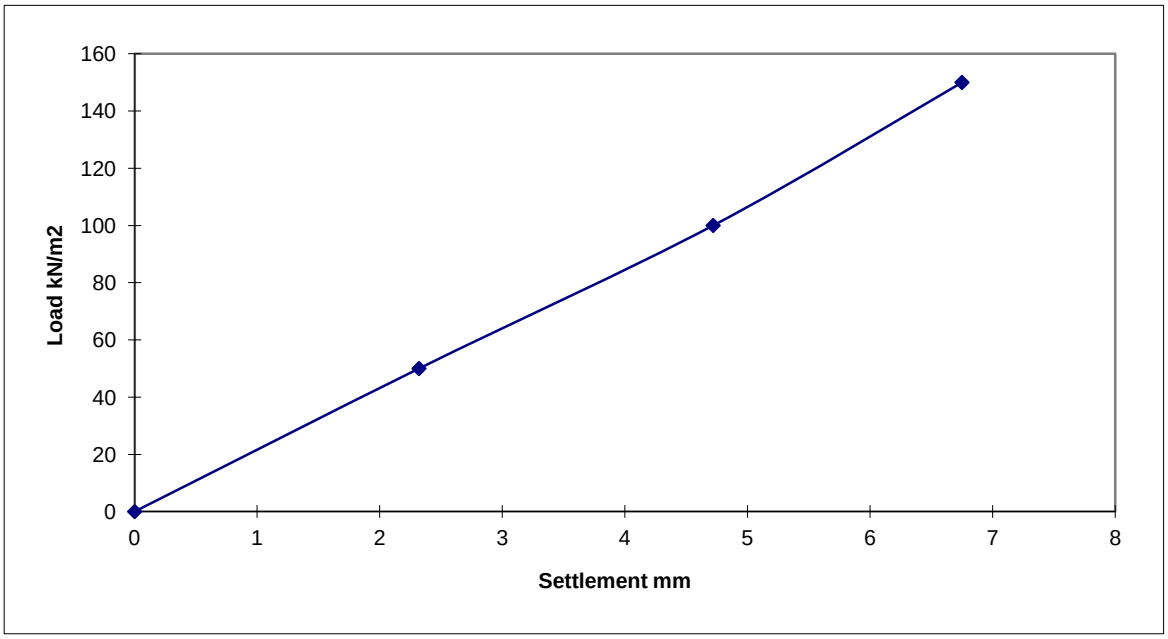
CONTRACT: Herbert Road	Date: 11.09.15 Sheet 1 of 1

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Plate 6	Surface	600mm	Engineered fill

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
2.32	50	4
4.72	100	8
6.75	150	12



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

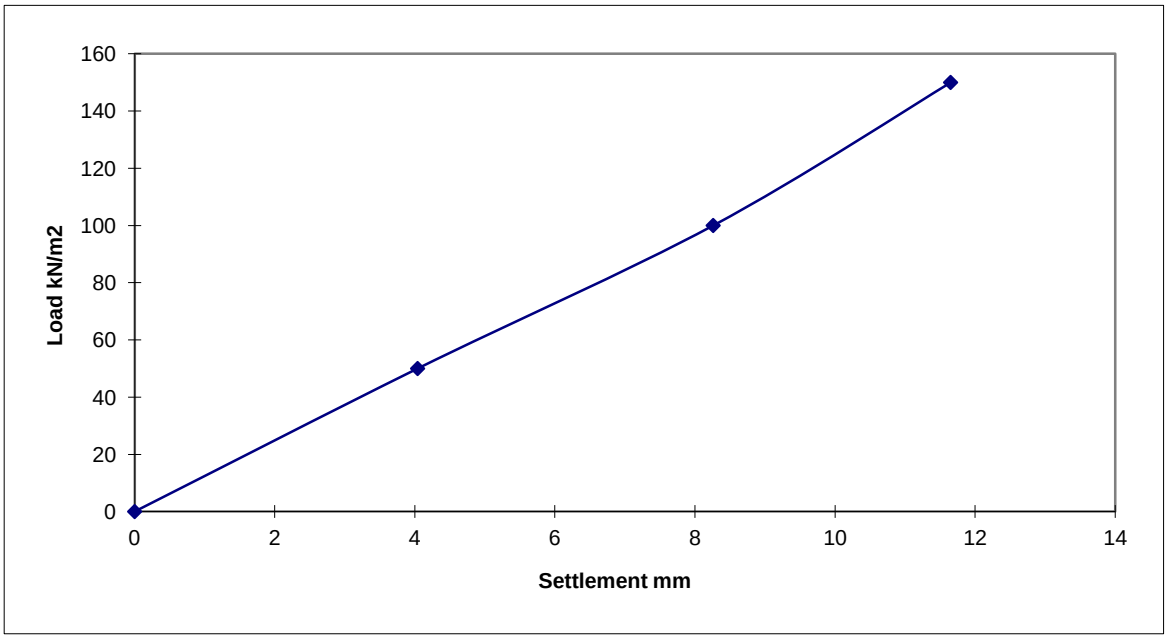
CONTRACT: Herbert Road	Date: 11.09.15 Sheet 1 of 1

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Plate 7	Surface	600mm	Engineered fill

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
4.04	50	4
8.26	100	9
11.65	150	15



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

CONTRACT: Herbert Road	Date: 11.09.15 Sheet 1 of 1

SOUTHERN GROUND TESTING

Plate Load Test Settlement v Time Data

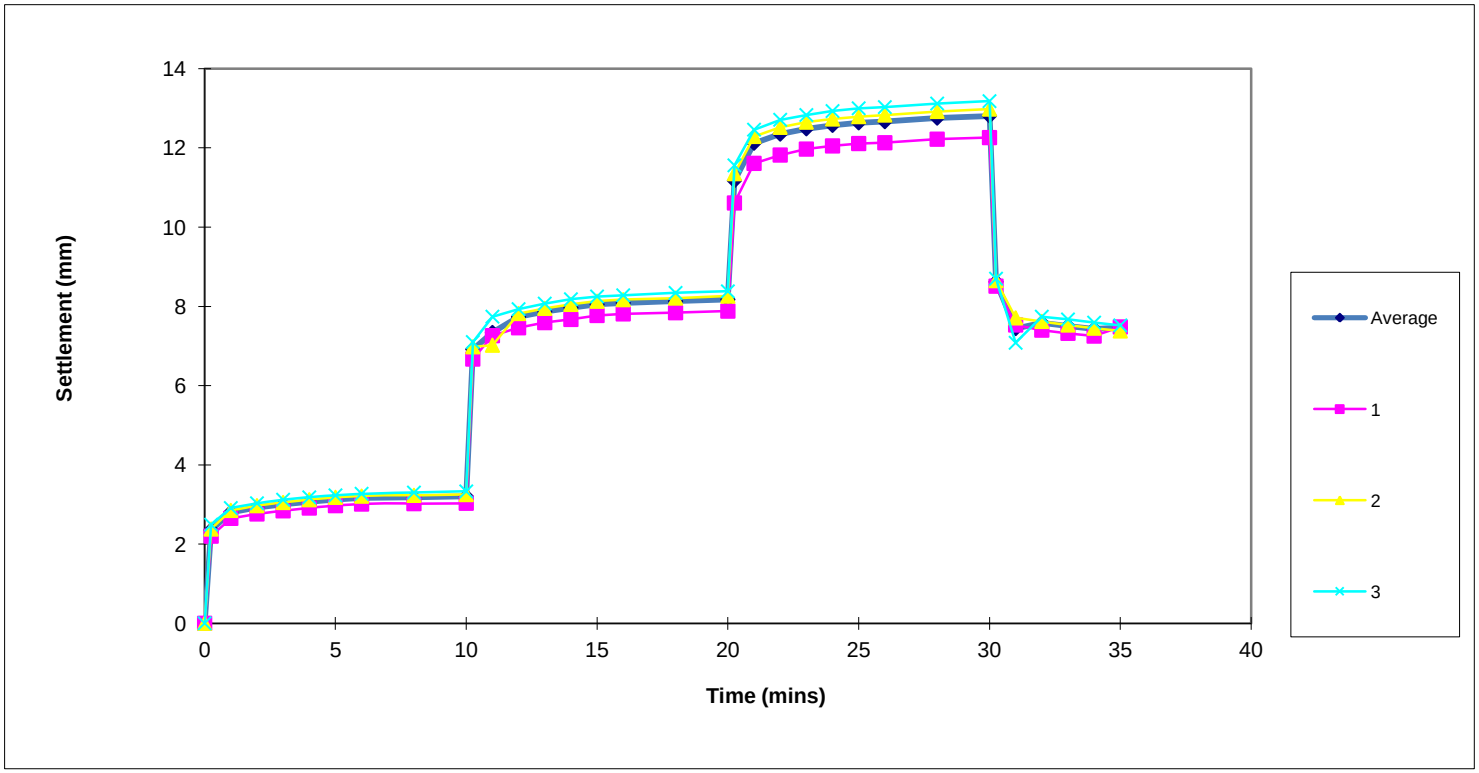
Contract: Herbert Road, Newport		Date: 03.05.17
Test Reference: Test 1	Test Depth: Surface	Plate Diameter: 600mm Seating Load: 7.5kN/m^2

		Travel Gauges set on plate			
	Time (mins)	Gauge 1	Gauge 2	Gauge 3	Average Plate Settlement mm
50kN/m^2 Load	0	0	0	0	0
	0.25	2.20	2.38	2.49	2.36
	1	2.65	2.85	2.91	2.80
	2	2.76	2.97	3.03	2.92
	3	2.84	3.05	3.12	3.00
	4	2.91	3.12	3.18	3.07
	5	2.97	3.18	3.23	3.13
	6	3.01	3.21	3.27	3.16
	8	3.02	3.23	3.30	3.18
	10	3.03	3.25	3.33	3.20
100kN/m^2 Load	10.25	6.67	6.98	7.10	6.92
	11	7.26	7.02	7.74	7.34
	12	7.46	7.82	7.93	7.74
	13	7.59	7.95	8.07	7.87
	14	7.67	8.05	8.18	7.97
	15	7.77	8.13	8.25	8.05
	16	7.81	8.17	8.28	8.09
	18	7.84	8.21	8.34	8.13
	20	7.88	8.26	8.38	8.17
150kN/m^2 Load	20.25	10.61	11.35	11.56	11.17
	21	11.61	12.29	12.46	12.12
	22	11.82	12.52	12.71	12.35
	23	11.97	12.65	12.83	12.48
	24	12.05	12.73	12.93	12.57
	25	12.11	12.79	13.00	12.63
	26	12.13	12.83	13.03	12.66
	28	12.22	12.92	13.12	12.75
	30	12.26	12.98	13.18	12.81
0kN/m^2 Unload	30.25	8.51	8.65	8.70	8.62
	31	7.53	7.71	7.08	7.44
	32	7.40	7.62	7.74	7.59
	33	7.32	7.53	7.67	7.51
	34	7.25	7.45	7.59	7.43
	35	7.48	7.38	7.52	7.46

SOUTHERN GROUND TESTING

Southern Gound Testing

Plate Load Test Settlement v Time Plot	Test Reference: Test 1



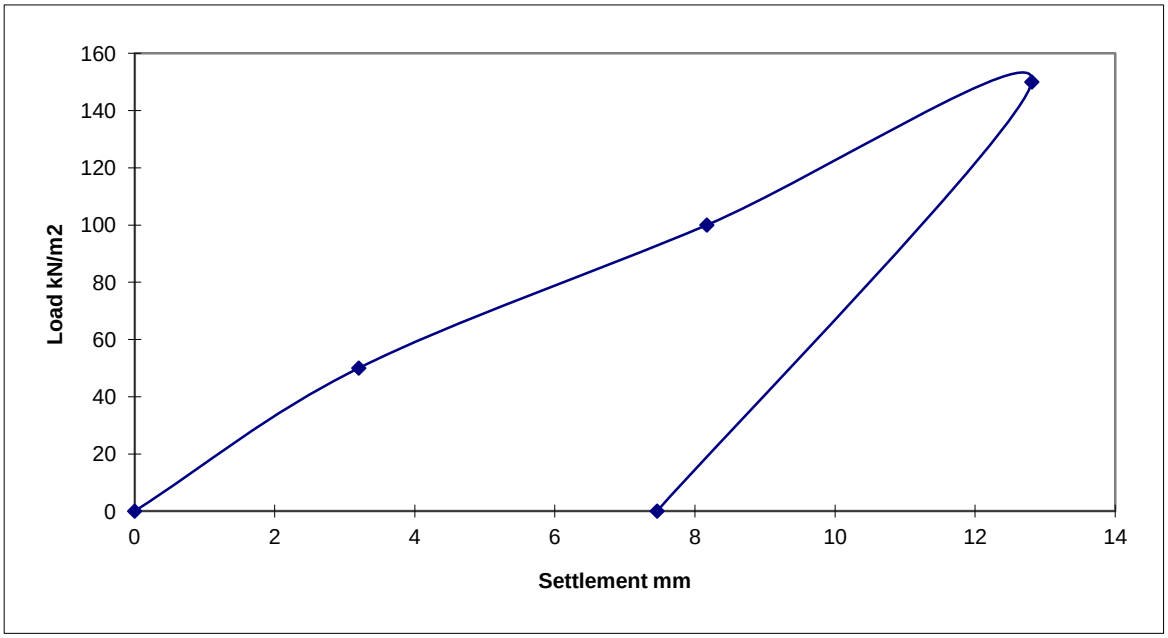
Contract:	Date:
Herbert Road, Newport	03.05.17

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference: Test 1	Test Depth: GL	Plate Diameter: 600mm	Soil Description: Crushed and compacted demolition rubble

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
3.20	50	10
8.17	100	20
12.81	150	30
7.46	0	35



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

SOUTHERN GROUND TESTING

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

CONTRACT: Herbert Road, Newport	Date: 03.05.17 Sheet 1 of 1

SOUTHERN GROUND TESTING

Plate Load Test Settlement v Time Data

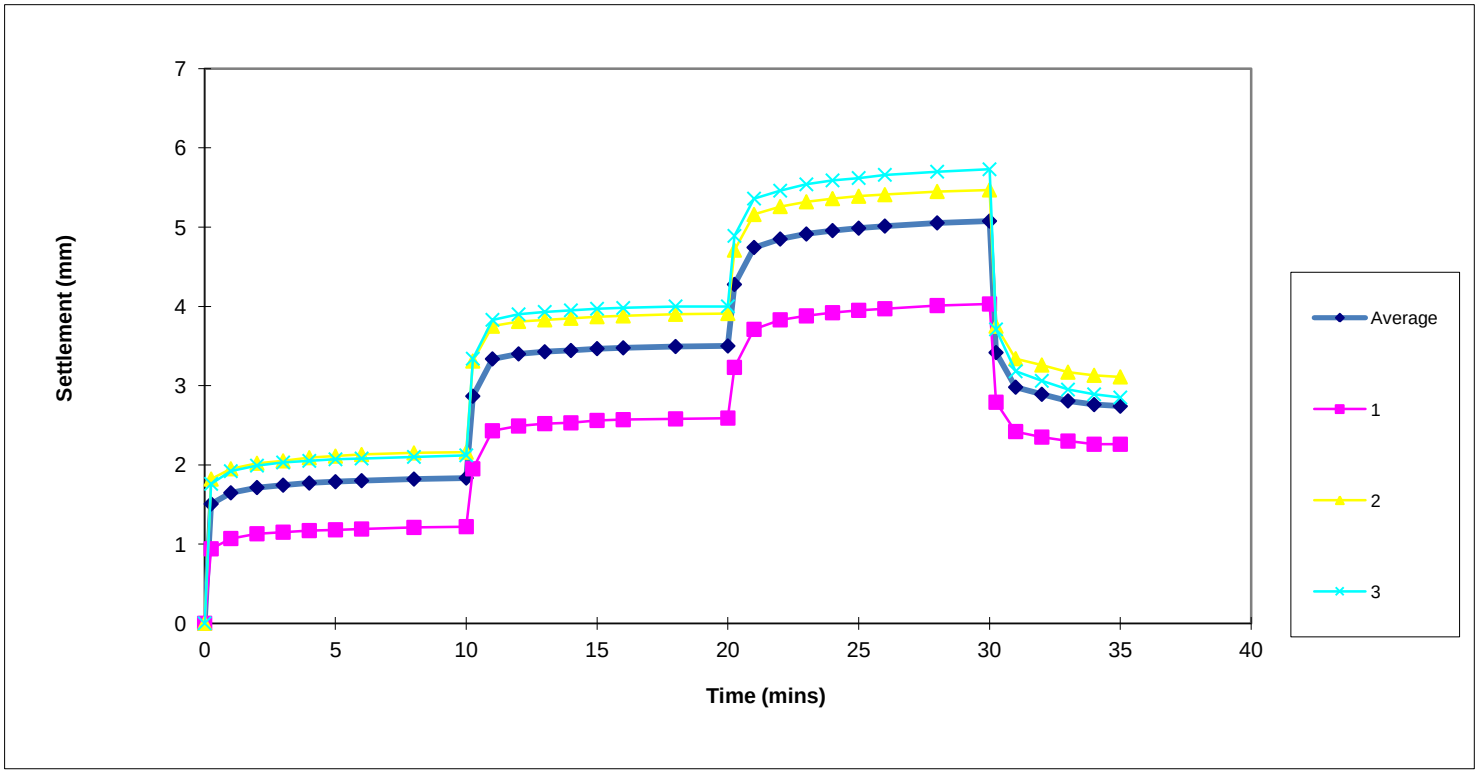
Contract: Herbert Road, Newport		Date: 03.05.17
Test Reference: Test 2	Test Depth: Surface	Plate Diameter: 600mm Seating Load: 7.5kN/m^2

		Travel Gauges set on plate			
	Time (mins)	Gauge 1	Gauge 2	Gauge 3	Average Plate Settlement mm
50kN/m^2 Load	0	0	0	0	0
	0.25	0.94	1.82	1.76	1.51
	1	1.07	1.95	1.92	1.65
	2	1.13	2.02	1.99	1.71
	3	1.15	2.05	2.03	1.74
	4	1.17	2.09	2.05	1.77
	5	1.18	2.11	2.07	1.79
	6	1.19	2.13	2.08	1.80
	8	1.21	2.15	2.10	1.82
	10	1.22	2.16	2.12	1.83
100kN/m^2 Load	10.25	1.95	3.31	3.34	2.87
	11	2.43	3.75	3.83	3.34
	12	2.49	3.81	3.90	3.40
	13	2.52	3.83	3.93	3.43
	14	2.53	3.85	3.95	3.44
	15	2.56	3.87	3.97	3.47
	16	2.57	3.88	3.98	3.48
	18	2.58	3.90	4.00	3.49
	20	2.59	3.91	4.00	3.50
150kN/m^2 Load	20.25	3.23	4.71	4.89	4.28
	21	3.71	5.16	5.36	4.74
	22	3.83	5.26	5.46	4.85
	23	3.88	5.32	5.54	4.91
	24	3.92	5.36	5.59	4.96
	25	3.95	5.39	5.62	4.99
	26	3.97	5.41	5.66	5.01
	28	4.01	5.45	5.70	5.05
	30	4.03	5.47	5.73	5.08
0kN/m^2 Unload	30.25	2.79	3.75	3.71	3.42
	31	2.42	3.34	3.18	2.98
	32	2.35	3.26	3.06	2.89
	33	2.30	3.17	2.95	2.81
	34	2.26	3.13	2.89	2.76
	35	2.26	3.11	2.85	2.74

SOUTHERN GROUND TESTING

Southern Gound Testing

Plate Load Test Settlement v Time Plot	Test Reference: Test 2



Contract:	Date:
Herbert Road, Newport	03.05.17

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference: Test 2	Test Depth: GL	Plate Diameter: 600mm	Soil Description: Crushed and compacted demolition rubble

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
1.83	50	10
3.50	100	20
5.08	150	30
2.74	0	35

Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

SOUTHERN GROUND TESTING

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

CONTRACT: Herbert Road, Newport	Date: 03.05.17 Sheet 1 of 1

SOUTHERN GROUND TESTING

Plate Load Test Settlement v Time Data

Contract: Herbert Road, Newport

Date: 03.05.17

Test Reference: Test 3

Test Depth: Surface

Plate Diameter: 600mm

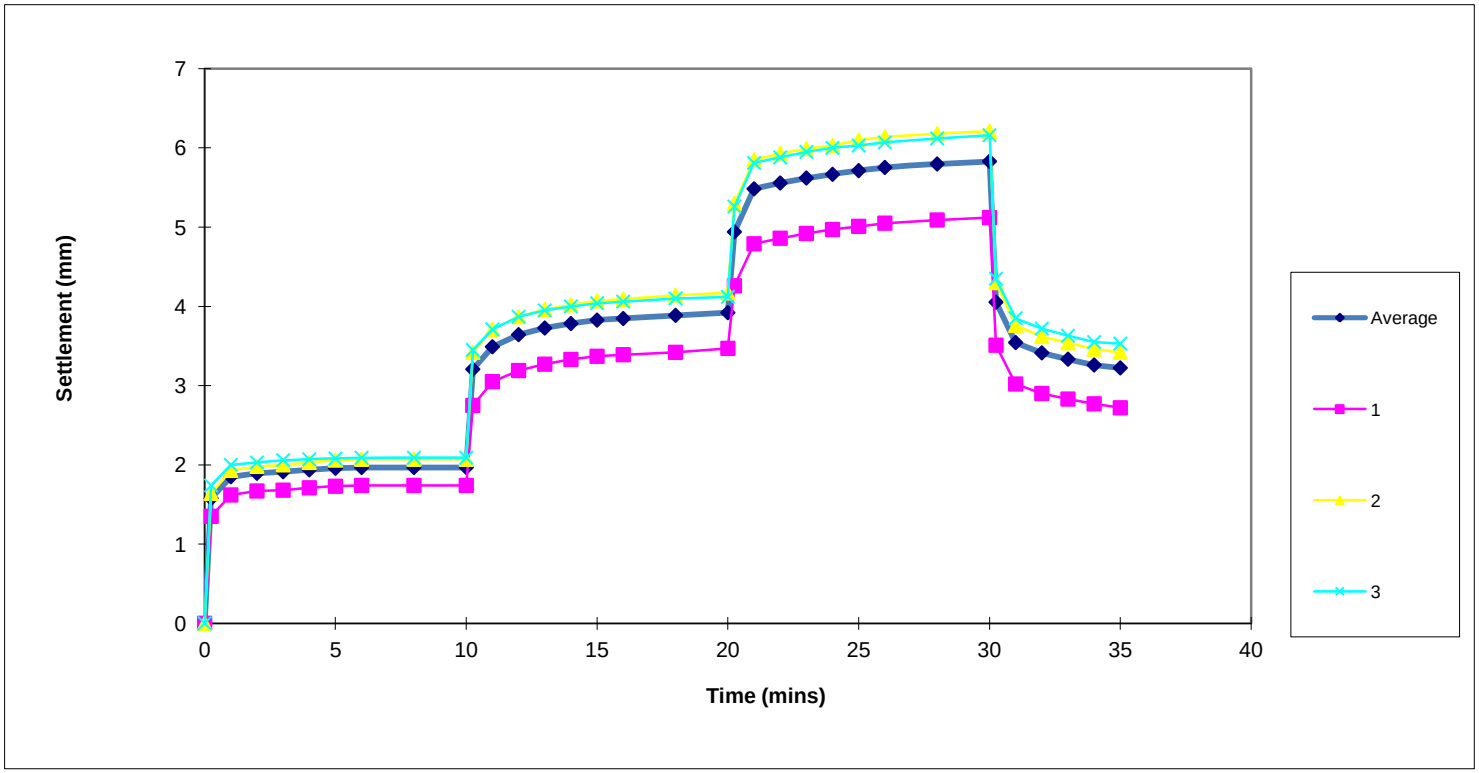
Seating Load: 7.5kN/m^2

		Travel Gauges set on plate			
	Time (mins)	Gauge 1	Gauge 2	Gauge 3	Average Plate Settlement mm
50kN/m^2 Load	0	0	0	0	0
	0.25	1.35	1.64	1.74	1.58
	1	1.62	1.93	2.00	1.85
	2	1.67	1.98	2.03	1.89
	3	1.68	2.00	2.06	1.91
	4	1.71	2.03	2.07	1.94
	5	1.73	2.06	2.08	1.96
	6	1.74	2.07	2.09	1.97
	8	1.74	2.07	2.09	1.97
	10	1.74	2.07	2.09	1.97
100kN/m^2 Load	10.25	2.75	3.42	3.45	3.21
	11	3.05	3.71	3.71	3.49
	12	3.19	3.87	3.87	3.64
	13	3.27	3.96	3.95	3.73
	14	3.33	4.02	4.00	3.78
	15	3.37	4.07	4.04	3.83
	16	3.39	4.09	4.06	3.85
	18	3.42	4.14	4.10	3.89
	20	3.47	4.17	4.12	3.92
150kN/m^2 Load	20.25	4.26	5.30	5.26	4.94
	21	4.79	5.85	5.81	5.48
	22	4.86	5.93	5.88	5.56
	23	4.92	5.99	5.95	5.62
	24	4.97	6.03	6.00	5.67
	25	5.01	6.10	6.03	5.71
	26	5.05	6.14	6.07	5.75
	28	5.09	6.18	6.12	5.80
	30	5.12	6.21	6.16	5.83
0kN/m^2 Unload	30.25	3.51	4.30	4.35	4.05
	31	3.02	3.76	3.85	3.54
	32	2.90	3.62	3.72	3.41
	33	2.83	3.54	3.63	3.33
	34	2.77	3.46	3.55	3.26
	35	2.72	3.42	3.53	3.22

SOUTHERN GROUND TESTING

Southern Gound Testing

Plate Load Test Settlement v Time Plot	Test Reference: Test 3



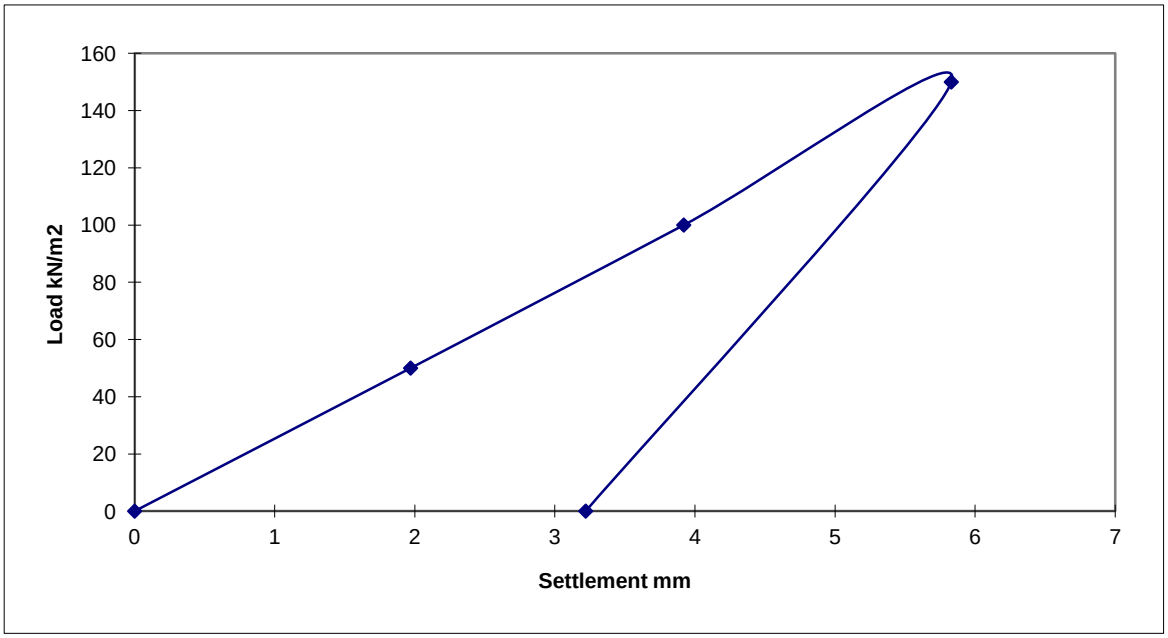
Contract:	Date:
Herbert Road, Newport	03.05.17

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference: Test 3	Test Depth: GL	Plate Diameter: 600mm	Soil Description: Crushed and compacted demolition rubble

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
1.97	50	10
3.92	100	20
5.83	150	30
3.22	0	35



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

SOUTHERN GROUND TESTING

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

CONTRACT: Herbert Road, Newport	Date: 03.05.17 Sheet 1 of 1

SOUTHERN GROUND TESTING

Plate Load Test Settlement v Time Data

Contract: Herbert Road, Newport | Date: 03.05.17

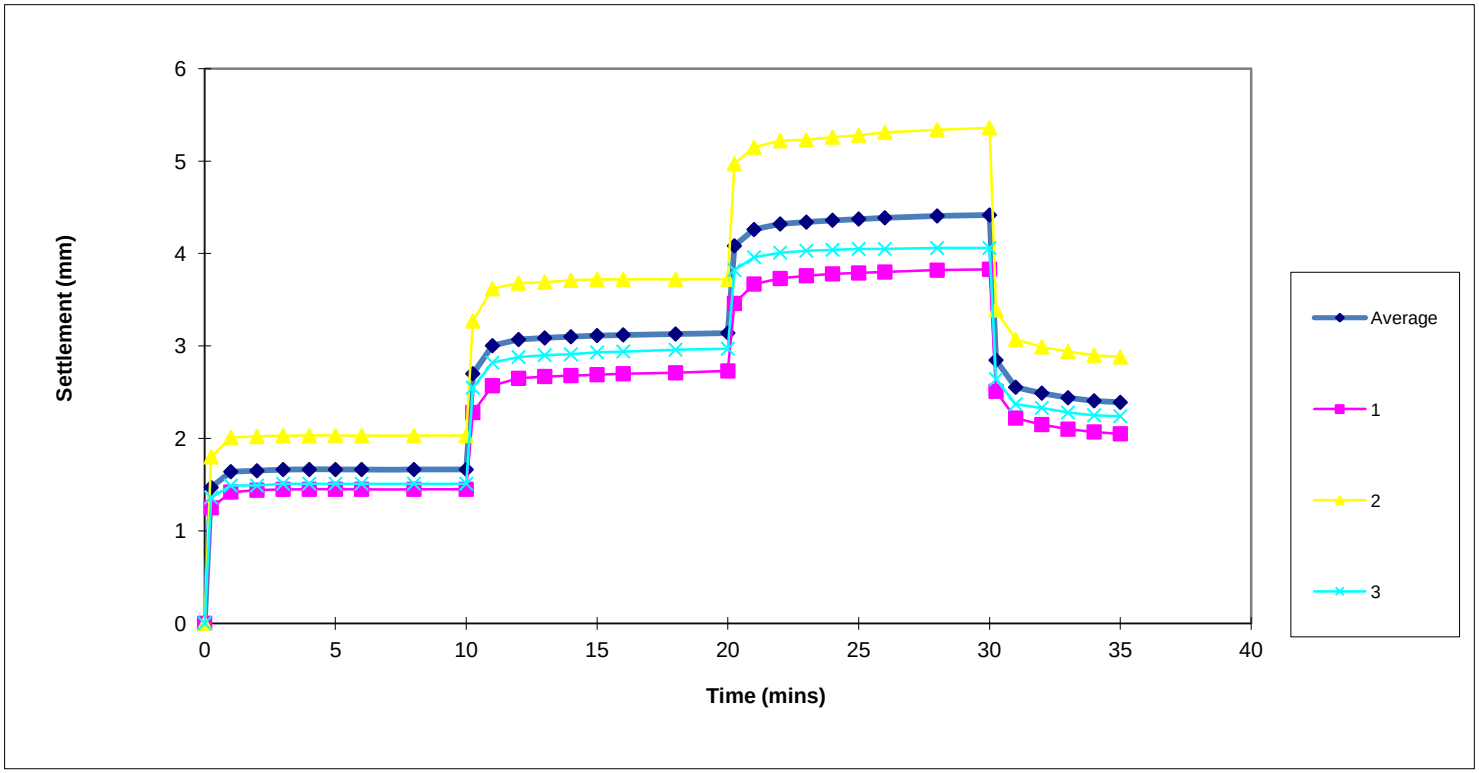
Test Reference: Test 4 | Test Depth: Surface | Plate Diameter: 600mm | Seating Load: 7.5kN/m^2

		Travel Gauges set on plate			
	Time (mins)	Gauge 1	Gauge 2	Gauge 3	Average Plate Settlement mm
50kN/m^2 Load	0	0	0	0	0
	0.25	1.25	1.80	1.36	1.47
	1	1.42	2.01	1.49	1.64
	2	1.44	2.02	1.49	1.65
	3	1.45	2.03	1.51	1.66
	4	1.45	2.03	1.51	1.66
	5	1.45	2.03	1.51	1.66
	6	1.45	2.03	1.51	1.66
	8	1.45	2.03	1.51	1.66
	10	1.45	2.03	1.51	1.66
100kN/m^2 Load	10.25	2.28	3.27	2.55	2.70
	11	2.57	3.62	2.82	3.00
	12	2.65	3.68	2.88	3.07
	13	2.67	3.69	2.90	3.09
	14	2.68	3.71	2.91	3.10
	15	2.69	3.72	2.93	3.11
	16	2.70	3.72	2.94	3.12
	18	2.71	3.72	2.96	3.13
	20	2.73	3.72	2.97	3.14
150kN/m^2 Load	20.25	3.46	4.97	3.82	4.08
	21	3.67	5.15	3.96	4.26
	22	3.73	5.22	4.01	4.32
	23	3.76	5.23	4.03	4.34
	24	3.78	5.26	4.04	4.36
	25	3.79	5.28	4.05	4.37
	26	3.80	5.31	4.05	4.39
	28	3.82	5.34	4.06	4.41
	30	3.83	5.36	4.06	4.42
0kN/m^2 Unload	30.25	2.51	3.39	2.64	2.85
	31	2.22	3.07	2.37	2.55
	32	2.15	2.99	2.33	2.49
	33	2.10	2.94	2.28	2.44
	34	2.07	2.90	2.25	2.41
	35	2.05	2.88	2.24	2.39

SOUTHERN GROUND TESTING

Southern Gound Testing

Plate Load Test Settlement v Time Plot	Test Reference: Test 4



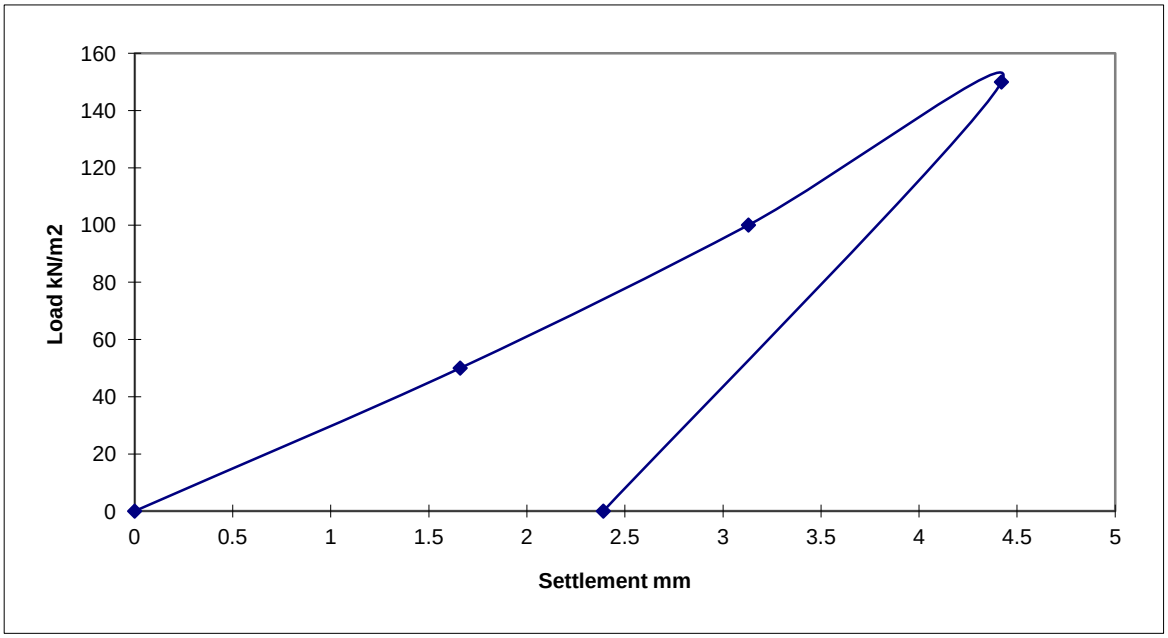
Contract:	Date:
Herbert Road, Newport	03.05.17

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference: Test 4	Test Depth: GL	Plate Diameter: 600mm	Soil Description: Crushed and compacted demolition rubble

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
1.66	50	10
3.13	100	20
4.42	150	30
2.39	0	35



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

SOUTHERN GROUND TESTING

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

CONTRACT: Herbert Road, Newport	Date: 03.05.17 Sheet 1 of 1

SOUTHERN GROUND TESTING

Plate Load Test Settlement v Time Data

Contract: Herbert Road, Newport | Date: 03.05.17

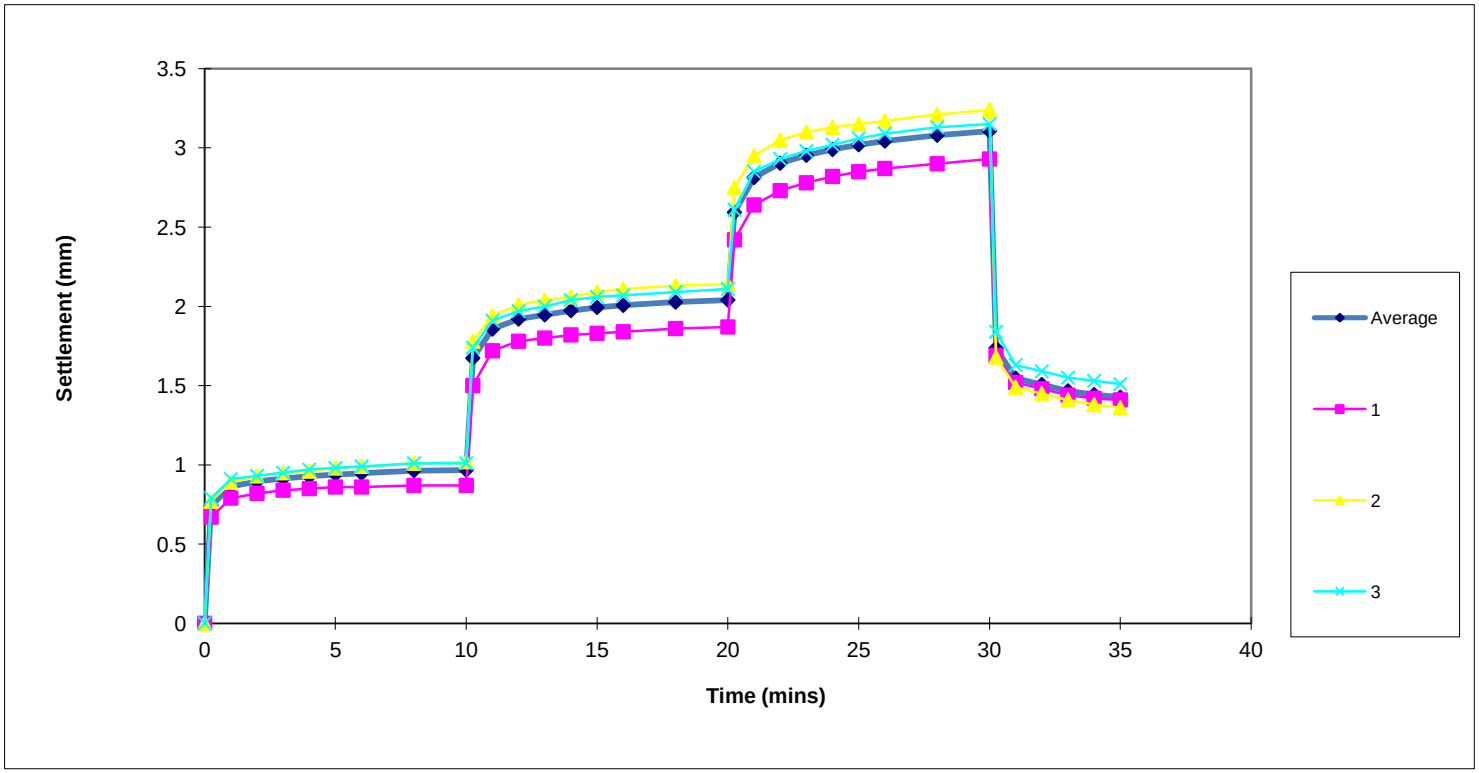
Test Reference: Test 5 | Test Depth: Surface | Plate Diameter: 600mm | Seating Load: 7.5kN/m^2

		Travel Gauges set on plate			
	Time (mins)	Gauge 1	Gauge 2	Gauge 3	Average Plate Settlement mm
50kN/m^2 Load	0	0	0	0	0
	0.25	0.67	0.77	0.79	0.74
	1	0.79	0.89	0.91	0.86
	2	0.82	0.93	0.93	0.89
	3	0.84	0.95	0.95	0.91
	4	0.85	0.96	0.97	0.93
	5	0.86	0.98	0.98	0.94
	6	0.86	0.99	0.99	0.95
	8	0.87	1.01	1.01	0.96
	10	0.87	1.02	1.01	0.97
100kN/m^2 Load	10.25	1.50	1.78	1.74	1.67
	11	1.72	1.94	1.91	1.86
	12	1.78	2.01	1.97	1.92
	13	1.80	2.04	2.00	1.95
	14	1.82	2.06	2.04	1.97
	15	1.83	2.09	2.06	1.99
	16	1.84	2.11	2.07	2.01
	18	1.86	2.13	2.09	2.03
	20	1.87	2.14	2.11	2.04
150kN/m^2 Load	20.25	2.42	2.75	2.61	2.59
	21	2.64	2.95	2.85	2.81
	22	2.73	3.05	2.93	2.90
	23	2.78	3.10	2.98	2.95
	24	2.82	3.13	3.02	2.99
	25	2.85	3.15	3.06	3.02
	26	2.87	3.17	3.09	3.04
	28	2.90	3.21	3.13	3.08
	30	2.93	3.24	3.15	3.11
0kN/m^2 Unload	30.25	1.69	1.68	1.84	1.74
	31	1.52	1.49	1.63	1.55
	32	1.48	1.45	1.59	1.51
	33	1.44	1.41	1.55	1.47
	34	1.42	1.38	1.53	1.44
	35	1.41	1.36	1.51	1.43

SOUTHERN GROUND TESTING

Southern Gound Testing

Plate Load Test Settlement v Time Plot	Test Reference: Test 5



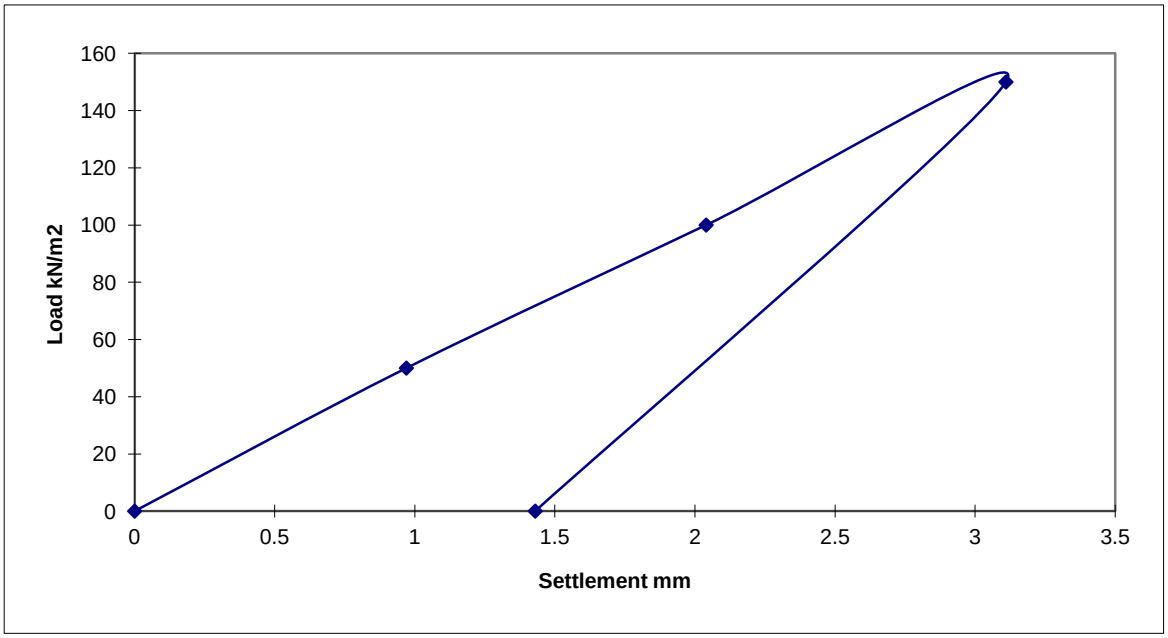
Contract:	Date:
Herbert Road, Newport	03.05.17

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference: Test 5	Test Depth: GL	Plate Diameter: 600mm	Soil Description: Crushed and compacted demolition rubble

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
0.97	50	10
2.04	100	20
3.11	150	30
1.43	0	35



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

SOUTHERN GROUND TESTING

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

CONTRACT: Herbert Road, Newport	Date: 03.05.17 Sheet 1 of 1

SOUTHERN GROUND TESTING

Plate Load Test Settlement v Time Data

Contract: Herbert Road, Newport | Date: 03.05.17

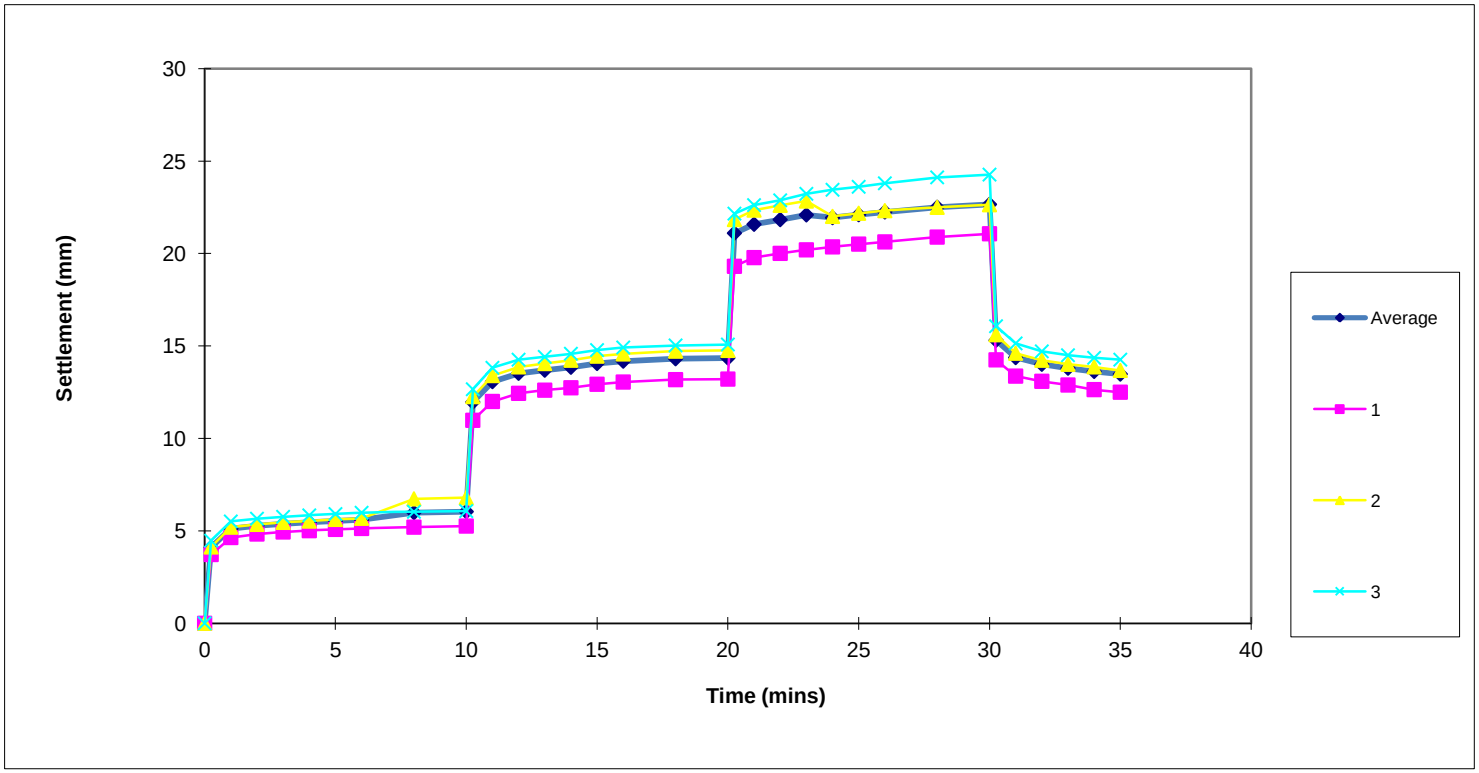
Test Reference: Test 6 | Test Depth: Surface | Plate Diameter: 600mm | Seating Load: 7.5kN/m^2

		Travel Gauges set on plate			
	Time (mins)	Gauge 1	Gauge 2	Gauge 3	Average Plate Settlement mm
50kN/m^2 Load	0	0	0	0	0
	0.25	3.72	4.13	4.47	4.11
	1	4.64	5.20	5.51	5.12
	2	4.83	5.35	5.66	5.28
	3	4.94	5.46	5.76	5.39
	4	5.01	5.53	5.84	5.46
	5	5.08	5.62	5.91	5.54
	6	5.13	5.68	5.98	5.60
	8	5.20	6.73	6.03	5.99
	10	5.26	6.79	6.07	6.04
100kN/m^2 Load	10.25	10.98	12.26	12.66	11.97
	11	12.00	13.40	13.82	13.07
	12	12.44	13.87	14.26	13.52
	13	12.61	14.05	14.41	13.69
	14	12.74	14.23	14.58	13.85
	15	12.93	14.45	14.78	14.05
	16	13.05	14.57	14.92	14.18
	18	13.18	14.72	15.03	14.31
	20	13.21	14.76	15.08	14.35
150kN/m^2 Load	20.25	19.31	21.84	22.16	21.10
	21	19.78	22.35	22.62	21.58
	22	20.01	22.61	22.88	21.83
	23	20.20	22.84	23.23	22.09
	24	20.36	22.01	23.45	21.94
	25	20.51	22.18	23.61	22.10
	26	20.63	22.32	23.80	22.25
	28	20.89	22.50	24.12	22.50
	30	21.07	22.64	24.27	22.66
0kN/m^2 Unload	30.25	14.25	15.61	16.07	15.31
	31	13.37	14.61	15.14	14.37
	32	13.09	14.23	14.71	14.01
	33	12.89	14.01	14.50	13.80
	34	12.64	13.87	14.36	13.62
	35	12.50	13.68	14.26	13.48

SOUTHERN GROUND TESTING

Southern Gound Testing

Plate Load Test Settlement v Time Plot	Test Reference: Test 6



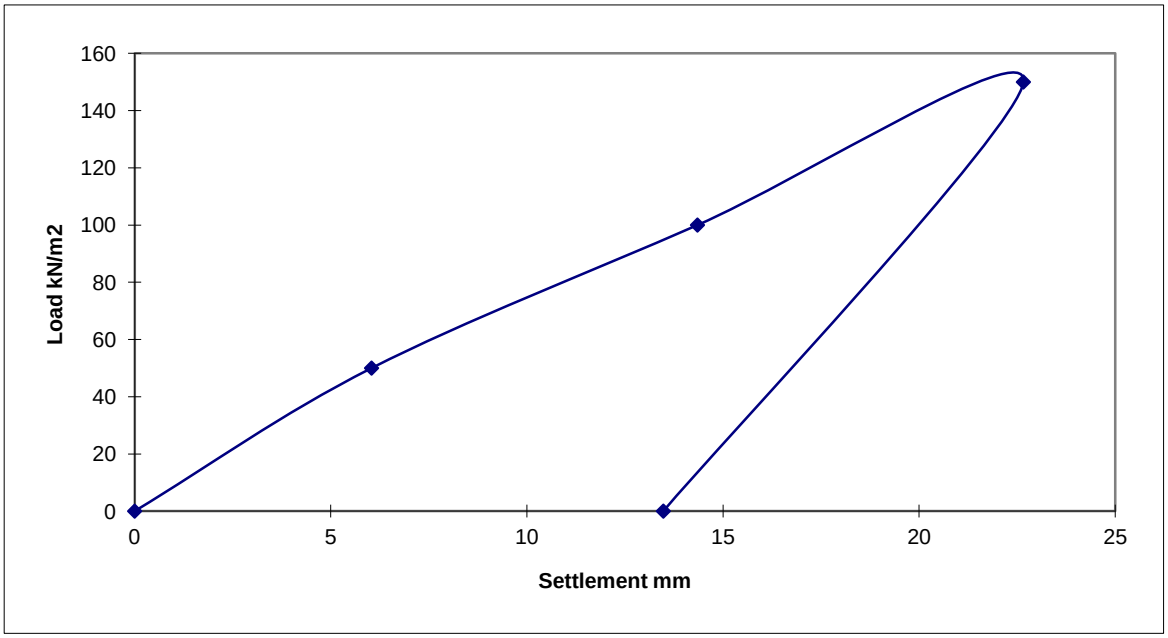
Contract:	Date:
Herbert Road, Newport	03.05.17

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference: Test 6	Test Depth: GL	Plate Diameter: 600mm	Soil Description: Crushed and compacted demolition rubble

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
6.04	50	10
14.35	100	20
22.66	150	30
13.48	0	35



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

SOUTHERN GROUND TESTING

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

CONTRACT: Herbert Road, Newport	Date: 03.05.17 Sheet 1 of 1

SOUTHERN GROUND TESTING

Plate Load Test Settlement v Time Data

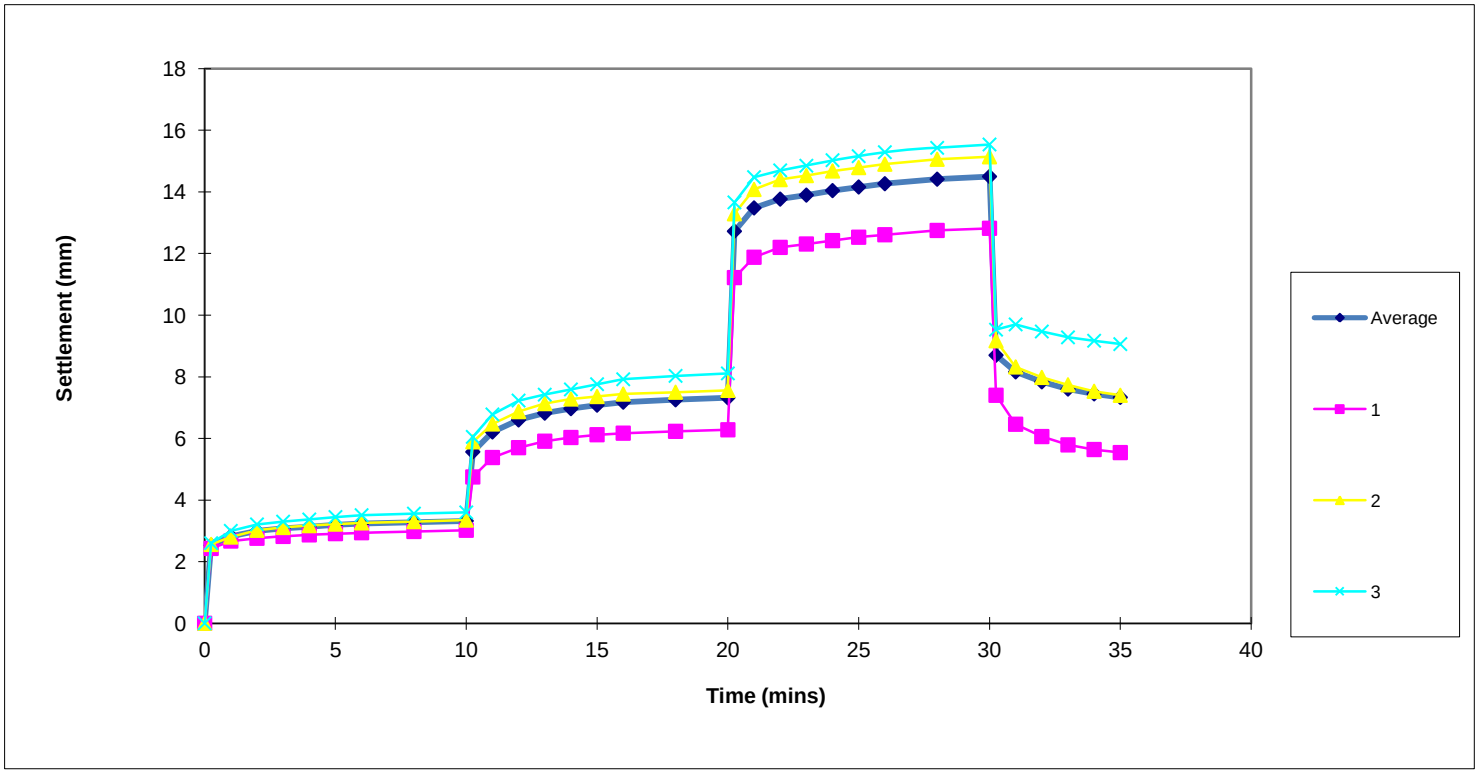
Contract: Herbert Road, Newport		Date: 03.05.17
Test Reference: Test 6a	Test Depth: Surface	Plate Diameter: 600mm Seating Load: 7.5kN/m^2

		Travel Gauges set on plate			
	Time (mins)	Gauge 1	Gauge 2	Gauge 3	Average Plate Settlement mm
50kN/m^2 Load	0	0	0	0	0
	0.25	2.43	2.56	2.60	2.53
	1	2.67	2.80	3.00	2.82
	2	2.76	3.02	3.21	3.00
	3	2.82	3.11	3.30	3.08
	4	2.87	3.17	3.37	3.14
	5	2.91	3.22	3.45	3.19
	6	2.94	3.26	3.51	3.24
	8	2.98	3.30	3.56	3.28
	10	3.02	3.35	3.60	3.32
100kN/m^2 Load	10.25	4.75	5.89	6.05	5.56
	11	5.38	6.47	6.78	6.21
	12	5.70	6.87	7.23	6.60
	13	5.91	7.13	7.42	6.82
	14	6.03	7.28	7.59	6.97
	15	6.12	7.36	7.76	7.08
	16	6.17	7.44	7.92	7.18
	18	6.23	7.50	8.03	7.25
	20	6.28	7.56	8.11	7.32
150kN/m^2 Load	20.25	11.22	13.29	13.66	12.72
	21	11.88	14.08	14.48	13.48
	22	12.20	14.40	14.70	13.77
	23	12.31	14.53	14.85	13.90
	24	12.42	14.68	15.03	14.04
	25	12.53	14.79	15.16	14.16
	26	12.61	14.90	15.29	14.27
	28	12.75	15.06	15.43	14.41
	30	12.82	15.14	15.54	14.50
0kN/m^2 Unload	30.25	7.40	9.17	9.53	8.70
	31	6.46	8.32	9.70	8.16
	32	6.06	7.98	9.47	7.84
	33	5.79	7.74	9.28	7.60
	34	5.64	7.53	9.17	7.45
	35	5.54	7.40	9.06	7.33

SOUTHERN GROUND TESTING

Southern Gound Testing

Plate Load Test Settlement v Time Plot	Test Reference: Test 6a



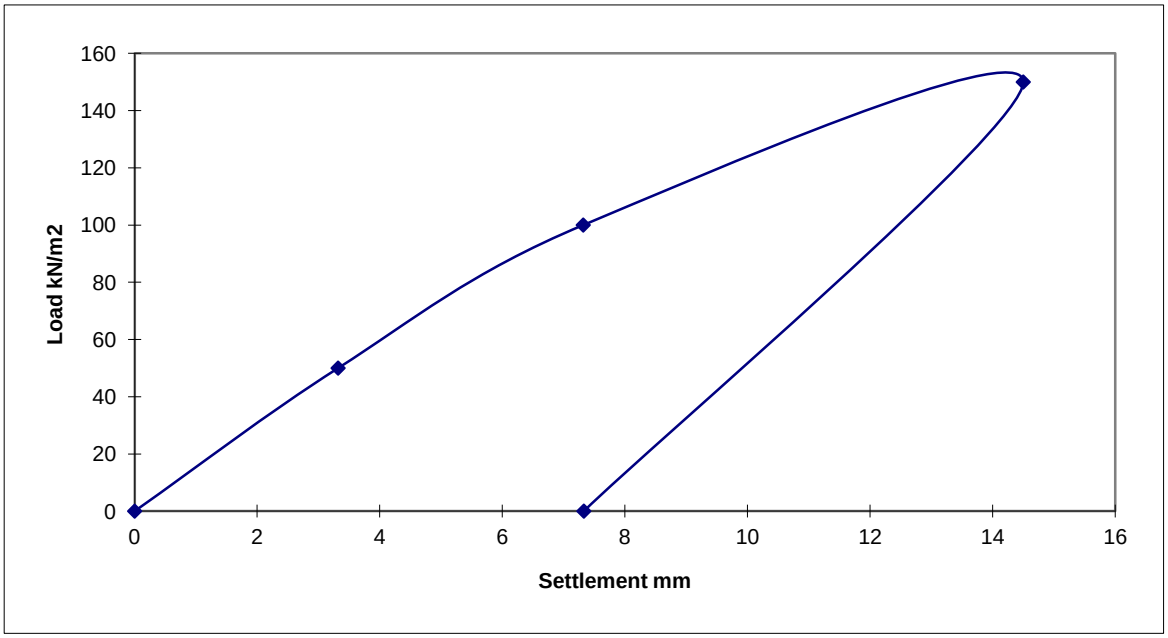
Contract: Herbert Road, Newport	Date: 03.05.17

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference: Test 6a	Test Depth: GL	Plate Diameter: 600mm	Soil Description: Crushed and compacted demolition rubble

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
3.32	50	10
7.32	100	20
14.50	150	30
7.33	0	35



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

SOUTHERN GROUND TESTING

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

CONTRACT: Herbert Road, Newport	Date: 03.05.17 Sheet 1 of 1

SOUTHERN GROUND TESTING

Plate Load Test Settlement v Time Data

Contract: Herbert Road, Newport | Date: 03.05.17

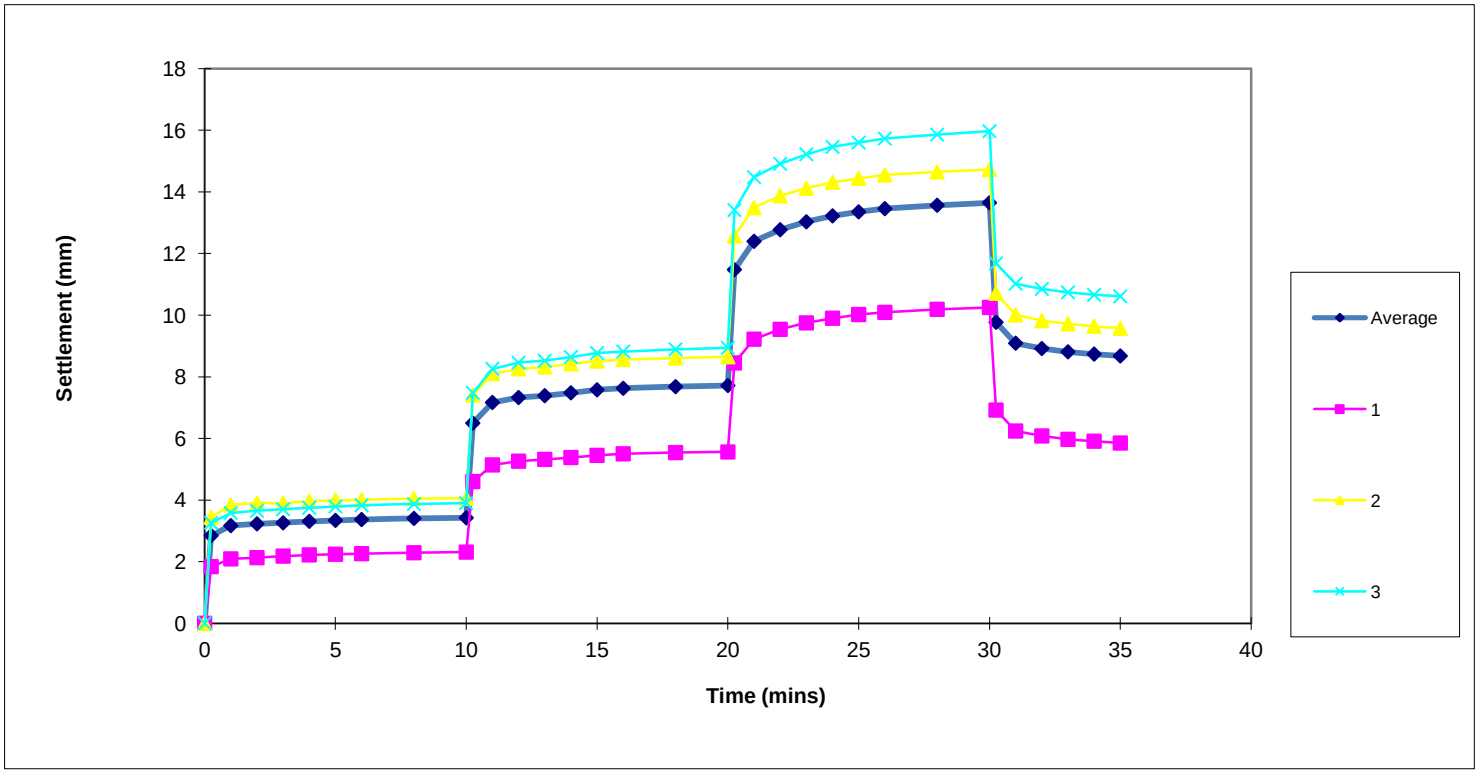
Test Reference: Test 7 | Test Depth: Surface | Plate Diameter: 600mm | Seating Load: 7.5kN/m^2

		Travel Gauges set on plate			
	Time (mins)	Gauge 1	Gauge 2	Gauge 3	Average Plate Settlement mm
50kN/m^2 Load	0	0	0	0	0
	0.25	1.84	3.44	3.26	2.85
	1	2.09	3.84	3.58	3.17
	2	2.13	3.90	3.65	3.23
	3	2.18	3.90	3.70	3.26
	4	2.22	3.96	3.75	3.31
	5	2.24	3.99	3.79	3.34
	6	2.26	4.01	3.83	3.37
	8	2.29	4.05	3.87	3.40
	10	2.31	4.06	3.90	3.42
100kN/m^2 Load	10.25	4.60	7.41	7.48	6.50
	11	5.14	8.10	8.26	7.17
	12	5.26	8.26	8.46	7.33
	13	5.32	8.32	8.52	7.39
	14	5.38	8.42	8.64	7.48
	15	5.45	8.51	8.77	7.58
	16	5.50	8.56	8.82	7.63
	18	5.54	8.61	8.89	7.68
	20	5.56	8.65	8.94	7.72
150kN/m^2 Load	20.25	8.45	12.57	13.41	11.48
	21	9.22	13.49	14.48	12.40
	22	9.54	13.87	14.91	12.77
	23	9.75	14.12	15.22	13.03
	24	9.90	14.31	15.46	13.22
	25	10.02	14.44	15.60	13.35
	26	10.09	14.55	15.73	13.46
	28	10.19	14.65	15.86	13.57
	30	10.25	14.73	15.97	13.65
0kN/m^2 Unload	30.25	6.92	10.71	11.68	9.77
	31	6.24	10.01	11.02	9.09
	32	6.08	9.82	10.85	8.92
	33	5.97	9.72	10.74	8.81
	34	5.91	9.64	10.66	8.74
	35	5.85	9.57	10.61	8.68

SOUTHERN GROUND TESTING

Southern Gound Testing

Plate Load Test Settlement v Time Plot	Test Reference: Test 7



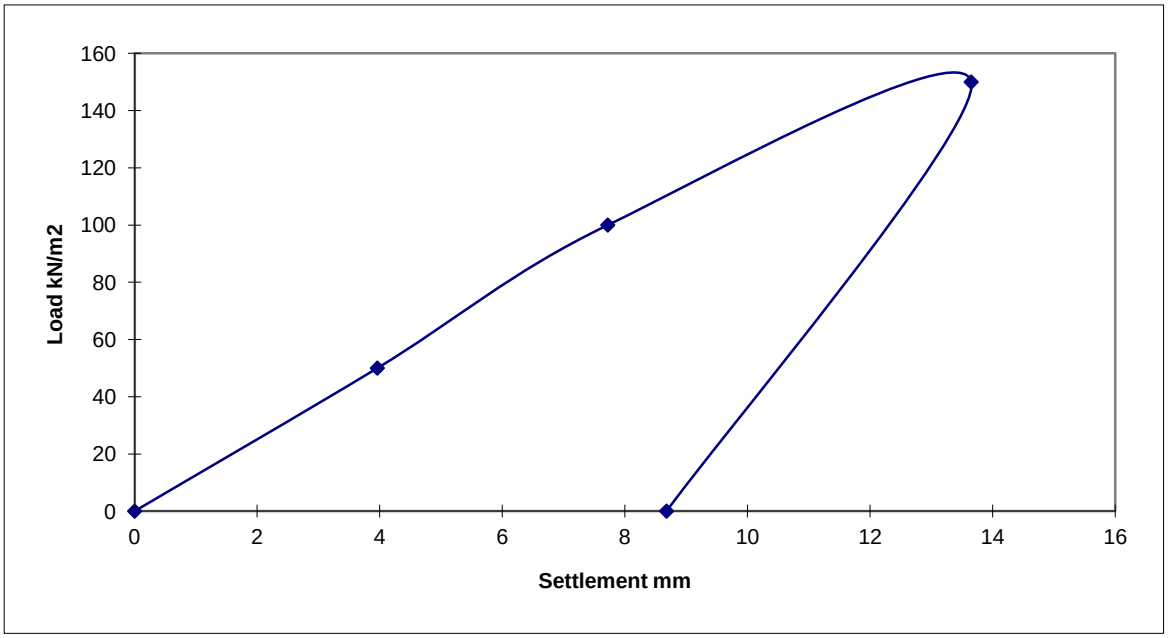
Contract:	Date:
Herbert Road, Newport	03.05.17

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference: Test 7	Test Depth: GL	Plate Diameter: 600mm	Soil Description: Crushed and compacted demolition rubble

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
3.96	50	10
7.72	100	20
13.65	150	30
8.68	0	35



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

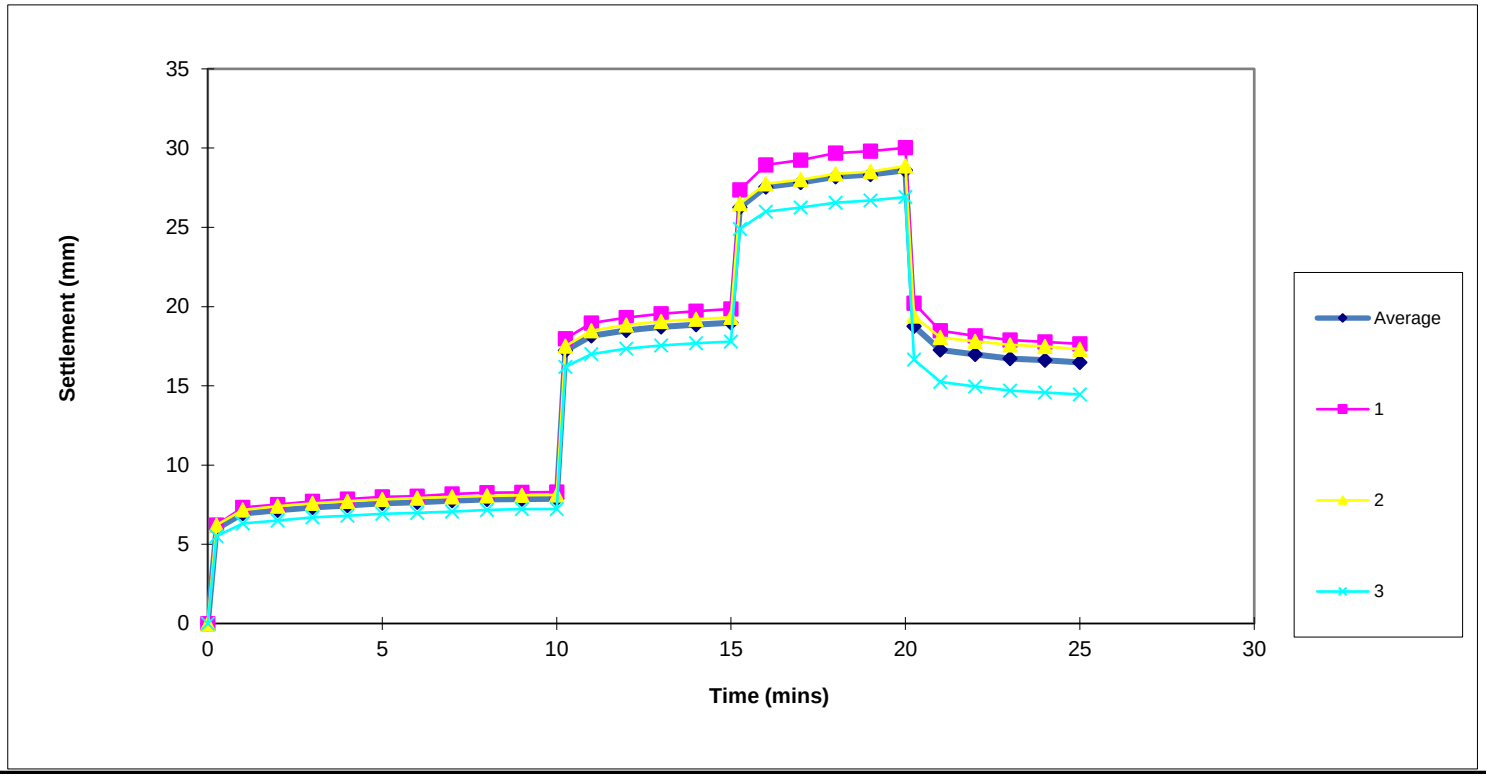
SOUTHERN GROUND TESTING

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

CONTRACT: Herbert Road, Newport	Date: 03.05.17 Sheet 1 of 1

Southern Ground Testing

Plate Load Test Settlement v Time Plot	Test Referece: Plate 1



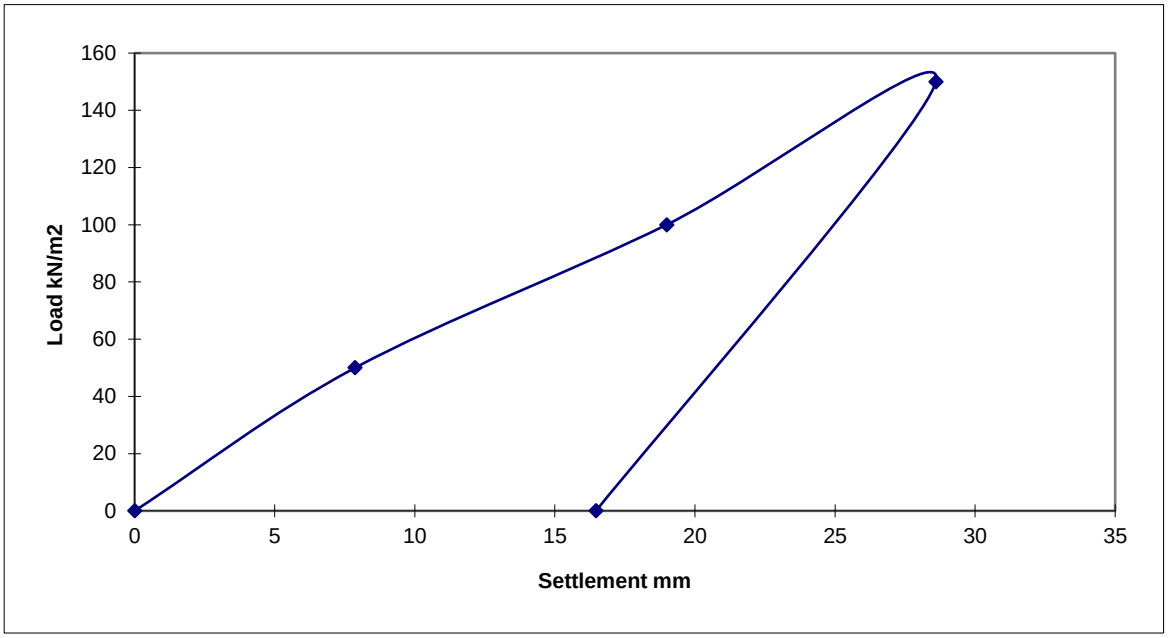
Contract: Herbert Road	Date: 26.05.17

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Plate 1	Surface	600mm	Compacted clay and demolition rubble.

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
7.87	50	10
18.99	100	15
28.60	150	20
16.47	0	25



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.
100 and 150Kn stages shortened due to the amount of travel.

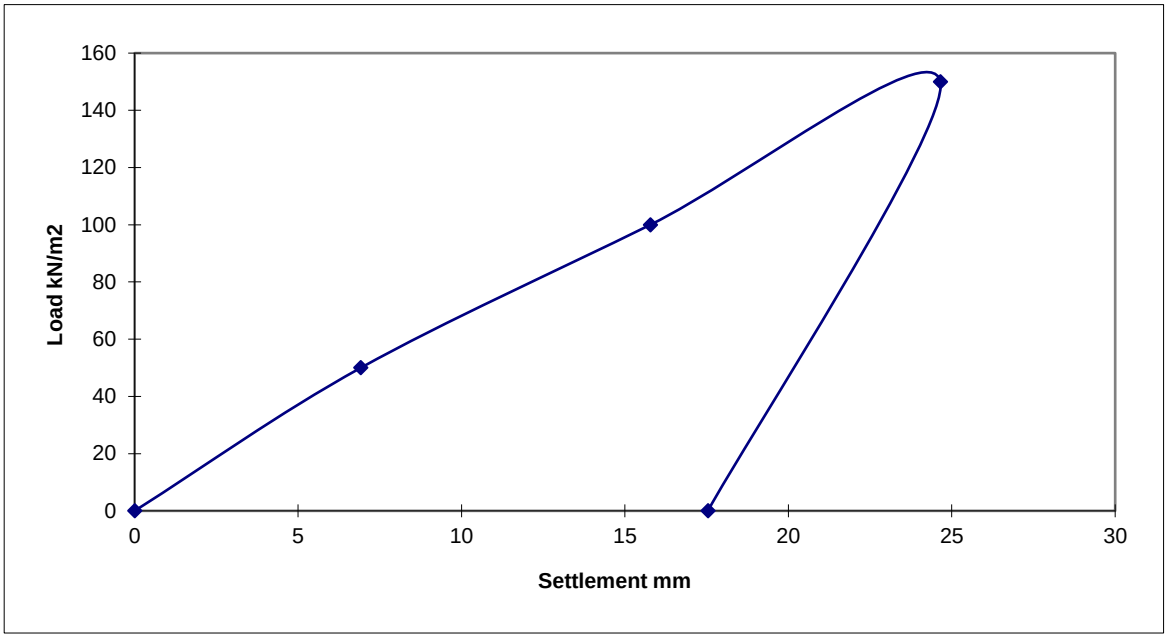
CONTRACT: Herbert Road	Date: 26.05.17 Sheet 1 of 1

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Plate 2	Surface	600mm	Compacted clay and demolition rubble.

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
6.92	50	7
15.78	100	12
24.65	150	17
17.54	0	22



Notes:

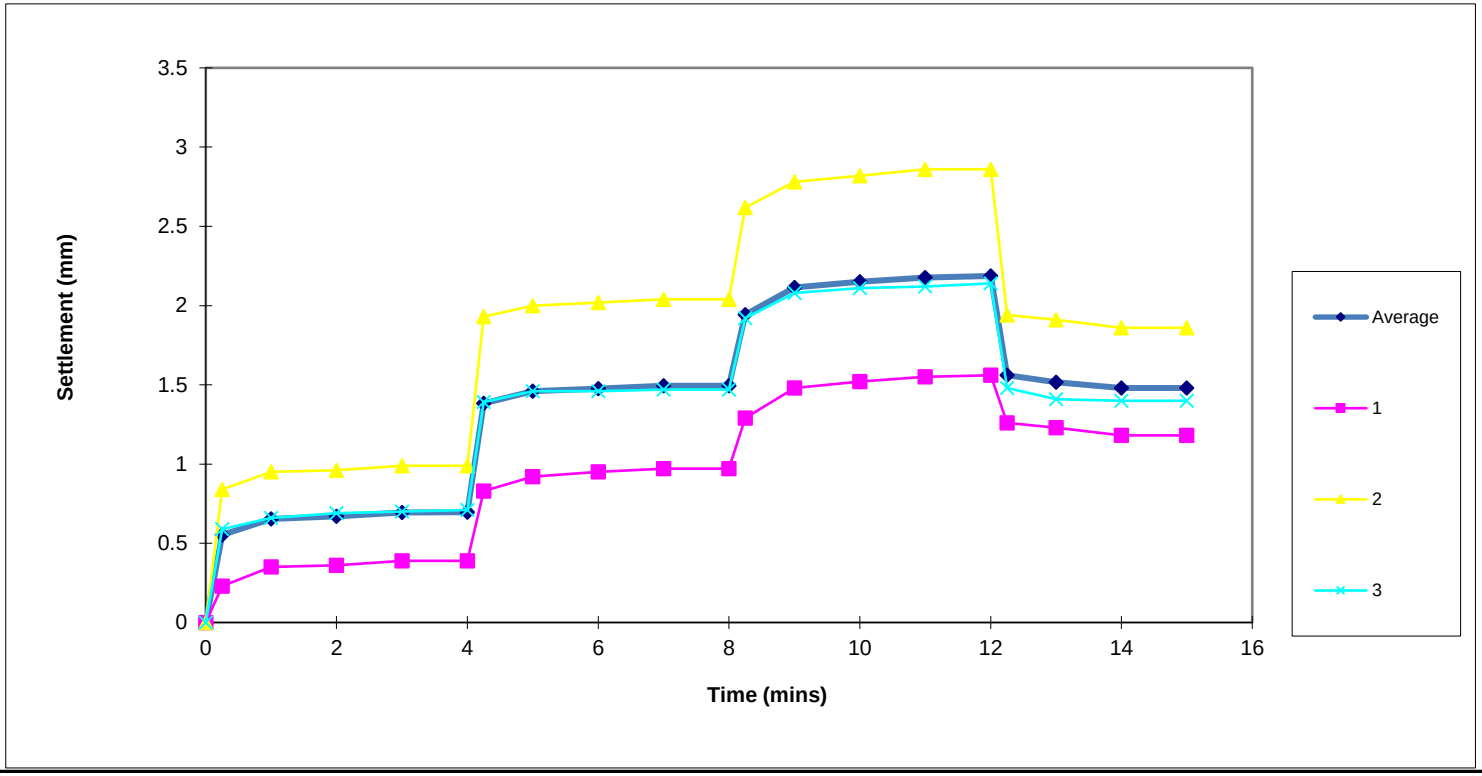
1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.
100 and 150Kn stages shortened due to the amount of travel.

CONTRACT: Herbert Road	Date: 26.05.17 Sheet 1 of 1

Southern Ground Testing

Plate Load Test Settlement v Time Plot	Test Referece: Plate 3



Contract: Herbert Road	Date: 26.05.17

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Plate 3	Surface	600mm	Compacted clay and demolition rubble.

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
0.70	50	4
1.49	100	8
2.19	150	12
1.48	0	15

Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

CONTRACT: Herbert Road	Date: 26.05.17 Sheet 1 of 1

SOUTHERN GROUND TESTING

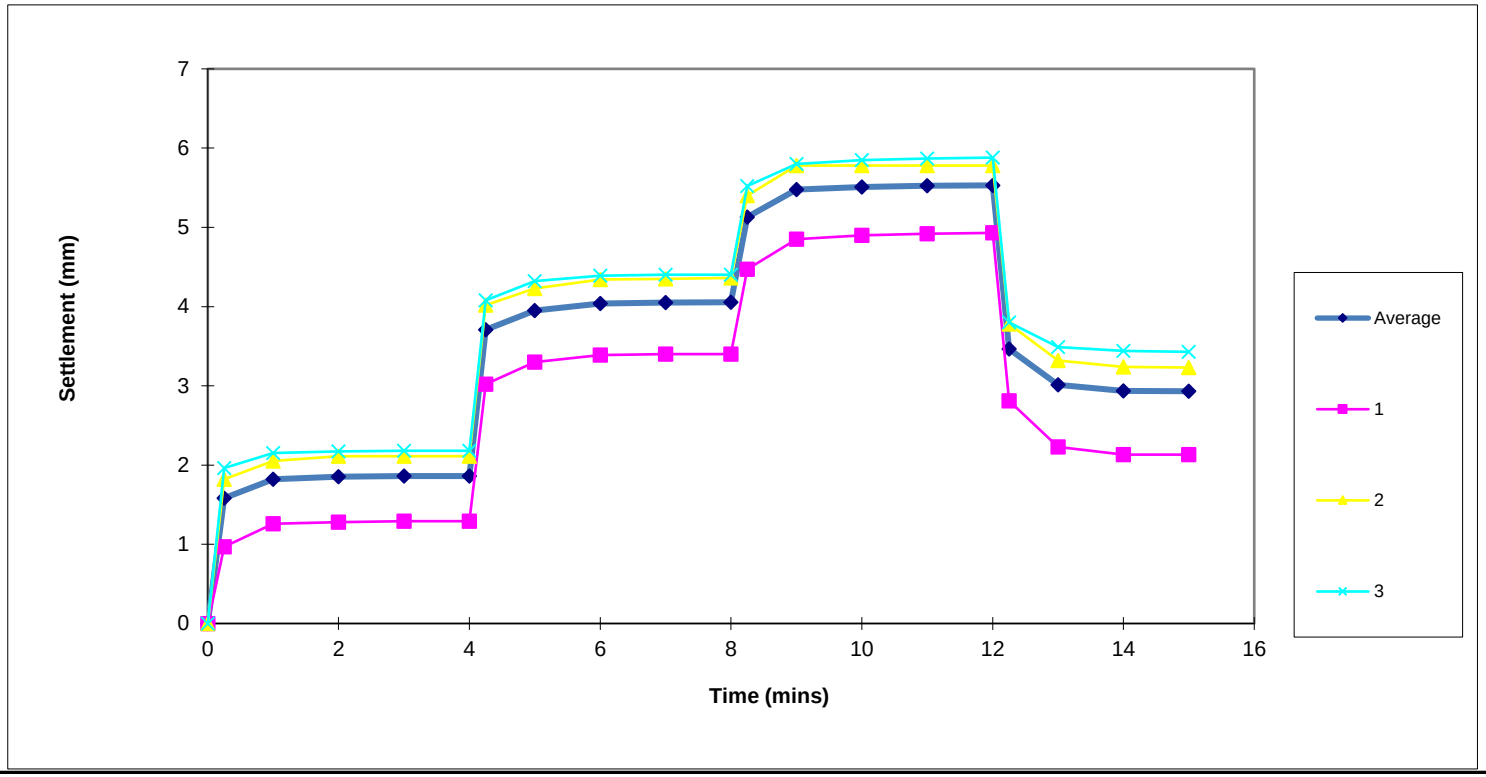
Plate Load Test Settlement v Time Data

Contract: Herbert Road		Date: 26.05.17
Test Reference: Plate 4	Test Depth: Surface	Plate Diameter: 600 Seating Load: 10kN/m^2

		Travel Guages set on plate			
	Time (mins)	Guage 1	Guage 2	Guage 3	Average Plate Settlement mm
50kN/m^2	0	0	0	0	0
Load	0.25	0.97	1.82	1.96	1.58
	1	1.26	2.05	2.15	1.82
	2	1.28	2.11	2.17	1.85
	3	1.29	2.11	2.18	1.86
	4	1.29	2.11	2.18	1.86
100kN/m^2	4.25	3.02	4.02	4.08	3.71
Load	5	3.30	4.23	4.32	3.95
	6	3.39	4.34	4.39	4.04
	7	3.40	4.35	4.40	4.05
	8	3.40	4.36	4.40	4.05
150kN/m^2	8.25	4.47	5.40	5.52	5.13
Load	9	4.85	5.78	5.80	5.48
	10	4.90	5.78	5.85	5.51
	11	4.92	5.78	5.87	5.52
	12	4.93	5.78	5.88	5.53
0kN/m^2	12.25	2.81	3.78	3.80	3.46
Unload	13	2.23	3.32	3.49	3.01
	14	2.13	3.24	3.44	2.94
	15	2.13	3.23	3.43	2.93

Southern Ground Testing

Plate Load Test Settlement v Time Plot	Test Referece: Plate 4



Contract: Herbert Road	Date: 26.05.17

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Plate 4	Surface	600mm	Compacted clay and demolition rubble.

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
1.86	50	4
4.05	100	8
5.53	150	12
2.93	0	15

Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

CONTRACT: Herbert Road	Date: 26.05.17 Sheet 1 of 1

SOUTHERN GROUND TESTING

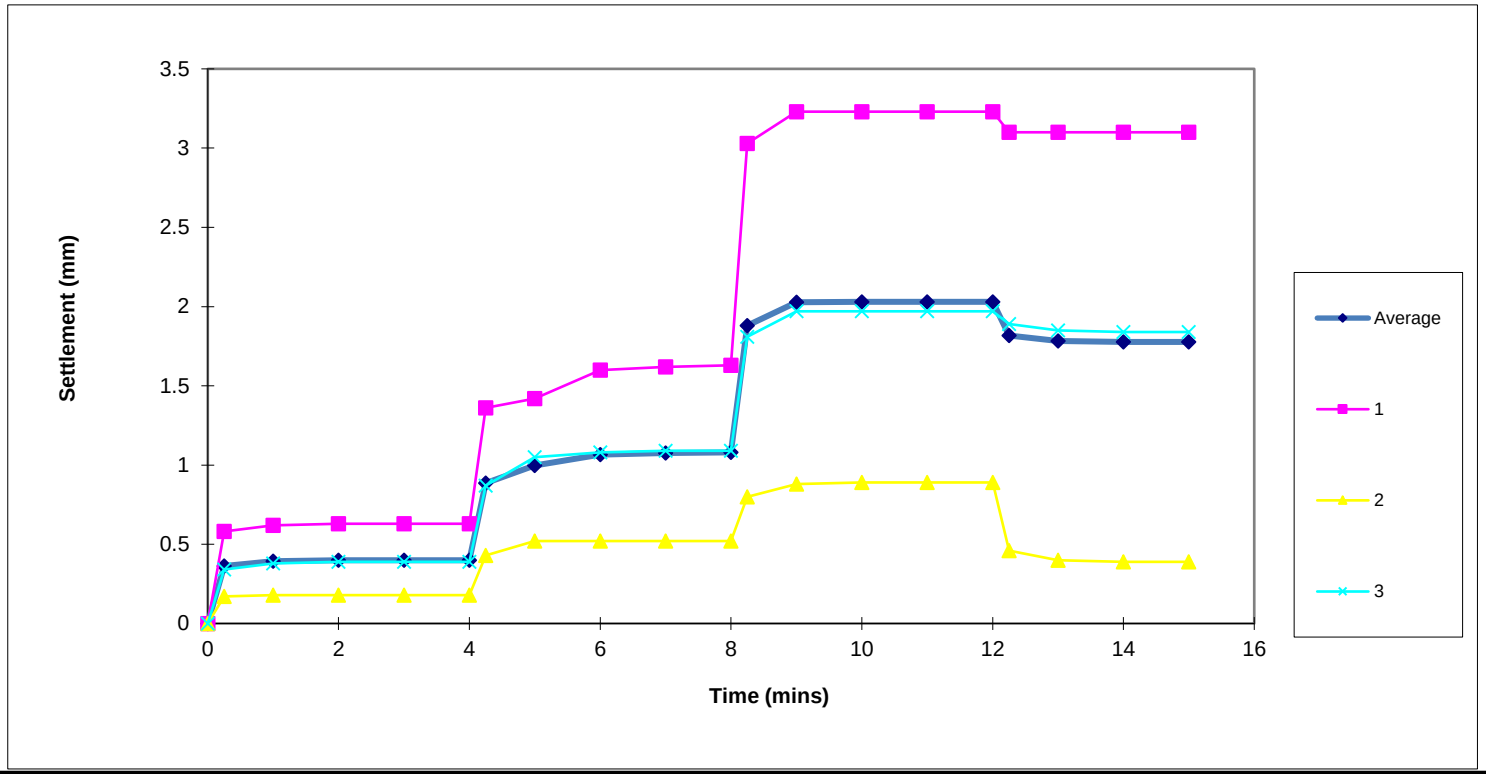
Plate Load Test Settlement v Time Data

Contract: Herbert Road		Date: 26.05.17
Test Reference: Plate 5	Test Depth: Surface	Plate Diameter: 600 Seating Load: 10kN/m^2

		Travel Guages set on plate			
	Time (mins)	Guage 1	Guage 2	Guage 3	Average Plate Settlement mm
50kN/m^2	0	0	0	0	0
Load	0.25	0.58	0.17	0.34	0.36
	1	0.62	0.18	0.38	0.39
	2	0.63	0.18	0.39	0.40
	3	0.63	0.18	0.39	0.40
	4	0.63	0.18	0.39	0.40
100kN/m^2	4.25	1.36	0.43	0.87	0.89
Load	5	1.42	0.52	1.05	1.00
	6	1.60	0.52	1.08	1.07
	7	1.62	0.52	1.09	1.08
	8	1.63	0.52	1.09	1.08
150kN/m^2	8.25	3.03	0.80	1.81	1.88
Load	9	3.23	0.88	1.97	2.03
	10	3.23	0.89	1.97	2.03
	11	3.23	0.89	1.97	2.03
	12	3.23	0.89	1.97	2.03
0kN/m^2	12.25	3.10	0.46	1.89	1.82
Unload	13	3.10	0.40	1.85	1.78
	14	3.10	0.39	1.84	1.78
	15	3.10	0.39	1.84	1.78

Southern Ground Testing

Plate Load Test Settlement v Time Plot	Test Referece: Plate 5



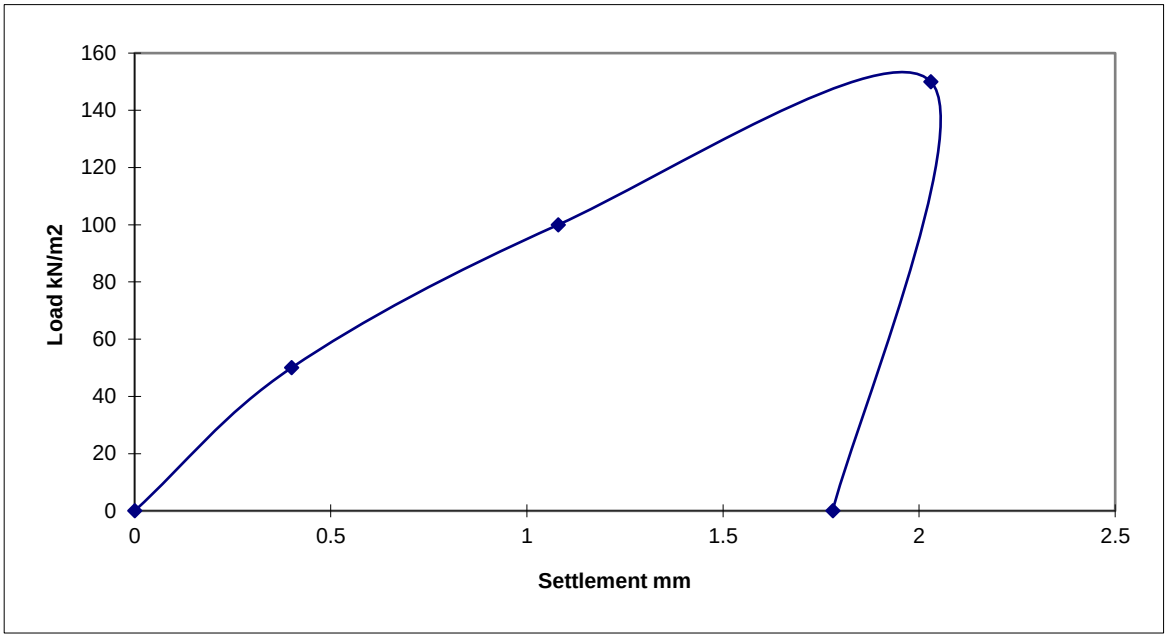
Contract: Herbert Road	Date: 26.05.17

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Plate 5	Surface	600mm	Compacted clay and demolition rubble.

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
0.40	50	4
1.08	100	8
2.03	150	12
1.78	0	15



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

CONTRACT: Herbert Road	Date: 26.05.17 Sheet 1 of 1

SOUTHERN GROUND TESTING

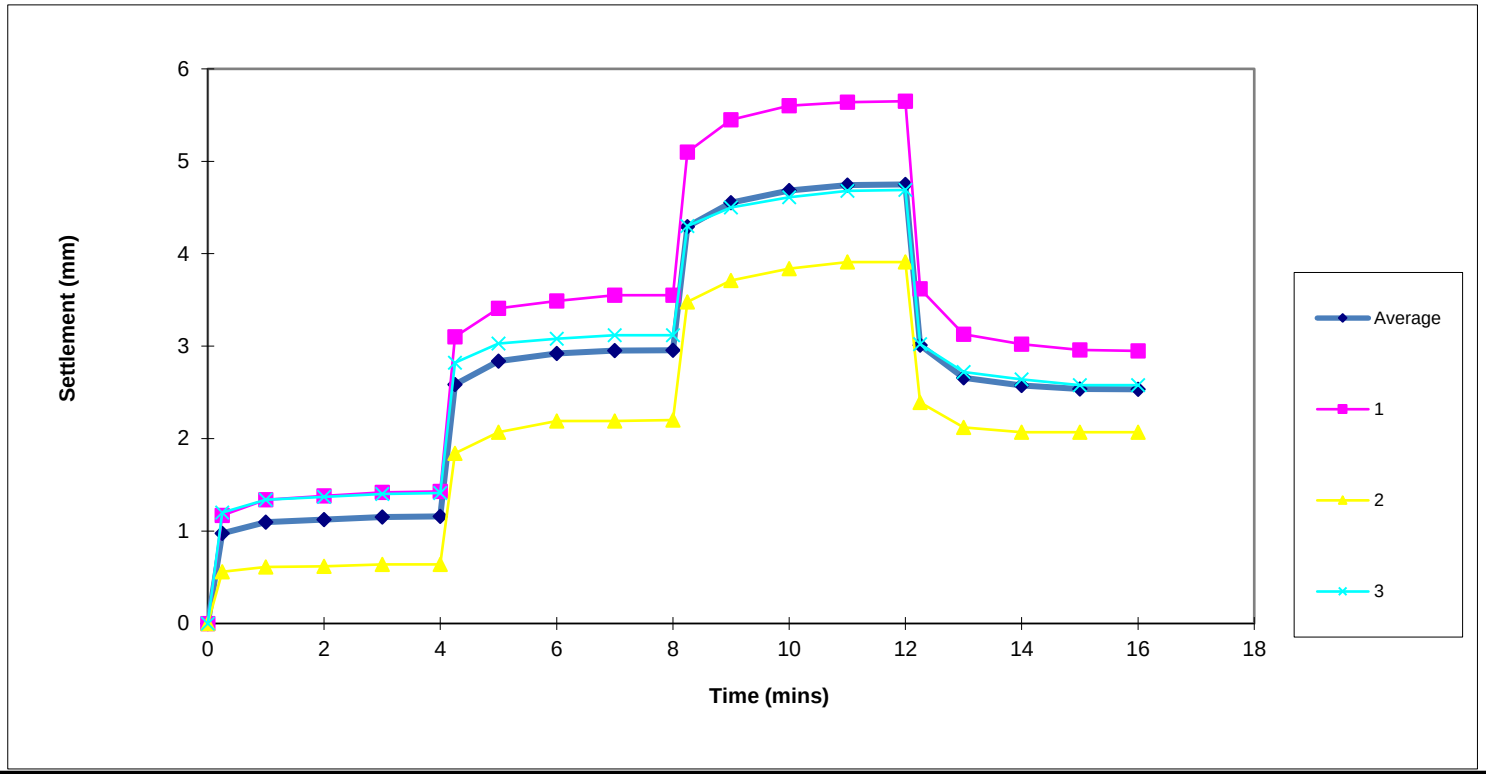
Plate Load Test Settlement v Time Data

Contract: Herbert Road		Date: 26.05.17
Test Reference: Plate 6	Test Depth: Surface	Plate Diameter: 600 Seating Load: 10kN/m^2

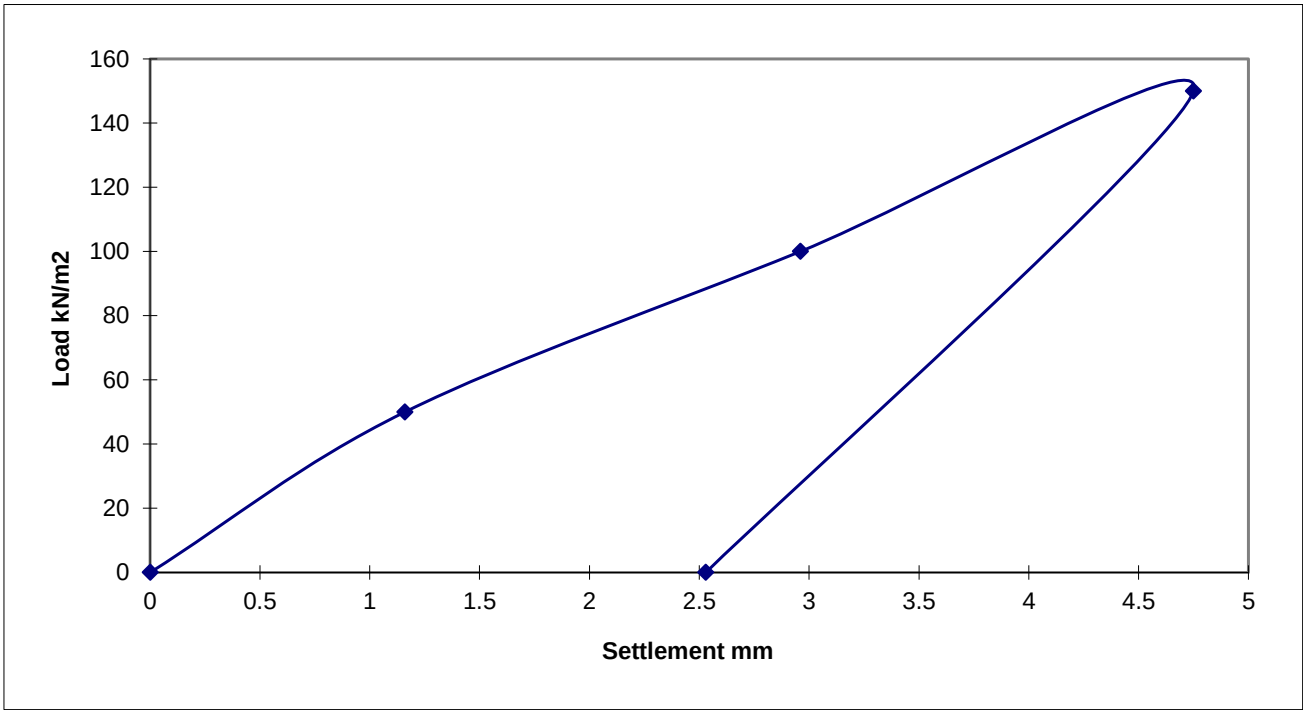
		Travel Guages set on plate			
	Time (mins)	Guage 1	Guage 2	Guage 3	Average Plate Settlement mm
50kN/m^2	0	0	0	0	0
Load	0.25	1.17	0.56	1.20	0.98
	1	1.34	0.61	1.34	1.10
	2	1.38	0.62	1.37	1.12
	3	1.42	0.64	1.40	1.15
	4	1.43	0.64	1.41	1.16
100kN/m^2	4.25	3.10	1.84	2.82	2.59
Load	5	3.41	2.07	3.03	2.84
	6	3.49	2.19	3.08	2.92
	7	3.55	2.19	3.12	2.95
	8	3.55	2.20	3.12	2.96
150kN/m^2	8.25	5.10	3.48	4.30	4.29
Load	9	5.45	3.71	4.50	4.55
	10	5.60	3.84	4.61	4.68
	11	5.64	3.91	4.68	4.74
	12	5.65	3.91	4.69	4.75
0kN/m^2	12.25	3.62	2.39	3.02	3.01
Unload	13	3.13	2.12	2.72	2.66
	14	3.02	2.07	2.64	2.58
	15	2.96	2.07	2.58	2.54
	16	2.95	2.07	2.58	2.53

Southern Ground Testing

Plate Load Test Settlement v Time Plot	Test Referece: Plate 6



Contract: Herbert Road	Date: 26.05.17


160
140
120
100
80
60
40
20
0
Load kN/m2
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Settlement mm

SOUTHERN GROUND TESTING

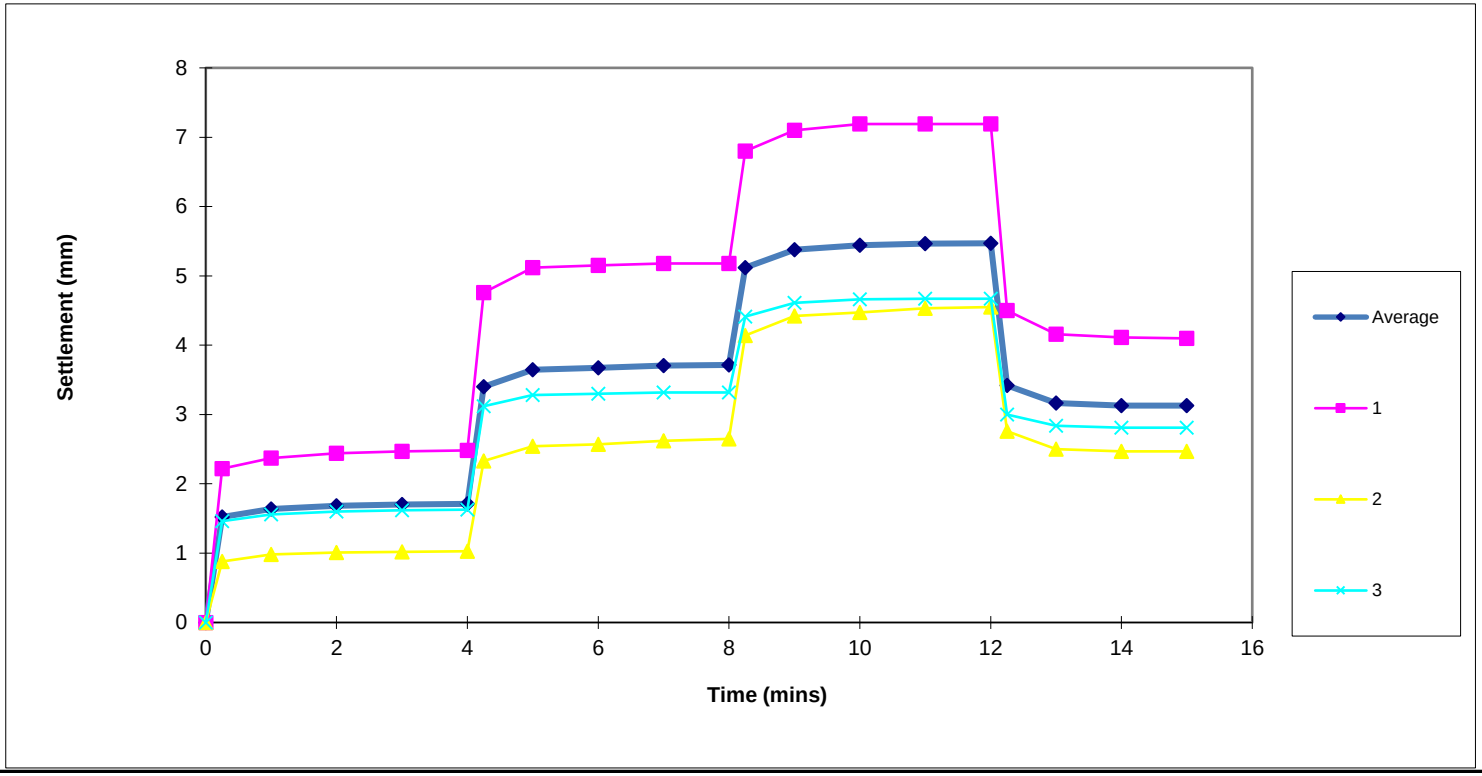
Plate Load Test Settlement v Time Data

Contract: Herbert Road		Date: 26.05.17
Test Reference: Plate 7	Test Depth: Surface	Plate Diameter: 600 Seating Load: 10kN/m^2

		Travel Guages set on plate			
	Time (mins)	Guage 1	Guage 2	Guage 3	Average Plate Settlement mm
50kN/m^2	0	0	0	0	0
Load	0.25	2.22	0.88	1.46	1.52
	1	2.37	0.98	1.56	1.64
	2	2.44	1.01	1.60	1.68
	3	2.47	1.02	1.62	1.70
	4	2.48	1.03	1.63	1.71
100kN/m^2	4.25	4.76	2.33	3.12	3.40
Load	5	5.12	2.54	3.28	3.65
	6	5.15	2.57	3.30	3.67
	7	5.18	2.62	3.32	3.71
	8	5.18	2.65	3.32	3.72
150kN/m^2	8.25	6.80	4.14	4.41	5.12
Load	9	7.10	4.42	4.61	5.38
	10	7.19	4.47	4.66	5.44
	11	7.19	4.53	4.67	5.46
	12	7.19	4.55	4.67	5.47
0kN/m^2	12.25	4.50	2.76	3.00	3.42
Unload	13	4.16	2.50	2.84	3.17
	14	4.11	2.47	2.81	3.13
	15	4.10	2.47	2.81	3.13

Southern Ground Testing

Plate Load Test Settlement v Time Plot	Test Referece: Plate 7



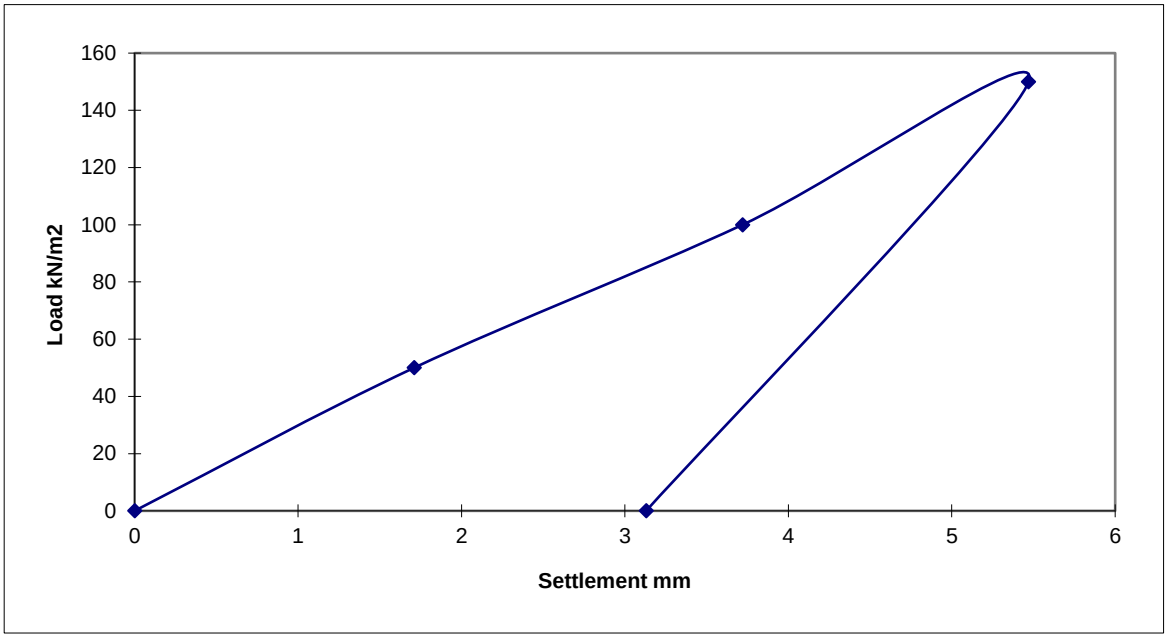
Contract: Herbert Road	Date: 26.05.17

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Plate 7	Surface	600mm	Compacted clay and demolition rubble.

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
1.71	50	4
3.72	100	8
5.47	150	12
3.13	0	15



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

CONTRACT: Herbert Road	Date: 26.05.17 Sheet 1 of 1

SOUTHERN GROUND TESTING

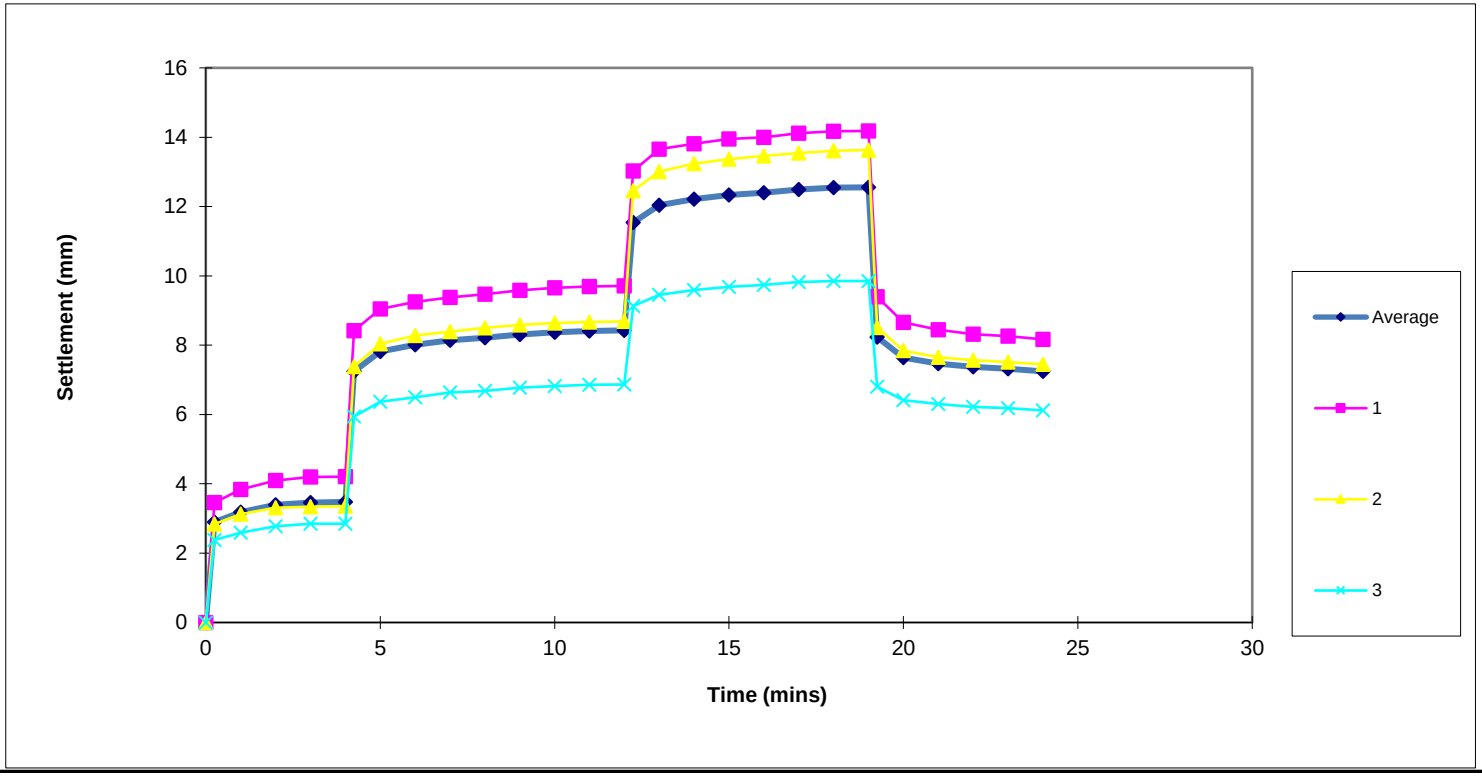
Plate Load Test Settlement v Time Data

Contract: Herbert Road		Date: 26.05.17
Test Reference: Plate 8	Test Depth: Surface	Plate Diameter: 600 Seating Load: 10kN/m^2

		Travel Guages set on plate			
	Time (mins)	Guage 1	Guage 2	Guage 3	Average Plate Settlement mm
50kN/m^2	0	0	0	0	0
Load	0.25	3.46	2.84	2.38	2.89
	1	3.84	3.13	2.59	3.19
	2	4.10	3.31	2.78	3.40
	3	4.20	3.34	2.85	3.46
	4	4.21	3.36	2.85	3.47
100kN/m^2	4.25	8.42	7.38	5.94	7.25
Load	5	9.05	8.04	6.37	7.82
	6	9.25	8.28	6.50	8.01
	7	9.38	8.39	6.64	8.14
	8	9.47	8.50	6.68	8.22
	9	9.58	8.58	6.77	8.31
	10	9.66	8.64	6.82	8.37
	11	9.69	8.67	6.86	8.41
	12	9.71	8.69	6.87	8.42
150kN/m^2	12.25	13.03	12.45	9.13	11.54
Load	13	13.65	13.01	9.45	12.04
	14	13.81	13.24	9.59	12.21
	15	13.95	13.37	9.68	12.33
	16	14.00	13.46	9.74	12.40
	17	14.12	13.54	9.82	12.49
	18	14.17	13.61	9.85	12.54
	19	14.18	13.63	9.85	12.55
0kN/m^2	19.25	9.40	8.51	6.80	8.24
Unload	20	8.66	7.85	6.41	7.64
	21	8.45	7.65	6.30	7.47
	22	8.32	7.57	6.22	7.37
	23	8.26	7.51	6.18	7.32
	24	8.17	7.45	6.12	7.25

Southern Ground Testing

Plate Load Test Settlement v Time Plot	Test Referece: Plate 8



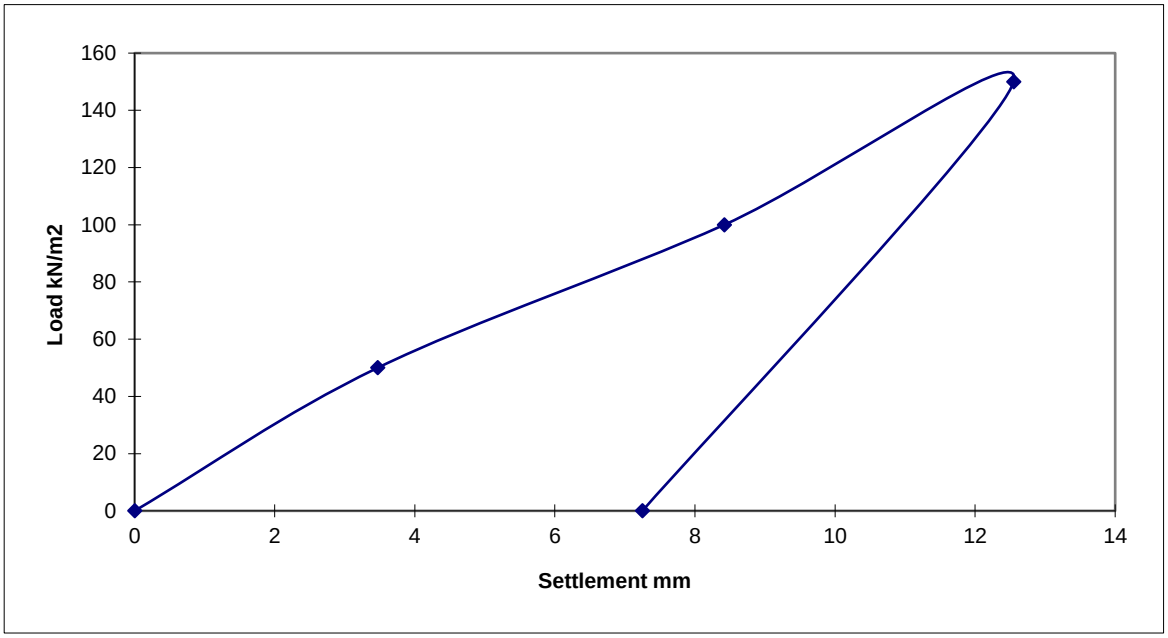
Contract: Herbert Road	Date: 26.05.17

SOUTHERN GROUND TESTING

PLATE LOAD TEST SUMMARY

Test Reference:	Test Depth:	Plate Diameter:	Soil Description:
Plate 8	Surface	600mm	Compacted clay and demolition rubble.

Average Plate Settlement (mm)	Load (kN/m^2)	Time (mins)
0	0	0
3.47	50	4
8.42	100	12
12.55	150	19
7.25	0	24



Notes:

1: Circular steel plate bedded on uniform coarse sand.
2: Tracked excavator used as counter weight.
3: Load applied to plate via hydraulic jack and loading columns.
4: Each load increment applied until plate settlement less than 0.01mm per minute.
5: Plate settlement measured by three travel guages fixed to datum beams.
6: Load measured using electric load cell.

REMARKS: Test carried out in accordance with BS1377.1990, Part 9.

CONTRACT: Herbert Road	Date: 26.05.17 Sheet 1 of 1

ANNEX M
Geotechnical Test Results Certificates – July 2018

TEST REPORT
DETERMINATION OF PLATE BEARING CAPACITY

Project	Herbert Road	**Test No:**	1
Client	Engie Regeneration Ltd	**Lab Ref No:**	
		Date Tested	18.07.2018
		Date Reported	
Technician	Roy Winnett	**Weather Conditions**	Dry
Location	NEWPORT	**Plate Dia (mm)**	600
GPS Coord's	W 2° 59' 10.6", N 51° 35' 58.0"	**m to excavation wall**	
Material Type	HARDCORE	**Depth (m)**	0
No Cycles	1	**Reaction Type**	13

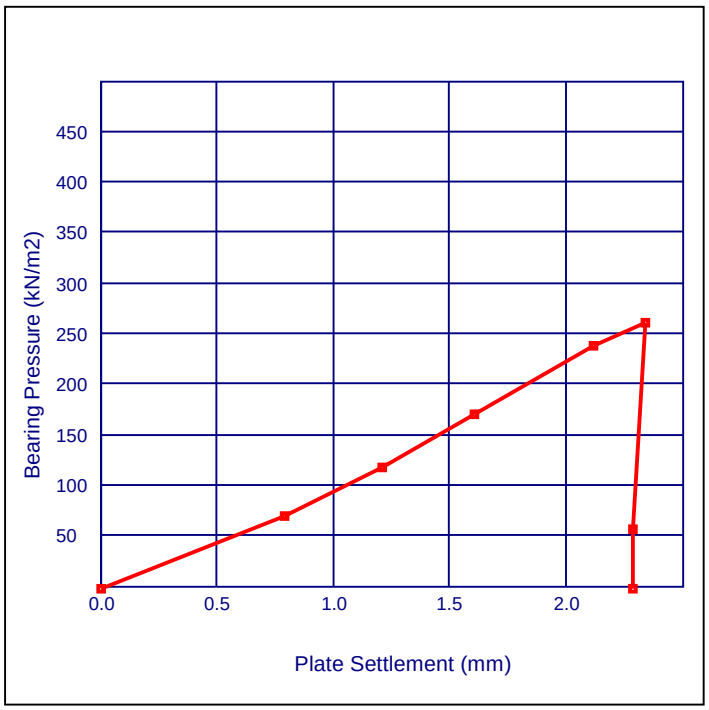


Plate Settlement (mm)	Bearing Pressure (kN/m2)
0.00	0.0
0.79	71.9
1.21	120.3
1.60	172.7
2.11	240.4
2.34	263.2
2.28	59.1
2.28	0.0

	Cycle 1	Cycle 2
Maximum Applied Pressure (kPa):	**263**	**0**
Maximum deformation (mm):	**2.34**	**0.00**
Modulus of subgrade reaction K (MN/m3):	**100.9**	**N/A**
K762 (MN/m3):	**81.1**	**N/A**
Estimated CBR (%):	**20**	**N/A**

Comments:

Approved Signature
Terra Firma (wales) Limited
Dr Gwyn Lake
Director

Plate Load - Tested in accordance with BS 1377 : Part
Moisture Content - Tested in accordance with BS 137
Opinions and interpolations expressed herein are outside the scope of UKAS accreditation

TEST REPORT
DETERMINATION OF PLATE BEARING CAPACITY

Project	Herbert Road	**Test No:**	2
Client	Engie Regeneration Ltd	**Lab Ref No:**	
		Date Tested	18.07.2018
		Date Reported	
Technician	Roy Winnett	**Weather Conditions**	Dry
Location	NEWPORT	**Plate Dia (mm)**	600
GPS Coord's	W 2° 59' 10.5", N 51° 35' 57.0"	**m to excavation wall**	
Material Type	HARDCORE	**Depth (m)**	0
No Cycles	1	**Reaction Type**	13

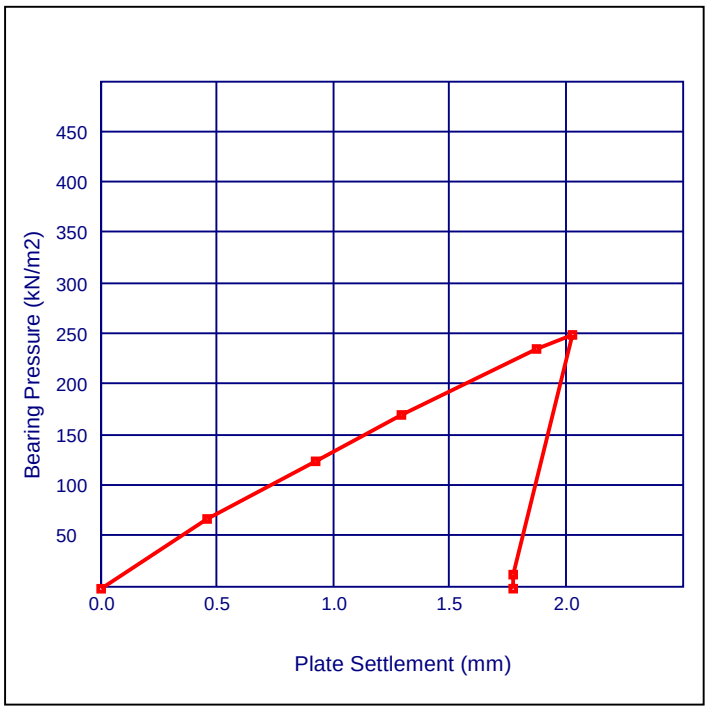


Plate Settlement (mm)	Bearing Pressure (kN/m2)
0.00	0.0
0.45	69.1
0.92	126.3
1.29	172.2
1.87	237.3
2.02	251.2
1.77	14.1
1.77	0.0

	Cycle 1	Cycle 2
Maximum Applied Pressure (kPa):	**251**	**0**
Maximum deformation (mm):	**2.02**	**0.00**
Modulus of subgrade reaction K (MN/m3):	**133.8**	**N/A**
K762 (MN/m3):	**107.7**	**N/A**
Estimated CBR (%):	**32**	**N/A**

Comments:

Approved Signature
Terra Firma (wales) Limited
Dr Gwyn Lake
Director

Plate Load - Tested in accordance with BS 1377 : Part
Moisture Content - Tested in accordance with BS 137
Opinions and interpolations expressed herein are outside the scope of UKAS accreditation

TEST REPORT
DETERMINATION OF PLATE BEARING CAPACITY

Project	Herbert Road	**Test No:**	3
Client	Engie Regeneration Ltd	**Lab Ref No:**	
		Date Tested	18.07.2018
		Date Reported	
Technician	Roy Winnett	**Weather Conditions**	Dry
Location	NEWPORT	**Plate Dia (mm)**	600
GPS Coord's	W 2° 59' 10.5", N 51° 35' 55.7"	**m to excavation wall**	
Material Type	HARDCORE	**Depth (m)**	0
No Cycles	1	**Reaction Type**	13

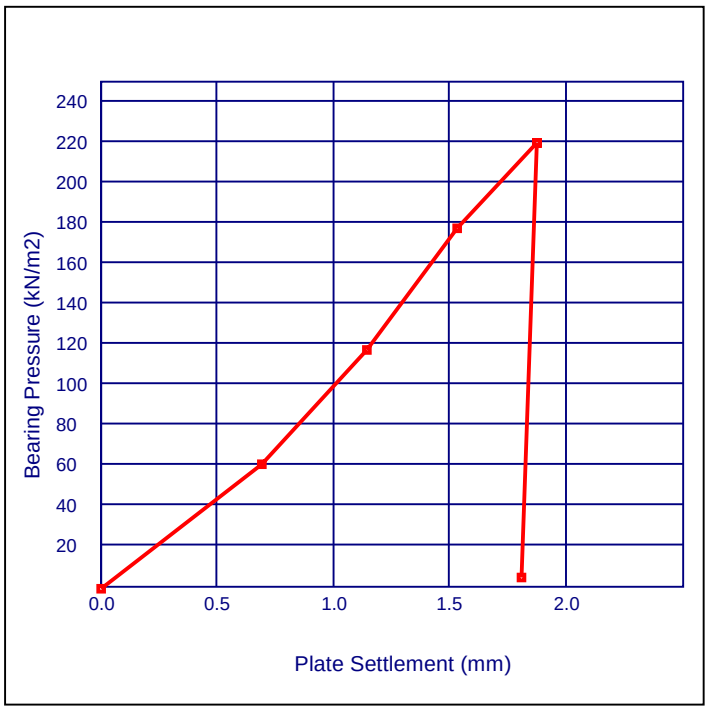


Plate Settlement (mm)	Bearing Pressure (kN/m2)
0.00	0.0
0.69	61.6
1.14	118.3
1.53	178.4
1.87	220.6
1.87	220.7
1.80	5.6

	Cycle 1
Maximum Applied Pressure (kPa):	**221**
Maximum deformation (mm):	**1.87**
Modulus of subgrade reaction K (MN/m3):	**108.2**
K762 (MN/m3):	**87.0**
Estimated CBR (%):	**22**

Comments:

Approved Signature
Terra Firma (wales) Limited
Dr Gwyn Lake
Director

Plate Load - Tested in accordance with BS 1377 : Part
Moisture Content - Tested in accordance with BS 137
Opinions and interpolations expressed herein are outside the scope of UKAS accreditation

TEST REPORT
DETERMINATION OF PLATE BEARING CAPACITY

Project	Herbert Road	**Test No:**	4
Client	Engie Regeneration Ltd	**Lab Ref No:**	
		Date Tested	18.07.2018
		Date Reported	
Technician	Roy Winnett	**Weather Conditions**	Dry
Location	NEWPORT	**Plate Dia (mm)**	600
GPS Coord's	W 2° 59' 10.6", N 51° 35' 54.7"	**m to excavation wall**	
Material Type	HARDCORE	**Depth (m)**	0
No Cycles	1	**Reaction Type**	13

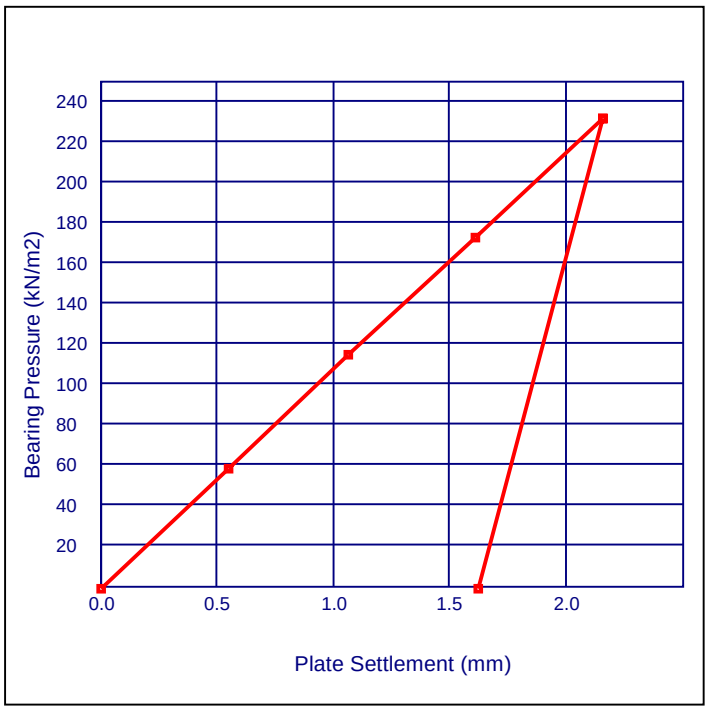


Plate Settlement (mm)	Bearing Pressure (kN/m2)
0.00	0.0
0.55	59.4
1.06	115.8
1.61	173.9
2.15	232.8
2.15	232.8
1.62	0.0

	Cycle 1
Maximum Applied Pressure (kPa):	**233**
Maximum deformation (mm):	**2.15**
Modulus of subgrade reaction K (MN/m3):	**108.7**
K762 (MN/m3):	**87.4**
Estimated CBR (%):	**22**

Comments:

Approved Signature
Terra Firma (wales) Limited
Dr Gwyn Lake
Director

Plate Load - Tested in accordance with BS 1377 : Part
Moisture Content - Tested in accordance with BS 137
Opinions and interpolations expressed herein are outside the scope of UKAS accreditation

TEST REPORT
DETERMINATION OF PLATE BEARING CAPACITY

Project	Herbert Road	**Test No:**	5
Client	Engie Regeneration Ltd	**Lab Ref No:**	
		Date Tested	18.07.2018
		Date Reported	
Technician	Roy Winnett	**Weather Conditions**	Dry
Location	NEWPORT	**Plate Dia (mm)**	600
GPS Coord's	W 2° 59' 11.9", N 51° 35' 58.0"	**m to excavation wall**	
Material Type	HARDCORE	**Depth (m)**	0
No Cycles	1	**Reaction Type**	13

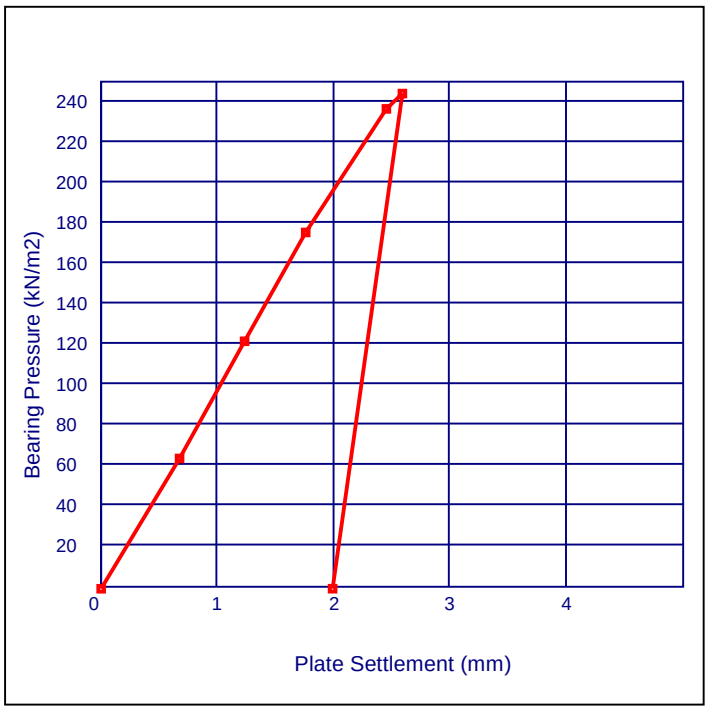


Plate Settlement (mm)	Bearing Pressure (kN/m2)
0.00	0.0
0.67	64.5
1.23	122.4
1.76	176.4
2.45	237.5
2.59	245.1
1.99	0.0

	Cycle 1
Maximum Applied Pressure (kPa):	**245**
Maximum deformation (mm):	**2.59**
Modulus of subgrade reaction K (MN/m3):	**99.6**
K762 (MN/m3):	**80.1**
Estimated CBR (%):	**19**

Comments:

Approved Signature
Terra Firma (wales) Limited
Dr Gwyn Lake
Director

Plate Load - Tested in accordance with BS 1377 : Part
Moisture Content - Tested in accordance with BS 137
Opinions and interpolations expressed herein are outside the scope of UKAS accreditation

TEST REPORT
DETERMINATION OF PLATE BEARING CAPACITY

Project	Herbert Road	**Test No:**	6
Client	Engie Regeneration Ltd	**Lab Ref No:**	
		Date Tested	18.07.2018
		Date Reported	
Technician	Roy Winnett	**Weather Conditions**	Dry
Location	NEWPORT	**Plate Dia (mm)**	600
GPS Coord's	W 2° 59' 13.3", N 51° 35' 53.9"	**m to excavation wall**	
Material Type	HARDCORE	**Depth (m)**	0
No Cycles	1	**Reaction Type**	13

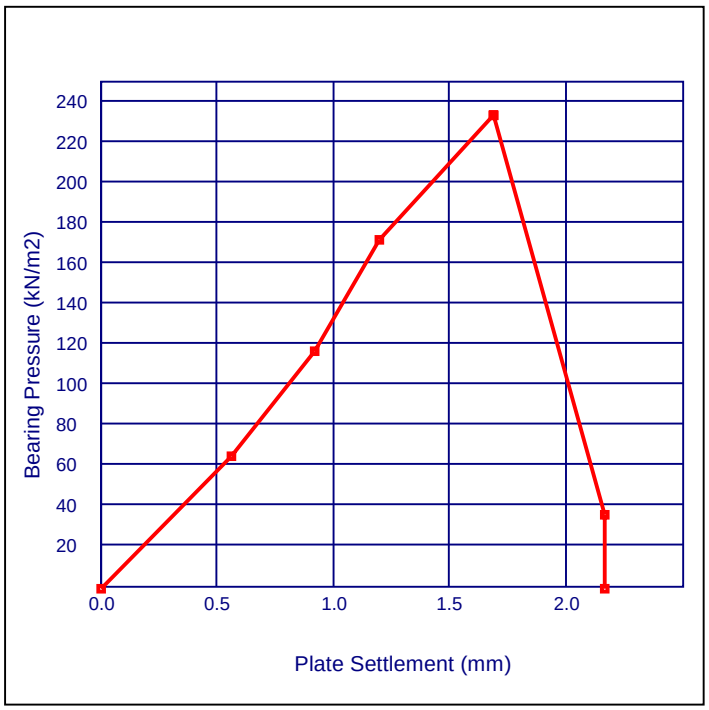


Plate Settlement (mm)	Bearing Pressure (kN/m2)
0.00	0.0
0.56	65.6
0.92	117.6
1.19	172.7
1.68	234.3
1.69	234.3
2.16	36.6
2.16	0.0

	Cycle 1	Cycle 2
Maximum Applied Pressure (kPa):	**234**	**0**
Maximum deformation (mm):	**2.16**	**0.00**
Modulus of subgrade reaction K (MN/m3):	**143.8**	**N/A**
K762 (MN/m3):	**115.7**	**N/A**
Estimated CBR (%):	**36**	**N/A**

Comments:

Approved Signature
Terra Firma (wales) Limited
Dr Gwyn Lake
Director

Plate Load - Tested in accordance with BS 1377 : Part
Moisture Content - Tested in accordance with BS 137
Opinions and interpolations expressed herein are outside the scope of UKAS accreditation

TEST REPORT
DETERMINATION OF PLATE BEARING CAPACITY

Project	Herbert Road	**Test No:**	7
Client	Engie Regeneration Ltd	**Lab Ref No:**	
		Date Tested	18.07.2018
		Date Reported	
Technician	Roy Winnett	**Weather Conditions**	Dry
Location	NEWPORT	**Plate Dia (mm)**	600
GPS Coord's	W 2° 59' 13.3", N 51° 35' 53.9"	**m to excavation wall**	
Material Type	HARDCORE	**Depth (m)**	0
No Cycles	1	**Reaction Type**	13

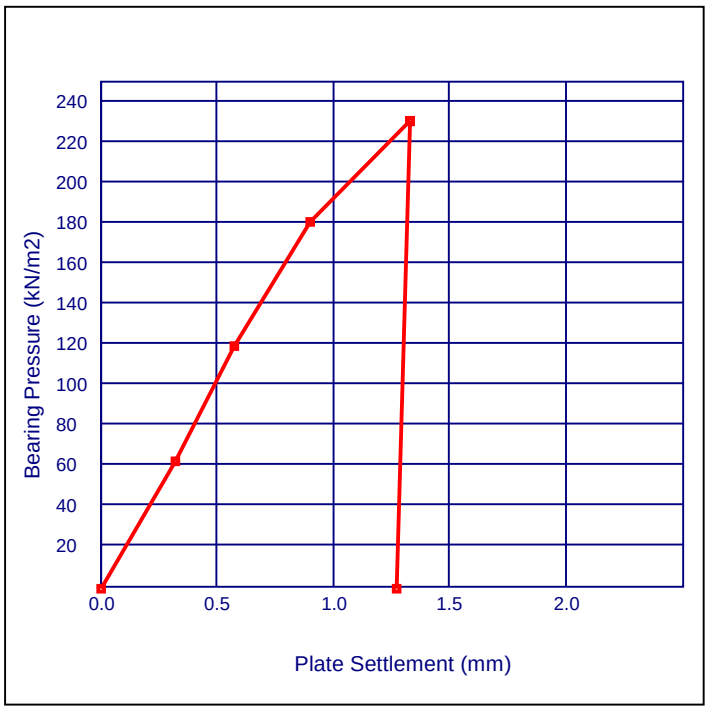


Plate Settlement (mm)	Bearing Pressure (kN/m2)
0.00	0.0
0.32	63.1
0.57	120.1
0.90	181.6
1.33	231.7
1.33	231.3
1.27	0.0

	Cycle 1
Maximum Applied Pressure (kPa):	**232**
Maximum deformation (mm):	**1.33**
Modulus of subgrade reaction K (MN/m3):	**178.2**
K762 (MN/m3):	**143.4**
Estimated CBR (%):	**53**

Comments:

Approved Signature
Terra Firma (wales) Limited
Dr Gwyn Lake
Director

Plate Load - Tested in accordance with BS 1377 : Part
Moisture Content - Tested in accordance with BS 137
Opinions and interpolations expressed herein are outside the scope of UKAS accreditation

TEST REPORT
DETERMINATION OF PLATE BEARING CAPACITY

Project	Herbert Road	**Test No:**	8
Client	Engie Regeneration Ltd	**Lab Ref No:**	
		Date Tested	18.07.2018
		Date Reported	
Technician	Roy Winnett	**Weather Conditions**	Dry
Location	NEWPORT	**Plate Dia (mm)**	600
GPS Coord's	W 2° 59' 13.3", N 51° 35' 53.9"	**m to excavation wall**	
Material Type	HARDCORE	**Depth (m)**	0
No Cycles	1	**Reaction Type**	13

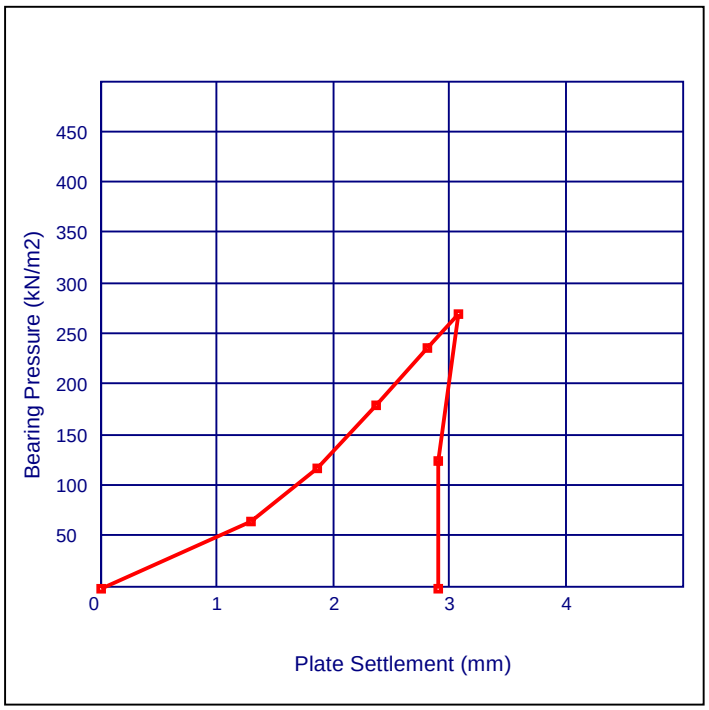


Plate Settlement (mm)	Bearing Pressure (kN/m2)
0.00	0.0
1.29	66.7
1.86	119.1
2.36	181.7
2.80	238.4
3.07	272.1
2.89	126.4
2.89	0.0

	Cycle 1	Cycle 2
Maximum Applied Pressure (kPa):	**272**	**0**
Maximum deformation (mm):	**3.07**	**0.00**
Modulus of subgrade reaction K (MN/m3):	**51.8**	**N/A**
K762 (MN/m3):	**41.7**	**N/A**
Estimated CBR (%):	**6.2**	**N/A**

Comments:

Approved Signature
Terra Firma (wales) Limited
Dr Gwyn Lake
Director

Plate Load - Tested in accordance with BS 1377 : Part
Moisture Content - Tested in accordance with BS 137
Opinions and interpolations expressed herein are outside the scope of UKAS accreditation

TEST REPORT
DETERMINATION OF PLATE BEARING CAPACITY

Project	Herbert Road	**Test No:**	9
Client	Engie Regeneration Ltd	**Lab Ref No:**	
		Date Tested	18.07.2018
		Date Reported	
Technician	Roy Winnett	**Weather Conditions**	Dry
Location	NEWPORT	**Plate Dia (mm)**	600
GPS Coord's	W 2° 59' 13.7", N 51° 35' 57.7"	**m to excavation wall**	
Material Type	HARDCORE	**Depth (m)**	0
No Cycles	1	**Reaction Type**	13

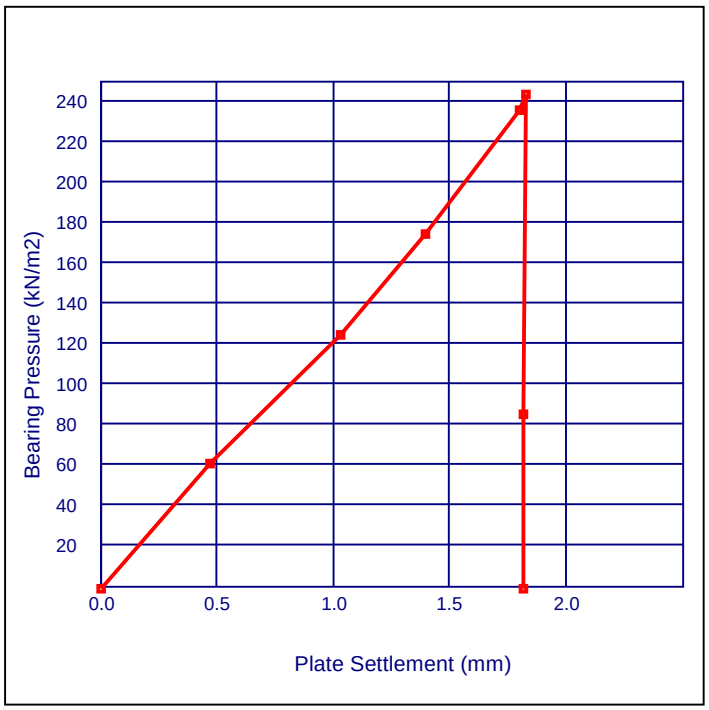


Plate Settlement (mm)	Bearing Pressure (kN/m2)
0.00	0.0
0.47	62.0
1.03	125.6
1.39	175.6
1.80	236.9
1.82	244.7
1.81	86.3
1.81	0.0

	Cycle 1	Cycle 2
Maximum Applied Pressure (kPa):	**245**	**0**
Maximum deformation (mm):	**1.82**	**0.00**
Modulus of subgrade reaction K (MN/m3):	**124.9**	**N/A**
K762 (MN/m3):	**100.5**	**N/A**
Estimated CBR (%):	**28**	**N/A**

Comments:

Approved Signature
Terra Firma (wales) Limited
Dr Gwyn Lake
Director

Plate Load - Tested in accordance with BS 1377 : Part
Moisture Content - Tested in accordance with BS 137
Opinions and interpolations expressed herein are outside the scope of UKAS accreditation

TEST REPORT
DETERMINATION OF PLATE BEARING CAPACITY

Project	Herbert Road	**Test No:**	10
Client	Engie Regeneration Ltd	**Lab Ref No:**	
		Date Tested	18.07.2018
		Date Reported	
Technician	Roy Winnett	**Weather Conditions**	Dry
Location	NEWPORT	**Plate Dia (mm)**	600
GPS Coord's	W 2° 59' 13.3", N 51° 35' 53.9"	**m to excavation wall**	
Material Type	HARDCORE	**Depth (m)**	0
No Cycles	1	**Reaction Type**	13

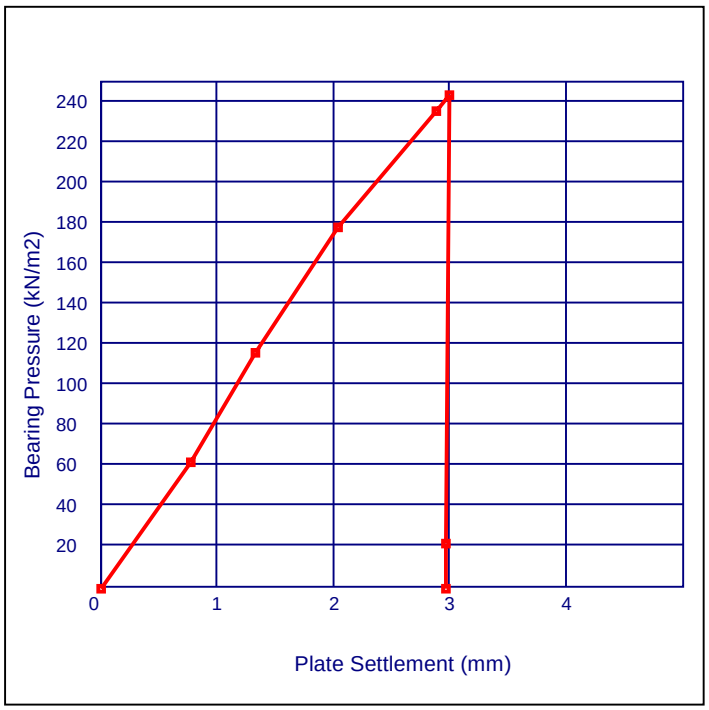


Plate Settlement (mm)	Bearing Pressure (kN/m2)
0.00	0.0
0.77	62.5
1.32	116.7
2.03	178.9
2.88	236.4
2.99	244.3
2.96	22.4
2.96	0.0

	Cycle 1	Cycle 2
Maximum Applied Pressure (kPa):	**244**	**0**
Maximum deformation (mm):	**2.99**	**0.00**
Modulus of subgrade reaction K (MN/m3):	**87.6**	**N/A**
K762 (MN/m3):	**70.5**	**N/A**
Estimated CBR (%):	**15**	**N/A**

Comments:

Approved Signature
Terra Firma (wales) Limited
Dr Gwyn Lake
Director

Plate Load - Tested in accordance with BS 1377 : Part
Moisture Content - Tested in accordance with BS 137
Opinions and interpolations expressed herein are outside the scope of UKAS accreditation

TEST REPORT
DETERMINATION OF PLATE BEARING CAPACITY

Project	Herbert Road	**Test No:**	11
Client	Engie Regeneration Ltd	**Lab Ref No:**	
		Date Tested	18.07.2018
		Date Reported	
Technician	Roy Winnett	**Weather Conditions**	Dry
Location	NEWPORT	**Plate Dia (mm)**	600
GPS Coord's	W 2° 59' 13.3", N 51° 35' 53.9"	**m to excavation wall**	
Material Type	HARDCORE	**Depth (m)**	0
No Cycles	1	**Reaction Type**	13

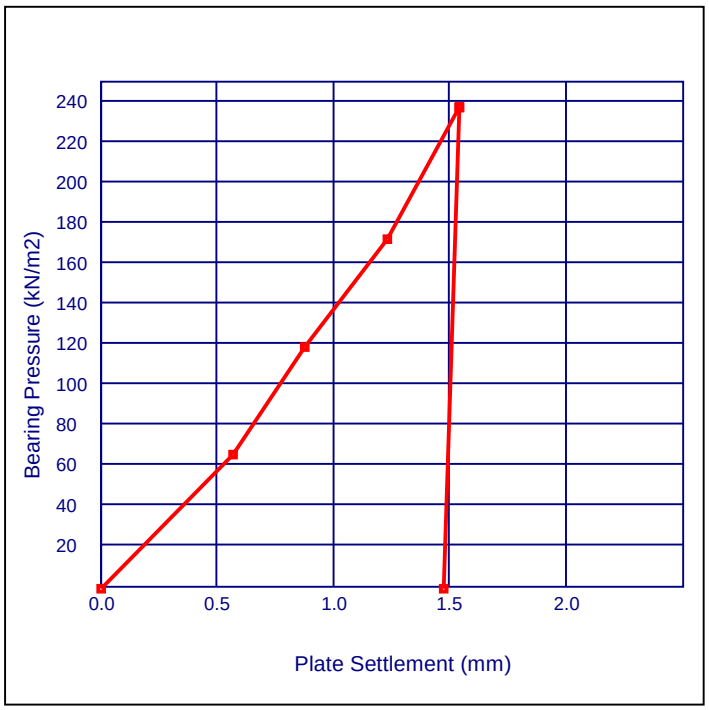


Plate Settlement (mm)	Bearing Pressure (kN/m2)
0.00	0.0
0.57	66.4
0.87	119.7
1.23	173.1
1.54	238.5
1.54	238.2
1.47	0.0

	Cycle 1
Maximum Applied Pressure (kPa):	**239**
Maximum deformation (mm):	**1.54**
Modulus of subgrade reaction K (MN/m3):	**142.0**
K762 (MN/m3):	**114.2**
Estimated CBR (%):	**36**

Comments:

Approved Signature
Terra Firma (wales) Limited
Dr Gwyn Lake
Director

Plate Load - Tested in accordance with BS 1377 : Part
Moisture Content - Tested in accordance with BS 137
Opinions and interpolations expressed herein are outside the scope of UKAS accreditation

TEST REPORT
DETERMINATION OF PLATE BEARING CAPACITY

Project	Herbert Road	**Test No:**	12
Client	Engie Regeneration Ltd	**Lab Ref No:**	
		Date Tested	18.07.2018
		Date Reported	
Technician	Roy Winnett	**Weather Conditions**	Dry
Location	NEWPORT	**Plate Dia (mm)**	600
GPS Coord's	W 2° 59' 13.3", N 51° 35' 53.9"	**m to excavation wall**	
Material Type	HARDCORE	**Depth (m)**	0
No Cycles	1	**Reaction Type**	13

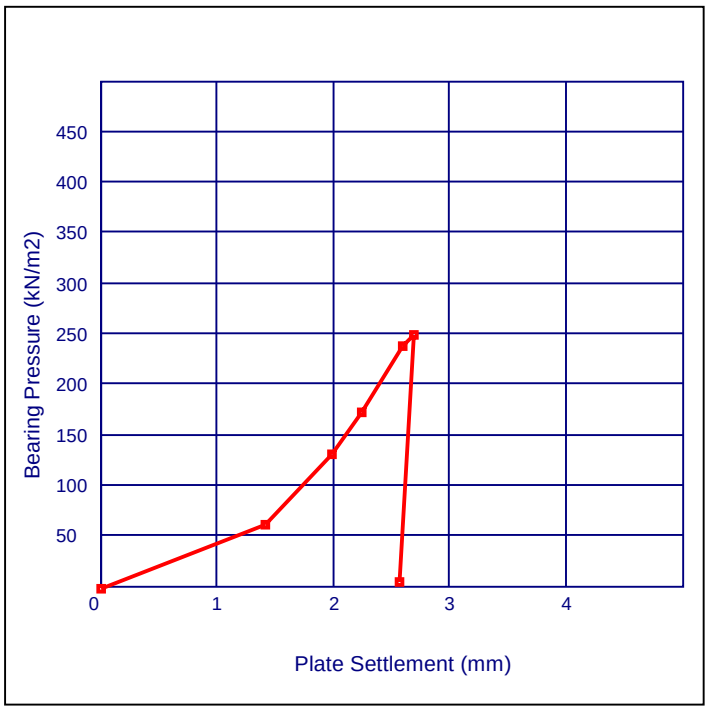


Plate Settlement (mm)	Bearing Pressure (kN/m2)
0.00	0.0
1.41	63.5
1.98	133.3
2.24	174.7
2.59	240.2
2.69	251.3
2.56	6.6

	Cycle 1
Maximum Applied Pressure (kPa):	**251**
Maximum deformation (mm):	**2.69**
Modulus of subgrade reaction K (MN/m3):	**45.0**
K762 (MN/m3):	**36.2**
Estimated CBR (%):	**4.9**

Comments:

Approved Signature
Terra Firma (wales) Limited
Dr Gwyn Lake
Director

Plate Load - Tested in accordance with BS 1377 : Part
Moisture Content - Tested in accordance with BS 137
Opinions and interpolations expressed herein are outside the scope of UKAS accreditation

TEST REPORT
DETERMINATION OF PLATE BEARING CAPACITY

Project	Herbert Road	**Test No:**	13
Client	Engie Regeneration Ltd	**Lab Ref No:**	
		Date Tested	18.07.2018
		Date Reported	
Technician	Roy Winnett	**Weather Conditions**	Dry
Location	NEWPORT	**Plate Dia (mm)**	600
GPS Coord's	W 2° 59' 16.0", N 51° 35' 57.5"	**m to excavation wall**	
Material Type	HARDCORE	**Depth (m)**	0
No Cycles	1	**Reaction Type**	13

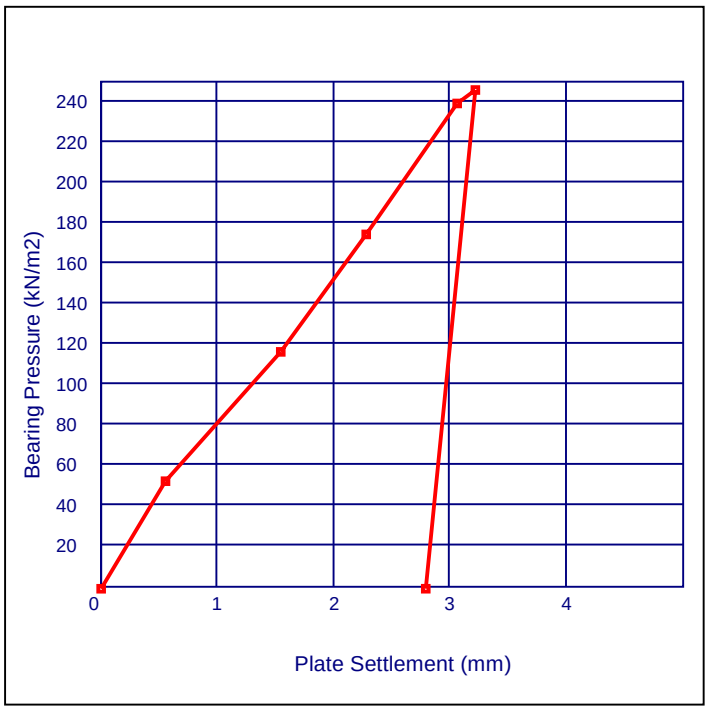


Plate Settlement (mm)	Bearing Pressure (kN/m2)
0.00	0.0
0.55	53.3
1.54	117.3
2.28	175.5
3.06	240.2
3.21	246.8
2.79	0.0

	Cycle 1
Maximum Applied Pressure (kPa):	**247**
Maximum deformation (mm):	**3.21**
Modulus of subgrade reaction K (MN/m3):	**78.8**
K762 (MN/m3):	**63.4**
Estimated CBR (%):	**13**

Comments:

Approved Signature
Terra Firma (wales) Limited
Dr Gwyn Lake
Director

Plate Load - Tested in accordance with BS 1377 : Part
Moisture Content - Tested in accordance with BS 137
Opinions and interpolations expressed herein are outside the scope of UKAS accreditation

TEST REPORT
DETERMINATION OF PLATE BEARING CAPACITY

Project	Herbert Road	**Test No:**	14
Client	Engie Regeneration Ltd	**Lab Ref No:**	
		Date Tested	18.07.2018
		Date Reported	
Technician	Roy Winnett	**Weather Conditions**	Dry
Location	NEWPORT	**Plate Dia (mm)**	600
GPS Coord's	W 2° 59' 15.9", N 51° 35' 56.6"	**m to excavation wall**	
Material Type	HARDCORE	**Depth (m)**	0
No Cycles	1	**Reaction Type**	13

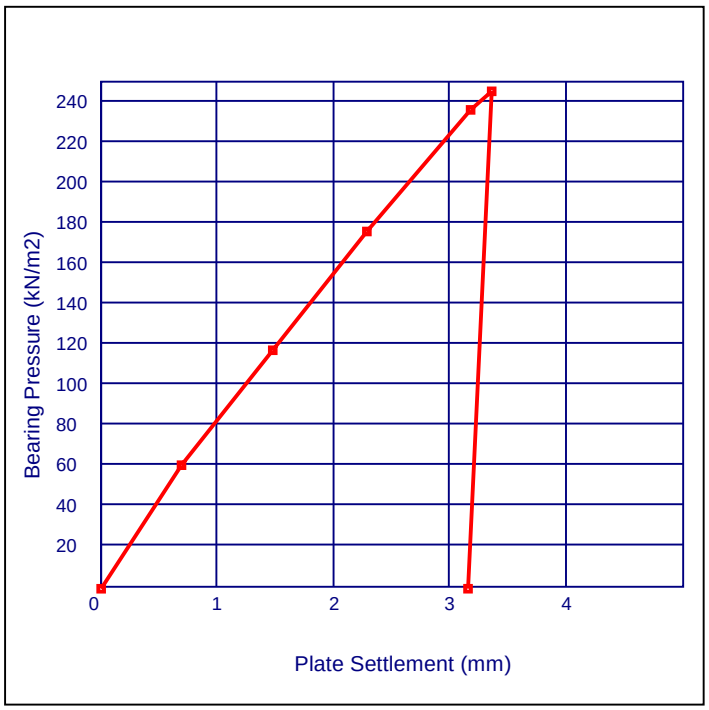


Plate Settlement (mm)	Bearing Pressure (kN/m2)
0.00	0.0
0.69	61.2
1.47	118.1
2.28	176.8
3.17	237.1
3.35	246.3
3.15	0.0

	Cycle 1
Maximum Applied Pressure (kPa):	**246**
Maximum deformation (mm):	**3.35**
Modulus of subgrade reaction K (MN/m3):	**81.5**
K762 (MN/m3):	**65.6**
Estimated CBR (%):	**14**

Comments:

Approved Signature
Terra Firma (wales) Limited
Dr Gwyn Lake
Director

Plate Load - Tested in accordance with BS 1377 : Part
Moisture Content - Tested in accordance with BS 137
Opinions and interpolations expressed herein are outside the scope of UKAS accreditation

TEST REPORT
DETERMINATION OF PLATE BEARING CAPACITY

Project	Herbert Road	**Test No:**	15
Client	Engie Regeneration Ltd	**Lab Ref No:**	
		Date Tested	18.07.2018
		Date Reported	
Technician	Roy Winnett	**Weather Conditions**	Dry
Location	NEWPORT	**Plate Dia (mm)**	600
GPS Coord's	W 2° 59' 16.0", N 51° 35' 56.0"	**m to excavation wall**	
Material Type	HARDCORE	**Depth (m)**	0
No Cycles	1	**Reaction Type**	13

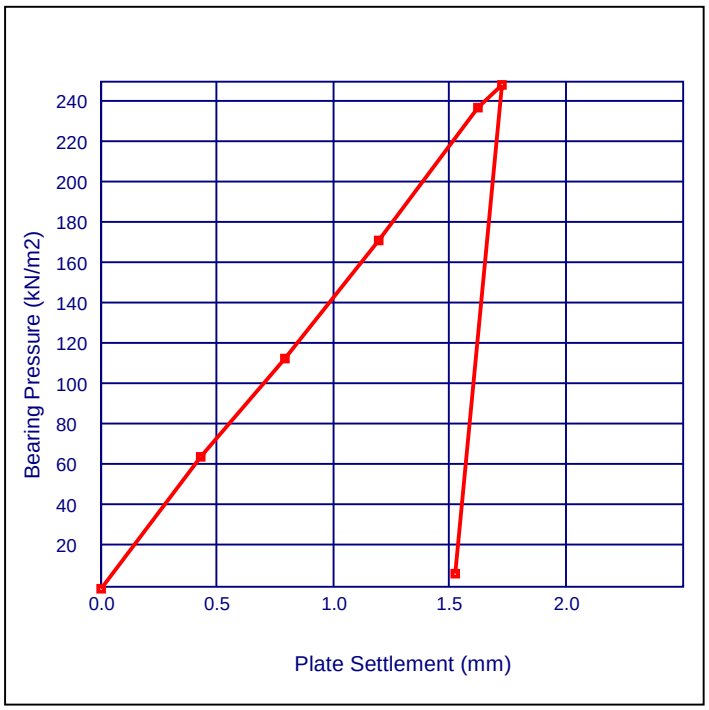


Plate Settlement (mm)	Bearing Pressure (kN/m2)
0.00	0.0
0.43	65.2
0.79	113.9
1.19	172.5
1.62	238.2
1.72	249.4
1.52	7.5

	Cycle 1
Maximum Applied Pressure (kPa):	**249**
Maximum deformation (mm):	**1.72**
Modulus of subgrade reaction K (MN/m3):	**145.2**
K762 (MN/m3):	**116.8**
Estimated CBR (%):	**37**

Comments:

Approved Signature
Terra Firma (wales) Limited
Dr Gwyn Lake
Director

Plate Load - Tested in accordance with BS 1377 : Part
Moisture Content - Tested in accordance with BS 137
Opinions and interpolations expressed herein are outside the scope of UKAS accreditation

TEST REPORT
DETERMINATION OF PLATE BEARING CAPACITY

Project	Herbert Road	**Test No:**	16
Client	Engie Regeneration Ltd	**Lab Ref No:**	
		Date Tested	18.07.2018
		Date Reported	
Technician	Roy Winnett	**Weather Conditions**	Dry
Location	NEWPORT	**Plate Dia (mm)**	600
GPS Coord's	W 2° 59' 15.9", N 51° 35' 54.4"	**m to excavation wall**	
Material Type	HARDCORE	**Depth (m)**	0
No Cycles	1	**Reaction Type**	13

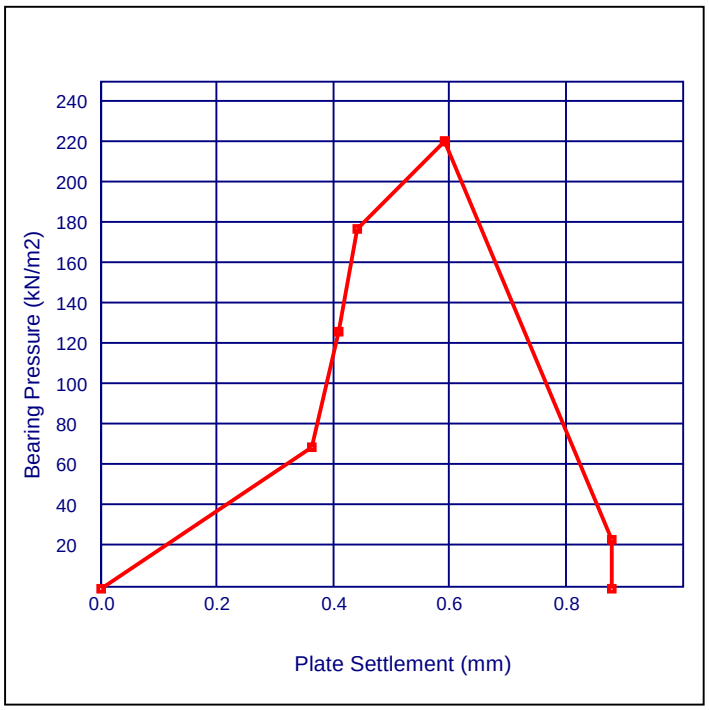


Plate Settlement (mm)	Bearing Pressure (kN/m2)
0.00	0.0
0.36	70.0
0.41	127.3
0.44	178.1
0.59	221.4
0.59	221.3
0.88	24.2
0.88	0.0

	Cycle 1	Cycle 2
Maximum Applied Pressure (kPa):	**221**	**0**
Maximum deformation (mm):	**0.88**	**0.00**
Modulus of subgrade reaction K (MN/m3):	**N/A**	**N/A**
K762 (MN/m3):	**N/A**	**N/A**
Estimated CBR (%):	**N/A**	**N/A**

Comments:

Approved Signature
Terra Firma (wales) Limited
Dr Gwyn Lake
Director

Plate Load - Tested in accordance with BS 1377 : Part
Moisture Content - Tested in accordance with BS 137
Opinions and interpolations expressed herein are outside the scope of UKAS accreditation

ANNEX D
Groundwater Letter

Our Ref: RH/10411/Let25

Your Ref:

Contact: Ruth Howells

Terra Firma (Wales) Ltd.
Consulting Geotechnical & Geo-Environmental Engineers
Site Investigation Contractors

5 Deryn Court, Wharfedale Road,
Pentwyn, Cardiff CF23 7HA
Tel: 029 2073 5354 Fax: 029 2073 5433
Email: info@terrafirmawales.co.uk
www.terrafirmawales.co.uk

30th August 2016

Natural Resources Wales

Via Email

For the attn. of Mr Matthew Llewhellin

Dear Matthew

GROUNDWATER MONITORING: HERBERT ROAD, NEWPORT

In our Remediation Strategy Report No.12032/RS, dated August 2015, it was proposed that further assessment of the groundwater beneath the site and the reen water be completed. The purpose of this was to increase confidence that no risks are presented to the aquatic environment from filling of the site. It was specified that one round of water sampling be completed prior to fill works, and two upon completion of the Riversee Limited fill works, or in the event of delay, the second and third monitoring rounds should be completed no later than five and six months following commencement of the earthworks.

The fill works were delayed in 2015 and are to re-commence shortly. The three groundwater sampling and testing rounds were completed as necessary.

Detailed in the enclosed groundwater test results summary table are the exceedences found in the groundwater results from testing completed in 2013 (BH1 – BH6), 2014 (BH1 – BH6) and from the additional three rounds (newly installed replacement wells, named BH1a – BH6a). The reen was also sampled and tested in the recent monitoring rounds.

All results have been compared to current threshold levels, rather than those used in previous assessment. Water Framework Directive thresholds are referred to where available, and in their absence drinking water directive thresholds are quoted. As per previous reporting petroleum hydrocarbon fractions have been assessed using a target concentration of 10ug/l (0.01mg/l) as a threshold in the absence of available guidelines. Some substances have also been highlighted where present above the laboratory detection limit (LoD), but where no guideline is available.

It should be noted that due to activity on site the well in BH4 was accidentally damaged. Also, the water sampling pump became jammed in BH1. These boreholes could therefore not be sampled in the monitoring rounds 5 months and 6 months after earthworks commencement.

In general, substances previously identified in exceedence at some stage in 2013, 2014 and 2015 tend to also be present in the two more recent 2016 samples. Also, only changes in Water Framework Directive guidance now means copper and zinc are highlighted as potential contaminants.

No correlation between the earthworks and water quality can be identified, and despite an incomplete dataset (due to the damaged/inaccessible wells) the table does not indicate that the fill works on site have had an adverse impact upon the underlying groundwater or reen.

In addition, it should be reiterated that all imported fill has adhered to thresholds levels quoted in our Remediation Strategy, with the exception of some minor exceedences already brought to your attention and subsequently confirmed acceptable.

Earthworks are due to re-commence in the early September 2016. Prior to this the Remediation Strategy Report needs to be revised to cover these remaining fill works.

Based on the above I do not see any merit in continuing water sampling and testing during the remainder of the earthworks.

Further fill will be screened as previously in accordance with our Remediation Strategy, to include leachate analysis to BS:EN:12457. Any unacceptable soils will be rejected and therefore no potential contaminative source to groundwater will be introduced to site.

I would be grateful if you could consider my suggestion for terminating groundwater monitoring at this stage and advise at your earliest opportunity whether you are in agreement or otherwise.

I 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 me.

Yours sincerely
for: Terra Firma (Wales) Ltd

[redacted]

Mrs Ruth Howells

ANNEX E
Reen Testing Letter

Our Ref: RH/12032/ReenLetter

Your Ref:

Contact: Ruth Howells

Terra Firma (Wales) Ltd.
Consulting Geotechnical & Geo-Environmental Engineers
Site Investigation Contractors

5 Deryn Court, Wharfedale Road,
Pentwyn, Cardiff CF23 7HA
Tel: 029 2073 5354 Fax: 029 2073 5433
Email: info@terrafirmawales.co.uk
www.terrafirmawales.co.uk

2nd August 2018

Engie
Second Floor
31 Bocam Park
Pencoed
Bridgend
CF35 5LJ

For the attn. of Mr Tom James

Dear Tom

REEN MONITORING: HERBERT ROAD

Testing Summary

In our Remediation Strategy Report No.12032/RS, dated August 2015, it was proposed that assessment of reen water be completed to confirm that the fill imported during the earthworks had not led to contamination of the reen.

It was specified that one round of water sampling be completed prior to fill works, and two upon completion of the Riversee Limited fill works, or in the event of delay, the second and third monitoring rounds should be completed no later than five and six months following commencement of the earthworks.

These three groundwater sampling and testing rounds were completed as required.

The reen was sampled on the 23.07.2015 at the start the earthworks. The fill works were put on hold in late 2015 and in accordance with the above specification the second and third reen sampling rounds were carried out on the 12.01.2016 and 14.02.2016, respectively.

Terra Firma (Wales) Limited (TFW) presented the reen (and groundwater) monitoring data to NRW in August 2016, and suggested that based on the favourable results no further monitoring of the reen was necessary (TFW Letter 25, dated 30.08.2016).

By email NRW officer responded on 01.09.2016 confirming he had ‘no concerns with ending the groundwater monitoring’ but caveated this by suggesting ‘that this may need to be revisited should any fundamental changes occur’.

Between November 2016 and May 2017 fill materials sourced from Hawes Lane and Green Lane was imported.

TFW assessed the suitability of these soils prior to import in accordance with the Remediation Strategy, as detailed in TFW 'Proposed Fill For Importation Risk Assessment Report', dated November 2016.

With regards to reen waters, following a Remedial Targets Methodology Hydrogeological Risk Assessment for Land Contamination it was concluded that there was a potential risk of leaching of substances within the fill that could impact the reen. Therefore, in order to confirm that there were no adverse effects on the water quality of the reen it was recommended that regular sampling and testing of the reen waters be carried out during and two months following placement of this fill.

Reen sampling was subsequently carried out on the 09.02.17, 27.02.2017, 28.05.2018 and 04.08.2017.

In June 2017 Engie had took over management of the site and the final fill was imported. This comprised piling mat material. This material was sampled and tested by TFW as required in accordance with the Remediation Strategy. Leachate test results found some substances to be in exceedence of generic assessment criteria and at the request of NRW a Remedial Targets Methodology Hydrogeological Risk Assessment for Land Contamination was performed to determine site specific target leachate concentrations. Some substances remained in exceedence to unacceptable levels. Therefore, it was proposed that sampling and testing of the reen waters continue (see TFW Letter 38 dated 19.05.2017 and Letter 43 dated 24.08.2017 to NRW).

Import of the piling mat corresponded with works to enlarge and line the reen between the cross-over to land north of the reen and the western site boundary. The reen was inaccessible for some time due to these works, and it was mostly piped during this period. The photo in **Figure 1** below was taken in September 2017, showing the piped reen waters.

Figure 1: Preparation works for lining of the reen.

Reen samples were taken shortly following completion of the lining of the reen, on the 03.11.2017 (See **Figure 2**), and on the 04.01.2017. The short segment of the reen between the cross-over and eastern site boundary remains unchanged. The reen is culverted beneath the cross-over.

Figure 2: Newly lined reen (03.11.2017)

The reen lining is formed by concrete and is impermeable. Therefore any waters within the made ground cannot directly seep into the reen. Run-off of surface waters into the reen is also unlikely.

Reen Test Results

All reen water laboratory chemical test certificates may be found in **Annex A.**

All the test results are compiled in a table in **Annex B**. Results have been compared to Water Framework Directive thresholds where available, and in their absence drinking water directive thresholds or WHO drinking water standards are quoted (taken from CLAIRE: Petroleum Hydrocarbons in Groundwater (2017)). Some substances have also been highlighted where present above the laboratory detection limit (LoD) where no guideline is available.

The results are variable across the different monitoring periods and only limited correlation between the results and imported fill can be made.

The Green Land and Hawes Lane fill leachate results recorded exceedences of cadmium, copper, lead, zinc, cyanide, anthracene, fluoranthene, benzo(b)fluoranthene, benzo(k)fluoranthene, Benzo(a)pyrene and benzo(ghi)perylene in one or more samples.

The piling mat material had recorded leachate exceedences of copper, chromium III, chromium VI, anthracene, fluoranthene, benzo(b)fluoranthene, benzo(k)fluoranthene, Benzo(a)pyrene, benzo(ghi)perylene and some petroleum hydrocarbon fractions. Sampling of the reen could only be carried out after/during the placement of the piling mat once it had been lined.

Copper has consistently been in exceedence of its threshold level throughout the earthworks and following lining of the reen. The presence of copper cannot therefore be attributed to the fill. The levels of zinc have been variable but generally consistent and zinc concentrations too do not seem to correlate to the chemistry of the imported fill.

Levels of arsenic, cadmium, lead, mercury are inconsistent and their detection in reen water at concentrations above their respective threshold is similarly inconsistent. The presence of these chemicals above WFD threshold levels does correspond with the import of the Hawes Lane and Green Lane Fill. However, their absence following lining of the reen confirms that the concrete lining is acting to prevent inflow of surface water of any shallow waters in to the reen.

It should also be noted that whilst arsenic, cadmium, lead, mercury were at elevated concentrations, these concentrations were generally very low and would have soon been significantly diluted upon reaching the River Usk.

PAH levels recorded have been changeable. Elevated levels were first found to be above threshold levels and laboratory detection following placement of the Hawes Lane and Green Lane Fill (Sampling round 09.01.2017). However, results subsequently fell for the following 3 rounds, only becoming as elevated again following lining of the reen. No direct relationship between fill chemistry and the speciated PAH concentrations in reen water are therefore identified.

Conclusions

Test results suggest that minimal impact was made on the reen waters from fill sourced from Hawes Lane and Green Lane and the risk to the River Usk from this was negligible given that chemical concentrations would be significantly diluted in the river.

Where the reen has been lined infiltration of shallow waters and surface water in to the reen has been prevented. Only a very small section of reen, at it's far eastern end, remains in continuity with the fill on site. Any continuing risk to the reen is therefore very low, as demonstrated by the test results acquired following completion of the reen lining.

I 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 me.

Yours sincerely
for: Terra Firma (Wales) Ltd

[redacted]

Mrs Ruth Howells

Annex A
Reen Water Test Results

Derwentside Environmental Testing Services

Certificate of Analysis

Certificate Number 15-41183

03-Aug-15

Client Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference 15-41183

Client Reference 12032

Contract Title HERBERT ROAD-ROUND 1

Description 7 Water samples.

Date Received 27-Jul-15

Date Started 27-Jul-15

Date Completed 03-Aug-15

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

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

Approved By [redacted]

Richard Bennett
Managing Director

UKAS TESTING
2139

Summary of Chemical Analysis
Water Samples

Our Ref 15-41183
Client Ref 12032
Contract Title HERBERT ROAD-ROUND 1

			Lab No	844518	844519	844520	844521	844522	844523	844524
			Sample ID	BH1	BH2	BH3	BH4	BH5	BH6	REEN
			Depth							
			Other ID							
			Sample Type	WATER	WATER	WATER	WATER	WATER	WATER	WATER
			Sampling Date	23/07/15	23/07/15	23/07/15	23/07/15	23/07/15	23/07/15	23/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**							
Metals										
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	8.1	10	5.2	0.48	1.4	1.4	1.6
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	0.05	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	0.32	< 0.25	1.3	0.66	< 0.25	< 0.25	< 0.25
Copper, Dissolved	DETSC 2306	0.4	ug/l	0.7	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.38	< 0.09	0.12	< 0.09	< 0.09	< 0.09	0.18
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	1.3	0.6	1.8	< 0.5	1.0	1.4	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.43	< 0.25	4.3	0.83	3.2	220	2.0
Zinc, Dissolved	DETSC 2306	1.25	ug/l	3.41	3.49	2.45	1.90	10.9	15.1	< 1.25
Inorganics										
Conductivity	DETSC 2009	1	uS/cm	6960	3460	5490	744	1410	5950	590
pH	DETSC 2008			7.1	7.5	7.3	7.8	7.5	7.1	7.6
Total Biochemical Oxygen Demand	DETSC 2031	1	mg/l	13	5.8	1.6	1.2	3.9	9.1	4.6
Total Chemical Oxygen Demand	DETSC 2032	10	mg/l	360	830	710	57	620	880	270
Cyanide Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40	< 40	< 40	< 40
Hardness	DETSC 2303	0.1	mg/l	954	541	834	254	353	850	188
Sulphate as SO4	DETSC 2055	0.1	mg/l	30	58	70	28	26	120	34
Sulphide	DETSC 2208	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Petroleum Hydrocarbons										
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	1.7	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	7.6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	12	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	21	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	ug/l	21	< 10	< 10	< 10	< 10	< 10	< 10
EPH (C10-C40)	DETSC 3311	10	ug/l	40	28	55	16	68	64	67

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Water Samples

Our Ref 15-41183
Client Ref 12032
Contract Title HERBERT ROAD-ROUND 1

			Lab No	844518	844519	844520	844521	844522	844523	844524
			Sample ID	BH1	BH2	BH3	BH4	BH5	BH6	REEN
			Depth							
			Other ID							
			Sample Type	WATER	WATER	WATER	WATER	WATER	WATER	WATER
			Sampling Date	23/07/15	23/07/15	23/07/15	23/07/15	23/07/15	23/07/15	23/07/15
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**							
PAHs										
Naphthalene	DETS 074*	0.01	ug/l	0.03	0.04	0.02	< 0.01	< 0.01	0.06	< 0.01
Acenaphthylene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	DETS 074*	0.01	ug/l	0.04	0.03	0.02	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	DETS 074*	0.01	ug/l	0.03	0.03	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	DETS 074*	0.01	ug/l	0.09	0.03	0.03	< 0.01	< 0.01	0.03	< 0.01
Anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	DETS 074*	0.01	ug/l	0.02	< 0.01	< 0.01	< 0.01	< 0.01	0.21	< 0.01
Pyrene	DETS 074*	0.01	ug/l	0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.13	< 0.01
Benzo(a)anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
PAH	DETS 074*	0.2	ug/l	0.22	< 0.20	< 0.20	< 0.20	< 0.20	0.42	< 0.20
PCBs										
PCB 28 + PCB 31	DETSC 3402	0.3	ug/l	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
PCB 52	DETSC 3402	0.2	ug/l	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
PCB 101	DETSC 3402	0.3	ug/l	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
PCB 118 + PCB 123	DETSC 3402	0.6	ug/l	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
PCB 138	DETSC 3402	0.2	ug/l	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
PCB 153	DETSC 3402	0.2	ug/l	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
PCB 180	DETSC 3402	0.2	ug/l	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
PCB 7 Total	DETSC 3402	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Phenols										
Phenol	DETSC 3452*	0.1	ug/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4-Chloro-3-methylphenol	DETSC 3452*	0.1	ug/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
2,4-Dichlorophenol	DETSC 3452*	0.1	ug/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
2,4-Dimethylphenol	DETSC 3452*	0.1	ug/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
p-cresol	DETSC 3452*	0.1	ug/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
2,6-Dimethylphenol	DETSC 3452*	0.1	ug/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
2,6-Dichlorophenol	DETSC 3452*	0.1	ug/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
2,4,6-Trichlorophenol	DETSC 3452*	0.1	ug/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

Key: * -not accredited. n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 15-41183
Client Ref 12032
Contract HERBERT ROAD-ROUND 1

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
844518	BH1 WATER	23/07/15	GB 1L, GV x2, PB 1L	BOD (2 days)	
844519	BH2 WATER	23/07/15	GB 1L, GV x2, PB 1L	BOD (2 days)	
844520	BH3 WATER	23/07/15	GB 1L, GV x2, PB 1L	BOD (2 days)	
844521	BH4 WATER	23/07/15	GB 1L, GV x2, PB 1L	BOD (2 days)	
844522	BH5 WATER	23/07/15	GB 1L, GV x2, PB 1L	BOD (2 days)	
844523	BH6 WATER	23/07/15	GB 1L, GV x2, PB 1L	BOD (2 days)	
844524	REEN WATER	23/07/15	GB 1L, GV x2, PB 1L	BOD (2 days)	

Key: G-Glass P-Plastic B-Bottle V-Vial

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

Disposal

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

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

Derwentside Environmental Testing Services

Certificate of Analysis

Certificate Number 16-55306

19-Jan-16

Client Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference 16-55306

Client Reference 12032

Order No 12032

Contract Title Herbert Road - Round 2

Description 5 Water samples.

Date Received 13-Jan-16

Date Started 13-Jan-16

Date Completed 19-Jan-16

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

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

Approved By [redacted]

Rob Brown
Business Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Water Samples

Our Ref 16-55306
Client Ref 12032
Contract Title Herbert Road - Round 2

				Lab No	926091	926092	926093	926094	926095
				Sample ID	Hole 2	Hole 3	Hole 5	Hole 6	Reen
				Depth					
				Other ID					
				Sample Type	WATER	WATER	WATER	WATER	WATER
				Sampling Date	11/01/16	11/01/16	11/01/16	11/01/16	11/01/16
				Sampling Time	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Metals									
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	9.9	31	1.7	4.5	1.6
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	0.05	0.20	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	3.7	0.35	< 0.25	< 0.25	< 0.25
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.2	1.1	2.6	1.6	1.2
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.13	0.16	0.12	0.13	0.14
Mercury, Dissolved	DETSC 2306	0.01	ug/l	0.02	0.01	0.02	0.02	0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	2.9	1.7	1.0	3.9	1.0
Selenium, Dissolved	DETSC 2306	0.25	ug/l	1.0	0.71	0.49	0.65	1.2
Zinc, Dissolved	DETSC 2306	1.3	ug/l	58	28	9.1	23	27
Inorganics									
Conductivity	DETSC 2009	1	uS/cm	4510	2640	339	1360	647
pH	DETSC 2008			6.7	7.1	7.5	7.1	7.5
Total Biochemical Oxygen Demand	DETSC 2031	1	mg/l	16	3100	16	1.8	2.0
Total Chemical Oxygen Demand	DETSC 2032	10	mg/l	85	6100	39	78	< 10
Cyanide Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40	< 40
Hardness	DETSC 2303	0.1	mg/l	596	309	135	470	280
Sulphate as SO4	DETSC 2055	0.1	mg/l	37	26	39	110	39
Sulphide	DETSC 2208	10	ug/l	< 10	< 10	< 10	< 10	< 10
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10
EPH (C10-C40)	DETSC 3311	10	ug/l	24	240	< 10	86	< 10

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Water Samples

Our Ref 16-55306
Client Ref 12032
Contract Title Herbert Road - Round 2

			Lab No	926091	926092	926093	926094	926095
			Sample ID	Hole 2	Hole 3	Hole 5	Hole 6	Reen
			Depth					
			Other ID					
			Sample Type	WATER	WATER	WATER	WATER	WATER
			Sampling Date	11/01/16	11/01/16	11/01/16	11/01/16	11/01/16
			Sampling Time	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**					
PAHs								
Naphthalene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
PAH	DETS 074*	0.2	ug/l	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
PCBs								
PCB 28 + PCB 31	DETSC 3402	0.3	ug/l	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
PCB 52	DETSC 3402	0.2	ug/l	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
PCB 101	DETSC 3402	0.3	ug/l	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
PCB 118 + PCB 123	DETSC 3402	0.6	ug/l	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
PCB 138	DETSC 3402	0.2	ug/l	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
PCB 153	DETSC 3402	0.2	ug/l	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
PCB 180	DETSC 3402	0.2	ug/l	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
PCB 7 Total	DETSC 3402	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Phenols								
Phenol	DETSC 3452*	0.1	ug/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4-Chloro-3-methylphenol	DETSC 3452*	0.1	ug/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
2,4-Dichlorophenol	DETSC 3452*	0.1	ug/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
2,4-Dimethylphenol	DETSC 3452*	0.1	ug/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
p-cresol	DETSC 3452*	0.1	ug/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
2,6-Dimethylphenol	DETSC 3452*	0.1	ug/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
2,6-Dichlorophenol	DETSC 3452*	0.1	ug/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
2,4,6-Trichlorophenol	DETSC 3452*	0.1	ug/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

Key: * -not accredited. n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 16-55306
Client Ref 12032
Contract Herbert Road - Round 2

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
926091	Hole 2 WATER	11/01/16	GB 1L x2, GV, PB 1L		
926092	Hole 3 WATER	11/01/16	GB 1L x2, GV, PB 1L		
926093	Hole 5 WATER	11/01/16	GB 1L x2, GV, PB 1L		
926094	Hole 6 WATER	11/01/16	GB 1L x2, GV, PB 1L		
926095	Reen WATER	11/01/16	GB 1L x2, GV, PB 1L		

Key: G-Glass P-Plastic B-Bottle V-Vial

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

Disposal

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

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

Derwentside Environmental Testing Services

Certificate of Analysis

Certificate Number 16-58182

22-Feb-16

Client Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference 16-58182

Client Reference 12032

Order No (not supplied)

Contract Title Herbert Road - Round Three

Description 5 Water samples.

Date Received 15-Feb-16

Date Started 15-Feb-16

Date Completed 22-Feb-16

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

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

Approved By [redacted]

Rob Brown
Business Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Water Samples

Our Ref 16-58182
Client Ref 12032
Contract Title Herbert Road - Round Three

			Lab No	942175	942176	942177	942178	942179
			Sample ID	Hole 2	Hole 3	Hole 5	Hole 6	Reen
			Depth					
			Other ID					
			Sample Type	WATER	WATER	WATER	WATER	WATER
			Sampling Date	10/02/16	10/02/16	10/02/16	10/02/16	10/02/16
			Sampling Time	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**					
Metals								
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	12	11	2.1	3.4	1.8
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	0.08	0.04	< 0.03	0.05
Chromium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	1.5	< 0.25	< 0.25	0.88
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.0	0.8	2.4	< 0.4	2.1
Lead, Dissolved	DETSC 2306	0.09	ug/l	< 0.09	0.32	0.16	< 0.09	0.29
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	0.01	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	3.6	5.4	2.0	2.3	2.0
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.50	2.5	1.4	1.8	2.0
Zinc, Dissolved	DETSC 2306	1.3	ug/l	19	10	6.7	13	23
Inorganics								
Conductivity	DETSC 2009	1	uS/cm	2320	2440	473	2000	496
pH	DETSC 2008			7.0	6.9	7.2	7.4	7.4
Total Biochemical Oxygen Demand	DETSC 2031	1	mg/l	3.8	7.8	7.5	2.7	3.1
Total Chemical Oxygen Demand	DETSC 2032	10	mg/l	24	26	21	29	< 10
Cyanide Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40	< 40
Hardness	DETSC 2303	0.1	mg/l	328	278	103	271	179
Sulphate as SO4	DETSC 2055	0.1	mg/l	9.8	13	32	120	33
Sulphide	DETSC 2208	10	ug/l	15	17	15	17	19
Petroleum Hydrocarbons								
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	0.5	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10
EPH (C10-C40)	DETSC 3311	10	ug/l	< 10	< 10	< 10	< 10	< 10

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Water Samples

Our Ref 16-58182
Client Ref 12032
Contract Title Herbert Road - Round Three

			Lab No	942175	942176	942177	942178	942179
			Sample ID	Hole 2	Hole 3	Hole 5	Hole 6	Reen
			Depth					
			Other ID					
			Sample Type	WATER	WATER	WATER	WATER	WATER
			Sampling Date	10/02/16	10/02/16	10/02/16	10/02/16	10/02/16
			Sampling Time	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**					
PAHs								
Naphthalene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
PAH	DETS 074*	0.2	ug/l	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
PCBs								
PCB 28 + PCB 31	DETSC 3402	0.3	ug/l	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
PCB 52	DETSC 3402	0.2	ug/l	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
PCB 101	DETSC 3402	0.3	ug/l	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
PCB 118 + PCB 123	DETSC 3402	0.6	ug/l	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
PCB 138	DETSC 3402	0.2	ug/l	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
PCB 153	DETSC 3402	0.2	ug/l	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
PCB 180	DETSC 3402	0.2	ug/l	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
PCB 7 Total	DETSC 3402	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Phenols								
Phenol - Monohydric	DETSC 2130	100	ug/l	< 100	< 100	< 100	< 100	< 100
Phenol	DETSC 3452*	0.1	ug/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4-Chloro-3-methylphenol	DETSC 3452*	0.1	ug/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
2,4-Dichlorophenol	DETSC 3452*	0.1	ug/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
2,4-Dimethylphenol	DETSC 3452*	0.1	ug/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
p-cresol	DETSC 3452*	0.1	ug/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
2,6-Dimethylphenol	DETSC 3452*	0.1	ug/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
2,6-Dichlorophenol	DETSC 3452*	0.1	ug/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
2,4,6-Trichlorophenol	DETSC 3452*	0.1	ug/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

Key: * -not accredited. n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 16-58182
Client Ref 12032
Contract Herbert Road - Round Three

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
942175	Hole 2 WATER	10/02/16	GB 1L x2, GV, PB 1L	BOD (2 days)	
942176	Hole 3 WATER	10/02/16	GB 1L x2, GV, PB 1L	BOD (2 days)	
942177	Hole 5 WATER	10/02/16	GB 1L x2, GV, PB 1L	BOD (2 days)	
942178	Hole 6 WATER	10/02/16	GB 1L x2, GV, PB 1L	BOD (2 days)	
942179	Reen WATER	10/02/16	GB 1L, GV, PB 1L	BOD (2 days)	

Key: G-Glass P-Plastic B-Bottle V-Vial

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

Disposal

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

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

Certificate of Analysis

Certificate Number 17-88417

17-Jan-17

Client Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference 17-88417

Client Reference 12032

Order No 12032

Contract Title H.Rd (Herbert Road)

Description One Water sample.

Date Received 11-Jan-17

Date Started 11-Jan-17

Date Completed 17-Jan-17

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

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

Approved By [redacted]

Rob Brown
Business Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Water Samples

Our Ref 17-88417
Client Ref 12032
Contract Title H.Rd (Herbert Road)

			Lab No	1108406
			Sample ID	H. ROAD - REEN
			Depth	
			Other ID	
			Sample Type	WATER
			Sampling Date	09/01/17
			Sampling Time	n/s
Test	**Method**	**LOD**	**Units**	
Metals				
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	1.8
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	0.84
Chromium III, Dissolved	DETSC 2302*	1	ug/l	< 1.0
Chromium, Hexavalent	DETSC 2203	0.007	mg/l	< 0.007
Copper, Dissolved	DETSC 2306	0.4	ug/l	2.3
Lead, Dissolved	DETSC 2306	0.09	ug/l	2.7
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	1.4
Selenium, Dissolved	DETSC 2306	0.25	ug/l	1.1
Zinc, Dissolved	DETSC 2306	1.3	ug/l	9.0
Inorganics				
Conductivity	DETSC 2009	1	uS/cm	738
pH	DETSC 2008			7.6
Biochemical Oxygen Demand, Total	DETSC 2031	1	mg/l	8.7
Chemical Oxygen Demand, Total	DETSC 2032	10	mg/l	15
Cyanide, Total	DETSC 2130	40	ug/l	< 40
Hardness	DETSC 2303	0.1	mg/l	230
Sulphate as SO4	DETSC 2055	0.1	mg/l	40
Sulphide	DETSC 2208	10	ug/l	12
Petroleum Hydrocarbons				
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	< 10
EPH (C10-C40)	DETSC 3311	10	ug/l	89

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Water Samples

Our Ref 17-88417
Client Ref 12032
Contract Title H.Rd (Herbert Road)

Lab No	1108406
Sample ID	H. ROAD - REEN
Depth	
Other ID	
Sample Type	WATER
Sampling Date	09/01/17
Sampling Time	n/s

Test	Method	LOD	Units	
PAHs				
Naphthalene	DETSC 3304	0.01	ug/l	0.01
Acenaphthylene	DETSC 3304	0.01	ug/l	0.01
Acenaphthene	DETSC 3304	0.01	ug/l	0.02
Fluorene	DETSC 3304	0.01	ug/l	0.01
Phenanthrene	DETSC 3304	0.01	ug/l	0.05
Anthracene	DETSC 3304	0.01	ug/l	0.01
Fluoranthene	DETSC 3304	0.01	ug/l	0.08
Pyrene	DETSC 3304	0.01	ug/l	0.07
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	0.03
Chrysene	DETSC 3304	0.01	ug/l	0.05
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	0.07
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	0.02
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	0.04
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	0.04
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	0.05
PAH Total	DETSC 3304	0.04	ug/l	0.58
Phenols				
Phenol	DETSC 3452*	0.1	ug/l	< 0.10
4-Chloro-3-methylphenol	DETSC 3452*	0.1	ug/l	< 0.10
2,4-Dichlorophenol	DETSC 3452*	0.1	ug/l	< 0.10
2,4-Dimethylphenol	DETSC 3452*	0.1	ug/l	< 0.10
p-cresol	DETSC 3452*	0.1	ug/l	< 0.10
2,6-Dimethylphenol	DETSC 3452*	0.1	ug/l	< 0.10
2,6-Dichlorophenol	DETSC 3452*	0.1	ug/l	< 0.10
2,4,6-Trichlorophenol	DETSC 3452*	0.1	ug/l	< 0.10

Key: * -not accredited. n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 17-88417
Client Ref 12032
Contract H.Rd (Herbert Road)

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1108406	H. ROAD - REEN WATER	09/01/17	GB 1L x2, PB 1L		

Key: G-Glass P-Plastic B-Bottle

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

Disposal

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

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

Certificate of Analysis

Certificate Number 17-92972

07-Mar-17

Client Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference 17-92972

Client Reference 12032

Order No 12032

Contract Title H.Rd (Herbert Road)

Description One Water sample.

Date Received 28-Feb-17

Date Started 28-Feb-17

Date Completed 07-Mar-17

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

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

Approved By [redacted]

Rob Brown
Business Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Water Samples

Our Ref 17-92972
Client Ref 12032
Contract Title H.Rd (Herbert Road)

			Lab No	1135067
			Sample ID	H. Road - Reen
			Depth	
			Other ID	
			Sample Type	WATER
			Sampling Date	27/02/17
			Sampling Time	n/s
Test	**Method**	**LOD**	**Units**	
Metals				
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	0.83
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	5.4
Chromium III, Dissolved	DETSC 2302*	1	ug/l	5.4
Chromium, Hexavalent	DETSC 2203	0.007	mg/l	< 0.007
Copper, Dissolved	DETSC 2306	0.4	ug/l	3.3
Lead, Dissolved	DETSC 2306	0.09	ug/l	2.0
Mercury, Dissolved	DETSC 2306	0.01	ug/l	0.02
Nickel, Dissolved	DETSC 2306	0.5	ug/l	1.2
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.89
Zinc, Dissolved	DETSC 2306	1.3	ug/l	11
Inorganics				
Conductivity	DETSC 2009	1	uS/cm	721
pH	DETSC 2008			7.4
Biochemical Oxygen Demand, Total	DETSC 2031	1	mg/l	9.4
Chemical Oxygen Demand, Total	DETSC 2032	10	mg/l	36
Cyanide, Total	DETSC 2130	40	ug/l	< 40
Hardness	DETSC 2303	0.1	mg/l	306
Sulphate as SO4	DETSC 2055	0.1	mg/l	40
Sulphide	DETSC 2208	10	ug/l	< 10
Petroleum Hydrocarbons				
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	< 10
EPH (C10-C40)	DETSC 3311	10	ug/l	< 10

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Water Samples

Our Ref 17-92972
Client Ref 12032
Contract Title H.Rd (Herbert Road)

Lab No	1135067
Sample ID	H. Road - Reen
Depth	
Other ID	
Sample Type	WATER
Sampling Date	27/02/17
Sampling Time	n/s

Test	Method	LOD	Units	
PAHs				
Naphthalene	DETSC 3304	0.01	ug/l	< 0.01
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01
Fluorene	DETSC 3304	0.01	ug/l	< 0.01
Phenanthrene	DETSC 3304	0.01	ug/l	0.01
Anthracene	DETSC 3304	0.01	ug/l	< 0.01
Fluoranthene	DETSC 3304	0.01	ug/l	0.02
Pyrene	DETSC 3304	0.01	ug/l	0.02
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	< 0.01
Chrysene	DETSC 3304	0.01	ug/l	< 0.01
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	< 0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	< 0.01
PAH Total	DETSC 3304	0.04	ug/l	0.05
Phenols				
Phenol	DETSC 3452*	0.1	ug/l	< 0.10
4-Chloro-3-methylphenol	DETSC 3452*	0.1	ug/l	< 0.10
2,4-Dichlorophenol	DETSC 3452*	0.1	ug/l	< 0.10
2,4-Dimethylphenol	DETSC 3452*	0.1	ug/l	< 0.10
p-cresol	DETSC 3452*	0.1	ug/l	< 0.10
2,6-Dimethylphenol	DETSC 3452*	0.1	ug/l	< 0.10
2,6-Dichlorophenol	DETSC 3452*	0.1	ug/l	< 0.10
2,4,6-Trichlorophenol	DETSC 3452*	0.1	ug/l	< 0.10

Key: * -not accredited. n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 17-92972
Client Ref 12032
Contract H.Rd (Herbert Road)

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1135067	H. Road - Reen WATER	27/02/17	GB 1L x2, GV x2, PB 1L		

Key: G-Glass P-Plastic B-Bottle V-Vial

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

Disposal

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

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

Certificate of Analysis

Certificate Number 17-01119

05-Jun-17

Client Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference 17-01119

Client Reference 12032

Order No (not supplied)

Contract Title H.Rd (Herbert Road)

Description One Water sample.

Date Received 28-May-17

Date Started 28-May-17

Date Completed 05-Jun-17

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

Notes Opinions and interpretations are outside the laboratory's scope of ISO 10725 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By [redacted]

Adam Fenwick
Contracts Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Water Samples

Our Ref 17-01119
Client Ref 12032
Contract Title H.Rd (Herbert Road)

Lab No	1180407
Sample ID	H. Road - Reen
Depth	
Other ID	
Sample Type	WATER
Sampling Date	23/05/17
Sampling Time	n/s

Test	Method	LOD	Units	
Metals				
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	1.2
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	2.7
Chromium III, Dissolved	DETSC 2302*	1	ug/l	2.7
Chromium, Hexavalent	DETSC 2203	0.007	mg/l	< 0.007
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.6
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.26
Mercury, Dissolved	DETSC 2306	0.01	ug/l	0.11
Nickel, Dissolved	DETSC 2306	0.5	ug/l	0.6
Selenium, Dissolved	DETSC 2306	0.25	ug/l	1.3
Zinc, Dissolved	DETSC 2306	1.3	ug/l	9.0
Inorganics				
Conductivity	DETSC 2009	1	uS/cm	6620
pH	DETSC 2008			7.6
Biochemical Oxygen Demand, Total	DETSC 2031	1	mg/l	< 1.0
Chemical Oxygen Demand, Total	DETSC 2032	10	mg/l	13
Cyanide, Total	DETSC 2130	40	ug/l	< 40
Hardness	DETSC 2303	0.1	mg/l	960
Sulphate as SO4	DETSC 2055	0.1	mg/l	360
Sulphide	DETSC 2208	10	ug/l	< 10
Petroleum Hydrocarbons				
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	2.2
Aliphatic C21-C35	DETSC 3072*	1	ug/l	7.3
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	< 10
EPH (C10-C40)	DETSC 3311	10	ug/l	< 10

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Water Samples

Our Ref 17-01119
Client Ref 12032
Contract Title H.Rd (Herbert Road)

			Lab No	1180407
			Sample ID	H. Road - Reen
			Depth	
			Other ID	
			Sample Type	WATER
			Sampling Date	23/05/17
			Sampling Time	n/s
Test	**Method**	**LOD**	**Units**	
PAHs				
Naphthalene	DETSC 3304	0.01	ug/l	< 0.01
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01
Fluorene	DETSC 3304	0.01	ug/l	< 0.01
Phenanthrene	DETSC 3304	0.01	ug/l	< 0.01
Anthracene	DETSC 3304	0.01	ug/l	< 0.01
Fluoranthene	DETSC 3304	0.01	ug/l	0.03
Pyrene	DETSC 3304	0.01	ug/l	0.02
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	< 0.01
Chrysene	DETSC 3304	0.01	ug/l	< 0.01
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	< 0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	< 0.01
PAH Total	DETSC 3304	0.04	ug/l	0.06
Phenols				
Phenol	DETSC 3452*	0.1	ug/l	< 0.10
4-Chloro-3-methylphenol	DETSC 3452*	0.1	ug/l	< 0.10
2,4-Dichlorophenol	DETSC 3452*	0.1	ug/l	< 0.10
2,4-Dimethylphenol	DETSC 3452*	0.1	ug/l	< 0.10
p-cresol	DETSC 3452*	0.1	ug/l	< 0.10
2,6-Dimethylphenol	DETSC 3452*	0.1	ug/l	< 0.10
2,6-Dichlorophenol	DETSC 3452*	0.1	ug/l	< 0.10
2,4,6-Trichlorophenol	DETSC 3452*	0.1	ug/l	< 0.10

Key: * -not accredited. n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 17-01119
Client Ref 12032
Contract H.Rd (Herbert Road)

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1180407	H. Road - Reen WATER	23/05/17	GB 1L x2, GV x2, PB 1L x2	Chromium, Hexavalent (4 days)	

Key: G-Glass P-Plastic B-Bottle V-Vial

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

Disposal

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

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

Certificate of Analysis

Certificate Number	17-07209
	14-Aug-17
Client	Terra Firma (Wales) Ltd 5 Deryn Court Wharfdale Road Pentwyn Cardiff CF23 7HB
Our Reference	17-07209
Client Reference	12032
Order No	12032
Contract Title	H.Rd (Herbert Road)
Description	One Water sample.
Date Received	05-Aug-17
Date Started	05-Aug-17
Date Completed	14-Aug-17
Test Procedures	Identified by prefix DETSn (details on request).
Notes	Opinions and interpretations are outside the laboratory's scope of ISO 10725 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By [redacted]

Adam Fenwick
Contracts Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Water Samples

Our Ref 17-07209
Client Ref 12032
Contract Title H.Rd (Herbert Road)

Lab No	1214167
Sample ID	H. Road - Reen
Depth	
Other ID	S7
Sample Type	WATER
Sampling Date	04/08/17
Sampling Time	n/s

Test	Method	LOD	Units	
Metals				
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	57
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	7.3
Chromium, Dissolved	DETSC 2306	0.25	ug/l	7.1
Chromium III, Dissolved	DETSC 2302*	1	ug/l	7.1
Chromium, Hexavalent	DETSC 2203	0.007	mg/l	< 0.007
Copper, Dissolved	DETSC 2306	0.4	ug/l	11
Lead, Dissolved	DETSC 2306	0.09	ug/l	1.7
Mercury, Dissolved	DETSC 2306	0.01	ug/l	0.10
Nickel, Dissolved	DETSC 2306	0.5	ug/l	15
Selenium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25
Zinc, Dissolved	DETSC 2306	1.3	ug/l	26
Inorganics				
Conductivity	DETSC 2009	1	uS/cm	649
pH	DETSC 2008			7.6
Biochemical Oxygen Demand, Total	DETSC 2031	1	mg/l	3.9
Chemical Oxygen Demand, Total	DETSC 2032	10	mg/l	82
Cyanide, Total	DETSC 2130	40	ug/l	< 40
Hardness	DETSC 2303	0.1	mg/l	270
Sulphate as SO4	DETSC 2055	0.1	mg/l	48
Sulphide	DETSC 2208	10	ug/l	< 10
Petroleum Hydrocarbons				
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	< 10
EPH (C10-C40)	DETSC 3311	10	ug/l	110

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Water Samples

Our Ref 17-07209
Client Ref 12032
Contract Title H.Rd (Herbert Road)

			Lab No	1214167
			Sample ID	H. Road - Reen
			Depth	
			Other ID	S7
			Sample Type	WATER
			Sampling Date	04/08/17
			Sampling Time	n/s
Test	**Method**	**LOD**	**Units**	
PAHs				
Naphthalene	DETSC 3304	0.01	ug/l	< 0.01
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01
Fluorene	DETSC 3304	0.01	ug/l	< 0.01
Phenanthrene	DETSC 3304	0.01	ug/l	< 0.01
Anthracene	DETSC 3304	0.01	ug/l	< 0.01
Fluoranthene	DETSC 3304	0.01	ug/l	0.02
Pyrene	DETSC 3304	0.01	ug/l	0.01
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	< 0.01
Chrysene	DETSC 3304	0.01	ug/l	< 0.01
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	< 0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	< 0.01
PAH Total	DETSC 3304	0.04	ug/l	< 0.04
Phenols				
Phenol	DETSC 3452*	0.1	ug/l	< 0.10
4-Chloro-3-methylphenol	DETSC 3452*	0.1	ug/l	< 0.10
2,4-Dichlorophenol	DETSC 3452*	0.1	ug/l	< 0.10
2,4-Dimethylphenol	DETSC 3452*	0.1	ug/l	< 0.10
p-cresol	DETSC 3452*	0.1	ug/l	< 0.10
2,6-Dimethylphenol	DETSC 3452*	0.1	ug/l	< 0.10
2,6-Dichlorophenol	DETSC 3452*	0.1	ug/l	< 0.10
2,4,6-Trichlorophenol	DETSC 3452*	0.1	ug/l	< 0.10

Key: * -not accredited. n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 17-07209
Client Ref 12032
Contract H.Rd (Herbert Road)

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1214167	H. Road - Reen WATER	04/08/17	GB 1L, GV, PB 1L x2		

Key: G-Glass P-Plastic B-Bottle V-Vial

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Disposal

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

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

Certificate of Analysis

Certificate Number 17-14744

10-Nov-17

Client Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference 17-14744

Client Reference 12032RH

Order No 12032RH

Contract Title Herbert Road

Description One Water sample.

Date Received 04-Nov-17

Date Started 04-Nov-17

Date Completed 10-Nov-17

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

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

Approved By [redacted]

Adam Fenwick
Contracts Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Water Samples

Our Ref 17-14744
Client Ref 12032RH
Contract Title Herbert Road

Lab No	1252960
	Reen
Sample ID	Sample
Depth	
Other ID	
Sample Type	WATER
Sampling Date	03/11/17
Sampling Time	n/s

Test	Method	LOD	Units	
Metals				
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	2.7
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	0.55
Chromium III, Dissolved	DETSC 2302*	1	ug/l	< 1.0
Chromium, Hexavalent	DETSC 2203	0.007	mg/l	< 0.007
Copper, Dissolved	DETSC 2306	0.4	ug/l	2.7
Lead, Dissolved	DETSC 2306	0.09	ug/l	< 0.09
Mercury, Dissolved	DETSC 2306	0.01	ug/l	0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	1.9
Selenium, Dissolved	DETSC 2306	0.25	ug/l	1.4
Zinc, Dissolved	DETSC 2306	1.3	ug/l	12
Inorganics				
Conductivity	DETSC 2009	1	uS/cm	189
pH	DETSC 2008			7.0
Biochemical Oxygen Demand, Total	DETSC 2031	1	mg/l	< 1.0
Chemical Oxygen Demand, Total	DETSC 2032	10	mg/l	17
Cyanide, Total	DETSC 2130	40	ug/l	< 40
Hardness	DETSC 2303	0.1	mg/l	164
Sulphate as SO4	DETSC 2055	0.1	mg/l	63
Sulphide	DETSC 2208	10	ug/l	< 10
Petroleum Hydrocarbons				
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	< 10
EPH (C10-C40)	DETSC 3311	10	ug/l	< 10

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Water Samples

Our Ref 17-14744
Client Ref 12032RH
Contract Title Herbert Road

Lab No	1252960
	Reen
Sample ID	Sample
Depth	
Other ID	
Sample Type	WATER
Sampling Date	03/11/17
Sampling Time	n/s

Test	Method	LOD	Units	
PAHs				
Naphthalene	DETSC 3304	0.01	ug/l	0.02
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	0.02
Fluorene	DETSC 3304	0.01	ug/l	0.01
Phenanthrene	DETSC 3304	0.01	ug/l	0.02
Anthracene	DETSC 3304	0.01	ug/l	0.01
Fluoranthene	DETSC 3304	0.01	ug/l	0.09
Pyrene	DETSC 3304	0.01	ug/l	0.07
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	0.04
Chrysene	DETSC 3304	0.01	ug/l	0.06
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	0.10
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	0.04
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	0.06
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	0.07
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	0.06
PAH Total	DETSC 3304	0.04	ug/l	0.68
Phenols				
Phenol	DETSC 3452*	0.1	ug/l	< 0.10
4-Chloro-3-methylphenol	DETSC 3452*	0.1	ug/l	< 0.10
2,4-Dichlorophenol	DETSC 3452*	0.1	ug/l	< 0.10
2,4-Dimethylphenol	DETSC 3452*	0.1	ug/l	< 0.10
p-cresol	DETSC 3452*	0.1	ug/l	< 0.10
2,6-Dimethylphenol	DETSC 3452*	0.1	ug/l	< 0.10
2,6-Dichlorophenol	DETSC 3452*	0.1	ug/l	< 0.10
2,4,6-Trichlorophenol	DETSC 3452*	0.1	ug/l	< 0.10

Key: * -not accredited. n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 17-14744
Client Ref 12032RH
Contract Herbert Road

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1252960	Reen Sample WATER	03/11/17	GB 1L, GV, PB 1L		

Key: G-Glass P-Plastic B-Bottle V-Vial

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

Disposal

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

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

Certificate of Analysis

Certificate Number 18-00241

11-Jan-18

Client Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference 18-00241

Client Reference 12032RH

Order No 12032RH

Contract Title H.Rd (Herbert Road)

Description One Water sample.

Date Received 05-Jan-18

Date Started 05-Jan-18

Date Completed 11-Jan-18

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

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

Approved By [redacted]

Adam Fenwick
Contracts Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Water Samples

Our Ref 18-00241
Client Ref 12032RH
Contract Title H.Rd (Herbert Road)

			Lab No	1280568
				Reen
			Sample ID	Sample
			Depth	
			Other ID	
			Sample Type	WATER
			Sampling Date	04/01/18
			Sampling Time	n/s
Test	**Method**	**LOD**	**Units**	
Metals				
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	1.4
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	2.1
Chromium III, Dissolved	DETSC 2302*	1	ug/l	< 1.0
Chromium, Hexavalent	DETSC 2203	0.007	mg/l	< 0.007
Copper, Dissolved	DETSC 2306	0.4	ug/l	2.7
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.10
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	1.0
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.86
Zinc, Dissolved	DETSC 2306	1.3	ug/l	4.8
Inorganics				
Conductivity	DETSC 2009	1	uS/cm	565
pH	DETSC 2008			8.4
Biochemical Oxygen Demand, Total	DETSC 2031	1	mg/l	< 1.0
Chemical Oxygen Demand, Total	DETSC 2032	10	mg/l	< 10
Cyanide, Total	DETSC 2130	40	ug/l	< 40
Hardness	DETSC 2303	0.1	mg/l	178
Sulphate as SO4	DETSC 2055	0.1	mg/l	43
Sulphide	DETSC 2208	10	ug/l	< 10
Petroleum Hydrocarbons				
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 25.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 25.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 25.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 25.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	100
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 25.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 25.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 25.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 25.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	100
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	200
EPH (C10-C40)	DETSC 3311	10	ug/l	420

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Water Samples

Our Ref 18-00241
Client Ref 12032RH
Contract Title H.Rd (Herbert Road)

Lab No	1280568
	Reen
Sample ID	Sample
Depth	
Other ID	
Sample Type	WATER
Sampling Date	04/01/18
Sampling Time	n/s

Test	Method	LOD	Units	
PAHs				
Naphthalene	DETSC 3304	0.01	ug/l	< 0.01
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01
Fluorene	DETSC 3304	0.01	ug/l	< 0.01
Phenanthrene	DETSC 3304	0.01	ug/l	0.02
Anthracene	DETSC 3304	0.01	ug/l	< 0.01
Fluoranthene	DETSC 3304	0.01	ug/l	0.03
Pyrene	DETSC 3304	0.01	ug/l	0.02
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	< 0.01
Chrysene	DETSC 3304	0.01	ug/l	< 0.01
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	< 0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	< 0.01
PAH Total	DETSC 3304	0.04	ug/l	0.07
Phenols				
Phenol	DETSC 3452*	0.1	ug/l	< 0.25
4-Chloro-3-methylphenol	DETSC 3452*	0.1	ug/l	< 0.25
2,4-Dichlorophenol	DETSC 3452*	0.1	ug/l	< 0.25
2,4-Dimethylphenol	DETSC 3452*	0.1	ug/l	< 0.25
p-cresol	DETSC 3452*	0.1	ug/l	< 0.25
2,6-Dimethylphenol	DETSC 3452*	0.1	ug/l	< 0.25
2,6-Dichlorophenol	DETSC 3452*	0.1	ug/l	< 0.25
2,4,6-Trichlorophenol	DETSC 3452*	0.1	ug/l	< 0.25

Key: * -not accredited. n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 18-00241
Client Ref 12032RH
Contract H.Rd (Herbert Road)

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1280568	Reen Sample WATER	04/01/18	GV, PB 1L x2		

Key: G-Glass P-Plastic B-Bottle V-Vial

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

Disposal

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

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

Annex B
Summary of Reen Water Test Results

REEN WATER TEST RESULTS

Substance	Threshold (ug/l)	Source	Results (ug/l)								
			Reen Sampling Date								
			Prior to Fill	5 Months After Earthworks Commencement	5 Months After Earthworks Commencement	During and following placement of Hawes Lane and Green Lane Fill				Following Placement of Piling Mat	
			23.07.2015	12.01.2016	14.02.2016	09.01.2017	27.02.2017	23.05.2017	04.08.2017	03.11.2017	04.01.2017
Arsenic	50	WFD	1.6	1.6	1.8	1.8	0.83	1.2	57	2.7	1.4
Cadmium	0.15*	WFD	<0.03	<0.03	0.05	<0.03	<0.03	<0.03	7.3	<0.03	<0.03
Total Chromium	3.4^	WFD	<0.25	<0.25	0.88	-	-	-	-	-	-
Cr III	4.7		-	-	-	<1.0	5.4	2.8	7.1	<1.0	<1.0
Cr VI	3.4		-	-	-	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
Copper	1.0	WFD	<0.4	1.2	2.1	2.3	3.3	1.6	11	2.7	2.7
Lead	1.2	WFD	0.18	0.14	0.29	2.7	2.0	0.26	1.7	<0.09	0.1
Mercury	0.07^^	WFD	<0.01	0.01	<0.01	<0.01	0.02	0.11	0.1	0.01	<0.01
Nickel	4.0	WFD	<0.5	1.0	2.0	1.4	1.2	0.6	15	1.9	1.0
Selenium	10	DWD	2.0	1.2	2.0	1.1	0.89	1.3	<0.25	1.4	0.86
Zinc	13.1**	WFD	<1.25	27	23	9.0	11	9.0	26	12	4.8
Cyanide (Total)	1.0	WFD	<40	<40	>40	<40	<40	<40	<40	<40	<40
Sulphate	250mg/l	DWD	34	39	33	40	40	360	48	63	43
Sulphide	10	LoD	<10	<10	19	12	<10	<10	<10	<10	<10
Total Phenol	7.7	WFD	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Naphthalene	2.0	WFD	All BLDL of 0.01	All BLDL of 0.01	All BLDL of 0.01	0.01	BLDL	BLDL	BLDL	0.02	BLDL
Acenaphthylene	0.01	LoD				0.01				<0.01	
Acenaphthene	0.01	LoD				0.02				0.02	
Fluorene	0.01	LoD				0.01				0.01	
Phenanthrene	0.01	LoD				0.05	0.01			0.02	0.02
Anthracene	0.1	WFD				0.01	BLDL			0.01	<0.01
Fluoranthene	0.0063	WFD				0.08	0.02	0.03	0.02	0.09	0.03
Pyrene	0.01	LoD				0.07	0.02	0.02	0.01	0.07	0.02
Benzo(a)anthracene	0.01	LoD				0.03	BLDL	BLDL	BLDL	0.04	BLDL
Chrysene	0.01	LoD				0.05				0.06	
Benzo(b)fluoranthene	0.017^^	WFD				0.07				0.1	
Benzo(k)fluoranthene	0.017^^	WFD				0.02				0.04	
Benzo(a)pyrene	0.00017	WFD				0.04				0.06	
Indeno(123-cd)pyrene	0.01	LoD				0.04				0.07	
Dibenzo(ah)anthracene	0.01	LoD				<0.01				<0.01	
Benzo(ghi)perylene	0.0082^^	WFD				0.05				0.06	
TPH (Ali C5 – C6)	15000	WHO	Total TPH Ali/Aro <10	Total TPH Ali/Aro <10	Total TPH Ali/Aro <10	Total TPH Ali/Aro <10	Total TPH Ali/Aro <10	Total TPH Ali/Aro <10	Total TPH Ali/Aro <10	Total TPH Ali/Aro <10	<0.1
TPH (Ali C6 – C8)	15000	WHO									<0.1
TPH (Ali C8 – C10)	300	WHO									<0.1
TPH (Ali C10 – C12)	300	WHO									<25
TPH (Ali C12 – C16)	300	WHO									<25
TPH (Ali C16 – C21)	-	-									<25
TPH (Ali C21 – C35)	-	-									<25
TPH (Aro C5 – C7)	10+	WHO									<0.1
TPH (Aro C7 – C8)	700++	WHO									<0.1
TPH (Aro C8 – C10)	300	WHO									<0.1
TPH (Aro C10 – C12)	90	WHO									<25
TPH (Aro C12 – C16)	90	WHO									<25
TPH (Aro C16 – C21)	90	WHO									<25
TPH (Aro C21 – C35)	90	WHO									<25

Notes

- ^ Threshold for CrVI
- All thresholds Annual Averaged, except ^^MAC maximum allowable concentration
- *Hardness dependent – threshold base on minimum recorded hardness 164 $CaCO_3$mg/l
- ** Zinc based on bioavailable portion and background concentration (catchment of River Usk, see WFD Part 2,Table 2)
- + Threshold for C5 – C6
- ++ Threshold for C6 – C8
- LoD – Limit of Detection
- BLDL – Below Laboratory Detection Limit

REEN WATER TEST RESULTS

ANNEX F
Phase 2 Soil Validation Report

terra firma
Geotechnical & Geoenvironmental Specialists
www.terrafirmawales.co.uk

Our Ref: RH/12032/VP1-38

Your Ref:

Contact: Ruth Howells

29th October 2020

NHBC

For the attn. of Mr Steve Moreby

Dear Steve

PLOTS 1-38, PHASE 2, HERBERT ROAD NEWPORT: CAPPING VALIDATION

I confirm that the required remedial capping has now been imported and validated within the landscaped and garden areas of Plots 1 – 38.

The required remedial measures were:

- Plots 1 – 36 600mm imported soil capping with underlying no-dig barrier
- Plots 37 & 38 600mm imported soil capping only

Both subsoil and topsoil have been imported. The volume imported for both the topsoil and subsoil did not exceed 250m^2.

It is understood that the subsoil has been provided by Shadow Civils, sourced from Neal Soils. The topsoil has been sourced by Engie from another development site at Curtis Lane, Stoke Gifford. Test certificates provided by Neal Soils and from the Curtis Lane site may be found in **Annex A**.

A visit was made to site on Thursday 17th September 2020 to sample the imported soils and to confirm the capping thickness and presence of the no-dig barrier.

Sample/validation hole locations are illustrated in **Figure 1** on the following page.

Visual inspection of the capping at the trial holes confirmed the capping layer to be 600mm. Please see **Annex B** for photographs of the trial holes.

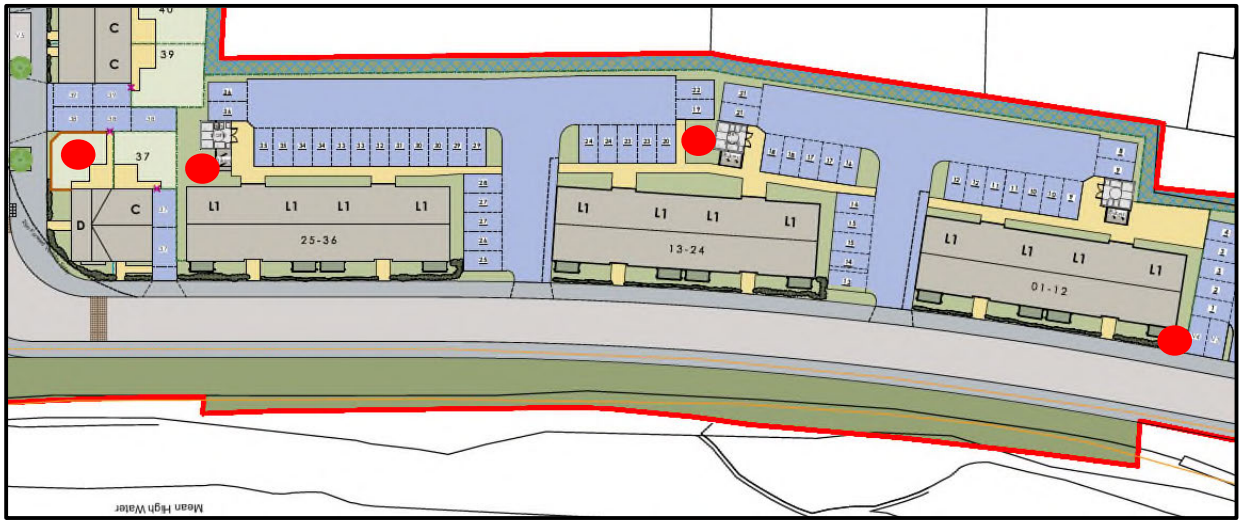

Figure 1: Validation Locations

The samples were submitted for laboratory analysis at the laboratory of Eurofins Chemtest. The chemical test certificate may be found in **Annex C**.

Comparison of the analytical results has been made with residential (including plant uptake) Suitable 4 Use Levels (S4ULs) provided by Land Quality Management Limited and the Chartered Institute of Environmental Health (CIEH). Suitable 4 Use Levels (S4ULs) provided by Land Quality Management Limited and the Chartered Institute of Environmental Health (CIEH). Where

Results are summarised in the following tables.

Table 1 Summary of Soil Chemical Test Results Imported Subsoil					
Substance	**SGV/GAC** (mg/kg)	**Source**	**Measured Concentrations of Tested Substances** (mg/kg)		**Number of Exceedances**
			Minimum	**Maximum**	
Arsenic	37	CIEH	9.7	11	0
Boron	290	CIEH	0.72	0.97	0
Cadmium	11	CIEH	0.51	0.8	0
Chromium III	910	CIEH	20	25	0
Chromium VI	6	CIEH	<0.5	<0.5	0
Copper	2400	CIEH	20	37	0
Lead	200	C4SL	41	78	0
Mercury	40	CIEH	0.07	0.1	0
Nickel	130	CIEH	21	28	0
Selenium	250	CIEH	<0.2	0.22	0
Zinc	3700	CIEH	91	140	0
Cyanide	8	CLEA	<0.5	<0.5	0
Phenols	120	CIEH	<0.3	<0.3	0
Organic Matter	-	-	0.2	1.4	-
pH	-	-	8.7	9.1	-
Asbestos	-	-	Not detected	Not detected	-
Naphthalene	2.3	CIEH	<0.1	<0.1	0
Acenaphthylene	170	CIEH	<0.1	<0.1	0
Acenaphthene	210	CIEH	<0.1	<0.1	0
Fluorene	170	CIEH	<0.1	<0.1	0
Phenanthrene	95	CIEH	<0.1	<0.1	0
Anthracene	2400	CIEH	<0.1	<0.1	0
Fluoranthene	280	CIEH	<0.1	<0.1	0
Pyrene	620	CIEH	<0.1	<0.1	0
Benzo(a)anthracene	7.2	CIEH	<0.1	<0.1	0
Chrysene	15	CIEH	<0.1	<0.1	0
Benzo(b)fluoranthene	2.6	CIEH	<0.1	<0.1	0
Benzo(k)fluoranthene	77	CIEH	<0.1	<0.1	0
Benzo(a)pyrene	2.2	CIEH	<0.1	<0.1	0
Indeno(123cd)pyrene	27	CIEH	<0.1	<0.1	0
Dibenzo(ah)anthracene	0.24	CIEH	<0.1	<0.1	0
Benzo(ghi)perylene	320	CIEH	<0.1	<0.1	0

Notes:

- PAH thresholds based on 1.0% SOM

Table 1 Summary of Soil Chemical Test Results (Continued) Imported Subsoil					
Substance	**SGV/GAC** (mg/kg)	**Source**	**Measured Concentrations of Tested Substances** (mg/kg)		**Number of Exceedances**
			Minimum	**Maximum**	
Aliphatic					
PH C5 – C6 Ali	42	CIEH	<1.0	<1.0	0
PH C6 – C8 Ali	100	CIEH	<1.0	<1.0	0
PH C8 – C10 Ali	27	CIEH	<1.0	<1.0	0
PH C10 – C12 Ali	130	CIEH	<1.0	<1.0	0
PH C12 – C16 Ali	1100	CIEH	<1.0	<1.0	0
PH C16 – C21 Ali*	65000	CIEH	<1.0	<1.0	0
PH C21 – C35 Ali*	65000	CIEH	<1.0	<1.0	0
PH C35 – C44 Ali	65000	CIEH	<1.0	<1.0	0
Aromatic					
PH C5 – C7 Arom	70	CIEH	<1.0	<1.0	0
PH C7 – C8 Arom	130	CIEH	<1.0	<1.0	0
PH C8 – C10 Arom	34	CIEH	<1.0	<1.0	0
PH C10 – C12 Arom	74	CIEH	<1.0	<1.0	0
PH C12 – C16 Arom	140	CIEH	<1.0	<1.0	0
PH C16 – C21 Arom	260	CIEH	<1.0	<1.0	0
PH C21 – C35 Arom	1100	CIEH	<1.0	<1.0	0
PH C35 – C44 Arom	1100	CIEH	<1.0	<1.0	0

Notes

- Thresholds based on 1.0% SOM
- CIEH for Ali C16 - 21 and C21 - C35 based on CIEH for EC >16 – 35

Table 2 Summary of Soil Chemical Test Results Imported Topsoil					
Substance	**SGV/GAC** (mg/kg)	**Source**	**Measured Concentrations of Tested Substances** (mg/kg)		**Number of Exceedances**
			Minimum	**Maximum**	
Arsenic	37	CIEH	12	14	0
Boron	290	CIEH	0.65	0.96	0
Cadmium	11	CIEH	0.79	1.7	0
Chromium III	910	CIEH	20	41	0
Chromium VI	6	CIEH	<0.5	<0.5	0
Copper	2400	CIEH	27	43	0
Lead	200	C4SL	72	180	0
Mercury	40	CIEH	0.13	0.18	0
Nickel	130	CIEH	22	32	0
Selenium	250	CIEH	<0.2	0.27	0
Zinc	3700	CIEH	170	210	0
Cyanide	8	CLEA	<0.5	<0.5	0
Phenols	120	CIEH	<0.3	<0.3	0
Organic Matter	-	-	3.5	3.9	-
pH	-	-	8.4	9.0	-
Asbestos	-	-	Not detected	Not detected	-
Naphthalene	2.3	CIEH	<0.1	<0.1	0
Acenaphthylene	170	CIEH	<0.1	<0.1	0
Acenaphthene	210	CIEH	<0.1	<0.1	0
Fluorene	170	CIEH	<0.1	<0.1	0
Phenanthrene	95	CIEH	<0.1	<0.1	0
Anthracene	2400	CIEH	<0.1	<0.1	0
Fluoranthene	280	CIEH	<0.1	1.5	0
Pyrene	620	CIEH	<0.1	1.2	0
Benzo(a)anthracene	7.2	CIEH	<0.1	<0.1	0
Chrysene	15	CIEH	<0.1	<0.1	0
Benzo(b)fluoranthene	2.6	CIEH	<0.1	<0.1	0
Benzo(k)fluoranthene	77	CIEH	<0.1	<0.1	0
Benzo(a)pyrene	2.2	CIEH	<0.1	<0.1	0
Indeno(123cd)pyrene	27	CIEH	<0.1	<0.1	0
Dibenzo(ah)anthracene	0.24	CIEH	<0.1	<0.1	0
Benzo(ghi)perylene	320	CIEH	<0.1	<0.1	0

Notes:

- PAH thresholds based on 1.0% SOM

Table 2 Summary of Soil Chemical Test Results (Continued) Imported Topsoil					
Substance	**SGV/GAC** (mg/kg)	**Source**	**Measured Concentrations of Tested Substances** (mg/kg)		**Number of Exceedances**
			Minimum	**Maximum**	
Aliphatic					
PH C5 – C6 Ali	42	CIEH	<1.0	<1.0	0
PH C6 – C8 Ali	100	CIEH	<1.0	<1.0	0
PH C8 – C10 Ali	27	CIEH	<1.0	<1.0	0
PH C10 – C12 Ali	130	CIEH	<1.0	<1.0	0
PH C12 – C16 Ali	1100	CIEH	<1.0	<1.0	0
PH C16 – C21 Ali*	65000	CIEH	<1.0	<1.0	0
PH C21 – C35 Ali*	65000	CIEH	<1.0	<1.0	0
PH C35 – C44 Ali	65000	CIEH	<1.0	<1.0	0
Aromatic					
PH C5 – C7 Arom	70	CIEH	<1.0	<1.0	0
PH C7 – C8 Arom	130	CIEH	<1.0	<1.0	0
PH C8 – C10 Arom	34	CIEH	<1.0	<1.0	0
PH C10 – C12 Arom	74	CIEH	<1.0	<1.0	0
PH C12 – C16 Arom	140	CIEH	<1.0	<1.0	0
PH C16 – C21 Arom	260	CIEH	<1.0	<1.0	0
PH C21 – C35 Arom	1100	CIEH	<1.0	<1.0	0
PH C35 – C44 Arom	1100	CIEH	<1.0	<1.0	0

Notes

- Thresholds based on 1.0% SOM
- CIEH for Ali C16 - 21 and C21 - C35 based on CIEH for EC >16 – 35

From the above tables is can be seen that all substances tested for are present at levels below their respective human health threshold levels. It is therefore confirmed that the imported subsoil and topsoil are uncontaminated and do not present a risk to the human health of future site residents.

I 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 me.

Yours sincerely
for: Terra Firma (Wales) Ltd

[redacted]

Mrs Ruth Howells

Annex A
Soil test Certificates from Soil Suppliers

Terra Firma (Wales) Ltd. 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA
Tel: 029 2073 5354 **Fax:** 029 2073 5433 **Email:** info@terrafirmawales.co.uk **www.terrafirmawales.co.uk**
Registered in Wales No. 4013230. VAT No: 753 2566 25. Registered Office: 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA

2531

ANALYTICAL TEST REPORT

Contract no: 89658

Contract name: NS/HM

Client reference: NS/HM

Clients name: Neal Soil Suppliers

Clients address: Ty-To-Maen Farm
Newton Road
Rumney, Cardiff
CF3 2EJ

Samples received: 05 March 2020

Analysis started: 05 March 2020

Analysis completed: 12 March 2020

Report issued: 12 March 2020

Notes:
Opinions and interpretations expressed herein are outside the UKAS accreditation scope.
Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.
Methods, procedures and performance data are available on request.
Results reported herein relate only to the material supplied to the laboratory.
This report shall not be reproduced except in full, without prior written approval.
Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

Key:
U UKAS accredited test
M MCERTS & UKAS accredited test
$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing
NAD No Asbestos Detected

Approved by: [redacted]

Dave Bowerbank
Customer Services Co-ordinator

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

All results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.
Analytical results are inclusive of stones.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
89658-2	Residential Soil	-	Clayey Loam	-	-	20.7

Chemtech Environmental Limited

SOILS

Lab number			89658-2
Sample id			Residential Soil
Depth (m)			-
Date sampled			03/03/2020
Test	**Method**	**Units**	
Arsenic (total)	CE127 M	mg/kg As	7.8
Cadmium (total)	CE127 M	mg/kg Cd	0.9
Chromium (total)	CE127 M	mg/kg Cr	44
Chromium (VI)	CE146	mg/kg CrVI	<1
Copper (total)	CE127 M	mg/kg Cu	11
Lead (total)	CE127 M	mg/kg Pb	50
Mercury (total)	CE127 M	mg/kg Hg	<0.5
Nickel (total)	CE127 M	mg/kg Ni	24
Selenium (total)	CE127 M	mg/kg Se	0.7
Zinc (total)	CE127 M	mg/kg Zn	70
pH	CE004 M	units	7.5
PAH			
Naphthalene	CE087 M	mg/kg	<0.02
Acenaphthylene	CE087 M	mg/kg	<0.02
Acenaphthene	CE087 M	mg/kg	<0.02
Fluorene	CE087 U	mg/kg	<0.02
Phenanthrene	CE087 M	mg/kg	<0.01
Anthracene	CE087 U	mg/kg	<0.02
Fluoranthene	CE087 M	mg/kg	<0.01
Pyrene	CE087 M	mg/kg	<0.01
Benzo(a)anthracene	CE087 U	mg/kg	<0.01
Chrysene	CE087 M	mg/kg	<0.01
Benzo(b)fluoranthene	CE087 M	mg/kg	<0.01
Benzo(k)fluoranthene	CE087 M	mg/kg	<0.03
Benzo(a)pyrene	CE087 U	mg/kg	<0.02
Indeno(123cd)pyrene	CE087 M	mg/kg	<0.02
Dibenz(ah)anthracene	CE087 M	mg/kg	<0.02
Benzo(ghi)perylene	CE087 M	mg/kg	<0.02
PAH (total of USEPA 16)	CE087	mg/kg	< 2
TPH			
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	0.05
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	<1
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	<1
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	<1
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	<1
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	<1
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1

Chemtech Environmental Limited

SOILS

Lab number			89658-2
Sample id			Residential Soil
Depth (m)			-
Date sampled			03/03/2020
Test	**Method**	**Units**	
VPH Aliphatic (>C8-C10)	CE067	mg/kg	<0.1
EPH Aliphatic (>C10-C12)	CE068	mg/kg	<4
EPH Aliphatic (>C12-C16)	CE068	mg/kg	<4
EPH Aliphatic (>C16-C35)	CE068	mg/kg	60
EPH Aliphatic (>C35-C44)	CE068	mg/kg	35
Subcontracted analysis			
Asbestos (qualitative)	$	-	NAD

Chemtech Environmental Limited

SOILS

METHOD	SOLIDS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE127	Arsenic (total)	Aqua regia digest, ICP-MS	Dry		1	mg/kg As
CE127	Cadmium (total)	Aqua regia digest, ICP-MS	Dry		0.2	mg/kg Cd
CE127	Chromium (total)	Aqua regia digest, ICP-MS	Dry		1	mg/kg Cr
CE146	Chromium (VI)	Acid extraction, Colorimetry	Dry		1	mg/kg CrVI
CE127	Copper (total)	Aqua regia digest, ICP-MS	Dry		1	mg/kg Cu
CE127	Lead (total)	Aqua regia digest, ICP-MS	Dry		1	mg/kg Pb
CE127	Mercury (total)	Aqua regia digest, ICP-MS	Dry		0.5	mg/kg Hg
CE127	Nickel (total)	Aqua regia digest, ICP-MS	Dry		1	mg/kg Ni
CE127	Selenium (total)	Aqua regia digest, ICP-MS	Dry		0.3	mg/kg Se
CE127	Zinc (total)	Aqua regia digest, ICP-MS	Dry		5	mg/kg Zn
CE004	pH	Based on BS 1377, pH Meter	As received		-	units
CE087	Naphthalene	Solvent extraction, GC-MS	As received		0.02	mg/kg
CE087	Acenaphthylene	Solvent extraction, GC-MS	As received		0.02	mg/kg
CE087	Acenaphthene	Solvent extraction, GC-MS	As received		0.02	mg/kg
CE087	Fluorene	Solvent extraction, GC-MS	As received		0.02	mg/kg
CE087	Phenanthrene	Solvent extraction, GC-MS	As received		0.02	mg/kg
CE087	Anthracene	Solvent extraction, GC-MS	As received		0.02	mg/kg
CE087	Fluoranthene	Solvent extraction, GC-MS	As received		0.02	mg/kg
CE087	Pyrene	Solvent extraction, GC-MS	As received		0.02	mg/kg
CE087	Benzo(a)anthracene	Solvent extraction, GC-MS	As received		0.02	mg/kg
CE087	Chrysene	Solvent extraction, GC-MS	As received		0.03	mg/kg
CE087	Benzo(b)fluoranthene	Solvent extraction, GC-MS	As received		0.02	mg/kg
CE087	Benzo(k)fluoranthene	Solvent extraction, GC-MS	As received		0.03	mg/kg
CE087	Benzo(a)pyrene	Solvent extraction, GC-MS	As received		0.02	mg/kg
CE087	Indeno(123cd)pyrene	Solvent extraction, GC-MS	As received		0.02	mg/kg
CE087	Dibenz(ah)anthracene	Solvent extraction, GC-MS	As received		0.02	mg/kg
CE087	Benzo(ghi)perylene	Solvent extraction, GC-MS	As received		0.02	mg/kg
CE087	PAH (total of USEPA 16)	Solvent extraction, GC-MS	As received		0.34	mg/kg
CE067	VPH Aromatic (>EC5-EC7)	Headspace GC-FID	As received		0.01	mg/kg
CE067	VPH Aromatic (>EC7-EC8)	Headspace GC-FID	As received		0.01	mg/kg
CE067	VPH Aromatic (>EC8-EC10)	Headspace GC-FID	As received		0.01	mg/kg
CE068	EPH Aromatic (>EC10-EC12)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC12-EC16)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC16-EC21)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC21-EC35)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC35-EC44)	Solvent extraction, GC-FID	As received		1	mg/kg
CE067	VPH Aliphatic (>C5-C6)	Headspace GC-FID	As received		0.1	mg/kg
CE067	VPH Aliphatic (>C6-C8)	Headspace GC-FID	As received		0.1	mg/kg
CE067	VPH Aliphatic (>C8-C10)	Headspace GC-FID	As received		0.1	mg/kg
CE068	EPH Aliphatic (>C10-C12)	Solvent extraction, GC-FID	As received		4	mg/kg
CE068	EPH Aliphatic (>C12-C16)	Solvent extraction, GC-FID	As received		4	mg/kg
CE068	EPH Aliphatic (>C16-C35)	Solvent extraction, GC-FID	As received		4	mg/kg
CE068	EPH Aliphatic (>C35-C44)	Solvent extraction, GC-FID	As received		10	mg/kg
$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-

89658
NS/HM
NS/HM

Chemtech Environmental Limited

DEVIATING SAMPLE INFORMATION

Comments
Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.
For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.
Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
89658-2	Residential Soil	-	N	

Intégral Géotechnique

Intégral House
7 Beddau Way
Castlegate Business Park
Caerphilly
CF83 2AX
Tel: 029 2080 7991
mail@integralgeotec.com

11810/LW

8 July 2019

Engie UK Places & Communities
2nd Floor
31 Bocam Park
Oakfield Road
Bridgend CF35 5LJ

For the attention of Mr Dylan Hammett

Dear Sirs,

Curtis Lane, Stoke Gifford – Supplementary Topsoil Sampling

We have now completed the supplementary topsoil sampling at the above site and report as follows.

The site was previously investigated by Intégral Géotechnique in June 2016 and reported in Site Investigation Report, Ref: 11810/LW/16/SI dated June 2016.

Intégral Géotechnique have been commissioned to undertake further topsoil sampling, followed by laboratory chemical testing and risk assessment to inform the suitability of the topsoil for re-use.

This report is supplemental to the above site investigation report and should be read in conjunction with it.

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Introduction

The site is located in Stoke Gifford, approximately 7km north east of Bristol, at a National Grid Reference of 363250, 179540.

The site consisted of a green field, lined with hedgerows and mature trees. The field was previously used for grazing of livestock.

A residential property exists in the southern part of the site. The property consists of a house and garages with areas of hardstanding and gardens. During the supplementary site works, the property was vacant and access was available.

Two above ground storage tanks are located to the north east of the property and were still present during the supplementary site investigation. The two rectangular oil tanks were located adjacent to each other and situated above a gravel base. No visual evidence of leakages from the tanks was observed, however, an olfactory evidence of petroleum hydrocarbons was noted.

In the eastern area of the site, a small stockpile was located with an area of dense vegetation.

Site Works

Site works were carried out on the 18th March 2019 to undertake the supplementary topsoil sampling.

The approximate location of the trial pits and sampling locations are shown on Figure 1 enclosed. The trial pits logs are included in Appendix A.

Representative samples were taken from the topsoil, encountered in the northern field. The topsoil samples were tested for a range of contaminants including petroleum hydrocarbons and asbestos.

The samples were sent to the UKAS accredited laboratories of i2 Analytical for testing. A copy of the results of the laboratory testing is presented in Appendix B.

The results of the chemical testing have been summarised and compared against the appropriate soils screening values of the proposed residential with home grown produce end use. A copy of the summary is presented in Appendix C.

Ground Conditions

The ground conditions encountered within the trial pits consisted of a veneer of topsoil overlying the weathered strata of the Mercia Mudstone Formation.

A veneer of topsoil was encountered within trial pits TP101 to TP103 and typically consisted of silty slightly gravelly clay. The topsoil was encountered at a thickness of between 0.10m and 0.20m.

The topsoil was overlying the weathered strata of the Mercia Mudstone Formation. The weathered strata consisted of firm, locally soft to firm brown to red brown slightly sandy silty clay, grading into firm, firm to stiff red brown silty clay with mudstone lithorelicts. The firm or firm to stiff clays were encountered at depths of between 0.6m and 1.0m below existing ground level.

The weathered clay strata further graded into mudstone bedrock within trial pits TP102 at depths of 2.2m.

Groundwater was not encountered within the trial pits.

Chemical Assessment

The results of the laboratory testing of representative topsoil samples from TP101 to TP103 at depths of 0.10m, indicate that the analysed chemical elements or compounds are present at concentrations below the appropriate threshold for residential with home grown produce end use.

Asbestos was not detected within the screened samples.

Based on these results, it is considered that the topsoil does not present a potential risk to residential end users, and it is considered that the topsoil, located within the zone indicated on Figure 1, to be suitable for re-use on or off site.

We trust the above and enclosed are to your satisfaction. However, if you have any queries, or require further information, please do not hesitate to contact us.

Yours faithfully,

[redacted]

PP **Lowri Williams**
For
Intégral Géotechnique (Wales) Limited

APPENDIX A

TRIAL PIT LOGS

Intégral Géotechnique	Project Name:	Project No.:	Trial Pit No.:
Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com	**Curtis Lane, Stoke Gifford**	**11810**	**TP101** Sheet 1 of 1

Location:	Client: Engie UK Places & Communities	Logged By:	Scale
Bristol		LW	1:25

Equipment: JCB 3CX	Coordinates:	**Dimensions** 3.00m
Date Excavated: 18/03/2019	Level:	Depth : 2.60m; 0.70m

Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.20			Topsoil: Grass onto brown slightly sandy slightly gravelly silty clay with rootlets. Gravel is fine to medium angular of mudstone.
						Firm, locally soft to firm brown becoming red brown slightly sandy silty CLAY.
			1.00			Firm, firm to stiff red brown silty CLAY with very weak weathered mudstone lithorelicts. ... becoming locally mottled green grey with increase in mudstone fabric from 1.9m.
			2.60			End of Trialpit at 2.60 m

1
2
3
4
5

Remarks:
1. Trial pit terminated at 2.6m bgl.

Groundwater: Groundwater not encountered

Stability: Stable

Key:
D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
W - Water sample

AGS

Intégral Géotechnique	Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com	Project Name: **Curtis Lane, Stoke Gifford**	Project No.: **11810**	Trial Pit No.: **TP102** Sheet 1 of 1
Location: Bristol		Client: Engie UK Places & Communities	Logged By: LW	Scale 1:25
Equipment: JCB 3CX		Coordinates:	**Dimensions** 2.80m Depth : 2.60m 0.70m	
Date Excavated: 18/03/2019		Level:		

Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.10	ES		0.15			Topsoil: Grass onto brown slightly gravelly silty clay with rootlets. Gravel is fine to medium angular of mudstone.
						Firm brown to red brown silty CLAY.
			0.60			Firm to stiff red brown slightly silty CLAY with frequent extremely weak weathered mudstone lithorelicts. ... Mudstone cobbles from 2m.
			2.20			Extremely weak thinly bedded highly weathered MUDSTONE. Excavated as fine to coarse angular to subangular mudstone gravel with some cobbles in a clayey matrix.
			2.60			End of Trialpit at 2.60 m

Remarks:
1. Trial pit terminated at 2.6m bgl.

Groundwater: Groundwater not encountered.

Stability: Stable

Key:
D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
W - Water sample

Intégral Géotechnique
Intégral House, 7 Beddau Way
Castlegate Business Park
Caerphilly CF83 2AX
Tel. 029 20807991
Fax. 029 20862176
mail@integralgeotec.com

Project Name:	Project No.:	Trial Pit No.:
Curtis Lane, Stoke Gifford	**11810**	**TP103** Sheet 1 of 1

Location:	Client:	Logged By:	Scale
Bristol	Engie UK Places & Communities	LW	1:25

Equipment: JCB 3CX

Coordinates:

Date Excavated: 18/03/2019

Level:

Dimensions

Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.10	ES		0.15			Topsoil: Grass onto brown slightly gravelly silty clay with rootlets. Gravel is fine to medium angular of mudstone.
						Soft to firm, firm red brown slightly gravelly silty CLAY.
			0.60			Firm, firm to stiff red brown slightly silty CLAY with very weak frequent mudstone lithorelicts.
			2.30			End of Trialpit at 2.30 m

Remarks:
1. Trial pit terminated at 2.3m bgl.

Groundwater: Groundwater not encountered.

Stability: Stable

Key:
D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
W - Water sample

AGS

APPENDIX B

LABORATORY CHEMICAL TEST RESULTS

Lowri Williams
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e: reception@i2analytical.com

Analytical Report Number : 19-33901-A

Replaces Analytical Report Number : 19-33901, issue no. 1

Project / Site name:	Curtis Lane, Stoke Gifford	**Samples received on:**	20/03/2019
Your job number:	11810	**Samples instructed on:**	20/03/2019
Your order number:		**Analysis completed by:**	29/03/2019
Report Issue Number:	2	**Report issued on:**	15/07/2019
Samples Analysed:	3 soil samples		

Signed: [redacted]

Zina Abdul Razzak
Senior Quality Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 19-33901-A

Project / Site name: Curtis Lane, Stoke Gifford

Lab Sample Number				1182518	1182519	1182520		
Sample Reference				TP101	TP102	TP103		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				0.10	0.10	0.10		
Date Sampled				18/03/2019	18/03/2019	18/03/2019		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1		
Moisture Content	%	N/A	NONE	16	17	20		
Total mass of sample received	kg	0.001	NONE	1.0	1.1	1.1		
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected		
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.5	8.0	7.8		
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1		
Total Sulphate as SO_4	mg/kg	50	MCERTS	770	1100	1200		
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.013	0.017	0.015		
Sulphide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Total Sulphur	mg/kg	50	MCERTS	440	520	550		
Total Organic Carbon (TOC)	%	0.1	MCERTS	2.7	1.4	3.0		
Loss on Ignition @ 450°C	%	0.2	MCERTS	6.1	3.9	7.9		
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Phenanthrene	mg/kg	0.05	MCERTS	0.23	0.30	0.94		
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.29		
Fluoranthene	mg/kg	0.05	MCERTS	0.37	0.52	1.8		
Pyrene	mg/kg	0.05	MCERTS	0.30	0.48	1.5		
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.28	0.98		
Chrysene	mg/kg	0.05	MCERTS	< 0.05	0.29	0.78		
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	0.29	1.2		
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	0.21	0.53		
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.27	0.96		
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.63		
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.75		
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	0.90	2.64	10.3		
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	9.5	11	14		
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.76	0.68	1.1		
Boron (water soluble)	mg/kg	0.2	MCERTS	1.8	0.9	2.1		
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.5	0.5	1.1		
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0		
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	20	19	30		
Copper (aqua regia extractable)	mg/kg	1	MCERTS	30	25	31		
Lead (aqua regia extractable)	mg/kg	1	MCERTS	70	44	60		
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3		
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	18	15	27		
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	25	25	39		
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	160	390	180		

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 19-33901-A

Project / Site name: Curtis Lane, Stoke Gifford

Lab Sample Number				1182518	1182519	1182520		
Sample Reference				TP101	TP102	TP103		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				0.10	0.10	0.10		
Date Sampled				18/03/2019	18/03/2019	18/03/2019		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001		
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001		
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001		
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0		
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0		
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0		
TPH-CWG - Aliphatic >EC16 - EC35	mg/kg	10	MCERTS	< 10	< 10	< 10		
TPH-CWG - Aliphatic > EC35 - EC44	mg/kg	8.4	NONE	< 8.4	< 8.4	< 8.4		
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	< 10		
TPH-CWG - Aliphatic (EC5 - EC44)	mg/kg	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001		
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001		
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001		
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0		
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	< 10	< 10		
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10	< 10	16		
TPH-CWG - Aromatic >EC35 - EC40	mg/kg	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aromatic > EC35 - EC44	mg/kg	8.4	NONE	< 8.4	< 8.4	< 8.4		
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	20		
TPH-CWG - Aromatic (EC5 - EC44)	mg/kg	10	NONE	< 10	< 10	20		
TPH Total C5 - C44	mg/kg	10	NONE	< 10	< 10	20		

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number : 19-33901-A

Project / Site name: Curtis Lane, Stoke Gifford

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1182518	TP101	None Supplied	0.10	Brown loam and clay with gravel and vegetation.
1182519	TP102	None Supplied	0.10	Brown loam and clay with brick and vegetation.
1182520	TP103	None Supplied	0.10	Brown clay and loam with gravel and vegetation.

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Analytical Report Number : 19-33901-A

Project / Site name: Curtis Lane, Stoke Gifford

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L047-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L009-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE

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Analytical Report Number : 19-33901-A

Project / Site name: Curtis Lane, Stoke Gifford

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

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The results included within the report are representative of the samples submitted for analysis.

APPENDIX C

SUMMARY OF CHEMICAL RESULTS

SUMMARY OF LABORATORY SOIL TEST RESULTS

Job No.: 11810
Site: Curtis Lane, Stoke Gifford
Soil Type: Topsoil
Soil Organic Matter: 1%

METALS AND SEMI-METALS

No.	Location	Depth (m)	Arsenic (mg/kg)	Boron (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Chromium (VI) (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (Elemental) (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
1	TP101	0.10	9.5	1.8	0.76	0.5	20	< 4.0	30	70	< 0.3	18	< 1.0	25	160
2	TP102	0.10	11	0.9	0.68	0.5	19	< 4.0	25	44	< 0.3	15	< 1.0	25	390
3	TP103	0.10	14	2.1	1.1	1.1	30	< 4.0	31	60	< 0.3	27	< 1.0	39	180
	Screening Criteria Value		37.0	290.0	1.7	11.0	-	6.0	2400.0	200.0	1.2	130.0	250.0	410.0	3700.0
	Source of Screening Criteria Value		S4UL	S4UL	S4UL	S4UL	-	S4UL	S4UL	C4SL	S4UL	S4UL	S4UL	S4UL	S4UL

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Intégral Géotechnique

SUMMARY OF LABORATORY SOIL TEST RESULTS

Job No.: 11810

Site: Curtis Lane, Stoke Gifford

Soil Type: Topsoil

Soil Organic Matter: 1%

INORGANIC CHEMICALS & OTHERS

No.	Location	Depth (m)	Cyanide (mg/kg)	Loss on ignition, dried solids (%)	Moisture content at 30 C (%)	Phenol (mg/kg)	pH (pH units)	Water Soluble Sulphate (g/l)	Sulphate Total as SO4 (mg/kg)	Sulphide (mg/kg)	Total Sulphur (mg/kg)	TOC by Ignition in O2 (%)	Equivalent SOM (%)	Asbestos in Soil	Asbestos Quantification (%)
1	**TP101**	**0.10**	< 1	6.1	16	< 1.0	7.5	0.013	770	< 1.0	440	2.7	4.64	Not-detected	#N/A
2	**TP102**	**0.10**	< 1	3.9	17	< 1.0	8.0	0.017	1100	< 1.0	520	1.4	2.41	Not-detected	#N/A
3	**TP103**	**0.10**	< 1	7.9	20	< 1.0	7.8	0.015	1200	< 1.0	550	3.0	5.16	Not-detected	#N/A
	Screening Criteria Value		**34.0**	-	-	**280.0**	-	-	-	-	-	-	-	-	**0.001**
	Source of Screening Criteria Value		ATRISK	-	-	S4UL	-	-	-	-	-	-	-	-	IOM

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Intégral Géotechnique

SUMMARY OF LABORATORY SOIL TEST RESULTS

Job No.: 11810

Site: Curtis Lane, Stoke Gifford

Soil Type: Topsoil

Soil Organic Matter: 1%

POLYAROMATIC HYDROCARBONS (PAH)

No.	Location	Depth (m)	Acenaphthene (mg/kg)	Acenaphthylene (mg/kg)	Anthracene (mg/kg)	Benzo(a)anthracene (mg/kg)	Benzo(a)pyrene (mg/kg)	Benzo(b)fluoranthene (mg/kg)	Benzo(ghi)perylene (mg/kg)	Benzo(k)fluoranthene (mg/kg)	Chrysene (mg/kg)	Dibenzo(ah)anthracene (mg/kg)	Fluoranthene (mg/kg)	Fluorene (mg/kg)	Indeno(123cd)pyrene (mg/kg)	Naphthalene (mg/kg)	Phenanthrene (mg/kg)	Pyrene (mg/kg)
1	TP101	0.10	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.37	< 0.05	< 0.05	< 0.05	0.23	0.30
2	TP102	0.10	< 0.05	< 0.05	< 0.05	0.28	0.27	0.29	< 0.05	0.21	0.29	< 0.05	0.52	< 0.05	< 0.05	< 0.05	0.30	0.48
3	TP103	0.10	< 0.05	< 0.05	0.29	0.98	0.96	1.2	0.75	0.53	0.78	< 0.05	1.8	< 0.05	0.63	< 0.05	0.94	1.5
	Screening Criteria Value		210.0	170.0	2400.0	7.2	2.2	2.6	320.0	77.0	15.0	0.2	280.0	170.0	27.0	2.3	95.0	620.0
	Source of Screening Criteria Value		S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL

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Intégral Géotechnique

SUMMARY OF LABORATORY SOIL TEST RESULTS

Job No.: 11810

Site: Curtis Lane, Stoke Gifford

Soil Type: Topsoil

Soil Organic Matter: 1%

PETROLEUM HYDROCARBONS

No.	Location	Depth (m)	Aliphatic C5-C6 (mg/kg)	Aliphatic C6-C8 (mg/kg)	Aliphatic C8-C10 (mg/kg)	Aliphatic C10-C12 EPH (mg/kg)	Aliphatic C12-C16 EPH (mg/kg)	Aliphatic C16-C35 EPH (mg/kg)	Aliphatic C35-C44 EPH (mg/kg)	Aromatic C5-C7 (mg/kg)	Aromatic C7-C8 (mg/kg)	Aromatic C8-C10 (mg/kg)	Aromatic C10-C12 EPH (mg/kg)	Aromatic C12-C16 EPH (mg/kg)	Aromatic C16-C21 EPH (mg/kg)	Aromatic C21-C35 EPH (mg/kg)	Aromatic C35-C40 EPH (mg/kg)
1	TP101	0.10	< 0.001	< 0.001	< 0.001	< 1.0	< 2.0	< 10	< 8.4	< 0.001	< 0.001	< 0.001	< 1.0	< 2.0	< 10	< 10	< 8.4
2	TP102	0.10	< 0.001	< 0.001	< 0.001	< 1.0	< 2.0	< 10	< 8.4	< 0.001	< 0.001	< 0.001	< 1.0	< 2.0	< 10	< 10	< 8.4
3	TP103	0.10	< 0.001	< 0.001	< 0.001	< 1.0	< 2.0	< 10	< 8.4	< 0.001	< 0.001	< 0.001	< 1.0	< 2.0	< 10	16	< 8.4
	Screening Criteria Value		42.0	100.0	27.0	130.0	1100.0	65000.0	65000.0	0.1	130.0	34.0	74.0	140.0	260.0	1100.0	1100.0
	Source of Screening Criteria Value		S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL

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Intégral Géotechnique

FIGURES

NORTH

KEY

Approximate location of trial pit

Approximate site boiundary

Figure 1: Site Plan

Project: Curtis Lane, Stoke Gifford	Job No.: 11810	Intégral Géotechnique	Integral House, 7 Beddau Way, Castlegate Business Park, Caerphilly, CF83 2AX. Tel: 029 2080 7991
Client: Engie UK Places & Communities	Scale: 1:800 at A3		

Annex B
Photographs of Soil Sampling and Capping Thickness Validation

Terra Firma (Wales) Ltd. 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA
Tel: 029 2073 5354 **Fax:** 029 2073 5433 **Email:** info@terrafirmawales.co.uk **www.terrafirmawales.co.uk**
Registered in Wales No. 4013230. VAT No: 753 2566 25. Registered Office: 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA

PLOTS 1 - 12

PLOTS 13 - 24

PLOTS 25 – 36

PLOTS 37 & 38

Annex C
Laboratory Soil Chemical Test Results

Terra Firma (Wales) Ltd. 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA
Tel: 029 2073 5354 **Fax:** 029 2073 5433 **Email:** info@terrafirmawales.co.uk **www.terrafirmawales.co.uk**
Registered in Wales No. 4013230. VAT No: 753 2566 25. Registered Office: 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA

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

Final Report

Report No.:	20-25355-1
Initial Date of Issue:	28-Sep-2020
Client	Terra Firma (Wales) Ltd
Client Address:	5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA
Contact(s):	[redacted]
Project	Herbert Road
Quotation No.:	
Order No.:	12032RH
No. of Samples:	8
Turnaround (Wkdays):	5
Date Approved:	28-Sep-2020
Approved By:	[redacted]
Details:	Glynn Harvey, Technical Manager

Date Received:	22-Sep-2020
Date Instructed:	22-Sep-2020
Results Due:	28-Sep-2020

Results - Soil

Project: Herbert Road

Client: Terra Firma (Wales) Ltd				**Chemtest Job No.:**	20-25355	20-25355	20-25355	20-25355	20-25355	20-25355	20-25355	20-25355
Quotation No.:				**Chemtest Sample ID.:**	1068155	1068156	1068157	1068158	1068159	1068160	1068161	1068162
Order No.: 12032RH				Client Sample Ref.:	PLOTS 1 - 12	PLOTS 13 - 14	PLOTS 25 - 36	PLOTS 37-38	PLOTS 1 - 12	PLOTS 13 - 24	PLOTS 25 - 36	PLOTS 37-38
				Client Sample ID.:	S1 TS	S1 TS	S1 TS	S1 TS	S1 SS	S2 SS	S3 SS	S4 SS
				Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Date Sampled:	17-Sep-2020	17-Sep-2020	17-Sep-2020	17-Sep-2020	17-Sep-2020	17-Sep-2020	17-Sep-2020	17-Sep-2020
				Time Sampled:	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**								
ACM Type	U	2192		N/A	-	-	-	-	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-	-	-	-	-	-
Moisture	N	2030	%	0.020	14	5.1	13	13	13	7.4	13	13
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	None	Stones	Stones	Stones	Stones	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Clay
pH	M	2010		4.0	8.4	8.4	9.0	8.7	9.1	8.7	9.1	8.8
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	0.70	0.85	0.65	0.96	0.97	0.72	0.86	0.81
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Sulphate (Acid Soluble)	M	2430	%	0.010	0.097	0.12	0.097	0.15	0.13	0.096	0.17	0.15
Arsenic	M	2450	mg/kg	1.0	12	13	12	14	9.9	11	9.7	9.8
Cadmium	M	2450	mg/kg	0.10	0.79	1.1	1.7	0.91	0.80	0.74	0.51	0.60
Chromium	M	2450	mg/kg	1.0	20	22	41	39	25	21	23	20
Mercury Low Level	M	2450	mg/kg	0.05	0.15	0.17	0.18	0.13	0.10	0.09	0.07	0.09
Copper	M	2450	mg/kg	0.50	27	42	32	43	37	29	27	20
Nickel	M	2450	mg/kg	0.50	23	26	22	32	28	23	24	21
Lead	M	2450	mg/kg	0.50	72	83	77	180	51	78	53	41
Selenium	M	2450	mg/kg	0.20	0.27	< 0.20	< 0.20	< 0.20	< 0.20	0.22	< 0.20	< 0.20
Zinc	M	2450	mg/kg	0.50	170	210	200	200	140	130	98	91
Chromium (Trivalent)	N	2490	mg/kg	1.0	20	22	41	39	25	21	23	20
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 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	< 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	< 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	< 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	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 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	< 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	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Results - Soil

Project: Herbert Road

Client: Terra Firma (Wales) Ltd		**Chemtest Job No.:**			20-25355	20-25355	20-25355	20-25355	20-25355	20-25355	20-25355	20-25355
Quotation No.:		**Chemtest Sample ID.:**			1068155	1068156	1068157	1068158	1068159	1068160	1068161	1068162
Order No.: 12032RH		Client Sample Ref.:			PLOTS 1 - 12	PLOTS 13 - 14	PLOTS 25 - 36	PLOTS 37-38	PLOTS 1 - 12	PLOTS 13 - 24	PLOTS 25 - 36	PLOTS 37-38
		Client Sample ID.:			S1 TS	S1 TS	S1 TS	S1 TS	S1 SS	S2 SS	S3 SS	S4 SS
		Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Date Sampled:			17-Sep-2020	17-Sep-2020	17-Sep-2020	17-Sep-2020	17-Sep-2020	17-Sep-2020	17-Sep-2020	17-Sep-2020
		Time Sampled:			12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
		Asbestos Lab:			DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**								
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Naphthalene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 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	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 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	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 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	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	1.5	1.1	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	1.2	1.0	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 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	< 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	< 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	< 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	< 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	< 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	< 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	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	M	2700	mg/kg	2.0	< 2.0	< 2.0	2.7	2.1	< 2.0	< 2.0	< 2.0	< 2.0
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
Organic Matter BS1377	N	2930	%	0.10	3.5	3.6	3.9	3.6	0.90	1.4	0.50	0.20

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	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
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; 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"

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 45 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

terra firma
Geotechnical & Geoenvironmental Specialists
www.terrafirmawales.co.uk

Our Ref: RH/12032/VP39-46/56-75

Your Ref:

Contact: Ruth Howells

8th January 2021

NHBC

For the attn. of Mr Steve Moreby

Dear Steve

PLOTS 39-46 and 56-75 PHASE 2, HERBERT ROAD NEWPORT: CAPPING VALIDATION

I confirm that the required 600mm of remedial capping has now been imported and validated within the gardens of Plots 39-46 and 56-75.

Figure 1: Site Layout and Sampling Locations

The topsoil and subsoil for Plots 39-46 was sourced from a development site in Bonvilston. Terra Firma (Wales) Limited sampled and tested these soils at source from stockpiles. Please refer to **Annex A** for the test results. A volume of <250m^3 of both the Bonvilston topsoil and subsoil was subsequently imported.

The topsoil and subsoil within Plots 56-75 was sourced from a development site known as Curtis Lane. Results of samples tested at source are provided in **Annex B**. The volume of the Curtis Lane topsoil and subsoil imported was <250m^3, each.

A visit was made to site on 17th December 2020 to sample the imported soils and to confirm the capping thickness.

The capping thickness was found to be at 600mm, confirmed by hand dug pits. Please see **Annex C** for photographs of the pits.

Two samples of Bonvilston sourced topsoil and subsoil were taken. Four samples of each of the Curtis Lane sourced soils were taken.

Sample/validation hole locations are illustrated in **Figure 1** on the previous page. Those positions shown in red are the locations where soil samples were taken.

Soil samples were submitted for laboratory analysis at the laboratory of Eurofins Chemtest. The chemical test certificate may be found in **Annex D**.

Comparison of the analytical results has been made residential (including plant uptake) Suitable 4 Use Levels (S4ULs) provided by Land Quality Management Limited and the Chartered Institute of Environmental Health (CIEH). Where CIEH thresholds are not available reference has been made to Category 4 Screening Levels (C4SLs).

Both subsoil and topsoil results from all sampling locations are summarised in the following table.

Table 1 Summary of Soil Chemical Test Results Imported Soils

Substance	SGV/GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of Exceedances
			Minimum	Maximum	
Arsenic	37	CIEH	10	16	0
Boron	290	CIEH	0..44	0.96	0
Cadmium	11	CIEH	0.37	1.1	0
Chromium III	910	CIEH	13	62	0
Chromium VI	6	CIEH	<0.5	<0.5	0
Copper	2400	CIEH	17	33	0
Lead	200	C4SL	43	81	0
Mercury	40	CIEH	0.06	0.15	0
Nickel	130	CIEH	13	28	0
Selenium	250	CIEH	<0.2	0.46	0
Zinc	3700	CIEH	91	190	0
Cyanide	8	-	<0.5	<0.5	0
Phenols	120	CIEH	<0.3	<0.3	0
Organic Matter	-	-	0.9	3.6	-
pH	-	-			-
Asbestos	-	-	Not detected	Not detected	-
Naphthalene	2.3	CIEH	<0.1	<0.1	0
Acenaphthylene	170	CIEH	<0.1	<0.1	0
Acenaphthene	210	CIEH	<0.1	<0.1	0
Fluorene	170	CIEH	<0.1	<0.1	0
Phenanthrene	95	CIEH	<0.1	1.6	0
Anthracene	2400	CIEH	<0.1	0.51	0
Fluoranthene	280	CIEH	<0.1	1.5	0
Pyrene	620	CIEH	<0.1	1.5	0
Benzo(a)anthracene	7.2	CIEH	<0.1	<0.1	0
Chrysene	15	CIEH	<0.1	<0.1	0
Benzo(b)fluoranthene	2.6	CIEH	<0.1	<0.1	0
Benzo(k)fluoranthene	77	CIEH	<0.1	<0.1	0
Benzo(a)pyrene	2.2	CIEH	<0.1	<0.1	0
Indeno(123cd)pyrene	27	CIEH	<0.1	<0.1	0
Dibenzo(ah)anthracene	0.24	CIEH	<0.1	<0.1	0
Benzo(ghi)perylene	320	CIEH	<0.1	<0.1	0

Table 1 Summary of Soil Chemical Test Results (Continued) Imported Soils					
Substance	**GAC** (mg/kg)	**Source**	**Measured Concentrations of Tested Substances** (mg/kg)		**Number of Exceedances**
			Minimum	**Maximum**	
Aliphatic					
PH C5 – C6 Ali	42	CIEH	<1.0	<1.0	0
PH C6 – C8 Ali	100	CIEH	<1.0	<1.0	0
PH C8 – C10 Ali	27	CIEH	<1.0	670	1
PH C10 – C12 Ali	130	CIEH	<1.0	2400	1
PH C12 – C16 Ali	1100	CIEH	<1.0	5800	1
PH C16 – C21 Ali*	65000	CIEH	<1.0	<1.0	0
PH C21 – C35 Ali*	65000	CIEH	<1.0	24	0
PH C35 – C44 Ali	65000	CIEH	<1.0	<1.0	0
Aromatic					
PH C5 – C7 Arom	70	CIEH	<1.0	<1.0	0
PH C7 – C8 Arom	130	CIEH	<1.0	<1.0	0
PH C8 – C10 Arom	34	CIEH	<1.0	430	1
PH C10 – C12 Arom	74	CIEH	<1.0	1600	1
PH C12 – C16 Arom	140	CIEH	<1.0	4300	1
PH C16 – C21 Arom	260	CIEH	<1.0	4400	1
PH C21 – C35 Arom	1100	CIEH	<1.0	2400	1
PH C35 – C44 Arom	1100	CIEH	<1.0	<1.0	0

Notes

- Thresholds based on 1.0% SOM
- CIEH for Ali C16 - 21 and C21 - C35 based on CIEH for EC >16 – 35

From the above table is can be seen that all substances tested for are present at levels below their respective human health threshold levels with the exception of petroleum hydrocarbons in one sample.

This was identified in subsoil in Plot 74. Given the unusual results and no evidence of petroleum hydrocarbons in the soil during sampling this was anticipated to be an anomaly. Terra Firma (Wales) Limited therefore returned to site on the 6th January 2021. Three hand dug holes were excavated around the original sample location at Plot 74 and additional samples of the subsoil retrieved (S1-S3), please refer to **Figure 2** on the following page.

The three subsoil samples were submitted for laboratory analysis for TPHCWG. The test result certificate may be found in **Annex E**. Results are summarised in **Table 2**.

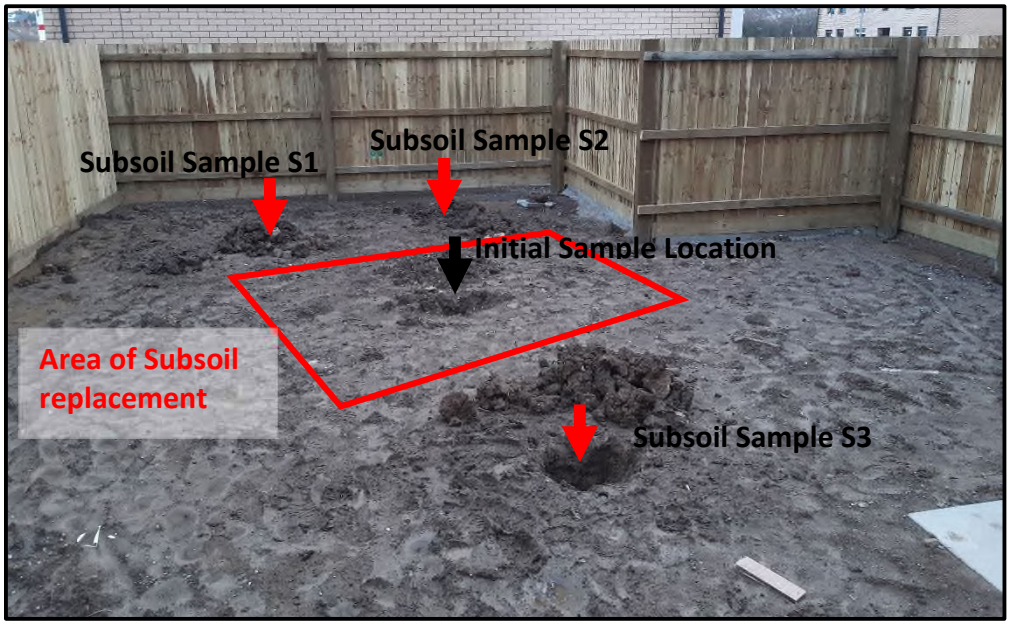


Figure 2: Plot 74 Subsoil Sampling Locations

Table 2 Additional Subsoil Test Results Plot 74

Substance	GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of Exceedances
			Minimum	Maximum	
Aliphatic					
PH C5 – C6 Ali	42	CIEH	<1.0	<1.0	0
PH C6 – C8 Ali	100	CIEH	<1.0	<1.0	0
PH C8 – C10 Ali	27	CIEH	<1.0	<1.0	0
PH C10 – C12 Ali	130	CIEH	<1.0	<1.0	0
PH C12 – C16 Ali	1100	CIEH	<1.0	<1.0	0
PH C16 – C21 Ali*	65000	CIEH	<1.0	<1.0	0
PH C21 – C35 Ali*	65000	CIEH	<1.0	<1.0	0
PH C35 – C44 Ali	65000	CIEH	<1.0	<1.0	0
Aromatic					
PH C5 – C7 Arom	70	CIEH	<1.0	<1.0	0
PH C7 – C8 Arom	130	CIEH	<1.0	<1.0	0
PH C8 – C10 Arom	34	CIEH	<1.0	<1.0	0
PH C10 – C12 Arom	74	CIEH	<1.0	<1.0	0
PH C12 – C16 Arom	140	CIEH	<1.0	<1.0	0
PH C16 – C21 Arom	260	CIEH	<1.0	<1.0	0
PH C21 – C35 Arom	1100	CIEH	<1.0	<1.0	0
PH C35 – C44 Arom	1100	CIEH	<1.0	<1.0	0

Notes

- Thresholds based on 1.0% SOM
- CIEH for Ali C16 - 21 and C21 - C35 based on CIEH for EC >16 – 35

These results provide confidence that the original anomalous Plot 74 subsoil sample results were not representative of the subsoil as a whole and most likely caused by recent site activities.

It was therefore recommended that an area of subsoil roughly 2m by 2m be excavated out, removed from site, and replaced. The approximate dig area is illustrated in **Figure 2**. This was completed on 8th January 2020, with subsoil from the same Curtis Lane source used to replace that excavated.

It may now be confirmed that the imported subsoil and topsoil does not present a risk to the human health of future site residents.

I 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 me.

Yours sincerely
for: Terra Firma (Wales) Ltd

[redacted]

Mrs Ruth Howells

Annex A
Bonvilston Soils Source Test Results

Terra Firma (Wales) Ltd. 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA
Tel: 029 2073 5354 **Fax:** 029 2073 5433 **Email:** info@terrafirmawales.co.uk **www.terrafirmawales.co.uk**
Registered in Wales No. 4013230. VAT No: 753 2566 25. Registered Office: 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA

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

Final Report

Report No.:	20-28927-1
Initial Date of Issue:	02-Nov-2020
Client	Terra Firma (Wales) Ltd
Client Address:	5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA
Contact(s):	[redacted]
Project	Bonvilston
Quotation No.:	
Date Received:	27-Oct-2020
Order No.:	13032/RH
Date Instructed:	27-Oct-2020
No. of Samples:	9
Turnaround (Wkdays):	5
Results Due:	02-Nov-2020
Date Approved:	02-Nov-2020
Approved By:	[redacted]
Details:	Glynn Harvey, Technical Manager

Results - Soil

Project: Bonvilston

Client: Terra Firma (Wales) Ltd				**Chemtest Job No.:**	20-28927	20-28927	20-28927	20-28927	20-28927	20-28927	20-28927	20-28927	20-28927
Quotation No.:				**Chemtest Sample ID.:**	1086797	1086798	1086799	1086800	1086801	1086802	1086803	1086804	1086805
Order No.: 13032/RH				Client Sample Ref.:	SS S1	SS S2	SS S3	SS S4	SS S5	SS S6	TS S1	TS S2	TS S3
				Client Sample ID.:	SS S1	SS S2	SS S3	SS S4	SS S5	SS S6	TS S1	TS S2	TS S3
				Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Date Sampled:	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020
				Time Sampled:	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	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	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-	-	-	-	-	-	-
Moisture	N	2030	%	0.020	13	10	12	11	10	13	16	13	13
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones	Stones	Stones	Stones	Stones	Stones and Roots	Stones
Soil Texture	N	2040		N/A	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand
pH	M	2010		4.0	8.7	8.6	8.9	9.3	8.4	8.0	7.3	7.6	8.1
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	< 0.40	< 0.40	< 0.40	0.47	< 0.40	< 0.40	0.47	0.51	< 0.40
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	0.50
Sulphate (Acid Soluble)	M	2430	%	0.010	0.022	0.036	0.048	0.042	< 0.010	0.022	0.054	0.051	0.036
Arsenic	M	2450	mg/kg	1.0	11	14	12	11	9.2	8.6	12	12	11
Cadmium	M	2450	mg/kg	0.10	0.24	0.36	0.28	0.29	0.28	0.17	0.34	0.34	0.32
Chromium	M	2450	mg/kg	1.0	20	21	20	17	17	17	14	15	13
Mercury Low Level	M	2450	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.06	0.13	0.12
Copper	M	2450	mg/kg	0.50	17	18	20	24	17	14	15	16	14
Nickel	M	2450	mg/kg	0.50	25	27	25	23	27	22	14	17	16
Lead	M	2450	mg/kg	0.50	32	33	33	28	41	34	47	52	43
Selenium	M	2450	mg/kg	0.20	0.28	< 0.20	< 0.20	< 0.20	0.32	0.42	0.37	0.37	0.40
Zinc	M	2450	mg/kg	0.50	83	89	90	79	89	80	72	75	71
Chromium (Trivalent)	N	2490	mg/kg	1.0	20	21	20	17	17	17	14	15	13
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 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	< 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	< 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	< 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	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 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	< 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	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Results - Soil

Project: Bonvilston

Client: Terra Firma (Wales) Ltd			**Chemtest Job No.:**		20-28927	20-28927	20-28927	20-28927	20-28927	20-28927	20-28927	20-28927	20-28927
Quotation No.:			**Chemtest Sample ID.:**		1086797	1086798	1086799	1086800	1086801	1086802	1086803	1086804	1086805
Order No.: 13032/RH			Client Sample Ref.:		SS S1	SS S2	SS S3	SS S4	SS S5	SS S6	TS S1	TS S2	TS S3
			Client Sample ID.:		SS S1	SS S2	SS S3	SS S4	SS S5	SS S6	TS S1	TS S2	TS S3
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Date Sampled:		23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020
			Time Sampled:		12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
			Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Naphthalene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 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	< 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	< 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	< 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	< 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	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.13	< 0.10	< 0.10	< 0.10	< 0.10	1.1
Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.12	< 0.10	< 0.10	< 0.10	< 0.10	1.0
Benzo[a]anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 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	< 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	< 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	< 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	< 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	< 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	< 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	< 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	< 2.0	< 2.0	< 2.0	< 2.0	2.1
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
Organic Matter BS1377	N	2930	%	0.10	0.80	0.60	0.60	0.80	0.30	1.4	3.1	2.6	2.5

Results - Topsoil Report

BS3882:2015

Chemtest Job No.: 20-28927
Chemtest Sample ID.: 1086803
Client Sample Ref.: TS S1
Sample Location:
Client Sample ID.: TS S1
Top Depth (m):
Bottom Depth (m):
Date Sampled: 23-Oct-2020
Time Sampled:

Parameter	Units	Multipurpose Range	Result	Compliant with Multipurpose Range? (Y/N)	Compliant with Specific Purpose Range? (Y/N)		
Texture					**Acid**	**Low F**	**Calc.**
Clay content	%		21				
Silt content	%		27				
Sand content	%		52				
Soil texture class		See Attached Chart	Sandy Clay Loam	YES			
Mass Loss on Ignition							
Clay 5-20%		3.0-20	4.1	NO	NO	YES	NO
Clay 20-35%		5.0-20					
Stone Content	**% m/m**						
>2mm		0-30	28	YES			
>20mm		0-10	3.8	YES			
>50mm		0	< 0.020	YES			
Soil pH value		5.5-8.5	7.3	YES	NO	YES	NO
Carbonate (Calcareous only)	%		5.3				YES
Electrical Conductivity	µS/cm	If >3300 do ESP	2200	YES			
Available Nutrient Content							
Nitrogen %		>0.15	0.23	YES	YES		YES
Extractable phosphorus	mg/l	16-140	6.5	NO	NO	YES	NO
Extractable potassium	mg/l	121-1500	75	NO	NO		NO
Extractable magnesium	mg/l	51-600	120	YES	YES		YES
Carbon : Nitrogen Ratio		<20:1	10.4/1	YES	YES	YES	YES
Exchangeable sodium	**%**	<15	0.95				
Available Calcium	mg/l		1900				
Available Sodium	mg/l		24				
Phytotoxic Contaminants (by soil pH)		**< 6.0** / **6.0-7.0** / **> 7.0**					
Zinc (Nitric Acid extract)	mg/kg	<200 / <200 / <300	57	YES			
Copper (Nitric Acid extract)	mg/kg	<100 / <135 / <200	14	YES			
Nickel (Nitric Acid extract)	mg/kg	<60 / <75 / <110	12	YES			
Visible Contaminants	**% mm**						
>2mm		<0.5	0.000	YES			
….. of which plastics		<0.25	0.000	YES			
….. man-made sharps		zero in 1kg	0.000	YES			

Results - Topsoil Report

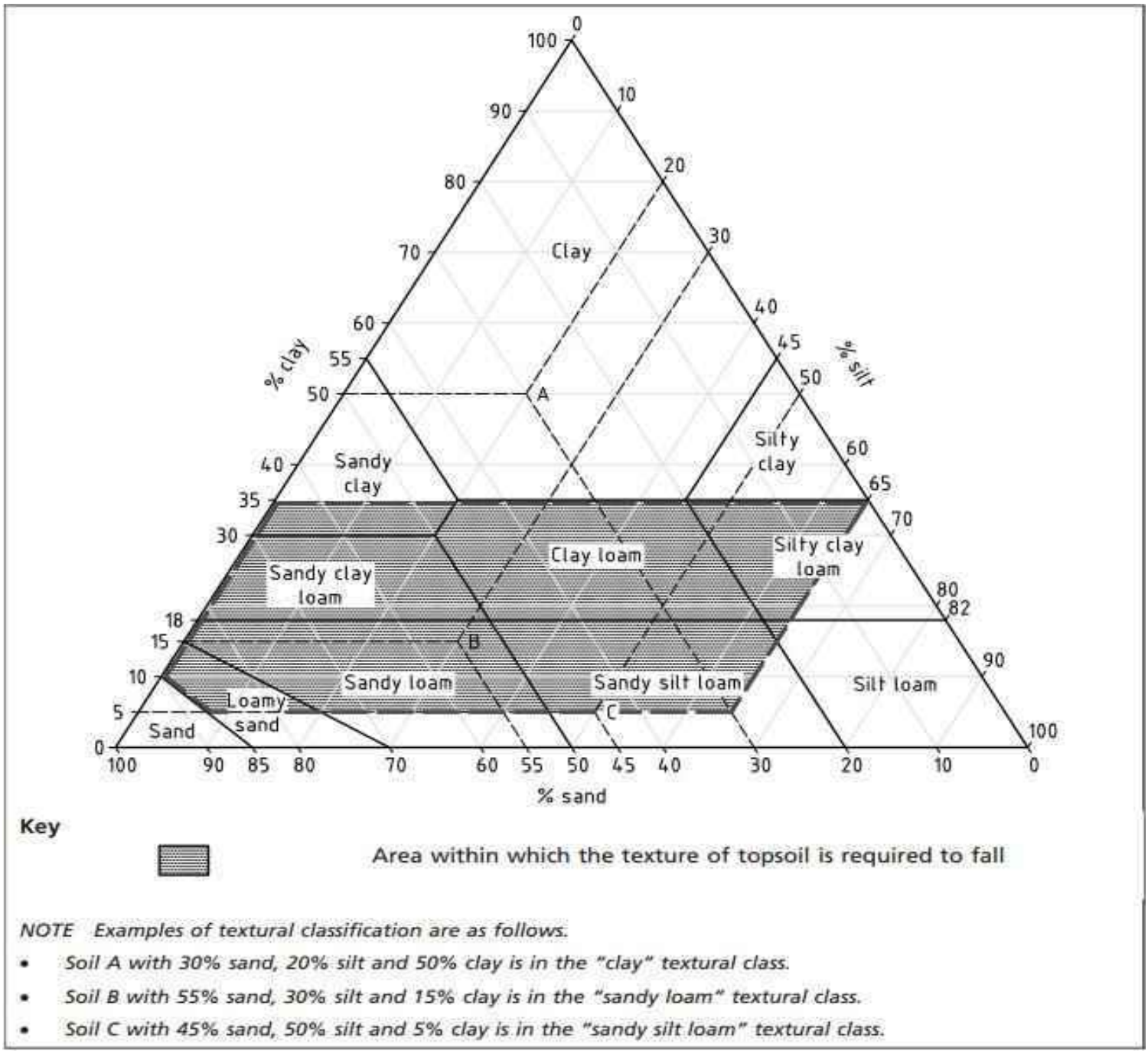
BS3882:2015

Chemtest Job No.: 20-28927
Chemtest Sample ID.: 1086804
Client Sample Ref.: TS S2
Sample Location:
Client Sample ID.: TS S2
Top Depth (m):
Bottom Depth (m):
Date Sampled: 23-Oct-2020
Time Sampled:

Parameter	Units	Multipurpose Range	Result	Compliant with Multipurpose Range? (Y/N)	Compliant with Specific Purpose Range? (Y/N)		
Texture					**Acid**	**Low F**	**Calc.**
Clay content	%		19				
Silt content	%		24				
Sand content	%		56				
Soil texture class		See Attached Chart	Sandy Clay Loam	YES			
Mass Loss on Ignition							
Clay 5-20%		3.0-20	3.5	YES	YES	YES	YES
Clay 20-35%		5.0-20					
Stone Content	**% m/m**						
>2mm		0-30	23	YES			
>20mm		0-10	9.7	YES			
>50mm		0	< 0.020	YES			
Soil pH value		5.5-8.5	7.6	YES	NO	YES	YES
Carbonate (Calcareous only)	%		4.0				YES
Electrical Conductivity	µS/cm	If >3300 do ESP	2200	YES			
Available Nutrient Content							
Nitrogen %		>0.15	0.21	YES	YES		YES
Extractable phosphorus	mg/l	16-140	7.2	NO	NO	YES	NO
Extractable potassium	mg/l	121-1500	85	NO	NO		NO
Extractable magnesium	mg/l	51-600	130	YES	YES		YES
Carbon : Nitrogen Ratio		<20:1	9.9/1	YES	YES	YES	YES
Exchangeable sodium	**%**	<15	0.87				
Available Calcium	mg/l		1600				
Available Sodium	mg/l		19				
Phytotoxic Contaminants (by soil pH)		**< 6.0** / **6.0-7.0** / **> 7.0**					
Zinc (Nitric Acid extract)	mg/kg	<200 / <200 / <300	59	YES			
Copper (Nitric Acid extract)	mg/kg	<100 / <135 / <200	16	YES			
Nickel (Nitric Acid extract)	mg/kg	<60 / <75 / <110	14	YES			
Visible Contaminants	**% mm**						
>2mm		<0.5	0.000	YES			
….. of which plastics		<0.25	0.000	YES			
….. man-made sharps		zero in 1kg	0.000	YES			

Topsoil: BS3882:2015

Texture Classification Chart



Key

Area within which the texture of topsoil is required to fall

NOTE Examples of textural classification are as follows.

- *Soil A with 30% sand, 20% silt and 50% clay is in the "clay" textural class.*
- *Soil B with 55% sand, 30% silt and 15% clay is in the "sandy loam" textural class.*
- *Soil C with 45% sand, 50% silt and 5% clay is in the "sandy silt loam" textural class.*

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Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2020	Electrical Conductivity	Electrical conductivity (EC) of aqueous extract or calcium sulphate solution for topsoil	Measurement of the electrical resistance of a 2:1 water/soil extract.
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
2115	Total Nitrogen in Soils	Nitrogen	Determination by elemental analyser
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2260	Carbonate	Carbonate	Titration
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2400	Cations	Cations	ICP-MS
2420	Phosphate	Phosphate	Spectrophotometry - Discrete 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-diphenylcarbazide.
2620	LOI 440	LOI 440 Trommel Fines	Determination of the proportion by mass that is lost from a soil by ignition at 440°C.
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"

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

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

Annex B
Curtis Lane Soils Source Test Results

Terra Firma (Wales) Ltd. 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA
Tel: 029 2073 5354 **Fax:** 029 2073 5433 **Email:** info@terrafirmawales.co.uk **www.terrafirmawales.co.uk**
Registered in Wales No. 4013230. VAT No: 753 2566 25. Registered Office: 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA

Intégral Géotechnique

Intégral House
7 Beddau Way
Castlegate Business Park
Caerphilly
CF83 2AX
Tel: 029 2080 7991
mail@integralgeotec.com

11810/LW

8 July 2019

Engie UK Places & Communities
2nd Floor
31 Bocam Park
Oakfield Road
Bridgend CF35 5LJ

For the attention of Mr Dylan Hammett

Dear Sirs,

Curtis Lane, Stoke Gifford – Supplementary Topsoil Sampling

We have now completed the supplementary topsoil sampling at the above site and report as follows.

The site was previously investigated by Intégral Géotechnique in June 2016 and reported in Site Investigation Report, Ref: 11810/LW/16/SI dated June 2016.

Intégral Géotechnique have been commissioned to undertake further topsoil sampling, followed by laboratory chemical testing and risk assessment to inform the suitability of the topsoil for re-use.

This report is supplemental to the above site investigation report and should be read in conjunction with it.

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Introduction

The site is located in Stoke Gifford, approximately 7km north east of Bristol, at a National Grid Reference of 363250, 179540.

The site consisted of a green field, lined with hedgerows and mature trees. The field was previously used for grazing of livestock.

A residential property exists in the southern part of the site. The property consists of a house and garages with areas of hardstanding and gardens. During the supplementary site works, the property was vacant and access was available.

Two above ground storage tanks are located to the north east of the property and were still present during the supplementary site investigation. The two rectangular oil tanks were located adjacent to each other and situated above a gravel base. No visual evidence of leakages from the tanks was observed, however, an olfactory evidence of petroleum hydrocarbons was noted.

In the eastern area of the site, a small stockpile was located with an area of dense vegetation.

Site Works

Site works were carried out on the 18th March 2019 to undertake the supplementary topsoil sampling.

The approximate location of the trial pits and sampling locations are shown on Figure 1 enclosed. The trial pits logs are included in Appendix A.

Representative samples were taken from the topsoil, encountered in the northern field. The topsoil samples were tested for a range of contaminants including petroleum hydrocarbons and asbestos.

The samples were sent to the UKAS accredited laboratories of i2 Analytical for testing. A copy of the results of the laboratory testing is presented in Appendix B.

The results of the chemical testing have been summarised and compared against the appropriate soils screening values of the proposed residential with home grown produce end use. A copy of the summary is presented in Appendix C.

Ground Conditions

The ground conditions encountered within the trial pits consisted of a veneer of topsoil overlying the weathered strata of the Mercia Mudstone Formation.

A veneer of topsoil was encountered within trial pits TP101 to TP103 and typically consisted of silty slightly gravelly clay. The topsoil was encountered at a thickness of between 0.10m and 0.20m.

The topsoil was overlying the weathered strata of the Mercia Mudstone Formation. The weathered strata consisted of firm, locally soft to firm brown to red brown slightly sandy silty clay, grading into firm, firm to stiff red brown silty clay with mudstone lithorelicts. The firm or firm to stiff clays were encountered at depths of between 0.6m and 1.0m below existing ground level.

The weathered clay strata further graded into mudstone bedrock within trial pits TP102 at depths of 2.2m.

Groundwater was not encountered within the trial pits.

Chemical Assessment

The results of the laboratory testing of representative topsoil samples from TP101 to TP103 at depths of 0.10m, indicate that the analysed chemical elements or compounds are present at concentrations below the appropriate threshold for residential with home grown produce end use.

Asbestos was not detected within the screened samples.

Based on these results, it is considered that the topsoil does not present a potential risk to residential end users, and it is considered that the topsoil, located within the zone indicated on Figure 1, to be suitable for re-use on or off site.

We trust the above and enclosed are to your satisfaction. However, if you have any queries, or require further information, please do not hesitate to contact us.

Yours faithfully,

[redacted]

PP **Lowri Williams**
For
Intégral Géotechnique (Wales) Limited

APPENDIX A

TRIAL PIT LOGS

Intégral Géotechnique	Project Name:	Project No.:	Trial Pit No.:
Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com	**Curtis Lane, Stoke Gifford**	**11810**	**TP101** Sheet 1 of 1

Location:	Client: Engie UK Places & Communities	Logged By:	Scale
Bristol		LW	1:25

Equipment: JCB 3CX	Coordinates:	**Dimensions** 3.00m
Date Excavated: 18/03/2019	Level:	Depth : 2.60m; 0.70m

Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.20			Topsoil: Grass onto brown slightly sandy slightly gravelly silty clay with rootlets. Gravel is fine to medium angular of mudstone.
						Firm, locally soft to firm brown becoming red brown slightly sandy silty CLAY.
			1.00			Firm, firm to stiff red brown silty CLAY with very weak weathered mudstone lithorelicts. ... becoming locally mottled green grey with increase in mudstone fabric from 1.9m.
			2.60			End of Trialpit at 2.60 m

1
2
3
4
5

Remarks:
1. Trial pit terminated at 2.6m bgl.

Groundwater: Groundwater not encountered

Stability: Stable

Key:
D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
W - Water sample

AGS

Intégral Géotechnique	Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com	Project Name: **Curtis Lane, Stoke Gifford**	Project No.: **11810**	Trial Pit No.: **TP102** Sheet 1 of 1
Location: Bristol		Client: Engie UK Places & Communities	Logged By: LW	Scale 1:25
Equipment: JCB 3CX		Coordinates:	**Dimensions** 2.80m Depth : 2.60m 0.70m	
Date Excavated: 18/03/2019		Level:		

Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.10	ES		0.15			Topsoil: Grass onto brown slightly gravelly silty clay with rootlets. Gravel is fine to medium angular of mudstone.
						Firm brown to red brown silty CLAY.
			0.60			Firm to stiff red brown slightly silty CLAY with frequent extremely weak weathered mudstone lithorelicts. ... Mudstone cobbles from 2m.
			2.20			Extremely weak thinly bedded highly weathered MUDSTONE. Excavated as fine to coarse angular to subangular mudstone gravel with some cobbles in a clayey matrix.
			2.60			End of Trialpit at 2.60 m

Remarks:
1. Trial pit terminated at 2.6m bgl.

Groundwater: Groundwater not encountered.

Stability: Stable

Key:
D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
W - Water sample

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Project Name:	Project No.:	Trial Pit No.:
Curtis Lane, Stoke Gifford	**11810**	**TP103** Sheet 1 of 1

Location:	Client:	Logged By:	Scale
Bristol	Engie UK Places & Communities	LW	1:25

Equipment: JCB 3CX

Coordinates:

Date Excavated: 18/03/2019

Level:

Dimensions

Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.10	ES		0.15			Topsoil: Grass onto brown slightly gravelly silty clay with rootlets. Gravel is fine to medium angular of mudstone.
						Soft to firm, firm red brown slightly gravelly silty CLAY.
			0.60			Firm, firm to stiff red brown slightly silty CLAY with very weak frequent mudstone lithorelicts.
			2.30			End of Trialpit at 2.30 m

Remarks:
1. Trial pit terminated at 2.3m bgl.

Groundwater: Groundwater not encountered.

Stability: Stable

Key:
D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
W - Water sample

AGS

APPENDIX B

LABORATORY CHEMICAL TEST RESULTS

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Analytical Report Number : 19-33901-A

Replaces Analytical Report Number : 19-33901, issue no. 1

Project / Site name:	Curtis Lane, Stoke Gifford	**Samples received on:**	20/03/2019
Your job number:	11810	**Samples instructed on:**	20/03/2019
Your order number:		**Analysis completed by:**	29/03/2019
Report Issue Number:	2	**Report issued on:**	15/07/2019
Samples Analysed:	3 soil samples		

Signed: [redacted]

Zina Abdul Razzak
Senior Quality Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 19-33901-A

Project / Site name: Curtis Lane, Stoke Gifford

Lab Sample Number				1182518	1182519	1182520		
Sample Reference				TP101	TP102	TP103		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				0.10	0.10	0.10		
Date Sampled				18/03/2019	18/03/2019	18/03/2019		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1		
Moisture Content	%	N/A	NONE	16	17	20		
Total mass of sample received	kg	0.001	NONE	1.0	1.1	1.1		
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected		
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.5	8.0	7.8		
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1		
Total Sulphate as SO_4	mg/kg	50	MCERTS	770	1100	1200		
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.013	0.017	0.015		
Sulphide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Total Sulphur	mg/kg	50	MCERTS	440	520	550		
Total Organic Carbon (TOC)	%	0.1	MCERTS	2.7	1.4	3.0		
Loss on Ignition @ 450°C	%	0.2	MCERTS	6.1	3.9	7.9		
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Phenanthrene	mg/kg	0.05	MCERTS	0.23	0.30	0.94		
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.29		
Fluoranthene	mg/kg	0.05	MCERTS	0.37	0.52	1.8		
Pyrene	mg/kg	0.05	MCERTS	0.30	0.48	1.5		
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.28	0.98		
Chrysene	mg/kg	0.05	MCERTS	< 0.05	0.29	0.78		
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	0.29	1.2		
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	0.21	0.53		
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.27	0.96		
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.63		
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.75		
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	0.90	2.64	10.3		
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	9.5	11	14		
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.76	0.68	1.1		
Boron (water soluble)	mg/kg	0.2	MCERTS	1.8	0.9	2.1		
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.5	0.5	1.1		
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0		
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	20	19	30		
Copper (aqua regia extractable)	mg/kg	1	MCERTS	30	25	31		
Lead (aqua regia extractable)	mg/kg	1	MCERTS	70	44	60		
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3		
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	18	15	27		
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	25	25	39		
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	160	390	180		

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 19-33901-A

Project / Site name: Curtis Lane, Stoke Gifford

Lab Sample Number				1182518	1182519	1182520		
Sample Reference				TP101	TP102	TP103		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				0.10	0.10	0.10		
Date Sampled				18/03/2019	18/03/2019	18/03/2019		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001		
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001		
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001		
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0		
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0		
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0		
TPH-CWG - Aliphatic >EC16 - EC35	mg/kg	10	MCERTS	< 10	< 10	< 10		
TPH-CWG - Aliphatic > EC35 - EC44	mg/kg	8.4	NONE	< 8.4	< 8.4	< 8.4		
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	< 10		
TPH-CWG - Aliphatic (EC5 - EC44)	mg/kg	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001		
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001		
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001		
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0		
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	< 10	< 10		
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10	< 10	16		
TPH-CWG - Aromatic >EC35 - EC40	mg/kg	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aromatic > EC35 - EC44	mg/kg	8.4	NONE	< 8.4	< 8.4	< 8.4		
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	20		
TPH-CWG - Aromatic (EC5 - EC44)	mg/kg	10	NONE	< 10	< 10	20		
TPH Total C5 - C44	mg/kg	10	NONE	< 10	< 10	20		

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Analytical Report Number : 19-33901-A

Project / Site name: Curtis Lane, Stoke Gifford

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1182518	TP101	None Supplied	0.10	Brown loam and clay with gravel and vegetation.
1182519	TP102	None Supplied	0.10	Brown loam and clay with brick and vegetation.
1182520	TP103	None Supplied	0.10	Brown clay and loam with gravel and vegetation.

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Analytical Report Number : 19-33901-A

Project / Site name: Curtis Lane, Stoke Gifford

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L047-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L009-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE

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Analytical Report Number : 19-33901-A

Project / Site name: Curtis Lane, Stoke Gifford

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

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APPENDIX C

SUMMARY OF CHEMICAL RESULTS

SUMMARY OF LABORATORY SOIL TEST RESULTS

Job No.: 11810
Site: Curtis Lane, Stoke Gifford
Soil Type: Topsoil
Soil Organic Matter: 1%

METALS AND SEMI-METALS

No.	Location	Depth (m)	Arsenic (mg/kg)	Boron (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Chromium (VI) (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (Elemental) (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
1	TP101	0.10	9.5	1.8	0.76	0.5	20	< 4.0	30	70	< 0.3	18	< 1.0	25	160
2	TP102	0.10	11	0.9	0.68	0.5	19	< 4.0	25	44	< 0.3	15	< 1.0	25	390
3	TP103	0.10	14	2.1	1.1	1.1	30	< 4.0	31	60	< 0.3	27	< 1.0	39	180
	Screening Criteria Value		37.0	290.0	1.7	11.0	-	6.0	2400.0	200.0	1.2	130.0	250.0	410.0	3700.0
	Source of Screening Criteria Value		S4UL	S4UL	S4UL	S4UL	-	S4UL	S4UL	C4SL	S4UL	S4UL	S4UL	S4UL	S4UL

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SUMMARY OF LABORATORY SOIL TEST RESULTS

Job No.: 11810

Site: Curtis Lane, Stoke Gifford

Soil Type: Topsoil

Soil Organic Matter: 1%

INORGANIC CHEMICALS & OTHERS

No.	Location	Depth (m)	Cyanide (mg/kg)	Loss on ignition, dried solids (%)	Moisture content at 30 C (%)	Phenol (mg/kg)	pH (pH units)	Water Soluble Sulphate (g/l)	Sulphate Total as SO4 (mg/kg)	Sulphide (mg/kg)	Total Sulphur (mg/kg)	TOC by Ignition in O2 (%)	Equivalent SOM (%)	Asbestos in Soil	Asbestos Quantification (%)
1	**TP101**	**0.10**	< 1	6.1	16	< 1.0	7.5	0.013	770	< 1.0	440	2.7	4.64	Not-detected	#N/A
2	**TP102**	**0.10**	< 1	3.9	17	< 1.0	8.0	0.017	1100	< 1.0	520	1.4	2.41	Not-detected	#N/A
3	**TP103**	**0.10**	< 1	7.9	20	< 1.0	7.8	0.015	1200	< 1.0	550	3.0	5.16	Not-detected	#N/A
	Screening Criteria Value		**34.0**	-	-	**280.0**	-	-	-	-	-	-	-	-	**0.001**
	Source of Screening Criteria Value		ATRISK	-	-	S4UL	-	-	-	-	-	-	-	-	IOM

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Intégral Géotechnique

SUMMARY OF LABORATORY SOIL TEST RESULTS

Job No.: 11810

Site: Curtis Lane, Stoke Gifford

Soil Type: Topsoil

Soil Organic Matter: 1%

POLYAROMATIC HYDROCARBONS (PAH)

No.	Location	Depth (m)	Acenaphthene (mg/kg)	Acenaphthylene (mg/kg)	Anthracene (mg/kg)	Benzo(a)anthracene (mg/kg)	Benzo(a)pyrene (mg/kg)	Benzo(b)fluoranthene (mg/kg)	Benzo(ghi)perylene (mg/kg)	Benzo(k)fluoranthene (mg/kg)	Chrysene (mg/kg)	Dibenzo(ah)anthracene (mg/kg)	Fluoranthene (mg/kg)	Fluorene (mg/kg)	Indeno(123cd)pyrene (mg/kg)	Naphthalene (mg/kg)	Phenanthrene (mg/kg)	Pyrene (mg/kg)
1	TP101	0.10	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.37	< 0.05	< 0.05	< 0.05	0.23	0.30
2	TP102	0.10	< 0.05	< 0.05	< 0.05	0.28	0.27	0.29	< 0.05	0.21	0.29	< 0.05	0.52	< 0.05	< 0.05	< 0.05	0.30	0.48
3	TP103	0.10	< 0.05	< 0.05	0.29	0.98	0.96	1.2	0.75	0.53	0.78	< 0.05	1.8	< 0.05	0.63	< 0.05	0.94	1.5
	Screening Criteria Value		210.0	170.0	2400.0	7.2	2.2	2.6	320.0	77.0	15.0	0.2	280.0	170.0	27.0	2.3	95.0	620.0
	Source of Screening Criteria Value		S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL

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SUMMARY OF LABORATORY SOIL TEST RESULTS

Job No.: 11810

Site: Curtis Lane, Stoke Gifford

Soil Type: Topsoil

Soil Organic Matter: 1%

PETROLEUM HYDROCARBONS

No.	Location	Depth (m)	Aliphatic C5-C6 (mg/kg)	Aliphatic C6-C8 (mg/kg)	Aliphatic C8-C10 (mg/kg)	Aliphatic C10-C12 EPH (mg/kg)	Aliphatic C12-C16 EPH (mg/kg)	Aliphatic C16-C35 EPH (mg/kg)	Aliphatic C35-C44 EPH (mg/kg)	Aromatic C5-C7 (mg/kg)	Aromatic C7-C8 (mg/kg)	Aromatic C8-C10 (mg/kg)	Aromatic C10-C12 EPH (mg/kg)	Aromatic C12-C16 EPH (mg/kg)	Aromatic C16-C21 EPH (mg/kg)	Aromatic C21-C35 EPH (mg/kg)	Aromatic C35-C40 EPH (mg/kg)
1	TP101	0.10	< 0.001	< 0.001	< 0.001	< 1.0	< 2.0	< 10	< 8.4	< 0.001	< 0.001	< 0.001	< 1.0	< 2.0	< 10	< 10	< 8.4
2	TP102	0.10	< 0.001	< 0.001	< 0.001	< 1.0	< 2.0	< 10	< 8.4	< 0.001	< 0.001	< 0.001	< 1.0	< 2.0	< 10	< 10	< 8.4
3	TP103	0.10	< 0.001	< 0.001	< 0.001	< 1.0	< 2.0	< 10	< 8.4	< 0.001	< 0.001	< 0.001	< 1.0	< 2.0	< 10	16	< 8.4
	Screening Criteria Value		42.0	100.0	27.0	130.0	1100.0	65000.0	65000.0	0.1	130.0	34.0	74.0	140.0	260.0	1100.0	1100.0
	Source of Screening Criteria Value		S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL

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Intégral Géotechnique

FIGURES

NORTH

KEY

Approximate location of trial pit

Approximate site boiundary

Figure 1: Site Plan

Project: Curtis Lane, Stoke Gifford	Job No.: 11810	Intégral Géotechnique	Integral House, 7 Beddau Way, Castlegate Business Park, Caerphilly, CF83 2AX. Tel: 029 2080 7991
Client: Engie UK Places & Communities	Scale: 1:800 at A3		

Annex C
Capping Thickness Validation Photos

Terra Firma (Wales) Ltd. 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA
Tel: 029 2073 5354 **Fax:** 029 2073 5433 **Email:** info@terrafirmawales.co.uk **www.terrafirmawales.co.uk**
Registered in Wales No. 4013230. VAT No: 753 2566 25. Registered Office: 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA

Plot 56

Plot 62

Plot 65

Plot 68

Plot 74

Plot 39

Plot 41

Adjacent to Plot 45

Annex D
Laboratory Soil Test Results

Terra Firma (Wales) Ltd. 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA
Tel: 029 2073 5354 **Fax:** 029 2073 5433 **Email:** info@terrafirmawales.co.uk **www.terrafirmawales.co.uk**
Registered in Wales No. 4013230. VAT No: 753 2566 25. Registered Office: 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA

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

Final Report

Report No.:	20-34859-1
Initial Date of Issue:	24-Dec-2020
Client	Terra Firma (Wales) Ltd
Client Address:	5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA
Contact(s):	[redacted]
Project	H. Road

Quotation No.:		**Date Received:**	18-Dec-2020
Order No.:	12032RH	**Date Instructed:**	18-Dec-2020
No. of Samples:	12		
Turnaround (Wkdays):	5	**Results Due:**	24-Dec-2020
Date Approved:	24-Dec-2020		

Approved By:

[redacted]

Details: Glynn Harvey, Technical Manager

Results - Soil

Project: H. Road

Client: Terra Firma (Wales) Ltd				**Chemtest Job No.:**	20-34859	20-34859	20-34859	20-34859	20-34859	20-34859	20-34859	20-34859	20-34859
Quotation No.:				**Chemtest Sample ID.:**	1116028	1116029	1116030	1116031	1116032	1116033	1116034	1116035	1116036
Order No.: 12032RH				Client Sample Ref.:	PLOT 46 TS	PLOT 46 SS	PLOT 41 TS	PLOT 41 SS	PLOT 56 TS	PLOT 56 SS	PLOT 67 TS	PLOT 67 SS	PLOT 68 TS
				Client Sample ID.:	PLOT 46 TS	PLOT 46 SS	PLOT 41 TS	PLOT 41 SS	PLOT 56 TS	PLOT 56 SS	PLOT 67 TS	PLOT 67 SS	PLOT 68 TS
				Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Date Sampled:	17-Dec-2020	17-Dec-2020	17-Dec-2020	17-Dec-2020	17-Dec-2020	17-Dec-2020	17-Dec-2020	17-Dec-2020	17-Dec-2020
				Time Sampled:	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
ACM Type	U	2192		N/A	-	-	-	-	-	-	-	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-	-	-	-	-	-	-
Moisture	N	2030	%	0.020	23	19	26	17	27	18	31	15	27
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	None	None	None	None	None	None	None	None	None
Soil Texture	N	2040		N/A	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay
pH	M	2010		4.0	7.9	8.3	8.0	9.3	8.2	8.4	8.4	8.4	8.4
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	0.59	0.96	0.53	0.82	0.51	0.50	0.59	0.44	0.66
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Sulphate (Acid Soluble)	M	2430	%	0.010	0.10	0.089	0.056	0.15	0.053	0.058	0.057	0.055	0.080
Arsenic	M	2450	mg/kg	1.0	10	11	14	13	12	16	13	11	13
Cadmium	M	2450	mg/kg	0.10	0.68	0.83	0.49	1.1	0.41	0.84	0.37	0.39	0.93
Chromium	M	2450	mg/kg	1.0	13	18	21	62	16	22	16	18	26
Mercury Low Level	M	2450	mg/kg	0.05	0.09	0.09	0.12	0.14	0.08	0.09	0.08	0.06	0.15
Copper	M	2450	mg/kg	0.50	17	32	19	33	19	26	17	18	30
Nickel	M	2450	mg/kg	0.50	13	19	18	27	16	27	16	22	28
Lead	M	2450	mg/kg	0.50	46	65	59	55	50	81	52	43	83
Selenium	M	2450	mg/kg	0.20	0.31	0.21	0.46	< 0.20	0.25	0.20	0.43	0.23	0.26
Zinc	M	2450	mg/kg	0.50	91	170	110	140	96	140	89	94	190
Chromium (Trivalent)	N	2490	mg/kg	1.0	13	18	21	62	16	22	16	18	26
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 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	< 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	< 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	< 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	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	24	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	24	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 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	< 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	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	7.9	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	21	< 1.0	< 1.0	< 1.0

Results - Soil

Project: H. Road

Client: Terra Firma (Wales) Ltd			**Chemtest Job No.:**		20-34859	20-34859	20-34859	20-34859	20-34859	20-34859	20-34859	20-34859	20-34859
Quotation No.:			**Chemtest Sample ID.:**		1116028	1116029	1116030	1116031	1116032	1116033	1116034	1116035	1116036
Order No.: 12032RH			Client Sample Ref.:		PLOT 46 TS	PLOT 46 SS	PLOT 41 TS	PLOT 41 SS	PLOT 56 TS	PLOT 56 SS	PLOT 67 TS	PLOT 67 SS	PLOT 68 TS
			Client Sample ID.:		PLOT 46 TS	PLOT 46 SS	PLOT 41 TS	PLOT 41 SS	PLOT 56 TS	PLOT 56 SS	PLOT 67 TS	PLOT 67 SS	PLOT 68 TS
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Date Sampled:		17-Dec-2020	17-Dec-2020	17-Dec-2020	17-Dec-2020	17-Dec-2020	17-Dec-2020	17-Dec-2020	17-Dec-2020	17-Dec-2020
			Time Sampled:		12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	180	< 1.0	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	210	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10	< 10	< 10	< 10	240	< 10	< 10	< 10
Naphthalene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 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	< 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	< 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	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2700	mg/kg	0.10	0.14	0.36	< 0.10	0.47	< 0.10	1.6	< 0.10	< 0.10	< 0.10
Anthracene	M	2700	mg/kg	0.10	< 0.10	0.19	< 0.10	0.16	< 0.10	0.51	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2700	mg/kg	0.10	0.28	0.34	0.79	0.83	0.72	1.5	0.91	< 0.10	< 0.10
Pyrene	M	2700	mg/kg	0.10	0.33	0.48	0.76	0.94	0.67	1.5	0.61	< 0.10	< 0.10
Benzo[a]anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 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	< 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	< 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	< 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	< 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	< 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	< 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	< 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	2.4	< 2.0	5.1	< 2.0	< 2.0	< 2.0
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
Organic Matter BS1377	N	2930	%	0.10	3.1	1.7	3.6	1.3	3.1	1.7	3.5	1.4	4.4

Results - Soil

Project: H. Road

Client: Terra Firma (Wales) Ltd		**Chemtest Job No.:**			20-34859	20-34859	20-34859
Quotation No.:		**Chemtest Sample ID.:**			1116037	1116038	1116039
Order No.: 12032RH		Client Sample Ref.:			PLOT 68 SS	PLOT 74 TS	PLOT 74 SS
		Client Sample ID.:			PLOT 68 SS	PLOT 74 TS	PLOT 74 SS
		Sample Type:			SOIL	SOIL	SOIL
		Date Sampled:			17-Dec-2020	17-Dec-2020	17-Dec-2020
		Time Sampled:			12:00	12:00	12:00
		Asbestos Lab:			COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type	U	2192		N/A	-	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-
Moisture	N	2030	%	0.020	16	28	22
Soil Colour	N	2040		N/A	Brown	Brown	Brown
Other Material	N	2040		N/A	Roots	None	None
Soil Texture	N	2040		N/A	Clay	Clay	Clay
pH	M	2010		4.0	8.5	8.2	8.3
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	0.44	0.51	0.66
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Sulphate (Acid Soluble)	M	2430	%	0.010	0.041	0.064	0.079
Arsenic	M	2450	mg/kg	1.0	14	16	15
Cadmium	M	2450	mg/kg	0.10	0.54	0.47	1.1
Chromium	M	2450	mg/kg	1.0	20	23	20
Mercury Low Level	M	2450	mg/kg	0.05	0.07	0.08	0.11
Copper	M	2450	mg/kg	0.50	23	19	29
Nickel	M	2450	mg/kg	0.50	24	23	21
Lead	M	2450	mg/kg	0.50	46	51	60
Selenium	M	2450	mg/kg	0.20	< 0.20	0.46	0.24
Zinc	M	2450	mg/kg	0.50	110	100	150
Chromium (Trivalent)	N	2490	mg/kg	1.0	20	23	20
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	670
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	2400
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	5800
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	5500
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	2400
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	17000
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	430
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	1600
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	4300
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	4400

Results - Soil

Project: H. Road

Client: Terra Firma (Wales) Ltd		**Chemtest Job No.:**			20-34859	20-34859	20-34859
Quotation No.:		**Chemtest Sample ID.:**			1116037	1116038	1116039
Order No.: 12032RH		Client Sample Ref.:			PLOT 68 SS	PLOT 74 TS	PLOT 74 SS
		Client Sample ID.:			PLOT 68 SS	PLOT 74 TS	PLOT 74 SS
		Sample Type:			SOIL	SOIL	SOIL
		Date Sampled:			17-Dec-2020	17-Dec-2020	17-Dec-2020
		Time Sampled:			12:00	12:00	12:00
		Asbestos Lab:			COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	2400
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	120
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	13000
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10	30000
Naphthalene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Chrysene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2700	mg/kg	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
Dibenz(a,h)Anthracene	M	2700	mg/kg	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
Total Of 16 PAH's	M	2700	mg/kg	2.0	< 2.0	< 2.0	< 2.0
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30
Organic Matter BS1377	N	2930	%	0.10	0.90	3.2	2.0

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	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
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; 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
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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"

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 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com

Annex E
Curtis Lane Soils Source Test Results – Plot 74 Subsoil Additional Samples

Terra Firma (Wales) Ltd. 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA
Tel: 029 2073 5354 **Fax:** 029 2073 5433 **Email:** info@terrafirmawales.co.uk **www.terrafirmawales.co.uk**
Registered in Wales No. 4013230. VAT No: 753 2566 25. Registered Office: 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA

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

Final Report

Report No.:	21-00132-1
Initial Date of Issue:	08-Jan-2021
Client	Terra Firma (Wales) Ltd
Client Address:	5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA
Contact(s):	[redacted]
Project	H. Road
Quotation No.:	
Order No.:	12032RH
No. of Samples:	3
Turnaround (Wkdays):	5
Date Approved:	08-Jan-2021
Approved By:	[redacted]
Details:	Glynn Harvey, Technical Manager

Date Received:	07-Jan-2021
Date Instructed:	07-Jan-2021
Results Due:	13-Jan-2021

Results - Soil

Project: H. Road

Client: Terra Firma (Wales) Ltd			**Chemtest Job No.:**		21-00132	21-00132	21-00132
Quotation No.:			**Chemtest Sample ID.:**		1120990	1120991	1120992
Order No.: 12032RH			Client Sample Ref.:		PLOT 74 SS-S1	PLOT 74 SS-S2	PLOT 71 SS-S3
			Client Sample ID.:		PLOT 74 SS-S1	PLOT 74 SS-S2	PLOT 74 SS-S3
			Sample Type:		SOIL	SOIL	SOIL
			Date Sampled:		06-Jan-2021	06-Jan-2021	06-Jan-2021
			Time Sampled:		12:00	12:00	12:00
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Moisture	N	2030	%	0.020	16	15	14
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10	< 10

Test Methods

SOP	Title	Parameters included	Method summary
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
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

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Charges may apply to extended sample storage

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customerservices@chemtest.com

terra firma
Geotechnical & Geoenvironmental Specialists
www.terrafirmawales.co.uk

Our Ref: RH/12032/VP76-99

Your Ref:

Contact: Ruth Howells

12th November 2020

NHBC

For the attn. of Mr Steve Moreby

Dear Steve

PLOTS 76-99, PHASE 2, HERBERT ROAD NEWPORT: CAPPING VALIDATION

I confirm that the required 600mm of remedial capping has now been imported and validated within the landscaped and garden areas of Plots 76-99.

Both subsoil and topsoil has been imported, comprising one source of subsoil (SS) and two sources of topsoil (TS1 & TS2). Each of the three soil sources did not exceed 250m^3.

A visit was made to site on 2nd November 2020 to sample the imported soils and to confirm the capping thickness. Four samples of each soil source were taken.

Sample/validation hole locations are illustrated in **Figure 1** below. Those shown in yellow are the locations where the capping thickness of 600mm was confirmed by hand dug holes.

Please see **Annex A** for photographs of the trial holes.

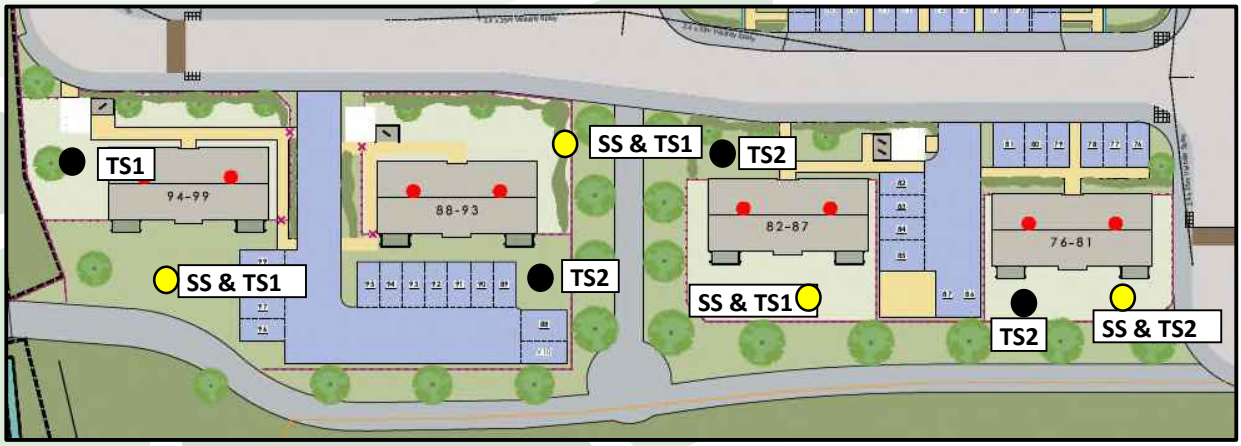

Figure 1: Validation Locations

The samples were submitted for laboratory analysis at the laboratory of Eurofins Chemtest. The chemical test certificate may be found in **Annex B**.

Comparison of the analytical results has been made residential (including plant uptake) Suitable 4 Use Levels (S4ULs) provided by Land Quality Management Limited and the Chartered Institute of Environmental Health (CIEH). Where CIEH thresholds are not available reference has been made to Category 4 Screening Levels (C4SLs).

Both subsoil and topsoil results are summarised in the following table.

Table 1 Summary of Soil Chemical Test Results Imported Soils

Substance	SGV/GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of Exceedances
			Minimum	Maximum	
Arsenic	37	CIEH	5.3	20	0
Boron	290	CIEH	0.6	2.3	0
Cadmium	11	CIEH	0.17	1.4	0
Chromium III	910	CIEH	9.3	75	0
Chromium VI	6	CIEH	<0.5	<0.5	0
Copper	2400	CIEH	14	100	0
Lead	200	C4SL	25	110	0
Mercury	40	CIEH	<0.05	0.18	0
Nickel	130	CIEH	20	46	0
Selenium	250	CIEH	<0.2	0.29	0
Zinc	3700	CIEH	68	290	0
Cyanide	8	-	<0.5	<0.5	0
Phenols	120	CIEH	<0.3	<0.3	0
Organic Matter	-	-	0.8	4.2	-
pH	-	-	7.8	9.1	-
Asbestos	-	-	Not detected	Not detected	-

Table 1 Summary of Soil Chemical Test Results (Continued) Imported Soils					
Substance	**SGV/GAC** (mg/kg)	**Source**	**Measured Concentrations of Tested Substances** (mg/kg)		**Number of Exceedances**
			Minimum	**Maximum**	
Naphthalene	2.3	CIEH	<0.1	<0.1	0
Acenaphthylene	170	CIEH	<0.1	<0.1	0
Acenaphthene	210	CIEH	<0.1	<0.1	0
Fluorene	170	CIEH	<0.1	<0.1	0
Phenanthrene	95	CIEH	<0.1	0.82	0
Anthracene	2400	CIEH	<0.1	0.18	0
Fluoranthene	280	CIEH	<0.1	1.1	0
Pyrene	620	CIEH	<0.1	1.2	0
Benzo(a)anthracene	7.2	CIEH	<0.1	0.69	0
Chrysene	15	CIEH	<0.1	0.87	0
Benzo(b)fluoranthene	2.6	CIEH	<0.1	<0.1	0
Benzo(k)fluoranthene	77	CIEH	<0.1	<0.1	0
Benzo(a)pyrene	2.2	CIEH	<0.1	<0.1	0
Indeno(123cd)pyrene	27	CIEH	<0.1	<0.1	0
Dibenzo(ah)anthracene	0.24	CIEH	<0.1	<0.1	0
Benzo(ghi)perylene	320	CIEH	<0.1	<0.1	0
Aliphatic					
PH C5 – C6 Ali	42	CIEH	<1.0	<1.0	0
PH C6 – C8 Ali	100	CIEH	<1.0	<1.0	0
PH C8 – C10 Ali	27	CIEH	<1.0	<1.0	0
PH C10 – C12 Ali	130	CIEH	<1.0	<1.0	0
PH C12 – C16 Ali	1100	CIEH	<1.0	<1.0	0
PH C16 – C21 Ali*	65000	CIEH	<1.0	<1.0	0
PH C21 – C35 Ali*	65000	CIEH	<1.0	<1.0	0
PH C35 – C44 Ali	65000	CIEH	<1.0	<1.0	0
Aromatic					
PH C5 – C7 Arom	70	CIEH	<1.0	<1.0	0
PH C7 – C8 Arom	130	CIEH	<1.0	<1.0	0
PH C8 – C10 Arom	34	CIEH	<1.0	<1.0	0
PH C10 – C12 Arom	74	CIEH	<1.0	<1.0	0
PH C12 – C16 Arom	140	CIEH	<1.0	<1.0	0
PH C16 – C21 Arom	260	CIEH	<1.0	<1.0	0
PH C21 – C35 Arom	1100	CIEH	<1.0	<1.0	0
PH C35 – C44 Arom	1100	CIEH	<1.0	<1.0	0

Notes

- Thresholds based on 1.0% SOM
- CIEH for Ali C16 - 21 and C21 - C35 based on CIEH for EC >16 – 35

From the above table is can be seen that all substances tested for are present at levels below their respective human health threshold levels. It is therefore confirmed that the imported subsoil and topsoil are uncontaminated and do not present a risk to the human health of future site residents.

I 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 me.

Yours sincerely
for: Terra Firma (Wales) Ltd

[redacted]

Mrs Ruth Howells

Annex A
Photographs of Soil Sampling and Capping Thickness Validation

Terra Firma (Wales) Ltd. 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA
Tel: 029 2073 5354 **Fax:** 029 2073 5433 **Email:** info@terrafirmawales.co.uk **www.terrafirmawales.co.uk**
Registered in Wales No. 4013230. VAT No: 753 2566 25. Registered Office: 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA

PLOTS 76-81

PLOTS 82-87

PLOTS 88-93

PLOTS 94-99

Annex B
Laboratory Soil Chemical Test Results

Terra Firma (Wales) Ltd. 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA
Tel: 029 2073 5354 **Fax:** 029 2073 5433 **Email:** info@terrafirmawales.co.uk **www.terrafirmawales.co.uk**
Registered in Wales No. 4013230. VAT No: 753 2566 25. Registered Office: 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA

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

Final Report

Report No.:	20-29585-1
Initial Date of Issue:	09-Nov-2020
Client	Terra Firma (Wales) Ltd
Client Address:	5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA
Contact(s):	[redacted]
Project	Herbert Road

Quotation No.:		**Date Received:**	02-Nov-2020
Order No.:	123032RH	**Date Instructed:**	02-Nov-2020
No. of Samples:	12		
Turnaround (Wkdays):	5	**Results Due:**	06-Nov-2020
Date Approved:	09-Nov-2020		

Approved By:

[redacted]

Details: Glynn Harvey, Technical Manager

Results - Soil

Project: Herbert Road

Client: Terra Firma (Wales) Ltd				**Chemtest Job No.:**	20-29585	20-29585	20-29585	20-29585	20-29585	20-29585	20-29585	20-29585	20-29585
Quotation No.:				**Chemtest Sample ID.:**	1089890	1089891	1089892	1089893	1089894	1089895	1089896	1089897	1089898
Order No.: 123032RH				Client Sample Ref.:	PLOTS 81-76 SS	PLOTS 82-87 SS	PLOTS 88-93 SS	PLOTS 94-99 SS	PLOTS 82-87 TS1	PLOTS 88-93 TS1	PLOTS 94-99 TS1	PLOTS 94-99B TS1	PLOTS 76-81 TS2
				Client Sample ID.:	PLOTS 81-76 SS	PLOTS 21-87 SS	PLOTS 22-93 SS	PLOTS 94-99 SS	PLOTS 82-87 TS1	PLOTS 88-93 TS1	PLOTS 94-99 TS1	PLOTS 94-99B TS1	PLOTS 76-81 TS2
				Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Date Sampled:	29-Oct-2020	29-Oct-2020	29-Oct-2020	29-Oct-2020	29-Oct-2020	29-Oct-2020	29-Oct-2020	29-Oct-2020	29-Oct-2020
				Time Sampled:	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	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	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-	-	-	-	-	-	-
Moisture	N	2030	%	0.020	16	28	14	16	17	12	16	17	29
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones	Stones	Stones	Stones	Stones and Roots	Stones and Roots	Stones and Roots
Soil Texture	N	2040		N/A	Clay	Clay	Clay	Clay	Clay	Clay	Sand	Sand	Sand
pH	M	2010		4.0	8.8	7.8	8.4	9.1	8.6	8.8	8.4	8.3	8.3
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	0.60	0.62	0.73	1.0	0.84	1.1	0.77	0.81	1.5
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Sulphate (Acid Soluble)	M	2430	%	0.010	0.067	0.075	0.069	0.12	0.059	0.12	0.062	0.055	0.048
Arsenic	M	2450	mg/kg	1.0	14	13	20	14	14	16	13	11	6.8
Cadmium	M	2450	mg/kg	0.10	0.61	0.87	0.78	1.4	1.0	1.4	0.91	0.64	0.30
Chromium	M	2450	mg/kg	1.0	19	18	25	30	22	75	18	18	15
Mercury Low Level	M	2450	mg/kg	0.05	0.08	0.15	0.09	0.13	0.16	0.10	0.18	0.16	0.06
Copper	M	2450	mg/kg	0.50	19	27	34	26	29	100	27	31	18
Nickel	M	2450	mg/kg	0.50	20	24	28	27	29	46	21	20	28
Lead	M	2450	mg/kg	0.50	47	77	64	58	86	110	79	66	31
Selenium	M	2450	mg/kg	0.20	< 0.20	< 0.20	0.21	< 0.20	0.28	< 0.20	0.24	0.29	< 0.20
Zinc	M	2450	mg/kg	0.50	97	160	170	140	170	290	170	140	94
Chromium (Trivalent)	N	2490	mg/kg	1.0	19	18	25	30	22	75	18	18	15
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 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	< 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	< 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	< 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	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 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	< 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	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Results - Soil

Project: Herbert Road

Client: Terra Firma (Wales) Ltd					**Chemtest Job No.:**	20-29585	20-29585	20-29585	20-29585	20-29585	20-29585	20-29585	20-29585
Quotation No.:					**Chemtest Sample ID.:**	1089890	1089891	1089892	1089893	1089894	1089895	1089896	1089897	1089898
Order No.: 123032RH					Client Sample Ref.:	PLOTS 81-76 SS	PLOTS 82-87 SS	PLOTS 88-93 SS	PLOTS 94-99 SS	PLOTS 82-87 TS1	PLOTS 88-93 TS1	PLOTS 94-99 TS1	PLOTS 94-99B TS1	PLOTS 76-81 TS2
					Client Sample ID.:	PLOTS 81-76 SS	PLOTS 21-87 SS	PLOTS 22-93 SS	PLOTS 94-99 SS	PLOTS 82-87 TS1	PLOTS 88-93 TS1	PLOTS 94-99 TS1	PLOTS 94-99B TS1	PLOTS 76-81 TS2
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Date Sampled:	29-Oct-2020	29-Oct-2020	29-Oct-2020	29-Oct-2020	29-Oct-2020	29-Oct-2020	29-Oct-2020	29-Oct-2020	29-Oct-2020
					Time Sampled:	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
					Asbestos Lab:	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Naphthalene	M	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 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	< 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	< 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	< 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	< 0.10	< 0.10	0.71	< 0.10	< 0.10
Anthracene	M	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.13	< 0.10	< 0.10
Fluoranthene	M	2700	mg/kg	0.10		< 0.10	0.69	0.49	0.82	0.28	0.44	1.1	0.72	< 0.10
Pyrene	M	2700	mg/kg	0.10		< 0.10	0.78	0.65	1.0	0.35	0.78	1.2	0.72	< 0.10
Benzo[a]anthracene	M	2700	mg/kg	0.10		< 0.10	< 0.10	0.41	0.50	< 0.10	< 0.10	0.69	0.38	< 0.10
Chrysene	M	2700	mg/kg	0.10		< 0.10	< 0.10	0.33	0.87	< 0.10	< 0.10	0.67	0.60	< 0.10
Benzo[b]fluoranthene	M	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 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	< 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	< 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	< 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	< 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	< 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	3.2	< 2.0	< 2.0	4.5	2.4	< 2.0
Total Phenols	M	2920	mg/kg	0.30		< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
Organic Matter BS1377	N	2930	%	0.10		1.7	3.0	1.2	0.80	3.4	1.3	3.4	3.8	4.2

Results - Soil

Project: Herbert Road

Client: Terra Firma (Wales) Ltd			**Chemtest Job No.:**		20-29585	20-29585	20-29585
Quotation No.:			**Chemtest Sample ID.:**		1089899	1089900	1089901
Order No.: 123032RH			Client Sample Ref.:		PLOTS 76-81B TS2	PLOTS 82-87 TS2	PLOTS 88-93 TS2
			Client Sample ID.:		PLOTS 76-81B TS2	PLOTS 82-87 TS2	PLOTS 88-93 TS2
			Sample Type:		SOIL	SOIL	SOIL
			Date Sampled:		29-Oct-2020	29-Oct-2020	29-Oct-2020
			Time Sampled:		12:00	12:00	12:00
			Asbestos Lab:		DURHAM	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	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-
Moisture	N	2030	%	0.020	20	22	16
Soil Colour	N	2040		N/A	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones and Roots	Stones and Roots
Soil Texture	N	2040		N/A	Sand	Sand	Sand
pH	M	2010		4.0	8.3	8.3	8.3
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	1.5	1.8	2.3
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Sulphate (Acid Soluble)	M	2430	%	0.010	0.047	0.062	0.076
Arsenic	M	2450	mg/kg	1.0	8.7	6.8	5.3
Cadmium	M	2450	mg/kg	0.10	0.23	0.23	0.17
Chromium	M	2450	mg/kg	1.0	20	15	9.3
Mercury Low Level	M	2450	mg/kg	0.05	0.07	0.06	< 0.05
Copper	M	2450	mg/kg	0.50	21	25	14
Nickel	M	2450	mg/kg	0.50	33	24	23
Lead	M	2450	mg/kg	0.50	34	25	30
Selenium	M	2450	mg/kg	0.20	< 0.20	< 0.20	< 0.20
Zinc	M	2450	mg/kg	0.50	110	84	68
Chromium (Trivalent)	N	2490	mg/kg	1.0	20	15	9.3
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0

Results - Soil

Project: Herbert Road

Client: Terra Firma (Wales) Ltd			**Chemtest Job No.:**		20-29585	20-29585	20-29585
Quotation No.:			**Chemtest Sample ID.:**		1089899	1089900	1089901
Order No.: 123032RH			Client Sample Ref.:		PLOTS 76-81B TS2	PLOTS 82-87 TS2	PLOTS 88-93 TS2
			Client Sample ID.:		PLOTS 76-81B TS2	PLOTS 82-87 TS2	PLOTS 88-93 TS2
			Sample Type:		SOIL	SOIL	SOIL
			Date Sampled:		29-Oct-2020	29-Oct-2020	29-Oct-2020
			Time Sampled:		12:00	12:00	12:00
			Asbestos Lab:		DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10	< 10
Naphthalene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2700	mg/kg	0.10	< 0.10	0.78	0.82
Anthracene	M	2700	mg/kg	0.10	< 0.10	0.18	0.15
Fluoranthene	M	2700	mg/kg	0.10	0.96	0.52	0.37
Pyrene	M	2700	mg/kg	0.10	0.42	0.39	0.48
Benzo[a]anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Chrysene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2700	mg/kg	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
Dibenz(a,h)Anthracene	M	2700	mg/kg	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
Total Of 16 PAH's	M	2700	mg/kg	2.0	< 2.0	< 2.0	< 2.0
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30
Organic Matter BS1377	N	2930	%	0.10	3.9	4.0	4.2

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	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
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; 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"

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 45 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

terra firma
Geotechnical & Geoenvironmental Specialists
www.terrafirmawales.co.uk

Our Ref: RH/12032/VP100-107

Your Ref:

Contact: Ruth Howells

10th June 2021

NHBC

For the attn. of Mr Steve Moreby

Dear Steve

PLOTS 100 - 107 PHASE 2, HERBERT ROAD NEWPORT: CAPPING VALIDATION

I confirm that the required 600mm of remedial capping has now been imported and validated within the gardens of Plots 100-107.

Validation of capping thickness and soil sampling was undertaken in Plots 101, 104 and 106, as illustrated below.

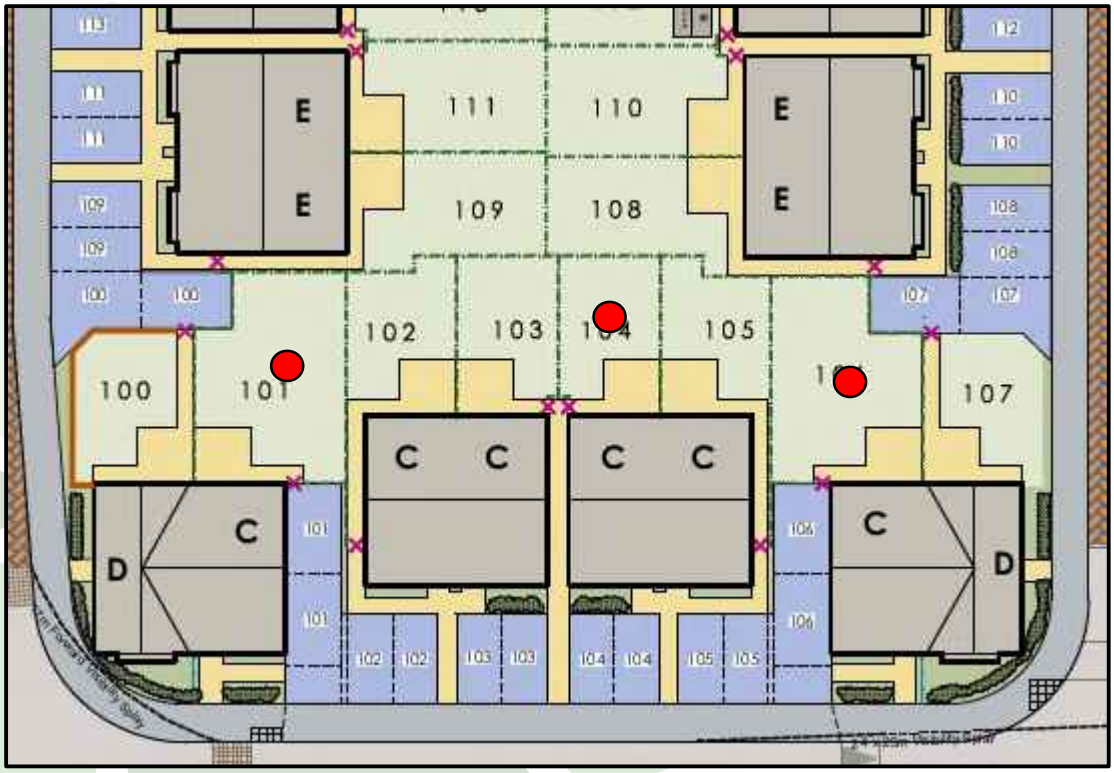

Figure 1: Validation Locations

The subsoil was imported and placed in the gardens at the same time as Plots 108 – 119 (volume <250m^3). The subsoil was sourced from a development site in Bonvilston. Terra Firma (Wales) Limited sampled and tested this at source (please refer to **Annex A** for the test results) from a stockpile and in Plots 108 – 119 and as such sufficient representative samples have already been tested from this soil source.

The topsoil was supplied by Neal Soils. A volume of topsoil imported was <250m^3.

Topsoil samples were retrieved from the prepared gardens and submitted for analysis at the laboratory of Eurofins Chemtest. Test results for the topsoil samples may be found in **Annex B**.

Inspection of the capping soils in hand dug pits confirmed the capping thickness to be 600mm. Please see **Annex C** for photographs of the pits.

Comparison of the analytical results has been made residential (including plant uptake) Suitable 4 Use Levels (S4ULs) provided by Land Quality Management Limited and the Chartered Institute of Environmental Health (CIEH). Where CIEH thresholds are not available reference has been made to Category 4 Screening Levels (C4SLs).

The topsoil results from the three sampling locations are summarised in the following table.

Table 1 Summary of Soil Chemical Test Results Imported Soils

Substance	SGV/GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of Exceedances
			Minimum	Maximum	
Arsenic	37	CIEH	6.3	9.4	0
Boron	290	CIEH	1.9	2.7	0
Cadmium	11	CIEH	0.22	0.74	0
Chromium III	910	CIEH	19	24	0
Chromium VI	6	CIEH	<0.5	<0.5	0
Copper	2400	CIEH	15	42	0
Lead	200	C4SL	18	29	0
Mercury	40	CIEH	0.07	0.09	0
Nickel	130	CIEH	33	62	0
Selenium	250	CIEH	<0.2	<0.2	0
Zinc	3700	CIEH	83	120	0
Cyanide	8	-	<0.5	<0.5	0
Phenols	120	CIEH	<0.1	<0.1	0
Organic Matter	-	-	5.1	6.2	-
pH	-	-	8.4	8.5	-
Asbestos	-	-	Not detected	Not detected	-

Table 1 Summary of Soil Chemical Test Results (Continued) Imported Soils					
Substance	**GAC** (mg/kg)	**Source**	**Measured Concentrations of Tested Substances** (mg/kg)		**Number of Exceedances**
			Minimum	**Maximum**	
Naphthalene	2.3	CIEH	<0.1	<0.1	0
Acenaphthylene	170	CIEH	<0.1	<0.1	0
Acenaphthene	210	CIEH	<0.1	<0.1	0
Fluorene	170	CIEH	<0.1	<0.1	0
Phenanthrene	95	CIEH	<0.1	<0.1	0
Anthracene	2400	CIEH	<0.1	<0.1	0
Fluoranthene	280	CIEH	<0.1	<0.1	0
Pyrene	620	CIEH	<0.1	<0.1	0
Benzo(a)anthracene	7.2	CIEH	<0.1	<0.1	0
Chrysene	15	CIEH	<0.1	<0.1	0
Benzo(b)fluoranthene	2.6	CIEH	<0.1	<0.1	0
Benzo(k)fluoranthene	77	CIEH	<0.1	<0.1	0
Benzo(a)pyrene	2.2	CIEH	<0.1	<0.1	0
Indeno(123cd)pyrene	27	CIEH	<0.1	<0.1	0
Dibenzo(ah)anthracene	0.24	CIEH	<0.1	<0.1	0
Benzo(ghi)perylene	320	CIEH	<0.1	<0.1	0
Aliphatic					
PH C5 – C6 Ali	42	CIEH	<1.0	<1.0	0
PH C6 – C8 Ali	100	CIEH	<1.0	<1.0	0
PH C8 – C10 Ali	27	CIEH	<1.0	<1.0	0
PH C10 – C12 Ali	130	CIEH	<1.0	<1.0	0
PH C12 – C16 Ali	1100	CIEH	<1.0	<1.0	0
PH C16 – C21 Ali*	65000	CIEH	<1.0	<1.0	0
PH C21 – C35 Ali*	65000	CIEH	<1.0	<1.0	0
PH C35 – C44 Ali	65000	CIEH	<1.0	<1.0	0
Aromatic					
PH C5 – C7 Arom	70	CIEH	<1.0	<1.0	0
PH C7 – C8 Arom	130	CIEH	<1.0	<1.0	0
PH C8 – C10 Arom	34	CIEH	<1.0	<1.0	0
PH C10 – C12 Arom	74	CIEH	<1.0	<1.0	0
PH C12 – C16 Arom	140	CIEH	<1.0	<1.0	0
PH C16 – C21 Arom	260	CIEH	<1.0	<1.0	0
PH C21 – C35 Arom	1100	CIEH	<1.0	<1.0	0
PH C35 – C44 Arom	1100	CIEH	<1.0	<1.0	0

Notes

- Thresholds based on 1.0% SOM
- CIEH for Ali C16 - 21 and C21 - C35 based on CIEH for EC >16 – 35

From the above table is can be seen that all substances tested for are present at levels below their respective human health threshold levels.

It may, therefore, be confirmed that the imported subsoil and topsoil does not present a risk to the human health of future site residents.

I 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 me.

Yours sincerely
for: Terra Firma (Wales) Ltd

[redacted]

Mrs Ruth Howells

Annex A
Bonvilston Subsoil Source Test Results

Terra Firma (Wales) Ltd. 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA
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Final Report

Report No.:	20-28927-1
Initial Date of Issue:	02-Nov-2020
Client	Terra Firma (Wales) Ltd
Client Address:	5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA
Contact(s):	[redacted]
Project	Bonvilston
Quotation No.:	
Date Received:	27-Oct-2020
Order No.:	13032/RH
Date Instructed:	27-Oct-2020
No. of Samples:	9
Turnaround (Wkdays):	5
Results Due:	02-Nov-2020
Date Approved:	02-Nov-2020
Approved By:	[redacted]
Details:	Glynn Harvey, Technical Manager

Results - Soil

Project: Bonvilston

Client: Terra Firma (Wales) Ltd				**Chemtest Job No.:**	20-28927	20-28927	20-28927	20-28927	20-28927	20-28927	20-28927	20-28927	20-28927
Quotation No.:				**Chemtest Sample ID.:**	1086797	1086798	1086799	1086800	1086801	1086802	1086803	1086804	1086805
Order No.: 13032/RH				Client Sample Ref.:	SS S1	SS S2	SS S3	SS S4	SS S5	SS S6	TS S1	TS S2	TS S3
				Client Sample ID.:	SS S1	SS S2	SS S3	SS S4	SS S5	SS S6	TS S1	TS S2	TS S3
				Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Date Sampled:	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020
				Time Sampled:	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	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	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-	-	-	-	-	-	-
Moisture	N	2030	%	0.020	13	10	12	11	10	13	16	13	13
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones	Stones	Stones	Stones	Stones	Stones and Roots	Stones
Soil Texture	N	2040		N/A	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand
pH	M	2010		4.0	8.7	8.6	8.9	9.3	8.4	8.0	7.3	7.6	8.1
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	< 0.40	< 0.40	< 0.40	0.47	< 0.40	< 0.40	0.47	0.51	< 0.40
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	0.50
Sulphate (Acid Soluble)	M	2430	%	0.010	0.022	0.036	0.048	0.042	< 0.010	0.022	0.054	0.051	0.036
Arsenic	M	2450	mg/kg	1.0	11	14	12	11	9.2	8.6	12	12	11
Cadmium	M	2450	mg/kg	0.10	0.24	0.36	0.28	0.29	0.28	0.17	0.34	0.34	0.32
Chromium	M	2450	mg/kg	1.0	20	21	20	17	17	17	14	15	13
Mercury Low Level	M	2450	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.06	0.13	0.12
Copper	M	2450	mg/kg	0.50	17	18	20	24	17	14	15	16	14
Nickel	M	2450	mg/kg	0.50	25	27	25	23	27	22	14	17	16
Lead	M	2450	mg/kg	0.50	32	33	33	28	41	34	47	52	43
Selenium	M	2450	mg/kg	0.20	0.28	< 0.20	< 0.20	< 0.20	0.32	0.42	0.37	0.37	0.40
Zinc	M	2450	mg/kg	0.50	83	89	90	79	89	80	72	75	71
Chromium (Trivalent)	N	2490	mg/kg	1.0	20	21	20	17	17	17	14	15	13
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 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	< 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	< 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	< 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	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 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	< 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	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Results - Soil

Project: Bonvilston

Client: Terra Firma (Wales) Ltd			**Chemtest Job No.:**		20-28927	20-28927	20-28927	20-28927	20-28927	20-28927	20-28927	20-28927	20-28927
Quotation No.:			**Chemtest Sample ID.:**		1086797	1086798	1086799	1086800	1086801	1086802	1086803	1086804	1086805
Order No.: 13032/RH			Client Sample Ref.:		SS S1	SS S2	SS S3	SS S4	SS S5	SS S6	TS S1	TS S2	TS S3
			Client Sample ID.:		SS S1	SS S2	SS S3	SS S4	SS S5	SS S6	TS S1	TS S2	TS S3
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Date Sampled:		23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020
			Time Sampled:		12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
			Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Naphthalene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 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	< 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	< 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	< 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	< 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	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.13	< 0.10	< 0.10	< 0.10	< 0.10	1.1
Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.12	< 0.10	< 0.10	< 0.10	< 0.10	1.0
Benzo[a]anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 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	< 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	< 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	< 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	< 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	< 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	< 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	< 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	< 2.0	< 2.0	< 2.0	< 2.0	2.1
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
Organic Matter BS1377	N	2930	%	0.10	0.80	0.60	0.60	0.80	0.30	1.4	3.1	2.6	2.5

Results - Topsoil Report

BS3882:2015

Chemtest Job No.: 20-28927
Chemtest Sample ID.: 1086803
Client Sample Ref.: TS S1
Sample Location:
Client Sample ID.: TS S1
Top Depth (m):
Bottom Depth (m):
Date Sampled: 23-Oct-2020
Time Sampled:

Parameter	Units	Multipurpose Range	Result	Compliant with Multipurpose Range? (Y/N)	Compliant with Specific Purpose Range? (Y/N)		
Texture					**Acid**	**Low F**	**Calc.**
Clay content	%		21				
Silt content	%		27				
Sand content	%		52				
Soil texture class		See Attached Chart	Sandy Clay Loam	YES			
Mass Loss on Ignition							
Clay 5-20%		3.0-20	4.1	NO	NO	YES	NO
Clay 20-35%		5.0-20					
Stone Content	**% m/m**						
>2mm		0-30	28	YES			
>20mm		0-10	3.8	YES			
>50mm		0	< 0.020	YES			
Soil pH value		5.5-8.5	7.3	YES	NO	YES	NO
Carbonate (Calcareous only)	%		5.3				YES
Electrical Conductivity	µS/cm	If >3300 do ESP	2200	YES			
Available Nutrient Content							
Nitrogen %		>0.15	0.23	YES	YES		YES
Extractable phosphorus	mg/l	16-140	6.5	NO	NO	YES	NO
Extractable potassium	mg/l	121-1500	75	NO	NO		NO
Extractable magnesium	mg/l	51-600	120	YES	YES		YES
Carbon : Nitrogen Ratio		<20:1	10.4/1	YES	YES	YES	YES
Exchangeable sodium	**%**	<15	0.95				
Available Calcium	mg/l		1900				
Available Sodium	mg/l		24				
Phytotoxic Contaminants (by soil pH)		**< 6.0** / **6.0-7.0** / **> 7.0**					
Zinc (Nitric Acid extract)	mg/kg	<200 / <200 / <300	57	YES			
Copper (Nitric Acid extract)	mg/kg	<100 / <135 / <200	14	YES			
Nickel (Nitric Acid extract)	mg/kg	<60 / <75 / <110	12	YES			
Visible Contaminants	**% mm**						
>2mm		<0.5	0.000	YES			
….. of which plastics		<0.25	0.000	YES			
….. man-made sharps		zero in 1kg	0.000	YES			

Results - Topsoil Report

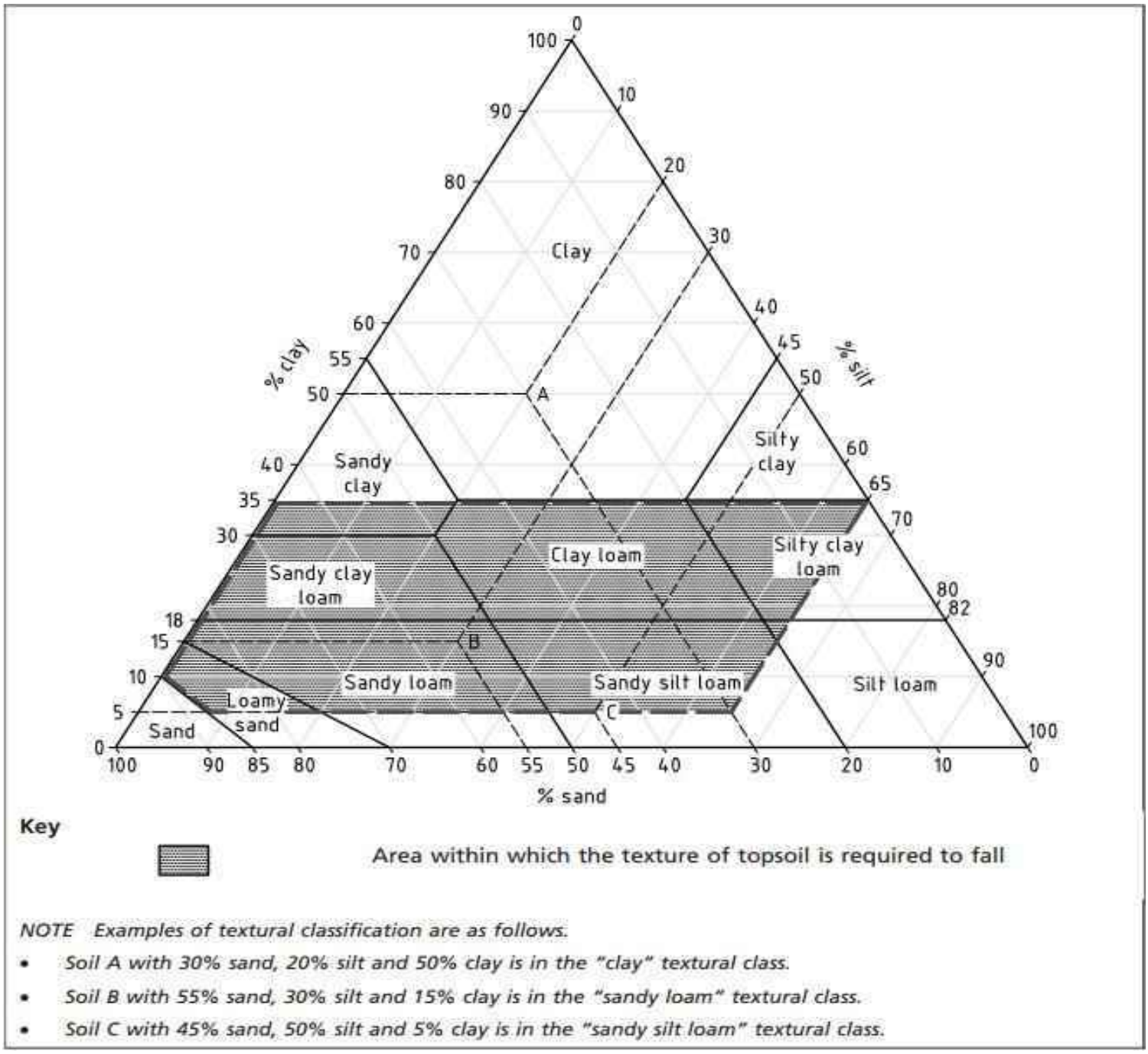
BS3882:2015

Chemtest Job No.: 20-28927
Chemtest Sample ID.: 1086804
Client Sample Ref.: TS S2
Sample Location:
Client Sample ID.: TS S2
Top Depth (m):
Bottom Depth (m):
Date Sampled: 23-Oct-2020
Time Sampled:

Parameter	Units	Multipurpose Range	Result	Compliant with Multipurpose Range? (Y/N)	Compliant with Specific Purpose Range? (Y/N)		
Texture					**Acid**	**Low F**	**Calc.**
Clay content	%		19				
Silt content	%		24				
Sand content	%		56				
Soil texture class		See Attached Chart	Sandy Clay Loam	YES			
Mass Loss on Ignition							
Clay 5-20%		3.0-20	3.5	YES	YES	YES	YES
Clay 20-35%		5.0-20					
Stone Content	**% m/m**						
>2mm		0-30	23	YES			
>20mm		0-10	9.7	YES			
>50mm		0	< 0.020	YES			
Soil pH value		5.5-8.5	7.6	YES	NO	YES	YES
Carbonate (Calcareous only)	%		4.0				YES
Electrical Conductivity	µS/cm	If >3300 do ESP	2200	YES			
Available Nutrient Content							
Nitrogen %		>0.15	0.21	YES	YES		YES
Extractable phosphorus	mg/l	16-140	7.2	NO	NO	YES	NO
Extractable potassium	mg/l	121-1500	85	NO	NO		NO
Extractable magnesium	mg/l	51-600	130	YES	YES		YES
Carbon : Nitrogen Ratio		<20:1	9.9/1	YES	YES	YES	YES
Exchangeable sodium	**%**	<15	0.87				
Available Calcium	mg/l		1600				
Available Sodium	mg/l		19				
Phytotoxic Contaminants (by soil pH)		**< 6.0** / **6.0-7.0** / **> 7.0**					
Zinc (Nitric Acid extract)	mg/kg	<200 / <200 / <300	59	YES			
Copper (Nitric Acid extract)	mg/kg	<100 / <135 / <200	16	YES			
Nickel (Nitric Acid extract)	mg/kg	<60 / <75 / <110	14	YES			
Visible Contaminants	**% mm**						
>2mm		<0.5	0.000	YES			
….. of which plastics		<0.25	0.000	YES			
….. man-made sharps		zero in 1kg	0.000	YES			

Topsoil: BS3882:2015

Texture Classification Chart



Key

Area within which the texture of topsoil is required to fall

NOTE Examples of textural classification are as follows.

- *Soil A with 30% sand, 20% silt and 50% clay is in the "clay" textural class.*
- *Soil B with 55% sand, 30% silt and 15% clay is in the "sandy loam" textural class.*
- *Soil C with 45% sand, 50% silt and 5% clay is in the "sandy silt loam" textural class.*

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Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2020	Electrical Conductivity	Electrical conductivity (EC) of aqueous extract or calcium sulphate solution for topsoil	Measurement of the electrical resistance of a 2:1 water/soil extract.
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
2115	Total Nitrogen in Soils	Nitrogen	Determination by elemental analyser
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2260	Carbonate	Carbonate	Titration
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2400	Cations	Cations	ICP-MS
2420	Phosphate	Phosphate	Spectrophotometry - Discrete 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-diphenylcarbazide.
2620	LOI 440	LOI 440 Trommel Fines	Determination of the proportion by mass that is lost from a soil by ignition at 440°C.
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"

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

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

Annex B
Topsoil Test Results

Terra Firma (Wales) Ltd. 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA
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Final Report

Report No.:	21-18610-1
Initial Date of Issue:	08-Jun-2021
Client	Terra Firma (Wales) Ltd
Client Address:	5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA
Contact(s):	[redacted]
Project	Herbert Road

Quotation No.:		**Date Received:**	03-Jun-2021
Order No.:	12032RH	**Date Instructed:**	03-Jun-2021
No. of Samples:	3		
Turnaround (Wkdays):	5	**Results Due:**	09-Jun-2021
Date Approved:	08-Jun-2021		

Approved By:

[redacted]

Details: Glynn Harvey, Technical Manager

Results - Soil

Project: Herbert Road

Client: Terra Firma (Wales) Ltd		**Chemtest Job No.:**			21-18610	21-18610	21-18610
Quotation No.:		**Chemtest Sample ID.:**			1213198	1213199	1213200
Order No.: 12032RH		Client Sample Ref.:			PLOT 101	PLOT 104	PLOT 106
		Client Sample ID.:			PLOT 101	PLOT 104	PLOT 106
		Sample Location:			topsoil	topsoil	topsoil
		Sample Type:			SOIL	SOIL	SOIL
		Date Sampled:			02-Jun-2021	02-Jun-2021	02-Jun-2021
		Time Sampled:			12:00	12:00	12:00
		Asbestos Lab:			COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type	U	2192		N/A	-	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-
Moisture	N	2030	%	0.020	16	15	17
Soil Colour	N	2040		N/A	Black	Black	Black
Other Material	N	2040		N/A	Stones and Roots	Stones and Roots	Stones and Roots
Soil Texture	N	2040		N/A	Sand	Sand	Sand
pH	M	2010		4.0	8.4	8.5	8.5
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	1.9	2.7	2.7
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Sulphate (Acid Soluble)	M	2430	%	0.010	0.059	0.083	0.053
Arsenic	M	2450	mg/kg	1.0	6.3	9.4	8.5
Cadmium	M	2450	mg/kg	0.10	0.22	0.37	0.74
Chromium	M	2450	mg/kg	1.0	19	23	24
Mercury Low Level	M	2450	mg/kg	0.05	0.07	0.09	0.07
Copper	M	2450	mg/kg	0.50	15	42	31
Nickel	M	2450	mg/kg	0.50	33	62	40
Lead	M	2450	mg/kg	0.50	18	29	29
Selenium	M	2450	mg/kg	0.20	< 0.20	< 0.20	< 0.20
Zinc	M	2450	mg/kg	0.50	83	120	120
Chromium (Trivalent)	N	2490	mg/kg	1.0	19	23	24
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0

Results - Soil

Project: Herbert Road

Client: Terra Firma (Wales) Ltd			**Chemtest Job No.:**		21-18610	21-18610	21-18610
Quotation No.:			**Chemtest Sample ID.:**		1213198	1213199	1213200
Order No.: 12032RH			Client Sample Ref.:		PLOT 101	PLOT 104	PLOT 106
			Client Sample ID.:		PLOT 101	PLOT 104	PLOT 106
			Sample Location:		topsoil	topsoil	topsoil
			Sample Type:		SOIL	SOIL	SOIL
			Date Sampled:		02-Jun-2021	02-Jun-2021	02-Jun-2021
			Time Sampled:		12:00	12:00	12:00
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10	< 10
Naphthalene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Chrysene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2700	mg/kg	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
Dibenz(a,h)Anthracene	M	2700	mg/kg	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
Total Of 16 PAH's	M	2700	mg/kg	2.0	< 2.0	< 2.0	< 2.0
Total Phenols	M	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Organic Matter BS1377	N	2930	%	0.10	5.1	6.2	6.1

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	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
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; 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 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

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

Annex C
Capping Thickness Validation Photos

Terra Firma (Wales) Ltd. 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA
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Registered in Wales No. 4013230. VAT No: 753 2566 25. Registered Office: 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA

terra firma
Geotechnical & Geoenvironmental Specialists
www.terrafirmawales.co.uk

Our Ref: RH/12032/VP108-119

Your Ref:

Contact: Ruth Howells

17th May 2021

NHBC

For the attn. of Mr Steve Moreby

Dear Steve

PLOTS 108 - 119 PHASE 2, HERBERT ROAD NEWPORT: CAPPING VALIDATION

I confirm that the required 600mm of remedial capping has now been imported and validated within the gardens of Plots 108 – 119.

Validation of capping thickness and soil sampling was undertaken in Plots 108, 113, 114 and 119.

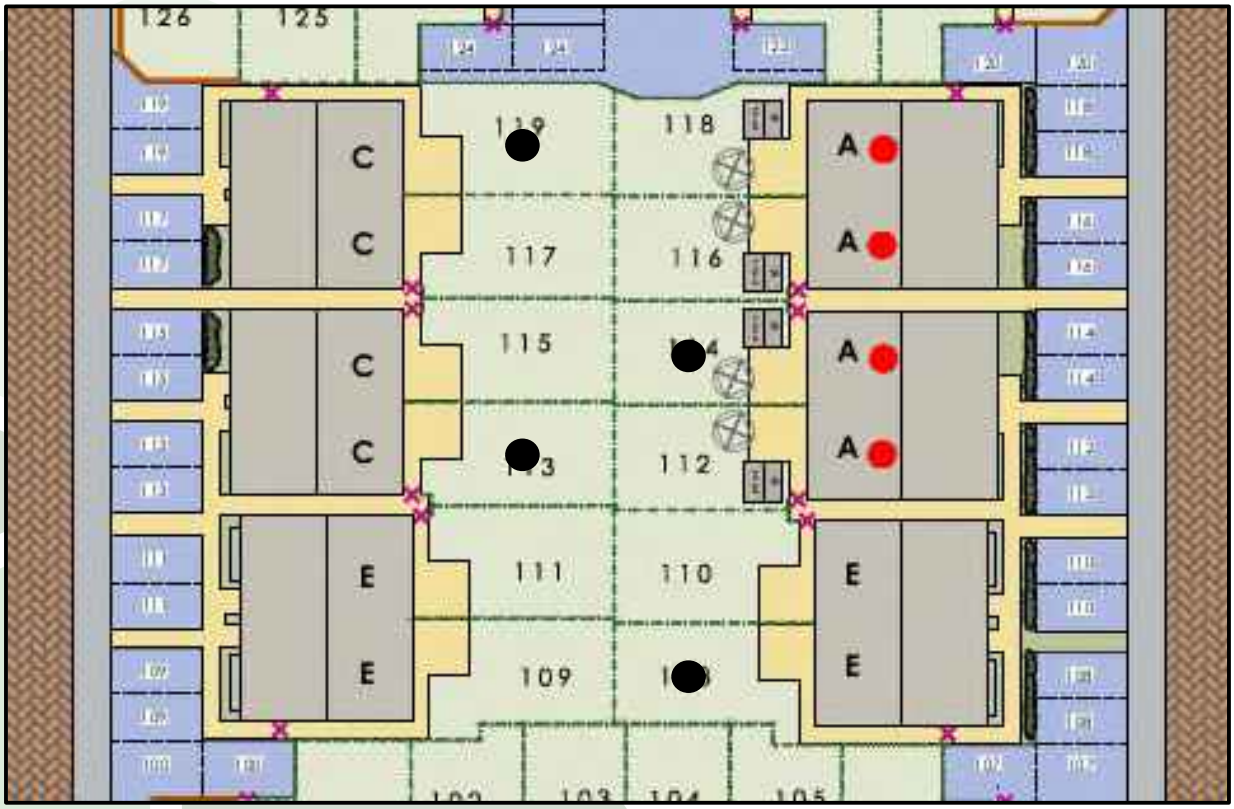

Figure 1: Site Layout and Sampling Locations

The subsoil was sourced from a development site in Bonvilston. Terra Firma (Wales) Limited sampled and tested this at source from a stockpile. Please refer to **Annex A** for the test results.

The topsoil was supplied by Neal Soils.

A volume of <250m^3 of both the topsoil and subsoil was imported.

Soil samples were submitted for analysis at the laboratory of Eurofins Chemtest. Test results for both topsoil and sub soil samples taken from the new gardens may be found in **Annex B**.

Inspection of the capping soils in hand dug pits confirmed the capping thickness to be at least 600mm. Please see **Annex C** for photographs of the pits.

Comparison of the analytical results has been made residential (including plant uptake) Suitable 4 Use Levels (S4ULs) provided by Land Quality Management Limited and the Chartered Institute of Environmental Health (CIEH). Where CIEH thresholds are not available reference has been made to Category 4 Screening Levels (C4SLs).

Both subsoil and topsoil results from the four sampling locations are summarised in the following table.

Table 1 Summary of Soil Chemical Test Results Imported Soils

Substance	SGV/GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of Exceedances
			Minimum	Maximum	
Arsenic	37	CIEH	19	27	0
Boron	290	CIEH	<0.4	0.96	0
Cadmium	11	CIEH	0.16	1.3	0
Chromium III	910	CIEH	11	30	0
Chromium VI	6	CIEH	<0.5	<0.5	0
Copper	2400	CIEH	9.8	40	0
Lead	200	C4SL	15	150	0
Mercury	40	CIEH	<0.05	0.39	0
Nickel	130	CIEH	22	33	0
Selenium	250	CIEH	<0.2	0.29	0
Zinc	3700	CIEH	53	180	0
Cyanide	8	-	<0.5	<0.5	0
Phenols	120	CIEH	<0.1	<0.3	0
Organic Matter	-	-	0.23	8.3	-
pH	-	-	8.5	8.9	-
Asbestos	-	-	Not detected	Not detected	-

Table 1 Summary of Soil Chemical Test Results (Continued) Imported Soils					
Substance	**GAC** (mg/kg)	**Source**	**Measured Concentrations of Tested Substances** (mg/kg)		**Number of Exceedances**
			Minimum	**Maximum**	
Naphthalene	2.3	CIEH	<0.1	<0.1	0
Acenaphthylene	170	CIEH	<0.1	<0.1	0
Acenaphthene	210	CIEH	<0.1	<0.1	0
Fluorene	170	CIEH	<0.1	<0.1	0
Phenanthrene	95	CIEH	<0.1	<0.1	0
Anthracene	2400	CIEH	<0.1	<0.1	0
Fluoranthene	280	CIEH	<0.1	<0.1	0
Pyrene	620	CIEH	<0.1	<0.1	0
Benzo(a)anthracene	7.2	CIEH	<0.1	<0.1	0
Chrysene	15	CIEH	<0.1	<0.1	0
Benzo(b)fluoranthene	2.6	CIEH	<0.1	<0.1	0
Benzo(k)fluoranthene	77	CIEH	<0.1	<0.1	0
Benzo(a)pyrene	2.2	CIEH	<0.1	<0.1	0
Indeno(123cd)pyrene	27	CIEH	<0.1	<0.1	0
Dibenzo(ah)anthracene	0.24	CIEH	<0.1	<0.1	0
Benzo(ghi)perylene	320	CIEH	<0.1	<0.1	0
Aliphatic					
PH C5 – C6 Ali	42	CIEH	<1.0	<1.0	0
PH C6 – C8 Ali	100	CIEH	<1.0	<1.0	0
PH C8 – C10 Ali	27	CIEH	<1.0	<1.0	0
PH C10 – C12 Ali	130	CIEH	<1.0	<1.0	0
PH C12 – C16 Ali	1100	CIEH	<1.0	<1.0	0
PH C16 – C21 Ali*	65000	CIEH	<1.0	<1.0	0
PH C21 – C35 Ali*	65000	CIEH	<1.0	20	0
PH C35 – C44 Ali	65000	CIEH	<1.0	<1.0	0
Aromatic					
PH C5 – C7 Arom	70	CIEH	<1.0	<1.0	0
PH C7 – C8 Arom	130	CIEH	<1.0	<1.0	0
PH C8 – C10 Arom	34	CIEH	<1.0	<1.0	0
PH C10 – C12 Arom	74	CIEH	<1.0	<1.0	0
PH C12 – C16 Arom	140	CIEH	<1.0	<1.0	0
PH C16 – C21 Arom	260	CIEH	<1.0	9.4	0
PH C21 – C35 Arom	1100	CIEH	<1.0	110	0
PH C35 – C44 Arom	1100	CIEH	<1.0	16	0

Notes

- Thresholds based on 1.0% SOM
- CIEH for Ali C16 - 21 and C21 - C35 based on CIEH for EC >16 – 35

From the above table is can be seen that all substances tested for are present at levels below their respective human health threshold levels.

It may, therefore, be confirmed that the imported subsoil and topsoil does not present a risk to the human health of future site residents.

I 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 me.

Yours sincerely
for: Terra Firma (Wales) Ltd

[redacted]

Mrs Ruth Howells

Annex A
Bonvilston Subsoil Source Test Results

Terra Firma (Wales) Ltd. 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA
Tel: 029 2073 5354 **Fax:** 029 2073 5433 **Email:** info@terrafirmawales.co.uk **www.terrafirmawales.co.uk**
Registered in Wales No. 4013230. VAT No: 753 2566 25. Registered Office: 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA

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Final Report

Report No.:	20-28927-1
Initial Date of Issue:	02-Nov-2020
Client	Terra Firma (Wales) Ltd
Client Address:	5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA
Contact(s):	[redacted]
Project	Bonvilston
Quotation No.:	
Date Received:	27-Oct-2020
Order No.:	13032/RH
Date Instructed:	27-Oct-2020
No. of Samples:	9
Turnaround (Wkdays):	5
Results Due:	02-Nov-2020
Date Approved:	02-Nov-2020
Approved By:	[redacted]
Details:	Glynn Harvey, Technical Manager

Results - Soil

Project: Bonvilston

Client: Terra Firma (Wales) Ltd				**Chemtest Job No.:**	20-28927	20-28927	20-28927	20-28927	20-28927	20-28927	20-28927	20-28927	20-28927
Quotation No.:				**Chemtest Sample ID.:**	1086797	1086798	1086799	1086800	1086801	1086802	1086803	1086804	1086805
Order No.: 13032/RH				Client Sample Ref.:	SS S1	SS S2	SS S3	SS S4	SS S5	SS S6	TS S1	TS S2	TS S3
				Client Sample ID.:	SS S1	SS S2	SS S3	SS S4	SS S5	SS S6	TS S1	TS S2	TS S3
				Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Date Sampled:	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020
				Time Sampled:	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	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	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-	-	-	-	-	-	-
Moisture	N	2030	%	0.020	13	10	12	11	10	13	16	13	13
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones	Stones	Stones	Stones	Stones	Stones and Roots	Stones
Soil Texture	N	2040		N/A	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand
pH	M	2010		4.0	8.7	8.6	8.9	9.3	8.4	8.0	7.3	7.6	8.1
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	< 0.40	< 0.40	< 0.40	0.47	< 0.40	< 0.40	0.47	0.51	< 0.40
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	0.50
Sulphate (Acid Soluble)	M	2430	%	0.010	0.022	0.036	0.048	0.042	< 0.010	0.022	0.054	0.051	0.036
Arsenic	M	2450	mg/kg	1.0	11	14	12	11	9.2	8.6	12	12	11
Cadmium	M	2450	mg/kg	0.10	0.24	0.36	0.28	0.29	0.28	0.17	0.34	0.34	0.32
Chromium	M	2450	mg/kg	1.0	20	21	20	17	17	17	14	15	13
Mercury Low Level	M	2450	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.06	0.13	0.12
Copper	M	2450	mg/kg	0.50	17	18	20	24	17	14	15	16	14
Nickel	M	2450	mg/kg	0.50	25	27	25	23	27	22	14	17	16
Lead	M	2450	mg/kg	0.50	32	33	33	28	41	34	47	52	43
Selenium	M	2450	mg/kg	0.20	0.28	< 0.20	< 0.20	< 0.20	0.32	0.42	0.37	0.37	0.40
Zinc	M	2450	mg/kg	0.50	83	89	90	79	89	80	72	75	71
Chromium (Trivalent)	N	2490	mg/kg	1.0	20	21	20	17	17	17	14	15	13
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 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	< 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	< 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	< 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	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 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	< 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	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Results - Soil

Project: Bonvilston

Client: Terra Firma (Wales) Ltd			**Chemtest Job No.:**		20-28927	20-28927	20-28927	20-28927	20-28927	20-28927	20-28927	20-28927	20-28927
Quotation No.:			**Chemtest Sample ID.:**		1086797	1086798	1086799	1086800	1086801	1086802	1086803	1086804	1086805
Order No.: 13032/RH			Client Sample Ref.:		SS S1	SS S2	SS S3	SS S4	SS S5	SS S6	TS S1	TS S2	TS S3
			Client Sample ID.:		SS S1	SS S2	SS S3	SS S4	SS S5	SS S6	TS S1	TS S2	TS S3
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Date Sampled:		23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020	23-Oct-2020
			Time Sampled:		12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
			Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Naphthalene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 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	< 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	< 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	< 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	< 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	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.13	< 0.10	< 0.10	< 0.10	< 0.10	1.1
Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.12	< 0.10	< 0.10	< 0.10	< 0.10	1.0
Benzo[a]anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 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	< 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	< 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	< 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	< 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	< 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	< 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	< 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	< 2.0	< 2.0	< 2.0	< 2.0	2.1
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
Organic Matter BS1377	N	2930	%	0.10	0.80	0.60	0.60	0.80	0.30	1.4	3.1	2.6	2.5

Results - Topsoil Report

BS3882:2015

Chemtest Job No.: 20-28927
Chemtest Sample ID.: 1086803
Client Sample Ref.: TS S1
Sample Location:
Client Sample ID.: TS S1
Top Depth (m):
Bottom Depth (m):
Date Sampled: 23-Oct-2020
Time Sampled:

Parameter	Units	Multipurpose Range	Result	Compliant with Multipurpose Range? (Y/N)	Compliant with Specific Purpose Range? (Y/N)		
Texture					**Acid**	**Low F**	**Calc.**
Clay content	%		21				
Silt content	%		27				
Sand content	%		52				
Soil texture class		See Attached Chart	Sandy Clay Loam	YES			
Mass Loss on Ignition							
Clay 5-20%		3.0-20	4.1	NO	NO	YES	NO
Clay 20-35%		5.0-20					
Stone Content	**% m/m**						
>2mm		0-30	28	YES			
>20mm		0-10	3.8	YES			
>50mm		0	< 0.020	YES			
Soil pH value		5.5-8.5	7.3	YES	NO	YES	NO
Carbonate (Calcareous only)	%		5.3				YES
Electrical Conductivity	µS/cm	If >3300 do ESP	2200	YES			
Available Nutrient Content							
Nitrogen %		>0.15	0.23	YES	YES		YES
Extractable phosphorus	mg/l	16-140	6.5	NO	NO	YES	NO
Extractable potassium	mg/l	121-1500	75	NO	NO		NO
Extractable magnesium	mg/l	51-600	120	YES	YES		YES
Carbon : Nitrogen Ratio		<20:1	10.4/1	YES	YES	YES	YES
Exchangeable sodium	**%**	<15	0.95				
Available Calcium	mg/l		1900				
Available Sodium	mg/l		24				
Phytotoxic Contaminants (by soil pH)		**< 6.0** / **6.0-7.0** / **> 7.0**					
Zinc (Nitric Acid extract)	mg/kg	<200 / <200 / <300	57	YES			
Copper (Nitric Acid extract)	mg/kg	<100 / <135 / <200	14	YES			
Nickel (Nitric Acid extract)	mg/kg	<60 / <75 / <110	12	YES			
Visible Contaminants	**% mm**						
>2mm		<0.5	0.000	YES			
….. of which plastics		<0.25	0.000	YES			
….. man-made sharps		zero in 1kg	0.000	YES			

Results - Topsoil Report

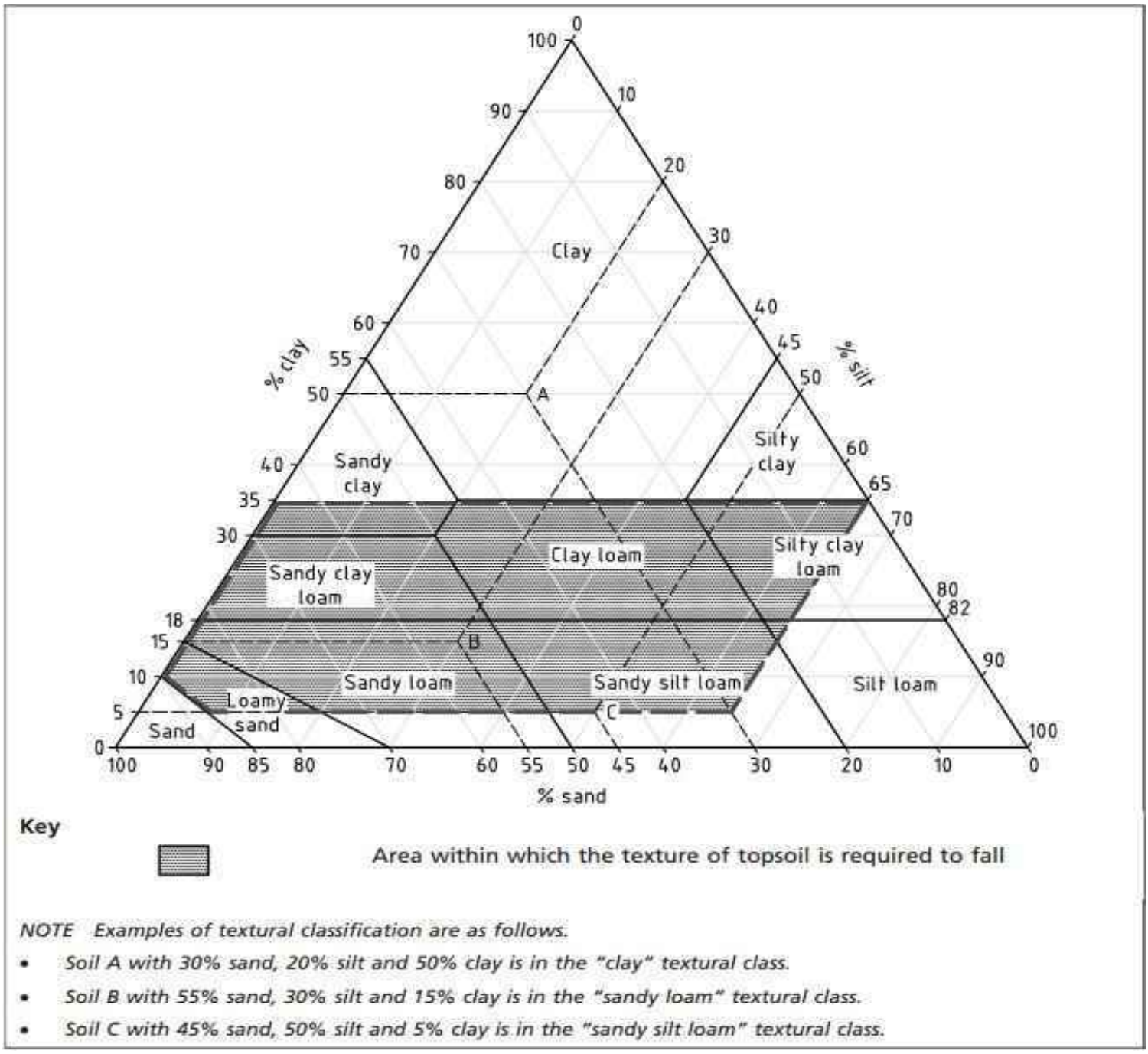
BS3882:2015

Chemtest Job No.: 20-28927
Chemtest Sample ID.: 1086804
Client Sample Ref.: TS S2
Sample Location:
Client Sample ID.: TS S2
Top Depth (m):
Bottom Depth (m):
Date Sampled: 23-Oct-2020
Time Sampled:

Parameter	Units	Multipurpose Range	Result	Compliant with Multipurpose Range? (Y/N)	Compliant with Specific Purpose Range? (Y/N)		
Texture					**Acid**	**Low F**	**Calc.**
Clay content	%		19				
Silt content	%		24				
Sand content	%		56				
Soil texture class		See Attached Chart	Sandy Clay Loam	YES			
Mass Loss on Ignition							
Clay 5-20%		3.0-20	3.5	YES	YES	YES	YES
Clay 20-35%		5.0-20					
Stone Content	**% m/m**						
>2mm		0-30	23	YES			
>20mm		0-10	9.7	YES			
>50mm		0	< 0.020	YES			
Soil pH value		5.5-8.5	7.6	YES	NO	YES	YES
Carbonate (Calcareous only)	%		4.0				YES
Electrical Conductivity	µS/cm	If >3300 do ESP	2200	YES			
Available Nutrient Content							
Nitrogen %		>0.15	0.21	YES	YES		YES
Extractable phosphorus	mg/l	16-140	7.2	NO	NO	YES	NO
Extractable potassium	mg/l	121-1500	85	NO	NO		NO
Extractable magnesium	mg/l	51-600	130	YES	YES		YES
Carbon : Nitrogen Ratio		<20:1	9.9/1	YES	YES	YES	YES
Exchangeable sodium	**%**	<15	0.87				
Available Calcium	mg/l		1600				
Available Sodium	mg/l		19				
Phytotoxic Contaminants (by soil pH)		**< 6.0** / **6.0-7.0** / **> 7.0**					
Zinc (Nitric Acid extract)	mg/kg	<200 / <200 / <300	59	YES			
Copper (Nitric Acid extract)	mg/kg	<100 / <135 / <200	16	YES			
Nickel (Nitric Acid extract)	mg/kg	<60 / <75 / <110	14	YES			
Visible Contaminants	**% mm**						
>2mm		<0.5	0.000	YES			
….. of which plastics		<0.25	0.000	YES			
….. man-made sharps		zero in 1kg	0.000	YES			

Topsoil: BS3882:2015

Texture Classification Chart



Key

Area within which the texture of topsoil is required to fall

NOTE Examples of textural classification are as follows.

- *Soil A with 30% sand, 20% silt and 50% clay is in the "clay" textural class.*
- *Soil B with 55% sand, 30% silt and 15% clay is in the "sandy loam" textural class.*
- *Soil C with 45% sand, 50% silt and 5% clay is in the "sandy silt loam" textural class.*

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Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2020	Electrical Conductivity	Electrical conductivity (EC) of aqueous extract or calcium sulphate solution for topsoil	Measurement of the electrical resistance of a 2:1 water/soil extract.
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
2115	Total Nitrogen in Soils	Nitrogen	Determination by elemental analyser
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2260	Carbonate	Carbonate	Titration
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2400	Cations	Cations	ICP-MS
2420	Phosphate	Phosphate	Spectrophotometry - Discrete 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-diphenylcarbazide.
2620	LOI 440	LOI 440 Trommel Fines	Determination of the proportion by mass that is lost from a soil by ignition at 440°C.
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"

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

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

Annex B
Topsoil and Subsoil Test Results

Terra Firma (Wales) Ltd. 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA
Tel: 029 2073 5354 **Fax:** 029 2073 5433 **Email:** info@terrafirmawales.co.uk **www.terrafirmawales.co.uk**
Registered in Wales No. 4013230. VAT No: 753 2566 25. Registered Office: 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA

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

Final Report

Report No.:	21-14851-1		
Initial Date of Issue:	12-May-2021		
Client	Terra Firma (Wales) Ltd		
Client Address:	5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA		
Contact(s):	[redacted]		
Project	H. Road		
Quotation No.:		**Date Received:**	06-May-2021
Order No.:	12032RH	**Date Instructed:**	06-May-2021
No. of Samples:	4		
Turnaround (Wkdays):	5	**Results Due:**	12-May-2021
Date Approved:	12-May-2021		
Approved By:	[redacted]		
Details:	Glynn Harvey, Technical Manager		

Results - Soil

Project: H. Road

Client: Terra Firma (Wales) Ltd		**Chemtest Job No.:**			21-14851	21-14851	21-14851	21-14851
Quotation No.:		**Chemtest Sample ID.:**			1194430	1194431	1194432	1194433
Order No.: 12032RH		Client Sample Ref.:			TS PLOT 119	TS PLOT 114	TS PLOT 113	TS PLOT 108
		Client Sample ID.:			PLOT 119	PLOT 114	PLOT 113	PLOT 108
		Sample Type:			SOIL	SOIL	SOIL	SOIL
		Date Sampled:			05-May-2021	05-May-2021	05-May-2021	05-May-2021
		Time Sampled:			12:00	12:00	12:00	12:00
		Asbestos Lab:			DURHAM	DURHAM	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	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-	-
Moisture	N	2030	%	0.020	14	14	17	13
Soil Colour	N	2040		N/A	Black	Black	Black	Black
Other Material	N	2040		N/A	Stones	Stones and Roots	Stones and Roots	Stones and Roots
Soil Texture	N	2040		N/A	Sand	Sand	Sand	Sand
pH	M	2010		4.0	8.4	8.1	8.3	8.3
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	0.40	0.43	< 0.40	0.40
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Sulphate (Acid Soluble)	M	2430	%	0.010	0.027	0.032	0.032	0.032
Arsenic	M	2450	mg/kg	1.0	3.9	5.1	5.0	5.7
Cadmium	M	2450	mg/kg	0.10	0.16	0.17	0.16	0.19
Chromium	M	2450	mg/kg	1.0	10	12	11	13
Mercury Low Level	M	2450	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Copper	M	2450	mg/kg	0.50	10	13	9.8	13
Nickel	M	2450	mg/kg	0.50	22	25	23	28
Lead	M	2450	mg/kg	0.50	15	15	15	16
Selenium	M	2450	mg/kg	0.20	< 0.20	< 0.20	< 0.20	< 0.20
Zinc	M	2450	mg/kg	0.50	53	62	62	66
Chromium (Trivalent)	N	2490	mg/kg	1.0	10	12	11	13
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	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	16	20	12
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	16	20	12
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	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0

Results - Soil

Project: H. Road

Client: Terra Firma (Wales) Ltd		**Chemtest Job No.:**			21-14851	21-14851	21-14851	21-14851
Quotation No.:		**Chemtest Sample ID.:**			1194430	1194431	1194432	1194433
Order No.: 12032RH		Client Sample Ref.:			TS PLOT 119	TS PLOT 114	TS PLOT 113	TS PLOT 108
		Client Sample ID.:			PLOT 119	PLOT 114	PLOT 113	PLOT 108
		Sample Type:			SOIL	SOIL	SOIL	SOIL
		Date Sampled:			05-May-2021	05-May-2021	05-May-2021	05-May-2021
		Time Sampled:			12:00	12:00	12:00	12:00
		Asbestos Lab:			DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	9.4	< 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	45	87	110	62
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	4.8	13	16	8.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	50	100	140	70
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	50	120	160	82
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	< 0.10	< 0.10	< 0.10
Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 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	7.2	7.9	7.6	8.3

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	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
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; 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
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N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
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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 45 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

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

Amended Report

Report No.:	21-12190-2		
Initial Date of Issue:	29-Apr-2021	**Date of Re-Issue:**	13-May-2021
Client	Terra Firma (Wales) Ltd		
Client Address:	5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA		
Contact(s):	[redacted]		
Project	H.Road		
Quotation No.:	Q19-16176	**Date Received:**	16-Apr-2021
Order No.:	12032RH	**Date Instructed:**	16-Apr-2021
No. of Samples:	3		
Turnaround (Wkdays):	5	**Results Due:**	22-Apr-2021
Date Approved:	13-May-2021		
Approved By:	[redacted]		
Details:	Glynn Harvey, Technical Manager		

Results - Soil

Project: H.Road

Client: Terra Firma (Wales) Ltd			**Chemtest Job No.:**		21-12190	21-12190	21-12190
Quotation No.: Q19-16176			**Chemtest Sample ID.:**		1180418	1180420	1180422
Order No.: 12032RH			Client Sample Ref.:		PLOT 108	PLOT 113	PLOT 114
			Client Sample ID.:		SS	SS	SS
			Sample Type:		SOIL	SOIL	SOIL
			Date Sampled:		14-Apr-2021	14-Apr-2021	14-Apr-2021
			Time Sampled:		12:00	12:00	12:00
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type	U	2192		N/A	-	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-
Moisture	N	2030	%	0.020	15	12	10
Soil Colour	N	2040		N/A	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Sand	Sand	Sand
pH	M	2010		4.0	8.7	8.9	8.5
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	0.40	0.40	0.96
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Sulphate (Acid Soluble)	M	2430	%	0.010	0.10	0.050	0.088
Arsenic	M	2450	mg/kg	1.0	23	19	27
Cadmium	M	2450	mg/kg	0.10	1.1	0.60	1.3
Chromium	M	2450	mg/kg	1.0	30	25	27
Mercury Low Level	M	2450	mg/kg	0.05	0.07	0.07	0.39
Copper	M	2450	mg/kg	0.50	32	22	40
Nickel	M	2450	mg/kg	0.50	33	27	32
Lead	M	2450	mg/kg	0.50	150	55	140
Selenium	M	2450	mg/kg	0.20	0.29	< 0.20	< 0.20
Zinc	M	2450	mg/kg	0.50	170	130	180
Chromium (Trivalent)	N	2490	mg/kg	1.0	30	25	27
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0

Results - Soil

Project: H.Road

Client: Terra Firma (Wales) Ltd			**Chemtest Job No.:**		21-12190	21-12190	21-12190
Quotation No.: Q19-16176			**Chemtest Sample ID.:**		1180418	1180420	1180422
Order No.: 12032RH			Client Sample Ref.:		PLOT 108	PLOT 113	PLOT 114
			Client Sample ID.:		SS	SS	SS
			Sample Type:		SOIL	SOIL	SOIL
			Date Sampled:		14-Apr-2021	14-Apr-2021	14-Apr-2021
			Time Sampled:		12:00	12:00	12:00
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10	< 10
Naphthalene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Chrysene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2700	mg/kg	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
Dibenz(a,h)Anthracene	M	2700	mg/kg	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
Total Of 16 PAH's	M	2700	mg/kg	2.0	< 2.0	< 2.0	< 2.0
Total PCBs (7 congeners)	N	2815	mg/kg	0.0010			
Total Phenols	M	2920	mg/kg	0.10	< 0.30	< 0.30	< 0.30
Organic Matter BS1377	N	2930	%	0.10	0.30	2.9	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	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
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; 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)
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.
2930	Organic Matter	Organic Matter	Acid Dichromate digestion/Titration

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Charges may apply to extended sample storage

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

Annex C
Capping Thickness Validation Photos

Terra Firma (Wales) Ltd. 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA
Tel: 029 2073 5354 **Fax:** 029 2073 5433 **Email:** info@terrafirmawales.co.uk **www.terrafirmawales.co.uk**
Registered in Wales No. 4013230. VAT No: 753 2566 25. Registered Office: 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff CF23 7HA

Plot 119

Plot 114

Plot 113

Plot 108

ANNEX G
Phase 2A Site Investigation Report

Geotechnical & Geo-environmental Site Investigation Report:
Proposed Residential Development
Herbert Road
Newport

Phase 2

Prepared For:
Engie

July 2018

Job No: 12032/P2

terrafirma

REPORT TITLE	:	**Geotechnical and Geoenvironmental Report Site Investigation Report:** Proposed Residential Development, Herbert Road, Newport Phase 2
REPORT STATUS	:	**Final**
JOB NUMBER	:	**12032/P2**
DATE	:	**July 2017**
PREPARED BY	:	[redacted] **Mrs Ruth Howells**
REVIEWED BY	:	[redacted] **Mathew Lake**
APPROVED BY	:	[redacted] **Dr Gwyn C Lake**

Executive Summary

Site Location	*The site is situated along the River Usk, Newport, and is centred on an approximate National Grid Reference of 331680 189228. It occupies a plan area of approximately 0.25 hectares.*
Site History	*The site in 1883 comprised field land alongside the River Usk. Several buildings were present on site over the years, all of unspecified use, although one property named Glen Usk was likely residential. The site has remained vacant since 1978. Historical maps indicate that the site level was raised in the 1980s.*
Ground Conditions	*Made ground of variable medium dense to dense sand and gravel deposits extend to a depth of 2.9m and 3.9m, overlying alluvial clays with peat bands to 13.2m/1.40m depth. A thin band of red silt site below the alluvium. Weathered St Maughan's Group mudstone bedrock was confirmed below 14.5m and 15.2m depth.*
Radon	*No radon protection is required for new development.*
Ground Gas/Landfill Gas	*In-situ gas monitoring has confirmed that gas protection measures will be required for the new apartments in accordance with BRE C665 Gas Characteristic Situation 2.*
Laboratory Chemical Testing and Proposed Remediation	*Laboratory analysis of made ground on site was undertaken. Lead and cyanide were found to be elevated. Chrysotile and crocidolite asbestos fibres were also identified.* *Upon development all communal garden and soft landscaped areas should be capped with 600mm imported clean material and underlying double layer no-dig barrier.* *Any imported soils should be validated as clean and suitable for use in accordance with 'Requirements for the Chemical testing of Imported Soils for Various End Uses and Validation Cover Systems'.* *For proposed new supply water pipes, the UK Water Industry Research publication 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites (Report 10/WM/03/21)' should be consulted.*
Foundation Solution	*Due to the presence of made ground and soft alluvial clays beneath the site traditional shallow foundations are not recommended. Such foundations will lead to high total and differential settlements.* *A piled foundation is advised for the proposed apartment blocks. Precast concrete driven piles founded within the underlying weathered red mudstone and/or sandstone is recommended. For a 275mm square precast concrete pile driven to an appropriate set within the underlying competent mudstone a safe working load of typically 500kN should be achieved. Based upon the site investigation data, pile lengths should vary between 17.5m and 18m beneath current ground levels.* *Measurements should be kept on pile vibrations during driving. Measures should also be taken to dampen such vibrations. If, however, vibrations exceed permissible values then consideration should be given to using a contiguous flight auger (cfa)/bored pile solution.* *Floor slabs should be designed as suspended.*

TABLE OF CONTENTS

SECTION 1 Introduction and Proposed Development

1.1 Introduction
1.2 Limitations and Exceptions of Investigation

SECTION 2 Review of Existing Data

2.1 Physical Setting and Current Site Use
2.2 History
2.3 Geological Setting
2.3.1 Geology
2.3.2 Coal Mining
2.3.3 Radon
2.4 Hydrogeology and Hydrology
2.5 Environmental Setting
2.5.1 Industrial Operator Scores
2.5.2 Industrial Pollution
2.5.3 Pollution Incidents
2.5.4 Landfills
2.5.5 Groundwater Source Protection Zones

SECTION 3 Preliminary Human Health and Environmental Risk Assessment

3.1 General
3.2 Preliminary Site Conceptual Model
3.3 Potential Sources of Contamination and Gas
3.4 Potential Receptors and Pollution Pathways

SECTION 4 Field Investigation

4.1 Site Works
4.2 Ground Conditions
4.3 Water Strikes
4.4 Stability and Obstructions
4.5 Soil Laboratory Chemical Testing
4.5.1 Exploratory Strategy and Sampling Regime
4.5.2 Laboratory Analysis

SECTION 5 Soil Analytical Results

5.1 Soil Assessment Methodology
5.2 Soil Test Results

SECTION 6 Gas Monitoring

TABLE OF CONTENTS (Continued)

SECTION 7 Quantitative Risk Assessment

7.1 Contaminants of Concern
7.1.1 Contaminants of Concern in Soil
7.1.2 Leachable Contaminants of Concern
7.2 Potential Receptors and Pathways
7.2.1 Human Receptors
7.2.2 Aquatic Environment
7.3 Mitigation and Remedial Measures
7.3.1 Human Health
7.3.2 Aquatic Environment

SECTION 8 Engineering Recommendations

8.1 Preparation of Site
8.2 Foundation and Floor Slab Solution
8.3 Excavations and Formations
8.4 Protection of Buried Concrete
8.5 Access Roads and Car Parking Areas

Tables

Table 3.1 Preliminary Human Health Risk Assessment
Table 3.2 Preliminary Environmental Risk Assessment
Table 4.1 Summary of Ground Conditions
Table 4.2 Sample Locations and Depths
Table 5.1 Summary of Soil Chemical Test Results - Standard Suite
Table 5.2 Summary of Soil Chemical Test Results - Speciated PAH
Table 5.3 Summary of Soil Chemical Test Results - Asbestos

Figures

Figure 2.1 Site Location - OS Map 152 Newport and Pontypool

Annexes

Annex A Landmark Historical Maps
Annex B Radon Report
Annex C Risk Assessment Definitions
Annex D Trial Pit Logs
Annex E Borehole Logs
Annex F Laboratory Soil Chemical Test Results
Annex G Gas Monitoring Results

Drawings

Drawing 01 Site Layout

SECTION 1 Introduction and Proposed Development

1.1 Introduction

Engie is proposing the residential development of an area of land off Herbert Street, Newport. This is scheduled to be carried out in three phases. Phase 1 is currently nearing completion.

The majority of the Phase 2 was investigated by Terra Firma in 2013, as reported in Geotechnical and Geo-environmental Report No. 12032. This area has therefore been excluded from this report as ground conditions have been proved and all soil chemical data has already been assessed and approved.

This report covers the southern portion of Phase 2 (referred to as 'the site' throughout) that has not previously been investigated, as illustrated in **Figure 1.1**.

Figure 1.1: Report Study Area

Terra Firma (Wales) Limited has been commissioned to undertake a geo-environmental assessment and geotechnical investigation of the site.

The main objectives of the geoenvironmental assessment programme were to:

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

The main objectives of the geotechnical site investigation were to:

- Determine the type, strength and bearing characteristics of the shallow superficial and underlying solid geology
- Provide engineering foundation and floor slab recommendations for the development
- Provide recommendations with regard to any other geotechnical aspects pertaining to the development

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

1.2 Limitations and Exceptions of Investigation

Engie has requested that a Geoenvironmental Site Assessment (GSA) and Geotechnical Investigation (GI) be performed in order to determine if contamination is present beneath the site and to determine an appropriate foundation and floor slab solution for the proposed development.

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

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

SECTION 2 Review of Existing Data

2.1 Physical Setting and Current Site Use

The site is situated along the River Usk, Newport, and is centred on an approximate National Grid Reference of 331680 189228. It occupies a plan area of approximately 0.25 hectares.

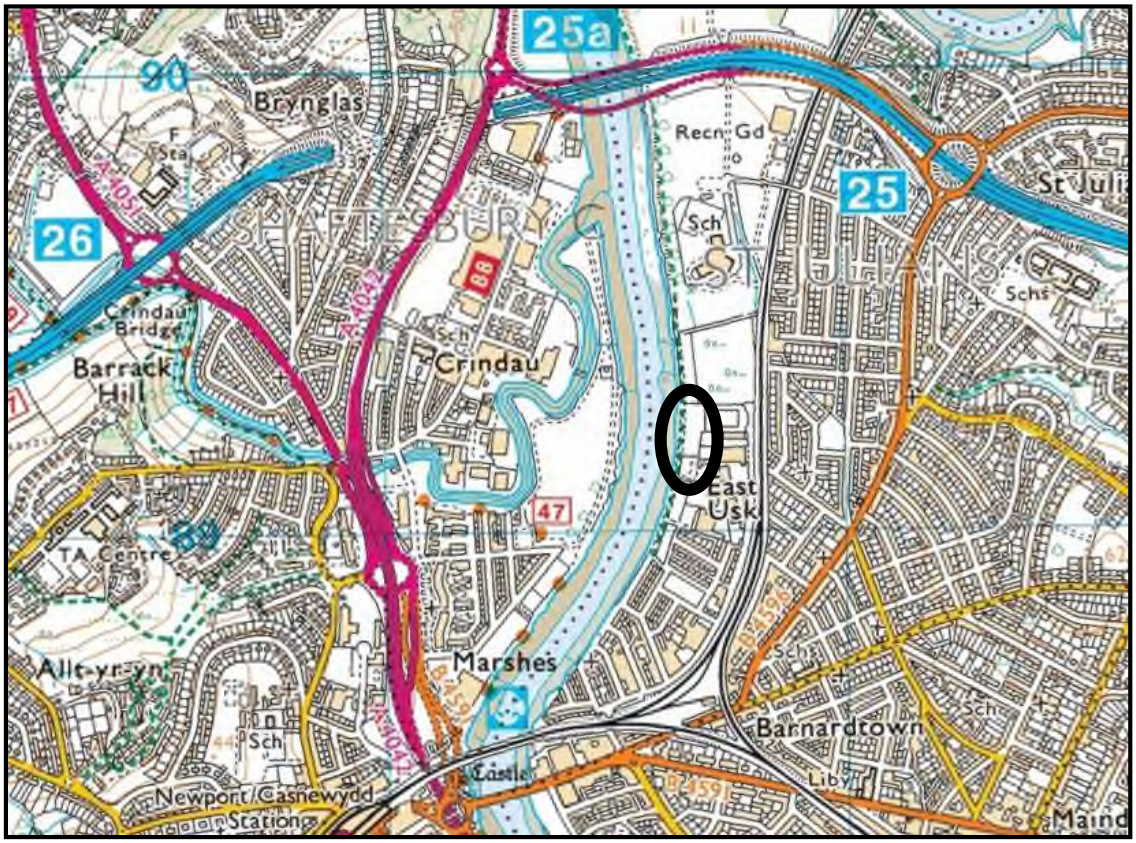

Figure 2.1: Site Location – OS Map 152 Newport and Pontypool

The site lies within boundaries of the entire Engie Herbert Road development area and currently comprises a section of land used only for storing building materials for the Phase 1 development.

The site is relatively level but raised in comparison to the River Usk and land immediately east.

The new site access road runs along the front/western side of the site.

The eastern edge of the site is defined by a new gabion retaining wall, acting to retain the site from the adjacent property, some of which is currently housing the offices and welfare compound for the development.

2.2 Site History

The history of the site has been traced using historical Ordnance Survey maps from Landmark Information Group. The maps may be found in **Annex A.** Please note that the boundary of the site is not specified on these plans. Distances, where quoted, are approximate.

The site in 1883 is seen to comprise field land alongside the River Usk, intersected roughly centrally by an east to west aligned drain. A single building overlapped on to the north of the site at this time. Its use is unspecified but given its secluded location it may have been used to house animals. By 1902 this building was smaller and by 1920 it was absent. Uskside saw mills located approximately 50m east of the site in 1920. By 1938 a collection of five to six buildings had been established in the south of the site. Again, no particular use was assigned to these. The 1955 edition map shows these buildings to have been demolished. However, a cart track looped through the north of the site leading to several buildings in the south, one known as Glen Usk. By 1966 the only building remaining on site was Glen Usk and the northern half of the site was indicated to be scrubland. A paint works and light engineering works had been established on land directly east, north of the saw mills, and a scout hall to the southeast. Glen Usk was no longer present in 1978. The 1987 map indicates that site levels may have been raised, with a short embankment illustrated just outside and roughly paralleling the site's eastern boundary. The saw mills had also closed at this point. Further earthworks are indicated on the 1994 map, where a batter now defines the site's eastern boundary. The site has remained disused since 1994.

2.3 Geological Setting

2.3.1 Geology

The 1:50,000 scale geological map of the area (Sheet 249) was consulted. This shows the site to be underlain by rocks of the by the St Maughan's Formation, belonging to the Devonian Period. These rocks comprise interbedded argillaceous rocks with subordinated sandstone.

The solid geology is shown to be overlain by estuarine alluvium. This often includes peat layers.

Made ground is anticipated to be present across the entire site.

2.3.2 Coal Mining

The site lies outside the South Wales Coalfield. The site will not be affected by past mining.

2.3.3 Radon

A radon report acquired for the site (**Annex B**) details that NO RADON PROTECTION will be required for new buildings on site.

2.4 Hydrogeology and Hydrology

The bedrock beneath the site is detailed to be a Secondary A aquifer. These aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

The estuarine alluvium is classified as unproductive strata.

Any surface or shallow groundwater flows along the river will either be towards the River Usk or adjacent land to the east.

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

2.5 Environmental Setting

Relevant data sourced from the Environment Agency online 'What's in Your Back Yard' database in 2013 is summarised in the following sections.

2.5.1 Industrial Operator Scores

There are no sites within a 1km radius of the site where pollution is regulated.

2.5.2 Industrial Pollution

There are no industrial pollution scores within a 1km radius of the site where pollution is regulated.

2.5.3 Pollution Incidents

No pollution incidents are recorded within 250m of the site.

2.5.4 Landfills

One historical landfill facilities is located within influencing distance of the part of the site to be residentially developed.

Shaftsbury Park historic landfill is located approximately on the opposing side of the River Usk. No information is provided regarding the date at which the landfill was active. Shaftsbury Park received industrial and household waste.

2.5.5 Groundwater Source Protection Zones

The site does not locate within a groundwater protection zone.

SECTION 3 Preliminary Human Health and Environmental Risk Assessment

3.1 General

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

(1) The identification of contaminated land
(2) The remediation of contaminated land that poses an unacceptable risk to human health and/or the environment

Under Part IIA the statutory definition of 'contaminated land' is: any land which appears to the local authority in whose area it is situated, to be in such a condition, by reason of substances in, on, or under the land, that:

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

For land to be classified as 'Contaminated Land' there must be a 'pollutant linkage'.

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

3.2 Preliminary Site Conceptual Model

The preceding sections enable a preliminary conceptual model of the site to be drawn up, to illustrate the likely ground conditions beneath the site together with a preliminary assessment of the nature of any underlying aquifers and groundwater movement. The preliminary site conceptual model is used as a model for the design and implementation of the site investigation, whereby areas of potential contamination can be targeted as well as investigating the site as a whole.

3.3 Potential Sources of Contamination and Gas

The potential contamination beneath the site, whether in the matrix of soil or any groundwater will be related to the sites site past use and the history of the surrounding area.

No specific site use has been identified but given the size and location of former buildings on site these are no anticipated to represent any significant industrial activity.

The site is known to have been historically raised and made ground of several metres thickness may be anticipated. The source or type of fill is unknown. Any fill is considered to be a potential source of contamination.

Made ground and underlying bands of peat known to exist within the alluvium present a risk from ground gas.

The risk from landfill gas is negligible given that the historical landfill identified within influencing distance of the site lies on the opposing side of the River Usk.

3.4 Potential Receptors and Pollution Pathways

There are both human and hydrological receptors to be considered should any contamination be detected on site.

Construction workers will be excavating in soils and will be exposed via dermal contact with soils and dust, ingestion of soil/soil dust and inhalation of soil dust. Workers may also be exposed to asbestos fibres, if present in fill soils.

A residential end use is proposed. Once developed, future site residents will potentially be at risk from any contamination from the same pathways as well as through intake of potable water and inhalation of ground gas.

Passers-by and neighbouring site users are potentially at risk from site soils via soil dust and asbestos fibre inhalation.

If any contamination is identified this may be leachable, enabling it to mobilise through perched groundwater within site soils and impact the river or deeper groundwater.

A qualitative preliminary Human Health and Environmental Risk Assessment summarises the above and is detailed in the **Tables 3.1 and 3.2** on the following pages.

Table 3.1 - Qualitative Preliminary Human Health Risk Assessment					
Potential Source	**Pathway**	**Receptor During Construction**	**Level of Risk**	**Receptor Post Construction**	**Level of Risk**
Made ground	**Ingestion, inhalation and dermal contact with soil and soil dust**	Construction Workers	Medium Risk	Future residents	Medium Risk
Made ground	**Inhalation of soil dust**	Neighbouring site users and passers-by	Low Risk	Neighbouring site users and passers-by	Low Risk
Made ground	**Inhalation of asbestos fibres**	Construction Workers Neighbouring site users and passers-by	Medium Risk	Future residents Neighbouring site users and passers-by	Medium Risk
Radon Gas	**Inhalation** *Accumulation of gas indoors in confined spaces- asphyxiation and explosion*	N/A	N/A	Future residents	Acceptable Risk *BGS confirm no Radon Protection required for new buildings*
Landfill Gas	**Inhalation** *Accumulation of gas indoors in confined spaces- asphyxiation and explosion*	N/A	N/A	Future residents	No Risk *Landfill lies on opposing side of River Usk*
Ground Gas	**Inhalation** *Accumulation of gas indoors in confined spaces- asphyxiation and explosion*	N/A	N/A	Future residents	High Risk *Potential gas where made ground and peat present.*
Made Ground	**Ingestion of potable water** *Absorption of contamination from made ground into potable water pipes*	N/A	N/A	Future Residents	Medium Risk

Table 3.2 – Qualitative Preliminary Environmental Risk Assessment					
Potential Source	**Pathway**	**Receptor During Construction**	**Level of Risk**	**Receptor Post Construction**	**Level of Risk**
Surface Water	**Run-off**	Site and Adjacent Sites Shallow/Perched Groundwater	Low	Site and Adjacent Sites Shallow/Perched Groundwater	Low
Accidental spillage	**Run-off , digging foundations, moving contaminated soil, drainage misconnections, discharges to local surface waters or the ground, construction materials and/or exposed ground, wheel washings, oil or chemical spills**	Site and Adjacent Sites	Low *On site procedures will ensure that all efforts are made to prevent accidental spillage*	N/A	N/A
Made Ground	**Leaching of contamination**	Shallow/Perched Groundwater	Medium Risk	Shallow/Perched Groundwater	Medium Risk
Contaminated Groundwater	**Direct migration and Perched Groundwater migration**	Secondary A Aquifer	Low Risk *Superficial alluvium acts to confine perched groundwater above underlying bedrock*	Secondary A Aquifer	Low Risk *Superficial alluvium acts to confine perched groundwater above underlying bedrock*
Contaminated Groundwater	**Groundwater Migration**	River Usk	Low Risk	River Usk	Low Risk

SECTION 4 Field Investigation

4.1 Site Works

A geo-technical and geo-environmental site investigation was carried out during June 2018. This comprised six machine excavated trial holes and three cable percussive boreholes.

The trial pits were excavated by JCB.

The boreholes were sunk using a Shell and Auger drilling rig. Standard penetration tests were undertaken at regular depths in the boreholes. The boreholes were terminated within the Mercia Mudstone after one hour of chiselling.

The fieldworks were supervised by Terra Firma (Wales) Limited and the trial pits and boreholes were logged to the requirements of BS5930:2015.

The trial pit logs may be found in **Annex D** and the borehole logs are available in **Annex E**. Exploratory locations are given on **Drawing 01.**

4.2 Ground Conditions

A summary of the ground conditions identified in the trial pits and boreholes beneath the site is given in **Table 4.1**.

Table 4.1 Summary of Ground Conditions

Depth (m)	Thickness (m)	Stratum
0.0 - 2.9/3.9	2.9/3.9	**MADE GROUND:** Variable medium dense to dense **SAND and GRAVEL** deposits. Variable content of brick, concrete, glass, timber and wire / Soft to firm grey **CLAY** with variable content of timber, metal, china, glass, plastic, brick and tile fragments / Firm to stiff red brown **CLAY**
2.9/3.9 - 5.4/6.0	2.1/2.5	Firm grading into soft to very soft grey **CLAY (Alluvium)**
5.4/6.0 - 13.2/14.0	7.6/8.0	Very soft grey peaty **CLAY (Alluvium)** with **soft PEAT** bands
13.2/14.0 - 13.8/15.2	0.5/1.2	Red sandy **SILT**
13.8/13.9 - 14.5/14.6	0.7	Stiff red purple **CLAY (BH1) /** Medium dense red **GRAVEL** of mudstone **(BH2)**
14.5/15.2 - 16.0/19.0	-	Weathered red **MUDSTONE and SANDSTONE (St Maughan's Formation)**

4.3 Water Strikes

Groundwater inflow was not encountered in the trial pits.

Water strikes were made in the boreholes, at 13.5m in BH1, 13.9m in BH2, and 14.0m in BH3.

4.4 Stability and Obstructions

Trial holes were generally stable during excavation. Obstructions were encountered in the boreholes or trial pits.

4.5 Soil Laboratory Chemical Testing

4.5.1 Exploratory Strategy and Sampling Regime

During the intrusive investigation, small disturbed soil samples were collected. The sampling regime was conducted in accordance with BS5930: 1999 in order to satisfy the following criteria:

- Identify and confirm suspected sources of contamination
- Determine type and concentration of contamination
- Determine lateral and vertical spread of contaminants
- Ensure representation of the entire site
- Provide sufficient data to determine suitable remedial measures if necessary

The sample locations and depths are listed in the following table.

Table 4.2 Sample Locations and Depths

Sample	Depth (m)	MCerts Sample Matrix Description
TP1	0.6	Brown gravelly clayey SAND (possible made ground – brick)
TP1	1.2	Dark brown gravelly clayey SAND
TP2	0.3	Dark brown gravelly clayey SAND (possible made ground – brick)
TP3	0.4	Brown gravelly sandy CAY
TP4	0.2	Dark brown gravely sandy CLAY
TP5	0.1	Brown gravelly clayey SAND
TP5	0.6	Red gravelly sandy CLAY
TP6	0.3	Dark brown gravelly clayey SAND (possible made ground-brick)

4.5.2 Laboratory Analysis

The soil samples taken were despatched to the laboratories of Derwentside Environmental Testing Services Limited.

The following chemical tests were undertaken:

Metals and Metalloids	**In-Organics**	**Others**
Lead	Cyanide	pH (acidity)
Arsenic	Sulphate	Organic Matter
Mercury		Asbestos
Chromium		
Copper		
Nickel		
Zinc		

Organic Chemicals
Phenol
Polycyclic Aromatic Hydrocarbons (PAHs)

The laboratory soil chemical test results are presented in **Annex F**.

SECTION 5 Soil Analytical Results

5.1 Soil Assessment Methodology

Comparison of the analytical results has been made with the 2015 residential (including plant uptake) Suitable 4 Use Levels (S4ULs) provided by Land Quality Management Limited and the Chartered Institute of Environmental Health (CIEH). Where CIEH thresholds are not available reference has been made to Category 4 Screening Levels (C4SLs) or CLEA SGVs.

Sulphate results have been compared to British Research Establishment (BRE) guidelines as sulphate levels need only be considered for buried concrete risk assessment only, not human health related.

5.2 Soil Test Results

A summary of the chemical test results which include the regulatory soil guideline values used in the Tier 1 assessment are given in **Tables 5.1** to **5.3**.

Table 5.1 Summary of Soil Chemical Test Results Standard Suite

Substance	SGV/GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of Exceedences
			Minimum	Maximum	
Arsenic	40	CLEA	2.3	17	0
Cadmium	85	CLEA	<0.1	0.8	0
Chromium III	910	CIEH	13	31	0
Chromium VI	6	CIEH	<1.0	<1.0	0
Copper	2400	CIEH	9.5	82	0
Lead	310	C4SL	9.8	530	**1**
Mercury	56	CLEA	<0.05	0.52	0
Nickel	180	CIEH	9.1	36	0
Selenium	430	CLEA	<0.5	0.6	0
Zinc	40000	CIEH	52	170	0
Cyanide	8	CLEA	<0.1	11	**1**
Phenols	420	CLEA	<0.3	<0.3	0
Sulphate	2400	BRE	500	16000	**2**
Aqueous sulphate	500	BRE	940	1500	**2**
Organic Matter	-	-	0.4	4.3	-
pH	-	-	8.2	11.3	-
Total PAH	-	-	0.59	11	See Table 5.2

Notes:

- - no available guideline

5.2 Soil Test Results (Continued)

All samples were tested for speciated PAH testing.

Table 5.2 Summary of Soil Chemical Test Results Speciated PAH

Substance	GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of Exceedences
			Minimum	Maximum	
Naphthalene	2.3	CIEH	<0.03	0.13	0
Acenaphthylene	2900	CIEH	<0.03	0.13	0
Acenaphthene	3000	CIEH	<0.03	0.23	0
Fluorene	2800	CIEH	<0.03	0.2	0
Phenanthrene	1300	CIEH	0.07	0.97	0
Anthracene	31000	CIEH	<0.03	0.31	0
Fluoranthene	1500	CIEH	0.12	1.9	0
Pyrene	3700	CIEH	0.17	1.6	0
Benzo(a)anthracene	11	CIEH	0.09	1.1	0
Chrysene	30	CIEH	0.09	1.1	0
Benzo(b)fluoranthene	3.9	CIEH	0.08	1.4	0
Benzo(k)fluoranthene	110	CIEH	0.03	0.55	0
Benzo(a)pyrene	3.2	CIEH	0.04	0.87	0
Indeno(123cd)pyrene	45	CIEH	<0.03	0.38	0
Dibenzo(ah)anthracene	0.31	CIEH	<0.03	0.11	0
Benzo(ghi)perylene	360	CIEH	<0.03	0.57	0

Notes:

- Thresholds based on 1.0% SOM

Asbestos testing was undertaken on samples of made ground. **Table 5.3** below summarises the findings:

Table 5.3 Summary of Soil Test Results Asbestos

Location	Depth (m)	Result
TP1	0.6	**Bundle of chrysotile fibres. <0.001% mass**
TP1	1.2	No asbestos detected
TP2	0.3	
TP3	0.4	
TP4	0.2	
TP5	0.1	
TP5	0.6	
TP6	0.3	**Bundles of crocidolite fibres <0.001% mass**

SECTION 6 Gas Monitoring

Three gas wells were installed to assess if there are any risks from ground gas/landfill gas on site, in all three boreholes.

One round of gas monitoring has been carried out to date.

Methane concentrations were found to be between 0.3% and 3.8% V/V.

Carbon dioxide levels varied between being 0.1% to 4.1% V/V.

Oxygen concentrations varied between 0.2% and 19.5% V/V.

The gas flow rate from the boreholes was also assessed. No flow was recorded.

Based on the gas monitor flow rate detection limit of 0.1l/hr and the highest recorded methane concentration of 4.1%, a gas screening value of 0.0041l/hr is calculated, as follows:

(4.1/100) x 0.1 = 0.0041l/hr

When this result is compared with Table 8.5 of CIRIA report C665, the site is classified as 'gas characteristic situation 1'.

No gas protection measures are required for 'gas characteristic situation 1' sites.

However, given that the maximum methane level exceeds 1% it is considered that gas protection should be incorporated into the development in accordance with **'gas characteristic situation 2'.**

The gas monitoring results are presented in **Annex G.**

SECTION 7 Quantitative Risk Assessment

7.1 Contaminants of Concern

7.1.1 Contaminants of Concern in Soil

Contaminants of concern are those that were found to exceed their residential threshold level.

Only lead and cyanide were identified as contaminants of concern.

Lead was found to be present at a concentration of 530mg/kg in made ground in TP6 (0.3m), exceeding the residential threshold level of 310mg/kg.

Cyanide was found to be present at a concentration of 11mg/kg in made ground in TP1 (0.6m), exceeding the residential threshold level of 8mg/kg.

Chrysotile asbestos fibres were identified in made ground in TP1 (0.6m) and bundles of crocidolite asbestos fibres were found in TP6 (0.3m)

Sulphate was exceeded in two samples when compared to BRE concrete criteria. Sulphate does not present a risk to human health.

7.1.2 Leachable Contaminants of Concern

No substances were present at levels deemed sufficiently high to produce unacceptable leachate concentrations.

7.2 Potential Receptors and Pathways

7.2.1 Human Receptors

Receptors are at risk from lead and cyanide contamination through dermal contact with soil/dust, ingestion of soil/soil dust and inhalation of soil dust.

Inhalation of asbestos is also a risk to all human receptors.

In-situ gas monitoring has identified a risk from methane gas and gas protection is required for all new buildings.

7.2 2 Aquatic Environment

The aquatic environment is not considered to be at risk.

7.3 Mitigation and Remedial Measures

7.3.1 Human Health

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

7.3.1 Human Health (Continued)

Dust suppression should be in place during site works to protect workers, neighbouring site users and passers-by.

Upon development all communal garden and soft landscaped areas should be capped with 600mm of clean imported soils.

A double 'no-dig' barrier comprising an orange geotextile and underlying geogrid will be required between the made ground and overlying capping layer.

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

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

Gas protection measures should be installed in accordance with CIRIA C665.

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

7.3.2 Aquatic Environment

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

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

The basic measures that should be taken are as follows:

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

SECTION 8 Engineering Recommendations

8.1 Preparation of Site

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

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

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

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

8.2 Foundation and Floor Slab Solution

Due to the presence of made ground and soft alluvial clays beneath the site traditional shallow foundations are not recommended. Such foundations will lead to high total and differential settlements.

A piled foundation is advised for the proposed apartment blocks. Precast concrete driven piles founded within the underlying weathered red mudstone and/or sandstone is recommended.

For a 275mm square precast concrete pile driven to an appropriate set within the underlying competent mudstone a safe working load of typically 500kN should be achieved. Based upon the site investigation data, pile lengths should vary between 17.5m and 18m beneath current ground levels.

The estimated working loads, pile type and lengths should be confirmed by a specialist piling contractor. It may be prudent to test drive piles at select locations.

For the quoted pile size, founded within the competent bedrock, total settlements should not exceed 10mm with differential movements between adjacent piles being less than half this value.

Allowances should be made for re-driving piles should buried obstructions be encountered.

Floor slabs should be designed as suspended.

Measurements should be kept on pile vibrations during driving. Measures should also be taken to dampen such vibrations. If, however, vibrations exceed permissible values then consideration should be given to using a contiguous flight auger (cfa)/bored pile solution.

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

8.3 Excavations and Formations

Shallow excavations will be possible with normal soil excavating machinery.

Shallow perched water flows are not expected. Any water inflows together with rainwater infiltration should be dealt with by conventional pumping techniques.

The sides of any excavations deeper than 1.0m, or shallower if unstable, should be supported by planking and strutting or other proprietary means.

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

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

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

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

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

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

8.4 Protection of Buried Concrete

Levels of total sulphate within the in-situ materials measured between 500mg/kg to 16000mg/kg and the pH varied between 8.2 and 11.3. Aqueous sulphate levels ranged between 940mg/l and 1500mg/l.

Buried concrete should as a minimum conform to Class AC-2 (Table C2 of BRE Digest 1:2005).

8.5 Access Roads and Car Parking Areas

For car parking and road areas, formations within the in-situ soils a CBR value of up to 5% may be applicable for design purposes.

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

ANNEX A
Landmark Historical Maps

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Monmouthshire

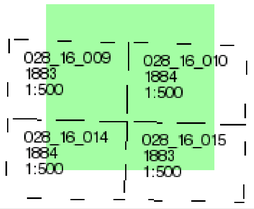
Published 1883 - 1884

Source map scale - 1:500

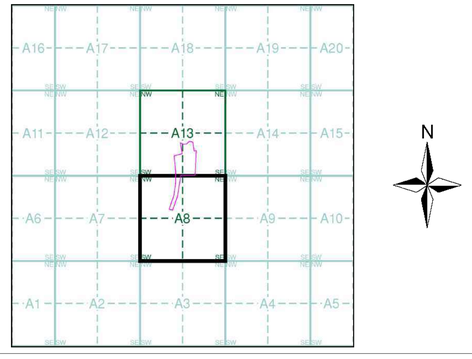
The 1:500 scale Ordnance Survey mapping was introduced in 1855 as a replacement for the 1:528 scale and to compliment the 1:2500 scale that had been implemented in 1853. By 1895, the 1:500 scale covered most towns over a population of about 4000 at the time of survey, although very few towns were mapped more than once at this scale, and none have been since 1910. The 1:500 scale gives particular emphasis to such features as lamp posts, man holes, arched passages and minor building projections. Also often featured are divisions between tenements, interior ground floor layouts of public buildings, and on earlier plans, the functions of the various parts of larger industrial premises are also indicated. Content of the plans does vary however, from one town to the next in terms of, for example, the completeness of railway tracks and the coverage of public buildings.

Please note: Due to the partial coverage of Historical Town Plans, it is possible that not all segments within an order will contain mapping. Only the segments that have Town Plan coverage will be generated.

Map Name(s) and Date(s)



Historical Town Plan - Segment A8



Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	0

Site Details

., Herbert Road, NEWPORT, Gwent, NP19 7BH

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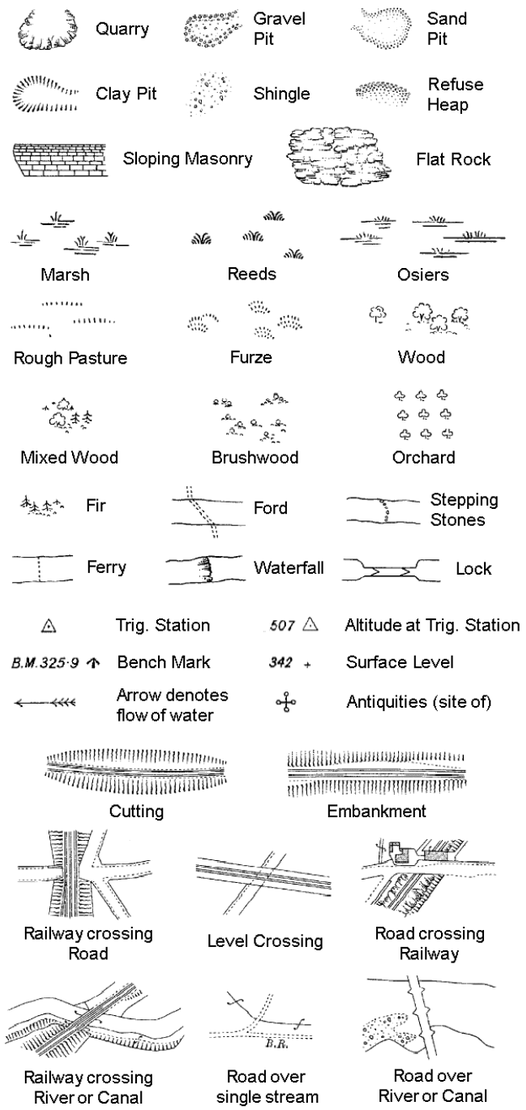
Historical Mapping Legends

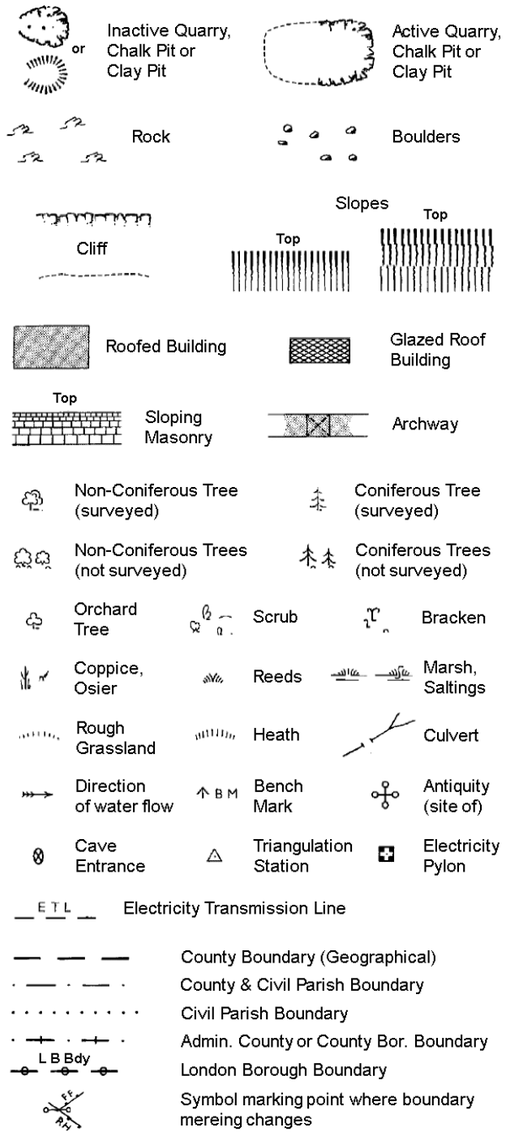
Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



County Boundary (Geographical)
County & Civil Parish Boundary
Administrative County & Civil Parish Boundary
Co. Boro. Bdy. County Borough Boundary (England)
Co. Burgh Bdy. County Burgh Boundary (Scotland)

B P B S	Boundary Post or Stone	P.C.B	Police Call Box
B.R.	Bridle Road	P	Pump
E.P	Electricity Pylon	S.P	Signal Post
F.B.	Foot Bridge	St.	Sluice
F.P.	Foot Path	Sp.	Spring
G.P	Guide Post or Board	T.C.B	Telephone Call Box
M.S	Mile Stone	Tr.	Trough
M.P M.R	Mooring Post or Ring	W	Well

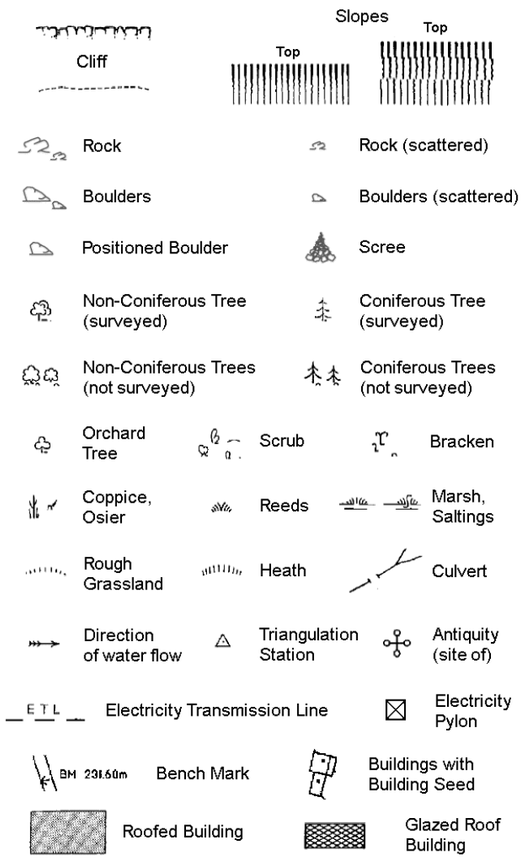
Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information 1:2,500 and 1:1,250



County Boundary (Geographical)
County & Civil Parish Boundary
Civil Parish Boundary
Admin. County or County Bor. Boundary
L B Bdy London Borough Boundary
Symbol marking point where boundary mereing changes

BH	Beer House	P	Pillar, Pole or Post
BP, BS	Boundary Post or Stone	PO	Post Office
Cn, C	Capstan, Crane	PC	Public Convenience
Chy	Chimney	PH	Public House
D Fn	Drinking Fountain	Pp	Pump
El P	Electricity Pillar or Post	SB, S Br	Signal Box or Bridge
FAP	Fire Alarm Pillar	SP, SL	Signal Post or Light
FB	Foot Bridge	Spr	Spring
GP	Guide Post	Tk	Tank or Track
H	Hydrant or Hydraulic	TCB	Telephone Call Box
LC	Level Crossing	TCP	Telephone Call Post
MH	Manhole	Tr	Trough
MP	Mile Post or Mooring Post	Wr Pt, Wr T	Water Point, Water Tap
MS	Mile Stone	W	Well
NTL	Normal Tidal Limit	Wd Pp	Wind Pump

Large-Scale National Grid Data 1:2,500 and 1:1,250



Civil parish/community boundary
District boundary
County boundary
Boundary post/stone
Boundary mereing symbol (note: these always appear in opposed pairs or groups of three)

Bks	Barracks	P	Pillar, Pole or Post
Bty	Battery	PO	Post Office
Cemy	Cemetery	PC	Public Convenience
Chy	Chimney	Pp	Pump
Cis	Cistern	Ppg Sta	Pumping Station
Dismtd Rly	Dismantled Railway	PW	Place of Worship
El Gen Sta	Electricity Generating Station	Sewage Ppg Sta	Sewage Pumping Station
El P	Electricity Pole, Pillar	SB, S Br	Signal Box or Bridge
El Sub Sta	Electricity Sub Station	SP, SL	Signal Post or Light
FB	Filter Bed	Spr	Spring
Fn / D Fn	Fountain / Drinking Ftn.	Tk	Tank or Track
Gas Gov	Gas Valve Compound	Tr	Trough
GVC	Gas Governer	Wd Pp	Wind Pump
GP	Guide Post	Wr Pt, Wr T	Water Point, Water Tap
MH	Manhole	Wks	Works (building or area)
MP, MS	Mile Post or Mile Stone	W	Well

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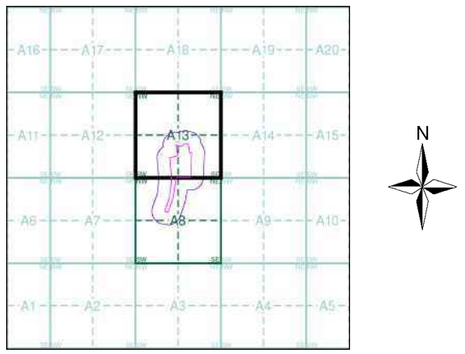
Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Monmouthshire	1:2,500	1883	2
Monmouthshire	1:2,500	1901 - 1902	3
Monmouthshire	1:2,500	1920	4
Monmouthshire	1:2,500	1936 - 1937	5
Ordnance Survey Plan	1:2,500	1955 - 1957	6
Ordnance Survey Plan	1:1,250	1955 - 1957	7
Additional SIMs	1:1,250	1957 - 1989	8
Ordnance Survey Plan	1:1,250	1966 - 1968	9
Ordnance Survey Plan	1:2,500	1969 - 1970	10
Supply of Unpublished Survey Information	1:1,250	1974	11
Ordnance Survey Plan	1:1,250	1977	12
Additional SIMs	1:1,250	1978 - 1989	13
Additional SIMs	1:1,250	1989	14
Large-Scale National Grid Data	1:1,250	1993	15
Large-Scale National Grid Data	1:1,250	1994 - 1995	16
Large-Scale National Grid Data	1:1,250	1995 - 1997	17
Large-Scale National Grid Data	1:1,250	1995	18

Historical Map - Segment A13



Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
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Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	100

Site Details

., Herbert Road, NEWPORT, Gwent, NP19 7BH

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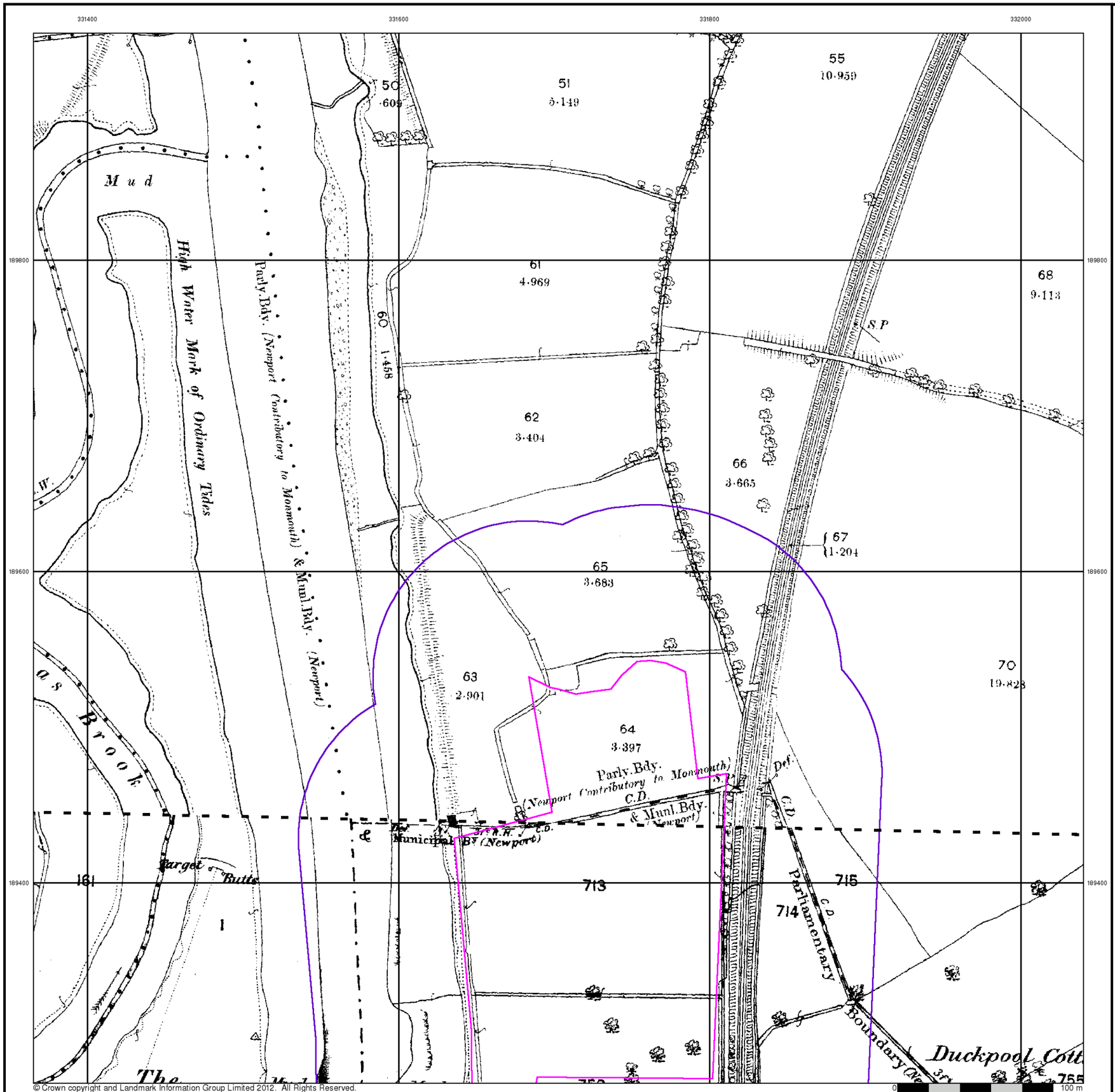

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Monmouthshire

Published 1883

Source map scale - 1:2,500

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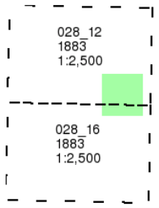
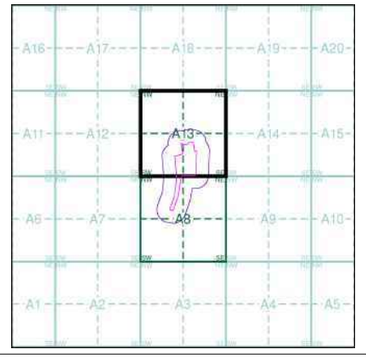
Map Name(s) and Date(s)



Historical Map - Segment A13



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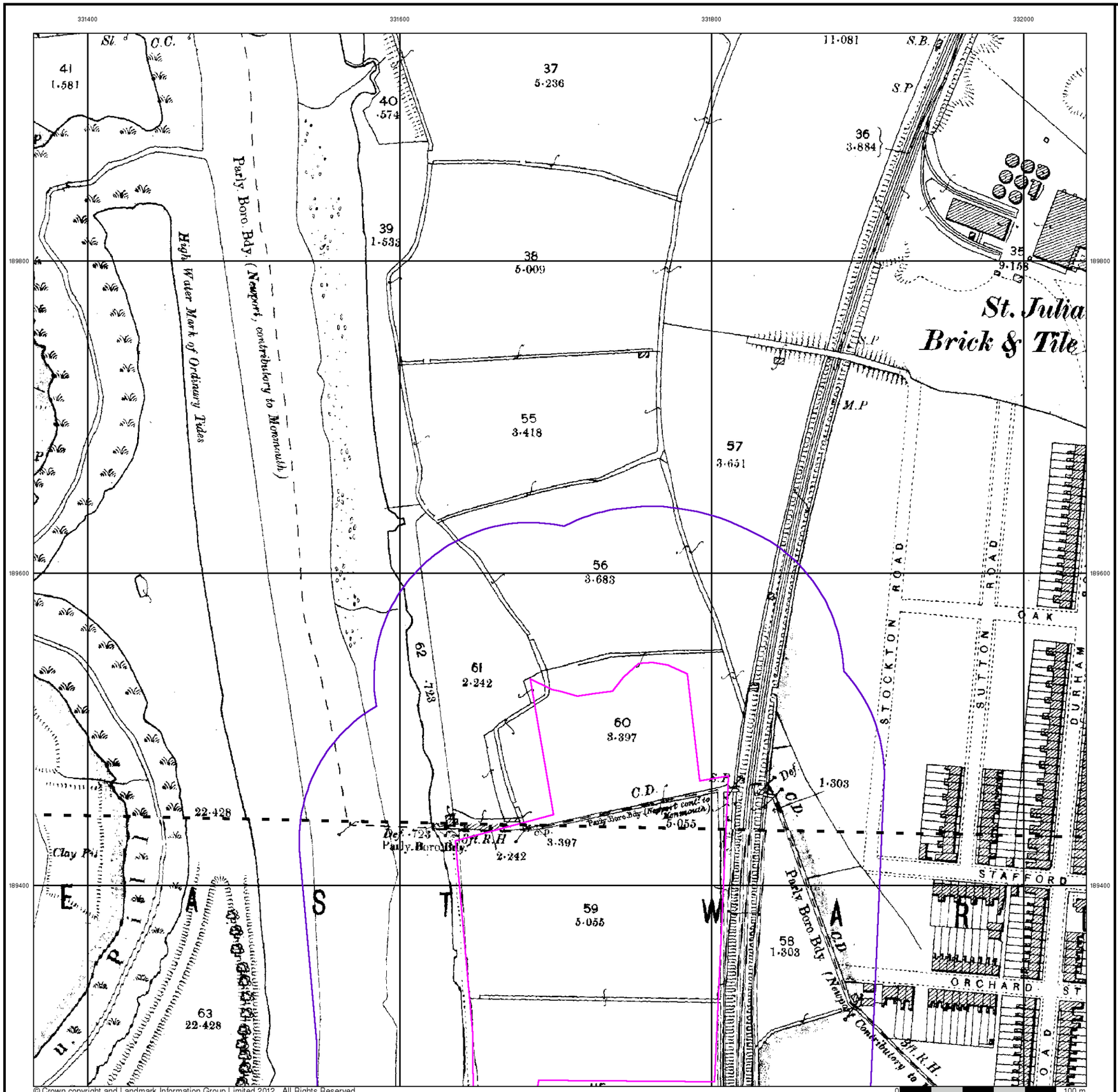

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Monmouthshire

Published 1901 - 1902

Source map scale - 1:2,500

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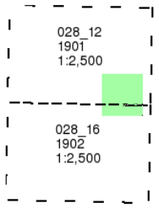
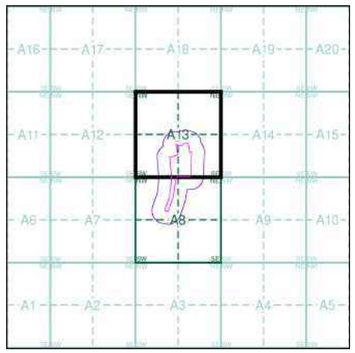
Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number:	41914630_1_1
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Slice:	A
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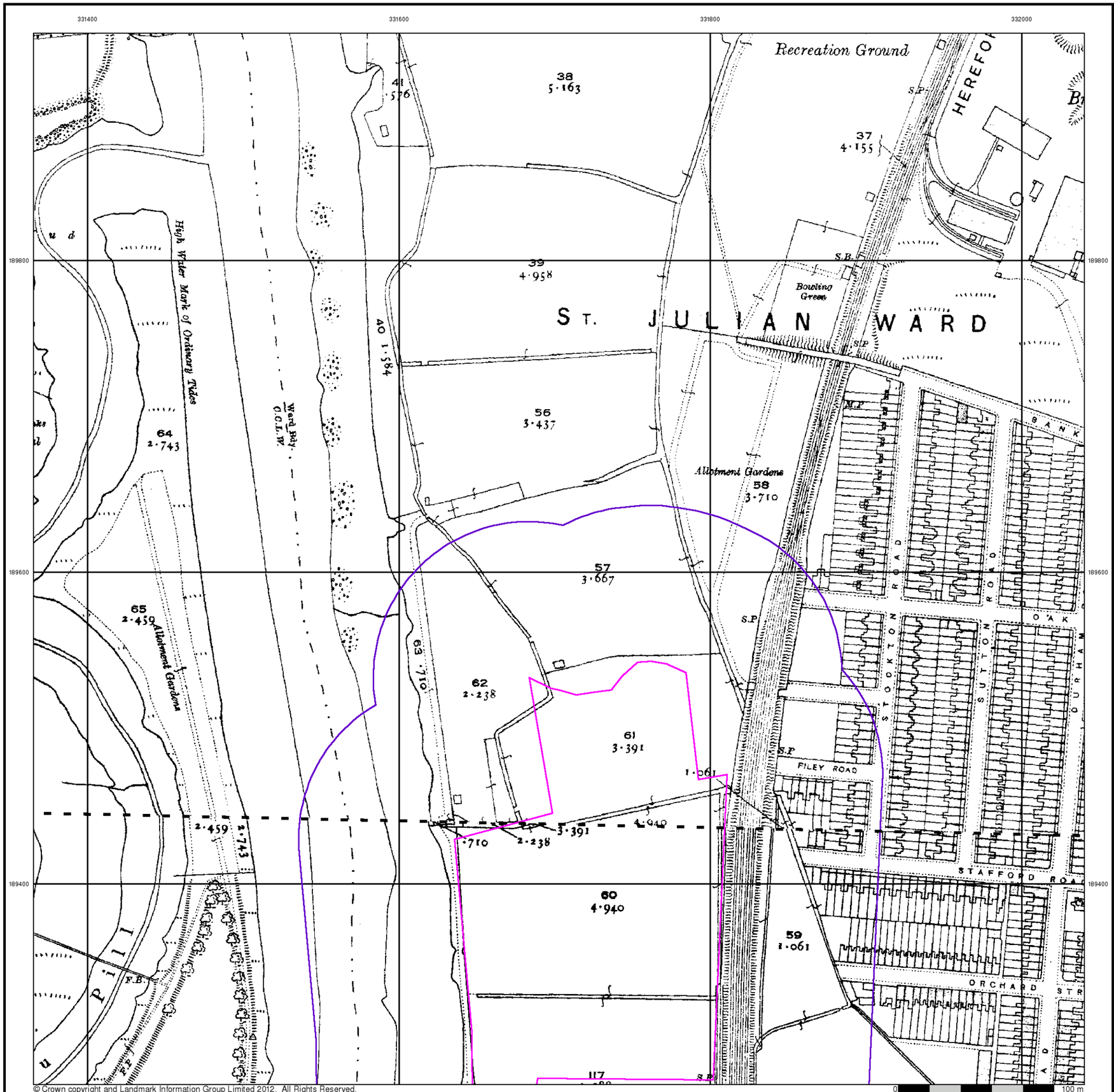

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Monmouthshire

Published 1920

Source map scale - 1:2,500

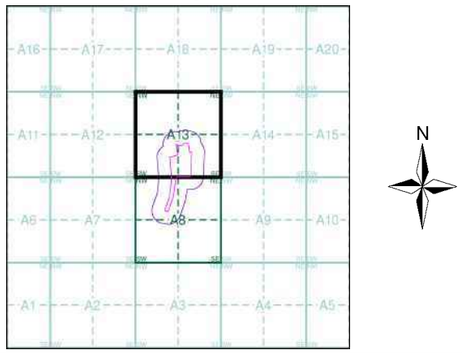
The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

028_12
1920
1:2,500

028_16
1920
1:2,500

Historical Map - Segment A13



Order Details

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National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	100

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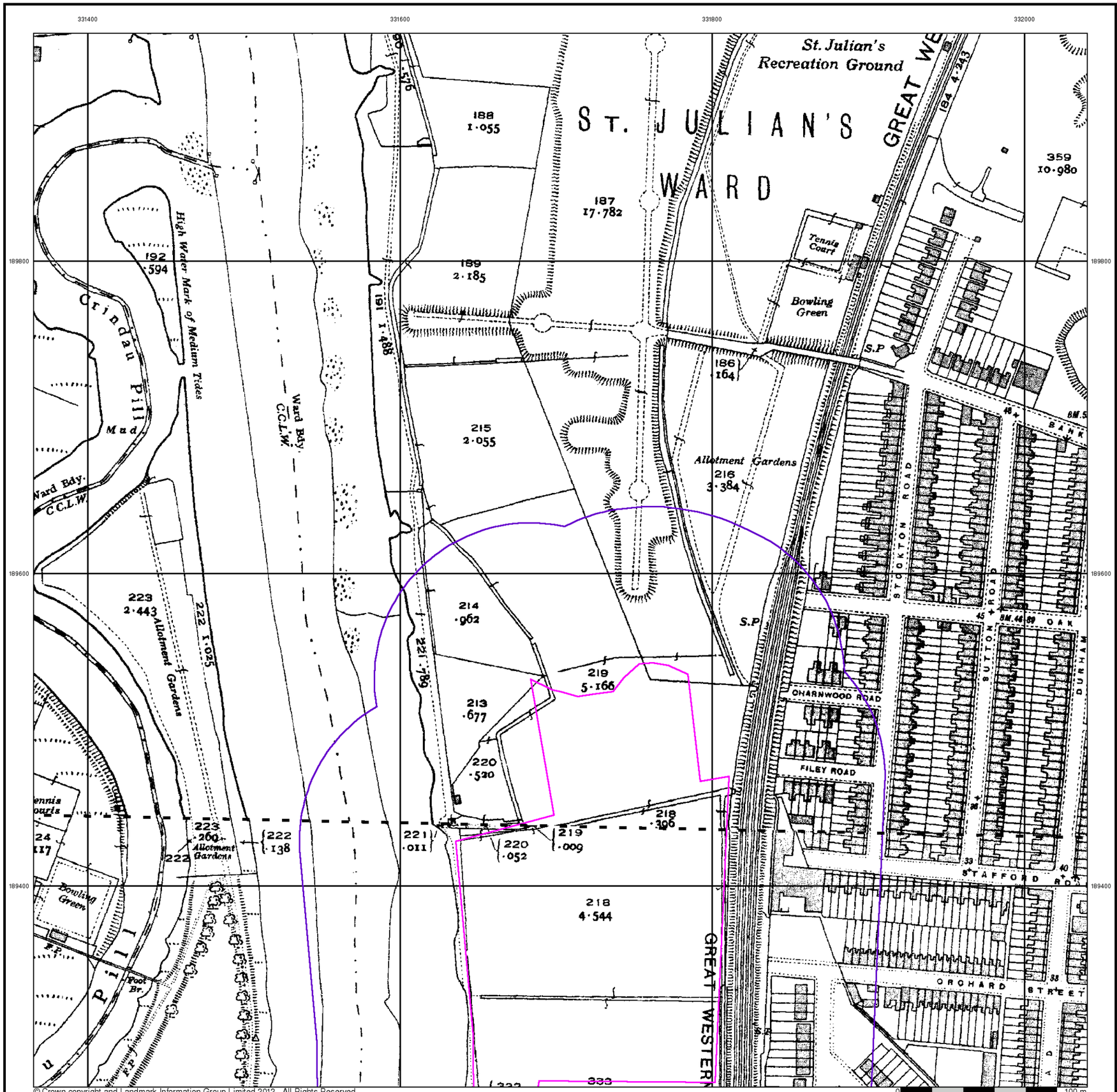

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Monmouthshire

Published 1936 - 1937

Source map scale - 1:2,500

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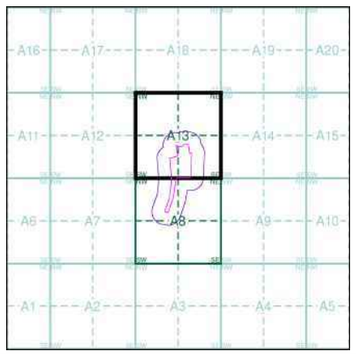
Map Name(s) and Date(s)

028_12
1936
1:2,500

028_16
1937
1:2,500

Historical Map - Segment A13



Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	100

Site Details

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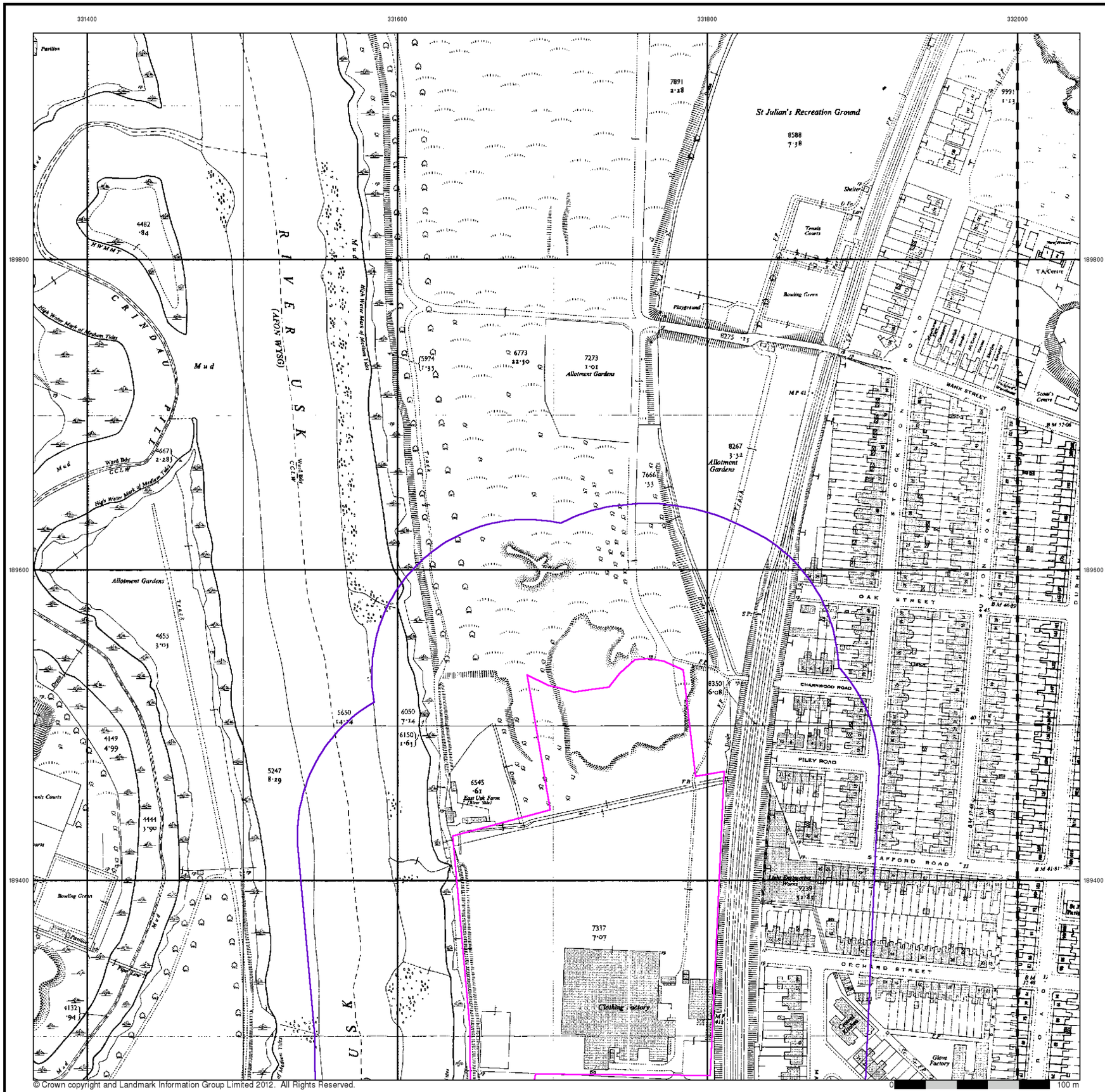

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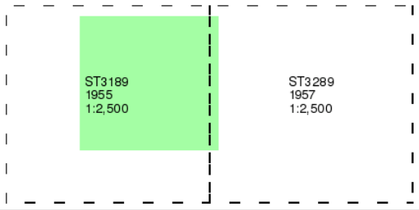
Ordnance Survey Plan

Published 1955 - 1957

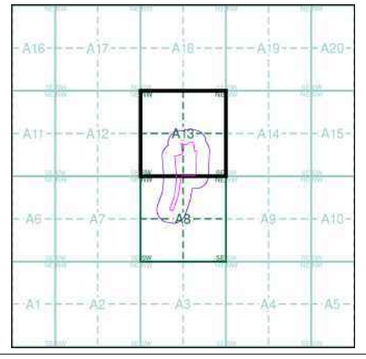
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	100

Site Details

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Ordnance Survey Plan

Published 1955 - 1957

Source map scale - 1:1,250

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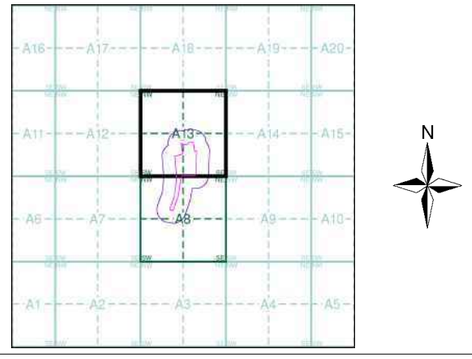
Map Name(s) and Date(s)

ST3189NW 1955 1:1,250	ST3189NE 1955 1:1,250	ST3289NW 1957 1:1,250
ST3189SW 1955 1:1,250	ST3189SE 1955 1:1,250	ST3289SW 1957 1:1,250

Historical Map - Segment A13



Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	100

Site Details

., Herbert Road, NEWPORT, Gwent, NP19 7BH

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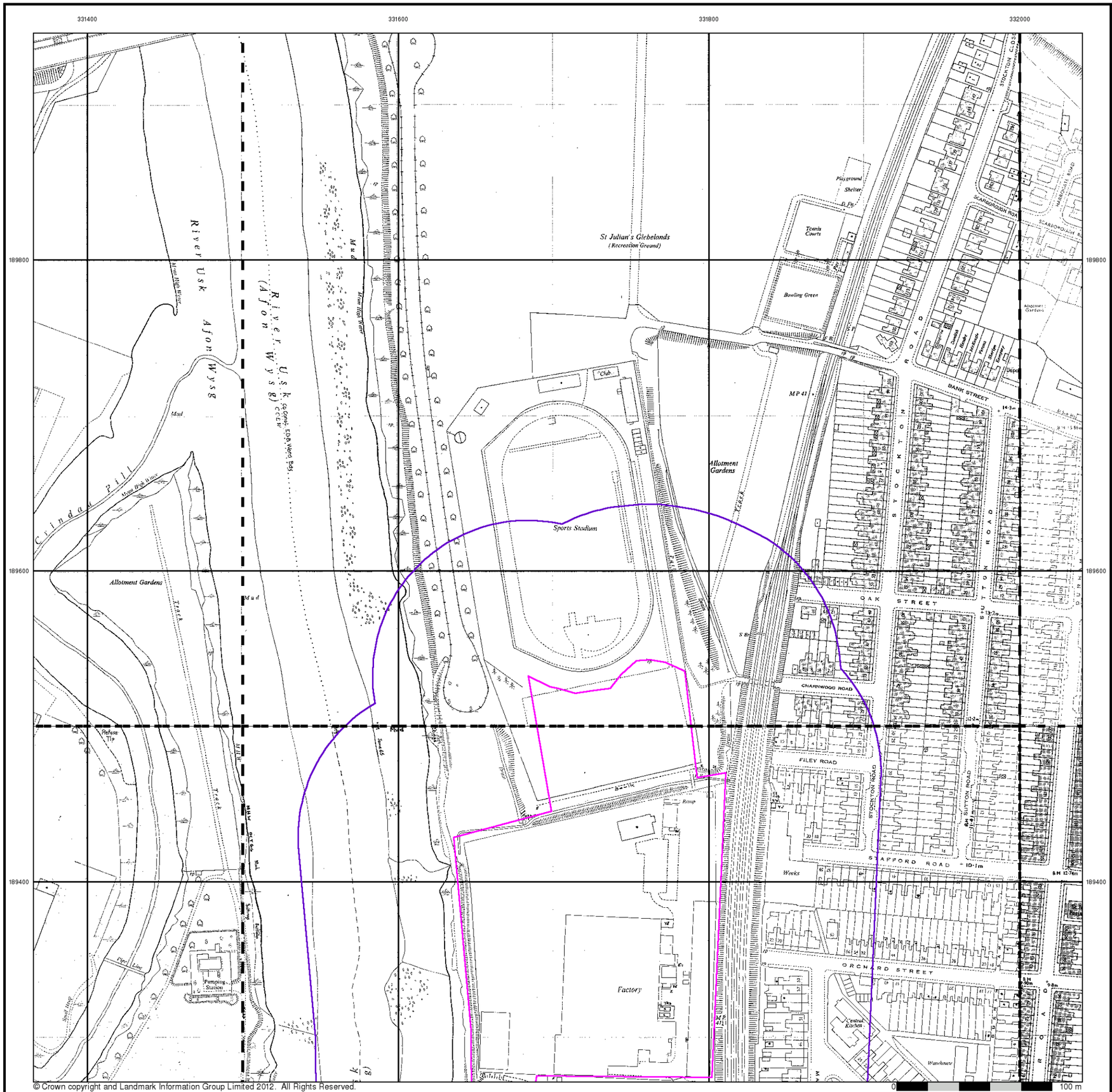

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Additional SIMs

Published 1957 - 1989

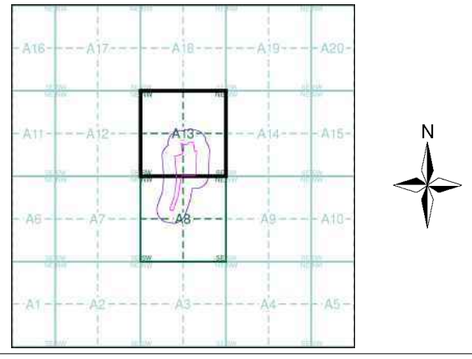
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

ST3189NW 1989 1:1,250	ST3189NE 1986 1:1,250	ST3289NW 1988 1:1,250
ST3189SW 1982 1:1,250	ST3189SE 1978 1:1,250	ST3289SW 1957 1:1,250

Historical Map - Segment A13



Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	100

Site Details

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Ordnance Survey Plan

Published 1966 - 1968

Source map scale - 1:1,250

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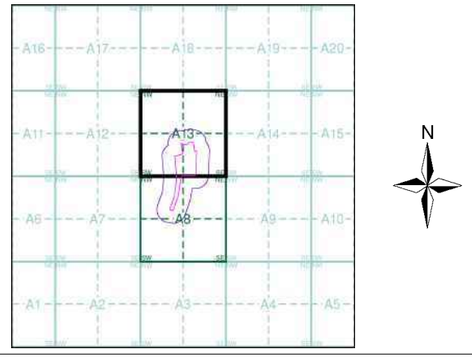
Map Name(s) and Date(s)

ST3 189NW 1968 1:1,250	ST3 189NE 1968 1:1,250	ST3 289NW 1968 1:1,250
ST3 189SW 1967 1:1,250	ST3 189SE 1966 1:1,250	

Historical Map - Segment A13



Order Details

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Site Area (Ha):	4.52
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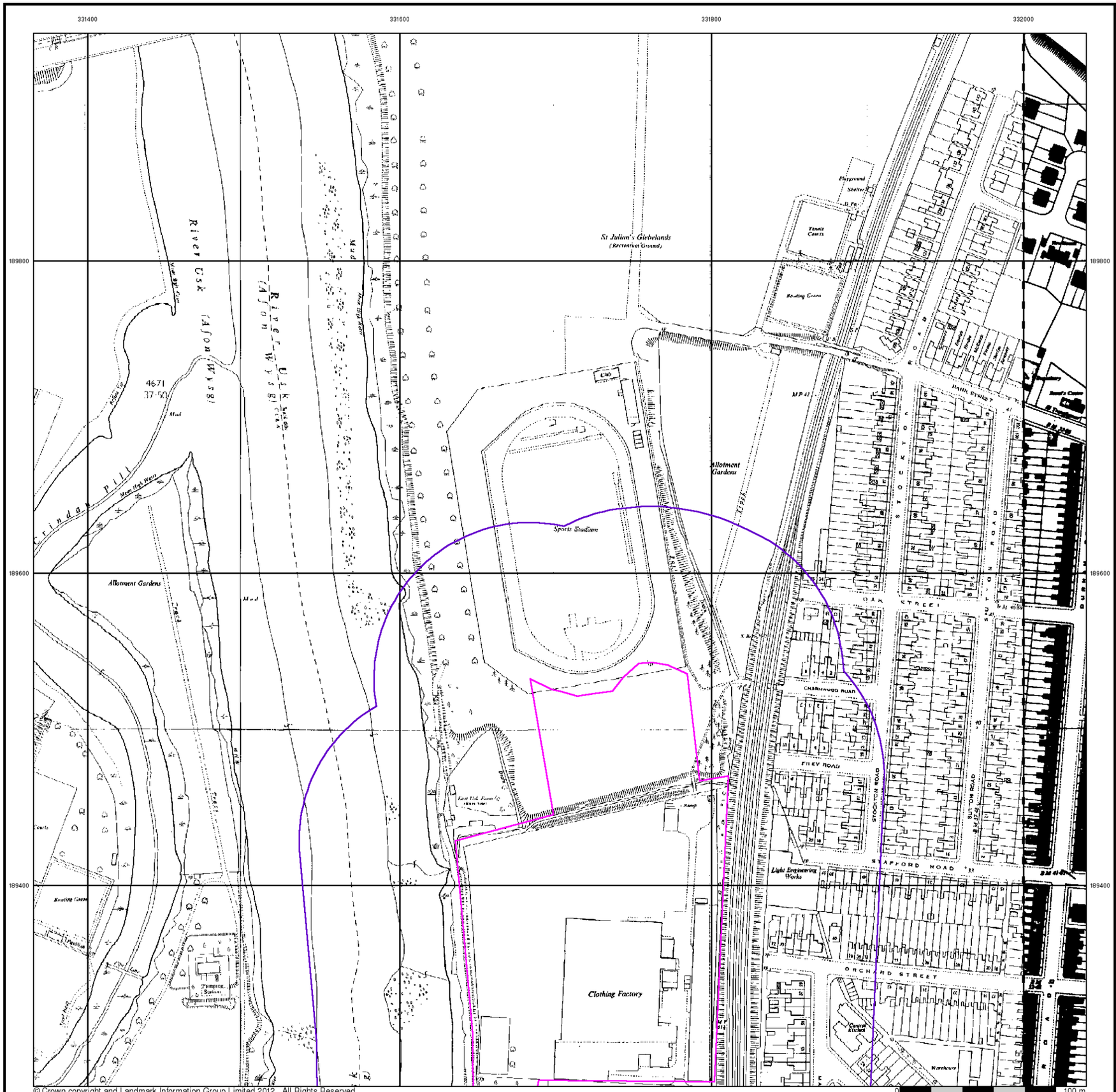

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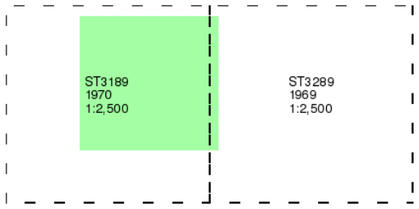
Ordnance Survey Plan

Published 1969 - 1970

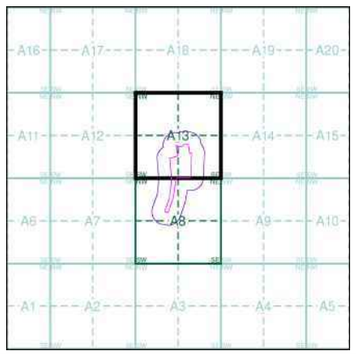
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



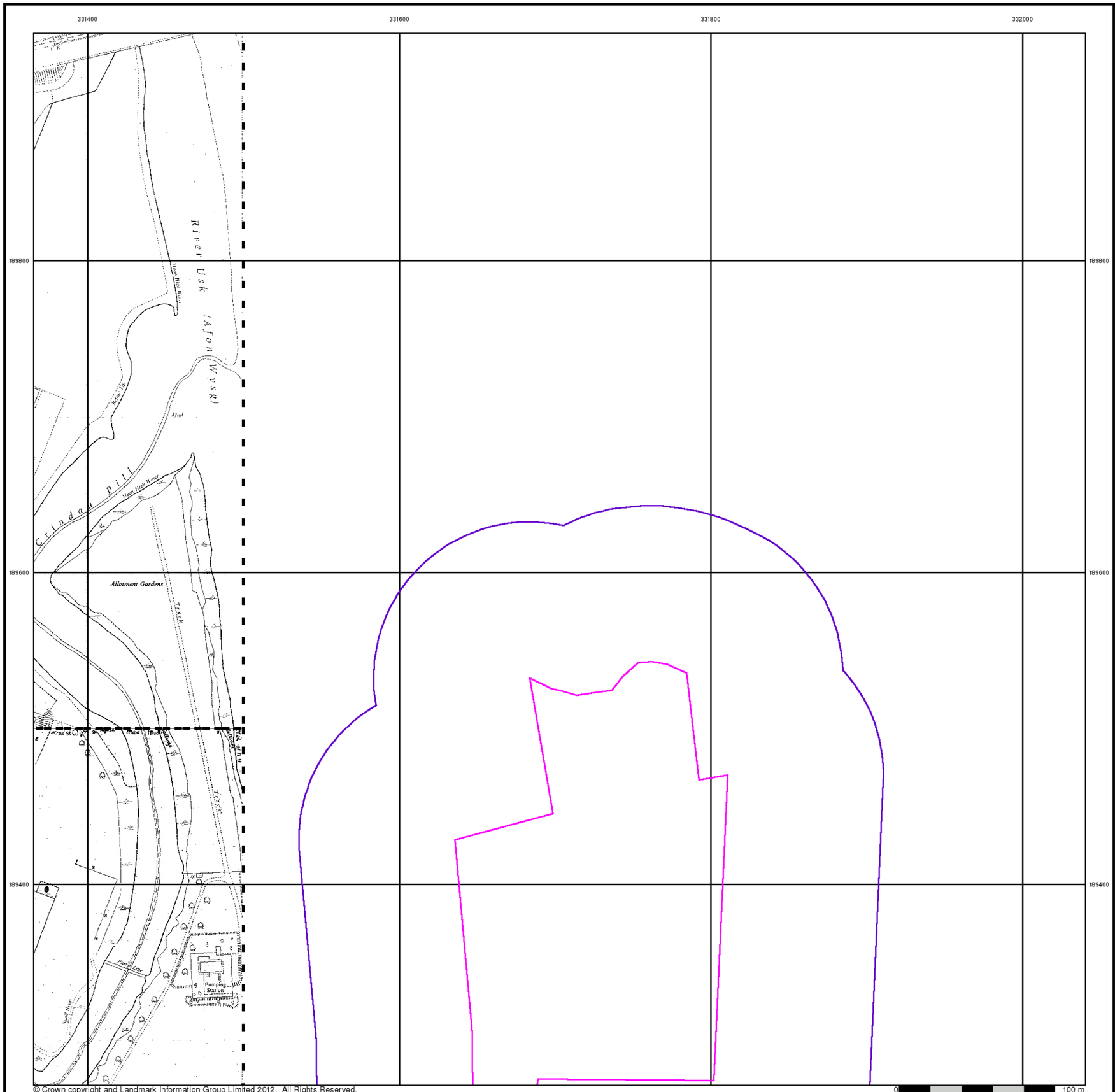
Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	100

Site Details

., Herbert Road, NEWPORT, Gwent, NP19 7BH

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



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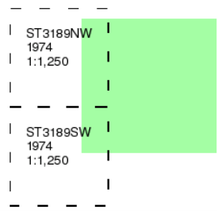
Supply of Unpublished Survey Information

Published 1974

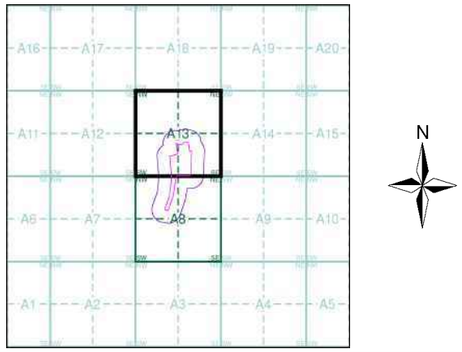
Source map scale - 1:1,250

SUSI maps (Supply of Unpublished Survey Information) were produced between 1972 and 1977, mainly for internal use at Ordnance Survey. These were more of a `work-in-progress' plan as they showed updates of individual areas on a map. These maps were unpublished, and they do not represent a single moment in time. They were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



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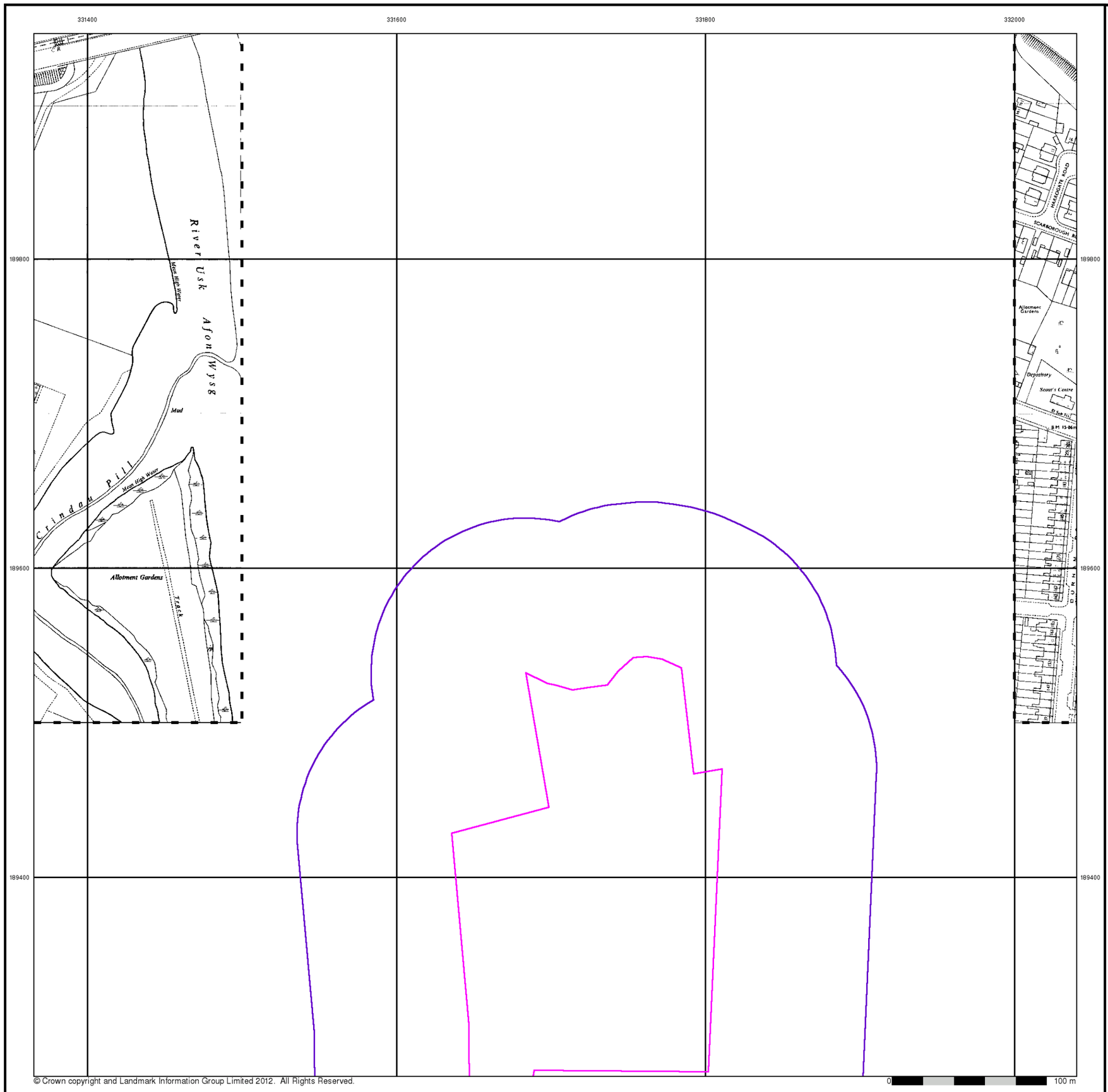

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Ordnance Survey Plan

Published 1977

Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

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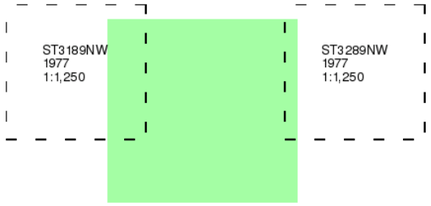
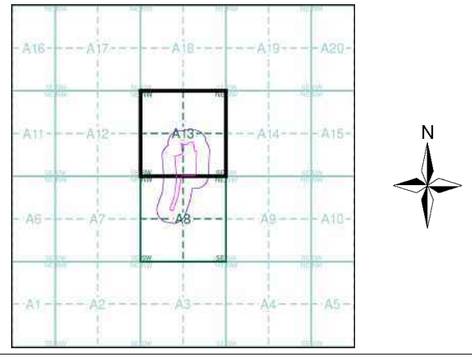


Historical Map - Segment A13



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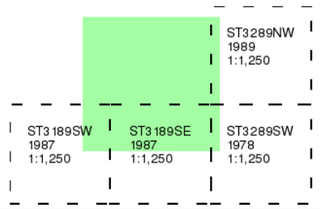
Additional SIMs

Published 1978 - 1989

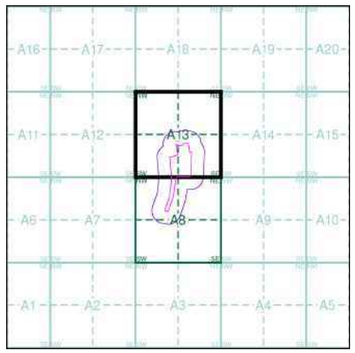
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



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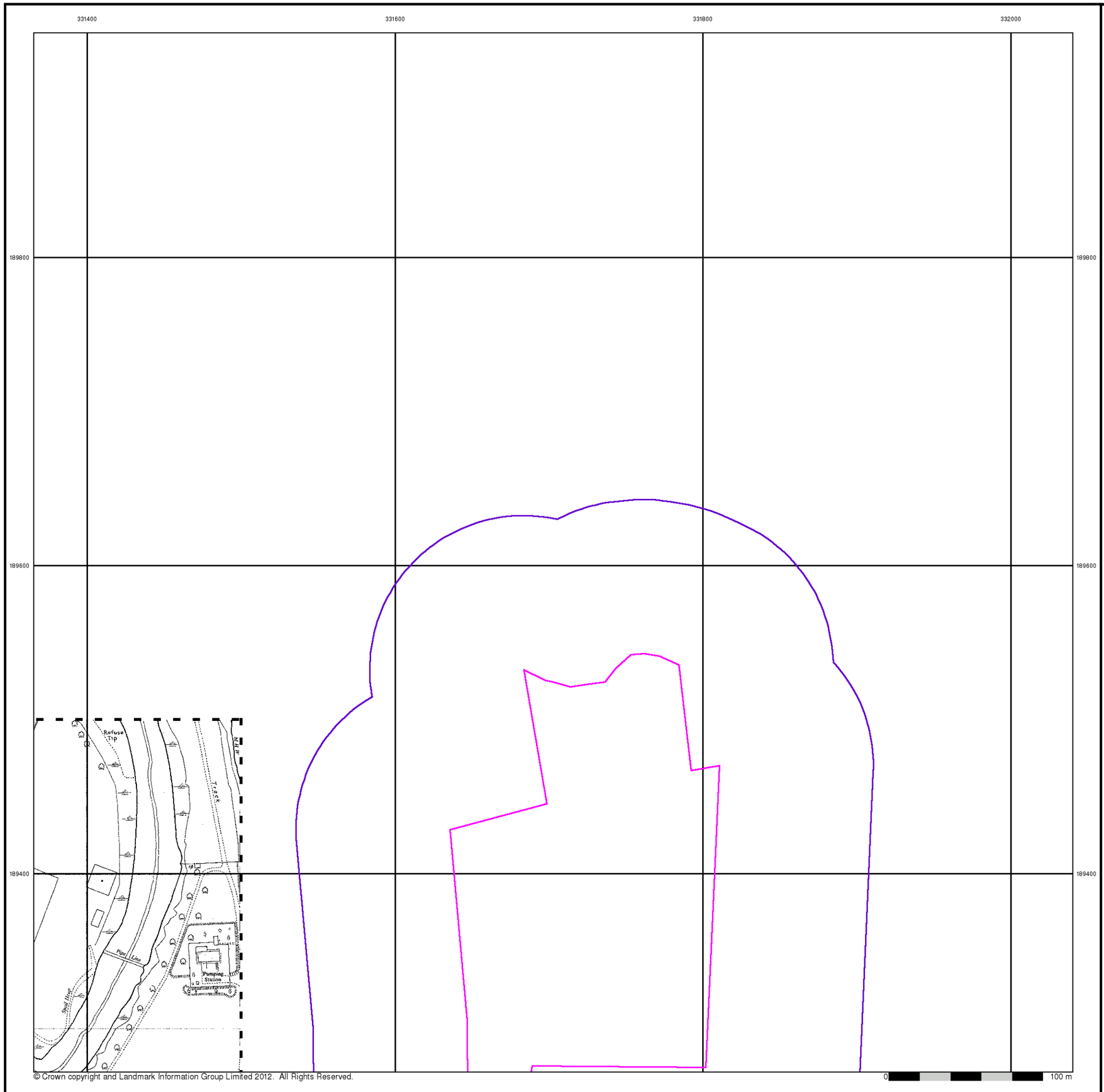

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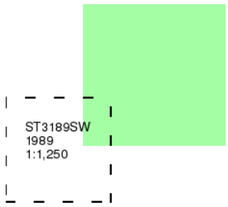
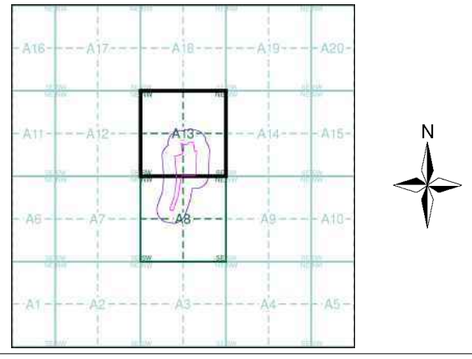


Historical Map - Segment A13



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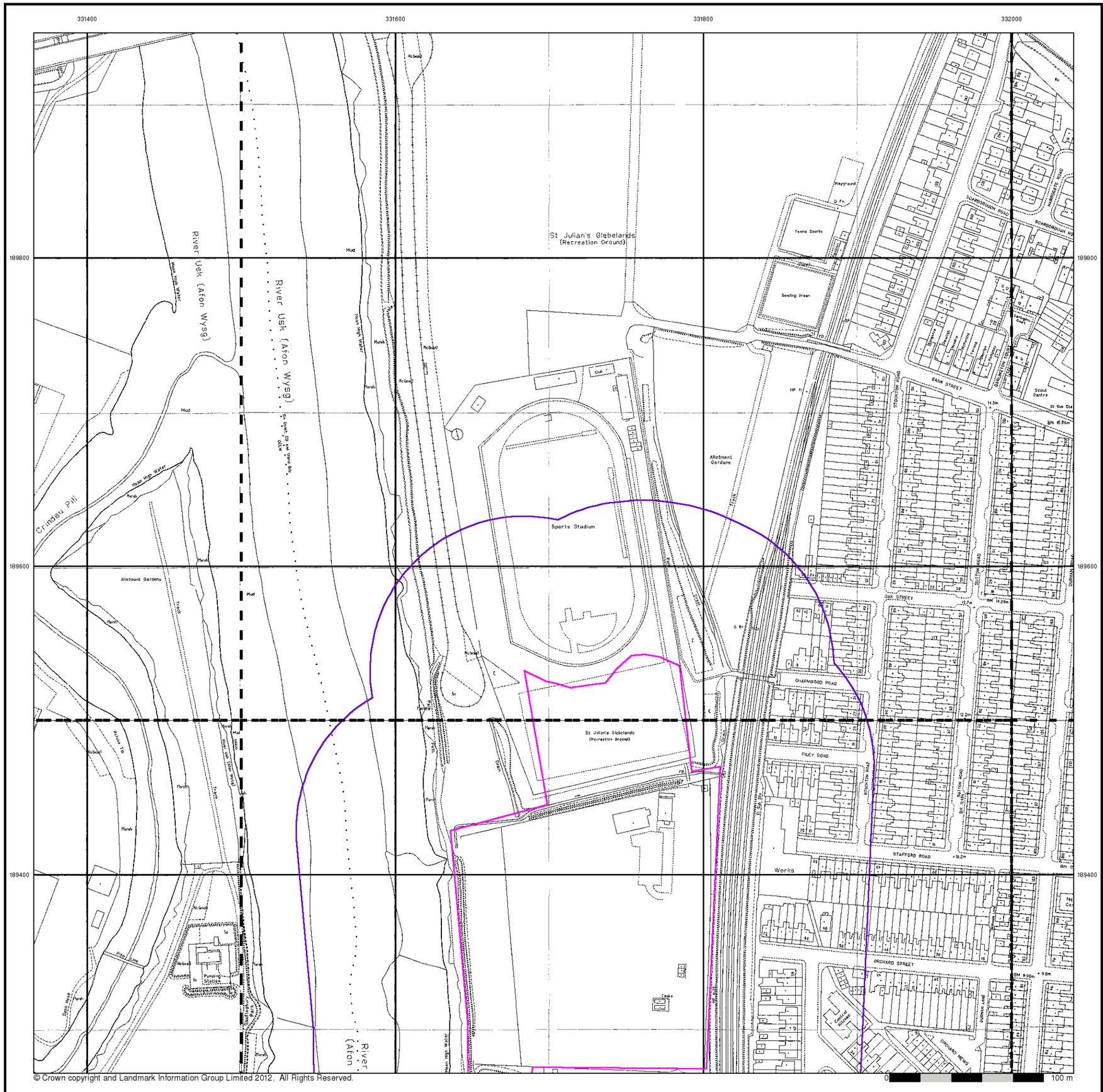

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Large-Scale National Grid Data

Published 1993

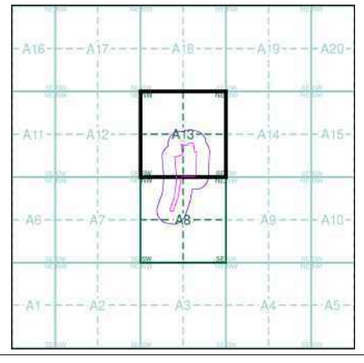
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

ST3189NW 1993 1:1,250	ST3189NE 1993 1:1,250	ST3289NW 1993 1:1,250
ST3189SW 1993 1:1,250	ST3189SE 1993 1:1,250	ST3289SW 1993 1:1,250

Historical Map - Segment A13



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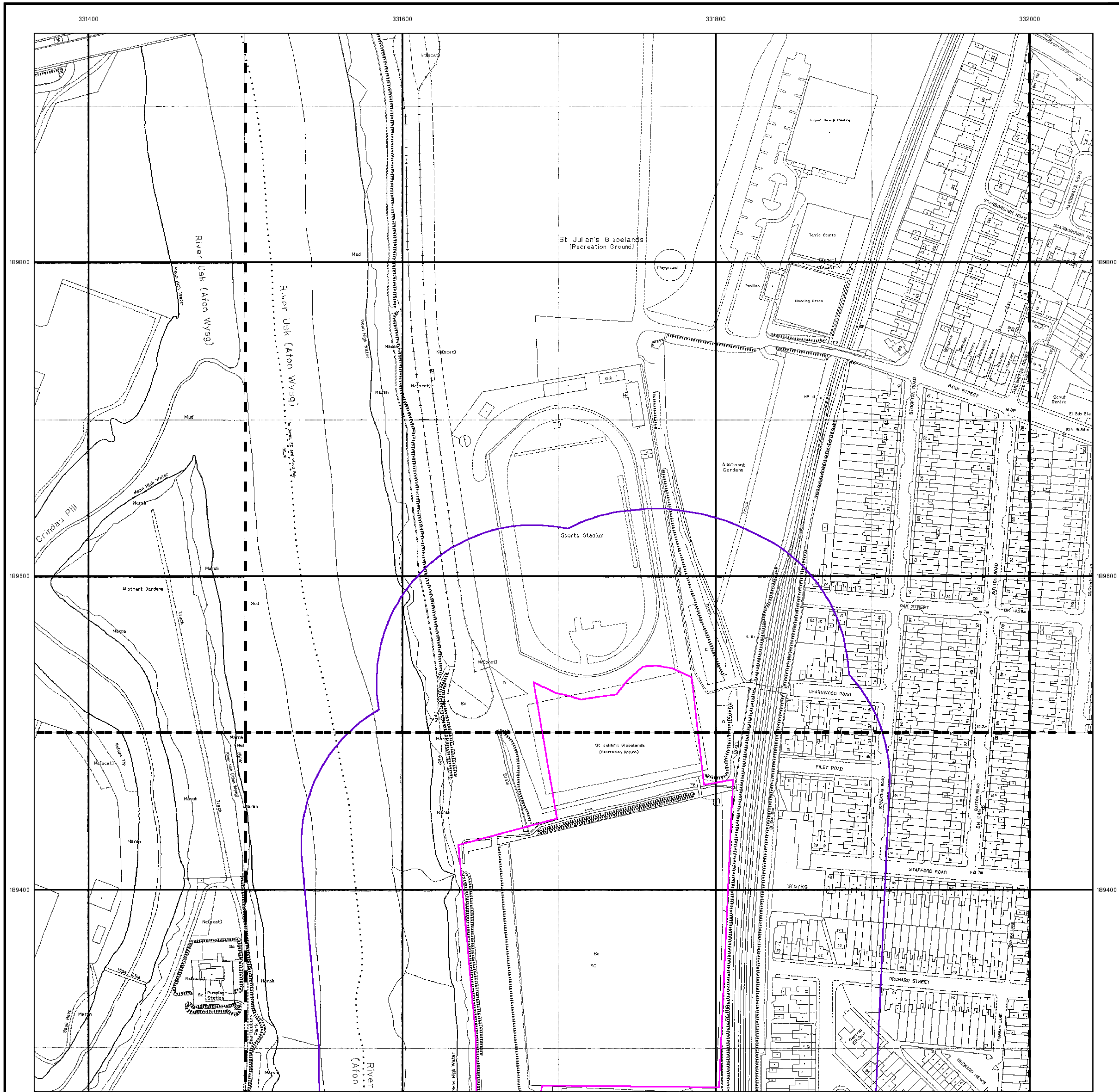

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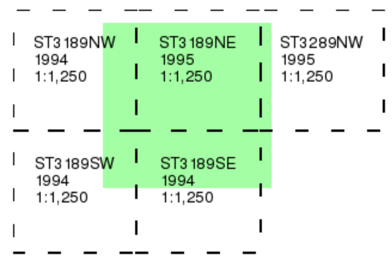
Large-Scale National Grid Data

Published 1994 - 1995

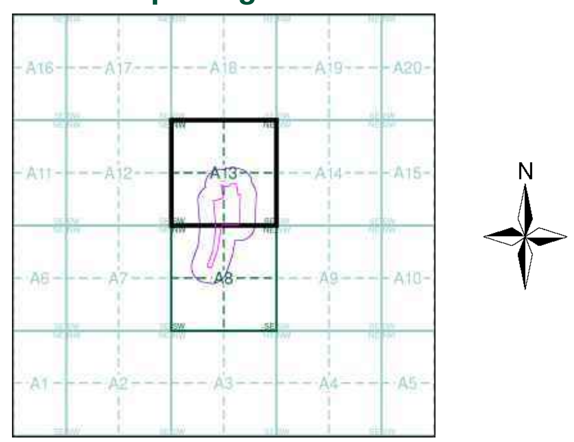
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



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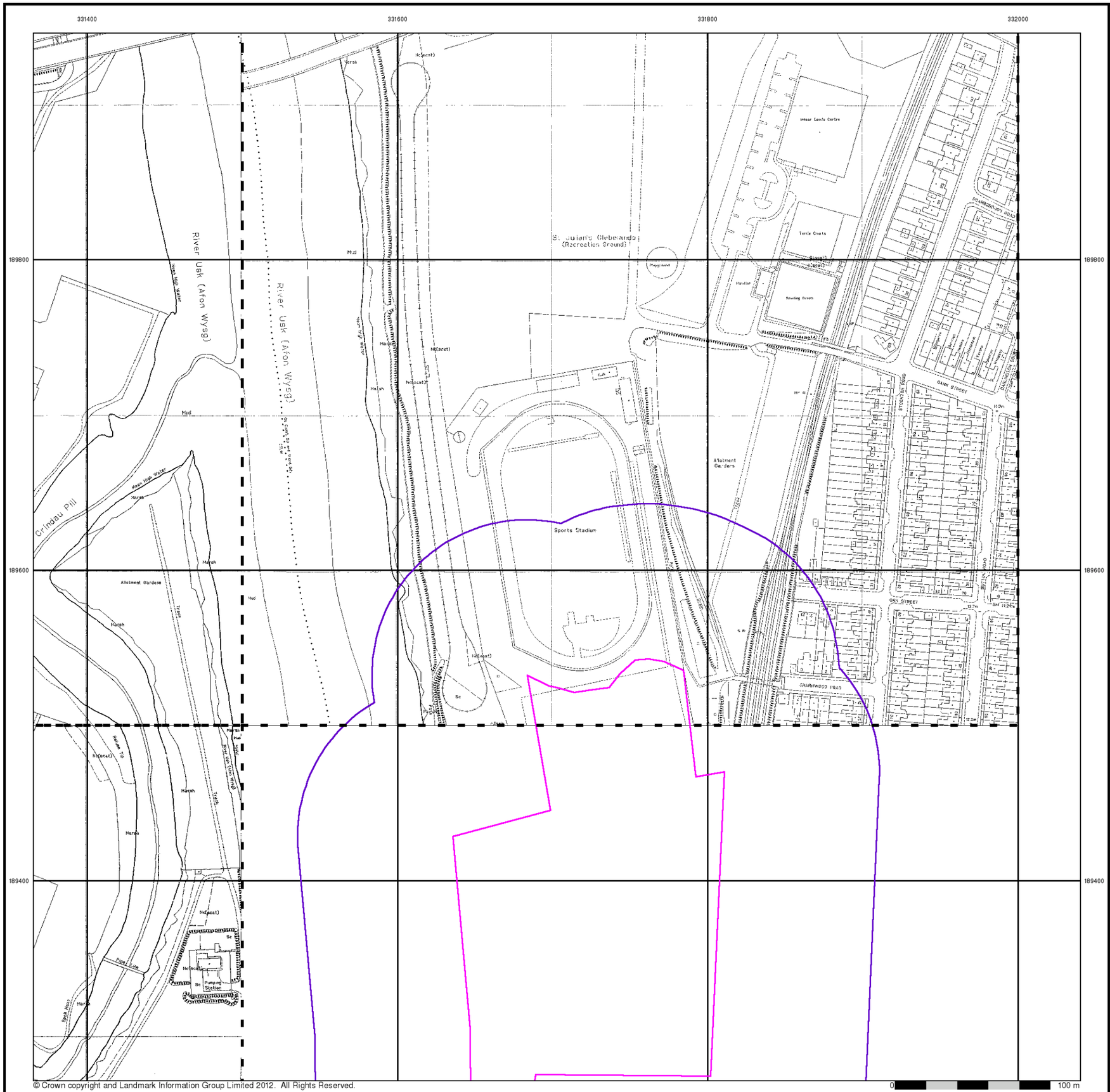

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Large-Scale National Grid Data

Published 1995 - 1997

Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

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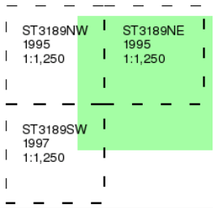
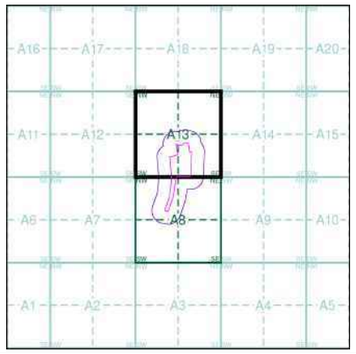


Historical Map - Segment A13



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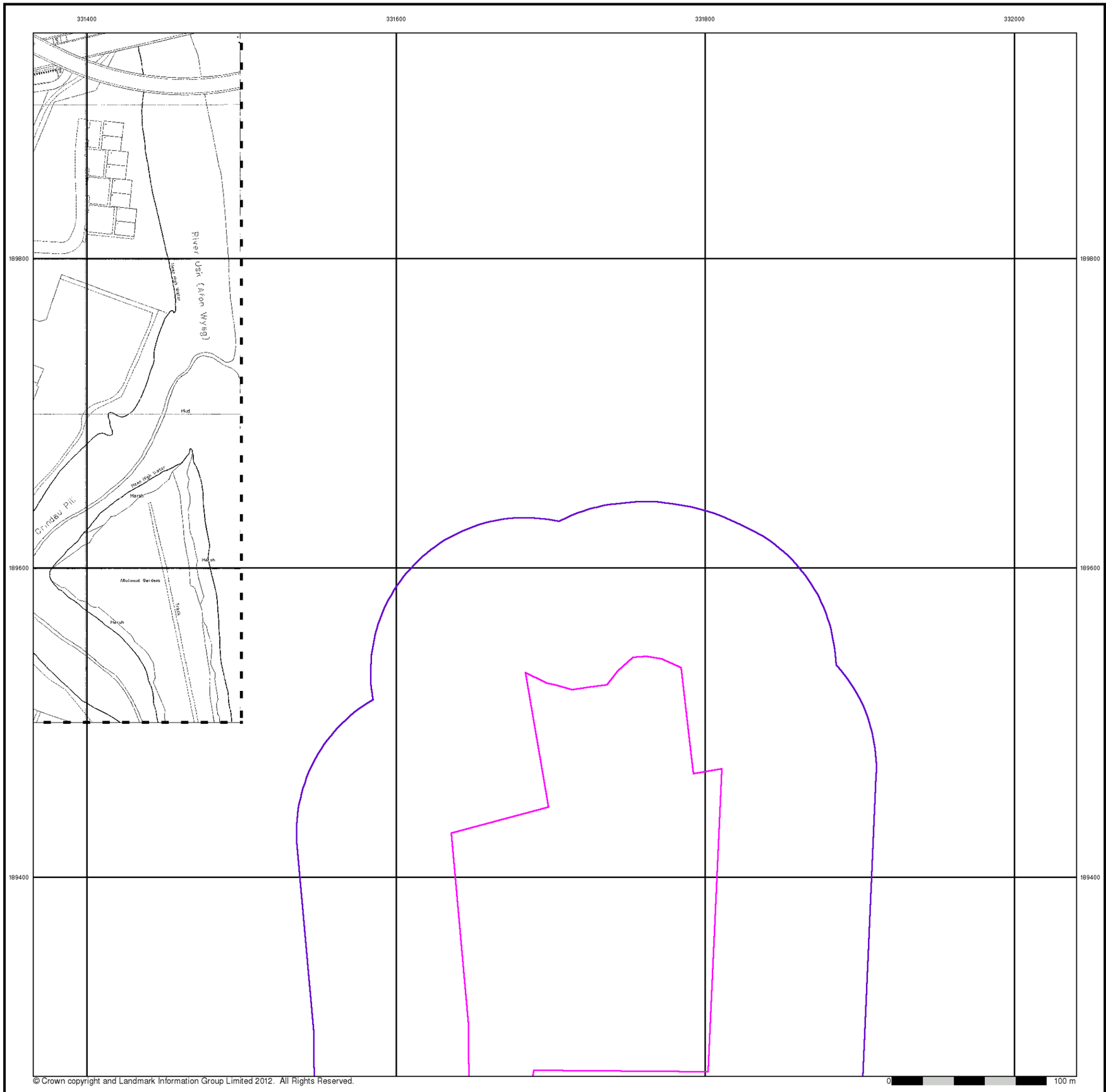

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Large-Scale National Grid Data

Published 1995

Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

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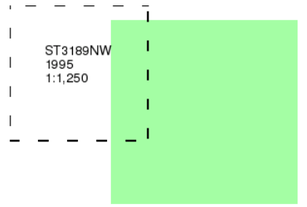
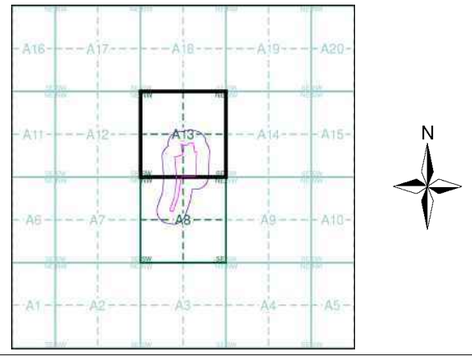


Historical Map - Segment A13



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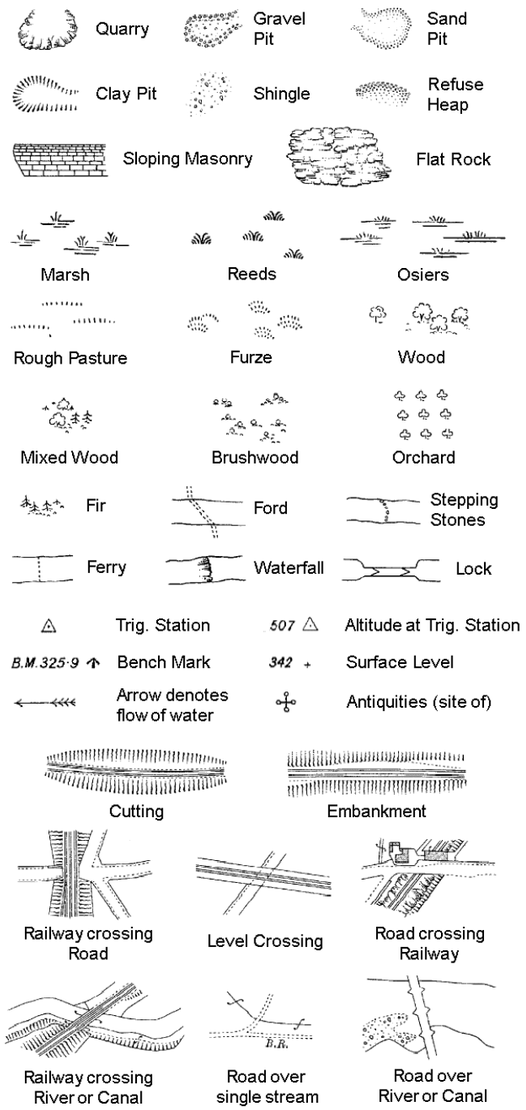
Historical Mapping Legends

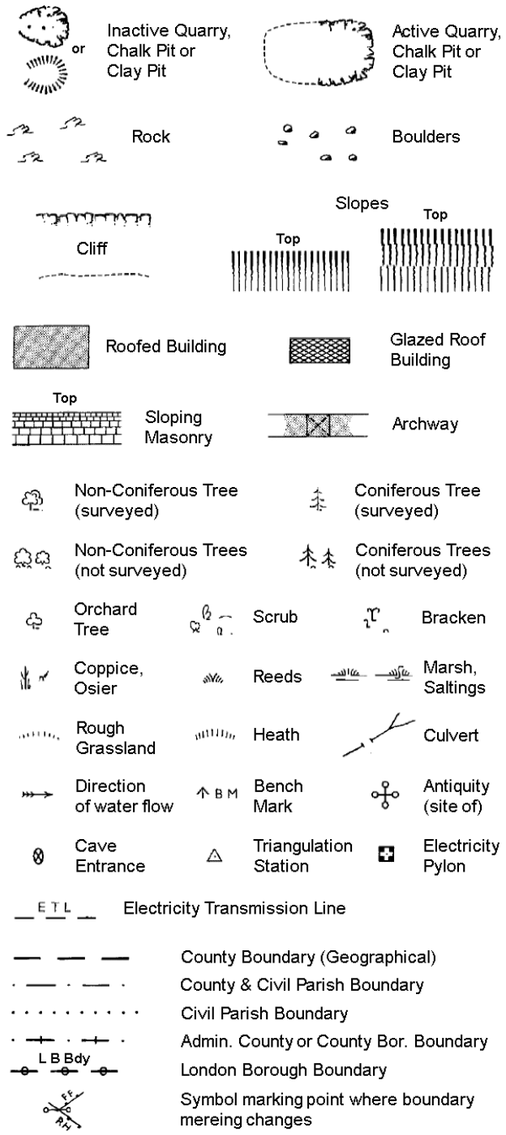
Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



County Boundary (Geographical)
County & Civil Parish Boundary
Administrative County & Civil Parish Boundary
Co. Boro. Bdy. County Borough Boundary (England)
Co. Burgh Bdy. County Burgh Boundary (Scotland)

B P B S	Boundary Post or Stone	P.C.B	Police Call Box
B.R.	Bridle Road	P	Pump
E.P	Electricity Pylon	S.P	Signal Post
F.B.	Foot Bridge	Sl.	Sluice
F.P.	Foot Path	Sp.	Spring
G.P	Guide Post or Board	T.C.B	Telephone Call Box
M.S	Mile Stone	Tr.	Trough
M.P M.R	Mooring Post or Ring	W	Well

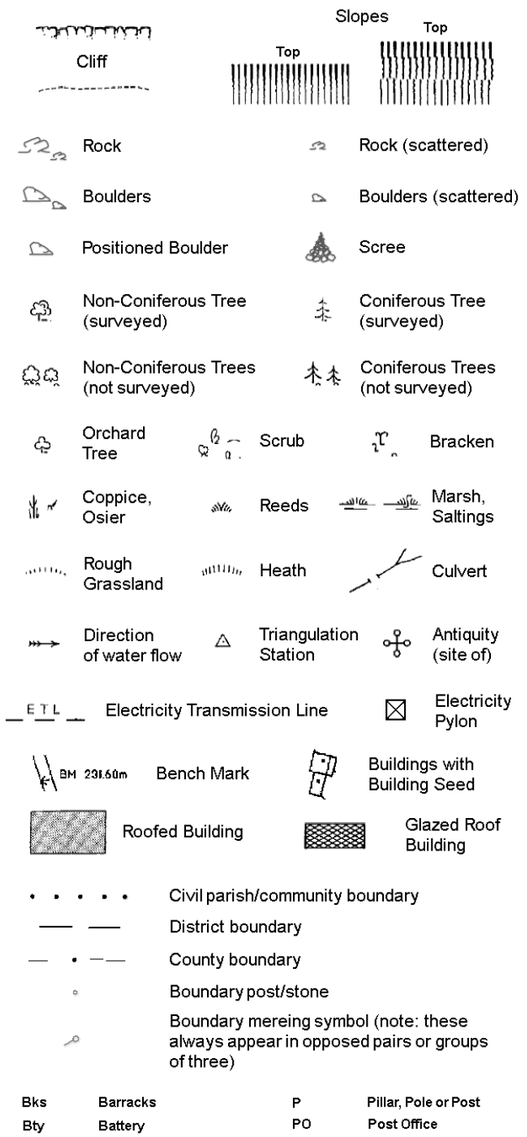
Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information 1:2,500 and 1:1,250



County Boundary (Geographical)
County & Civil Parish Boundary
Civil Parish Boundary
Admin. County or County Bor. Boundary
L B Bdy London Borough Boundary
Symbol marking point where boundary mereing changes

BH	Beer House	P	Pillar, Pole or Post
BP, BS	Boundary Post or Stone	PO	Post Office
Cn, C	Capstan, Crane	PC	Public Convenience
Chy	Chimney	PH	Public House
D Fn	Drinking Fountain	Pp	Pump
El P	Electricity Pillar or Post	SB, S Br	Signal Box or Bridge
FAP	Fire Alarm Pillar	SP, SL	Signal Post or Light
FB	Foot Bridge	Spr	Spring
GP	Guide Post	Tk	Tank or Track
H	Hydrant or Hydraulic	TCB	Telephone Call Box
LC	Level Crossing	TCP	Telephone Call Post
MH	Manhole	Tr	Trough
MP	Mile Post or Mooring Post	Wr Pt, Wr T	Water Point, Water Tap
MS	Mile Stone	W	Well
NTL	Normal Tidal Limit	Wd Pp	Wind Pump

Large-Scale National Grid Data 1:2,500 and 1:1,250



Civil parish/community boundary
District boundary
County boundary
Boundary post/stone
Boundary mereing symbol (note: these always appear in opposed pairs or groups of three)

Bks	Barracks	P	Pillar, Pole or Post
Bty	Battery	PO	Post Office
Cemy	Cemetery	PC	Public Convenience
Chy	Chimney	Pp	Pump
Cis	Cistern	Ppg Sta	Pumping Station
Dismtd Rly	Dismantled Railway	PW	Place of Worship
El Gen Sta	Electricity Generating Station	Sewage Ppg Sta	Sewage Pumping Station
El P	Electricity Pole, Pillar	SB, S Br	Signal Box or Bridge
El Sub Sta	Electricity Sub Station	SP, SL	Signal Post or Light
FB	Filter Bed	Spr	Spring
Fn / D Fn	Fountain / Drinking Ftn.	Tk	Tank or Track
Gas Gov	Gas Valve Compound	Tr	Trough
GVC	Gas Governer	Wd Pp	Wind Pump
GP	Guide Post	Wr Pt, Wr T	Water Point, Water Tap
MH	Manhole	Wks	Works (building or area)
MP, MS	Mile Post or Mile Stone	W	Well

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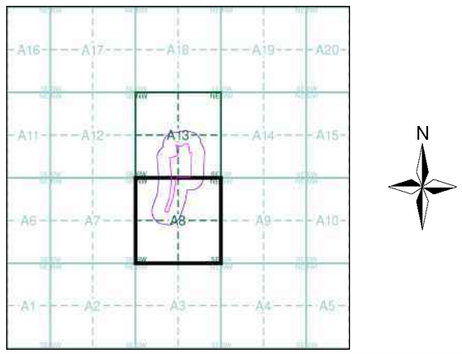
Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Monmouthshire	1:2,500	1883	2
Monmouthshire	1:2,500	1902	3
Monmouthshire	1:2,500	1920	4
Monmouthshire	1:2,500	1937	5
Ordnance Survey Plan	1:1,250	1955 - 1957	6
Ordnance Survey Plan	1:2,500	1955 - 1957	7
Additional SIMs	1:1,250	1957 - 1992	8
Ordnance Survey Plan	1:1,250	1966 - 1976	9
Ordnance Survey Plan	1:2,500	1969 - 1970	10
Supply of Unpublished Survey Information	1:1,250	1974	11
Additional SIMs	1:1,250	1978 - 1991	12
Additional SIMs	1:1,250	1989	13
Large-Scale National Grid Data	1:1,250	1993	14
Large-Scale National Grid Data	1:1,250	1994 - 1997	15
Large-Scale National Grid Data	1:1,250	1997	16

Historical Map - Segment A8



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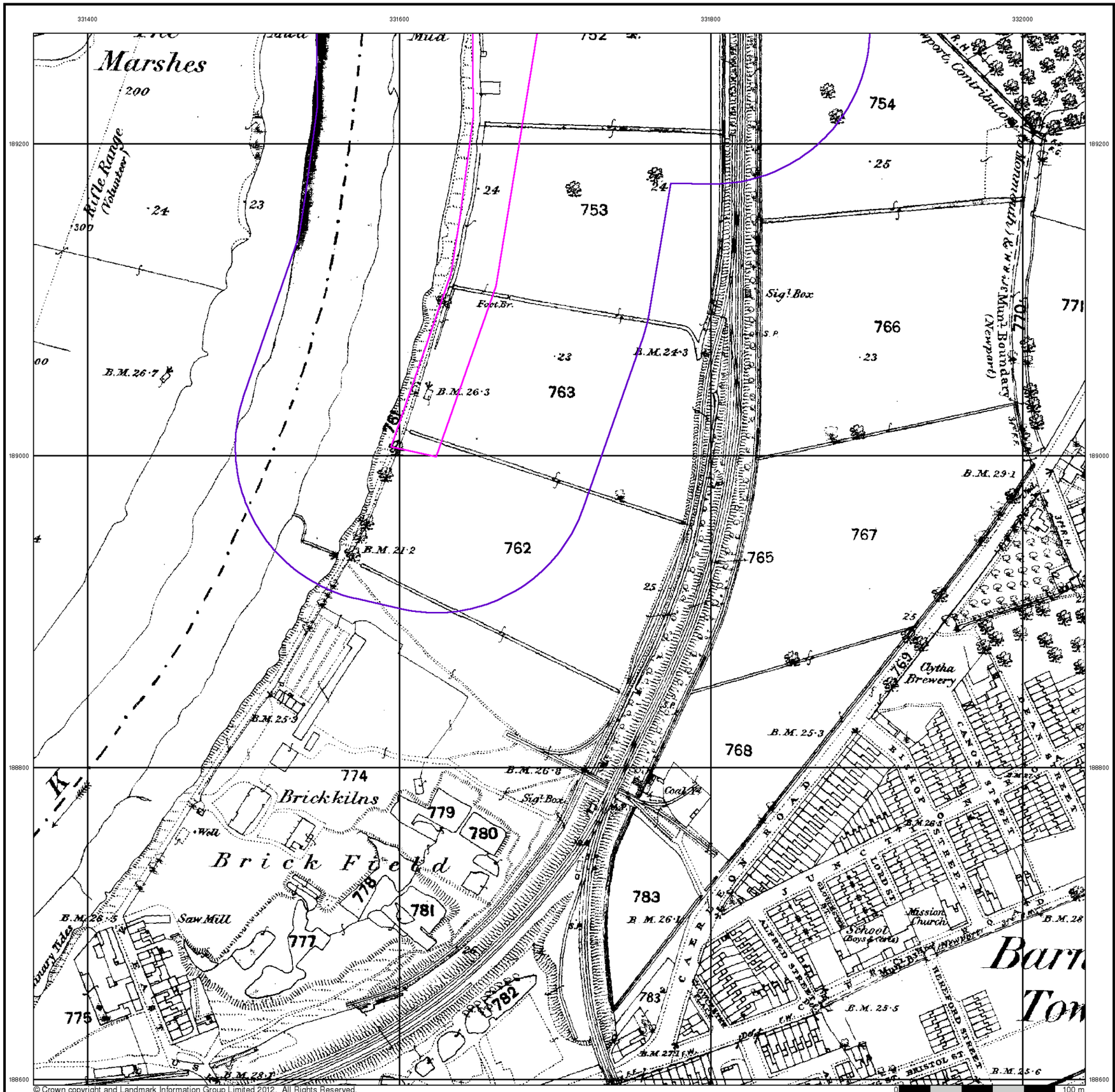

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Monmouthshire

Published 1883

Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

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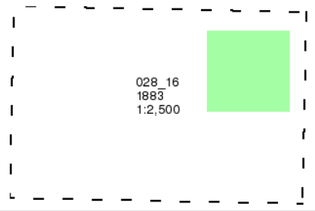
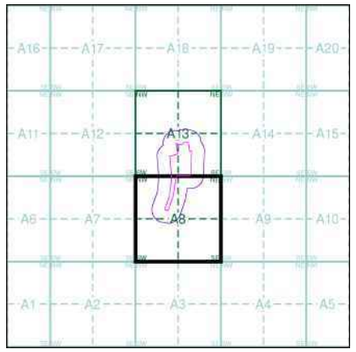


Historical Map - Segment A8



Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	100

Site Details

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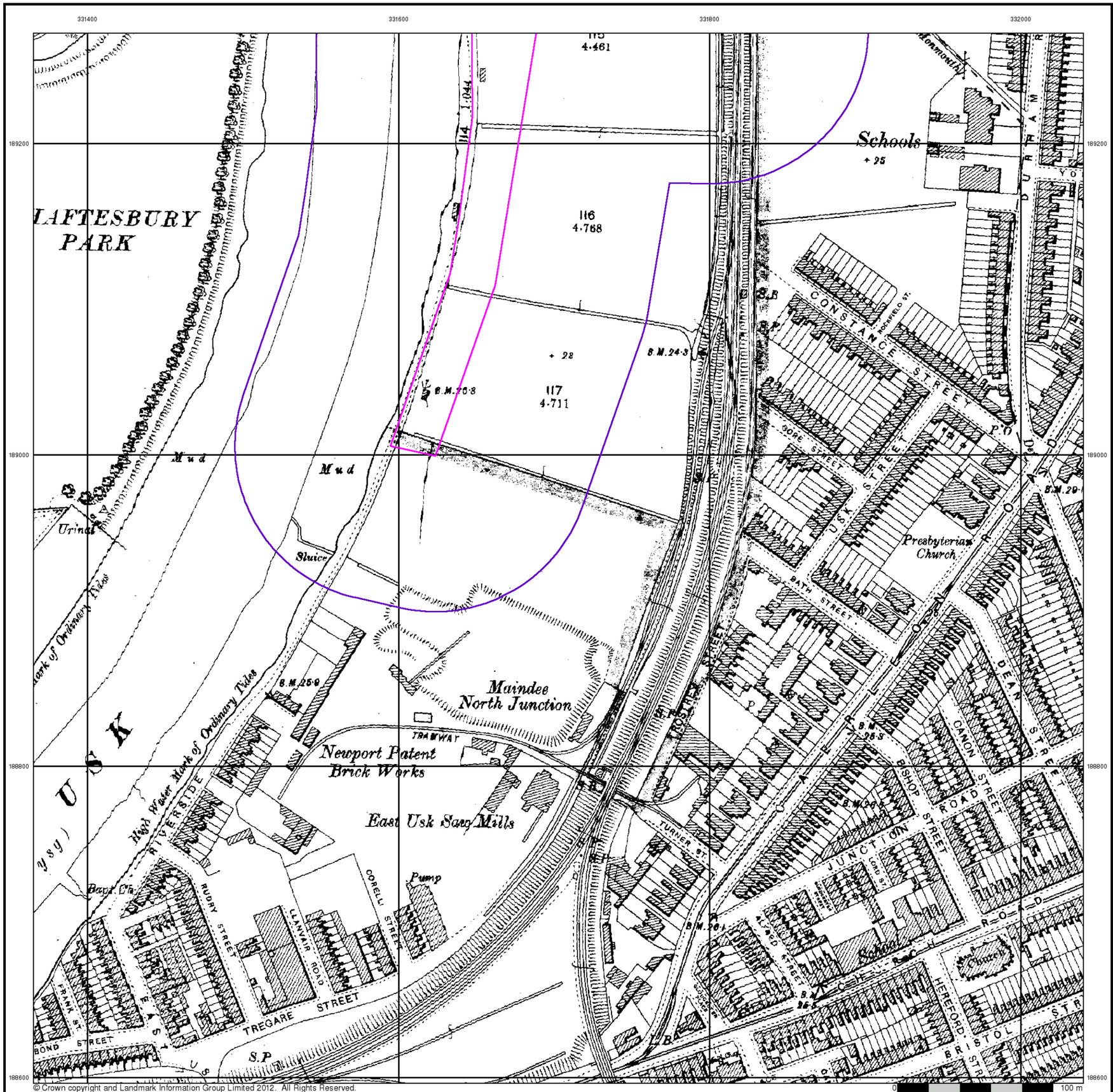

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Monmouthshire

Published 1902

Source map scale - 1:2,500

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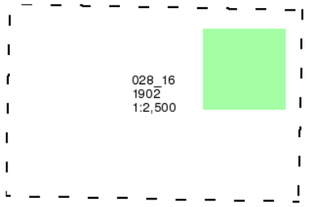
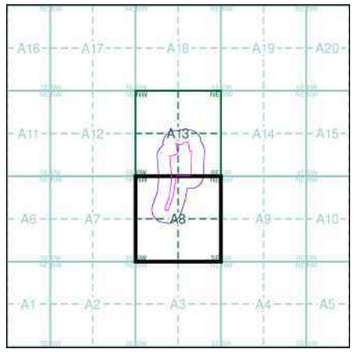
Map Name(s) and Date(s)



Historical Map - Segment A8



Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	100

Site Details

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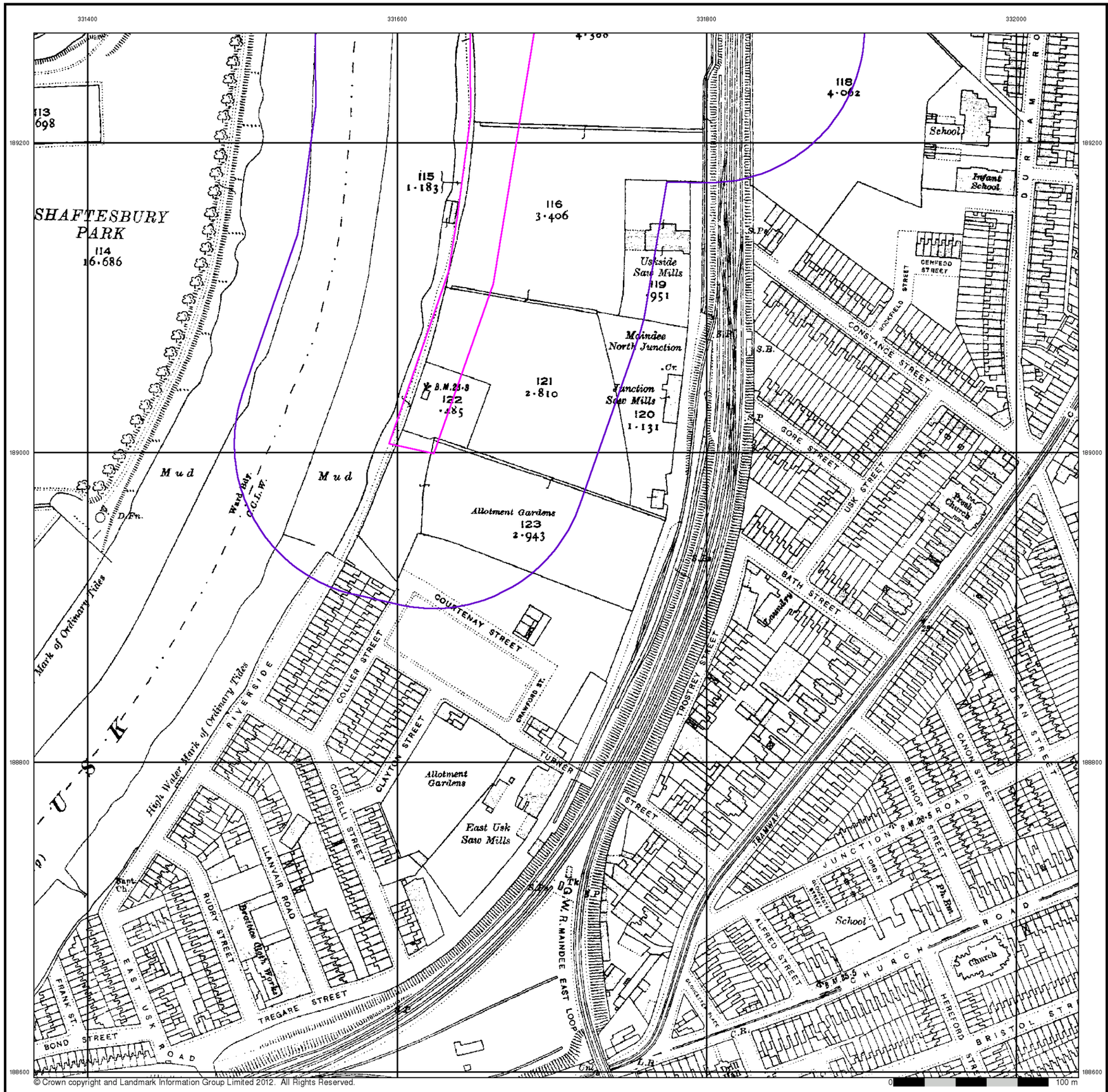

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Monmouthshire

Published 1920

Source map scale - 1:2,500

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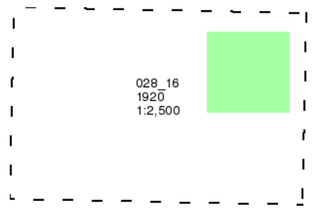
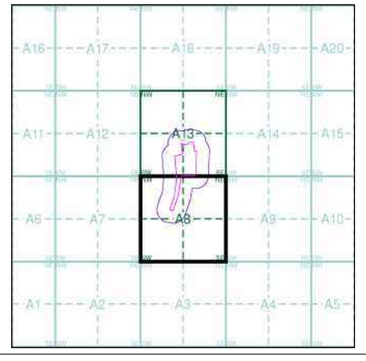
Map Name(s) and Date(s)



Historical Map - Segment A8



Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	100

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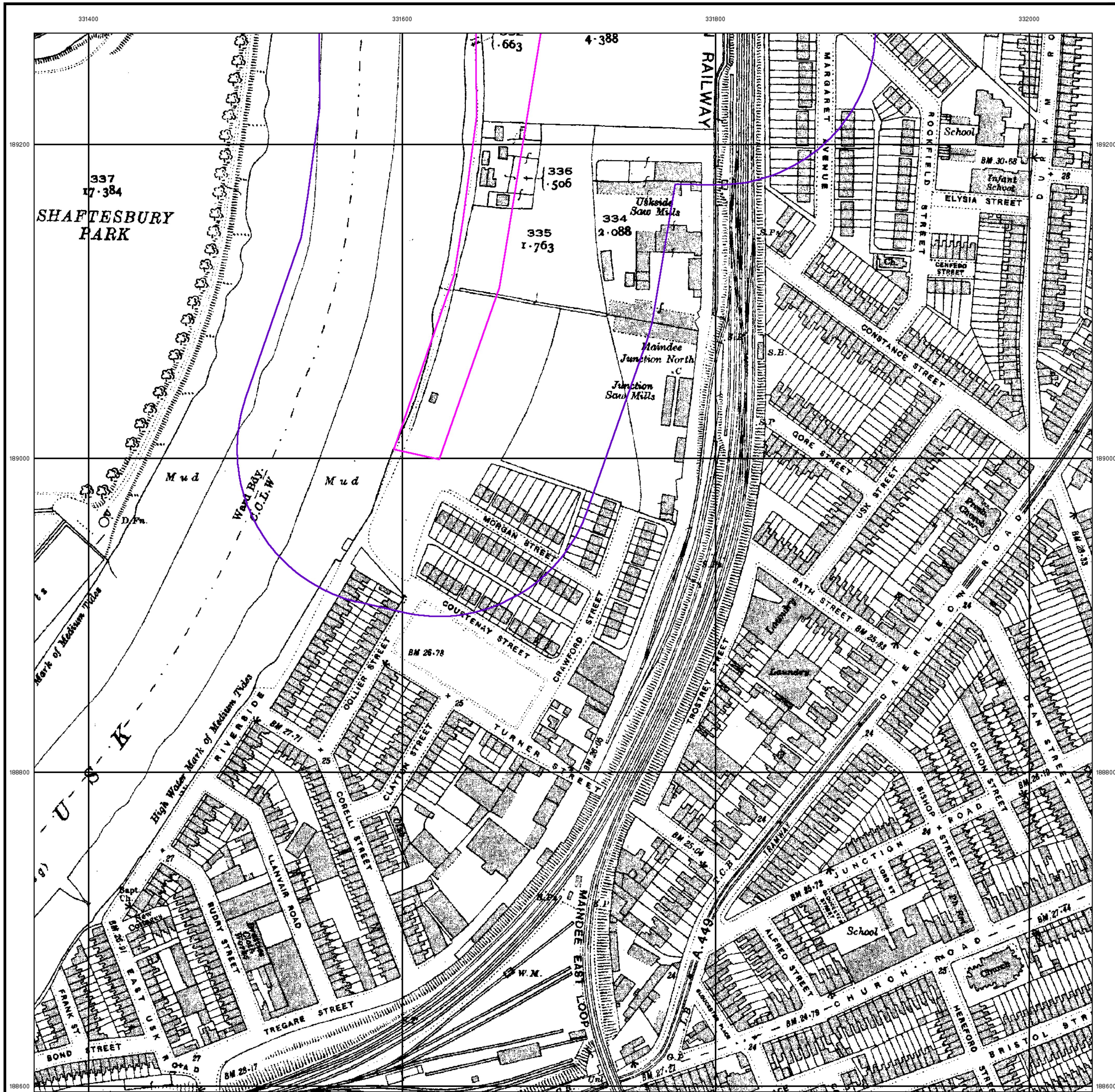

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Monmouthshire

Published 1937

Source map scale - 1:2,500

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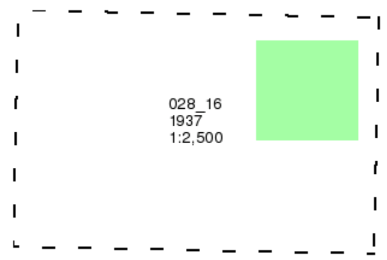
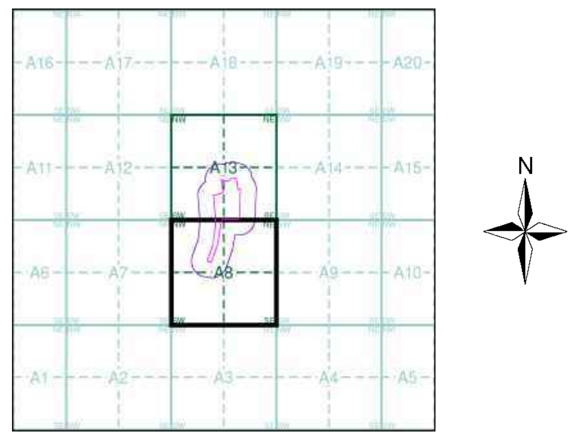
Map Name(s) and Date(s)



Historical Map - Segment A8



Order Details

Order Number: 41914630_1_1
Customer Ref: 12044
National Grid Reference: 331690, 189280
Slice: A
Site Area (Ha): 4.52
Search Buffer (m): 100

Site Details

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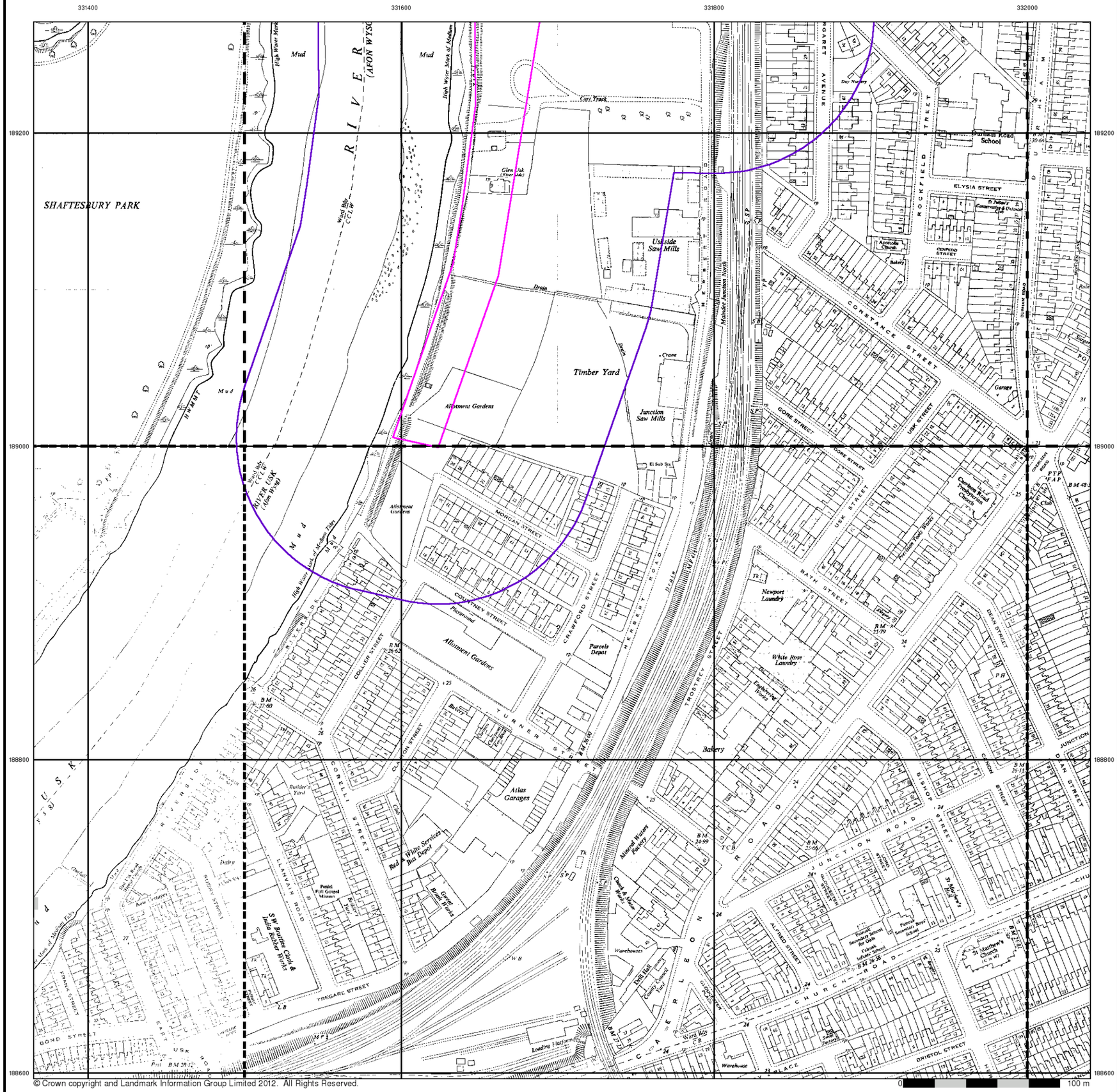

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Ordnance Survey Plan

Published 1955 - 1957

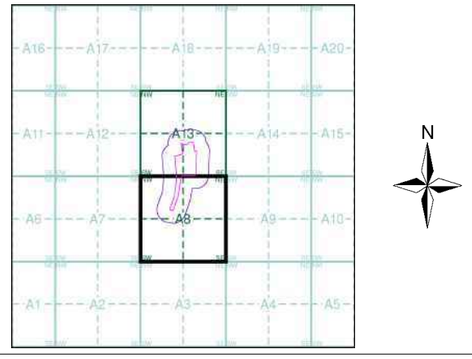
Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

ST3 189SW 1955 1:1,250	ST3 189SE 1955 1:1,250	ST3 289SW 1957 1:1,250
ST3 188NW 1955 1:1,250	ST3 188NE 1955 1:1,250	ST3 288NW 1956 1:1,250

Historical Map - Segment A8



Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	100

Site Details

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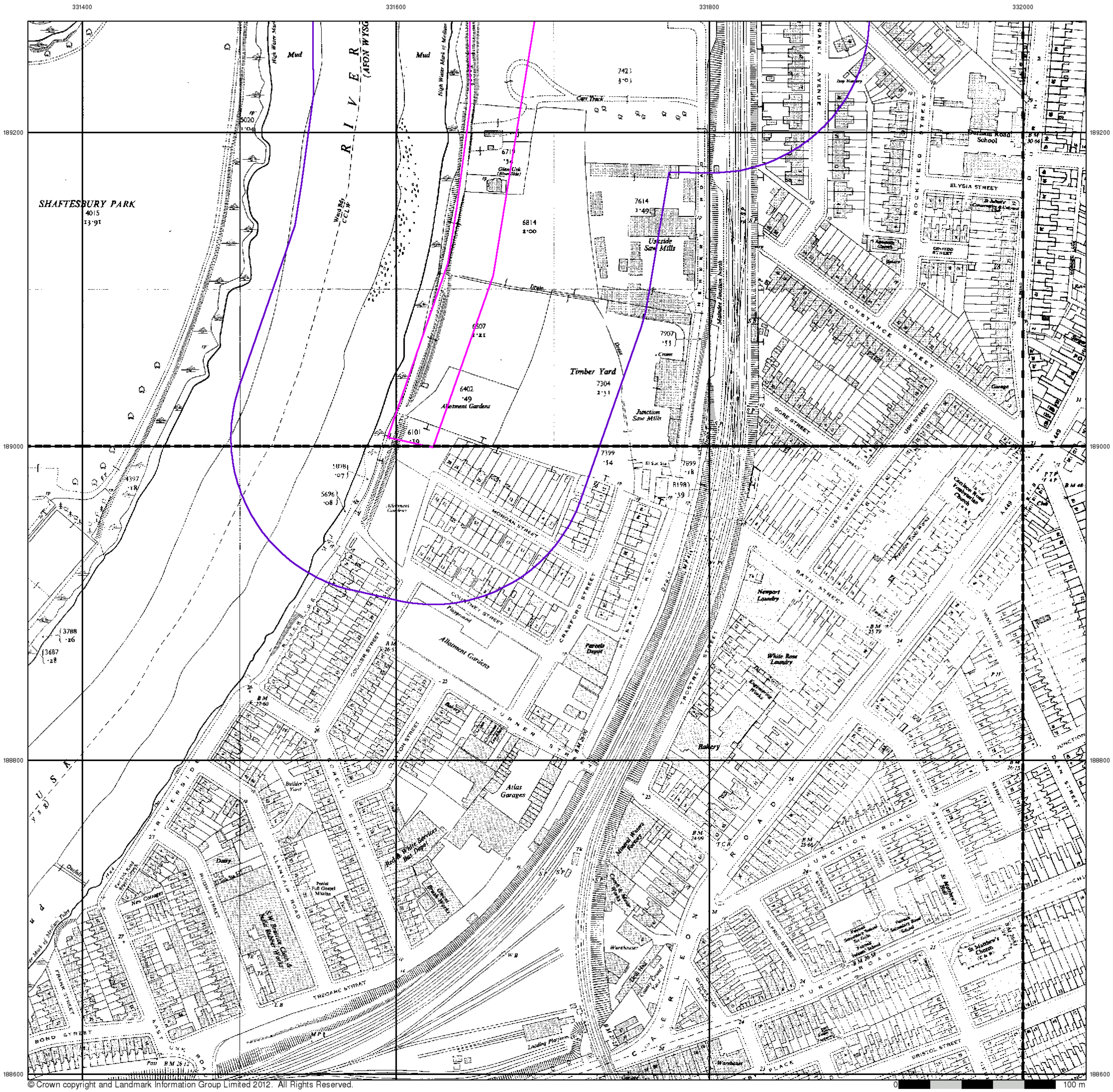

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0 100 m

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Ordnance Survey Plan

Published 1955 - 1957

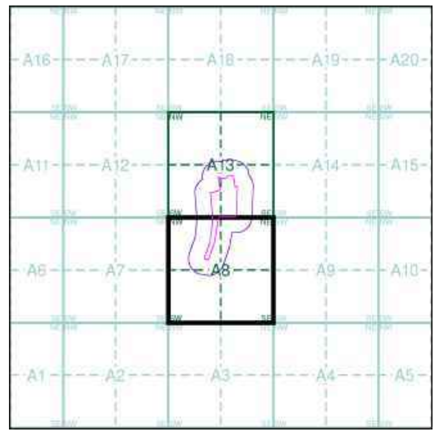
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

ST3189 1955 1:2,500	ST3289 1957 1:2,500
ST3188 1956 1:2,500	ST3288 1956 1:2,500

Historical Map - Segment A8



N

Order Details

Order Number: 41914630_1_1
Customer Ref: 12044
National Grid Reference: 331690, 189280
Slice: A
Site Area (Ha): 4.52
Search Buffer (m): 100

Site Details

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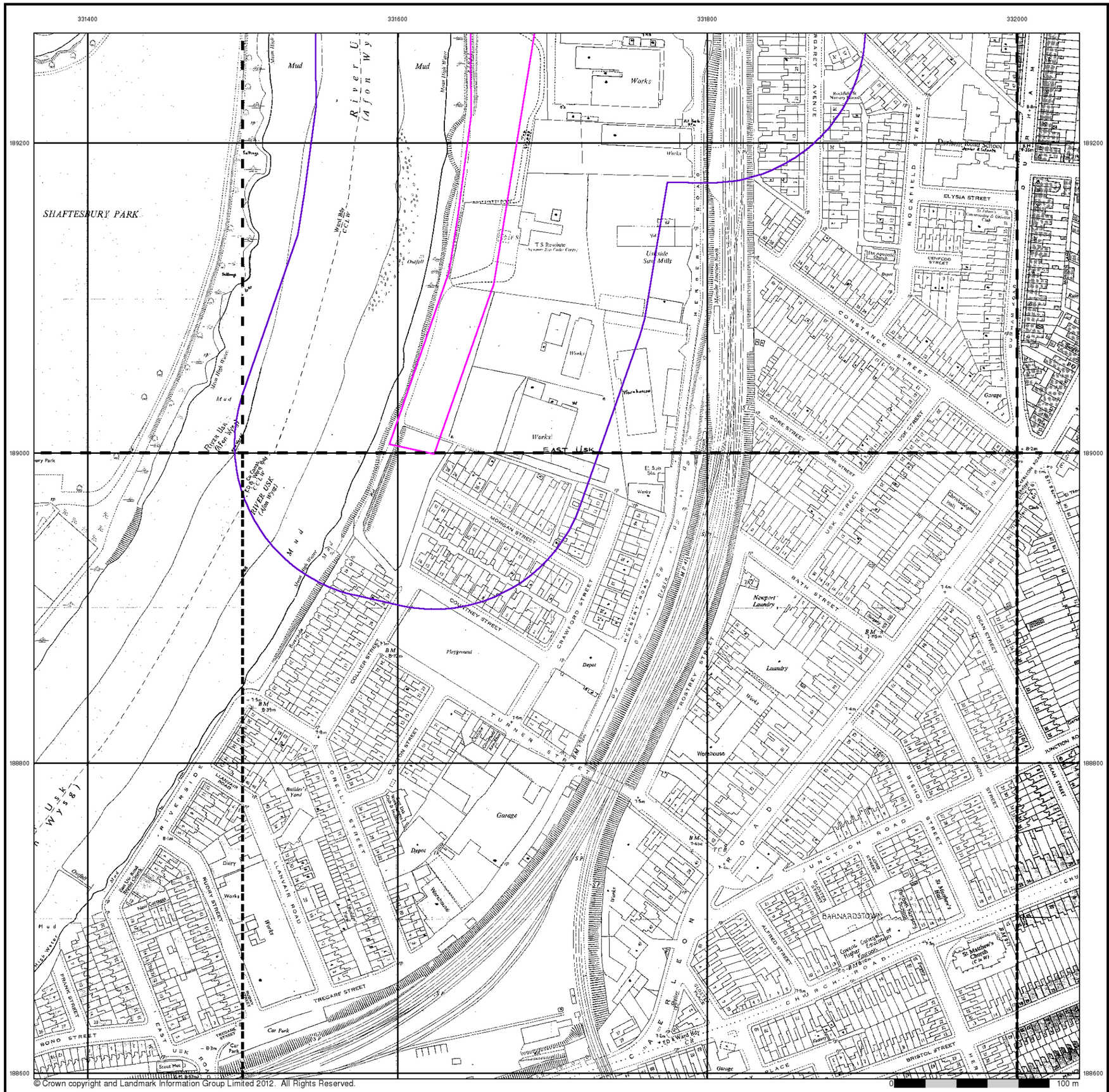

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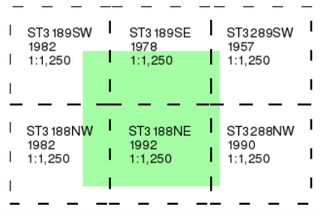
Additional SIMs

Published 1957 - 1992

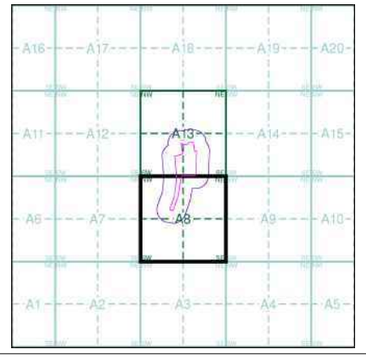
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A8



Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	100

Site Details

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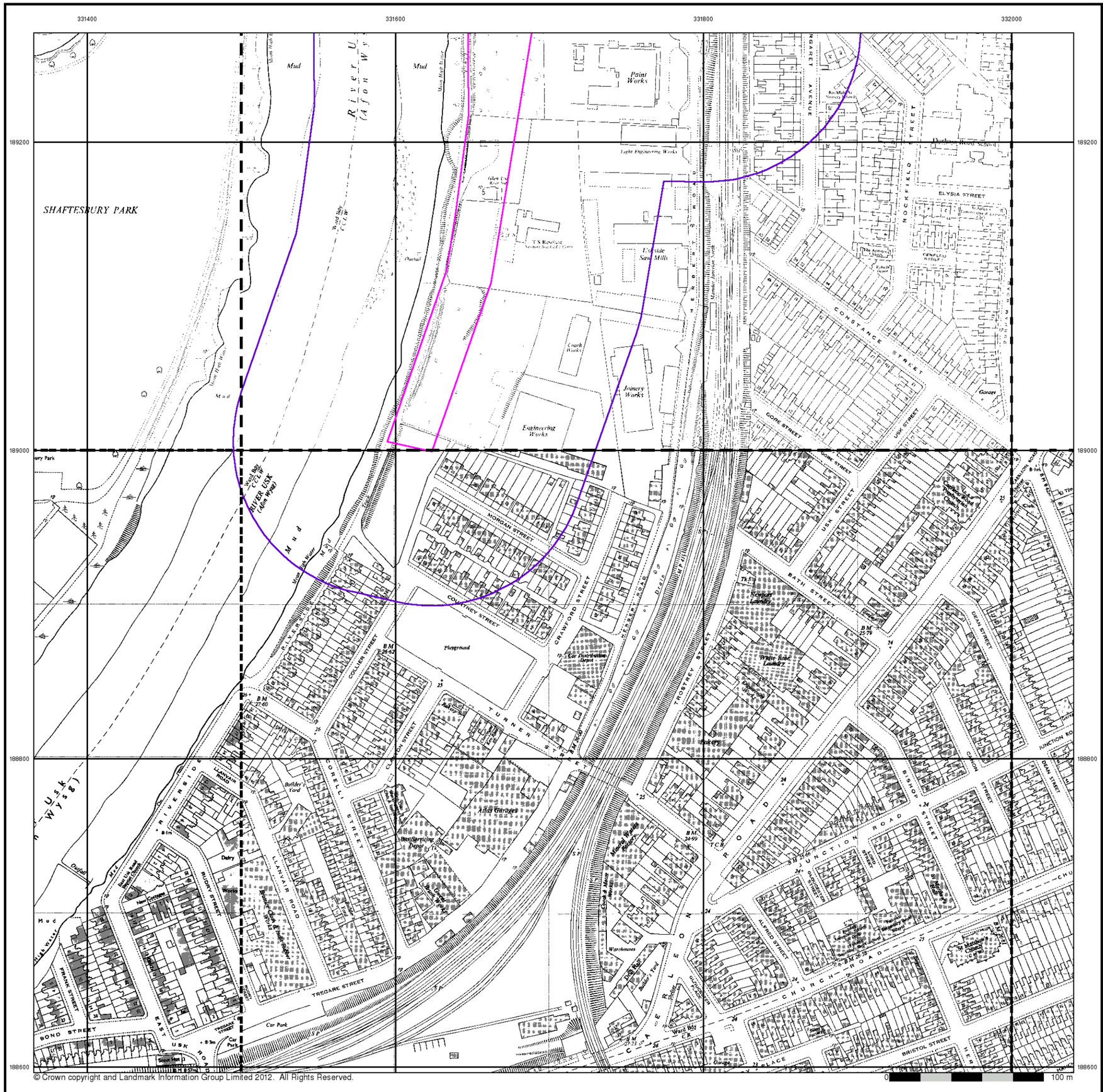

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Ordnance Survey Plan

Published 1966 - 1976

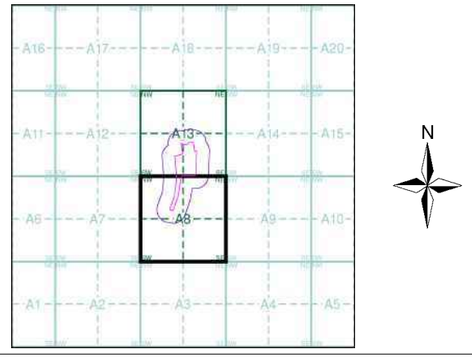
Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

ST3 189SW 1967 1:1,250	ST3 189SE 1966 1:1,250	
ST3 188NW 1976 1:1,250	ST3 188NE 1966 1:1,250	ST3 288NW 1974 1:1,250

Historical Map - Segment A8



Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	100

Site Details

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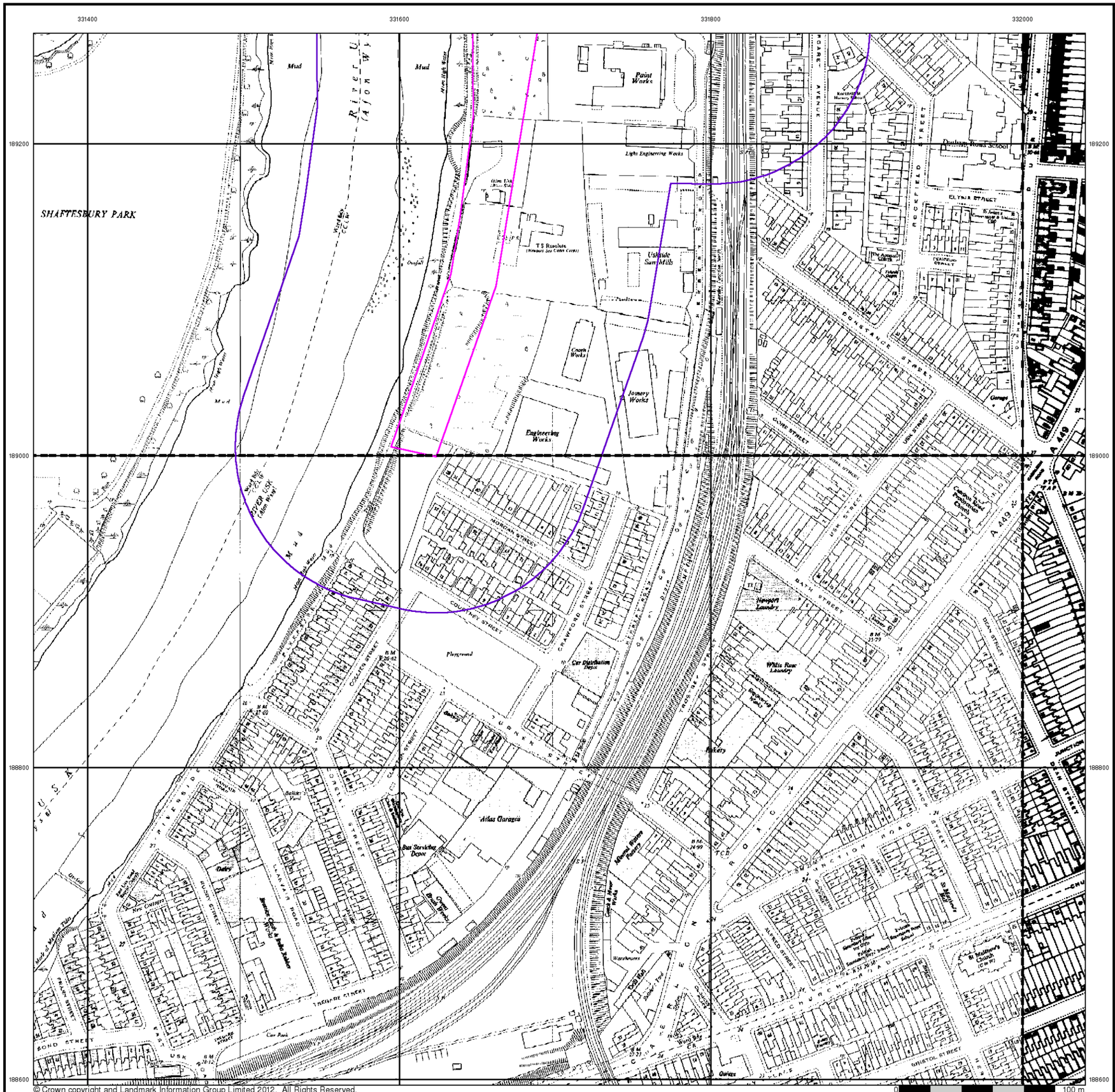

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Ordnance Survey Plan

Published 1969 - 1970

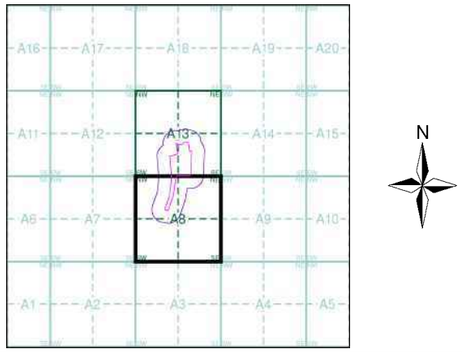
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

ST3189 1970 1:2,500	ST3289 1969 1:2,500
ST3188 1970 1:2,500	ST3288 1970 1:2,500

Historical Map - Segment A8



Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	100

Site Details

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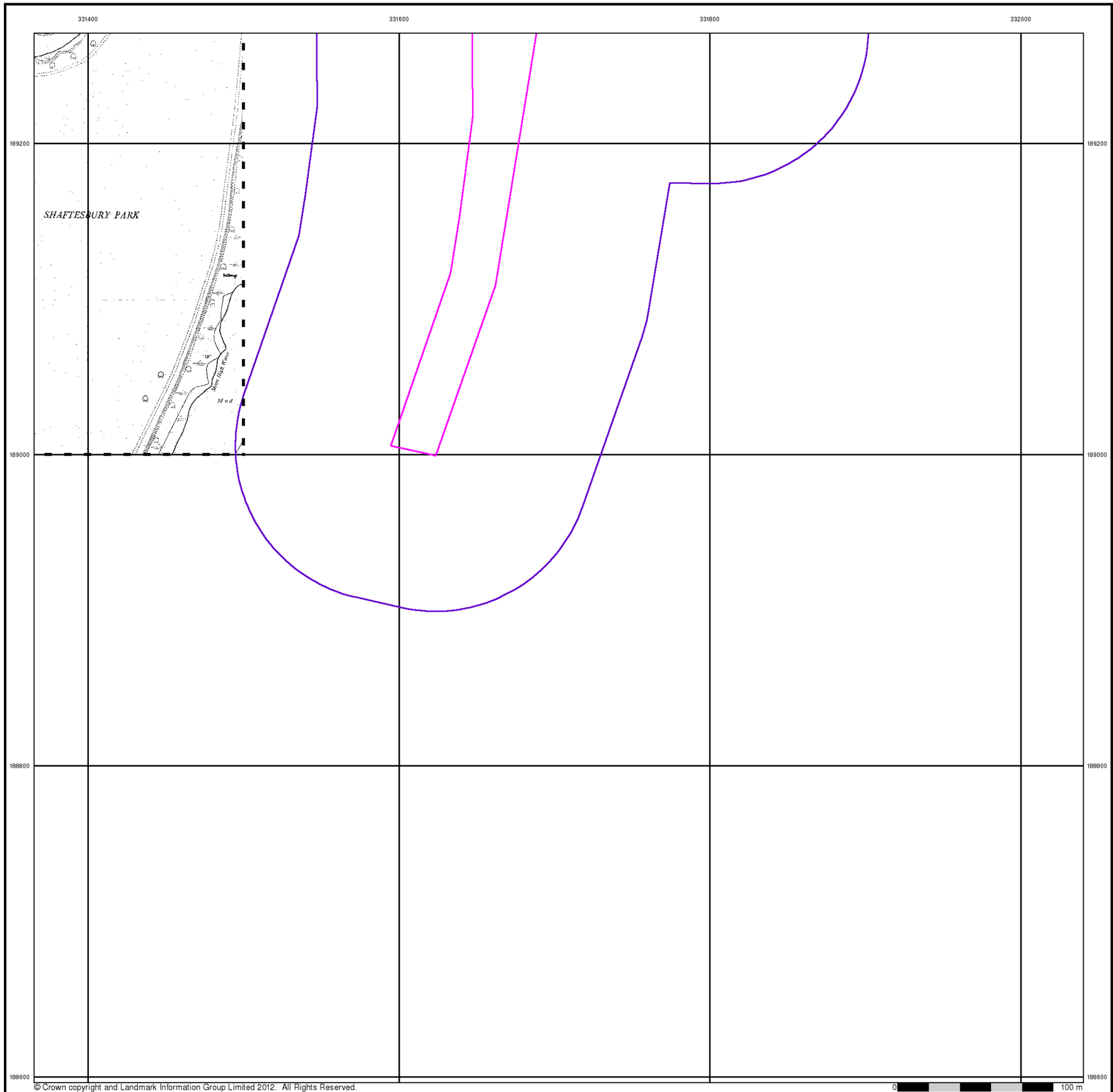

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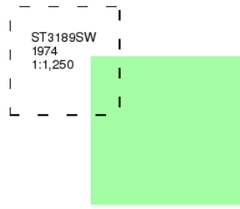
Supply of Unpublished Survey Information

Published 1974

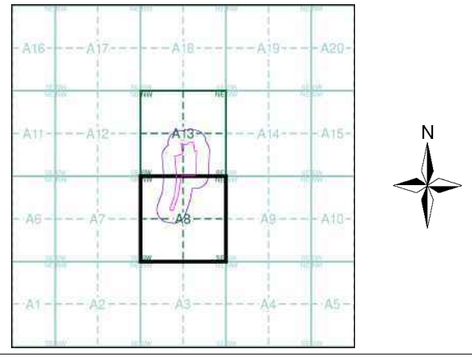
Source map scale - 1:1,250

SUSI maps (Supply of Unpublished Survey Information) were produced between 1972 and 1977, mainly for internal use at Ordnance Survey. These were more of a `work-in-progress' plan as they showed updates of individual areas on a map. These maps were unpublished, and they do not represent a single moment in time. They were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A8



Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	100

Site Details

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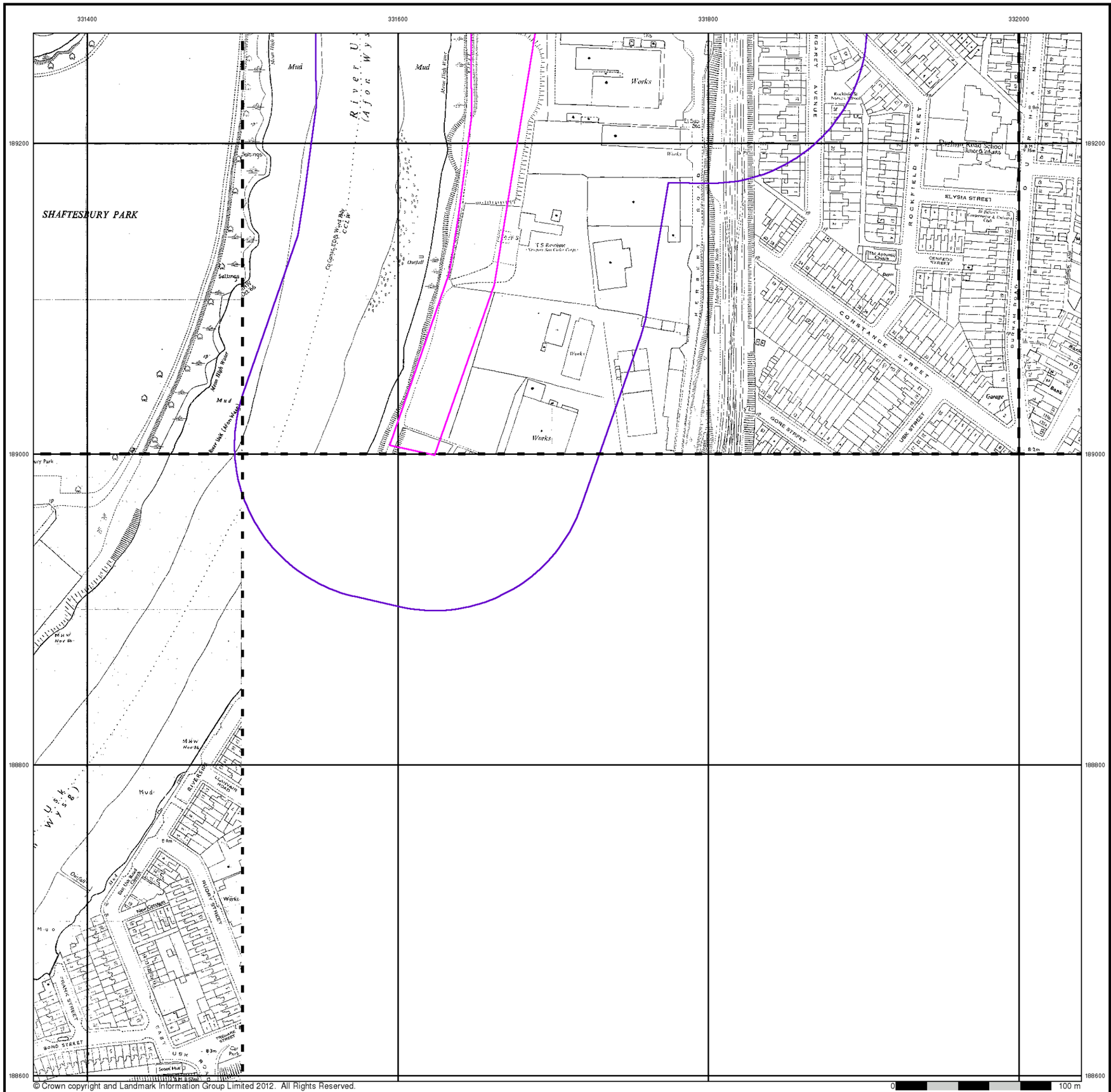

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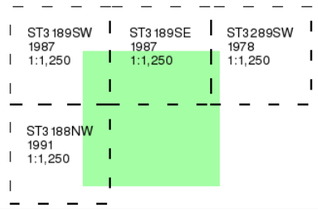
Additional SIMs

Published 1978 - 1991

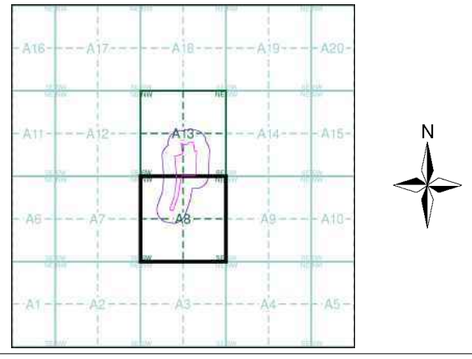
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A8



Order Details

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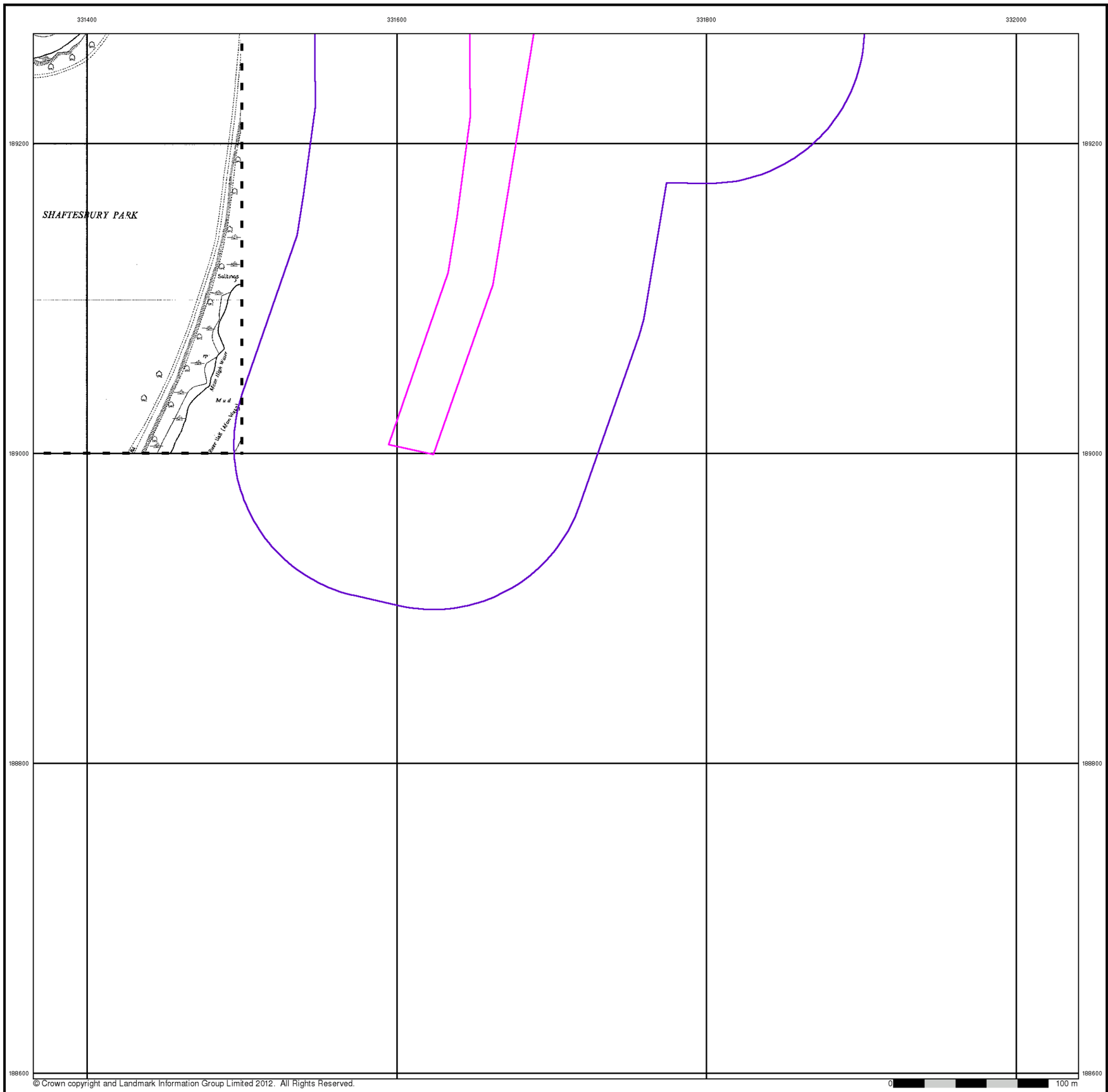

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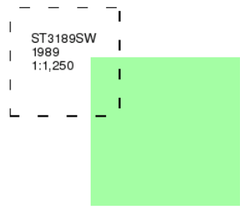
Additional SIMs

Published 1989

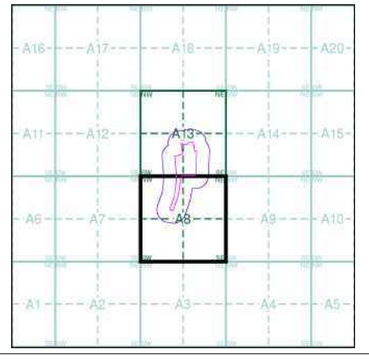
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A8



Order Details

Order Number:	41914630_1_1
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Slice:	A
Site Area (Ha):	4.52
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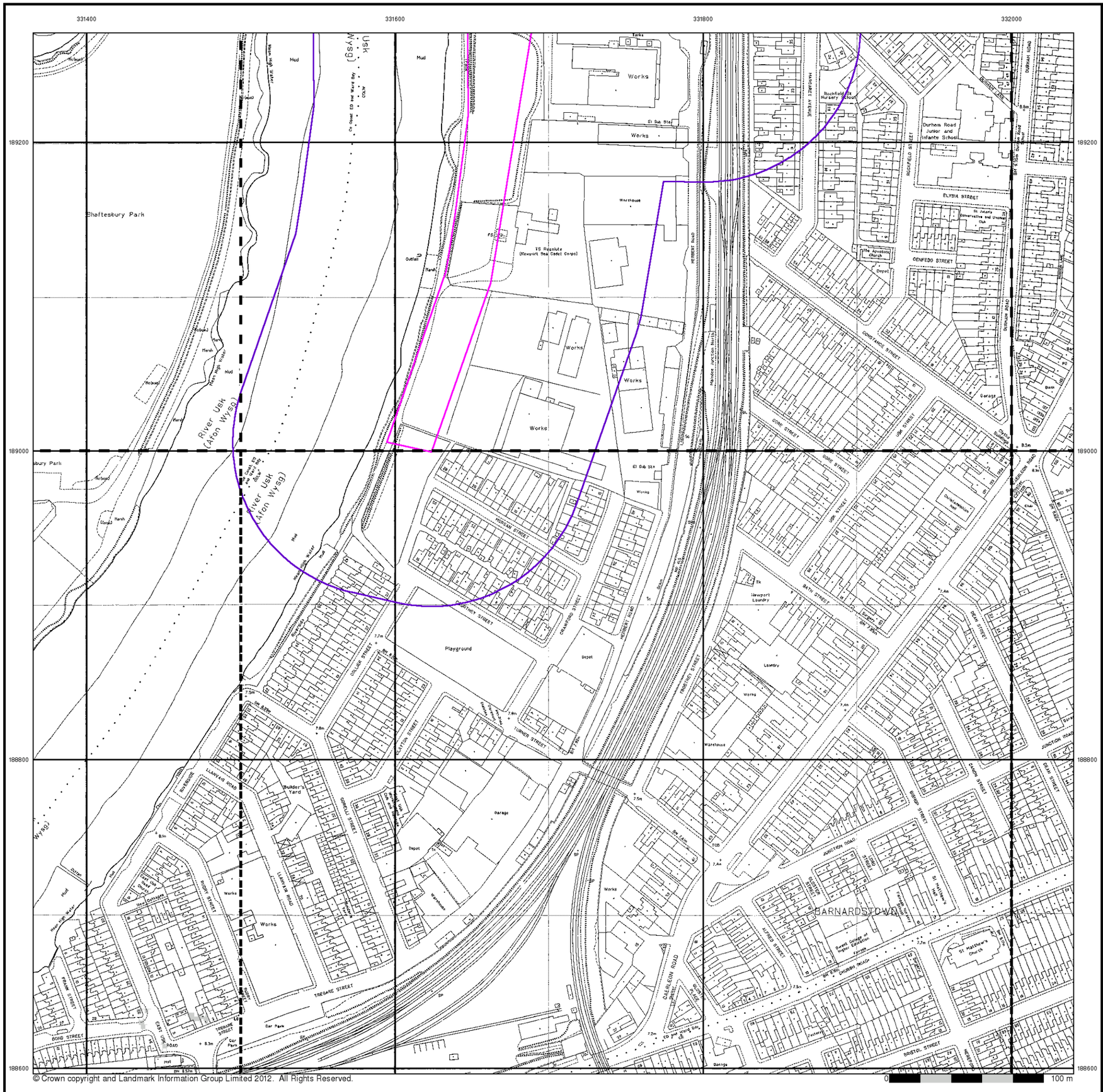

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Large-Scale National Grid Data

Published 1993

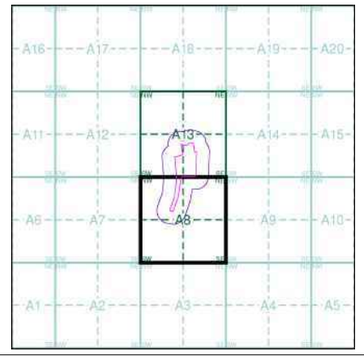
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

ST3 189SW 1993 1:1,250	ST3 189SE 1993 1:1,250	ST3 289SW 1993 1:1,250
ST3 188NW 1993 1:1,250	ST3 188NE 1993 1:1,250	ST3 288NW 1993 1:1,250

Historical Map - Segment A8



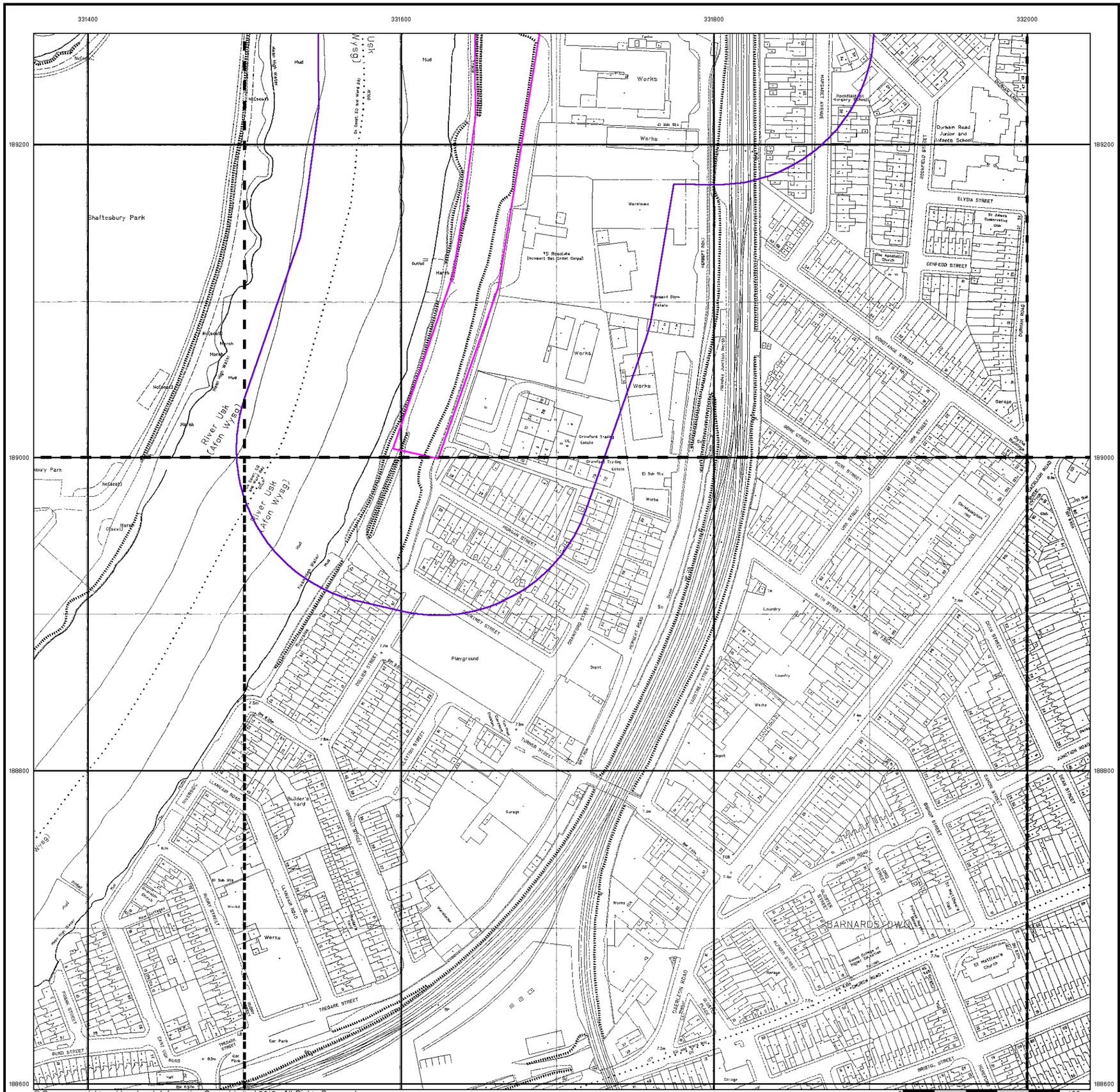
Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	100

Site Details

., Herbert Road, NEWPORT, Gwent, NP19 7BH

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



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terrafirma

Large-Scale National Grid Data

Published 1994 - 1997

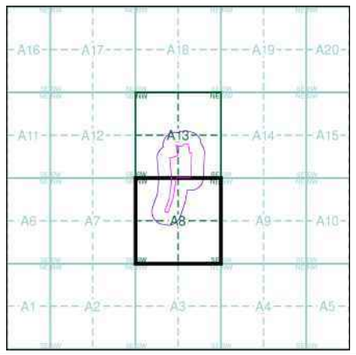
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

ST3 189SW 1994 1:1,250	ST3 189SE 1994 1:1,250	
ST3 188NW 1995 1:1,250	ST3 188NE 1994 1:1,250	ST3 288NW 1997 1:1,250

Historical Map - Segment A8



Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	100

Site Details

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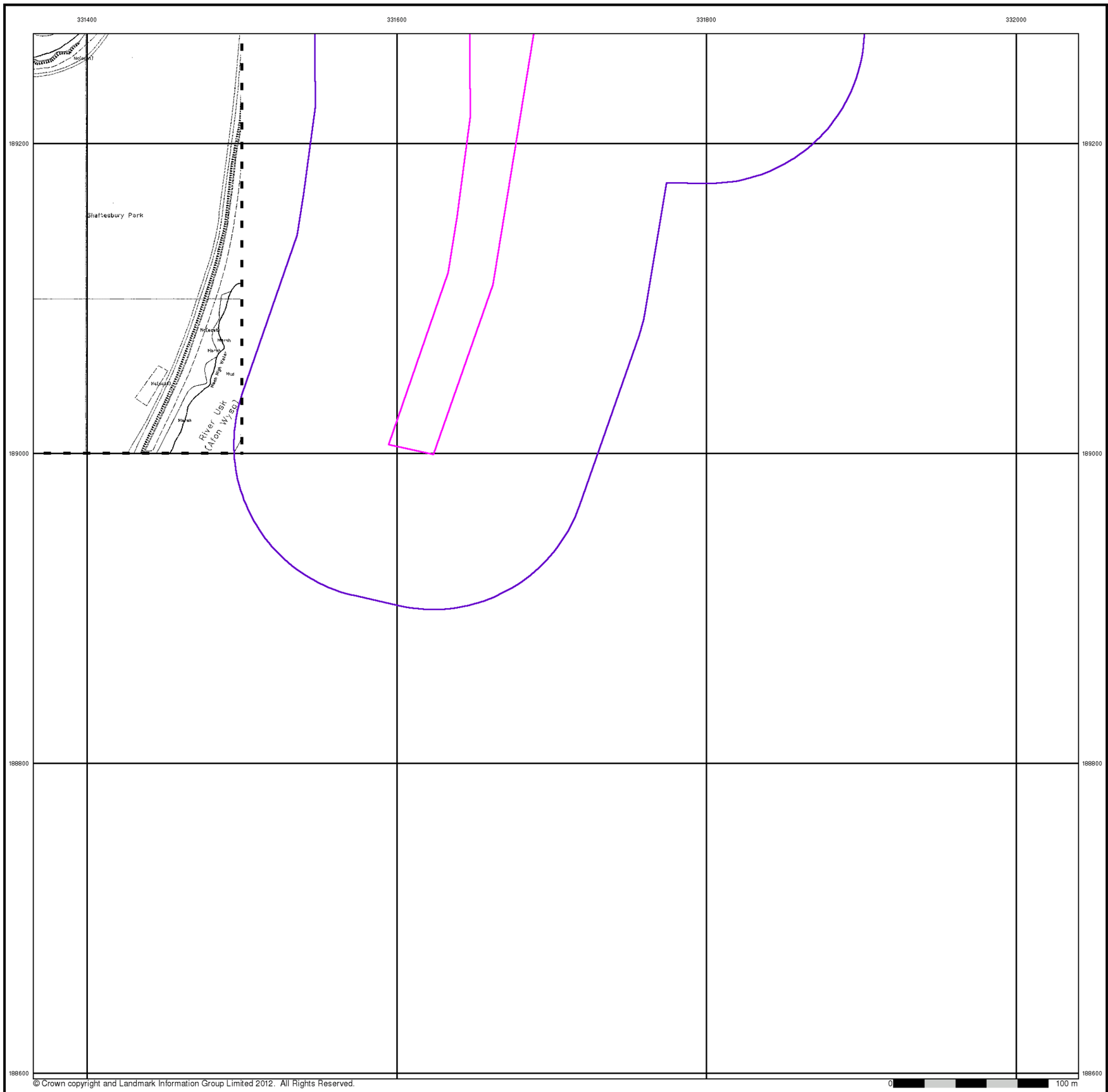


terrafirma

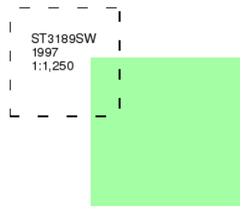
Large-Scale National Grid Data

Published 1997

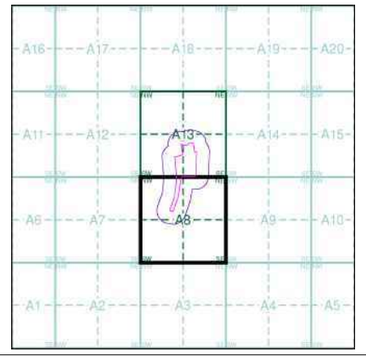
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A8



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Historical Mapping Legends

Ordnance Survey County Series 1:10,560

Gravel Pit
Sand Pit
Other Pits
Quarry
Shingle
Orchard
Osiers
Reeds
Marsh
Mixed Wood
Deciduous
Brushwood
Fir
Furze
Rough Pasture
Arrow denotes flow of water
Trigonometrical Station
Site of Antiquities
Bench Mark
Pump, Guide Post, Signal Post
Well, Spring, Boundary Post
285 Surface Level
Sketched Contour
Instrumental Contour
Main Roads
Fenced
Un-Fenced
Minor Roads
Fenced
Un-Fenced
Sunken Road
Raised Road
Road over Railway
Railway over River
Railway over Road
Level Crossing
Road over River or Canal
Road over Stream
Road over Stream
County Boundary (Geographical)
County & Civil Parish Boundary
Administrative County & Civil Parish Boundary
Co. Boro. Bdy. County Borough Boundary (England)
Co. Burgh Bdy. County Burgh Boundary (Scotland)
R.D. Bdy. Rural District Boundary
Civil Parish Boundary

Ordnance Survey Plan 1:10,000

Chalk Pit, Clay Pit or Quarry
Gravel Pit
Sand Pit
Disused Pit or Quarry
Refuse or Slag Heap
Lake, Loch or Pond
Dunes
Boulders
Coniferous Trees
Non-Coniferous Trees
Orchard
Scrub
Coppice
Bracken
Heath
Rough Grassland
Marsh
Reeds
Saltings
Building
Direction of Flow of Water
Shingle
Sand
Glasshouse
Pylon
Pylon
Electricity Transmission Line
Sloping Masonry
Cutting
Embankment
Standard Gauge Multiple Track
Road Under
Road Over
Level Crossing
Foot Bridge
Standard Gauge Single Track
Siding, Tramway or Mineral Line
Narrow Gauge
Geographical County
Administrative County, County Borough or County of City
Municipal Borough, Urban or Rural District, Burgh or District Council
Borough, Burgh or County Constituency
Shown only when not coincident with other boundaries
Civil Parish
Shown alternately when coincidence of boundaries occurs

BP, BS	Boundary Post or Stone	Pol Sta	Police Station
Ch	Church	PO	Post Office
CH	Club House	PC	Public Convenience
F E Sta	Fire Engine Station	PH	Public House
FB	Foot Bridge	SB	Signal Box
Fn	Fountain	Spr	Spring
GP	Guide Post	TCB	Telephone Call Box
MP	Mile Post	TCP	Telephone Call Post
MS	Mile Stone	W	Well

1:10,000 Raster Mapping

Gravel Pit
Refuse tip or slag heap
Rock
Rock (scattered)
Boulders
Boulders (scattered)
Shingle
Mud
Sand
Sand Pit
Slopes
Top of cliff
General detail
Underground detail
Overhead detail
Narrow gauge railway
Multi-track railway
Single track railway
County boundary (England only)
Civil, parish or community boundary
District, Unitary, Metropolitan, London Borough boundary
Constituency boundary
Area of wooded vegetation
Non-coniferous trees
Non-coniferous trees (scattered)
Coniferous trees
Coniferous trees (scattered)
Positioned tree
Orchard
Coppice or Osiers
Rough Grassland
Heath
Scrub
Marsh, Salt Marsh or Reeds
Water feature
Flow arrows
MHW(S) Mean high water (springs)
MLW(S) Mean low water (springs)
Telephone line (where shown)
Electricity transmission line (with poles)
BM 123.45 m Bench mark (where shown)
Triangulation station
Point feature (e.g. Guide Post or Mile Stone)
Pylon, flare stack or lighting tower
Site of (antiquity)
Glasshouse
General Building
Important Building

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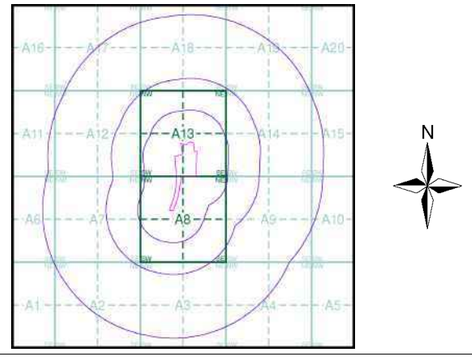
Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Monmouthshire	1:10,560	1886	3
Monmouthshire	1:10,560	1902	4
Monmouthshire	1:10,560	1922	5
Monmouthshire	1:10,560	1938	6
Historical Aerial Photography	1:10,560	1947	7
Historical Aerial Photography	1:10,560	1947	8
Monmouthshire	1:10,560	1954	9
Ordnance Survey Plan	1:10,000	1964 - 1965	10
Ordnance Survey Plan	1:10,000	1972 - 1973	11
Ordnance Survey Plan	1:10,000	1981 - 1983	12
Newport	1:10,000	1983	13
Ordnance Survey Plan	1:10,000	1987	14
10K Raster Mapping	1:10,000	2006	15
10K Raster Mapping	1:10,000	2012	16

Historical Map - Slice A



Order Details

Order Number: 41914630_1_1
Customer Ref: 12044
National Grid Reference: 331690, 189280
Slice: A
Site Area (Ha): 4.52
Search Buffer (m): 1000

Site Details

., Herbert Road, NEWPORT, Gwent, NP19 7BH

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Russian Military Mapping Legends

1:5,000 and 1:10,000 mapping

a. Not drawn to scale b. Drawn to scale

- Government and Administrative Buildings
- Military and Industrial Buildings
- Military and Communication Areas
- Subway Entrance
- Fireproof Building
- Prominent Fireproof Building
- Non-fireproof Building
- Non-fireproof Building (non-dwelling)
- Factory, mill, and flour mill, with chimneys
- Factory, mill, and flour mill, without chimneys
- Power Station, drawn to scale
- Hydroelectric Power Station
- Radio Station, drawn to scale
- Telephone Station, drawn to scale
- Abandoned Open-pit Mine or Quarry
- Open-pit Salt Mine
- Pit
- Oil Deposit or Well
- Oil Seepage
- Tailings Pile
- Fuel Storage Tanks
- Natural Gas Tank
- Bench Mark
- Drill Hole
- Burial Mound
- Triangulation Point on Burial Mound
- Single-track Railroad
- Double-track Railroad and Station Building
- Coniferous Forest
- Deciduous Forest
- Mixed Forest
- Lawns
- Citrus Orchard
- Wet Ground
- Scattered Vegetation

243,8 — Values for prominent elevations

186.0 — Numbers for spot elevations, depth soundings, contour lines, etc.

0,2 — Velocity of the current, width of river bed, depth of river

Fractional terms: length and capacity of bridges; depth of fords and condition of the river bottom; height of forest and the diameter of trees

Russian Alphabet (For reference and phonetic interpretation of map text)

А а (A)	З з (Z)	П п (P)	Ч ч (CH)
Б б (B)	И и (I)	Р р (R)	Ш ш (SH)
В в (V)	Й й (Y)	С с (S)	Щ щ (SHCH)
Г г (G)	К к (K)	Т т (T)	ъ (–)
Д д (D)	Л л (L)	У у (U)	ы (Y)
Е е (E)	М м (M)	Ф ф (F)	ь (')
Ё ё (YO)	Н н (N)	Х х (KH)	Э э (E)
Ж ж (ZH)	О о (O)	Ц ц (TS)	Ю ю (YU or IU)
			Я я (YA or IA)

1:25,000 mapping

a. Not drawn to scale b. Drawn to scale

- Government and Administrative Buildings
- Military and Industrial Buildings
- Military and Communication Areas
- Subway Entrance
- Partly Demolished Buildings
- Demolished Buildings
- Built-Up Area with Fireproof Buildings Predominant
- Built-Up Area with Non-Fireproof Buildings Predominant
- Individual Fireproof Building
- Prominent Industrial Building
- Individual Dwelling, Fireproof
- Ruins of an Individual Dwelling
- Factory or Mill Chimney
- Factory or Mill with Chimney
- Factory or Mill without Chimney
- Mine or Open Pit Mine
- Operating Shaft or Mine
- Non-Operating Shaft or Mine
- Salt Mine
- Tailings Pile
- Pit
- Stone Quarry
- Gas Pump or Service Station
- Fuel Storage or Natural Gas Tank
- Oil or Natural Gas Derrick
- Small Hydroelectric Power Station
- Power Station
- Transformer Station
- Cemetery
- Burial Mound (height in metres)
- Triangulation Point on Burial Mound
- Triangulation Point
- Bench Mark
- Bench Mark (monumented)
- Telegraph Office
- Telephone Station
- Radio Station
- Radio Tower
- Airfield or Seaplane Base
- Landing Strip
- Main Highway
- Highway under Construction
- Improved Dirt Road (former truck road)
- Double-track Railroad with First Class Station
- Dismantled Railroad
- Railroad Under Construction
- Shore Embankment
- River or Ditch with Embankment
- Direction and velocity of current
- Well
- Water Reservoir or Rain Water Pit
- Spring
- Isobath with value
- Heavy (Index) Contour Line
- Contour Line and Value
- Half Contour Line
- Spot Elevation Value
- Coniferous
- Deciduous
- Mixed
- Scrub

Key to Numbers on Mapping

ST38NW_Newport

No.	Description
15	Factory (Gas)
16	Factory (Gas)
21	Factory (Machinery)
23	Factory (Metals)
35	Factory (Non-Ferrous Metals)
40	Council/Government Buildings/Courts
44	Police Station/Headquarters
58	Post Office
59	Warehouses (Use Unknown)
63	Warehouses (Use Unknown) And Port Buildings
73	Railway Station

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Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Monmouthshire	1:10,560	1886	3
Monmouthshire	1:10,560	1902	4
Monmouthshire	1:10,560	1922	5
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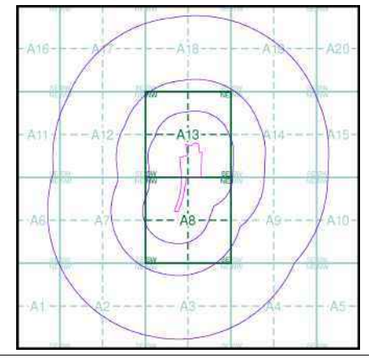
10K Raster Mapping	1:10,000	2006	15
10K Raster Mapping	1:10,000	2012	16

Russian Map - Slice A



Order Details

Order Number: 41914630_1_1
Customer Ref: 12044
National Grid Reference: 331690, 189280
Slice: A
Site Area (Ha): 4.52
Search Buffer (m): 1000

Site Details

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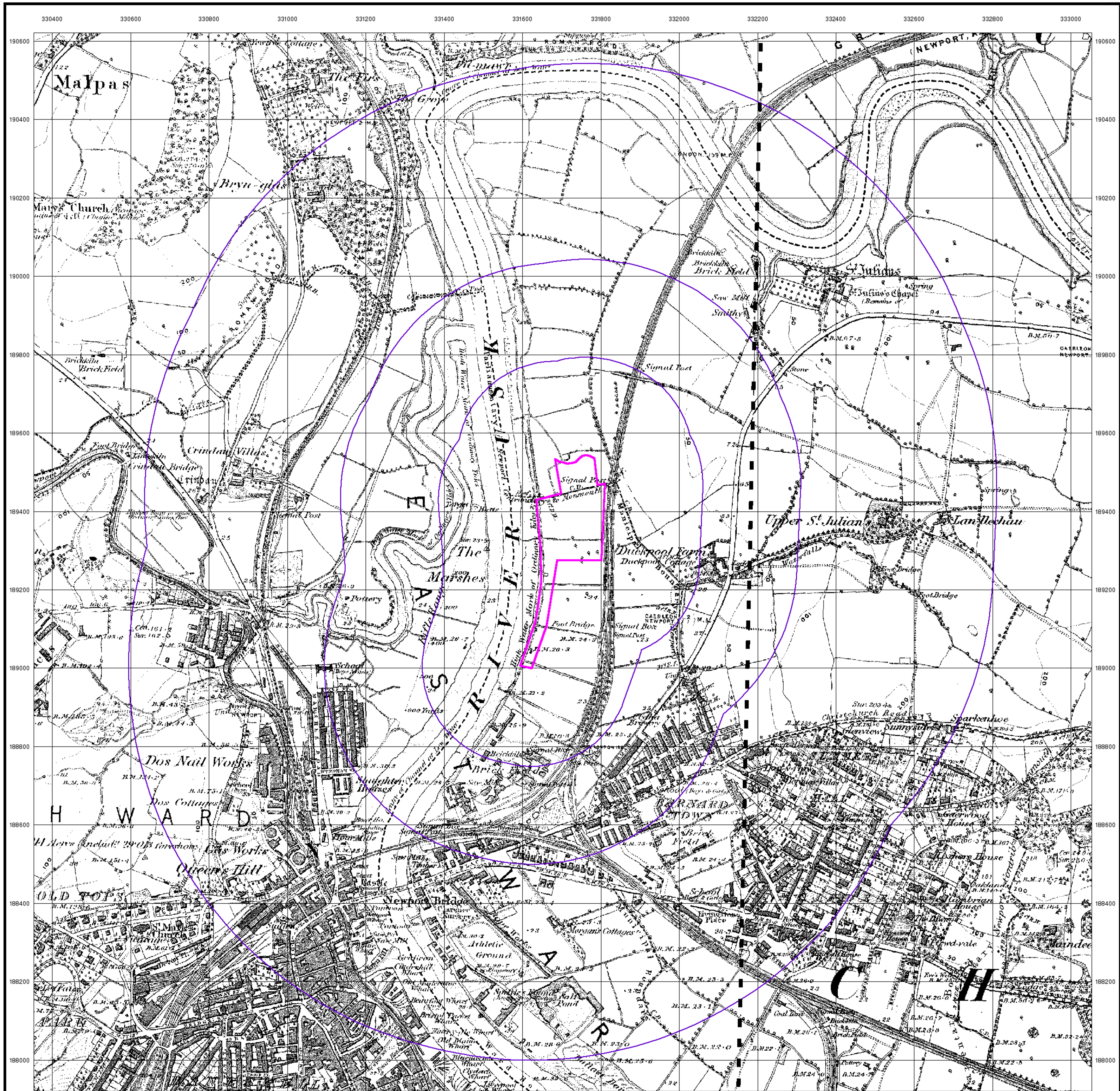

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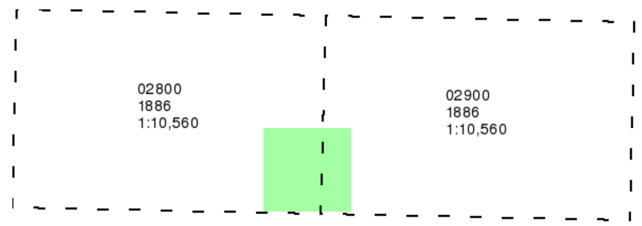
Monmouthshire

Published 1886

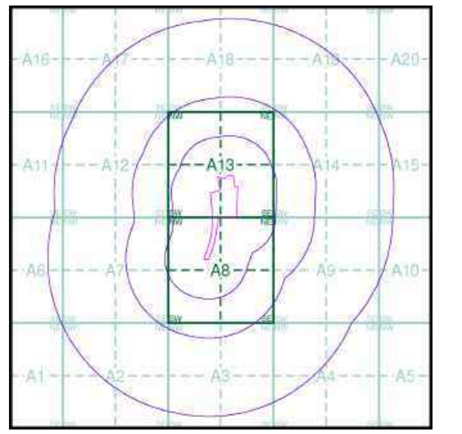
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



N

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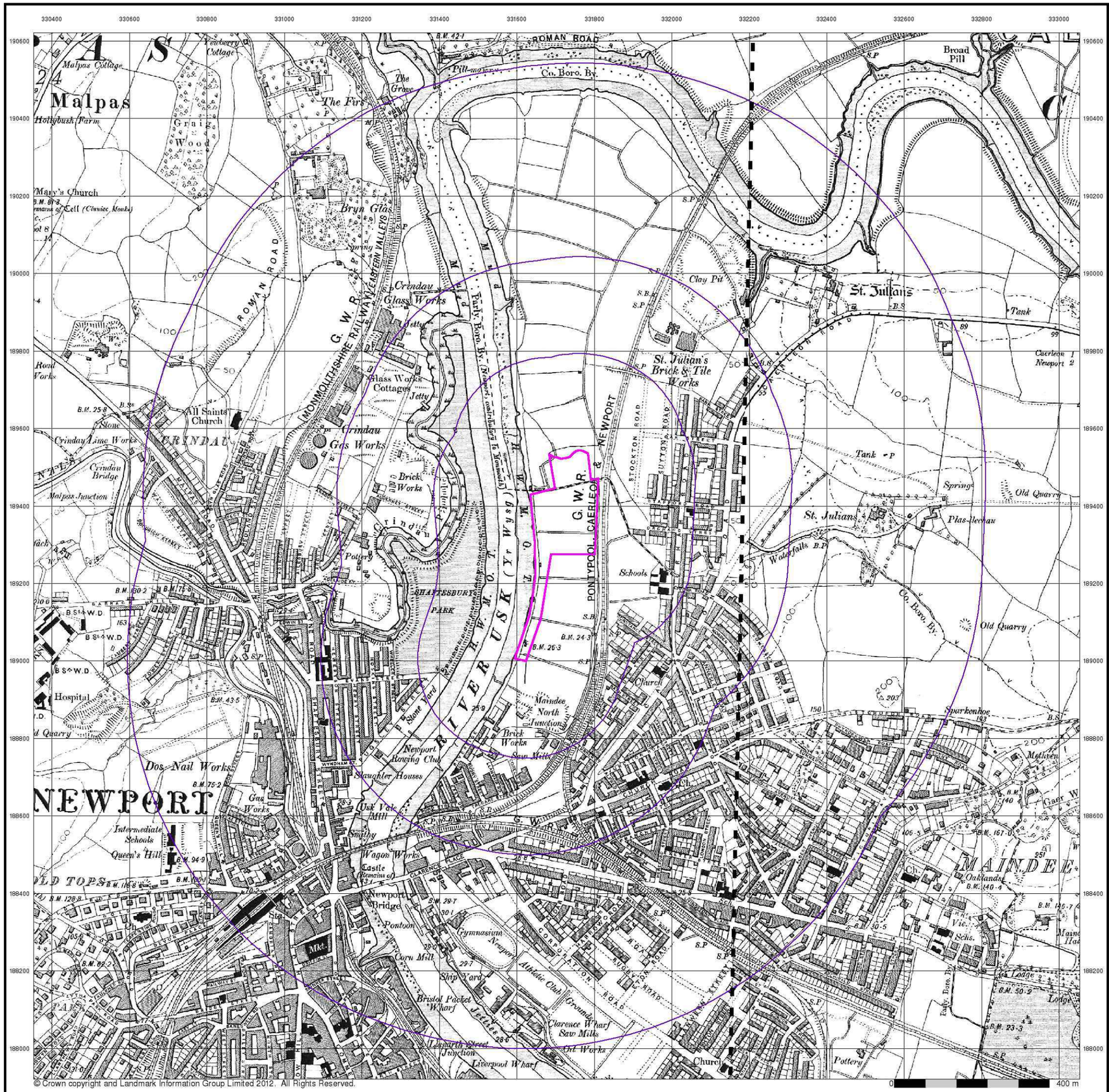

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Monmouthshire

Published 1902

Source map scale - 1:10,560

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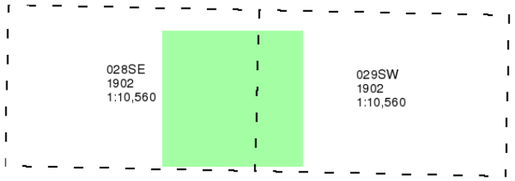
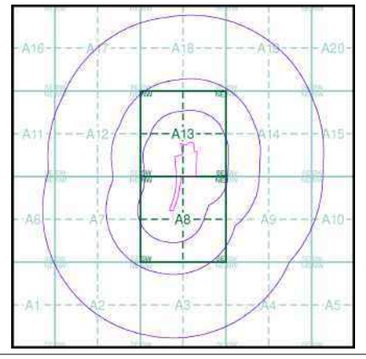


Historical Map - Slice A



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Monmouthshire

Published 1922

Source map scale - 1:10,560

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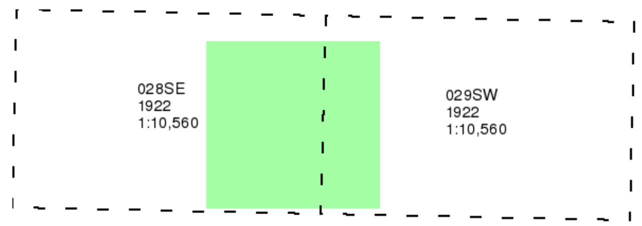
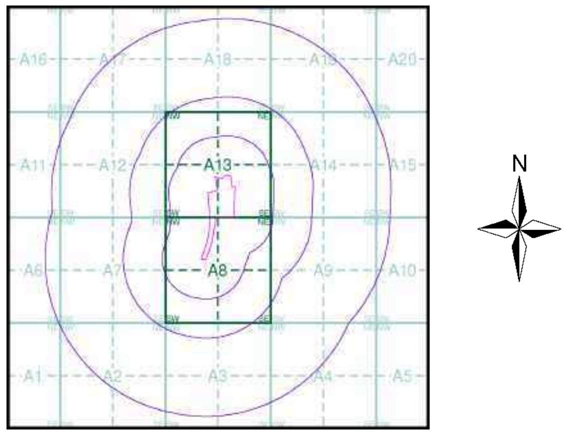
Map Name(s) and Date(s)



Historical Map - Slice A



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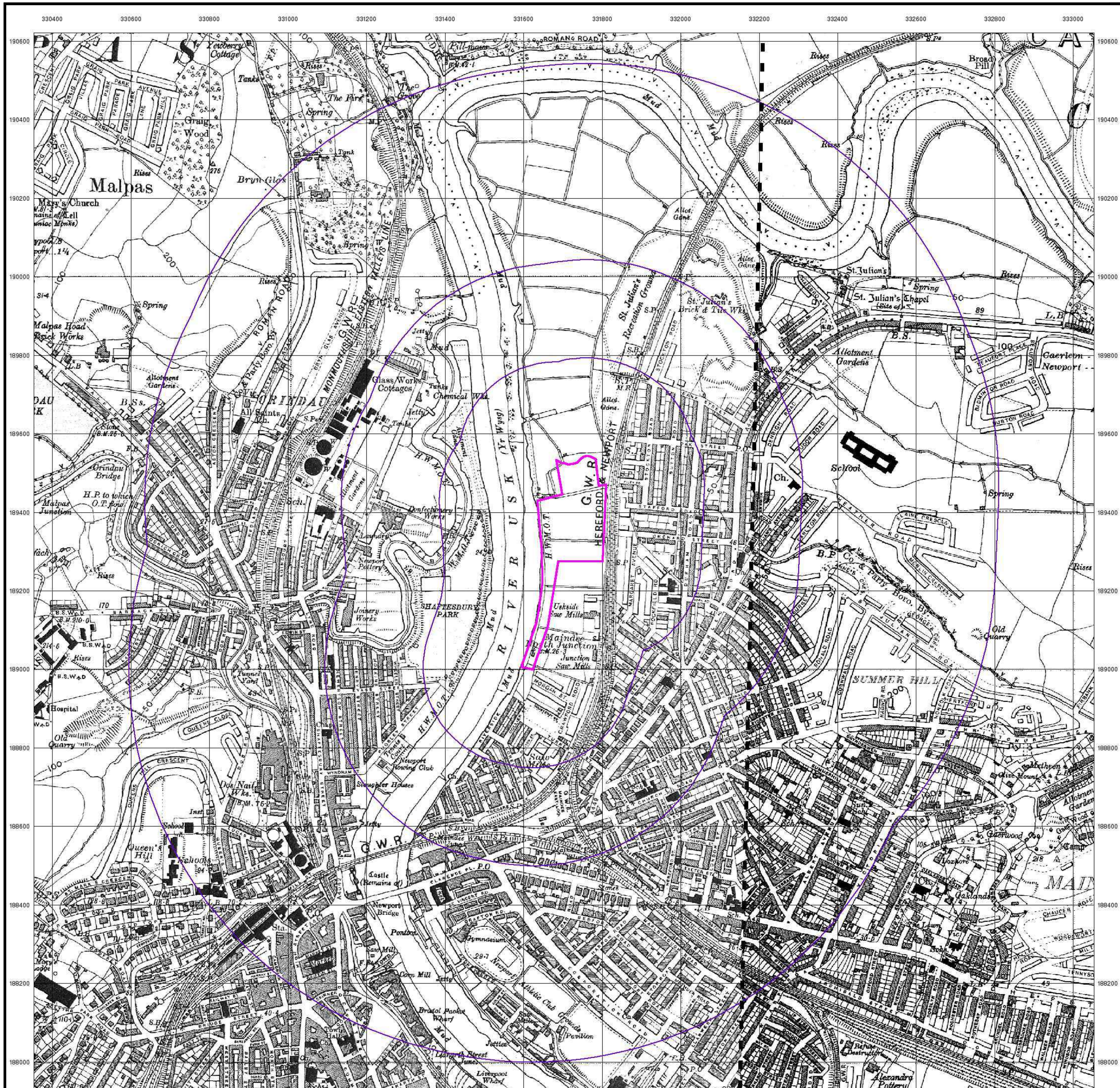

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Monmouthshire

Published 1938

Source map scale - 1:10,560

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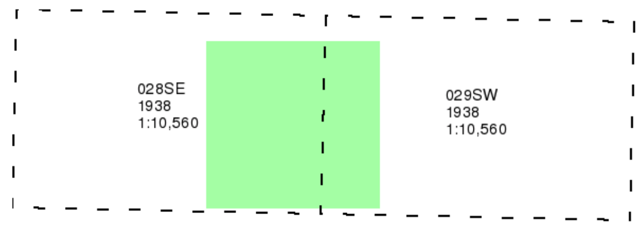
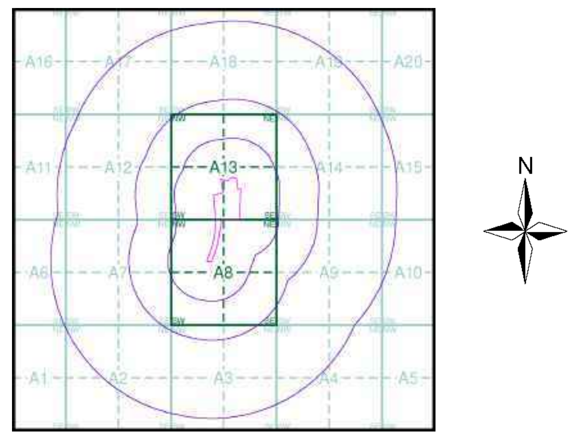


Historical Map - Slice A



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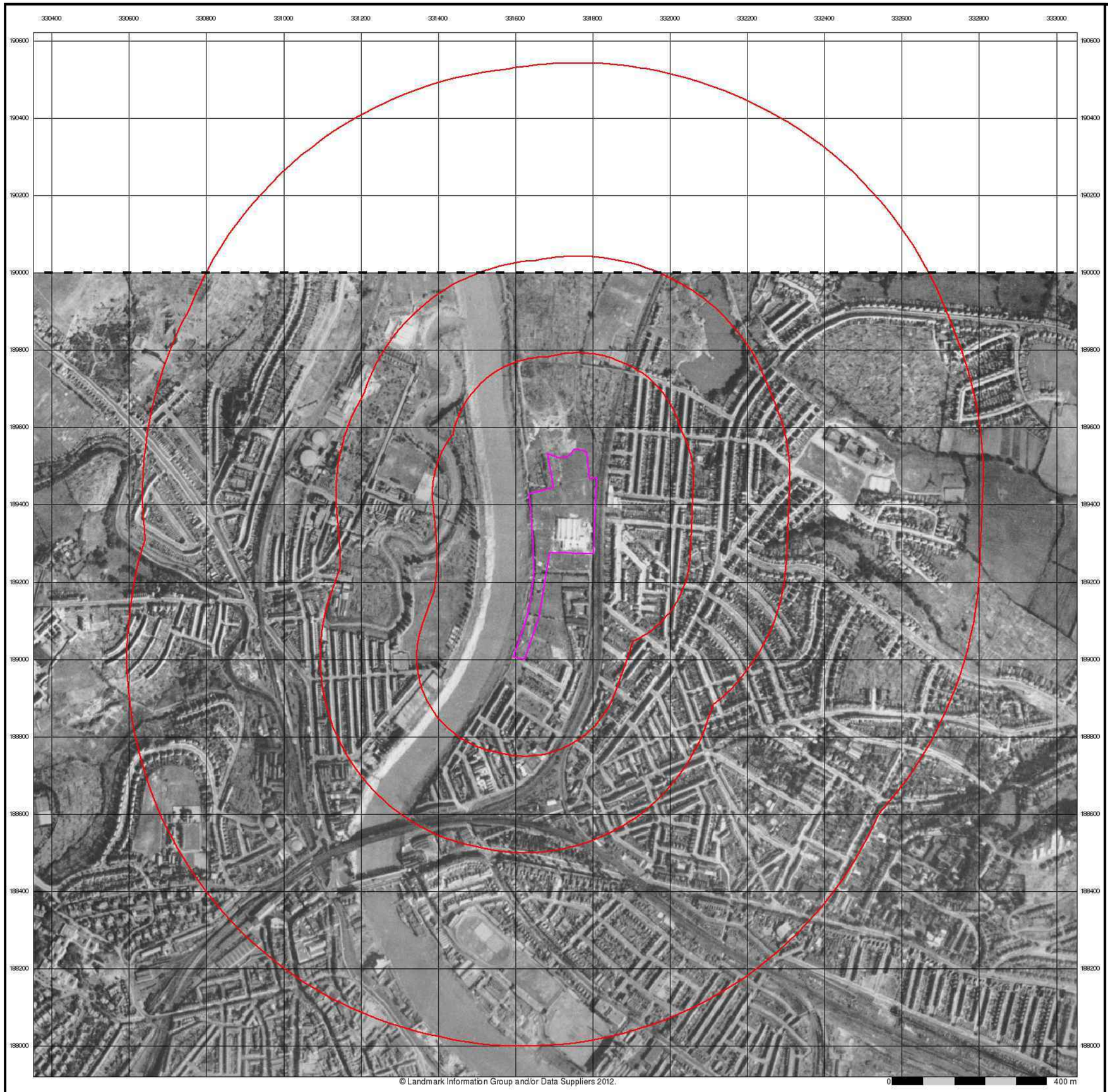

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Historical Aerial Photography

Published 1947

Source map scale - 1:10,560

The Historical Aerial Photos were produced by the Ordnance Survey at a scale of 1:1,250 and 1:10,560 from Air Force photography. They were produced between 1944 and 1951 as an interim measure, pending preparation of conventional mapping, due to post war resource shortages. New security measures in the 1950's meant that every photograph was re-checked for potentially unsafe information with security sites replaced by fake fields or clouds. The original editions were withdrawn and only later made available after a period of fifty years although due to the accuracy of the editing, without viewing both revisions it is not easy to spot the edits. Where available Landmark have included both revisions.

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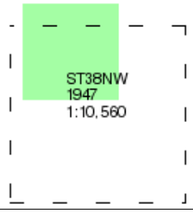
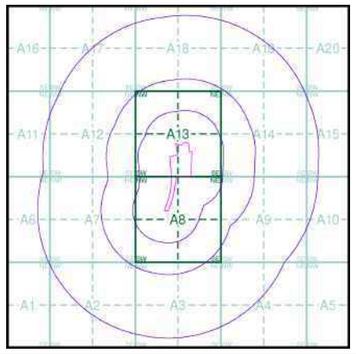
Map Name(s) and Date(s)



Historical Aerial Photography - Slice A



Order Details

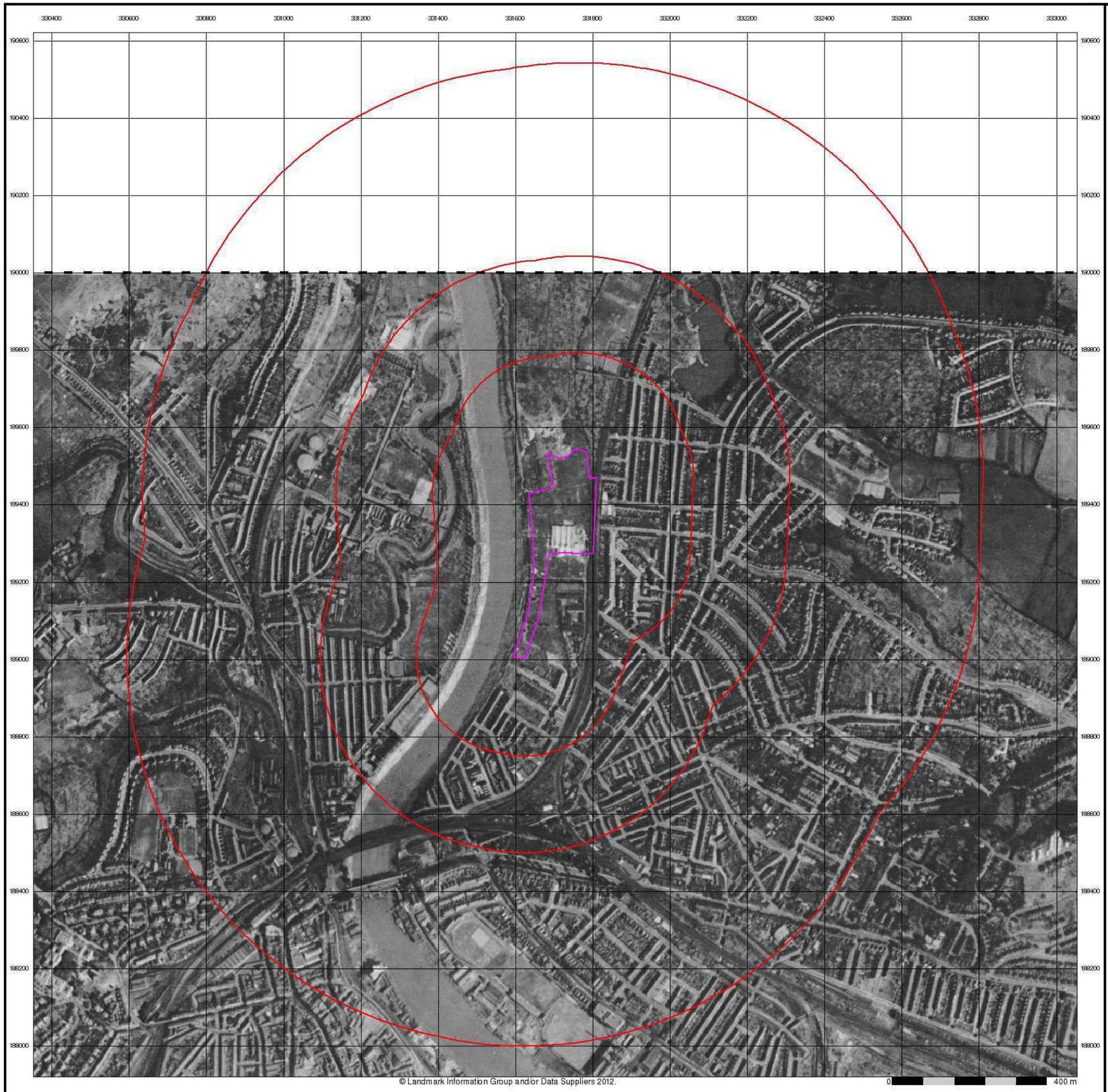
Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	1000

Site Details

., Herbert Road, NEWPORT, Gwent, NP19 7BH

Landmark Information Group

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



terrafirma

Historical Aerial Photography

Published 1947

Source map scale - 1:10,560

The Historical Aerial Photos were produced by the Ordnance Survey at a scale of 1:1,250 and 1:10,560 from Air Force photography. They were produced between 1944 and 1951 as an interim measure, pending preparation of conventional mapping, due to post war resource shortages. New security measures in the 1950's meant that every photograph was re-checked for potentially unsafe information with security sites replaced by fake fields or clouds. The original editions were withdrawn and only later made available after a period of fifty years although due to the accuracy of the editing, without viewing both revisions it is not easy to spot the edits. Where available Landmark have included both revisions.

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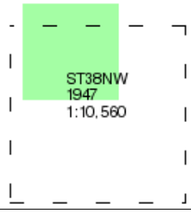
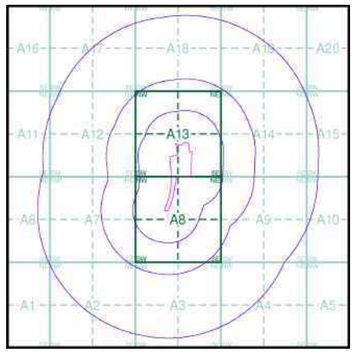
Map Name(s) and Date(s)



Historical Aerial Photography - Slice A



Order Details

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Slice:	A
Site Area (Ha):	4.52
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Monmouthshire

Published 1954

Source map scale - 1:10,560

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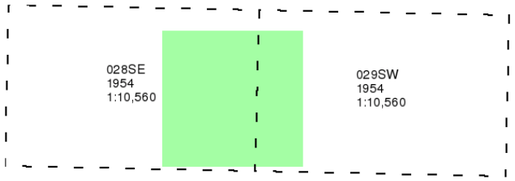
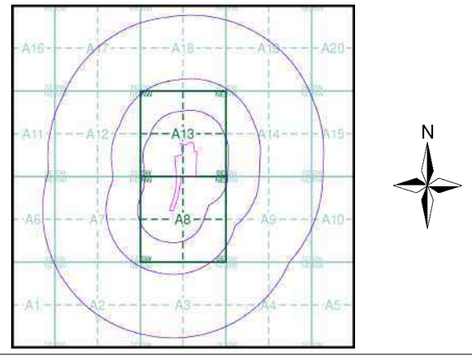
Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
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Site Details

., Herbert Road, NEWPORT, Gwent, NP19 7BH

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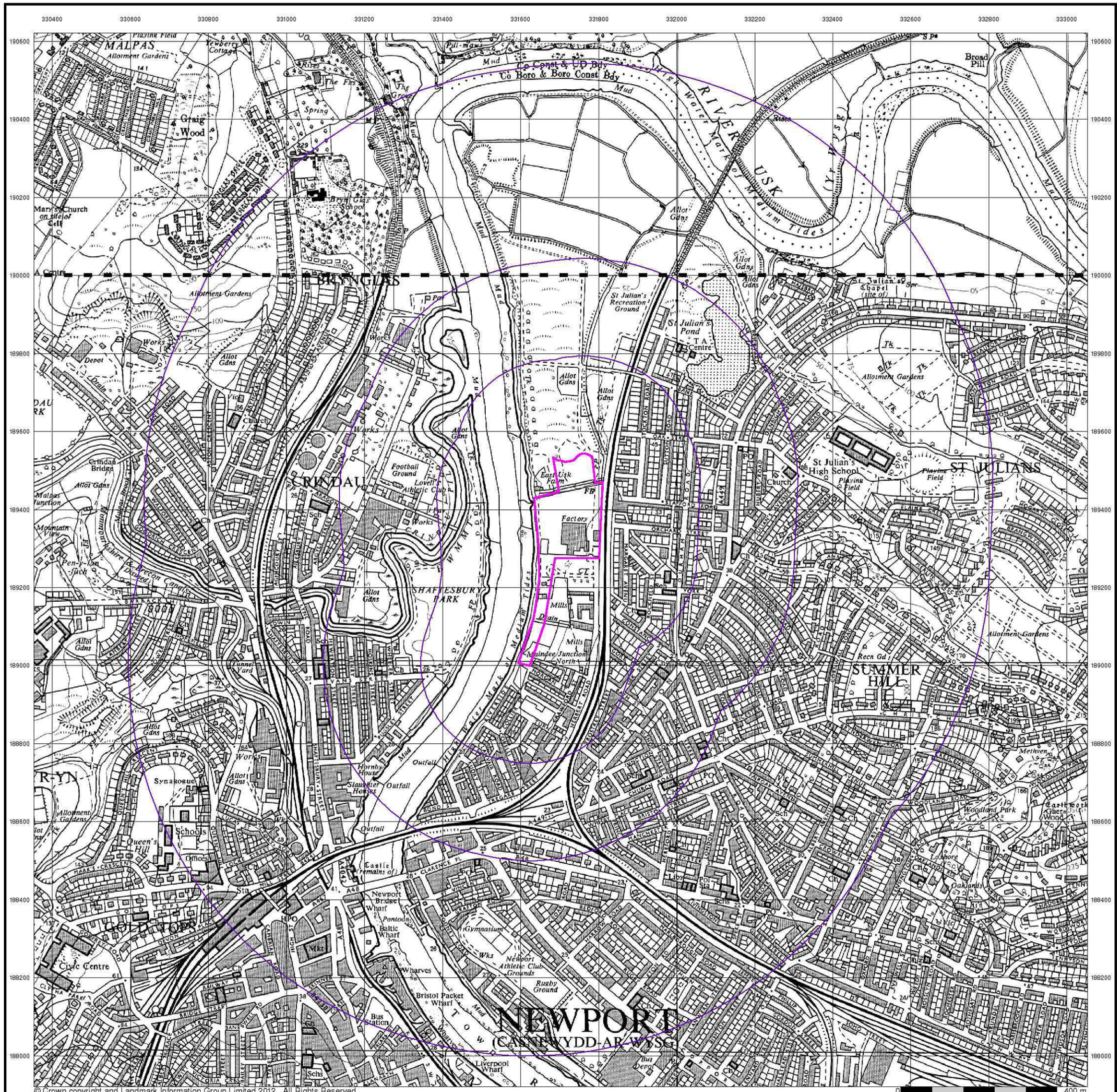

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Ordnance Survey Plan

Published 1964 - 1965

Source map scale - 1:10,000

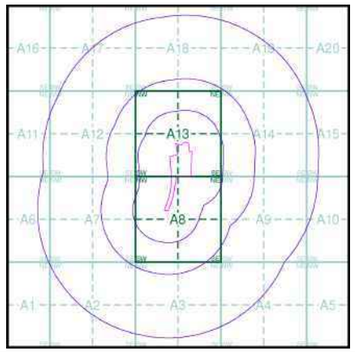
The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

ST39SW
1964
1:10,560

ST38NW
1965
1:10,560

Historical Map - Slice A



Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
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., Herbert Road, NEWPORT, Gwent, NP19 7BH

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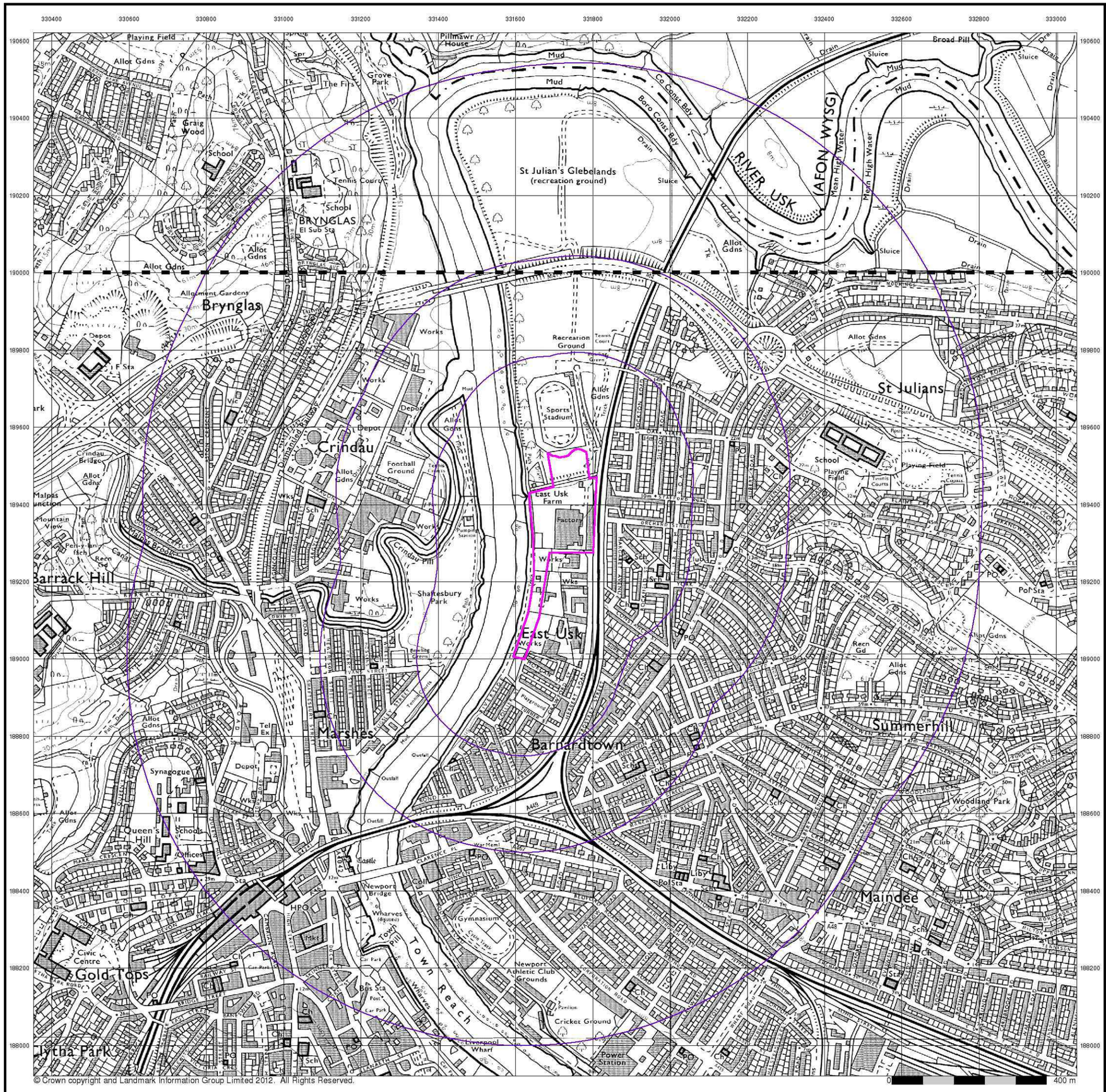

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Ordnance Survey Plan

Published 1972 - 1973

Source map scale - 1:10,000

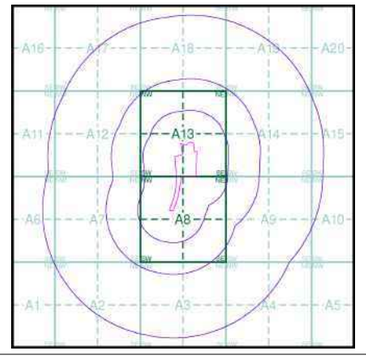
The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

ST39SW
1972
1:10,000

ST38NW
1973
1:10,000

Historical Map - Slice A



Order Details

Order Number:	41914630_1_1
Customer Ref:	12044
National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
Search Buffer (m):	1000

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Ordnance Survey Plan

Published 1981 - 1983

Source map scale - 1:10,000

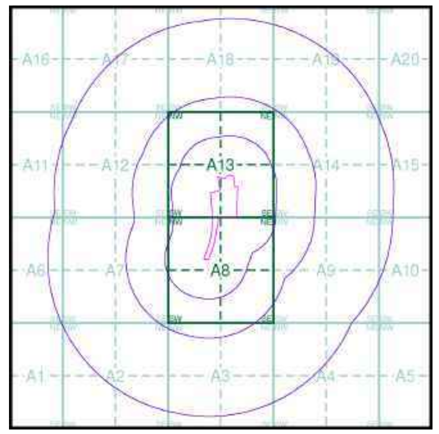
The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

ST39SW
1983
1:10,000

ST38NW
1981
1:10,000

Historical Map - Slice A



N

Order Details

Order Number: 41914630_1_1
Customer Ref: 12044
National Grid Reference: 331690, 189280
Slice: A
Site Area (Ha): 4.52
Search Buffer (m): 1000

Site Details

., Herbert Road, NEWPORT, Gwent, NP19 7BH

Landmark Information Group

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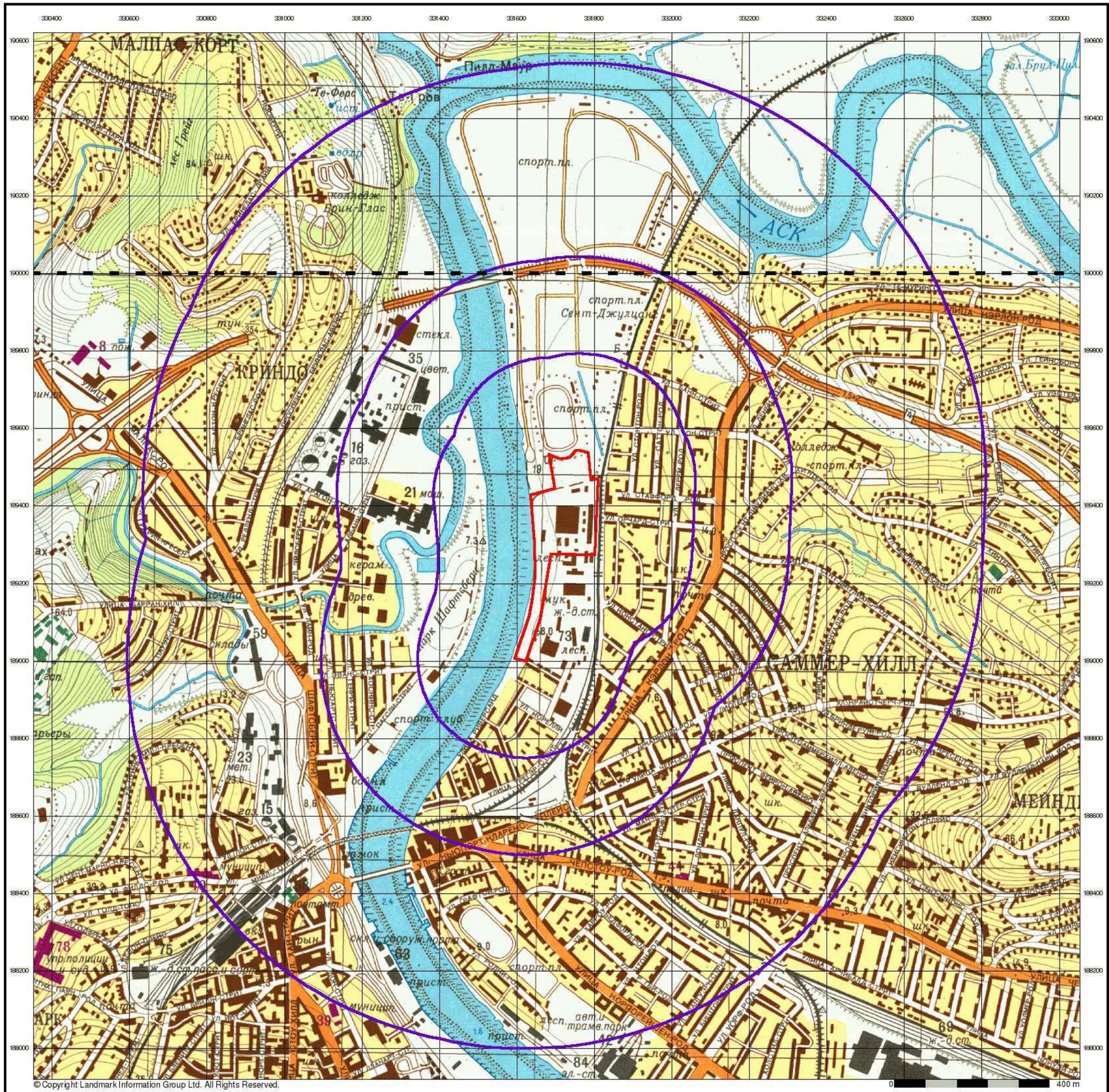
Web: www.envirocheck.co.uk



terrafirma

Newport

Published 1983

Source map scale - 1:10,000

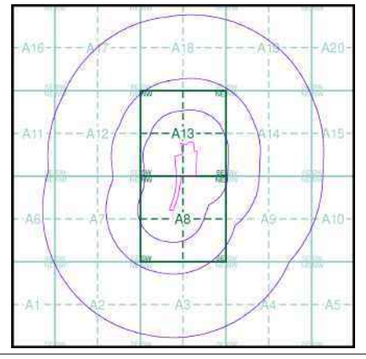
These maps were produced by the Russian military during the Cold War between 1950 and 1997, and cover 103 towns and cities throughout the U.K. The maps are produced at 1:25,000, 1:10,000 and 1:5,000 scale, and show detailed land use, with colour-coded areas for development, green areas, and non-developed areas. Buildings are coloured black and important building uses (such as hospitals, post offices, factories etc.) are numbered, with a numbered key describing their use.
They were produced by the Russians for the benefit of navigation, as well as strategic military sites and transport hubs, for use if they were to have invaded the U.K. The detailed information provided indicates that the areas were surveyed using land-based personnel, on the ground, in the cities that are mapped.

Map Name(s) and Date(s)

ST39SW
1983
1:10,000

ST38NW
1983
1:10,000

Russian Map - Slice A



Order Details

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Site Area (Ha):	4.52
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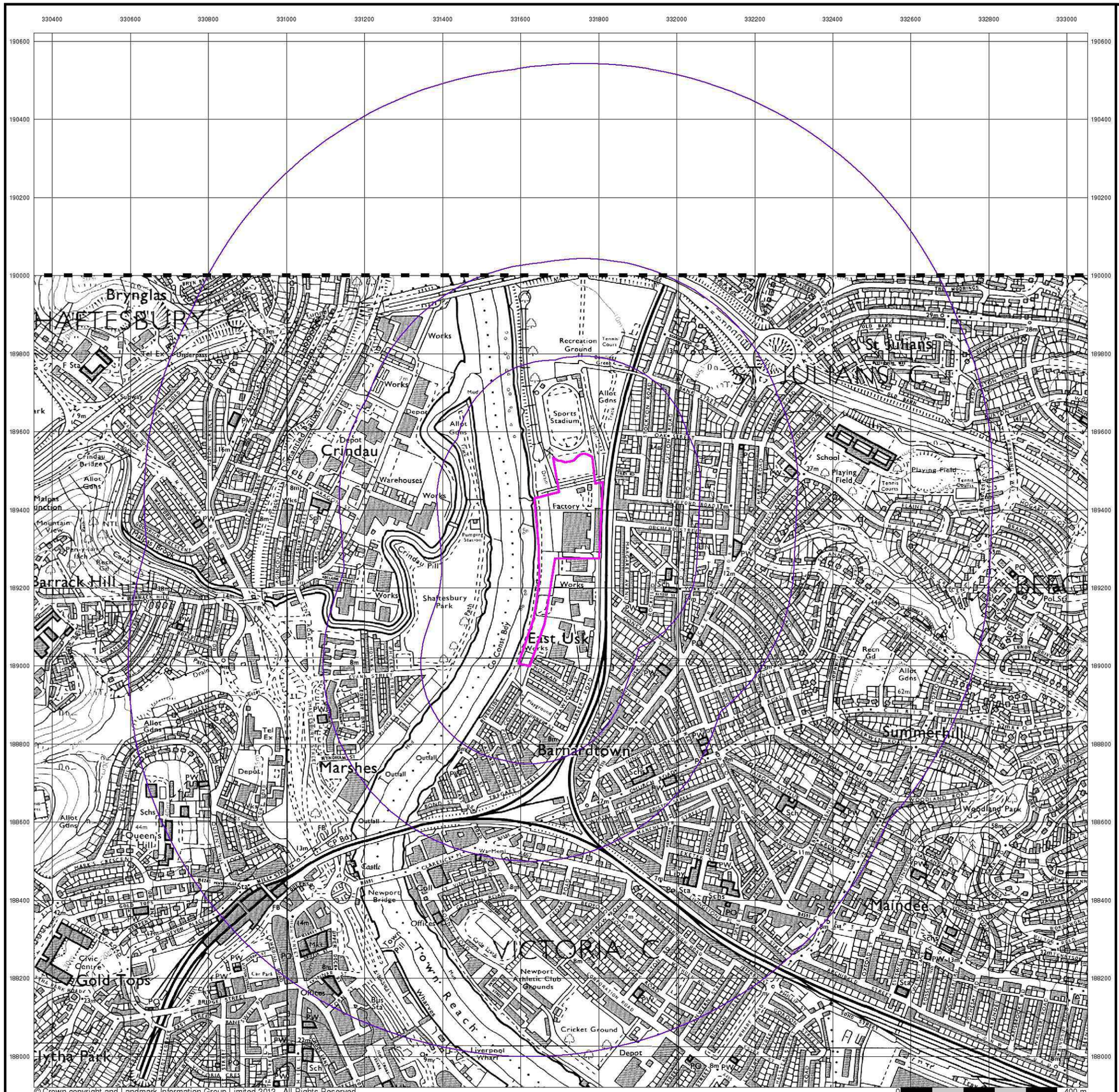

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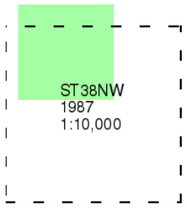
Ordnance Survey Plan

Published 1987

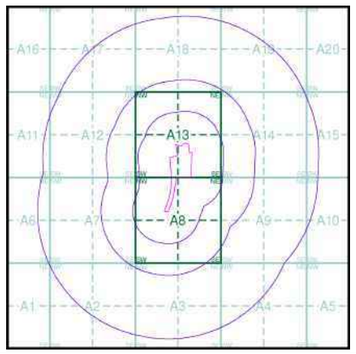
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

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Site Area (Ha):	4.52
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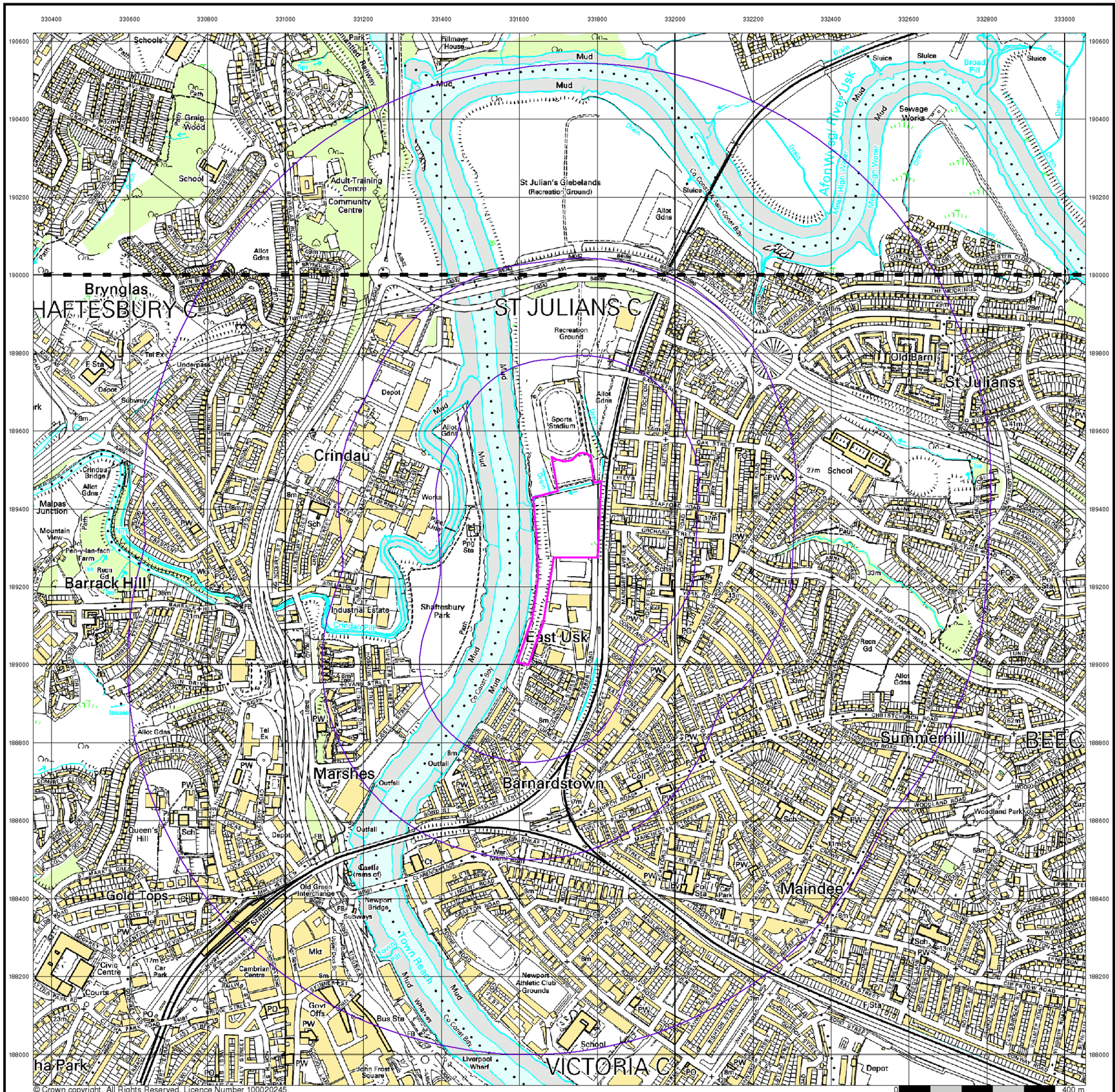

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10k Raster Mapping

Published 2006

Source map scale - 1:10,000

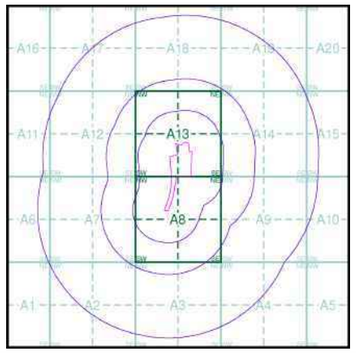
The historical maps shown were produced from the Ordnance Survey`s 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)

ST39SW
2006
1:10,000

ST38NW
2006
1:10,000

Historical Map - Slice A



Order Details

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National Grid Reference:	331690, 189280
Slice:	A
Site Area (Ha):	4.52
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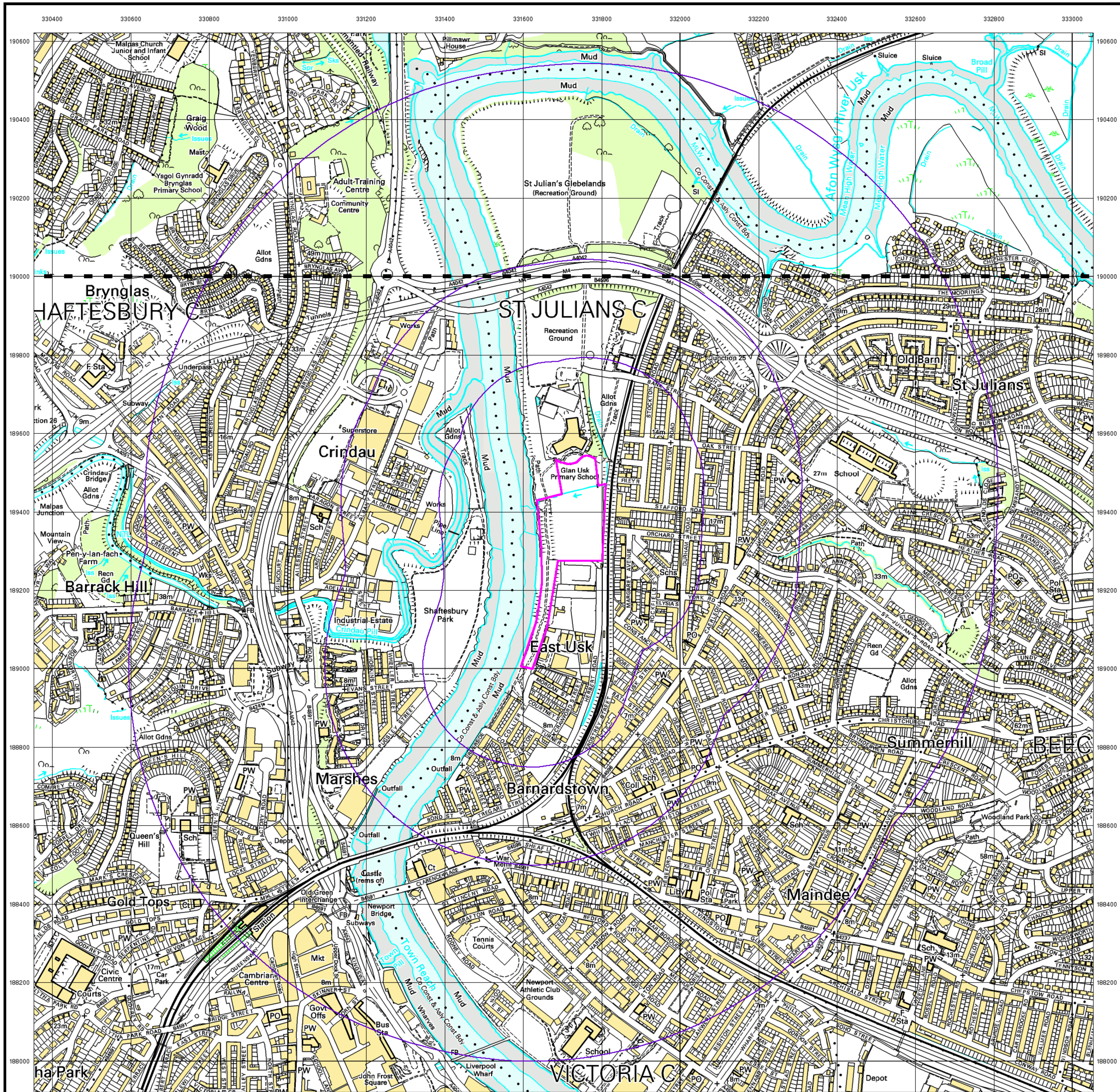

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10k Raster Mapping

Published 2012

Source map scale - 1:10,000

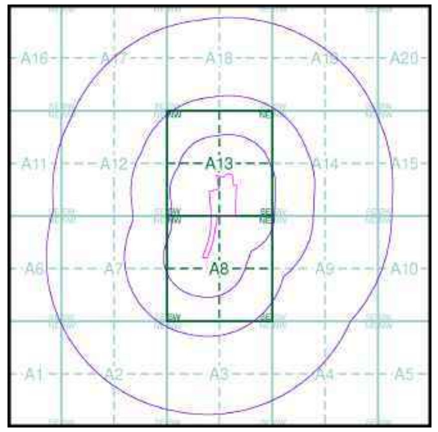
The historical maps shown were produced from the Ordnance Survey`s 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

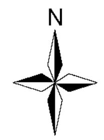
Map Name(s) and Date(s)

ST39SW
2012
1:10,000

ST38NW
2012
1:10,000

Historical Map - Slice A





Order Details

Order Number: 41914630_1_1
Customer Ref: 12044
National Grid Reference: 331690, 189280
Slice: A
Site Area (Ha): 4.52
Search Buffer (m): 1000

Site Details

., Herbert Road, NEWPORT, Gwent, NP19 7BH

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

ANNEX B
Radon Report

Groundsure Radon Check

Address: HERBERT ROAD DEVELOPMENT SITE PHASE 2, COURTNEY STREET, NEWPORT, NP19 7AY

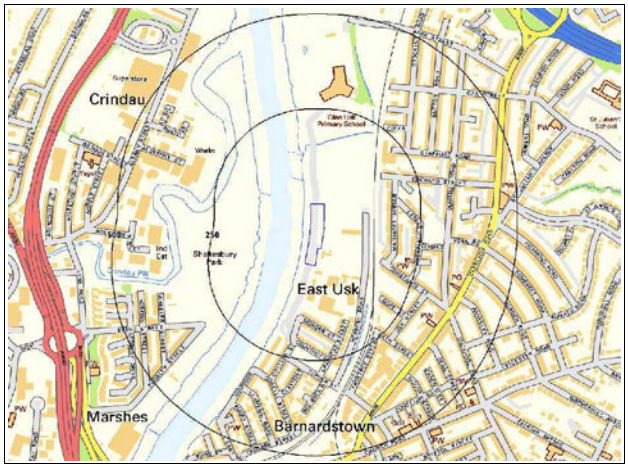
Date: 10 Jul 2018

Groundsure Reference: GS-5221500

Your Reference: 12032

Grid Reference: 331670,189210

Client: TerraFirma Wales



Brought to you by Groundsure

If you would like any further assistance regarding this report then please contact Groundsure on (T) 08444 159 000, email: info@groundsure.com

1. Residential Radon Potential Result

1.1 Is the property in a Radon Affected Area?

The information in this section provides an answer to one of the standard legal enquiries on house purchase in England and Wales, known as *CON29 standard Enquiry of Local Authority; 3.13 Radon Gas: Location of the Property in a Radon Affected Area*.

Question: Is the property in a Radon Affected Area as defined by Public Health England(PHE) and if so what percentage of homes are above the Action Level?

Answer: The property is in a Radon Affected Area, as between 1 and 3% of properties are above the Action Level.

1.2 Are radon protective measures required?

The information in this section will detail the level of protection required for new dwellings under as described in the latest Building Research Establishment guidance on radon protective measures for new dwellings. This may include extensions to the property.

Question: Is the property in an area where radon protection measures are required for new properties or extensions to existing ones as described in either publications BR211 (England and Wales) or BR376 (Scotland) by the Building Research Establishment?

Answer: No radon protective measures are necessary.

1.3 Radon Guidance

Radon is a colourless, odourless radioactive gas which is present in all areas of the United Kingdom, usually at levels that pose a negligible risk to homebuyers. However, in some areas levels of radon are much higher than in others, and in these cases it can pose a health risk. The data supplied by the Public Health England (PHE) and the British Geological Survey (BGS) is not able to determine exact Radon levels, as this information can only be obtained through site-specific, in-situ testing. As 1-3% of properties in the area may be radon affected the PHE recommend carrying out a site-specific radon assessment. This costs £49.80 including VAT and the results are confidential to the client. Please contact the PHE (01235 831 600) for further information and advice.

If planning on building an extension or a new build property, no radon protective measures are required.

1.4 Further details on radon

Radon is a naturally occurring radioactive gas, which enters buildings from the ground. Outdoors, it is diluted to very low levels. However, in some cases the radon level indoors can build up to high concentrations. In such cases, it does pose a serious risk to health. Exposure to high concentrations increases the risk of lung cancer. Public Health England recommends that radon levels should be reduced in homes where the annual average is at or above 200 becquerels per cubic metre (200 Bq m^{-3}). This is termed the Action Level. Public Health England defines Radon Affected Areas as those with 1% chance or more of a house having a radon concentration at or above the Action Level of 200 Bq m^{-3}.

The joint PHE-BGS digital Radon Potential Dataset used in this report provides the current definitive map of Radon Affected Areas in England and Wales.

Indoor radon levels can usually be substantially reduced at a cost comparable to many home improvements, such as replacing carpets. Details of methods of reducing radon levels are given on the Building Research Establishment Website. http://www.bre.co.uk/radon/index.html

2. Contact Details

Groundsure Helpline
Telephone: 08444 159 000
info@groundsure.com

Local Authority - Newport City Council. Address: Civic Centre, Newport, South Wales, NP20 4UR. Web: www.newport.gov.uk. Tel: 01633 656656

British Geological Survey Enquiries
Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143. Fax: 0115 936 3276.
Email: enquiries@bgs.ac.uk
Web: www.bgs.ac.uk
BGS Geological Hazards Reports and general geological enquiries

Public Health England
Public information access office, Public Health England
Wellington House, 133-155 Waterloo Road,
London, SE1 8UG
https://www.gov.uk/government/organisations/public-health-england
Email: enquiries@phe.gov.uk

Ordnance Survey
Adanac Drive, Southampton
SO16 0AS
Tel: 08456 050505

CoPSO
29 Harley Street, London W1G 9QR
Tel: 020 7927 6836
(www.copso.org.uk)

This report is produced by Groundsure Ltd, whose correspondence address is Groundsure Ltd, Sovereign House, Church Street, Brighton, BN1 1UJ (Tel: 08444 159 000, Fax: 01273 763569, Email: info@groundsure.com). Groundsure's registered address is Greater London House, Hampstead Road, London NW1 7EJ. Registration Number: 3421028. VAT Number 486 4004 42.

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·sets out minimum standards which firms compiling and selling search reports have to meet

·promotes the best practice and quality standards within the industry for the benefit of consumers and property professionals

·enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

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Firms which subscribe to the Search Code will:

·display the Search Code logo prominently on their search reports

·act with integrity and carry out work with due skill, care and diligence

·at all times maintain adequate and appropriate insurance to protect consumers

·conduct business in an honest, fair and professional manner

·handle complaints speedily and fairly

·ensure that products and services comply with industry registration rules and standards and relevant laws

·monitor their compliance with the Code

COMPLAINTS

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if they find that you have suffered actual loss as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs Contact Details:

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Website: www.tpos.co.uk
Email: admin@tpos.co.uk
You can get more information about the PCCB from www.propertycodes.org.uk.

PLEASE ASK YOUR SEARCH PROVIDER IF YOU WOULD LIKE A COPY OF THE SEARCH CODE

COMPLAINTS PROCEDURE

If you want to make a complaint, we will:

·Acknowledge it within 5 working days of receipt.
·Normally deal with it fully and provide a final response, in writing, within 20 working days of receipt.
·Keep you informed by letter, telephone or e-mail, as you prefer, if we need more time.
·Provide a final response, in writing, at the latest within 40 working days of receipt.
·Liaise, at your request, with anyone acting formally on your behalf.

Complaints should be sent to:Groundsure Ltd, Sovereign House, Church Street, Brighton, BN1 1UJ. Tel: 08444 159 000. Email: info@groundsure.com
If you are not satisfied with our final response, or if we exceed the response timescales, you may refer the complaint to The Property Ombudsman scheme (TPOs): Tel: 01722 333306, E-mail: admin@tpos.co.uk.
We will co-operate fully with the Ombudsman during an investigation and comply with their final decision.

3. Standard Terms and Conditions

Groundsure's Terms and Conditions can be viewed online at this link:
https://www.groundsure.com/terms-and-conditions-may25-2018

ANNEX C
Risk Assessment Definitions

Risk Assessment Definitions

Environmental risk assessment evaluates the risk to receptors via an analysis of the 'source-pathway-receptor' linkage.

(1) A **CONTAMINANT** (hazard) - a substance that is in, on or under the land and has the potential to cause harm or to cause pollution of controlled waters

(2) A **RECEPTOR** (target) - something which could be adversely affected by a contaminant

(3) A **PATHWAY** - a route or means which either allows the contaminant to cause significant harm to that receptor, or that there is a significant possibility of such harm being caused to the receptor, or that pollution of controlled waters is being or likely to be caused.

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

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

A 'Hazard' is defined as '*a property or situation that in particular circumstances could lead to harm'.*

The classification of consequences and probability and determining the risk category are defined in the following sections.

Table 1 Classification of Consequence

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

Table 2 Classification of Probability	
Classification	**Definition**
High	• There is a complete pollution linkage and an event appears very likely to occur in the short term and is inevitable in the long term. • Evidence of harm to the receptor
Medium	• There is a complete pollution linkage which means that is it probable that an event will occur • The event is not inevitable but possible in short term and likely in the long term
Low	• There is a complete pollution linkage and circumstances are possible under which an event could occur • It is not certain that an event will occur in the long term, and it is less likely to occur in the short term
Negligible	• There is a complete pollution linkage but circumstances are such that it is improbable that an event would occur even in the long term

By comparing the consequences of a risk and the probability of the risk of a pollution linkage, the likely risk category can be determined as shown in **Table 3** below.

Table 3 Risk Assessment Matrix					
Increasing acceptability →		**Consequence**			
		Severe	**Medium**	**Mild**	**Negligible**
Probability	**High**	High	High	Medium / Low	Near zero
	Medium	High	Medium	Low	Near zero
	Low	High / medium	Medium / Low	Low	Near zero
	Negligible	High / medium / Low	Medium / Low	Low	Near zero

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

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

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

Near Zero Risk
There is a very low risk of harm to the receptor. In the event of harm being realised the harm is

ANNEX D
Trial Pit Logs

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Trial Pit No: TP1
Sheet 1 of 1

Project Name: Hebert Road (Phase 2)	Project No: 12032-P2	Co-ords: - Level:	Date: 22/06/2018
Location: Newport		Dimensions: Depth 1.70	Scale: 1:25
Client: Engie			Logged:

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.20			MADE GROUND: Dense grey SAND and fine to coarse angular GRAVEL
				0.50			MADE GROUND: Dense red brown and dark grey SAND and fine to coarse angular GRAVEL
				0.70			Medium dense brown SAND and fine to coarse angular GRAVEL. Fragments of glass, brick, china, red tile, concrete, ceramic tile.
							MADE GROUND: Soft to firm dark grey brown gravelly CLAY. Fragments of china, metal, plastic, red tile. Cobble of stone and concrete.
				1.70			End of Pit at 1.700m

Stability:

Remarks:

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Trial Pit No: TP2
Sheet 1 of 1

Project Name: Hebert Road (Phase 2)	Project No: 12032-P2	Co-ords: - Level:	Date: 22/06/2018
Location: Newport		Dimensions: Depth 1.20	Scale: 1:25
Client: Engie			Logged:

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND: Dense grey brown SAND and fine to coarse angular GRAVEL. Gravel to cobble size fragments of concrete and breeze block. Occasional plastic.
				0.60			MADE GROUND: Firm red brown gravelly CLAY with grey green inclusions
				1.20			End of Pit at 1.200m

Stability:

Remarks:

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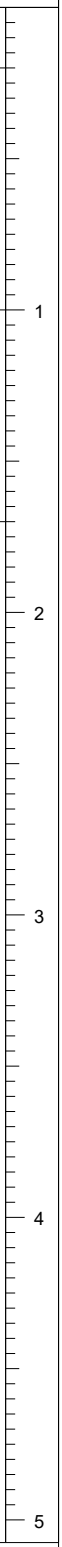
Trial Pit No: TP3
Sheet 1 of 1

Project Name: Hebert Road (Phase 2)	Project No: 12032-P2	Co-ords: - Level:	Date: 22/06/2018
Location: Newport		Dimensions: Depth 1.70	Scale: 1:25
Client: Engie			Logged:

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.20			MADE GROUND: Medium dense grey SAND and fine to coarse angular GRAVEL
							MADE GROUND: Stiff red brown gravelly CLAY
				1.00			MADE GROUND: Soft dark grey brown sandy gravelly CLAY. Fragments of brick, tile, plastic, concrete and timber.
				1.70			End of Pit at 1.700m



Stability:

Remarks:

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Trial Pit No: TP4
Sheet 1 of 1

Project Name: Hebert Road (Phase 2)	Project No: 12032-P2	Co-ords: - Level:	Date: 22/06/2018
Location: Newport		Dimensions: Depth 1.70	Scale: 1:25
Client: Engie			Logged:

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				1.70			MADE GROUND: Soft to firm grey brown and red brown gravelly cobbly CLAY. Fragments of glass, brick, concrete and rare slag. Concrete plinth.
							End of Pit at 1.700m

1
2
3
4
5

Stability:

Remarks:

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Trial Pit No: TP5
Sheet 1 of 1

Project Name: Hebert Road (Phase 2)	Project No: 12032-P2	Co-ords: - Level:	Date: 22/06/2018
Location: Newport		Dimensions: Depth 1.70	Scale: 1:25
Client: Engie			Logged:

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.30			MADE GROUND: Dense grey brown SAND and fine to coarse angular GRAVEL and COBBLE of stone, brick and concrete (Building Rubble)
							MADE GROUND: Firm red brown gravelly CLAY
				1.70			End of Pit at 1.700m

Stability:

Remarks:

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Trial Pit No: TP6
Sheet 1 of 1

Project Name: Hebert Road (Phase 2)	Project No: 12032-P2	Co-ords: - Level:	Date: 22/06/2018
Location: Newport		Dimensions: Depth 1.70	Scale: 1:25
Client: Engie			Logged:

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							MADE GROUND: Dense grey brown sandy very gravelly cobbly CLAY. Fragments of brick, concrete, gals, timber, china and wire.
				1.20			MADE GROUND: Soft dark grey gravelly CLAY. Fine roots. Occasional brick and glass fragments.
				1.70			End of Pit at 1.700m

Stability:

Remarks:

ANNEX E
Borehole Logs

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Borehole No.
BH1
Sheet 1 of 2

Project Name:	Hebert Road (Phase 2)	Project No: 12032-P2	Co-ords:
Location:	Newport		Level:
Client:	Engie		Dates: 20/06/2018 -

Hole Type: CP
Scale: 1:50
Logged By:

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description
	Depth (m)	Type	Results					
	1.00	SPT	N=29 (16,13/8,6,6,9)					MADE GROUND: Building rubble of brick and crushed concrete
				1.70				
	2.00	SPT	N=4 (1,0/1,1,1,1)					MADE GROUND: Very soft grey CLAY. Timber.
	3.00	SPT	N=9 (2,1/1,2,3,3)	2.90				Firm grey mottled CLAY (Alluvium)
	4.00	SPT	N=13 (2,2/3,3,3,4)					
	5.00	SPT	N=11 (1,2/3,3,3,2)					
				5.40				
	6.00	SPT	N=8 (1,1/2,2,2,2)					Firm grey peaty CLAY (Alluvium)
	8.00	SPT	N=5 (1,0/1,1,1,2)	7.90				Soft PEAT
				9.20				

	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Remarks
Chiseling	0.70	1.20	01:00	

Remarks:

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Borehole No.
BH1
Sheet 2 of 2

Project Name:	Hebert Road (Phase 2)	Project No: 12032-P2	Co-ords:
Location:	Newport		Level:
Client:	Engie		Dates: 20/06/2018 -

Hole Type: CP
Scale: 1:50
Logged By:

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description
	Depth (m)	Type	Results					
								Very soft grey peaty CLAY (Alluvium)
	10.00	SPT	N=3 (2,1/1,1,0,1)	10.10				Soft PEAT
				11.00				Soft grey peaty CLAY (Alluvium)
	12.00	SPT	N=13 (1,2/3,3,3,4)	12.20				Firm PEAT
				12.90				Firm grey peaty CLAY (Alluvium)
▼				13.20				Red sandy slightly cobbly SILT
	14.00	SPT	N=21 (2,3/4,4,5,8)	13.80				Stiff red purple CLAY with angular gravel of mudstone
				14.50				Weathered red MUDSTONE (St Maughan's Formation)
	15.30	SPT	N=50 (6,8/10,10,14,16)					
	16.00	SPT	56 (10,14/56 for 225mm)					
	16.50	SPT	50 (25 for 95mm/50 for 115mm)	16.50				End of Borehole at 16.500m

10 11 12 13 14 15 16 17 18

Chiseling

Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Remarks
16.00	16.50	01:00	

Remarks:

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Borehole No.
BH2
Sheet 1 of 3

Project Name:	Hebert Road (Phase 2)	Project No: 12032-P2	Co-ords:
Location:	Newport		Level:
Client:	Engie		Dates: 21/06/2018 -

Hole Type: CP
Scale: 1:50
Logged By:

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description
	Depth (m)	Type	Results					
								MADE GROUND: Building rubble of crushed brick and concerte
				0.70				
	1.00	SPT	N=3 (1,0/1,1,0,1)					MADE GROUND: Very soft red CLAY
	2.00	SPT	N=1 (1,0/0,0,1,0)					
	3.00	SPT	N=21 (6,12/10,5,3,3)	2.90				MADE GROUND: Dense brick and tarmac
				3.20				Grey mottled CLAY (Alluvium)
				5.60				Very soft grey peaty CLAY (Alluvium)
	6.00	SPT	N=3 (1,0/0,1,1,1)					
				8.30				PEAT
	9.00	SPT	N=9 (1,1/2,2,2,3)					

1 2 3 4 5 6 7 8 9

Chiseling

Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Remarks

Remarks:

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Borehole No.
BH2
Sheet 2 of 3

Project Name:	Hebert Road (Phase 2)	Project No: 12032-P2	Co-ords:
Location:	Newport		Level:
Client:	Engie		Dates: 21/06/2018 -

Hole Type: CP
Scale: 1:50
Logged By:

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description
	Depth (m)	Type	Results					
				9.50				PEAT
								Soft to firm grey peaty CLAY (Alluvium)
				10.40				PEAT
				11.10				Very soft grey peaty CLAY (Alluvium)
	12.00	SPT	0 (0 for 0mm/0 for 0mm)					
				12.60				PEAT
				13.20				Red sandy SILT
▼	14.00	SPT	N=7 (1,1/1,2,2,2)	13.90				Medium dense red fine to coarse angular GRAVEL of mudstone
	14.70	SPT	N=28 (2,3/5,7,7,9)	14.60				Highly weathered red MUDSTONE/SANDSTONE (St Maughan's Formation)
	15.50	SPT	N=31 (22,17/10,8,7,6)	15.20				Highly weathered red MUDSTONE (St Maughan's Formation)
	17.00	SPT	N=21 (2,3/4,5,6,6)					
	18.00	SPT	N=25 (2,4/5,5,7,8)	17.90				Weathered red MUDSTONE (St Maughan's Formation)

10 11 12 13 14 15 16 17 18

Chiseling

Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Remarks

Remarks:

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Borehole No.
BH2
Sheet 3 of 3

Project Name:	Hebert Road (Phase 2)	Project No: 12032-P2	Co-ords:	Hole Type CP
Location:	Newport		Level:	Scale 1:50
Client:	Engie		Dates: 21/06/2018 -	Logged By

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description
	Depth (m)	Type	Results					
	19.00	SPT	86 (25 for 132mm/86 for 95mm)	19.00				Weathered red MUDSTONE (St Maughan's Formation) End of Borehole at 19.000m

19
20
21
22
23
24
25
26
27

Chiselling

Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Remarks
18.50	19.00	01:00	

Remarks:

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Borehole No.
BH3
Sheet 1 of 2

Project Name:	Hebert Road (Phase 2)	Project No: 12032-P2	Co-ords:
Location:	Newport		Level:
Client:	Engie		Dates: 25/06/2018 -

Hole Type: CP
Scale: 1:50
Logged By:

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description
	Depth (m)	Type	Results					
	1.00	SPT	N=39 (9,8/13,13,7,6)					MADE GROUND: Dense building rubble of crushed brick and concrete grading into sandstone cobbles
	2.00	SPT	N=19 (2,5/7,4,4,4)					
	3.00	SPT	N=41 (2,3/3,8,11,19)					
	4.00	SPT	N=12 (1,2/2,3,3,4)	3.90				Firm grey mottled CLAY (Alluvium)
	5.00	SPT	N=13 (1,2/3,3,3,4)					
	6.50	SPT	N=5 (1,1/1,1,1,2)	6.00				Soft grey peaty CLAY (Alluvium)
				8.90				PEAT

1 2 3 4 5 6 7 8 9

Chiselling

Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Remarks
0.30	0.60	01:00	
3.50	3.90	01:00	

Remarks:

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Borehole No.
BH3
Sheet 2 of 2

Project Name: Hebert Road (Phase 2)	Project No: 12032-P2	Co-ords:	Hole Type CP
Location: Newport		Level:	Scale 1:50
Client: Engie		Dates: 25/06/2018 -	Logged By

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description	
	Depth (m)	Type	Results						
	9.50	SPT	N=9 (1,1/2,2,3,2)					PEAT	
				10.00				Soft grey peaty CLAY (Alluvium)	10
				11.00				PEAT	11
				11.70				Soft grey peaty CLAY (Alluvium)	12
	12.50	SPT	N=3 (1,0/1,0,1,1)						13
				13.30				PEAT	
▼				14.00				Dense red gravelly sandy SILT	14
				15.20				Weathered red MUDSTONE (St Maughan's Formation)	15
	15.50	SPT	50 (12,13/50 for 120mm)						
	16.00	SPT	50 (25 for 60mm/50 for 25mm)	16.00				End of Borehole at 16.000m	16
									17
									18

Chiseling	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Remarks
	15.20	16.00	02:00	

Remarks:

ANNEX F
Laboratory Soil Chemical Test Results

Certificate of Analysis

Certificate Number	18-15385-1
	09-Jul-18
Client	Terra Firma (Wales) Ltd 5 Deryn Court Wharfdale Road Pentwyn Cardiff CF23 7HB
Our Reference	18-15385-1
Client Reference	12032P2RH
Order No	12032PSRH
Contract Title	H.Rd P2 (Herbert Road Phase 2)
Description	8 Soil samples.
Date Received	26-Jun-18
Date Started	26-Jun-18
Date Completed	09-Jul-18
Test Procedures	Identified by prefix DETSn (details on request).
Notes	**This report supersedes 18-15385. Extra testing** Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By [redacted]

Adam Fenwick
Contracts Manager

mCERTS
THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

UKAS TESTING
2139

Summary of Chemical Analysis
Matrix Descriptions

Our Ref 18-15385-1
Client Ref 12032P2RH
Contract Title H.Rd P2 (Herbert Road Phase 2)

Sample ID	Depth	Lab No	Completed	Matrix Description
TP1	0.6	1358057	03/07/2018	Brown gravelly, clayey SAND (Possible made ground - brick)
TP1	1.2	1358058	03/07/2018	Dark brown gravelly, clayey SAND
TP2	0.3	1358059	03/07/2018	Dark brown gravelly, clayey SAND (Possible made ground - brick)
TP3	0.4	1358060	03/07/2018	Brown gravelly, sandy CLAY
TP4	0.2	1358061	03/07/2018	Dark brown gravelly, clayey SAND
TP5	0.1	1358062	03/07/2018	Brown gravelly, clayey SAND
TP5	0.6	1358063	03/07/2018	Red gravelly, sandy CLAY
TP6	0.3	1358064	03/07/2018	Dark brown gravelly, clayey SAND (Possible made ground - brick)

Summary of Chemical Analysis
Soil Samples

Our Ref 18-15385-1
Client Ref 12032P2RH
Contract Title H.Rd P2 (Herbert Road Phase 2)

			Lab No	1358057	1358058	1358059	1358060	1358061	1358062
			Sample ID	TP1	TP1	TP2	TP3	TP4	TP5
			Depth	0.60	1.20	0.30	0.40	0.20	0.10
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	22/06/18	22/06/18	22/06/18	22/06/18	22/06/18	22/06/18
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Asbestos Quantification	DETSC 1102	0		Y					
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	8.8	17	17	3.5	12	8.5
Cadmium	DETSC 2301#	0.1	mg/kg	0.5	0.3	0.5	< 0.1	0.5	0.2
Chromium	DETSC 2301#	0.15	mg/kg	24	22	25	22	23	13
Chromium III	DETSC 2301*	0.15	mg/kg	24	22	25	22	23	13
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	30	61	52	17	82	13
Lead	DETSC 2301#	0.3	mg/kg	78	130	150	15	73	17
Mercury	DETSC 2325#	0.05	mg/kg	0.13	0.36	0.46	0.05	0.21	< 0.05
Nickel	DETSC 2301#	1	mg/kg	9.7	27	20	29	24	9.1
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	0.6	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	92	130	150	52	140	65
Inorganics									
pH	DETSC 2008#			11.1	8.2	10.0	8.8	8.6	11.3
Cyanide, Total	DETSC 2130#	0.1	mg/kg	11	2.7	0.7	< 0.1	0.1	< 0.1
Organic matter	DETSC 2002#	0.1	%	2.4	4.3	4.0	0.6	2.9	0.4
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	940					1500
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.52	0.09	0.23	0.05	0.10	1.6
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	0.04	0.05	< 0.03	< 0.03	0.13	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	0.08	0.13	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	0.07	< 0.03	< 0.03	< 0.03	0.06	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	0.08	0.04	< 0.03	< 0.03	0.06	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.57	0.36	0.23	0.18	0.35	0.17
Anthracene	DETSC 3303	0.03	mg/kg	0.16	0.10	0.05	0.04	0.11	0.07
Fluoranthene	DETSC 3303#	0.03	mg/kg	1.3	1.0	0.52	0.21	0.66	0.56
Pyrene	DETSC 3303#	0.03	mg/kg	1.3	1.2	0.44	0.17	0.55	0.56
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.75	0.55	0.28	0.09	0.30	0.33
Chrysene	DETSC 3303	0.03	mg/kg	0.97	0.85	0.36	0.09	0.37	0.36
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	1.3	1.2	0.44	0.11	0.49	0.51
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.49	0.43	0.17	0.03	0.17	0.22
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.87	0.85	0.26	0.07	0.30	0.36
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.38	0.38	0.12	< 0.03	0.12	0.12
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	0.11	0.10	0.04	< 0.03	0.04	0.04
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.57	0.54	0.17	0.03	0.18	0.20
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	9.1	7.9	3.1	0.96	3.9	3.5
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 18-15385-1
Client Ref 12032P2RH
Contract Title H.Rd P2 (Herbert Road Phase 2)

			Lab No	1358063	1358064
			Sample ID	TP5	TP6
			Depth	0.60	0.30
			Other ID		
			Sample Type	SOIL	SOIL
			Sampling Date	22/06/18	22/06/18
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Asbestos Quantification	DETSC 1102	0			Y
Metals					
Arsenic	DETSC 2301#	0.2	mg/kg	2.3	13
Cadmium	DETSC 2301#	0.1	mg/kg	< 0.1	0.8
Chromium	DETSC 2301#	0.15	mg/kg	31	23
Chromium III	DETSC 2301*	0.15	mg/kg	31	23
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	9.5	50
Lead	DETSC 2301#	0.3	mg/kg	9.8	530
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	0.52
Nickel	DETSC 2301#	1	mg/kg	36	23
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	57	170
Inorganics					
pH	DETSC 2008#			8.7	9.0
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	0.2
Organic matter	DETSC 2002#	0.1	%	0.9	3.3
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l		
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.05	0.15
PAHs					
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	0.11
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	0.04
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	0.23
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	0.20
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.07	0.97
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	0.31
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.12	1.9
Pyrene	DETSC 3303#	0.03	mg/kg	0.11	1.6
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.05	1.1
Chrysene	DETSC 3303	0.03	mg/kg	0.09	1.1
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.08	1.4
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.03	0.55
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.04	0.87
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.30
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	0.11
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	0.43
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	0.59	11
Phenols					
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 18-15385-1
Client Ref 12032P2RH
Contract Title H.Rd P2 (Herbert Road Phase 2)

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1358057	TP1 0.60	SOIL	Chrysotile	Bundle of Chrysotile fibres	Keith Wilson
1358058	TP1 1.20	SOIL	NAD	none	Keith Wilson
1358059	TP2 0.30	SOIL	NAD	none	Keith Wilson
1358060	TP3 0.40	SOIL	NAD	none	Keith Wilson
1358061	TP4 0.20	SOIL	NAD	none	Keith Wilson
1358062	TP5 0.10	SOIL	NAD	none	Keith Wilson
1358063	TP5 0.60	SOIL	NAD	none	Keith Wilson
1358064	TP6 0.30	SOIL	Crocidolite	Bundles of Crocidolite fibres	Keith Wilson

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * -not included in laboratory scope of accreditation.

Summary of Asbestos Quantification Analysis
Soil Samples

Our Ref 18-15385-1
Client Ref 12032P2RH
Contract Title H.Rd P2 (Herbert Road Phase 2)

		Lab No	1358057	1358064
		Sample ID	TP1	TP6
		Depth	0.60	0.30
		Other ID		
		Sample Type	SOIL	SOIL
		Sampling Date	22/06/18	22/06/18
		Sampling Time		
Test	**Method**	**Units**		
Total Mass% Asbestos (a+b+c)	DETSC 1102	Mass %	**< 0.001**	**0.001**
Gravimetric Quantification (a)	DETSC 1102	Mass %	na	na
Detailed Gravimetric Quantification (b)	DETSC 1102	Mass %	<0.001	0.001
Quantification by PCOM (c)	DETSC 1102	Mass %	na	na
Potentially Respirable Fibres (d)	DETSC 1102	Fibres/g	na	na
Breakdown of Gravimetric Analysis (a)				
Mass of Sample		g	1149.61	899.34
ACMs present*		type		
Mass of ACM in sample		g		
% ACM by mass		%		
% asbestos in ACM		%		
% asbestos in sample		%		
Breakdown of Detailed Gravimetric Analysis (b)				
% Amphibole bundles in sample		Mass %	na	0.001
% Chrysotile bundles in sample		Mass %	<0.001	na
Breakdown of PCOM Analysis (c)				
% Amphibole fibres in sample		Mass %	na	na
% Chrysotile fibres in sample		Mass %	na	na
Breakdown of Potentially Respirable Fibre Analysis (d)				
Amphibole fibres		Fibres/g	na	na
Chrysotile fibres		Fibres/g	na	na

* Denotes test or material description outside of UKAS accreditation.
% asbestos in Asbestos Containing Materials (ACMs) is determined by
by reference to HSG 264.
Recommended sample size for quantification is approximately 1kg
# denotes deviating sample

Information in Support of the Analytical Results

Our Ref 18-15385-1
Client Ref 12032P2RH
Contract H.Rd P2 (Herbert Road Phase 2)

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1358057	TP1 0.60 SOIL	22/06/18	GJ 250ml, PT 1L		
1358058	TP1 1.20 SOIL	22/06/18	GJ 250ml, PT 1L		
1358059	TP2 0.30 SOIL	22/06/18	GJ 250ml, PT 1L		
1358060	TP3 0.40 SOIL	22/06/18	GJ 250ml x2, PT 1L		
1358061	TP4 0.20 SOIL	22/06/18	GJ 250ml x2, PT 1L		
1358062	TP5 0.10 SOIL	22/06/18	GJ 250ml, PT 1L		
1358063	TP5 0.60 SOIL	22/06/18	GJ 250ml x2, PT 1L		
1358064	TP6 0.30 SOIL	22/06/18	GJ 250ml x2, PT 1L		

Key: G-Glass P-Plastic J-Jar T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO4	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO4	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETSC2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

Appendix A - Details of Analysis

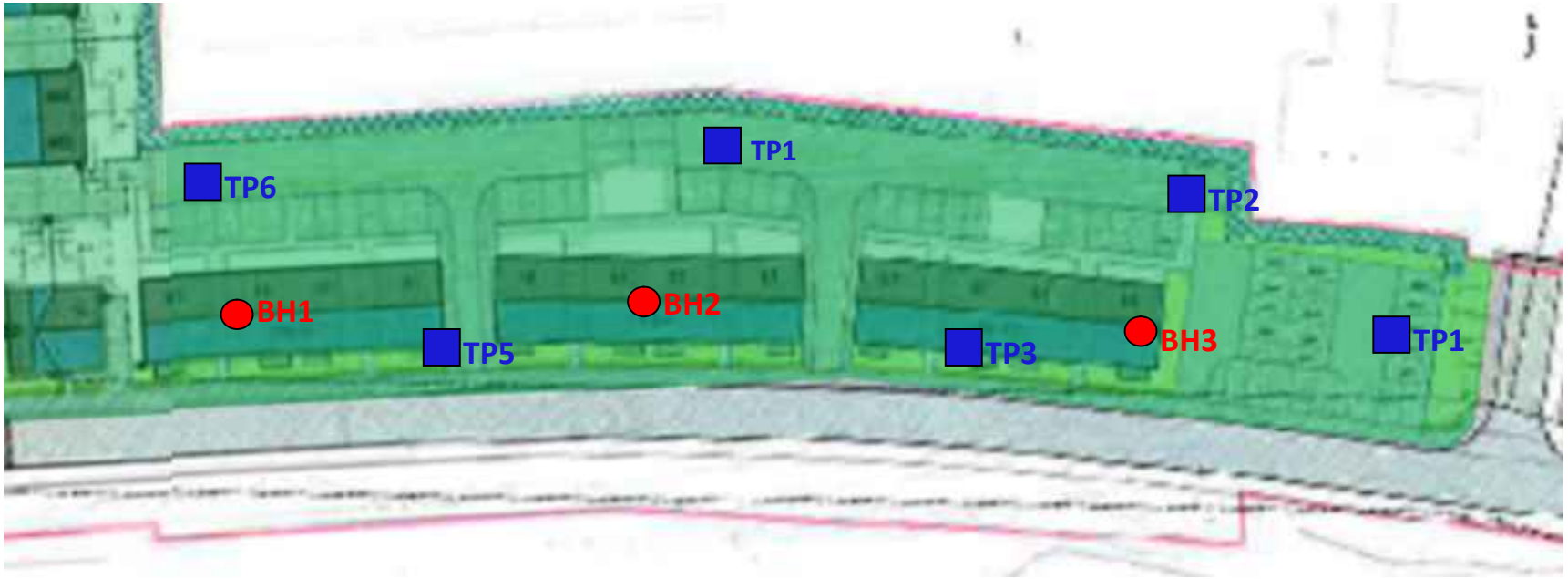
Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

ANNEX G
Gas Monitoring Results

					BH1	BH2	BH3
Round	1			**% CH_4**	3.8	1.9	0.3
Date	11.07.2018			**% CH_4 Peak**	4.2	1.9	0.3
Weather	Sunny			**% LEL**	76	0	6
Barometric pressure	1021	mb		**% CO_2**	4.1	2.7	0.1
				% O_2	8.5	0.2	19.5
				CO (ppm)	0	0	0
				H_2S (ppm)	0	0	0
				Flow (l/hr)	0	0	0

DRAWINGS



terrafirma

Drawing Number
01

Drawing Title
SITE LAYOUT

Job Number
12032

Job Title
HERBERT ROAD PHASE 2

NOT TO SCALE

ANNEX H
Phase 3 (North of Reen) Site Investigation Report

Geo-Environmental Report:
Proposed Residential Development
Herbert Road
Newport

Phase 3 North of Reen

Prepared For:
Pobl Group

July 2018

Job No: 12032/P3

terrafirma

REPORT TITLE	:	**Geo-environmental Report:** Proposed Residential Development, Herbert Road, Newport Phase 3 North of Reen
REPORT STATUS	:	**Final**
JOB NUMBER	:	**12032/P3**
DATE	:	**July 2017**
PREPARED BY	:	[redacted] **Mrs Ruth Howells**
REVIEWED BY	:	[redacted] **Mathew Lake**
APPROVED BY	:	[redacted] **Dr Gwyn C Lake**

Executive Summary

Site History	*Historically the site was used as a tip and in 2008 extensive remediation of the site and adjoining land to the north was completed, where some 778 drums of PCB type material were removed, as well as 2000 tonnes of impacted soils. Following remediation a soil cap of minimum 600mm thickness was laid across the site, where an orange geotextile was placed at the base of the capping.*
Ground Conditions	*Made ground is present across the site to depths of between 1.3m and 2.5m. The made ground is locally variable but primarily comprises ash material. Soft grey alluvial clay underlies the made ground.*
Radon	*Basic radon protection is required for new development.*
Ground Gas	*Gas protection measures will be required for housing.*
Laboratory Chemical Testing and Proposed Remediation	*During construction appropriate measures should be put in place to ensure construction workers, passers-by and neighbouring site users are adequately protected from asbestos fibres.* *Upon development all garden and soft landscaped areas should be capped with 600mm of clean imported soils. A double 'no-dig' barrier comprising an orange geotextile and underlying geogrid will be required between the made ground and overlying capping layer.* *Any imported soils should be validated as clean and suitable for use and the capping thickness and presence of no-dig barrier confirmed in accordance with 'Requirements for the Chemical testing of Imported Soils for Various End Uses and Validation Cover Systems'.* *For proposed new supply water pipes, the UK Water Industry Research publication 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites (Report 10/WM/03/21)' should be consulted.* *Radon, ground gas and PCB vapour protection measures should be installed as previously specified.*

TABLE OF CONTENTS

SECTION 1 Introduction and Proposed Development

1.1 Introduction
1.2 Limitations and Exceptions of Investigation

SECTION 2 Historical Site Investigation Summary

SECTION 3 Field Investigation

3.1 Site Works
3.2 Ground Conditions
3.3 Water Strikes
3.4 Stability and Obstructions
3.5 Soil and Leachate Laboratory Chemical Testing

SECTION 4 Soil and Leachate Analytical Results

4.1 Soil Assessment Methodology
4.2 Soil Test Results
4.3 Leachate Assessment Methodology
4.4 Leachate Test Results

SECTION 5 Quantitative Risk Assessment

5.1 Contaminants of Concern
5.1.1 Contaminants of Concern in Soil
5.1.2 Leachable Contaminants of Concern
5.2 Potential Receptors and Pathways
5.2.1 Human Receptors
5.2.2 Aquatic Environment
5.3 Mitigation and Remedial Measures
5.3.1 Human Health
5.3.2 Aquatic Environment

Tables

Table 3.1 Summary of Ground Conditions
Table 3.2 Soil Sample Locations, Depths and Testing Schedule
Table 3.3 Leachate Testing Schedule
Table 4.1 Summary of Soil Chemical Test Results - Standard Suite
Table 4.2 Summary of Soil Chemical Test Results - Speciated PAH and PCBs
Table 4.3 Summary of Soil Chemical Test Results - Petroleum Hydrocarbons
Table 4.4 Summary of Soil Chemical Test Results - Asbestos
Table 4.5 Summary of Leachate Chemical Test Results
Table 5.1 Contaminants of Concern In Soil

TABLE OF CONTENTS (Continued)

Figures
Figure 2.1 Site Location - OS Map 152 Newport and Pontypool

Annexes
Annex A Trial Pit Logs
Annex B Laboratory Soil and Leachate Chemical Test Results

Drawings
Drawing 01 Site Layout

SECTION 1 Introduction and Proposed Development

1.1 Introduction

Pobl Group is proposing the residential development of an area of land off Herbert Street, Newport. This is scheduled to be carried out in three phases.

Phase 3 was investigated by Terra Firma in 2013, as reported in Geotechnical and Geo-environmental Report No. 12032.

This report details the findings of the 2013 investigation, and further additional geo-environmental investigation, for the Phase 3 area north of the drainage reen (referred to in this report as 'the site'), as illustrated in **Figure 1.1**.

Figure 1.1: Report Study Area

Terra Firma (Wales) Limited has been commissioned to undertake a geo-environmental assessment of the site.

The objective of the investigation was to quantify the extent of any site contamination to ensure the remediation measures already intended are adequate to protect the health of site workers, passers-by, neighbouring site users and future site residents.

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

1.2 Limitations and Exceptions of Investigation

Pobl Group has requested that a Geo-environmental Site Assessment be performed in order to determine if contamination is present beneath the site and to determine an appropriate foundation and floor slab solution for the proposed development.

The Geo-environmental Site Assessment was conducted and this report has been prepared for the sole internal reliance of Pobl Group and its design and construction team. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Terra Firma (Wales) Limited. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill. The report represents the findings and opinions of experienced geo-environmental consultants. Terra Firma (Wales)

1.2 Limitations and Exceptions of Investigation (Continued)

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

SECTION 2 Historical Site Investigation Summary

Historically the site was part of a larger area (comprising the site and land to the north, beneath the current school) subject to investigation and extensive remediation in the latter part of 2008 following the identification of ground contaminated by PCBs. This relates to historical tipping on site, and some 778 drums of PCB type material were removed, as well as 2000 tonnes of impacted soils. Following remediation a soil cap of minimum 600mm thickness was laid across the site, where an orange geotextile was placed at the base of the capping.

The majority of this capping layer was removed in 2015 for use as fill in the Earthworks being carried out south of the reen. The orange geotextile layer that defined the base of this layer is now evident at or close to the surface.

The site was included in an investigation carried out by Terra Firma (Wales) Limited in 2013 and reported in Geotechnical and Geo-environmental Report No.12032. Relevant data from this report is included in later sections.

It was concluded that gas protection measures will be required for all new housing on site and that basic radon protection would also be required. It was also specified that a vapour barrier to protect against PCBs be installed.

SECTION 3 Field Investigation

3.1 Site Works

Terra Firma (Wales) Limited attended site in June 2018 and excavated eight trial pits (TP1 – TP8) across the site.

The Terra Firma 2013 investigation included two trial pits on site (TP5 and TP6), referred to in this report as TP5-13 and TP6-13.

Trial pit logs may be found in **Annex A**.

Trial pit locations are illustrated on **Drawing 01.** Trial Pits 1 and 2 were excavated on the grassed area just outside the current site boundary.

3.2 Ground Conditions

A summary of the ground conditions identified in the trial pits beneath the site is given in **Table 3.1**.

Table 3.1 Summary of Ground Conditions

Depth (m)	Thickness (m)	Stratum
TP1 & TP2		
0.0 - 0.2	0.2	**Made Ground:** Loose red brown slightly clayey **SAND**
0.2 - 0.4/0.9	0.2/0.7	**Made Ground:** Medium dense dark grey brown clayey **SAND and GRAVEL**. Bricks.
0.4/0.9 - 1.1/1.2	-	**Made Ground:** Medium dense red brown **SAND and GRAVEL** with brick, concrete, wire and plastic / Firm red brown and brown mottled gravelly **CLAY**
TP3 – TP8		
0.0 - 0.05/0.9	0.05/0.9	**Made Ground:** Loose grey **SAND and GRAVEL / Grey GRAVEL /** Dark grey clayey **SAND and GRAVEL** with fragments of slate, glass china and ceramic pipe.
0.05/0.9 - 1.3/2.5	1.25/1.8	**Made Ground:** Loose dark grey brown **ASH**. Many glass bottles and glass fragments. Occasional china and plastic, wire, brick.
1.3/2.5 - 1.7/2.7	-	Very soft dark grey **CLAY**/Firm grey **CLAY** (Alluvium). Often roots at top.

Within several of the trial pits the orange geotextile layer that underlay the remedial capping layer was noted at between 0.05m and 0.5m depth.

3.3 Water Strikes

Groundwater was generally encountered at the base of the made ground, retained above the underlying clay.

3.4 Stability and Obstructions

Trial holes were generally unstable during excavation, particularly in the ash soils.

3.5 Soil and Leachate Laboratory Chemical Testing

During the 2013 and 12018 intrusive investigation, small disturbed soil samples were collected. The sampling regime was conducted in accordance with BS5930: 1999 in order to satisfy the following criteria:

- Identify and confirm suspected sources of contamination
- Determine type and concentration of contamination
- Determine lateral and vertical spread of contaminants
- Ensure representation of the entire site
- Provide sufficient data to determine suitable remedial measures if necessary

The soil samples taken were despatched to the laboratories of Derwentside Environmental Testing Services Limited.

The sample locations and depths are listed in the following table as well as the substances tested for. Please note that it should be assumed that 2013 samples would now be approximately 500mm shallower than previous following removal of much of the capping layer in 2015.

Table 3.2 Soil Sample Locations, Depths and Testing Schedule

Sample	Depth (m)	Substances Tested For
TP5-13	1.3	TF1, TPHCWG, PCBs, Asbestos
TP6-13	0.6	TF1, TPHCWG, PCBs, Asbestos
TP6-13	1.8	TF1, PAH,TPHCWG, Asbestos
TP1	0.5	TF1, PAH, TPHCWG, PCBs, Asbestos
TP2	0.1	TF1, PAH
TP2	1.0	TPHCWG, PCBs
TP3	0.4	TF1, PAH, TPHCWG, PCBs, Asbestos
TP4	1.0	TF1, PAH, TPHCWG, PCBs, Asbestos
TP5	0.3	TF1, PAH, TPHCWG, PCBs, Asbestos, Asbestos quantification
TP6	0.5	TF1, PAH, TPHCWG, PCBs, Asbestos, Asbestos quantification
TP7	0.3	TF1, PAH, Asbestos quantification
TP7	1.0	TPHCWG, PCBs
TP8	0.6	TF1, PAH, TPHCWG, PCBs, Asbestos, Asbestos quantification

Notes

- TF1 – Arsenic, Cadmium, Chromium III, Chromium VI, Copper, Lead, Mercury, Nickel, Selenium, Zinc, Cyanide, Phenols, Sulphate, pH, Organic Matter and Speciated PAH
- PAH – Speciated Polyaromatic Hydrocarbons
- TPHCWG – Petroleum Hydrocarbons
- PCBS – Polychlorinated Biphenyls

The laboratory soil chemical test results are presented in **Annex B**.

3.5 Soil and Leachate Laboratory Chemical Testing (Continued)

Substances found to be elevated in 2018 soil samples were scheduled for leachate analysis, as summarised in **Table 3.3**.

Table 3.3 Leachate Testing Schedule

Sample	Depth (m)	Substances Tested For
TP3	0.4	Arsenic, Copper, Lead, Nickel
TP4	1.0	Arsenic, Lead
TP5	0.3	PCBs
TP6	0.5	PCBs
TP7	1.0	PCBs
TP8	0.6	Lead, PCBs

The laboratory leachate chemical test results are presented in **Annex B**.

SECTION 4 Soil and Leachate Analytical Results

4.1 Soil Assessment Methodology

Comparison of the analytical results has been made with the 2015 residential (including plant uptake) Suitable 4 Use Levels (S4ULs) provided by Land Quality Management Limited and the Chartered Institute of Environmental Health (CIEH). Where CIEH thresholds are not available reference has been made to Category 4 Screening Levels (C4SLs) or CLEA SGVs.

Sulphate results have been compared to British Research Establishment (BRE) guidelines as sulphate levels need only be considered for buried concrete risk assessment only, not human health related.

4.2 Soil Test Results

A summary of the chemical test results which include the regulatory soil guideline values used in the Tier 1 assessment are given in **Tables 4.1** to **4.4**.

Table 4.1 Summary of Soil Chemical Test Results Standard Suite

Substance	SGV/GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of Exceedences
			Minimum	Maximum	
Arsenic	37	CLEA	5.0	70	**2**
Cadmium	11	CLEA	0.3	1.7	0
Chromium III	910	CIEH	12	50	0
Chromium VI	6	CIEH	<1.0	<1.0	0
Copper	2400	CIEH	10	8900	**1**
Lead	200	C4SL	10	1400	**3**
Mercury	40	CLEA	0.05	5.5	0
Nickel	180	CIEH	12	990	**1**
Selenium	250	CLEA	<0.5	0.9	0
Zinc	3700	CIEH	83	1100	0
Cyanide	8	CLEA	<0.1	2.6	0
Phenols	420	CLEA	<0.3	<0.3	0
Sulphate	2400	BRE	300	5700	**2**
Organic Matter	-	-	<1.6	23	-
pH	-	-	7.3	10	-
Total PAH	-	-	1.1	14	See Table 4.2

Notes:

- - no available guideline

4.2 Soil Test Results (Continued)

Samples were tested for speciated PAH testing.

Table 4.2 Summary of Soil Chemical Test Results Speciated PAH and PCBs

Substance	GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of Exceedences
			Minimum	Maximum	
Naphthalene	2.3	CIEH	<0.03	0.2	0
Acenaphthylene	170	CIEH	<0.03	1.3	0
Acenaphthene	210	CIEH	<0.03	1.5	0
Fluorene	170	CIEH	<0.03	0.1	0
Phenanthrene	95	CIEH	0.08	0.5	0
Anthracene	2400	CIEH	<0.03	0.4	0
Fluoranthene	280	CIEH	0.07	2.1	0
Pyrene	620	CIEH	0.06	1.7	0
Benzo(a)anthracene	7.2	CIEH	0.05	1.8	0
Chrysene	15	CIEH	0.06	1.2	0
Benzo(b)fluoranthene	2.6	CIEH	0.07	2.1	0
Benzo(k)fluoranthene	77	CIEH	<0.03	0.62	0
Benzo(a)pyrene	2.2	CIEH	0.04	1.5	0
Indeno(123cd)pyrene	27	CIEH	<0.03	0.69	0
Dibenzo(ah)anthracene	0.24	CIEH	<0.03	0.25	**1****
Benzo(ghi)perylene	320	CIEH	<0.03	0.9	0
PCB 28 + 31	0.008	CLEA	<0.01	3.2	**4 ALDL**
PCB 52	0.008	CLEA	<0.01	6.1	**4 ALDL**
PCB 101	0.008	CLEA	<0.01	5.3	**4 ALDL**
PCB 118	0.008	CLEA	<0.01	2.9	**4 ALDL**
PCB 153	0.008	CLEA	<0.01	2.2	**4 ALDL**
PCB 138	0.008	CLEA	<0.01	2.4	**5 ALDL**
PCB 180	0.008	CLEA	<0.01	1.3	**5 ALDL**

Notes:

- Thresholds based on 1.0% SOM
- ALDL – Above Laboratory Detection Limit
- ** Not elevated when concentration compared with threshold for >2.5% SOM (2.8 recorded in specific sample TP5 0.3m).

5.2 Soil Test Results (Continued)

Selected samples were tested for petroleum hydrocarbons.

Table 4.3 Summary of Soil Chemical Test Results Petroleum Hydrocarbons

Substance	GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of Exceedences
			Minimum	Maximum	
Aliphatic					
PH C5 – C6 Ali	40	CIEH	<0.01	<0.01	0
PH C6 – C8 Ali	100	CIEH	<0.01	<0.01	0
PH C8 – C10 Ali	27	CIEH	<0.01	0.02	0
PH C10 – C12 Ali	130	CIEH	<1.5	<1.5	0
PH C12 – C16 Ali	1100	CIEH	<1.2	16	0
PH C16 – C21 Ali	65000	CIEH	<1.5	120	0
PH C21 – C35 Ali	65000	CIEH	<3.4	340	0
Aromatic					
PH C5 – C7 Arom	70	CIEH	<0.01	<0.01	0
PH C7 – C8 Arom	130	CIEH	<0.01	<0.01	0
PH C8 – C10 Arom	34	CIEH	<0.01	0.05	0
PH C10 – C12 Arom	74	CIEH	<0.9	<0.9	0
PH C12 – C16 Arom	140	CIEH	<0.5	15	0
PH C16 – C21 Arom	260	CIEH	<0.6	130	0
PH C21 – C35 Arom	1100	CIEH	<1.4	240	0

Notes:

- CIEH Based on 1.0% SOM
- * CIEH for Ali C16 - 21 and C21 - C35 based on CIEH for EC >16 – 35

Asbestos testing was undertaken. **Table 4.4** below summarises the findings:

Table 4.4 Summary of Soil Test Results Asbestos

Location	Depth (m)	Result
TP5-13	1.3	No asbestos detected
TP6-13	0.6	No asbestos detected
TP6-13	1.8	**Loose bundles of chrysotile**
TP1	0.5	No asbestos detected
TP2	0.1	
TP3	0.4	
TP4	1.0	
TP5	0.3	**Chrysotile present as fibre bundles <0.001% mass**
TP6	0.5	**Chrysotile present as fibre bundles <0.001% mass**
TP7	0.3	**Chrysotile present as fibre bundles 0.002% mass**
TP8	0.6	**Chrysotile, Amosite and Crocidolite present as fibre bundles. Chrysotile and amosite also present in microscopic and visible insulation 0.226% mass**

4.3 Leachate Assessment Methodology

Groundwater results have been compared to thresholds for inland freshwater environments (annual average or maximum allowable concentration where annual average not available) provided by the 2015 UK Water Framework Directive (WFD).

4.4 Leachate Test Results

Leachate test results are summarised in **Table 4.5**.

4.5 Summary of Leachate Chemical Test Results

Substance	Threshold (ug/l)	Source	Measured Concentrations of Tested Substances (ug/l)		Number of Exceedences
			Minimum	Maximum	
Arsenic	50	WFD	<0.16	1.5	0
Copper	1.0	WFD	1.3	-	**1**
Lead	1.2	WFD	<0.09	0.22	0
Nickel	4.0	WFD	<0.5	-	0
PCB 28 + 31	-	-	<0.3	<0.3	BLDL
PCB 52	-	-	<0.2	<0.2	BLDL
PCB 101	-	-	<0.3	<0.3	BLDL
PCB 118	-	-	<0.6	<0.6	BLDL
PCB 153	-	-	<0.2	<0.2	BLDL
PCB 138	-	-	<0.2	<0.2	BLDL
PCB 180	-	-	<0.2	<0.2	BLDL

Notes:

- - No threshold level available
- BLDL – Below Laboratory Detection Limit

SECTION 5 Quantitative Human Health and Environmental Risk Assessment

5.1 Contaminants of Concern

5.1.1 Contaminants of Concern in Soil

Made ground on site has been confirmed to be a source of contamination. Contaminants of concern are those that were found to exceed their residential threshold level. Those identified on site are listed in **Table 5.1** below.

Table 5.1 Contaminants of Concern in Soil

Substance	GAC (mg/kg)	Recorded Concentration (mg/kg)	Location	Depth
Arsenic	37	70 49	TP3 TP4	0.4 1.0
Lead	200	1400 650 270	TP3 TP4 TP8	0.4 1.0 0.6
Copper	2400	8900	TP3	0.4
Nickel	180	990	TP3	0.4
PCB 28 + 31	0.008	0.02 0.11 0.06 3.2	TP5 TP6 TP7 TP8	0.3 0.5 1.0 0.6
PCB 52	0.008	0.05 0.16 0.09 6.1	TP5 TP6 TP7 TP8	0.3 0.5 1.0 0.6
PCB 101	0.008	0.07 0.14 0.1 5.3	TP5 TP6 TP7 TP8	0.3 0.5 1.0 0.6
PCB 118	0.008	0.03 0.07 2.0 0.02	TP5 TP7 TP8 TP6-13	0.3 1.0 0.6 0.6
PCB 153	0.008	0.05 0.08 2.2 0.02	TP5 TP7 TP8 TP6-13	0.3 1.0 0.6 0.6
PCB 138	0.008	0.08 0.24 0.15 2.4 0.05	TP5 TP6 TP7 TP8 TP6-13	0.3 0.5 1.0 0.6
PCB 180	0.008	0.09 0.27 0.09 1.3 0.05	TP5 TP6 TP7 TP8 TP6-13	0.3 0.5 1.0 0.6 0.6
Loose bundles of chrysotile			TP6-13	1.8
Chrysotile present as fibre bundles			TP5	0.3
Chrysotile present as fibre bundles			TP6	0.5
Chrysotile present as fibre bundles			TP7	0.3
Chrysotile, Amosite and Crocidolite present as fibre bundles. Chrysotile and amosite also present in microscopic and visible insulation			TP8	0.6

Sulphate was exceeded in two samples when compared to BRE concrete criteria. Sulphate does not present a risk to human health so is not considered further.

5.1.2 Leachable Contaminants of Concern

Leachate analysis identified one minor exceedence of copper, with a recorded concentration of 1.3ug/l in soils from TP3 (0.4m), exceeding the threshold level of 1.0ug/l.

PCB leachate concentrations fell below the limits of laboratory detection.

5.2 Potential Receptors and Pollution Pathways

5.2.1 Human Receptors

Construction workers will be excavating in soils and will be exposed to metals via dermal contact with soils/soil dust, ingestion of soil/soil dust and inhalation of soil dust. Workers will also be exposed to asbestos fibres.

Once developed, future site residents will potentially be at risk from any contamination from the same pathways as well as through intake of potable water.

Site workers will not be at risk from PCB vapours as works are outdoors, but future site residents would be at risk from vapours indoors.

Future residents are also considered to be at risk from radon gas and ground gas.

Passers-by and neighbouring site users are potentially at risk from site soils via soil dust and asbestos fibre inhalation.

Radon gas and ground gas present a risk to future site residents.

5.2 2 Aquatic Environment

The aquatic environment is not considered to be at risk. Leachate levels were very low or below threshold levels/laboratory detection limits.

5.3 Mitigation and Remedial Measures

5.3.1 Human Health

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

During construction appropriate measures should be put in place to ensure construction workers, passers-by and neighbouring site users are adequately protected from asbestos fibres.

Upon development all garden and soft landscaped areas should be capped with 600mm of clean imported soils. A double ‘no-dig’ barrier comprising an orange geotextile and underlying geogrid will be required between the made ground and overlying capping layer.

Any imported soils should be validated as clean and suitable for use and the capping thickness and presence of no-dig barrier confirmed in accordance with ‘Requirements for the Chemical testing of Imported Soils for Various End Uses and Validation Cover Systems’.

5.3.1 Human Health (Continued)

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

Radon, ground gas and PCB vapour protection measures should be installed as previously specified.

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

5.3.2 Aquatic Environment

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

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

The basic measures that should be taken are as follows:

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

ANNEX A
Trial Pit Logs

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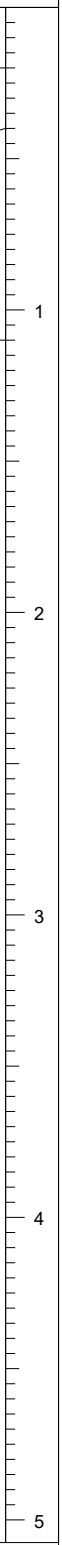
Trial Pit No: TP1
Sheet 1 of 1

Project Name: Herbert Road (Phase 3 North of Reen)	Project No: 12032-P3	Co-ords: - Level:	Date: 22/06/2018
Location: Newport		Dimensions: Depth 1.10	Scale: 1:25
Client: Pobl Group			Logged:

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			MADE GROUND: Loose red brown slightly clayey gravelly SAND
				0.40			MADE GROUND: Medium dense brown slightly clayey SAND and fine to coarse angular to sub-angular GRAVEL. Terra layer at base.
							MADE GROUND: Medium dense to dense red brown SAND and fine to coarse angular GRAVEL. Fragments of brick, concrete, wire and plastic.
				1.10			End of Pit at 1.100m



Stability:

Remarks:

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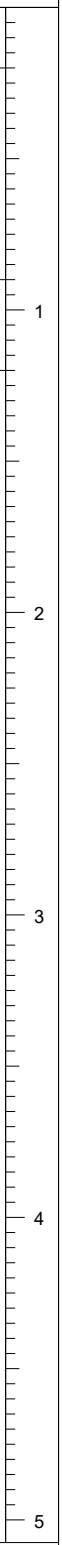
Trial Pit No: TP2
Sheet 1 of 1

Project Name: Herbert Road (Phase 3 North of Reen)	Project No: 12032-P3	Co-ords: - Level:	Date: 22/06/2018
Location: Newport		Dimensions: Depth 1.20	Scale: 1:25
Client: Pobl Group			Logged:

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.20			MADE GROUND: Loose red brown slightly clayey SAND and GRAVEL
				0.90			MADE GROUND: Medium dense dark grey brown clayey SAND and GRAVEL. Bricks.
				1.20			MADE GROUND: Firm red brown and brown mottled gravelly CLAY
							End of Pit at 1.200m



Stability:

Remarks:

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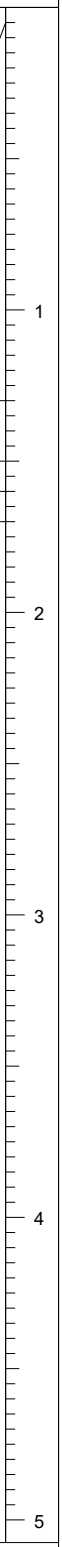
Trial Pit No: TP3
Sheet 1 of 1

Project Name: Herbert Road (Phase 3 North of Reen)	Project No: 12032-P3	Co-ords: - Level:	Date: 22/06/2018
Location: Newport		Dimensions: Depth 1.70	Scale: 1:25
Client: Pobl Group			Logged:

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.05			MADE GROUND: Loose grey SAND and GRAVEL. Orange terram at base
							MADE GROUND: Loose dark grey brown ASH. Many glass bottles and glass fragments. China and plastic fragments.
				1.30			Very soft dark grey CLAY
				1.50			Firm PEAT
				1.60			Firm grey CLAY. Very fine rootlets. (Alluvium)
				1.70			End of Pit at 1.700m



Stability:

Remarks: Fast groundwater inflow at 1.6m depth

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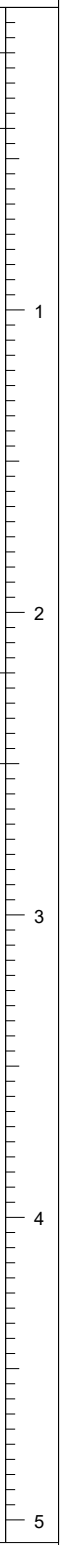
Trial Pit No: TP4
Sheet 1 of 1

Project Name: Herbert Road (Phase 3 North of Reen)	Project No: 12032-P3	Co-ords: - Level:	Date: 22/06/2018
Location: Newport		Dimensions: Depth 2.50	Scale: 1:25
Client: Pobl Group			Logged:

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.15			MADE GROUND: Loose grey SAND and GRAVEL. Orange terram at base.
				0.40			MADE GROUND: Dense coarse angular GRAVEL of limestone
							MADE GROUND: Loose dark grey brown ASH. Many glass bottles and glass fragments. Occasional china. Rare timber.
				2.20			Firm dark grey CLAY (Alluvium)
				2.50			End of Pit at 2.500m



Stability:

Remarks: Soils becoming wet at 2.0m depth

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Trial Pit No: TP5
Sheet 1 of 1

Project Name: Herbert Road (Phase 3 North of Reen)	Project No: 12032-P3	Co-ords: - Level:	Date: 22/06/2018
Location: Newport		Dimensions: Depth 2.70	Scale: 1:25
Client: Pobl Group			Logged:

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.15			MADE GROUND: Loose grey SAND and GRAVEL. Orange terram at base.
							MADE GROUND: Dark grey clayey SAND and fine to coarse angular GRAVEL. Fragments of slate, glass, china, ceramic pipe.
				0.70			MADE GROUND: Brown silty SAND
				0.75			MADE GROUND: Dense grey angular coarse GRAVEL
				0.90			MADE GROUND: Loose dark grey brown ASH. Many glass bottles and glass fragments.
				2.10			MADE GROUND: Loose dark grey brown very clayey ASH
				2.50			Firm dark grey brown CLAY. Fine roots at top. (Alluvium)
				2.70			End of Pit at 2.700m

Stability:

Remarks: Groundwater inflow at 2.1m depth

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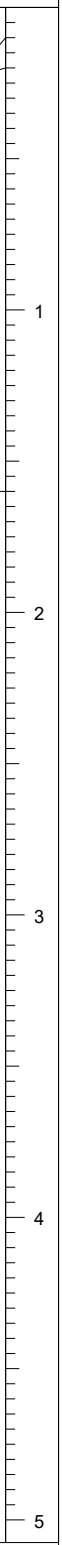
Trial Pit No: TP6
Sheet 1 of 1

Project Name: Herbert Road (Phase 3 North of Reen)	Project No: 12032-P3	Co-ords: - Level:	Date: 22/06/2018
Location: Newport		Dimensions: Depth 1.60	Scale: 1:25
Client: Pobl Group			Logged:

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			MADE GROUND: Loose grey SAND and GRAVEL. Orange terram at base.
				0.20			MADE GROUND: Grey GRAVEL
							MADE GROUND: Loose dark grey brown slightly clayey ASH. Rare brick.
				1.60			End of Pit at 1.600m



Stability:

Remarks:

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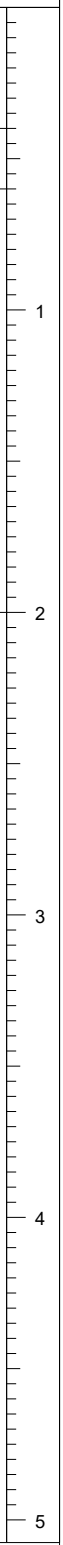
Trial Pit No: TP7
Sheet 1 of 1

Project Name: Herbert Road (Phase 3 North of Reen)	Project No: 12032-P3	Co-ords: - Level:	Date: 22/06/2018
Location: Newport		Dimensions: Depth 2.00	Scale: 1:25
Client: Pobl Group			Logged:

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.40			MADE GROUND: Loose grey SAND and GRAVEL. Orange terram at base.
				0.60			MADE GROUND: Grey angular GRAVEL
				2.00			MADE GROUND: Loose dark grey brown slightly clayey gravelly ASH. Fragments of glass, brick and china. Occasional stone cobble.
							End of Pit at 2.000m



Stability:

Remarks:

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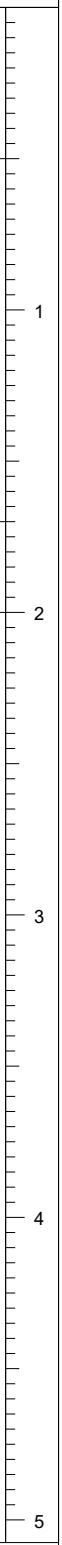
Trial Pit No: TP8
Sheet 1 of 1

Project Name: Herbert Road (Phase 3 North of Reen)	Project No: 12032-P3	Co-ords: - Level:	Date: 22/06/2018
Location: Newport		Dimensions: Depth 2.00	Scale: 1:25
Client: Pobl Group			Logged:

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.50			MADE GROUND: Dense dark grey brown SAND and GRAVEL. Orange terram at base.
				1.70			MADE GROUND: Loose dark grey brown ASH. Fragments of glass, brick, plastic and wire. Stone cobble.
				2.00			Firm grey brown CLAY (Alluvium)
							End of Pit at 2.000m



Stability:

Remarks: Soils becomin wet at 1.4m depth

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Trialpit No
TP5
Sheet 1 of 1

Project Name: Herbert Road	Project No.: 12032	Co-ords: - Level: -	Date: 06/11/2012
Location: Newport		Dimensions: 2.20m Depth 2.50m 0.70m	Scale: 1:25
Client: Greenhill Construction			Logged By: MW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.20			MADE GROUND. Grass over soft red brown slightly gravelly clay with many rootlets. Gravel is fine to coarse of angular mudstone. Geosynthetic membrane at 0.70m
			0.70			MADE GROUND. Dense grey very gravelly sand with some cobbles of angular sandstone.
			2.50			MADE GROUND. Loose to medium dense brown mottled gravelly sand. Some litter, bottles, jars and ceramic. Gravel is fine to coarse of angular slate, mudstone and sandstone. Occasional cobble of angular brick. Trialpit Complete at 2.50 m

Remarks: Stable

Groundwater: Standing groundwater at 2.30m

AGS

HoleBASE III (Bld 426.48) Standard Trialpit Log v2 dated 27th Nov 03

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Trialpit No
TP6
Sheet 1 of 1

Project Name: Herbert Road	Project No.: 12032	Co-ords: - Level: -	Date: 06/11/2012
Location: Newport		Dimensions: 2.20m Depth 2.70m 0.70m	Scale: 1:25
Client: Greenhill Construction			Logged By: MW

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						MADE GROUND. Grass over soft red brown slightly gravelly clay with many rootlets. Gravel is fine to coarse of angular mudstone.
			0.20			MADE GROUND. Dense grey very gravelly sand with some cobbles of angular sandstone
			0.80			MADE GROUND. Firm black very gravelly clay with some cobbles of angular concrete and brick. Many litter including bottles, rubber, plastic and ceramic. Gravel is fine to coarse of angular brick, concrete and vitreous slag.
			2.50			Firm grey mottled CLAY
			2.70			Trialpit Complete at 2.70 m

1
2
3
4

Remarks: Stable

Groundwater: Dry

AGS

HoleBASE III (Bld 426.48) Standard Trialpit Log v2 dated 27th Nov 03

ANNEX B
Laboratory Soil and Leachate Chemical Test Results

Certificate of Analysis

Certificate Number 18-15383-1

11-Jul-18

Client Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
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Cardiff
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Our Reference 18-15383-1

Client Reference 12032P2RH

Order No 12032RH

Contract Title H.Rd Reen

Description 10 Soil samples, 6 Leachate samples.

Date Received 26-Jun-18

Date Started 26-Jun-18

Date Completed 11-Jul-18

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

Notes **This report supersedes 18-15383. Extra testing**

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

Approved By [redacted]

Adam Fenwick
Contracts Manager

2139

Summary of Chemical Analysis
Matrix Descriptions

Our Ref 18-15383-1
Client Ref 12032P2RH
Contract Title H.Rd Reen

Sample ID	Depth	Lab No	Completed	Matrix Description
TP1	0.5	1358038	04/07/2018	Brown gravelly, clayey SAND
TP2	0.1	1358039	04/07/2018	Brown gravelly, clayey SAND
TP3	0.4	1358041	04/07/2018	Dark brown gravelly SAND
TP4	1	1358042	04/07/2018	Black gravelly SAND
TP5	0.3	1358043	04/07/2018	Dark brown gravelly, clayey SAND
TP6	0.5	1358044	04/07/2018	Dark brown gravelly SAND
TP7	0.3	1358045	04/07/2018	Dark brown gravelly, clayey SAND
TP8	0.6	1358047	04/07/2018	Dark brown gravelly, sandy CLAY

Summary of Chemical Analysis
Soil Samples

Our Ref 18-15383-1
Client Ref 12032P2RH
Contract Title H.Rd Reen

			Lab No	1358038	1358039	1358040	1358041	1358042	1358043
			Sample ID	TP1	TP2	TP2	TP3	TP4	TP5
			Depth	0.50	0.10	1.00	0.40	1.00	0.30
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	22/06/18	22/06/18	22/06/18	22/06/18	22/06/18	22/06/18
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Asbestos Quantification	DETSC 1102	0							Y
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	5.0	12		70	49	11
Cadmium	DETSC 2301#	0.1	mg/kg	0.3	0.5		0.6	1.7	0.4
Chromium	DETSC 2301#	0.15	mg/kg	12	12		45	50	18
Chromium III	DETSC 2301*	0.15	mg/kg	12	12		45	50	18
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0		< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	23	21		8900	880	180
Lead	DETSC 2301#	0.3	mg/kg	29	42		1400	650	78
Mercury	DETSC 2325#	0.05	mg/kg	0.86	1.1		0.31	5.5	0.13
Nickel	DETSC 2301#	1	mg/kg	12	12		990	70	51
Selenium	DETSC 2301#	0.5	mg/kg	0.8	0.6		< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	83	100		540	1100	180
Inorganics									
pH	DETSC 2008#			10.0	8.5		7.3	7.4	8.2
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.1	0.2		1.0	2.4	< 0.1
Organic matter	DETSC 2002#	0.1	%	1.8	2.3		17	6.9	2.8
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l				330	350	
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.19	0.09		0.57	0.31	0.06
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5		< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2		< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5		< 1.5	< 1.5	< 1.5	2.1
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4		< 3.4	< 3.4	< 3.4	12
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10		< 10	< 10	< 10	14
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9		< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5		< 0.5	< 0.5	< 0.5	0.7
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6		< 0.6	< 0.6	< 0.6	7.4
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4		< 1.4	< 1.4	< 1.4	42
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10		< 10	< 10	< 10	50
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	< 10		< 10	< 10	< 10	64
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03		< 0.03	< 0.03	0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03		0.05	< 0.03	0.07
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03		< 0.03	< 0.03	0.08
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03		< 0.03	< 0.03	0.09

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 18-15383-1
Client Ref 12032P2RH
Contract Title H.Rd Reen

			Lab No	1358038	1358039	1358040	1358041	1358042	1358043
			Sample ID	TP1	TP2	TP2	TP3	TP4	TP5
			Depth	0.50	0.10	1.00	0.40	1.00	0.30
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	22/06/18	22/06/18	22/06/18	22/06/18	22/06/18	22/06/18
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.13	0.21		0.11	0.09	0.93
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	0.04		0.06	< 0.03	0.26
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.28	0.40		0.53	0.18	2.1
Pyrene	DETSC 3303#	0.03	mg/kg	0.24	0.33		0.55	0.17	1.7
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.16	0.22		0.35	0.12	1.1
Chrysene	DETSC 3303	0.03	mg/kg	0.22	0.31		0.43	0.13	1.2
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.27	0.40		0.63	0.17	2.1
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.10	0.14		0.22	0.06	0.62
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.16	0.26		0.47	0.11	1.5
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.11	0.15		0.26	< 0.03	0.69
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03		< 0.03	< 0.03	0.25
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.12	0.16		0.31	0.07	0.90
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	1.8	2.6		4.0	1.1	14
PCBs									
PCB 28 + PCB 31	DETSC 3401#	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	0.02
PCB 52	DETSC 3401#	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	0.05
PCB 101	DETSC 3401#	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	0.07
PCB 118	DETSC 3401#	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	0.03
PCB 153	DETSC 3401#	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	0.05
PCB 138	DETSC 3401#	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	0.08
PCB 180	DETSC 3401#	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	0.09
PCB 7 Total	DETSC 3401#	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	0.38
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3		< 0.3	< 0.3	< 0.3

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Summary of Chemical Analysis
Soil Samples

Our Ref 18-15383-1
Client Ref 12032P2RH
Contract Title H.Rd Reen

			Lab No	1358044	1358045	1358046	1358047
			Sample ID	TP6	TP7	TP7	TP8
			Depth	0.50	0.30	1.00	0.60
			Other ID				
			Sample Type	SOIL	SOIL	SOIL	SOIL
			Sampling Date	22/06/18	22/06/18	22/06/18	22/06/18
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Asbestos Quantification	DETSC 1102	0		Y	Y		Y
Metals							
Arsenic	DETSC 2301#	0.2	mg/kg	16	12		19
Cadmium	DETSC 2301#	0.1	mg/kg	1.3	0.3		0.9
Chromium	DETSC 2301#	0.15	mg/kg	35	20		25
Chromium III	DETSC 2301*	0.15	mg/kg	35	20		25
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0		< 1.0
Copper	DETSC 2301#	0.2	mg/kg	130	30		170
Lead	DETSC 2301#	0.3	mg/kg	170	40		270
Mercury	DETSC 2325#	0.05	mg/kg	0.30	0.82		3.5
Nickel	DETSC 2301#	1	mg/kg	46	36		48
Selenium	DETSC 2301#	0.5	mg/kg	0.6	< 0.5		< 0.5
Zinc	DETSC 2301#	1	mg/kg	230	100		380
Inorganics							
pH	DETSC 2008#			8.5	8.3		8.0
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.4	0.1		2.6
Organic matter	DETSC 2002#	0.1	%	3.8	2.4		4.8
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l				
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.15	0.03		0.16
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5		< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2		< 1.2	3.5
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5		2.3	75
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4		11	280
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10		14	360
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9		< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	1.7		< 0.5	15
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	6.7		< 0.6	130
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	40		< 1.4	240
Aromatic C5-C35	DETSC 3072*	10	mg/kg	48		< 10	380
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	48		14	740
PAHs							
Naphthalene	DETSC 3303#	0.03	mg/kg	0.06	< 0.03		0.05
Acenaphthylene	DETSC 3303#	0.03	mg/kg	0.05	< 0.03		0.06
Acenaphthene	DETSC 3303#	0.03	mg/kg	0.09	< 0.03		0.06
Fluorene	DETSC 3303	0.03	mg/kg	0.10	< 0.03		0.08

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 18-15383-1
Client Ref 12032P2RH
Contract Title H.Rd Reen

			Lab No	1358044	1358045	1358046	1358047
			Sample ID	TP6	TP7	TP7	TP8
			Depth	0.50	0.30	1.00	0.60
			Other ID				
			Sample Type	SOIL	SOIL	SOIL	SOIL
			Sampling Date	22/06/18	22/06/18	22/06/18	22/06/18
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.68	0.08		0.56
Anthracene	DETSC 3303	0.03	mg/kg	0.19	< 0.03		0.20
Fluoranthene	DETSC 3303#	0.03	mg/kg	1.4	0.07		1.2
Pyrene	DETSC 3303#	0.03	mg/kg	1.2	0.06		1.2
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.69	0.05		0.55
Chrysene	DETSC 3303	0.03	mg/kg	0.79	0.06		0.63
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	1.3	0.07		1.2
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.37	< 0.03		0.35
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.82	0.04		0.76
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.37	< 0.03		0.33
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03		< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.46	< 0.03		0.41
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	8.6	0.45		7.6
PCBs							
PCB 28 + PCB 31	DETSC 3401#	0.01	mg/kg	0.11		0.06	3.2
PCB 52	DETSC 3401#	0.01	mg/kg	0.16		0.09	6.1
PCB 101	DETSC 3401#	0.01	mg/kg	0.14		0.10	5.3
PCB 118	DETSC 3401#	0.01	mg/kg	< 0.10		0.07	2.9
PCB 153	DETSC 3401#	0.01	mg/kg	< 0.10		0.08	2.2
PCB 138	DETSC 3401#	0.01	mg/kg	0.24		0.15	2.4
PCB 180	DETSC 3401#	0.01	mg/kg	0.27		0.09	1.3
PCB 7 Total	DETSC 3401#	0.01	mg/kg	0.92		0.65	23
Phenols							
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3		< 0.3

Summary of Chemical Analysis
Leachate Samples

Our Ref 18-15383-1
Client Ref 12032P2RH
Contract Title H.Rd Reen

			Lab No	1361903	1361904	1361905	1361906	1361907	1361908
			Sample ID	TP3	TP4	TP5	TP6	TP7	TP8
			Depth	0.40	1.00	0.30	0.50	1.00	0.60
			Other ID						
			Sample Type	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	22/06/18	22/06/18	22/06/18	22/06/18	22/06/18	22/06/18
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Preparation									
NRA Leachate Preparation	DETS 036*			Y	Y	Y	Y	Y	Y
Metals									
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	1.5	< 0.16				
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.3					
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.22	< 0.09				< 0.09
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5					
PCBs									
PCB 28 + PCB 31	DETSC 3402	0.3	ug/l			< 0.3	< 0.3	< 0.3	< 0.3
PCB 52	DETSC 3402	0.2	ug/l			< 0.2	< 0.2	< 0.2	< 0.2
PCB 101	DETSC 3402	0.3	ug/l			< 0.3	< 0.3	< 0.3	< 0.3
PCB 118 + PCB 123	DETSC 3402	0.6	ug/l			< 0.6	< 0.6	< 0.6	< 0.6
PCB 138	DETSC 3402	0.2	ug/l			< 0.2	< 0.2	< 0.2	< 0.2
PCB 153	DETSC 3402	0.2	ug/l			< 0.2	< 0.2	< 0.2	< 0.2
PCB 180	DETSC 3402	0.2	ug/l			< 0.2	< 0.2	< 0.2	< 0.2
PCB 7 Total	DETSC 3402	1	ug/l			< 1.0	< 1.0	< 1.0	< 1.0

Key: * -not accredited. n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 18-15383-1
Client Ref 12032P2RH
Contract Title H.Rd Reen

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1358038	TP1 0.50	SOIL	NAD	none	D Wilkinson
1358039	TP2 0.10	SOIL	NAD	none	D Wilkinson
1358041	TP3 0.40	SOIL	NAD	none	D Wilkinson
1358042	TP4 1.00	SOIL	NAD	none	D Wilkinson
1358043	TP5 0.30	SOIL	Chrysotile	Chrysotile present as fibre bundles	D Wilkinson
1358044	TP6 0.50	SOIL	Chrysotile	Chrysotile present as fibre bundles	D Wilkinson
1358045	TP7 0.30	SOIL	Chrysotile	Chrysotile present as fibre bundles	D Wilkinson
1358047	TP8 0.60	SOIL	Chrysotile Amosite Crocidolite	Chrysotile Amosite and Crocidolite present as fibre bundles Chrysotile and Amosite also present in microscopic and visible insulation	D Wilkinson

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * -not included in laboratory scope of accreditation.

Summary of Asbestos Quantification Analysis
Soil Samples

Our Ref 18-15383-1
Client Ref 12032P2RH
Contract Title H.Rd Reen

		Lab No	1358043	1358044	1358045	1358047
		Sample ID	TP5	TP6	TP7	TP8
		Depth	0.30	0.50	0.30	0.60
		Other ID				
		Sample Type	SOIL	SOIL	SOIL	SOIL
		Sampling Date	22/06/18	22/06/18	22/06/18	22/06/18
		Sampling Time				
Test	**Method**	**Units**				
Total Mass% Asbestos (a+b+c)	DETSC 1102	Mass %	**< 0.001**	**< 0.001**	**0.002**	**0.226**
Gravimetric Quantification (a)	DETSC 1102	Mass %	na	na	na	0.222
Detailed Gravimetric Quantification (b)	DETSC 1102	Mass %	<0.001	<0.001	0.002	0.004
Quantification by PCOM (c)	DETSC 1102	Mass %	na	na	na	na
Potentially Respirable Fibres (d)	DETSC 1102	Fibres/g	na	na	na	na
Breakdown of Gravimetric Analysis (a)						
Mass of Sample		g	1227.43	962.27	1166.67	903.80
ACMs present*		type				Insulation
Mass of ACM in sample		g				2.36
% ACM by mass		%				0.26
% asbestos in ACM		%				85
% asbestos in sample		%				0.222
Breakdown of Detailed Gravimetric Analysis (b)						
% Amphibole bundles in sample		Mass %	na	na	na	0.002
% Chrysotile bundles in sample		Mass %	<0.001	<0.001	0.002	0.002
Breakdown of PCOM Analysis (c)						
% Amphibole fibres in sample		Mass %	na	na	na	na
% Chrysotile fibres in sample		Mass %	na	na	na	na
Breakdown of Potentially Respirable Fibre Analysis (d)						
Amphibole fibres		Fibres/g	na	na	na	na
Chrysotile fibres		Fibres/g	na	na	na	na

* Denotes test or material description outside of UKAS accreditation.
% asbestos in Asbestos Containing Materials (ACMs) is determined by
by reference to HSG 264.
Recommended sample size for quantification is approximately 1kg
# denotes deviating sample

Information in Support of the Analytical Results

Our Ref 18-15383-1
Client Ref 12032P2RH
Contract H.Rd Reen

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1358038	TP1 0.50 SOIL	22/06/18	GJ 250ml x3, GJ 60ml, PT 1L x2		
1358039	TP2 0.10 SOIL	22/06/18	GJ 250ml, PT 1L		
1358040	TP2 1.00 SOIL	22/06/18	GJ 250ml x2, GJ 60ml, PT 1L		
1358041	TP3 0.40 SOIL	22/06/18	GJ 250ml x3, GJ 60ml, PT 1L x2		
1358042	TP4 1.00 SOIL	22/06/18	GJ 250ml x3, GJ 60ml, PT 1L x2		
1358043	TP5 0.30 SOIL	22/06/18	GJ 250ml x3, GJ 60ml, PT 1L x2		
1358044	TP6 0.50 SOIL	22/06/18	GJ 250ml x3, GJ 60ml, PT 1L x2		
1358045	TP7 0.30 SOIL	22/06/18	GJ 250ml, PT 1L		
1358046	TP7 1.00 SOIL	22/06/18	GJ 250ml x2, GJ 60ml, PT 1L		
1358047	TP8 0.60 SOIL	22/06/18	GJ 250ml x3, GJ 60ml, PT 1L x2		
1361903	TP3 0.40 LEACHATE	22/06/18	GJ 250ml x3, GJ 60ml, PT 1L x2		
1361904	TP4 1.00 LEACHATE	22/06/18	GJ 250ml x3, GJ 60ml, PT 1L x2		
1361905	TP5 0.30 LEACHATE	22/06/18	GJ 250ml x3, GJ 60ml, PT 1L x2		
1361906	TP6 0.50 LEACHATE	22/06/18	GJ 250ml x3, GJ 60ml, PT 1L x2		
1361907	TP7 1.00 LEACHATE	22/06/18	GJ 250ml x2, GJ 60ml, PT 1L		
1361908	TP8 0.60 LEACHATE	22/06/18	GJ 250ml x3, GJ 60ml, PT 1L x2		

Key: G-Glass P-Plastic J-Jar T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO4	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO4	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETSC2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

Certificate of Analysis

2139

Certificate Number: 12-71357-2

Date: 11/01/2013

Client: Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference: 12-71357-2

Client Reference:

Contract Title: Herbert Road

Description: 15 soil samples

Date Received: 09 November 2012

Date Started: 09 November 2012

Date Completed: 28 November 2012

Test Procedures: Identified by prefix DETSn (details on request), Asbestos Analysis (DETS 082).

Notes: **This report supersedes 12-71357-1, additional testing carried out**
Observations and interpretations are outside the scope of UKAS accreditation

Approved By: [redacted]
Rob Brown, Business Manager

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Information in Support of the Analytical Results

Analysis

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425um sieve, in accordance with BS1377.
Organic soil analysis was carried out on an 'as received' sample.

Key

*	Denotes test not included in laboratory scope of accreditation
#	Denotes test that holds MCERTS accreditation, however, MCERTS accreditation is only implied if the report carries the MCERTS logo
$	Denotes tests completed by an approved subcontractor
I/S	Denotes insufficient sample to carry out test
U/S	Denotes that the sample is not suitable for testing

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-
Soils - 1 month
Liquids - 2 weeks
Asbestos (test portion) - 6 months

Summary of Chemical Analysis
Matrix Descriptions

Our Ref: 12-71357-2
Client Ref:
Contract Title: Herbert Road

Sample ID	Depth	Sample No	Completed	Matrix Description
TP2	0.90	460753	28/11/2012	Dark brown gravelly sandy CLAY
TP4	0.70	460754	28/11/2012	Dark brown gravelly sandy CLAY
TP5	1.30	460755	28/11/2012	Dark brown clayey gravelly SAND
TP6	0.60	460756	28/11/2012	Brown clayey gravelly SAND
TP6	1.80	460757	28/11/2012	Dark brown gravelly sandy CLAY with odd rootlets
TP7	0.20	460758	28/11/2012	Dark brown gravelly sandy CLAY with odd rootlets
TP8	0.50	460759	28/11/2012	Dark brown clayey gravelly SAND
TP9	1.00	460760	28/11/2012	Dark brown gravelly sandy CLAY
TP10	0.80	460761	28/11/2012	Dark brown gravelly sandy CLAY
TP12	0.40	460762	28/11/2012	Brown very gravelly SAND
TP13	0.60	460763	28/11/2012	Brown very gravelly SAND
TP14	0.40	460764	28/11/2012	Dark brown clayey gravelly SAND
TP15	0.40	460765	28/11/2012	Brown gravelly sandy CLAY with odd rootlets
TP17	0.15	460766	28/11/2012	Dark brown gravelly sandy CLAY with odd rootlets
TP18	0.50	460767	28/11/2012	Dark brown clayey gravelly SAND with odd rootlets

Summary of Chemical Analysis
Soil Samples

Our Ref: 12-71357-2
Client Ref:
Contract Title: Herbert Road

			Lab No.	460753	460754	460755
			Sample ID	TP2	TP4	TP5
			Depth	0.90	0.70	1.30
			Sample Ref			
			Sample Type			
			Sampling Date	06/11/2012	06/11/2012	06/11/2012
			Sampling Time			
Test	**Units**	**DETSxx**	**LOD**			
Arsenic	mg/kg	DETS 042#	0.2	21	26	40
Cadmium	mg/kg	DETS 042#	0.1	1.0	0.8	1.1
Chromium III	mg/kg	DETS 042*	0.15	41	42	35
Chromium	mg/kg	DETS 042#	0.15	41	42	35
Hexavalent Chromium	mg/kg	DETSC 2204*	1	< 1.0	< 1.0	< 1.0
Copper	mg/kg	DETS 042#	0.2	230	44	950
Lead	mg/kg	DETS 042#	0.3	110	100	290
Mercury	mg/kg	DETSC 2325	0.05	0.45	0.39	0.41
Nickel	mg/kg	DETS 042#	1	45	31	69
Selenium	mg/kg	DETS 042#	0.5	0.6	< 0.5	0.9
Zinc	mg/kg	DETS 042#	1	250	150	410
Cyanide total	mg/kg	DETSC 2130#	0.1	10	1.2	2.1
Organic matter	%	DETSC 2002#	0.1	7.5	8.6	23
Total Sulphate as SO4	%	DETSC 2321#	0.01	0.10	0.09	0.24
Sulphate Aqueous Extract as SO4	mg/l	DETSC 2076#	10			
pH		DETSC 2008#		8.9	8.8	8.2
Aliphatic C5-C6	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	mg/kg	DETSC 3072#	1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	mg/kg	DETSC 3072#	1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	mg/kg	DETSC 3072#	1.5	< 1.5	< 1.5	1.7
Aliphatic C21-C35	mg/kg	DETSC 3072#	3.4	< 3.4	< 3.4	7.9
Aromatic C5-C7	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	mg/kg	DETSC 3072#	0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	mg/kg	DETSC 3072#	0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	mg/kg	DETSC 3072#	0.6	1.8	< 0.6	< 0.6
Aromatic C21-C35	mg/kg	DETSC 3072#	1.4	5.9	< 1.4	2.0
Aliphatic C5-C35	mg/kg	DETSC 3072*	10	< 10	< 10	< 10
Aromatic C5-C35	mg/kg	DETSC 3072*	10	< 10	< 10	< 10
TPH Ali/Aro	mg/kg	DETSC 3072*	10	< 10	< 10	12

Summary of Chemical Analysis
Soil Samples

Our Ref: 12-71357-2
Client Ref:
Contract Title: Herbert Road

			Lab No.	460753	460754	460755
			Sample ID	TP2	TP4	TP5
			Depth	0.90	0.70	1.30
			Sample Ref			
			Sample Type			
			Sampling Date	06/11/2012	06/11/2012	06/11/2012
			Sampling Time			
Test	**Units**	**DETSxx**	**LOD**			
Acenaphthene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1	
Acenaphthylene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1	
Anthracene	mg/kg	DETSC 3301	0.1	0.2	0.1	
Benzo(a)anthracene	mg/kg	DETSC 3301	0.1	0.8	0.8	
Benzo(a)pyrene	mg/kg	DETSC 3301	0.1	0.8	0.9	
Benzo(b)fluoranthene	mg/kg	DETSC 3301	0.1	0.8	0.6	
Benzo(k)fluoranthene	mg/kg	DETSC 3301	0.1	0.3	0.3	
Benzo(g,h,i)perylene	mg/kg	DETSC 3301	0.1	0.5	0.4	
Chrysene	mg/kg	DETSC 3301	0.1	0.9	0.8	
Dibenzo(a,h)anthracene	mg/kg	DESTC 3301	0.1	0.2	0.2	
Fluoranthene	mg/kg	DETSC 3301	0.1	1.2	1.2	
Fluorene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1	
Indeno(1,2,3-c,d)pyrene	mg/kg	DETSC 3301	0.1	0.7	0.5	
Naphthalene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1	
Phenanthrene	mg/kg	DETSC 3301	0.1	0.6	0.5	
Pyrene	mg/kg	DETSC 3301	0.1	1.1	1.0	
PAH	mg/kg	DETSC 3301	1.6	8.3	7.4	< 1.6
Phenol - Monohydric	mg/kg	DETSC 2130#	0.3	< 0.3	< 0.3	< 0.3
PCB	mg/kg	DETSC 3401#	0.01			< 0.01
2,4,4'-Trichlorobiphenyl PCB 28	mg/kg	DETSC 3401#	0.01			< 0.01
2,2',5,5'-Tetrachlorobiphenyl PCB 52	mg/kg	DETSC 3401#	0.01			< 0.01
2,2',4,5,5'-Pentachlorobiphenyl PCB 101	mg/kg	DETSC 3401#	0.01			< 0.01
2,3',4,4',5-Pentachlorobiphenyl PCB 118	mg/kg	DETSC 3401#	0.01			< 0.01
2,2',4,4',5,5'-Hexachlorobiphenyl PCB 153	mg/kg	DETSC 3401#	0.01			< 0.01
2,2',3,4,4',5'-Hexachlorobiphenyl PCB 138	mg/kg	DETSC 3401#	0.01			< 0.01
2,2',3,4,4',5,5'-Heptachlorobiphenyl PCB 180	mg/kg	DETSC 3401#	0.01			< 0.01

Summary of Chemical Analysis
Soil Samples

Our Ref: 12-71357-2
Client Ref:
Contract Title: Herbert Road

			Lab No.	460756	460757	460758
			Sample ID	TP6	TP6	TP7
			Depth	0.60	1.80	0.20
			Sample Ref			
			Sample Type			
			Sampling Date	06/11/2012	06/11/2012	06/11/2012
			Sampling Time			
Test	**Units**	**DETSxx**	**LOD**			
Arsenic	mg/kg	DETS 042#	0.2	8.1	17	19
Cadmium	mg/kg	DETS 042#	0.1	0.8	1.2	0.9
Chromium III	mg/kg	DETS 042*	0.15	19	31	42
Chromium	mg/kg	DETS 042#	0.15	19	31	42
Hexavalent Chromium	mg/kg	DETSC 2204*	1	< 1.0	< 1.0	< 1.0
Copper	mg/kg	DETS 042#	0.2	10	130	110
Lead	mg/kg	DETS 042#	0.3	10	190	93
Mercury	mg/kg	DETSC 2325	0.05	0.05	1.9	0.43
Nickel	mg/kg	DETS 042#	1	31	43	43
Selenium	mg/kg	DETS 042#	0.5	< 0.5	< 0.5	< 0.5
Zinc	mg/kg	DETS 042#	1	140	330	240
Cyanide total	mg/kg	DETSC 2130#	0.1	0.5	3.1	0.5
Organic matter	%	DETSC 2002#	0.1	1.4	5.7	4.9
Total Sulphate as SO4	%	DETSC 2321#	0.01	0.02	0.21	0.06
Sulphate Aqueous Extract as SO4	mg/l	DETSC 2076#	10			
pH		DETSC 2008#		9.0	8.7	9.0
Aliphatic C5-C6	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	mg/kg	DETSC 3321*	0.01	< 0.01	0.02	< 0.01
Aliphatic C10-C12	mg/kg	DETSC 3072#	1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	mg/kg	DETSC 3072#	1.2	< 1.2	16	< 1.2
Aliphatic C16-C21	mg/kg	DETSC 3072#	1.5	< 1.5	120	< 1.5
Aliphatic C21-C35	mg/kg	DETSC 3072#	3.4	< 3.4	340	< 3.4
Aromatic C5-C7	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	mg/kg	DETSC 3321*	0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	mg/kg	DETSC 3321*	0.01	< 0.01	0.05	< 0.01
Aromatic C10-C12	mg/kg	DETSC 3072#	0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	mg/kg	DETSC 3072#	0.5	< 0.5	9.1	< 0.5
Aromatic C16-C21	mg/kg	DETSC 3072#	0.6	< 0.6	45	2.0
Aromatic C21-C35	mg/kg	DETSC 3072#	1.4	< 1.4	140	12
Aliphatic C5-C35	mg/kg	DETSC 3072*	10	< 10	480	< 10
Aromatic C5-C35	mg/kg	DETSC 3072*	10	< 10	190	14
TPH Ali/Aro	mg/kg	DETSC 3072*	10	< 10	670	14

Summary of Chemical Analysis
Soil Samples

Our Ref: 12-71357-2
Client Ref:
Contract Title: Herbert Road

			Lab No.	460756	460757	460758
			Sample ID	TP6	TP6	TP7
			Depth	0.60	1.80	0.20
			Sample Ref			
			Sample Type			
			Sampling Date	06/11/2012	06/11/2012	06/11/2012
			Sampling Time			
Test	**Units**	**DETSxx**	**LOD**			
Acenaphthene	mg/kg	DETSC 3301	0.1		1.5	0.4
Acenaphthylene	mg/kg	DETSC 3301	0.1		1.4	< 0.1
Anthracene	mg/kg	DETSC 3301	0.1		0.4	0.9
Benzo(a)anthracene	mg/kg	DETSC 3301	0.1		1.8	2.4
Benzo(a)pyrene	mg/kg	DETSC 3301	0.1		0.7	1.9
Benzo(b)fluoranthene	mg/kg	DETSC 3301	0.1		0.8	1.5
Benzo(k)fluoranthene	mg/kg	DETSC 3301	0.1		0.4	0.7
Benzo(g,h,i)perylene	mg/kg	DETSC 3301	0.1		0.9	1.1
Chrysene	mg/kg	DETSC 3301	0.1		1.1	2.3
Dibenzo(a,h)anthracene	mg/kg	DESTC 3301	0.1		0.2	0.3
Fluoranthene	mg/kg	DETSC 3301	0.1		1.1	4.4
Fluorene	mg/kg	DETSC 3301	0.1		0.1	0.3
Indeno(1,2,3-c,d)pyrene	mg/kg	DETSC 3301	0.1		0.6	1.3
Naphthalene	mg/kg	DETSC 3301	0.1		0.2	0.7
Phenanthrene	mg/kg	DETSC 3301	0.1		0.5	3.3
Pyrene	mg/kg	DETSC 3301	0.1		1.3	3.8
PAH	mg/kg	DETSC 3301	1.6	< 1.6	13	25
Phenol - Monohydric	mg/kg	DETSC 2130#	0.3	< 0.3	0.5	< 0.3
PCB	mg/kg	DETSC 3401#	0.01	0.15		< 0.01
2,4,4'-Trichlorobiphenyl PCB 28	mg/kg	DETSC 3401#	0.01	< 0.01		< 0.01
2,2',5,5'-Tetrachlorobiphenyl PCB 52	mg/kg	DETSC 3401#	0.01	< 0.01		< 0.01
2,2',4,5,5'-Pentachlorobiphenyl PCB 101	mg/kg	DETSC 3401#	0.01	0.01		< 0.01
2,3',4,4',5-Pentachlorobiphenyl PCB 118	mg/kg	DETSC 3401#	0.01	0.02		< 0.01
2,2',4,4',5,5'-Hexachlorobiphenyl PCB 153	mg/kg	DETSC 3401#	0.01	0.02		< 0.01
2,2',3,4,4',5'-Hexachlorobiphenyl PCB 138	mg/kg	DETSC 3401#	0.01	0.05		< 0.01
2,2',3,4,4',5,5'-Heptachlorobiphenyl PCB 180	mg/kg	DETSC 3401#	0.01	0.04		< 0.01

Summary of Asbestos Analysis
Soil Samples

Our Ref: 12-71357-2
Client Ref:
Contract Title: Herbert Road

Lab No	Sample Ref	Material Type*	Result	Comment	Analyst
460753	TP2 0.90	Soil	NAD	na	Emrhys Sheldon
460754	TP4 0.70	Soil	NAD	na	Emrhys Sheldon
460755	TP5 1.30	Soil	NAD	na	Emrhys Sheldon
460756	TP6 0.60	Soil	NAD	na	Emrhys Sheldon
460757	TP6 1.80	Soil	Chrysotile	Loose Bundles	Emrhys Sheldon
460758	TP7 0.20	Soil	Chrysotile	Loose Bundles	Emrhys Sheldon
460759	TP8 0.50	Soil	NAD	na	Emrhys Sheldon
460760	TP9 1.00	Soil	NAD	na	Emrhys Sheldon
460761	TP10 0.80	Soil	NAD	na	Emrhys Sheldon
460762	TP12 0.40	Soil	NAD	na	Emrhys Sheldon
460763	TP13 0.60	Soil	NAD	na	Emrhys Sheldon
460764	TP14 0.40	Soil	NAD	na	Emrhys Sheldon
460765	TP15 0.40	Soil	NAD	na	Emrhys Sheldon
460766	TP17 0.15	Soil	NAD	na	Emrhys Sheldon
460767	TP18 0.50	Soil	NAD	na	Emrhys Sheldon

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. NAD = No Asbestos Detected. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETS 082 using polarised light microscopy in accordance with HSG248 and documented in-house methods. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'.

Sample Comments

DETS cannot be held responsible for the integrity of sample(s) received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating.

Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note "Guidance on Deviating Samples".

All samples received are listed below. However, those samples that have additional comments in relation to hold time and/or inappropriate containers are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations.

If no sampled date (soils) or date/time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters), this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Lab No.	Sample ID	Date Sampled	Containers Received	Deviating due to holding time being exceeded for test	Deviating due to inappropriate container for test
460753	TP2 0.90 SOIL	06/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)		
460754	TP4 0.70 SOIL	06/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)		
460755	TP5 1.30 SOIL	06/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)		
460756	TP6 0.60 SOIL	06/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)		
460757	TP6 1.80 SOIL	06/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)		
460758	TP7 0.20 SOIL	06/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)		
460759	TP8 0.50 SOIL	06/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)		
460760	TP9 1.00 SOIL	06/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)		

460761	TP10 0.80 SOIL	06/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)
460762	TP12 0.40 SOIL	06/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)
460763	TP13 0.60 SOIL	07/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)
460764	TP14 0.40 SOIL	07/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)
460765	TP15 0.40 SOIL	07/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)
460766	TP17 0.15 SOIL	07/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)
460767	TP18 0.50 SOIL	07/11/2012	Glass Jar 250ml or less (250ml) x2, Plastic Tub 1 litre (1kg)

Appendix A - Details of Analysis

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS.
No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

Method	Name of Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic Matter	%	0.01	Air Dried	No	Yes	Yes
DETSC 2003	Loss on Ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2004	Total Sulphate	%	0.01	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate	%	0.01	Air Dried	No	Yes	Yes
DETSC 2004	Water Soluble Sulphate	mg/l	10.00	Air Dried	No	Yes	Yes
DETSC 2076	Water Soluble Sulphate	mg/l	10.00	Air Dried	No	Yes	Yes
DETSC 2006	Chloride	mg/kg	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	0.10	Air Dried	No	Yes	Yes
DETS 042	Selenium	mg/kg	0.50	Air Dried	No	Yes	Yes
DETSC 2119	Ammonia	mg/kg	0.02	Air Dried	No	Yes	Yes
DETS 020	Boron (Water Soluble)	mg/kg	0.20	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10.00	Air Dried	No	Yes	Yes
DETS 042	Antimony	mg/kg	1.00	Air Dried	No	No	No
DETS 042	Arsenic	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 042	Barium	mg/kg	1.50	Air Dried	No	Yes	Yes
DETS 042	Beryllium	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 042	Cadmium	mg/kg	0.10	Air Dried	No	Yes	Yes
DETS 042	Cobalt	mg/kg	0.70	Air Dried	No	Yes	Yes
DETS 042	Copper	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 042	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETS 042	Iron	mg/kg	1.00	Air Dried	No	Yes	No

Appendix A - Details of Analysis

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS.
No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

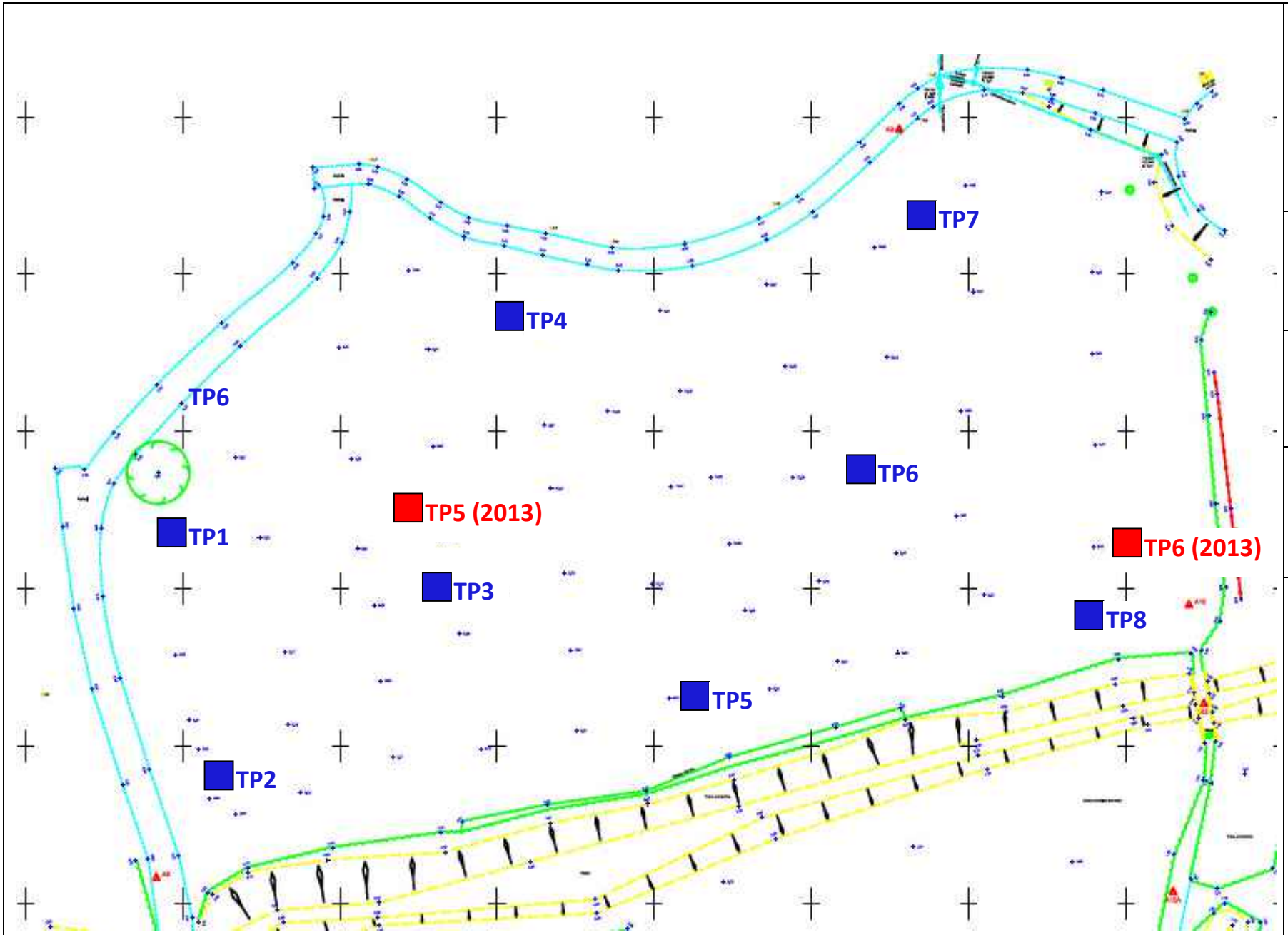
Method	Name of Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETS 042	Lead	mg/kg	0.30	Air Dried	No	Yes	Yes
DETS 042	Manganese	mg/kg	20.00	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETS 042	Molybdenum	mg/kg	0.40	Air Dried	No	Yes	Yes
DETS 042	Nickel	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 042	Thallium	mg/kg	1.00	Air Dried	No	No	No
DETS 042	Vanadium	mg/kg	0.80	Air Dried	No	Yes	Yes
DETS 042	Zinc	mg/kg	1.00	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (Free)	mg/kg	0.50	As Received	No	Yes	Yes
DETSC 3301	PAH by GC-FID	mg/kg	0.10	As Received	No	Yes	No
DETSC 3311	TPH (C10 - C40)	mg/kg	20.00	As Received	No	Yes	Yes
DETSC 3401	PCB	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	Ethylbenzne	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Easily Liberatable Cyanide	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Complex Cyanide	mg/kg	0.30	Air Dried	No	Yes	No
DETSC 2130	Total Cyanide	mg/kg	0.40	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes

Appendix A - Details of Analysis

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS.
No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

Method	Name of Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3431	VOC	mg/kg	0.01	As Received	No	No	No
DETSC 3303	PAH by GCMS (see list below)						
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Anthracene	mg/kg	0.03	As Received	No	Yes	No
DETSC 3303	Chrysene	mg/kg	0.03	As Received	No	Yes	No
DETSC 3303	Fluorene	mg/kg	0.03	As Received	No	Yes	No

DRAWINGS



terrafirma

Drawing Number
01

Drawing Title
SITE LAYOUT

Job Number
12032/P3

Job Title
HERBERT ROAD PHASE 3 NORTH OF REEN

NOT TO SCALE