



Your Ref. N/A  
GVR Geo Ref. G-22-009 SupplGILtrRpt 20230811  
Date 11 August 2023

Candy Day  
Technical Manager  
Orion Homes Limited  
5 Benton Office Park  
Bennett Avenue  
Horbury  
Wakefield  
WF4 5RA

**Re: G-22-009 Bankfield Drive, Holmbridge – Supplementary Soil Testing Report**

Dear Candy

Following your recent commission, please find below our report and advice on the above.

**1. Introduction**

GVR Geoservices Limited (GVR Geo) was commissioned by Orion Homes Ltd (Orion - the Client) to undertake a further assessment of lead concentrations in topsoil around former borehole WS2 to provide further data to assess a previously elevated concentration of total lead determined in a sample of topsoil at this location.

A site location plan is presented in as Dwg. No. G-22-009-001 and the exploratory hole locations plan is shown in Dwg. No. G-22-009-003 in Appendix A.

The works reported here are in response to a request for further assessment from Kirklees Council to consider whether the previously elevated lead concentration at WS2 was an isolated anomaly or was due to a localised hotspot of elevated lead, and to determine remedial actions if necessary.

**Limitations**

This report is based on and limited to an assessment of the resultant information obtained by GVR Geo. This report is prepared for the sole use of Orion and their agents only and should not be relied upon by any third parties without the written permission of GVR Geo. If any unauthorised third party comes into possession of this report, they rely on it at their own risk and the authors do not owe them any Duty of Care or warranty of Skill. This report is based on and limited to an assessment of the information and ground conditions identified here. GVR Geo is not responsible for ground or environmental conditions not revealed during these investigations.



## 2. Background and Scope of Works

The site is of greenfield status and has had no recorded previous potentially contaminative land use, other than agricultural. The whole site is considered as a single averaging area for the purposes of this assessment. The exploratory holes proved a natural profile of topsoil over soils of residual weathered bedrock throughout the site. No made ground was encountered on site.

Previously, 6 No. topsoil samples were taken from across the site and tested for a range of contaminants including heavy metals. The boreholes were positioned to represent general coverage of the site so are considered to be random in their spatial distribution.

An elevated concentration of lead of 340mg/kg was found in the topsoil sample from WS2. All lead results were subject to statistical analysis using the statistical assessment methodology derived from CLR7 (2002). A data entry error meant that the lead concentration at 340mg/kg in WS2 was originally input as 34mg/kg, so the Upper Bound Value (US95) of 81mg/kg discussed in the previous GVR Geo Phase 2 Ground Investigation Report, dated April 2022 was incorrect. A revised US95 value of 206mg/kg lead was obtained for all 6 samples in the dataset which was marginally higher than the lead GAC of 200mg/kg for 'residential with homegrown produce' end-use. The GAC value is a conservative human health screening value, and as such the single elevated lead concentration was not considered to pose an unacceptable risk to human health of the proposed end users of the development.

Statistical assessment of the corrected data, also noted the single elevated lead concentration from WS2 was a statistical outlier and was not part of the data population. However, the natural topsoil observed here was the same as the rest of the site and did not have any anthropogenic or other natural components/clasts observed within it that could give rise to elevated lead. However, KC requested further assessment of lead concentrations in the topsoil in this area.

After further dialogue with KC, it was agreed that further assessment works comprising taking a further 4 samples around WS2 and testing for total lead concentrations only.

## 3. Fieldwork Undertaken

Fieldworks were undertaken on 14 July 2023 and topsoil samples were taken from hand dug trial pits (HDP1-4) located at the corner of a 10m square, centred around former borehole WS2 as shown Dwg. No. G-22-056-003 in Appendix A. Natural topsoil was found in all HDPs and was 350mm thick with samples being taken over the full depth (beneath the turf) at all locations from 0.05-0.35m.

The laboratory test results are presented in Appendix B.

## 4. Findings of the Investigation

None of the 4 samples tested exceeded the lead GAC of 200mg/kg, returning a range of values from 73-92mg/kg.

When re-appraised using the statistical assessment methodology derived from CLR7 (2002), and the 4 new test results were combined with the previous 6 lead results, to give a total sample population of 10, the resultant Upper Bound Value (UBV) is 149mg/kg, which is less than the GAC for lead of 200mg/kg. The single elevated lead concentration from previous WS2 is still recorded as a statistical outlier, however, as the UBV does not exceed the GAC for lead, the single elevated result does not pose an unacceptable risk to the end



users when considered as part of the whole statistical population. The updated statistical analysis results are presented in Appendix B.

## **5. Conclusions**

Whilst the previous single elevated lead concentration at WS2 remains a statistical outlier, the topsoil here was physically the same as the remaining topsoil across the site and is considered to be entirely of natural origin. The further assessment works have confirmed that the single elevated lead concentration at WS2, when considered as part of the a whole of the mass of topsoil that was sampled and tested, does not pose an unacceptable risk to the end users and no further assessment or remedial action is considered necessary.

The topsoil can be stripped to allow construction, stockpiled and re-used in the proposed private gardens.

I trust that this is satisfactory for your current requirements.

Yours sincerely

Dr Grant Richardson BSc, PhD, FGS  
**Director**  
For and on behalf of GVR Geoservices Limited



## **Appendix A**

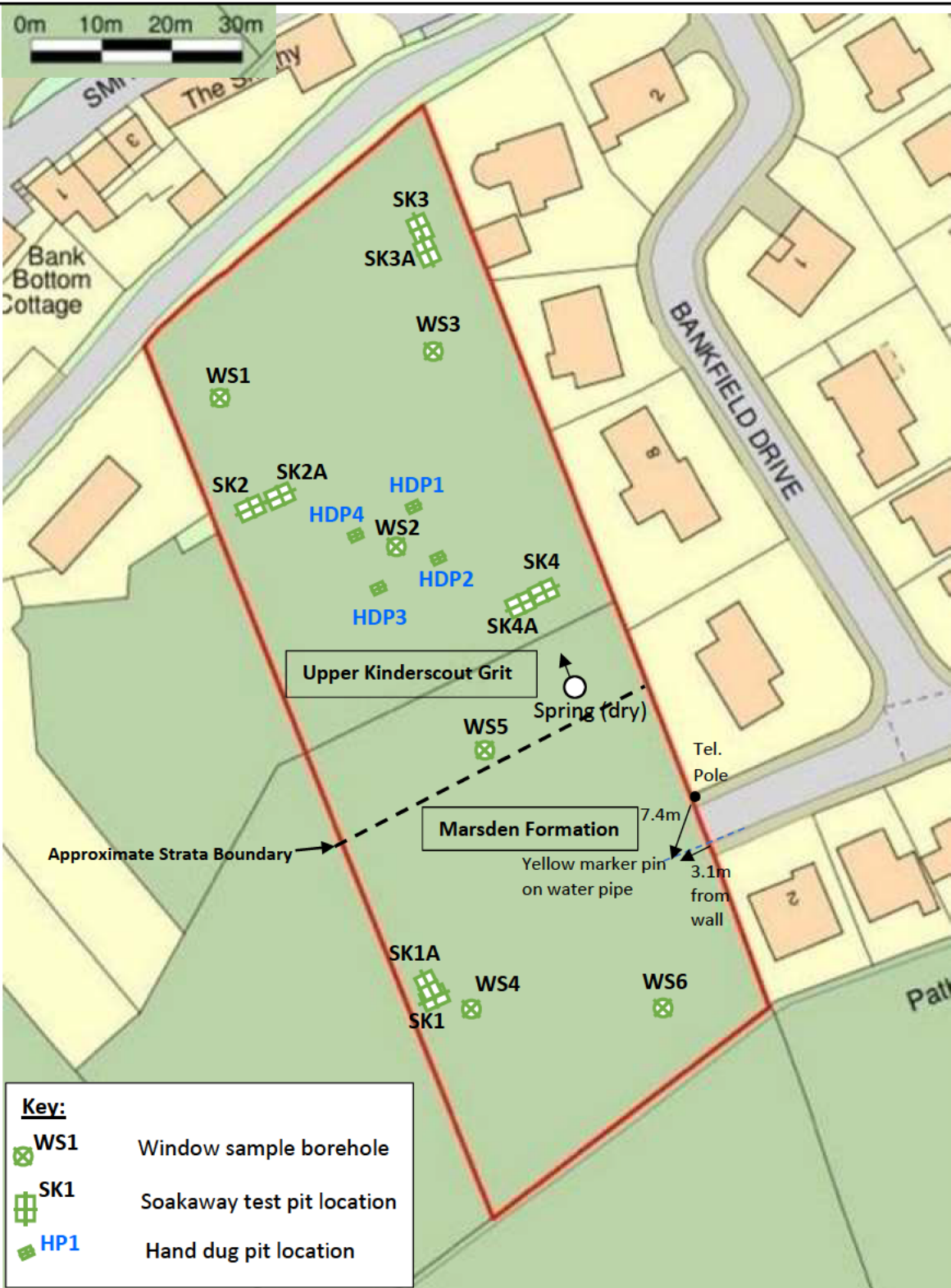
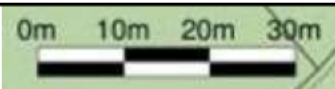
### **Drawings**




**GVR Geoservices Ltd**  
37-38 Market Street, Ferryhill, DL17 8JH

**Job:** G-22-009  
**Title:** Land West of Bankfield Drive, Holmbridge, Holmfirth  
**Client:** Orion Homes

**Scale:** NTS  
**Revision:** 0  
**Drawing Number:** G-22-009-001



Key:	
	WS1 Window sample borehole
	SK1 Soakaway test pit location
	HP1 Hand dug pit location

 **GVR Geoservices Ltd**  
37-38 Market Street, Ferryhill, DL17 8JH

**Job:** Land West of Bankfield Drive, Holmbridge, Holmfirth  
**Title:** Exploratory Hole Location Plan  
**Client:** Orion Homes Ltd

**Scale:** As shown  
**Revision:** 3  
**Drawing Number:** G-22-009-002



## **Appendix B**

### **Chemical Test Results**



Grant Richardson  
GVR Geoservices Ltd  
37-38 High Street  
Ferryhill County Durham  
DL17 8JH

i2 Analytical Ltd.  
7 Woodshots Meadow,  
Croxley Green  
Business Park,  
Watford,  
Herts,  
WD18 8YS

t: 01923 225404  
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## **Analytical Report Number : 23-45361**

<b>Project / Site name:</b>	Bankfield Drive, Holmbridge	<b>Samples received on:</b>	14/07/2023
<b>Your job number:</b>	G-22-009	<b>Samples instructed on/ Analysis started on:</b>	18/07/2023
<b>Your order number:</b>	G-22-009-GVR-232	<b>Analysis completed by:</b>	24/07/2023
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	24/07/2023
<b>Samples Analysed:</b>	4 soil samples		

**Signed:** \_\_\_\_\_

Dominika Warjan  
Reporting 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.

Analytical Report Number: 23-45361  
Project / Site name: Bankfield Drive, Holmbridge  
Your Order No: G-22-009-GVR-232

Lab Sample Number	2750245	2750246	2750247	2750248			
Sample Reference	HDP1	HDP2	HDP3	HDP4			
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied			
Depth (m)	0.05-0.35	0.05-0.35	0.05-0.35	0.05-0.35			
Date Sampled	14/07/2023	14/07/2023	14/07/2023	14/07/2023			
Time Taken	None Supplied	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	< 0.1
Moisture Content	%	0.01	NONE	18	14	17	18
Total mass of sample received	kg	0.001	NONE	0.8	0.8	0.8	0.8

**Heavy Metals / Metalloids**

Lead (aqua regia extractable)	mg/kg	1	MCERTS	73	73	74	92

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

**Analytical Report Number : 23-45361**

**Project / Site name: Bankfield Drive, Holmbridge**

\* 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 *
2750245	HDP1	None Supplied	0.05-0.35	Brown sandy loam with vegetation.
2750246	HDP2	None Supplied	0.05-0.35	Brown loam with gravel and vegetation.
2750247	HDP3	None Supplied	0.05-0.35	Brown loam with gravel and vegetation.
2750248	HDP4	None Supplied	0.05-0.35	Brown loam with gravel and vegetation.

Analytical Report Number : 23-45361

Project / Site name: Bankfield Drive, Holmbridge

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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. (30 oC)	In house method.	L019-UK/PL	W	NONE
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

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL or B' 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.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.



## CLEA Statistical Tests Derived from CLR7

<b>Project Name</b>	Land West of Bankfield Drive, Holmbridge
<b>Project Number</b>	G-22-009
<b>Sample Category</b>	Topsoil

Arsenic	
Upper Bound Value	
Mean	#DIV/0!
Number of samples	0.00
Standard Deviation	#DIV/0!
T Value	#N/A
<b>UBV</b>	<b>#DIV/0!</b>
Maximum Value Test	
Mean	#DIV/0!
Maximum Value	0.00
Standard Deviation	#DIV/0!
<b>Outlier Critical Value</b>	<b>#DIV/0!</b>
10% Value	#N/A

Lead	
Upper Bound Value	
Mean	99.70
Number of samples	10.00
Standard Deviation	85.66
T Value	1.833
<b>UBV</b>	<b>149.35</b>
Maximum Value Test	
Mean	1.92
Maximum Value	2.53
Standard Deviation	0.23
<b>Outlier Critical Value</b>	<b>2.63</b>
10% Value	2.04

Nickel	
Upper Bound Value	
Mean	#DIV/0!
Number of samples	0.00
Standard Deviation	#DIV/0!
T Value	#N/A
<b>UBV</b>	<b>#DIV/0!</b>
Maximum Value Test	
Mean	#DIV/0!
Maximum Value	0.00
Standard Deviation	#DIV/0!
<b>Outlier Critical Value</b>	<b>#DIV/0!</b>
10% Value	#N/A

Cadmium	
Upper Bound Value	
Mean	#DIV/0!
Number of samples	0.00
Standard Deviation	#DIV/0!
T Value	#N/A
<b>UBV</b>	<b>#DIV/0!</b>
Maximum Value Test	
Mean	#DIV/0!
Maximum Value	0.00
Standard Deviation	#DIV/0!
<b>Outlier Critical Value</b>	<b>#DIV/0!</b>
10% Value	#N/A

Mercury	
Upper Bound Value	
Mean	#DIV/0!
Number of samples	0.00
Standard Deviation	#DIV/0!
T Value	#N/A
<b>UBV</b>	<b>#DIV/0!</b>
Maximum Value Test	
Mean	#DIV/0!
Maximum Value	0.00
Standard Deviation	#DIV/0!
<b>Outlier Critical Value</b>	<b>#DIV/0!</b>
10% Value	#N/A

Phenol	
Upper Bound Value	
Mean	#DIV/0!
Number of samples	0.00
Standard Deviation	#DIV/0!
T Value	#N/A
<b>UBV</b>	<b>#DIV/0!</b>
Maximum Value Test	
Mean	#DIV/0!
Maximum Value	0.00
Standard Deviation	#DIV/0!
<b>Outlier Critical Value</b>	<b>#DIV/0!</b>
10% Value	#N/A

Chromium	
Upper Bound Value	
Mean	#DIV/0!
Number of samples	0.00
Standard Deviation	#DIV/0!
T Value	#N/A
<b>UBV</b>	<b>#DIV/0!</b>
Maximum Value Test	
Mean	#DIV/0!
Maximum Value	0.00
Standard Deviation	#DIV/0!
<b>Outlier Critical Value</b>	<b>#DIV/0!</b>
10% Value	#N/A

Selenium	
Upper Bound Value	
Mean	#DIV/0!
Number of samples	0.00
Standard Deviation	#DIV/0!
T Value	#N/A
<b>UBV</b>	<b>#DIV/0!</b>
Maximum Value Test	
Mean	#DIV/0!
Maximum Value	0.00
Standard Deviation	#DIV/0!
<b>Outlier Critical Value</b>	<b>#DIV/0!</b>
10% Value	#N/A

Cyanide	
Upper Bound Value	
Mean	#DIV/0!
Number of samples	0.00
Standard Deviation	#DIV/0!
T Value	#N/A
<b>UBV</b>	<b>#DIV/0!</b>
Maximum Value Test	
Mean	#DIV/0!
Maximum Value	0.00
Standard Deviation	#DIV/0!
<b>Outlier Critical Value</b>	<b>#DIV/0!</b>
10% Value	#N/A

## Generic Assessment Criteria (GACs)

<b>Project Name</b>	Land West of Bankfield Drive, Holmbridge
<b>Project Number</b>	G-22-009
<b>Sample Category</b>	Topsoil

Contaminant	Standard Land Use GACs (mg/kg)			Upper Bound Value (UBV)
	Residential with homegrown produce	Residential without homegrown produce	Commercial / industrial	
Arsenic	37	40	640	#DIV/0!
Lead	200	310	2,330	149.35
Nickel	180	180	980	#DIV/0!
Cadmium	11	150	190	#DIV/0!
Mercury, inorganic	40	56	110	#DIV/0!
Chromium, III	910	910	8,600	#DIV/0!
Selenium	250	430	1,200	#DIV/0!

### Notes

GACs are based on LQM/CIEH 2015 S4ULs for Human Health Risk Assessment for 'Residential with Homegrown Produce' end use criteria with 6% soil organic matter