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**Attention:** Sven Klinkenbergh

## CERTIFICATE OF ANALYSIS

**Date of report Generation:** 20 May 2021  
**Customer:** Minerex Environmental  
**Sample Delivery Group (SDG):** 210510-77  
**Your Reference:** 3131-A1-COC1  
**Location:** Firlough WF, Co. Mayo  
**Report No:** 598831

We received 4 samples on Monday May 10, 2021 and 4 of these samples were scheduled for analysis which was completed on Thursday May 20, 2021. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.

Incorrect sampling dates and/or sample information will affect the validity of results.

The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

**Sonia McWhan**

Operations Manager





# CERTIFICATE OF ANALYSIS

Validated

**SDG:** 210510-77      **Client Reference:** 3131-A1-COC1      **Report Number:** 598831  
**Location:** Firlough WF, Co. Mayo      **Order Number:**      **Superseded Report:**

## Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
24240454	3131-SW1		0.00 - 0.00	06/05/2021
24240471	3131-SW2		0.00 - 0.00	06/05/2021
24240482	3131-SW3		0.00 - 0.00	06/05/2021
24240494	3131-SW4		0.00 - 0.00	06/05/2021

Only received samples which have had analysis scheduled will be shown on the following pages.



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<b>Location:</b> Firlough WF, Co. Mayo	<b>Order Number:</b>	<b>Superseded Report:</b>

Results Legend	Lab Sample No(s)		Customer Sample Reference		AGS Reference		Depth (m)		Container				Sample Type	
	X Test	N No Determination Possible							HNO3 Unfiltered (ALE204)	H2SO4 (ALE244)	500ml Plastic (ALE208)	0.5l glass bottle (ALE227)	SW	
<p>Sample Types -</p> <ul style="list-style-type: none"> <li>S - Soil/Solid</li> <li>UNS - Unspecified Solid</li> <li>GW - Ground Water</li> <li>SW - Surface Water</li> <li>LE - Land Leachate</li> <li>PL - Prepared Leachate</li> <li>PR - Process Water</li> <li>SA - Saline Water</li> <li>TE - Trade Effluent</li> <li>TS - Treated Sewage</li> <li>US - Untreated Sewage</li> <li>RE - Recreational Water</li> <li>DW - Drinking Water Non-regulatory</li> <li>UNL - Unspecified Liquid</li> <li>SL - Sludge</li> <li>G - Gas</li> <li>OTH - Other</li> </ul>														
Alkalinity as CaCO3	All	NDPs: 0 Tests: 4	X			X			X				X	
Ammonium Low	All	NDPs: 0 Tests: 4		X			X			X				X
Anions by Kone (w)	All	NDPs: 0 Tests: 4	X			X			X				X	
BOD True Total	All	NDPs: 0 Tests: 4	X			X			X				X	
Colour Test	All	NDPs: 0 Tests: 4	X			X			X				X	
Conductivity (at 20 deg.C)	All	NDPs: 0 Tests: 4	X			X			X				X	
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 4	X			X			X				X	
Dissolved Organic/Inorganic Carbon	All	NDPs: 0 Tests: 4	X			X			X				X	
Kjeldahl Nitrogen on liquids	All	NDPs: 0 Tests: 4	X			X			X				X	
Nitrite by Kone (w)	All	NDPs: 0 Tests: 4	X			X			X				X	
pH Value	All	NDPs: 0 Tests: 4	X			X			X				X	
Phosphate by Kone (w)	All	NDPs: 0 Tests: 4	X			X			X				X	
Suspended Solids	All	NDPs: 0 Tests: 4	X			X			X				X	
Total Metals by ICP-MS	All	NDPs: 0 Tests: 4			X			X			X			X
Total Nitrogen	All	NDPs: 0 Tests: 4	X			X			X				X	



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**Client Reference:** 3131-A1-COC1  
**Order Number:**

**Report Number:** 598831  
**Superseded Report:**

<b>Results Legend</b>	<b>Lab Sample No(s)</b>	<b>Customer Sample Reference</b>	<b>AGS Reference</b>	<b>Depth (m)</b>	<b>Container</b>	<b>Sample Type</b>				
<p><b>X</b> Test</p> <p><b>N</b> No Determination Possible</p> <p>Sample Types -</p> <p>S - Soil/Solid            UNS - Unspecified Solid            GW - Ground Water            SW - Surface Water            LE - Land Leachate            PL - Prepared Leachate            PR - Process Water            SA - Saline Water            TE - Trade Effluent            TS - Treated Sewage            US - Untreated Sewage            RE - Recreational Water            DW - Drinking Water Non-regulatory            UNL - Unspecified Liquid            SL - Sludge            G - Gas            OTH - Other</p>	24240454	3131-SW1		0.00 - 0.00	HNO3 Unfiltered (ALE204) H2SO4 (ALE244) 500ml Plastic (ALE208) 0.5l glass bottle (ALE227)	SW				
	24240471	3131-SW2		0.00 - 0.00	HNO3 Unfiltered (ALE204) H2SO4 (ALE244) 500ml Plastic (ALE208) 0.5l glass bottle (ALE227)	SW				
	24240482	3131-SW3		0.00 - 0.00	HNO3 Unfiltered (ALE204) H2SO4 (ALE244) 500ml Plastic (ALE208) 0.5l glass bottle (ALE227)	SW				
	24240494	3131-SW4		0.00 - 0.00	HNO3 Unfiltered (ALE204) H2SO4 (ALE244) 500ml Plastic (ALE208) 0.5l glass bottle (ALE227)	SW				
	24240454	3131-SW1		0.00 - 0.00	HNO3 Unfiltered (ALE204) H2SO4 (ALE244) 500ml Plastic (ALE208) 0.5l glass bottle (ALE227)	SW				
	24240471	3131-SW2		0.00 - 0.00	HNO3 Unfiltered (ALE204) H2SO4 (ALE244) 500ml Plastic (ALE208) 0.5l glass bottle (ALE227)	SW				
TPH by IR Oils and Greases	All	NDPs: 0 Tests: 4					X	X	X	X
Turbidity in waters	All	NDPs: 0 Tests: 4					X	X	X	X



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<b>SDG:</b> 210510-77	<b>Client Reference:</b> 3131-A1-COC1	<b>Report Number:</b> 598831
<b>Location:</b> Firlough WF, Co. Mayo	<b>Order Number:</b>	<b>Superseded Report:</b>

Results Legend		Customer Sample Ref.	3131-SW1	3131-SW2	3131-SW3	3131-SW4
# ISO17025 accredited. M mCERTS accredited. aq Aqueous / settled sample. diss.filt Dissolved / filtered sample. tot.unfilt Total / unfiltered sample. * Subcontracted - refer to subcontractor report for accreditation status. ** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery. (F) Trigger breach confirmed 1-4*#@ Sample deviation (see appendix)	Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	3131-SW1	3131-SW2	3131-SW3	3131-SW4	
		0.00 - 0.00 Surface Water (SW)	0.00 - 0.00 Surface Water (SW)	0.00 - 0.00 Surface Water (SW)	0.00 - 0.00 Surface Water (SW)	
		06/05/2021 00:00 10/05/2021 210510-77 24240454	06/05/2021 00:00 10/05/2021 210510-77 24240471	06/05/2021 00:00 10/05/2021 210510-77 24240482	06/05/2021 00:00 10/05/2021 210510-77 24240494	
Component	LOD/Units	Method				
Suspended solids, Total	<2 mg/l	TM022	<4 #	<2 #	2.2 #	3.3 #
Alkalinity, Total as CaCO3	<2 mg/l	TM043	4 #	22.3 #	20.1 #	6 #
Alkalinity, Bicarbonate as CaCO3	<2 mg/l	TM043	4 #	22.3 #	20.1 #	6 #
BOD, unfiltered	<1 mg/l	TM045	2.08 @ #	<1 @ #	2.14 @ #	<1 @ #
Carbon, Organic (diss.filt)	<3 mg/l	TM090	14.7 #	14.9 #	15.2 #	13.4 #
Ammoniacal Nitrogen Low as NH3	<0.01 mg/l	TM099	0.0474 #	0.0607 #	0.0668 #	0.0716 #
Conductivity @ 20 deg.C	<0.02 mS/cm	TM120	0.0574 #	0.0745 #	0.0764 #	0.0508 #
Copper (tot.unfilt)	<1 µg/l	TM152	<1 #	<1 #	<1 #	<1 #
Copper (diss.filt)	<0.3 µg/l	TM152	0.838 2 #	<0.3 2 #	<0.3 2 #	<0.3 2 #
Phosphorus (tot.unfilt)	<20 µg/l	TM152	<20 #	<20 #	<20 #	<20 #
Phosphorus (diss.filt)	<10 µg/l	TM152	<10 2 #	<10 2 #	<10 2 #	<10 2 #
Zinc (tot.unfilt)	<5 µg/l	TM152	6.95 #	<5 #	<5 #	5.56 #
Zinc (diss.filt)	<1 µg/l	TM152	6.89 2 #	3.04 2 #	3.69 2 #	2.34 2 #
Hardness, Total as CaCO3 unfiltered	<0.35 mg/l	TM152	10.2 #	21.3 #	21.9 #	10.3 #
Nitrite as NO2	<0.05 mg/l	TM184	<0.05 2 #	<0.05 2 #	<0.05 2 #	<0.05 2 #
Phosphate (Ortho as P)	<0.02 mg/l	TM184	<0.02 #	<0.02 #	<0.02 #	<0.02 #
Nitrate as NO3	<0.3 mg/l	TM184	<0.3 @ #	<0.3 @ #	<0.3 @ #	<0.3 @ #
Total Oxidised Nitrogen as N	<0.1 mg/l	TM184	<0.1 #	<0.1 #	<0.1 #	<0.1 #
Turbidity	<0.1 ntu	TM195	0.897 @ #	1.05 @ #	1.45 @ #	2.35 @ #
Nitrogen, Kjeldahl	<1 mg/l	TM212	<1 #	<1 #	<1 #	<1 #
Nitrogen, Total	<1 mg/l	TM212	<1 #	<1 #	<1 #	<1 #
TPH / Oil & Greases	<1 mg/l	TM235	<1 #	<1 #	<1 #	<1 #
pH	<1 pH Units	TM256	6.33 #	7.34 #	7.05 #	6.68 #
Apparent Colour	<1 mg/l Pt/Co	TM261	110 #	146 #	170 #	126 #
True Colour	<1 mg/l Pt/Co	TM261	98.1 #	134 #	150 #	103 #



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## Table of Results - Appendix

Method No	Reference	Description
TM022	Method 2540D, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part120 1981;BS EN 872	Determination of total suspended solids in waters
TM043	Method 2320B, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part109 1984	Determination of alkalinity in aqueous samples
TM045	MEWAM BOD5 2nd Ed.HMSO 1988 / Method 5210B, AWWA/APHA, 20th Ed., 1999; SCA Blue Book 130	Determination of BOD5 (ATU) Filtered by Oxygen Meter on liquids
TM090	Method 5310, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 415.1 & 9060	Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water
TM099	BS 2690: Part 7:1968 / BS 6068: Part2.11:1984	Determination of Ammonium in Water Samples using the Kone Analyser
TM120	Method 2510B, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part 9:1970	Determination of Electrical Conductivity using a Conductivity Meter
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers
TM195	Colour and Turbidity of water. Methods for the Examination of Waters and Associated Materials. HMSO, 1981, ISBN 0 11 751955 3.	Determination of Turbidity in Waters & Associated Matrices
TM212	SO/TR 11905-2: 1997. Water quality – Determination of nitrogen –Part 2:Determination of bound nitrogen, after combustion and oxidation to nitrogen dioxide, chemiluminescence detection.	Determination of Total Nitrogen by High Temperature Catalytic Oxidation followed by Chemiluminescence Detection
TM235	The Determination of Hydrocarbon Oils in Waters by Solvent Extraction, Infra red Absorption and Gravimetry 1983, HMSO, London	Determination of Total Petroleum Hydrocarbons (TPH) in Waters By Infra-Red Spectroscopy
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4.	Determination of pH in Water and Leachate using the GLpH pH Meter
TM261	Colour and Turbidity of Waters, Methods for the Examination of Waters and Associated Materials, HMSO, 1981, ISBN 0 11 7519553.	Determination of True and Apparent Colour by Spectrophotometry

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).



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Order Number:

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Superseded Report:

## Test Completion Dates

Lab Sample No(s)	24240454	24240471	24240482	24240494
Customer Sample Ref.	3131-SW1	3131-SW2	3131-SW3	3131-SW4
AGS Ref.				
Depth	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Type	Surface Water	Surface Water	Surface Water	Surface Water

Alkalinity as CaCO3	13-May-2021	12-May-2021	12-May-2021	13-May-2021
Ammonium Low	14-May-2021	14-May-2021	14-May-2021	14-May-2021
Anions by Kone (w)	14-May-2021	17-May-2021	17-May-2021	17-May-2021
BOD True Total	16-May-2021	17-May-2021	16-May-2021	17-May-2021
Colour Test	12-May-2021	12-May-2021	12-May-2021	12-May-2021
Conductivity (at 20 deg.C)	13-May-2021	13-May-2021	13-May-2021	13-May-2021
Dissolved Metals by ICP-MS	13-May-2021	13-May-2021	13-May-2021	13-May-2021
Dissolved Organic/Inorganic Carbon	20-May-2021	20-May-2021	20-May-2021	20-May-2021
Kjeldahl Nitrogen on liquids	14-May-2021	17-May-2021	17-May-2021	17-May-2021
Nitrite by Kone (w)	14-May-2021	14-May-2021	14-May-2021	14-May-2021
pH Value	12-May-2021	12-May-2021	12-May-2021	12-May-2021
Phosphate by Kone (w)	13-May-2021	13-May-2021	13-May-2021	13-May-2021
Suspended Solids	15-May-2021	15-May-2021	15-May-2021	15-May-2021
Total Metals by ICP-MS	14-May-2021	14-May-2021	14-May-2021	14-May-2021
Total Nitrogen	12-May-2021	13-May-2021	12-May-2021	13-May-2021
TPH by IR Oils and Greases	13-May-2021	13-May-2021	13-May-2021	13-May-2021
Turbidity in waters	11-May-2021	11-May-2021	11-May-2021	11-May-2021



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## Appendix

## General

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH<sub>4</sub> by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

17. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

### 18. Sample Deviations

If a sample is classed as deviated then the associated results may be compromised.

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
4	Matrix interference
◆	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to late arrival of instructions or samples
§	Sampled on date not provided

### 19. Asbestos

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

#### Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

#### Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

#### Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung. Standing Committee of Analysts, *The Quantification of Asbestos in Soil (2017)*.

**Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.**

**The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.**



**Client:** RSK Ireland Ltd

IRELAND

**Certificate Code:** AR-23-M3-004056-01

**Page Number:** Page 1 of 2

**PO reference:**

## Certificate of Analysis

Sample number	966-2023-00004458	Received on	23/01/2023
Your sample reference	603676_UPstream	Analysis started on	24/01/2023
Sample Matrix	Waste water		
Sample Date	23/01/2023	Time Sampled	09:20

Test Code Analyte	SUB <sup>5</sup> Analysis Started	Method	LOQ <sup>3</sup>	SPEC <sup>2</sup>	Result	Units	ACCRED <sup>4</sup>
<b>Biochemical Oxygen Demand (BOD) [M3003]</b>							
Biochemical oxygen demand (BOD) 5d	24/01/23 16:42	EW001	1		<1	mg/l	C6

#### <sup>4</sup> Accreditation Information

C6: ISO/IEC 17025:2017 INAB 138-T



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

Emma Nicholl -

30/01/2023

#### NOTES

1. This Report shall not be reproduced, except in full, without the permission of the Laboratory and only relates to the items tested.
2. SPEC = Allowable limit or parametric value.
3. LOQ = Limit of Quantification or lowest value that can be reported
4. ACCRED = Indicates accreditation for the test, a blank field indicates not accredited
5. "\*" indicates the test was sub-contracted
6. No date of sampling was supplied, sample stability cannot be assessed, results may be compromised.
- 7A. This result is compromised as it was tested outside of stability times.
- 7C. Sample not received in appropriate containers, therefore results may be compromised.
- 7D. This result is comprised as the sample was received by the laboratory outside of the holding time.

**Client:** RSK Ireland Ltd

IRELAND

**Certificate Code:** AR-23-M3-004056-01

**Page Number:** Page 2 of 2

**PO reference:**

Sample number	966-2023-00004462	Received on	23/01/2023
Your sample reference	603676_DownStream	Analysis started on	24/01/2023
Sample Matrix	Waste water		
Sample Condition on Arrival	Satisfactory	Sample Date	23/01/2023
Time Sampled	09:45		

Test Code Analyte	SUB <sup>5</sup> Analysis Started	Method	LOQ <sup>3</sup>	SPEC <sup>2</sup>	Result	Units	ACCRED <sup>4</sup>
<b>Biochemical Oxygen Demand (BOD) [M3003]</b>							
Biochemical oxygen demand (BOD) 5d	24/01/23 16:42	EW001	1		1.1	mg/l	C6

**<sup>4</sup> Accreditation Information**

C6: ISO/IEC 17025:2017 INAB 138-T



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

Emma Nicholl -

30/01/2023

**NOTES**

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5. "\*" indicates the test was sub-contracted
6. No date of sampling was supplied, sample stability cannot be assessed, results may be compromised.
- 7A. This result is compromised as it was tested outside of stability times.
- 7C. Sample not received in appropriate containers, therefore results may be compromised.
- 7D. This result is comprised as the sample was received by the laboratory outside of the holding time.

RSK Group Plc  
Bluebell Business Centre  
Old Naas Road  
Dublin 12  
Ireland



**Attention :** Michael Owens  
**Date :** 9th January, 2023  
**Your reference :** PROJECT NO. 603676  
**Our reference :** Test Report 22/20109 Batch 1 Schedule C  
**Location :** Firlough Hydrogen Plant  
**Date samples received :** 6th December, 2022  
**Status :** Final Report  
**Issue :** 1

Two samples were received for analysis on 6th December, 2022 of which two were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Authorised By:**



**Simon Gomery BSc**

Project Manager

Please include all sections of this report if it is reproduced

**Element Materials Technology**

**Client Name:** RSK Group Plc  
**Reference:** PROJECT NO. 603676  
**Location:** Firlough Hydrogen Plant  
**Contact:** Michael Owens  
**EMT Job No:** 22/20109

**Report : Liquid**

**Liquids/products:** V=40ml vial, G=glass bottle, P=plastic bottle  
 H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

EMT Sample No.	1-4	5-8									Please see attached notes for all abbreviations and acronyms		
Sample ID	SW1 (US)	SW2 (DS)											
Depth													
COC No / misc													
Containers	P G	P G											
Sample Date	02/12/2022 12:00	02/12/2022 12:00											
Sample Type	Surface Water	Surface Water											
Batch Number	1	1											
Date of Receipt	06/12/2022	06/12/2022									LOD/LOR	Units	Method No.
Dissolved Aluminium #	<20	<20									<20	ug/l	TM30/PM14
Dissolved Arsenic #	<2.5	<2.5									<2.5	ug/l	TM30/PM14
Dissolved Barium #	24	26									<3	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5									<0.5	ug/l	TM30/PM14
Dissolved Calcium #	96.2	108.1									<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<1.5	<1.5									<1.5	ug/l	TM30/PM14
Dissolved Copper #	<7	<7									<7	ug/l	TM30/PM14
Total Dissolved Iron #	37	81									<20	ug/l	TM30/PM14
Dissolved Lead #	<5	<5									<5	ug/l	TM30/PM14
Dissolved Magnesium #	5.8	6.3									<0.1	mg/l	TM30/PM14
Dissolved Manganese #	3	8									<2	ug/l	TM30/PM14
Dissolved Mercury #	<1	<1									<1	ug/l	TM30/PM14
Dissolved Nickel #	<2	2									<2	ug/l	TM30/PM14
Dissolved Phosphorus #	6	10									<5	ug/l	TM30/PM14
Dissolved Potassium #	2.2	2.2									<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<3	<3									<3	ug/l	TM30/PM14
Dissolved Sodium #	12.4	12.4									<0.1	mg/l	TM30/PM14
Dissolved Zinc #	<3	4									<3	ug/l	TM30/PM14
Sulphate as SO <sub>4</sub> #	12.2	12.4									<0.5	mg/l	TM38/PM0
Chloride #	23.3	24.2									<0.3	mg/l	TM38/PM0
Ortho Phosphate as P #	<0.03	<0.03									<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH <sub>4</sub> #	<0.03	<0.03									<0.03	mg/l	TM38/PM0
Total Ammonia as N #	<0.03	<0.03									<0.03	mg/l	TM38/PM0
COD (Settled) #	22	41									<7	mg/l	TM57/PM0
Silica	3.40	3.60									<0.01	mg/l	TM52/PM0
Total Dissolved Solids #	328	366									<35	mg/l	TM20/PM0

Client Name: RSK Group Plc  
Reference: PROJECT NO. 603676  
Location: Firlough Hydrogen Plant  
Contact: Michael Owens

Matrix : Liquid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
22/20109	1	SW1 (US)		1-4	Mercury, Metals, Metals (Major), Phosphorus, TDS	Sample holding time exceeded
22/20109	1	SW2 (DS)		5-8	Mercury, Metals, Metals (Major), Phosphorus, TDS	Sample holding time exceeded

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

# NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 22/20109

## SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

## WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

## STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

## DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

## SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

## DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

## BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

Please include all sections of this report if it is reproduced

All solid results are expressed on a dry weight basis unless stated otherwise.

**NOTE**

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

Laboratory records are kept for a period of no less than 6 years.

**REPORTS FROM THE SOUTH AFRICA LABORATORY**

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

**Measurement Uncertainty**

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

**Customer Provided Information**

Sample ID and depth is information provided by the customer.

**ABBREVIATIONS and ACRONYMS USED**

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range



## HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 22/20109

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM20	Modified BS 1377-3:1990/USEPA 160.1/3 (TDS/TS: 1971) Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified	Yes			
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM0	No preparation is required.	Yes			
TM52	Silica determination by reaction with Amino Acid F Reagent, Citric acid and Molybdate Reagent which is analysed spectrophotometrically.	PM0	No preparation is required.				
TM57	Modified US EPA Method 410.4. (Rev. 2.0 1993) Comparable with ISO 15705:2002. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometrically.	PM0	No preparation is required.	Yes			