Prepared for
FCC ENVIRONMENT (UK) LIMITED

CONSTRUCTION QUALITY ASSURANCE
2023 GEOCOMPOSITE DRAINAGE LAYER AND SOILS CAP VALIDATION REPORT

AT PWLLFAWATKIN LANDFILL SITE

CQA Validation Report Reference: WR7957/05/02
January 2024

Project Quality Assurance
Information Sheet

CQA Validation Report 2023 Geocomposite Drainage Layer and Soils Cap
PWLLFAWATKIN LANDFILL SITE

Report Reference	:	WR7857/5/02	***Report Status***	: For Approval
			Report Date	January 2024

Prepared for : FCC Environment (UK) Limited
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Issued by : Sirius Environmental Limited
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APPENDICES

PWLLFAWATKIN LANDFILL SITE
2023 GEOCOMPOSITE DRAINAGE LAYER AND SOILS CAP
CQA VALIDATION REPORT

1. INTRODUCTION

1.1 FCC Environment (UK) Limited (FCC) have constructed the geo-composite drainage layer and restoration soils over a previously capped area at Pwllfawatkin Landfill Site.

1.2 The Capping Works were carried out in accordance with the CQA Plan and Specification dated February 2014 and May 2016 prepared by FCC, (Reference: CQA Plan and Specification FCC 479 SW 2013-24 & FCC 479 SW 2016-07).

1.3 The Principal Contractor was Jones Bros Ltd, who undertook the construction work between the 4th and 21st July 2023. The geo-synthetic installation works were subcontracted to UKLT Ltd.

1.4 The construction works incorporated the following elements:

(i) Visual inspection of existing geomembrane cap before deployment.

(ii) Installation of a Protection Geo-composite over the existing cap geomembrane; and

(iii) Installation of 1000mm of Restoration Soils above the Protection Geo-composite.

1.5 The Construction Quality Assurance (CQA) Engineer, Stanley Ugohuckwu, provided the CQA supervision and quality assurance for the works throughout the duration of the construction period.

1.6 This CQA Validation Report represents a record of the site works undertaken during the installation of the protection geo-composite and soils works at Pwllfawatkin Landfill Site and includes all in-situ and laboratory testing undertaken.

2. THE SITE

2.1 Pwllfawatkin Landfill Site is situated approximately 10km north of Swansea, West Glamorgan, at National Grid Reference **SN 698 089**.

3. PREPARATION OF THE EXISTING GEOMEMBRANE LAYER

3.1 Before the CQA Engineer issued a Subgrade Acceptance Certificate the upper surface of the existing geomembrane layer was inspected, and any non-compliant materials were removed ensuring no potentially deleterious materials would be in contact with the geomembrane layer. The Subgrade Acceptance Certificates are presented in **Appendix IV**.

4 GEO-COMPOSITE LAYER

4.1 General

4.1.1 The geo-composite layer material was comprised of Pozidrain 6S250D/NW8 manufactured by ABG Ltd.

4.2 Geo-composite Delivery, Handling and Storage

4.2.1 The geosynthetics were delivered to site prior to the works. The material delivery log is presented in **Appendix II**.

4.2.2 A dedicated storage area was employed on the Site. The rolls were stored in a manner that precluded sliding or rolling of the stacks, and the rolls were not stacked more than three rolls high and nothing was stacked above them.

4.3 Geo-composite Manufacturer's Quality Assurance

4.3.1 The CQA Engineer obtained the manufacturer's quality assurance data sheets for the rolls delivered to site. The data sheets are presented in **Appendix II**.

4.4 Geo-composite Inspection

4.4.1 The CQA Engineer inspected the rolls of geo-composite and geotextile to check that no damage had occurred during transportation to site. No traces of visible damage were found in the geotextile.

4.5 GEO-COMPOSITE TESTING

4.5.1 2 Samples were required under Table 6 of the Specification and 3 samples were removed from the rolls for testing at an independent laboratory, to check conformance with the Specification. The samples were split into two and one half retained for record purposes. The other half was forwarded to the laboratory, and tested for the following parameters:

(i) Static puncture strength (CBR) BS EN ISO 12236;

(ii) Tensile strength (md/cmd) BS EN ISO 10319;

(iii) Permeability BS EN ISO 11058;

(iv) Thickness @2Kpa BS EN ISO 9863;

(v) In Plane Water Flow BS EN ISO 12958.

4.5.2 The conformance testing results indicate that the 2 samples taken conform to the requirements stated within the CQA Plan. The geo-composite results are presented in **Appendix III**

4.5.3 All the laboratory testing was undertaken at a UKAS accredited laboratory with UKAS accreditation for the tests undertaken. The laboratory details are included with each result sheet in the appendices.

4.6 Geo-composite Installation

4.6.1 The seams were aligned normal to contours and the panel layout sought to minimise the total number of seams.

4.6.2 The rolls were transported to the required position using two straps slung from a 360º excavator; each panel was rolled out manually. Panels were installed with as few seams as possible and with no significant wrinkles in accordance with the CQA Plan.

4.6.3 The CQA Engineer witnessed all panel deployment ensuring that the geomembrane was not compromised. The panel layout is presented on the as-built drawings in **Appendix I**. The Geo-composite panel deployment records are presented in **Appendix IV**.

4.6.4 During the geo-composite installation, the CQA Engineer:

(i) inspected each sheet unrolled onto the geomembrane for defects or damage;

(ii) ensured that the correct sheet margin overlap was being adhered to;

(iii) ensured a consistent and strong seam had been formed;

(iv) ensured that any uncovered sheet margins were properly weighted down in order to minimise wind damage; and

(v) kept a record of the geotextile panel layout along with respective roll numbers.

5. RESTORATION SOILS

5.1 1000mm of restoration soils were placed in a progressive operation following completion of each section of protective geo-composite. The soil materials used were inspected by the CQA Engineer to ensure that they were suitable and free of deleterious and oversized material. These records are presented in **Appendix VI**.

5.2 The restoration soils were placed in one layer, the CQA Engineer continuously monitored restoration soils placement ensuring that the characteristics of the materials did not change and ensuring that the geosynthetics were not compromised.

5.3 The Interface Shear Box test results as required by the approved Specification Document are presented within **Appendix V**. The Sirius Designer checked the results against the design parameters and the results are deemed to be acceptable.

5.4 The CQA Engineer ensured that a minimum of 1000mm thickness of soil forming materials were maintained between the geo-composite layer and construction plant, with the exception of a tracked low ground pressure dozer and tracked excavators that operated on a minimum thickness of 300mm.

6. PHOTOGRAPHIC AND DAILY RECORDS

6.1 As a visual record of the works, the CQA Engineer supervising the works kept an on-going photographic record. **Appendix VII** constitutes a selection of photographs showing preparatory operations and capping system installation.

6.2 The CQA Engineer maintained daily records throughout the duration of the works. These daily records highlighted any problems encountered; solutions adopted and detailed the day-to-day site operations. The daily records are presented in **Appendix VIII**.

7. CONCLUSIONS

7.1 GEOMEMBRANE LINING - The Geomembrane liner was previously installed. The surface of the geomembrane was visually checked for damage and foreign objects were removed; this was then passed off for the Geo-composite installation.

7.2 GEOCOMPOSITE LAYER – The Geo-composite material installed within the construction works conformed to CQA Plan.

7.3 RESTORATION SOILS – The 1000mm restoration soils installed within the construction works conformed to the CQA Plan.

7.4 The Capping Works were carried out in accordance with the CQA Plan and Specification Documents dated January 2019 prepared by Sirius, (Reference: CQA Plan and Specification FCC 479 SW 2013-24 & 479 SW 2016-07). Approved 19th August 2016 (EPR/BU8819IV).

APPENDIX I
AS-BUILT DRAWINGS

NOTES

ALL LEVELS–COORDINATES RELATE TO FCC PERMANENT SITE CONTROL STATIONS

KEY

LEGEND

- Top of Batter
- Bottom of Batter
- + 188.00 Spot Levels

FCC Environment

FCC Environment (UK) Limited
Ground Floor West, 900 Pavilion Drive, Northampton Business Park, Northampton, NN4 7RG

JONES BROS CIVIL ENGINEERING UK

Jones Bros Civil Engineering UK
Ty Glyn
Canol y Dre
Ruthin
Denbighshire LL15 1QA Email: mail@jones-bros.com Tel (01824) 703 661

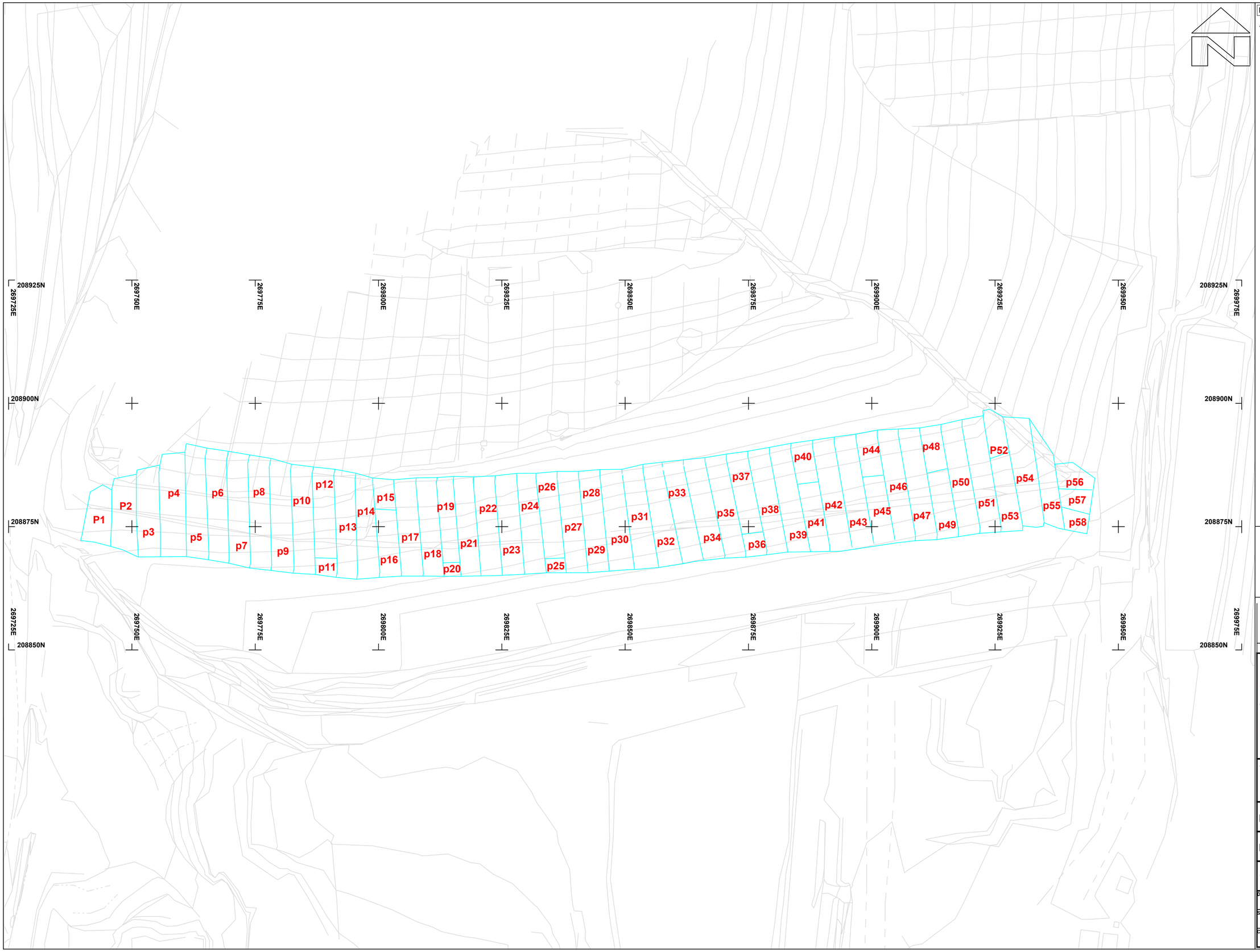
Rev	Description	Date	Initial

Client
FCC Environment

Site
Pwllfawatkin Landfill Site

Drawing
Prestart Survey 2023
Construction Works

Drawn By	Date	Checked By
GW	15/02/2024	SR
Scale	**Revision**	**Rev Checked By**
1:1000 @ A2		
Cad Plot Date	**Cad File Name**	
15/02/24	C1295–GW–15/02/24–01pre start	



NOTES

ALL LEVELS–COORDINATES RELATE TO FCC PERMANENT SITE CONTROL STATIONS

LEGEND

GDL Panel Layout

FCC Environment

FCC Environment (UK) Limited
Ground Floor West, 900 Pavilion Drive, Northampton Business Park, Northampton, NN4 7RG

Rev	Description	Date	Initial

JONES BROS CIVIL ENGINEERING UK

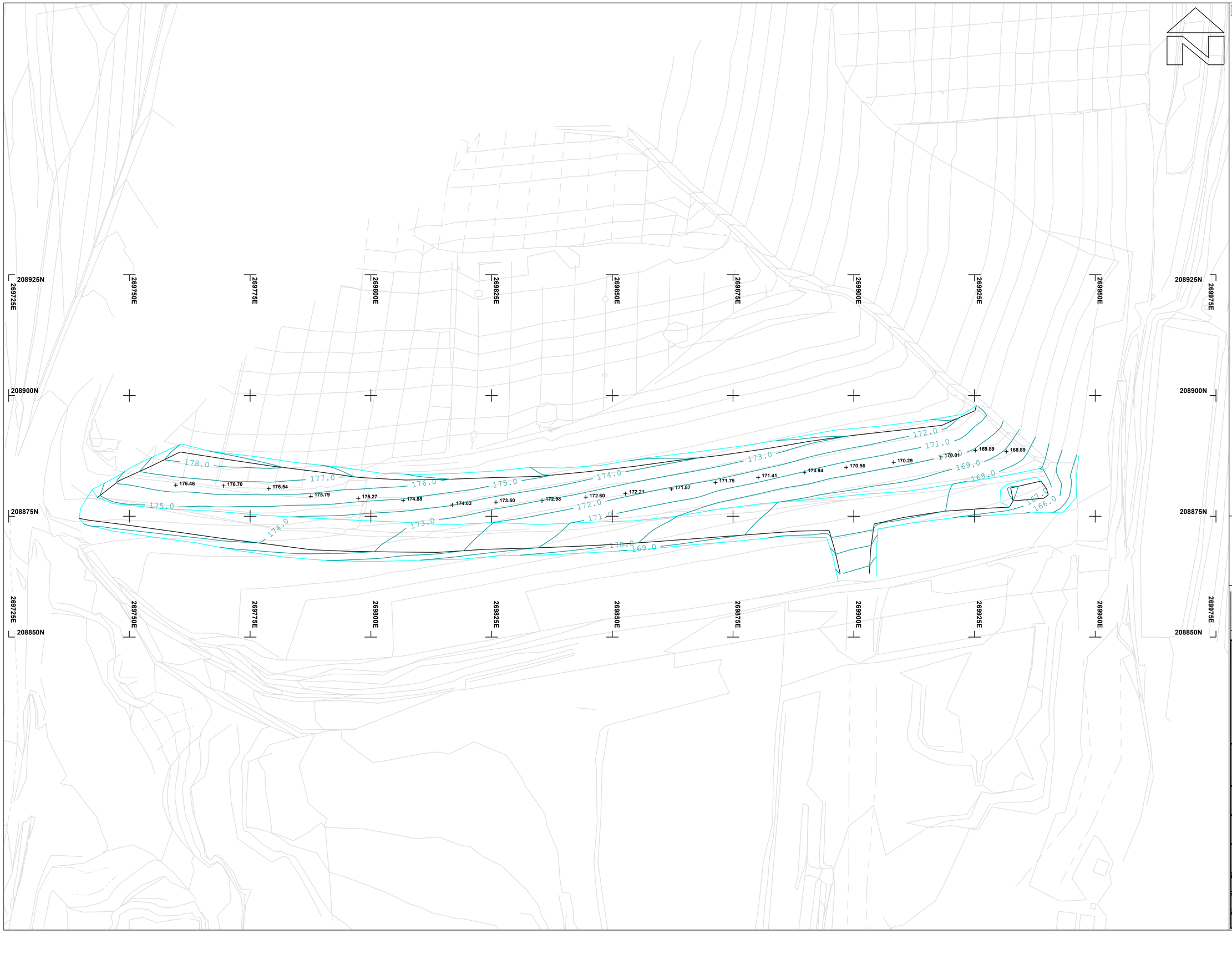
Jones Bros Civil Engineering UK
Ty Glyn
Canol y Dre
Ruthin
Denbighshire LL15 1QA Email: mail@jones-bros.com Tel (01824) 703 661

Client
FCC Environment

Site
Pwllfawatkin Landfill Site

Drawing
GDL Panel Layout 2023 Sidewall Buttress

Drawn By	Date	Checked By
CH	22/06/2023	LD
Scale	**Revision**	**Rev Checked By**
1:500 @ A2		
Cad Plot Date	**Cad File Name**	
22/06/2023	C2263–CH–220623–03 GDL	



NOTES

ALL LEVELS–COORDINATES RELATE TO FCC PERMANENT SITE CONTROL STATIONS

LEGEND

- Top of Batter
- Bottom of Batter
- + 66.45 Spot Level

FCC Environment

FCC Environment (UK) Limited
Ground Floor West, 900 Pavilion Drive, Northampton Business Park, Northampton, NN4 7RG

Rev	Description	Date	Initial

JONES BROS
CIVIL ENGINEERING UK

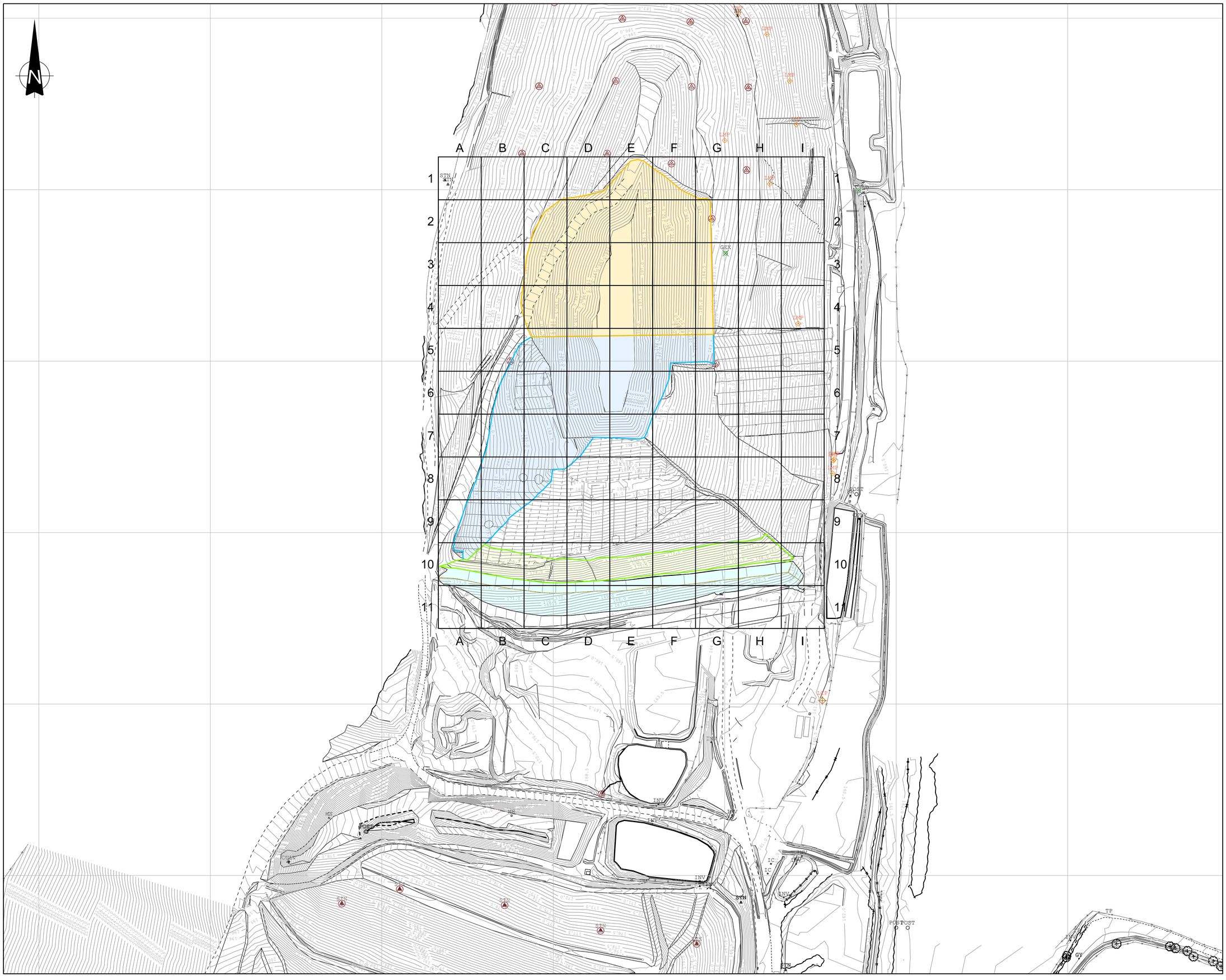
Jones Bros Civil Engineering UK
Ty Glyn
Canol y Dre
Ruthin
Denbighshire LL15 1QA Email: mail@jones-bros.com Tel (01824) 703 661

Client
FCC Environment

Site
Pwllfawatkin Landfill Site

Drawing
Restoration Survey 2023 Sidewall Buttress

Drawn By	Date	Checked By
CH	22/06/2023	LD
Scale	Revision	Rev Checked By
1:500 @ A2		
Cad Plot Date	Cad File Name	
22/06/2023	C2263-CH-220623-04 REST	



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NOTES

1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM.

2. DO NOT SCALE FROM THIS DRAWING.

3. ANY ANOMALIES IDENTIFIED WITH THE DETAILS SHOWN ON THIS DRAWING ARE TO BE BROUGHT TO THE ATTENTION OF SIRIUS ENVIRONMENTAL PRIOR TO CONSTRUCTION WORKS COMMENCING.

4. THE CAPPING SYSTEM SHALL NOT BE PLACED ON ANY SLOPE STEPPER THAN 1(V):3(H).

KEY

- 18.5 — SITE SURVEY
- PROPOSED PERM CAPPING AREA (GDL, AND SOILS)
- PROPOSED PERM CAPPING AREA PHASE 1 (LOWER GEOTEXTILE AND GEOMEMBRANE)
- PROPOSED PERM CAPPING AREA PHASE 2 (LOWER GEOTEXTILE AND GEOMEMBRANE)
- REMAINING SOILS BUTTRESS

REV	DESCRIPTION	DATE	BY
1	PERM CAPPING AREA AMENDED	31.03.23	BY

CLIENT

FCC Environment

FCC Environment (UK) Limited
Ground Floor West, 900 Pavilion Drive, Northampton Business Park, Northampton, NN4 7RG

Sirius Environmental

4245 Park Approach, Thorpe Park, Leeds. LS15 8GB. 0113 264 9960

JOB TITLE

PWLLFAWATKIN LFS
2022 Capping Works

DRAWING TITLE

25m Testing Grid

DRAWN	DATE	APPROVED	DATE
M.C	15/07/2022	A.K	15/07/2022

SCALE	SHEET	DRAWING NUMBER	REVISION
1:500	A1L	WR7957/01/04	1

APPENDIX II
MATERIALS RECEIVED INVENTORY & MANUFACTURER'S QUALITY ASSURANCE CERTIFICATES

Materials Received

Site:	Pwllfawatkin	**Sheet No:**	1 of 1
CQA Engineer:	Stanley Ugohuckwu	**CQA Plan Ref:**	FCC 479 SW 2016 - 07

Delivery Date	Material	Resin Batch Number	Roll Number	Dimensions (m) Length x Width	QC Certificate Recived Date	QA Certificate Pass / Fail	Visual Inspection
25/07/2022	6S250D	W16419	11	75 x 4.4	28/07/2023	Pass	Good
28/07/2023	6S250D	W16863	2	75 x 4.4	28/07/2023	Pass	Good
28/07/2023	6S250D	W16863	3	75 x 4.4	28/07/2023	Pass	Good
28/07/2023	6S250D	W16863	4	75 x 4.4	28/07/2023	Pass	Good
28/07/2023	6S250D	W16863	5	75 x 4.4	28/07/2023	Pass	Good
28/07/2023	6S250D	W16863	6	75 x 4.4	28/07/2023	Pass	Good
28/07/2023	6S250D	W16863	7	75 x 4.4	28/07/2023	Pass	Good
28/07/2023	6S250D	W16863	8	75 x 4.4	28/07/2023	Pass	Good
28/07/2023	6S250D	W16863	9	75 x 4.4	28/07/2023	Pass	Good
28/07/2023	6S250D	W16863	10	75 x 4.4	28/07/2023	Pass	Good
28/07/2023	6S250D	W16863	11	75 x 4.4	28/07/2023	Pass	Good
28/07/2023	6S250D	W16863	1	75 x 4.4	28/07/2023	Pass	Good

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Certificate of conformity

Scheme:	**Pwllfawatkin LFS, SA8**
Product:	**Pozidrain 6S250D/NW20XUV/NW8 – 4.4m x 75m**
Manufacturer:	**ABG Ltd, Unit E7, Meltham Mills Road Meltham, HD9 4DS, Yorkshire, UK**
Date of manufacture:	**June 2023**
Date of dispatch:	**27 June 2023**
Consignment number:	**1**
Delivery note number:	**106945**
Number of rolls:	**11**
Batch Information:	

Job Number:	*Roll Number(s):*	*Job Number:*	*Roll Number(s):*	*Job Number:*	*Roll Number(s):*
W16863	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11				

Product conforms to datasheet reference:	**ABG Pozidrain 6S250D.NW20XUV.NW8 [CE] Rev 1.00 DATASHEET**
Additional test details:	**None**

I certify that the above information is a true and correct statement relating to the goods supplied.

Signed for and on behalf of the manufacturer by:

Name and title:	**Howard Stevenson – Supply Chain Manager**
Date:	**27TH June 2023**
Certificate issued by:	**ABG Ltd**

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www.abgltd.com

abg creative geosynthetic engineering

Certificate of conformity

Scheme:	**Pwllfawatkin LFS, SA8**
Product:	**Pozidrain 6S250D/NW20XUV/NW8 – 4.4m x 75m**
Manufacturer:	**ABG Ltd, Unit E7, Meltham Mills Road Meltham, HD9 4DS, Yorkshire, UK**
Date of manufacture:	**July 2022**
Date of dispatch:	**25 July 2022**
Consignment number:	**1**
Delivery note number:	**105143**
Number of rolls:	**17**
Batch Information:	

Job Number:	*Roll Number(s):*	*Job Number:*	*Roll Number(s):*	*Job Number:*	*Roll Number(s):*
W16419	1,2,3,4,5,6, 7,8,9,10,11, 12,13,14,15, 16,17				

Product conforms to datasheet reference:	**ABG Pozidrain 6S250D.NW20XUV.NW8 [CE] Rev 1.01 DATASHEET**
Additional test details:	**None**

I certify that the above information is a true and correct statement relating to the goods supplied.

Signed for and on behalf of the manufacturer by:

Name and title:	**Mark Hutchinson – Quality Manager**
Date:	**25.07.2022**
Certificate issued by:	**ABG Ltd**

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APPENDIX III
MATERIAL CONFORMANCE SAMPLING

Conformance Sampling & Laboratory Schedule of Testing

Site:	Pwllfawatkin	**CQA Plan Ref:**	FCC 479 SW 2016 - 07	**Anticipated Area m²**	4,400	**Actual Area m²**	4,499
CQA Engineer:	Stanley Ugohuckwu		**GDL**	**Anticipated No of Tests:**	1	**Actual No of Tests:**	3

Ensure the GDL Batch & Roll Number are Inserted Into The Correct Column Along With The Panel Number. Please make sure you are correctly inserting the required testing as per the CQA Specification document and insert an `X` in the relevant box.

Date Sample Taken:	Date Sent to Laboratory:	Sample Reference:	Material Sampled	Panel No. / Location	Batch Number & Roll Number	In-Plane flow capacity i=1 with soft/soft platens, @ 20kPa: REQUIREMENT	Permeability (water flow through textile element): REQUIREMENT >1 / m's	Thickness @ 2kPa:	Tensile Strength - MD/CMD:	CBR Puncture Resistance (composite):
						BS EN ISO 12958:	BS EN ISO 11058	BS EN ISO 9863-1	BS EN ISO 10319	BS EN ISO 12236
17/07/2023	31/07/2023	CF1	6S250D	P2	Batch No: W16863 / Roll No: 11	X	X	X	X	X
18/07/2023	31/07/2023	CF4	6S250D	P34	Batch No: W16863 / Roll No: 3	X	X	X	X	X
19/07/2023	31/07/2023	CF5	6S250D	P47	Batch No: W16419 / Roll No: 11	X	X	X	X	X

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REPORT

GEOSYNTHETICS TEST REPORT

REPORT REFERENCE: BS-V294/a

Report Date	24/10/2023
Client	Jones Bros (Ruthin) Ltd
Address	Ruthin, Denbighshire, LL15 2YH
Contact	Chris Hunt
Contract Reference	Pwllfawatkin Landfill Site
Client PO/Ref No	M-C3230/00033
Material Tested	Geocomposite
Date Received	01/08/2023
Sample IDs	CF-1, CF-4 & CF-5
Tests Requested	Constant Head - BS EN ISO 11058:2019 In Plane Water Flow - BS EN ISO 12958-1:2020 Static Puncture CBR - BS EN ISO 12236:2006 Thickness - BS EN ISO 9863-1:2016+A1:2019 Wide Width Tensile - BS EN ISO 10319:2015

Prepared by:

David Smith
Technical Co-ordinator

Approved by:

Shazeena Iqbal
Technical Director

ilac-MRA UKAS TESTING 4438

Samples tested as received. Tests Marked with an asterisk (*) in this report are not included in the UKAS Accreditation Schedule for our laboratory.
Tests marked # have been subcontracted, tests marked * are not accredited. Tests marked [F] are accredited under the company's UKAS Flexible Scope.
This test report is in a condensed format, complete test details available upon request.

10 Owler Ings Road, Brighouse, West Yorkshire, HD6 1EJ
Directors: Clifford Butt, Shazeena N. Iqbal Company Registration Number: 4213030

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GEOSYNTHETICS TEST RESULTS
JONES BROS (RUTHIN) LTD

Contract Ref: Pwllfawatkin Landfill Site **Report Ref No: BS-V294/a**
Material: Geocomposite **Dates Tested: 17-23/10/2023**

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1	2	3	4	5	6	7	8	9	10		
Sample ID: CF-1, Roll No: 11, Batch No: W16863, P2										**BICS Sample Ref: 1**		
Constant Head (BS EN ISO 11058:2019) {Geotextile from Cuspated side}												
Water Temperature ºC:	21.4											
$L/m^2/s$	53	56	51	52	52						**53**	**2**
In Plane Water Flow (BS EN ISO 12958-1:2020), H.G 1.0, Soft/Soft Platens {Whole Geocomposite}												
20 kPa L/s/m (MD)	1.37	1.35	1.36								**1.36**	**0.01**
20 kPa L/s/m (CD)	1.38	1.37	1.33								**1.36**	**0.03**
Static Puncture CBR (BS EN ISO 12236:2006)												
Puncture Force kN	5.93	5.73	5.79	6.08	5.83						**5.87**	**0.14**
Puncture Displacement mm	47	46	45	47	48						**47**	**1**
Thickness under 2kPa (BS EN ISO 9863-1:2016+A1:2019) {Whole Geocomposite}												
mm	7.43	7.27	7.10	7.35	7.66	7.21	7.69	7.25	7.35	7.27	**7.36**	**0.19**
Wide Width Tensile Properties (BS EN ISO 10319:2015)												
Tensile Strength kN/m (MD)	36.7	35.5	36.1	36.0	34.6						**35.8**	**0.8**
Tensile Strength kN/m (CD)	34.3	31.7	30.6	33.1	32.6						**32.5**	**1.4**
Tensile Strain % (MD)	39.2	38.0	37.1	45.5	36.4						**39.2**	**3.6**
Tensile Strain % (CD)	34.1	35.0	31.1	37.7	36.8						**35.0**	**2.6**

Atmospheric Conditions at Test: 21 ± 2 °C, Relative Humidity : 65 ± 5 % RH

CONFIDENTIAL TEST REPORT

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UKAS TESTING
4438

GEOSYNTHETICS TEST RESULTS
JONES BROS (RUTHIN) LTD

Contract Ref: Pwllfawatkin Landfill Site **Report Ref No: BS-V294/a**
Material: Geocomposite **Dates Tested: 17-23/10/2023**

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1	2	3	4	5	6	7	8	9	10		
Sample ID: CF-4, Roll No: 3, Batch No: W16863, P34										**BICS Sample Ref: 2**		
Constant Head (BS EN ISO 11058:2019) {Geotextile from Cuspated side}												
Water Temperature ºC:	20.9											
$L/m^2/s$	35	40	40	35	43						**39**	**3**
In Plane Water Flow (BS EN ISO 12958-1:2020), H.G 1.0, Soft/Soft Platens {Whole Geocomposite}												
20 kPa L/s/m (MD)	1.41	1.42	1.41								**1.41**	**0.01**
20 kPa L/s/m (CD)	1.45	1.45	1.44								**1.45**	**0.01**
Static Puncture CBR (BS EN ISO 12236:2006)												
Puncture Force kN	5.57	6.12	6.03	5.62	5.71						**5.81**	**0.25**
Puncture Displacement mm	45	47	47	46	48						**46**	**1**
Thickness under 2kPa (BS EN ISO 9863-1:2016+A1:2019) {Whole Geocomposite}												
mm	7.34	7.37	7.34	7.71	7.29	7.37	7.21	7.26	7.32	7.46	**7.37**	**0.14**
Wide Width Tensile Properties (BS EN ISO 10319:2015)												
Tensile Strength kN/m (MD)	36.4	32.8	35.8	34.0	32.1						**34.2**	**1.9**
Tensile Strength kN/m (CD)	36.3	39.4	32.6	38.4	35.8						**36.5**	**2.6**
Tensile Strain % (MD)	42.8	43.4	37.8	41.1	41.3						**41.3**	**2.2**
Tensile Strain % (CD)	42.4	40.0	45.4	40.2	38.7						**41.3**	**2.6**

Atmospheric Conditions at Test: 21 ± 2 °C, Relative Humidity : 65 ± 5 % RH

CONFIDENTIAL TEST REPORT

BICS Laboratories Ltd

10 Owler Ings Road, Brighouse, West Yorkshire, HD6 1EJ
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UKAS TESTING
4438

GEOSYNTHETICS TEST RESULTS
JONES BROS (RUTHIN) LTD

Contract Ref: Pwllfawatkin Landfill Site **Report Ref No: BS-V294/a**
Material: Geocomposite **Dates Tested: 17-23/10/2023**

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1	2	3	4	5	6	7	8	9	10		
Sample ID: CF5, Roll No: 11, Batch No: W16419, P47											**BICS Sample Ref: 3**	
Constant Head (BS EN ISO 11058:2019) {Geotextile from Cuspated side}												
Water Temperature ºC:	20.1											
L/m^2/s	50	52	55	53	50						**52**	**2**
In Plane Water Flow (BS EN ISO 12958-1:2020), H.G 1.0, Soft/Soft Platens {Whole Geocomposite}												
20 kPa L/s/m (MD)	1.44	1.48	1.50								**1.47**	**0.03**
20 kPa L/s/m (CD)	1.46	1.44	1.46								**1.46**	**0.01**
Static Puncture CBR (BS EN ISO 12236:2006)												
Puncture Force kN	6.00	5.67	5.91	5.86	5.87						**5.86**	**0.12**
Puncture Displacement mm	52	51	51	50	51						**51**	**1**
Thickness under 2kPa (BS EN ISO 9863-1:2016+A1:2019) {Whole Geocomposite}												
mm	7.38	7.57	7.55	7.74	7.67	7.36	7.74	7.82	7.55	7.47	**7.59**	**0.16**
Wide Width Tensile Properties (BS EN ISO 10319:2015)												
Tensile Strength kN/m (MD)	30.7	33.1	38.8	35.0	35.6						**34.6**	**3.0**
Tensile Strength kN/m (CD)	39.2	37.7	39.5	38.0	36.0						**38.1**	**1.4**
Tensile Strain % (MD)	35.1	39.9	42.6	38.3	39.6						**39.1**	**2.7**
Tensile Strain % (CD)	51.3	47.9	49.3	44.2	49.7						**48.5**	**2.7**

Atmospheric Conditions at Test: 21 ± 2 °C, Relative Humidity : 65 ± 5 % RH

CONFIDENTIAL TEST REPORT

APPENDIX IV
GDL DEPLOYMENT RECORDS

Surface Acceptance Certificate

Site:	Pwllfawatkin	**Sheet No:**	1
CQA Engineer:	Stanley Ugohuckwu	**CQA Plan Ref:**	FCC 479 SW 2016 - 07

Area of Subgrade under consideration:	Existing Geomembrane

I the undersigned, a duly appointed representative of Sirius Environmental Limited, have visually observed the subgrade described above and confirm the subgrade is an acceptable surface upon which to install GDL Panels P1 to P10.

This certification is based on observation of the surface of the subgrade only. No subterranean inspections or tests have been performed by Sirius Environmental Limited, and Sirius Environmental Limited makes no representations or warranties regarding the conditions which may exist below the surface of the subgrade.

Sirius Environmental Representative:			
Name:	Stanley Ugohuckwu	Signature:	
Date:	07/07/2023	Position:	CQA Engineer

Surface Acceptance Certificate

Site:	Pwllfawatkin	**Sheet No:**	2
CQA Engineer:	Stanley Ugohuckwu	**CQA Plan Ref:**	FCC 479 SW 2016 - 07

Area of Subgrade under consideration:	Existing Geomembrane

I the undersigned, a duly appointed representative of Sirius Environmental Limited, have visually observed the subgrade described above and confirm the subgrade is an acceptable surface upon which to install GDL Panels P11 to P32.

This certification is based on observation of the surface of the subgrade only. No subterranean inspections or tests have been performed by Sirius Environmental Limited, and Sirius Environmental Limited makes no representations or warranties regarding the conditions which may exist below the surface of the subgrade.

Sirius Environmental Representative:			
Name:	Stanley Ugohuckwu	Signature:	
Date:	12/07/2023	Position:	CQA Engineer

Surface Acceptance Certificate

Site:	Pwllfawatkin	**Sheet No:**	3
CQA Engineer:	Stanley Ugohuckwu	**CQA Plan Ref:**	FCC 479 SW 2016 - 07

Area of Subgrade under consideration:	Existing Geomembrane

I the undersigned, a duly appointed representative of Sirius Environmental Limited, have visually observed the subgrade described above and confirm the subgrade is an acceptable surface upon which to install GDL Panels P33 to P42.

This certification is based on observation of the surface of the subgrade only. No subterranean inspections or tests have been performed by Sirius Environmental Limited, and Sirius Environmental Limited makes no representations or warranties regarding the conditions which may exist below the surface of the subgrade.

Sirius Environmental Representative:			
Name:	Stanley Ugohuckwu	Signature:	
Date:	18/07/2023	Position:	CQA Engineer

Surface Acceptance Certificate

Site:	Pwllfawatkin	**Sheet No:**	4
CQA Engineer:	Stanley Ugohuckwu	**CQA Plan Ref:**	FCC 479 SW 2016 - 07

Area of Subgrade under consideration:	Existing Geomembrane

I the undersigned, a duly appointed representative of Sirius Environmental Limited, have visually observed the subgrade described above and confirm the subgrade is an acceptable surface upon which to install GDL Panels P43 to P58.

This certification is based on observation of the surface of the subgrade only. No subterranean inspections or tests have been performed by Sirius Environmental Limited, and Sirius Environmental Limited makes no representations or warranties regarding the conditions which may exist below the surface of the subgrade.

Sirius Environmental Representative:			
Name:	Stanley Ugohuckwu	Signature:	
Date:	19/07/2023	Position:	CQA Engineer

Geocomposite Drainage Layer Deployment Records

Site:	Pwllfawatkin	**Project:**	GDL & Restoration Soils
CQA Engineer:	Stanley Ugohuckwu	**CQA Plan Ref:**	FCC 479 SW 2016 - 07

Date	Batch No.	Roll No.	Panel No.	Heat Bonded *	Actual Overlap (mm)	Length (m)	Width (m)	Accumulated Area (m^2)	Visual Inspection
07/07/2023	W16863	11	P1	Yes	300	12.0	4.4	52.8	Good
07/07/2023	W16863	11	P2	Yes	300	16.0	4.4	123.2	Good
07/07/2023	W16863	11	P3	Yes	300	20.0	4.4	211.2	Good
07/07/2023	W16863	11	P4	Yes	300	24.0	4.4	316.8	Good
07/07/2023	W16863	5	P5	Yes	300	24.0	4.4	422.4	Good
07/07/2023	W16863	5	P6	Yes	300	24.0	4.4	528.0	Good
07/07/2023	W16863	5	P7	Yes	300	24.0	4.4	633.6	Good
07/07/2023	W16863	2	P8	Yes	300	24.0	4.4	739.2	Good
07/08/2023	W16863	2	P9	Yes	300	24.0	4.4	844.8	Good
07/09/2023	W16863	2	P10	Yes	300	24.0	4.4	950.4	Good
12/07/2023	W16863	2	P11	Yes	300	2.5	4.4	961.4	Good
12/07/2023	W16863	8	P12	Yes	300	21.5	4.4	1056.0	Good
12/07/2023	W16863	8	P13	Yes	300	23.0	4.4	1157.2	Good
12/07/2023	W16863	8	P14	Yes	300	22.0	4.4	1254.0	Good
12/07/2023	W16863	8	P15	Yes	300	8.0	4.4	1289.2	Good
12/07/2023	W16863	7	P16	Yes	300	13.0	4.4	1346.4	Good
12/07/2023	W16863	7	P17	Yes	300	21.0	4.4	1438.8	Good
12/07/2023	W16863	7	P18	Yes	300	21.0	4.4	1531.2	Good
12/07/2023	W16863	7	P19	Yes	300	17.0	4.4	1606.0	Good
12/07/2023	W16863	1	P20	Yes	300	4.0	4.4	1623.6	Good
12/07/2023	W16863	1	P21	Yes	300	21.0	4.4	1716.0	Good
12/07/2023	W16863	1	P22	Yes	300	21.0	4.4	1808.4	Good
12/07/2023	W16863	1	P23	Yes	300	21.0	4.4	1900.8	Good
12/07/2023	W16863	9	P24	Yes	300	21.0	4.4	1993.2	Good
12/07/2023	W16863	1	P25	Yes	300	5.0	4.4	2015.2	Good
12/07/2023	W16863	9	P26	Yes	300	16.0	4.4	2085.6	Good
12/07/2023	W16863	9	P27	Yes	300	21.0	4.4	2178.0	Good
12/07/2023	W16863	9	P28	Yes	300	16.0	4.4	2248.4	Good
12/07/2023	W16863	6	P29	Yes	300	5.0	4.4	2270.4	Good
12/07/2023	W16863	6	P30	Yes	300	21.0	4.4	2362.8	Good
12/07/2023	W16863	6	P31	Yes	300	22.0	4.4	2459.6	Good
12/07/2023	W16863	6	P32	Yes	300	22.0	4.4	2556.4	Good
18/07/2023	W16863	6	P33	Yes	300	22.0	4.4	2653.2	Good

Geocomposite Drainage Layer Deployment Records

Site:	Pwllfawatkin	**Project:**	GDL & Restoration Soils
CQA Engineer:	Stanley Ugohuckwu	**CQA Plan Ref:**	FCC 479 SW 2016 - 07

Date	Batch No.	Roll No.	Panel No.	Heat Bonded *	Actual Overlap (mm)	Length (m)	Width (m)	Accumulated Area (m^2)	Visual Inspection
18/07/2023	W16863	6	P34	Yes	300	22.0	4.4	2750.0	Good
18/07/2023	W16863	6	P35	Yes	300	22.0	4.4	2846.8	Good
18/07/2023	W16863	6	P36	Yes	300	5.0	4.4	2868.8	Good
18/07/2023	W16863	10	P37	Yes	300	17.0	4.4	2943.6	Good
18/07/2023	W16863	10	P38	Yes	300	23.0	4.4	3044.8	Good
18/07/2023	W16863	10	P39	Yes	300	23.0	4.4	3146.0	Good
18/07/2023	W16863	10	P40	Yes	300	10.0	4.4	3190.0	Good
18/07/2023	W16863	3	P41	Yes	300	13.0	4.4	3247.2	Good
18/07/2023	W16863	3	P42	Yes	300	23.0	4.4	3348.4	Good
18/07/2023	W16863	3	P43	Yes	300	22.0	4.4	3445.2	Good
19/07/2023	W16863	3	P44	Yes	300	10.0	4.4	3489.2	Good
19/07/2023	W16419	11	P45	Yes	300	15.0	4.4	3555.2	Good
19/07/2023	W16419	11	P46	Yes	300	25.0	4.4	3665.2	Good
19/07/2023	W16419	11	P47	Yes	300	24.0	4.4	3770.8	Good
19/07/2023	W16419	11	P48	Yes	300	9.0	4.4	3810.4	Good
19/07/2023	W16419	9	P49	Yes	300	15.0	4.4	3876.4	Good
19/07/2023	W16419	9	P50	Yes	300	24.0	4.4	3982.0	Good
19/07/2023	W16419	9	P51	Yes	300	24.0	4.4	4087.6	Good
19/07/2023	W16419	9	P52	Yes	300	9.0	4.4	4127.2	Good
19/07/2023	W16419	8	P53	Yes	300	17.0	4.4	4202.0	Good
19/07/2023	W16419	8	P54	Yes	300	21.0	4.4	4294.4	Good
19/07/2023	W16419	8	P55	Yes	300	22.0	4.4	4391.2	Good
19/07/2023	W16419	8	P56	Yes	300	12.0	4.4	4444.0	Good
19/07/2023	W16419	13	P57	Yes	300	12.0	4.4	4496.8	Good
19/07/2023	W16419	13	P58	Yes	300	12.0	4.4	4549.6	Good

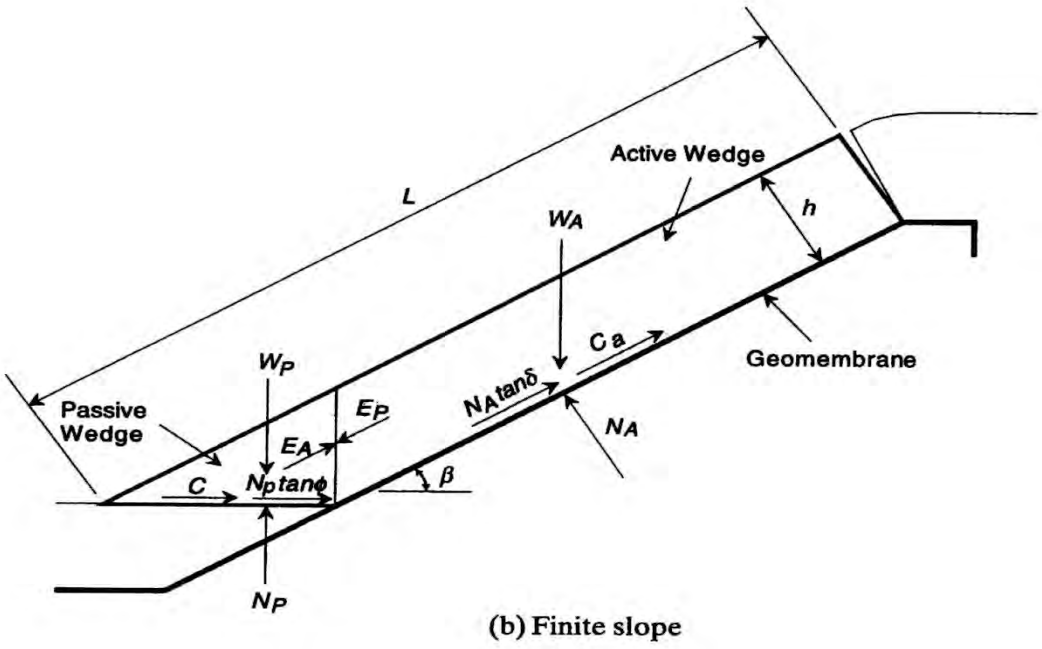
APPENDIX V
INTERFACE TESTING

PROJECT **Pwllfawatkin Landfill Site**

Job No. WR7842 Made By: S Saad Date: 26/05/2022
Checked: A Kirk
Reviewed: A Kirk

Capping system stability PSR 0.5

Geometry:



(b) Finite slope

Input Parameters

Cover soils unit weight (dry), γ_{dry}	18	kN/m³
Cover soils unit weight (saturated), γ_{sat}	20	kN/m³
Cover soils internal shear strength, ϕ	23	Deg.
Cover soils cohesion, c	1	kPa
Thickness of cover soils, h	1	m
Height of slope, H	9	m
Slope angle, β	18.43	Deg.
Geosynthetic interface shear strengths:		
Cover soil/Geocomposite friction angle, d1	33	Deg.
Cover soil/Geocomposite cohesion intercept, a1	4	kPa
Geocomposite/Geomembrane friction angle, d2	22	Deg.
Geocomposite/Geomembrane cohesion intercept, a2	2	kPa
Geomembrane/Blinding layer, δ_3	24	Deg.
Geomembrane/Blinding layer, α_3	2	kPa
Parallel submergence ratio, PSR	0.5	
Geosynthetic tensile strengths:		
Geocomposite	15	kN/m
Geomembrane	11	kN/m

PROJECT **Pwllfawatkin Landfill Site**

Job No. WR7842 | Made By: S Saad | Date: 26/05/2022 | Checked: A Kirk | Reviewed: A Kirk

1. Stability of Cover Soils

Calculated Parameters

Length of slope, L	28.468	m
Thickness of water, h_w	0.500	m
Weight of active wedge, W_A	510.049	kN
Weight of passive wedge, W_P	30.840	kN
Pore pressure perp. to slope, U_n	131.085	kN
Pore pressure in interwedge surface, U_h	1.250	kN
Force normal to active wedge, N_A	353.199	kN
Vert pp on passive wedge, U_V	3.751	kN
a	153.104	
b	-361.779	
c	46.062	

Factor of Safety against cover soils sliding **2.23**

2. Integrity of Geosynthetics

(i) Geotextile

Mobilised shear stress at upper interface	200.687	kN
Shear strength at lower interface	264.261	kN
Tension developed in the GT	0.000	kN
Tensile strength of the GT	15	kN

Factor of Safety against rupture **No Tension**

(ii) Geomembrane

Shear strength at upper surface	264.261	kN
Mobilised shear stress at upper interface	200.687	kN
Shear strength at lower interface	285.404	kN
Tension developed in the GM	0.000	kN
Tensile strength of the GM	11	kN

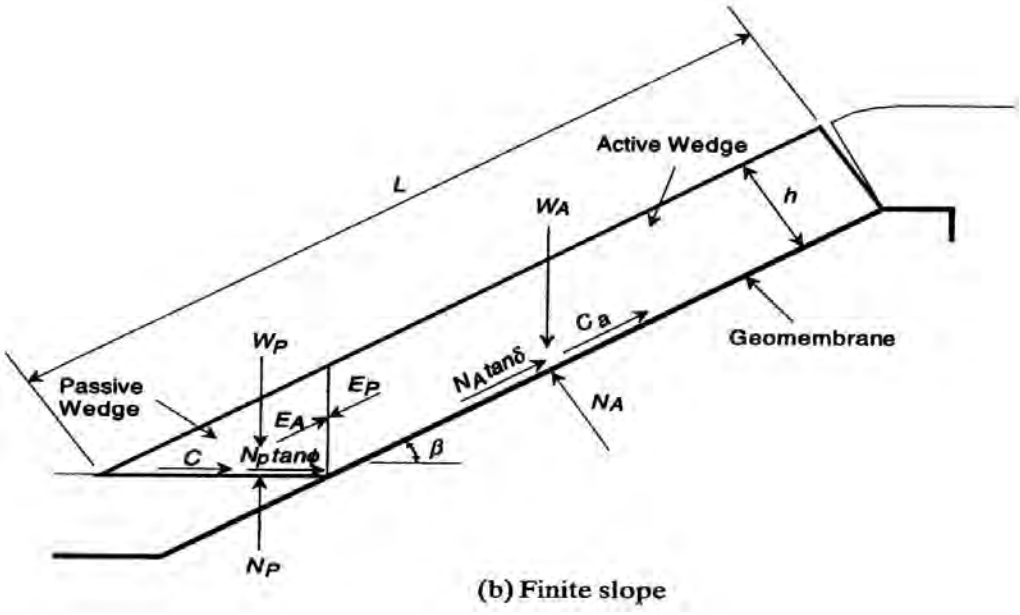
Factor of Safety against rupture **No Tension**

PROJECT **Pwllfawatkin Landfill Site**

Job No. WR7842 Made By: S Saad Date: 26/05/2022
Checked: A Kirk
Reviewed: A Kirk

Capping system stability PSR 1.0

Geometry:



(b) Finite slope

Input Parameters

Cover soils unit weight (dry), γ_{dry}	18	kN/m^3
Cover soils unit weight (saturated), γ_{sat}	20	kN/m^3
Cover soils internal shear strength, ϕ	23	Deg.
Cover soils cohesion, c	1	kPa
Thickness of cover soils, h	1	m
Height of slope, H	19	m
Slope angle, β	14.74	Deg.
Geosynthetic interface shear strengths:		
Cover soil/Geocomposite friction angle, d1	33	Deg.
Cover soil/Geocomposite cohesion intercept, a1	4	kPa
Geocomposite/Geomembrane friction angle, d2	22	Deg.
Geocomposite/Geomembrane cohesion intercept, a2	2	kPa
Geomembrane/Blinding layer, δ_3	22	Deg.
Geomembrane/Blinding layer, α_3	2	kPa
Parallel submergence ratio, PSR	1.0	
Geosynthetic tensile strengths:		
Geocomposite	15	kN/m
Geomembrane	11	kN/m

PROJECT **Pwllfawatkin Landfill Site**

Job No. WR7842 Made By: S Saad Date: 26/05/2022
Checked: A Kirk
Reviewed: A Kirk

1. Stability of Cover Soils

Calculated Parameters

Length of slope, L	74.676	m
Thickness of water, h_w	1.000	m
Weight of active wedge, W_A	1452.875	kN
Weight of passive wedge, W_P	40.641	kN
Pore pressure perp. to slope, U_n	702.531	kN
Pore pressure in interwedge surface, U_h	5.000	kN
Force normal to active wedge, N_A	703.803	kN
Vert pp on passive wedge, U_V	19.005	kN
a	357.818	
b	-783.402	
c	81.622	

Factor of Safety against cover soils sliding **2.08**

2. Integrity of Geosynthetics

(i) Geotextile

Mobilised shear stress at upper interface	594.645	kN
Shear strength at lower interface	732.913	kN
Tension developed in the GT	0.000	kN
Tensile strength of the GT	15	kN

Factor of Safety against rupture **No Tension**

(ii) Geomembrane

Shear strength at upper surface	732.913	kN
Mobilised shear stress at upper interface	594.645	kN
Shear strength at lower interface	732.913	kN
Tension developed in the GM	0.000	kN
Tensile strength of the GM	11	kN

Factor of Safety against rupture **No Tension**

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REPORT

GEOSYNTHETICS TEST REPORT

REPORT REFERENCE: BS-U145/a

Report Date	22/03/2022
Client	Jones Bros (Ruthin) Ltd
Address	Ruthin, Denbighshire, LL15 2YH
Contact	Sam Roberts
Project Ref	Pwllfawatkin Landfill Site
Client PO	TBA

Interface Tested	Drainage Geocomposite Vs Site Soils
Sample ID(s)	Drainge Geocomposite Site Soils
Date Received	02/03/2022

Tests Requested	BS EN ISO 12957-1:2018 {Modified in accordance with LGG 115}
Type of Shear Box	Large Shear Box (300mm by 300mm), direct shear.

Data Pending →	Particle Size Distribution (BS 1377-2:1990 Clause 9.2)#
	Mositure Content (BS 1377-2:1990 Clause 3.2)#
	Plasticity Index (BS 1377-2:1990 Clause 4.3, 5.3 & 5.4)#

If you have any questions or require additional information, please do not hesitate to contact us.

Prepared by:

David Smith
Technical Co-ordinator

Approved by:

Shazeena Iqbal
Technical Director

4438

Tests Marked with an asterisk (*) in this report are not UKAS accredited, and therefore are not included in the UKAS Accreditation Schedule for our laboratory.
Tests marked # have been subcontracted and are UKAS accredited. Tests marked F are accredited under the company's UKAS Flexible Scope.
This test report is in a condensed format, complete test details available upon request.

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GEOSYNTHETICS INTERFACE TEST RESULTS
JONES BROS (RUTHIN) LTD
P.O NO: TBA

Test Method: ISO Shear Strength - BS EN ISO 12957-1:2018 | **Report Ref: BS-U145/a**
Project/Site: Pwllfawatkin Landfill Site | **BICS Sample Ref: 1**
Interface: Drainage Geocomposite Vs Site Soils | **Dates Tested: 17-21/03/2022**

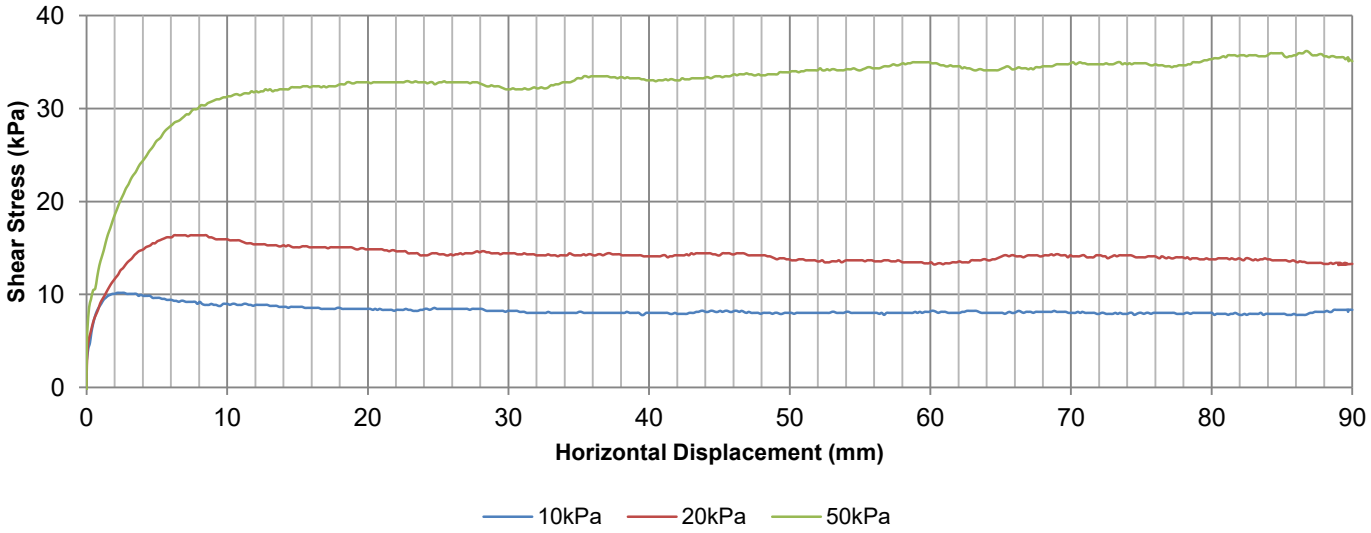
Material Details:

Upper Interface: Site Soils
Lower Interface: Drainage Geocomposite {cuspate side in contact with soil}
Soil Thickness: 100 mm
Interface Spacing: 1 mm

Test Setup:

Stage		1	2	3
Normal Stress	*(kPa)*	10	20	50
Test Condition		Submerged	Submerged	Submerged
Consolidation	*(hrs)*	1	1	1
Rate of Displacement	(mm/min)	1.00	1.00	1.00

Shear Stress vs Horizontal Displacement:



Test Observations:

Details of Apparatus: DGSI Shear Box - Lower moving box 405mm x 305mm, stationary upper box 305mm x 305mm. Load application - 100 & 600kPa load attachment, Recording devices - 50kN shear load cell, 100mm & 25mm LDT
Clamping Method: Rigid plates with nail plate gripping surface
Mode of Failure: N/A
Other Observations: N/A
Room Temperature: 21 ± 2°C, **Area Correction:** Not required

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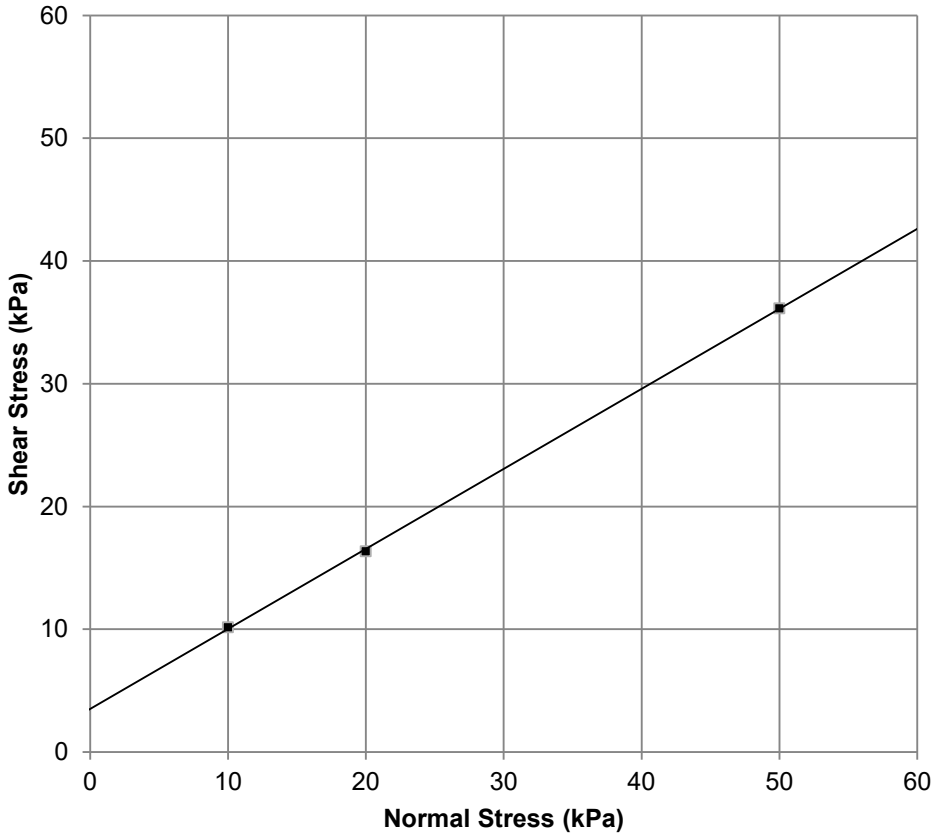
GEOSYNTHETICS INTERFACE TEST RESULTS
JONES BROS (RUTHIN) LTD
P.O NO: TBA

Test Method: ISO Shear Strength - BS EN ISO 12957-1:2018 | **Report Ref: BS-U145/a**
Project/Site: Pwllfawatkin Landfill Site | **BICS Sample Ref: 1**
Interface: Drainage Geocomposite Vs Site Soils | **Dates Tested: 17-21/03/2022**

Test Results:

Stage		1	2	3
Normal Stress	*kPa*	10	20	50
Peak Shear Stress	*kPa*	10	16	36
Displacement at Max Shear Stress	*mm*	2.2	6.2	86.7



	Adhesion kPa	Friction Angle degrees
Peak Shear Strength[1]	**4**	**33**
Factor of Safety	**-**	**27.8**

[1]The friction angle and adhesion values reported are only valid over the normal stress ranges tested.

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GEOSYNTHETICS INTERFACE TEST RESULTS
JONES BROS (RUTHIN) LTD
P.O NO: TBA

Test Method: ISO Shear Strength - BS EN ISO 12957-1:2018 | **Report Ref: BS-U145/a**
Project/Site: Pwllfawatkin Landfill Site | **BICS Sample Ref: 1**
Interface: Drainage Geocomposite Vs Site Soils | **Dates Tested: 17-21/03/2022**

Sequence of Interfaces in Situ:

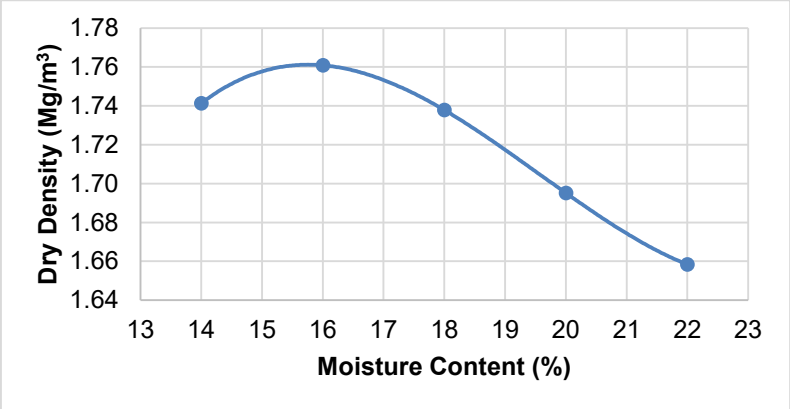
	2	Site Soils
Lowest	1	Drainage Geocomposite

Moisture Content as Received: 20 %

Compaction Test Results BS: 1377-4*:

Particle Size <20 mm
Mould Volume 995787 mm^3
Mass of Mould 4.0543 g

Moisture Content (%)	Mass of Mould and Soil (g)	Mass of Compacted Soil (g)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)
14	6031	1977	1.99	1.74
16	6088.3	2034	2.04	1.76
18	6096.3	2042	2.05	1.74
20	6079.9	2026	2.03	1.70
22	6069	2015	2.02	1.66



Optimum Moisture Content (%)	Maximum Dry Density (Mg/m^3)
16	1.76

Category of Soil:
N/A

Category of Geosynthetic:
N/A

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GEOSYNTHETICS INTERFACE TEST RESULTS
JONES BROS (RUTHIN) LTD
P.O NO: TBA

Test Method: ISO Shear Strength - BS EN ISO 12957-1:2018 {LGG 115}
Project/Site: Pwllfawatkin Landfill Site
Interface: Drainage Geocomposite Vs Site Soils

Report Ref: BS-U145/a
BICS Sample Ref: 1
Dates Tested: 17-21/03/2022

Shear Box: 10kPa Before

CONFIDENTIAL TEST REPORT

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JONES BROS (RUTHIN) LTD
P.O NO: TBA

Test Method: ISO Shear Strength - BS EN ISO 12957-1:2018 {LGG 115}
Project/Site: Pwllfawatkin Landfill Site
Interface: Drainage Geocomposite Vs Site Soils

Report Ref: BS-U145/a
BICS Sample Ref: 1
Dates Tested: 17-21/03/2022

Shear Box: 10kPa After

CONFIDENTIAL TEST REPORT

BICS Laboratories Ltd
10 Owler Ings Road, Brighouse, West Yorkshire, HD6 1EJ
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UKAS TESTING
4438

GEOSYNTHETICS INTERFACE TEST RESULTS
JONES BROS (RUTHIN) LTD
P.O NO: TBA

Test Method: ISO Shear Strength - BS EN ISO 12957-1:2018 {LGG 115}
Project/Site: Pwllfawatkin Landfill Site
Interface: Drainage Geocomposite Vs Site Soils

Report Ref: BS-U145/a
BICS Sample Ref: 1
Dates Tested: 17-21/03/2022

Shear Box: 20kPa Before

CONFIDENTIAL TEST REPORT

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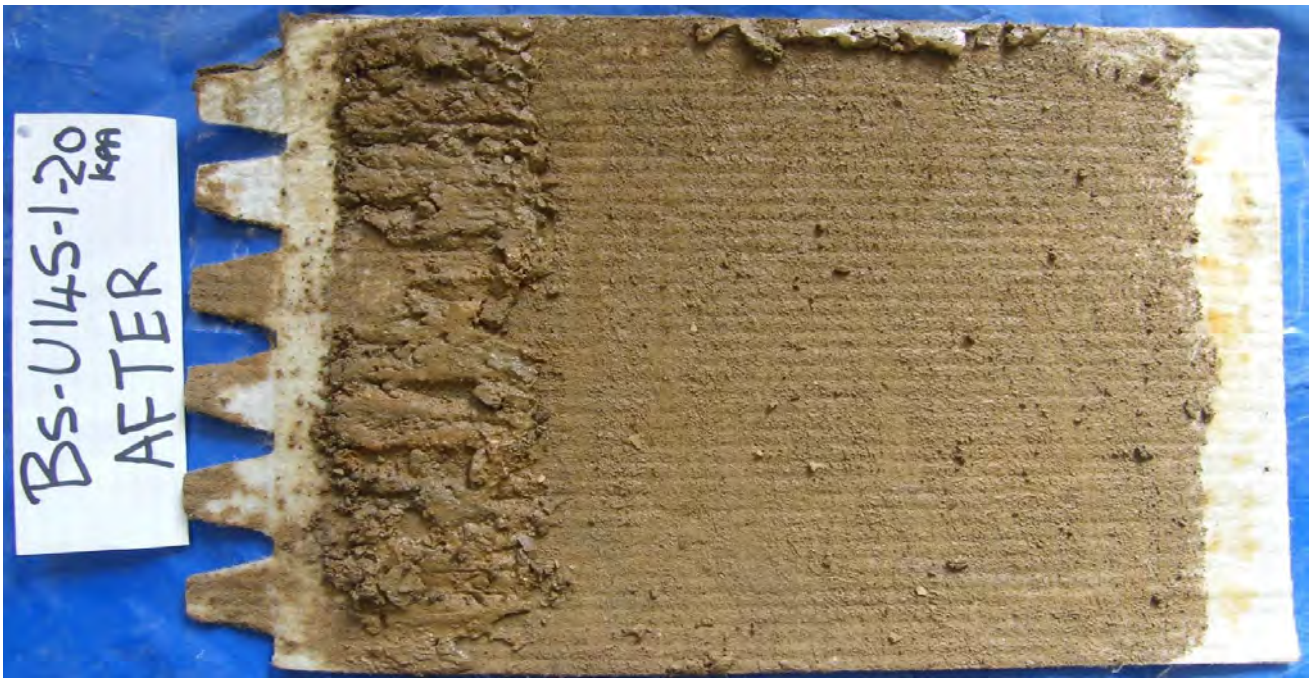
GEOSYNTHETICS INTERFACE TEST RESULTS
JONES BROS (RUTHIN) LTD
P.O NO: TBA

Test Method: ISO Shear Strength - BS EN ISO 12957-1:2018 {LGG 115}
Project/Site: Pwllfawatkin Landfill Site
Interface: Drainage Geocomposite Vs Site Soils

Report Ref: BS-U145/a
BICS Sample Ref: 1
Dates Tested: 17-21/03/2022

Shear Box: 20kPa After



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GEOSYNTHETICS INTERFACE TEST RESULTS
JONES BROS (RUTHIN) LTD
P.O NO: TBA

Test Method: ISO Shear Strength - BS EN ISO 12957-1:2018 {LGG 115}
Project/Site: Pwllfawatkin Landfill Site
Interface: Drainage Geocomposite Vs Site Soils

Report Ref: BS-U145/a
BICS Sample Ref: 1
Dates Tested: 17-21/03/2022

Shear Box: 50kPa Before

CONFIDENTIAL TEST REPORT

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GEOSYNTHETICS INTERFACE TEST RESULTS
JONES BROS (RUTHIN) LTD
P.O NO: TBA

Test Method: ISO Shear Strength - BS EN ISO 12957-1:2018 {LGG 115}
Project/Site: Pwllfawatkin Landfill Site
Interface: Drainage Geocomposite Vs Site Soils

Report Ref: BS-U145/a
BICS Sample Ref: 1
Dates Tested: 17-21/03/2022

Shear Box: 50kPa After

CONFIDENTIAL TEST REPORT

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REPORT

GEOSYNTHETICS TEST REPORT

REPORT REFERENCE: BS-U145/a {Supplementary[1]}

Report Date	20/04/2022
Client	Jones Bros (Ruthin) Ltd
Address	Ruthin, Denbighshire, LL15 2YH
Contact	Sam Roberts
Contract Reference	Pwllfawatkin Landfill Site
Client PO/Ref No	M-C1295/00001
Material Tested	Site Soils
Date Received	02/03/2022
Sample IDs	Site Soils
Tests Requested	Particle Size Distribution (BS 1377-2:1990 Clause 9.2)# Mositure Content (BS 1377-2:1990 Clause 3.2)# Plasticity Index (BS 1377-2:1990 Clause 4.3, 5.3 & 5.4)#

This supplementary report includes the 'data pending' results as referenced in BS-U145/a

Prepared by:

David Smith
Technical Co-ordinator

Approved by:

Shazeena Iqbal
Technical Director

4438

10 Owler Ings Road, Brighouse, West Yorkshire, HD6 1EJ
Directors: Clifford Butt, Shazeena N. Iqbal Company Registration Number: 4213030

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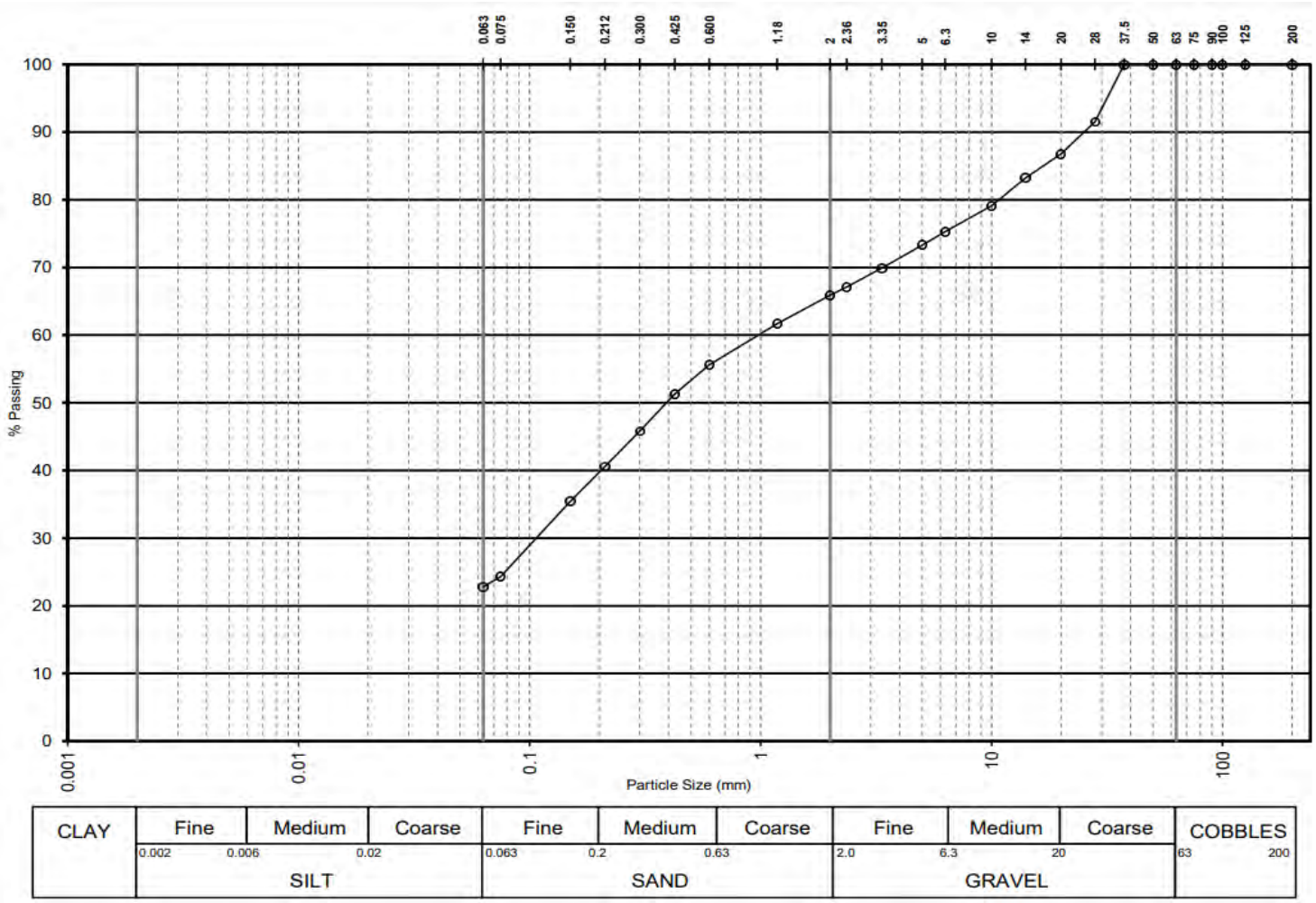
GEOSYNTHETICS TEST RESULTS
JONES BROS (RUTHIN) LTD

Contract Ref: Pwllfawatkin Landfill Site **Report Ref No: BS-U145/a {Supplementary[1]}**
Material: Site Soils **Dates Tested: 20/04/2022**

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1	2	3	4	5	6	7	8	9	10		

Sample ID: Site Soils **BICS Sample Ref: 1**

Particle Size Distribution (BS 1377-2:1990 Clause 9.2)#



Atmospheric Conditions at Test: 21 ± 2 °C, Relative Humidity : 65 ± 5 % RH

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GEOSYNTHETICS TEST RESULTS
JONES BROS (RUTHIN) LTD

Contract Ref: Pwllfawatkin Landfill Site **Report Ref No: BS-U145/a {Supplementary[1]}**
Material: Site Soils **Dates Tested: 20/04/2022**

TEST METHOD	TEST SPECIMEN NUMBER										MEAN	Std Dev
	1	2	3	4	5	6	7	8	9	10		

Sample ID: Site Soils **BICS Sample Ref: 1**

Particle Size Distribution (BS 1377-2:1990 Clause 9.2)#

MATERIAL DESCRIPTION

Brwon silty clayey SAND & GRAVEL

Sieve Size mm	% Passing	Sieve Size mm	% Passing
200	100	3.35	70
125	100	2.36	67
100	100	2.0	66
90	100	1.18	62
75	100	0.600	56
63	100	0.425	51
50	100	0.300	46
37.5	100	0.212	41
28	92	0.150	35
20	87	0.075	24
14	83	0.063	22.8
10	79		
6.3	75		
5.0	73		

Cobbles	0.0
Gravel	34.1
Sand	43.1
Silt/Clay	22.8

Mositure Content (BS 1377-2:1990 Clause 3.2)#

%	17	**17**	-

Plasticity Index (BS 1377-2:1990 Clause 4.3, 5.3 & 5.4)#

% Materials passing 425µm	52	**52**	-
Plastic Limit	19	**19**	-
Liquid Limit	35	**35**	-
Plasticity Index	16	**16**	-

Atmospheric Conditions at Test: 21 ± 2 °C, Relative Humidity : 65 ± 5 % RH

CONFIDENTIAL TEST REPORT

APPENDIX VI
RESTORATION SOILS

Surface Acceptance Certificate

Site:	Pwllfawatkin	**Sheet No:**	1
CQA Engineer:	Stanley Ugohuckwu	**CQA Plan Ref:**	FCC 479 SW 2016 - 07

Area of Subgrade under consideration:	GDL Panels P1 to P10.

I the undersigned, a duly appointed representative of Sirius Environmental Limited, have visually observed the subgrade described above and confirm the subgrade is an acceptable surface upon which to install Restoration Soils.

This certification is based on observation of the surface of the subgrade only. No subterranean inspections or tests have been performed by Sirius Environmental Limited, and Sirius Environmental Limited makes no representations or warranties regarding the conditions which may exist below the surface of the subgrade.

Sirius Environmental Representative:			
Name:	Stanley Ugohuckwu	Signature:	
Date:	07/07/2023	Position:	CQA Engineer

Surface Acceptance Certificate

Site:	Pwllfawatkin	**Sheet No:**	2
CQA Engineer:	Stanley Ugohuckwu	**CQA Plan Ref:**	FCC 479 SW 2016 - 07

Area of Subgrade under consideration:	GDL Panels P11 to P32.

I the undersigned, a duly appointed representative of Sirius Environmental Limited, have visually observed the subgrade described above and confirm the subgrade is an acceptable surface upon which to install Restoration Soils.

This certification is based on observation of the surface of the subgrade only. No subterranean inspections or tests have been performed by Sirius Environmental Limited, and Sirius Environmental Limited makes no representations or warranties regarding the conditions which may exist below the surface of the subgrade.

Sirius Environmental Representative:			
Name:	Stanley Ugohuckwu	Signature:	
Date:	12/07/2023	Position:	CQA Engineer

Surface Acceptance Certificate

Site:	Pwllfawatkin	**Sheet No:**	3
CQA Engineer:	Stanley Ugohuckwu	**CQA Plan Ref:**	FCC 479 SW 2016 - 07

Area of Subgrade under consideration:	GDL Panels P33 to P42.

I the undersigned, a duly appointed representative of Sirius Environmental Limited, have visually observed the subgrade described above and confirm the subgrade is an acceptable surface upon which to install Restoration Soils.

This certification is based on observation of the surface of the subgrade only. No subterranean inspections or tests have been performed by Sirius Environmental Limited, and Sirius Environmental Limited makes no representations or warranties regarding the conditions which may exist below the surface of the subgrade.

Sirius Environmental Representative:			
Name:	Stanley Ugohuckwu	Signature:	
Date:	18/07/2023	Position:	CQA Engineer

Surface Acceptance Certificate

Site:	Pwllfawatkin	**Sheet No:**	4
CQA Engineer:	Stanley Ugohuckwu	**CQA Plan Ref:**	FCC 479 SW 2016 - 07

Area of Subgrade under consideration:	GDL Panels P43 to P58.

I the undersigned, a duly appointed representative of Sirius Environmental Limited, have visually observed the subgrade described above and confirm the subgrade is an acceptable surface upon which to install Restoration Soils.

This certification is based on observation of the surface of the subgrade only. No subterranean inspections or tests have been performed by Sirius Environmental Limited, and Sirius Environmental Limited makes no representations or warranties regarding the conditions which may exist below the surface of the subgrade.

Sirius Environmental Representative:			
Name:	Stanley Ugohuckwu	Signature:	
Date:	19/07/2023	Position:	CQA Engineer

Ground Assessment & HSV Record Sheet

Site:	Pwllfawatkin	**CQA Engineer:**	**Sheet:**
CQA Plan Ref:	FCC 479 SW 2016 - 07	S. Ugohuckwu	1 of 1

Date	**Location /Grid Ref:**	**Layer Under Consideration** Formation, Drainage Layer, Protection Soils, Regulating Layer, Restoration Soils	**Thickness** (mm) (if applicable)	**Shear Strength** (kPa) (if applicable)	**Pass/Fail**
07/07/2023	10A	Restoration Soils	1000	N/A	Pass
07/07/2023	10B	Restoration Soils	1000	N/A	Pass
12/07/2023	10C	Restoration Soils	1000	N/A	Pass
12/07/2023	10D	Restoration Soils	1000	N/A	Pass
12/07/2023	10E	Restoration Soils	1000	N/A	Pass
12/07/2023	10F	Restoration Soils	1000	N/A	Pass
18/07/2023	10G	Restoration Soils	1000	N/A	Pass
18/07/2023	10H	Restoration Soils	1000	N/A	Pass
19/07/2023	10I	Restoration Soils	1000	N/A	Pass
19/07/2023	9H	Restoration Soils	1000	N/A	Pass

APPENDIX VII
PHOTOGRAPHIC RECORD

PHOTOGRAPHS

Plate: 1

Materials Received

Plate: 2

Preparing Working Area

sirius	Job Title: Pwllfawatkin Capping 2023		
	Approved: ASC	Signature	Client: FCC

PHOTOGRAPHS

Plate: 3

Preparing to Deploy GDL

Plate: 4

GDL Deployment in Progress

sirius	Job Title: Pwllfawatkin Capping 2023		
	Approved: ASC	Signature	Client: FCC

PHOTOGRAPHS

Plate: 5

Overview of Works

Plate: 6

Heat Bonding Material

sirius	Job Title: Pwllfawatkin Capping 2023		
	Approved: ASC	Signature	Client: FCC

PHOTOGRAPHS

Plate: 7

Overview of Works

Plate: 8

Place Restoration Material

sirius	Job Title: Pwllfawatkin Capping 2023		
	Approved: ASC	Signature	Client: FCC

PHOTOGRAPHS

Plate: 9

Overview of Works

Plate: 10

Overview of Works

sirius	Job Title: Pwllfawatkin Capping 2023		
	Approved: ASC	Signature	Client: FCC

PHOTOGRAPHS

Plate: 11

Overview of Works

Plate: 12

Restoration in Progress

sirius	Job Title: Pwllfawatkin Capping 2023		
	Approved: ASC	Signature	Client: FCC

PHOTOGRAPHS

Plate: 13

Continued GDL Installation

Plate: 14

Overview of Work

sirius	Job Title: Pwllfawatkin Capping 2023		
	Approved: ASC	Signature	Client: FCC

PHOTOGRAPHS

Plate: 15

Overview of Work

Plate: 16

Overview of Work

sirius	Job Title: Pwllfawatkin Capping 2023		
	Approved: ASC	Signature:	Client: FCC

PHOTOGRAPHS

Plate: 17

Restoration Placement in Progress

Plate: 18

Completed

sirius	Job Title: Pwllfawatkin Capping 2023		
	Approved: ASC	Signature	Client: FCC

APPENDIX VIII
DAILY RECORDS

Daily Site Record Sheet

Date:	Tuesday 04/06/2023	Site:	Pwllfawatkin
Weather:	AM/PM: Intermittent rain showers.	CQA Plan Ref:	FCC 479 SW 2016 - 07

Visitors to Site:	None

Location: Buttress area along the southern toe section of existing landfill cap.

- The V380 excavator loaded the A30 dump trucks with clay material for the buttress.
- The A30 dump trucks then transported the clay material to the front of the D6 bulldozer.
- The D6 bulldozer spread the clay material in 300 mm layers.
- The sheepsfoot roller compacted the clay layers to spec.
- HSV (hand shear vane) test conducted on compacted CLAY liner.
- The PC210 excavator worked with the liners to remove and properly dispose of the cut-out existing geomembrane rain flaps.
- JB engineer worked with the D6 operator to give design levels.
- CQA engineer ensured all non-compliant areas were adequately remediated and non-conformance materials /debris (wood pieces, metal rods, cobble /boulder gravels) removed prior to progressing with works.
- Photographs taken to capture works undertaken.
- All works conducted in accordance to specification.

Location: Southern lower slope of landfill cap.

Assess and approve the method statements for the GDL installation works.

- Cut out rain flaps from existing geomembrane.
- Properly removed and disposed of cut-out rain flaps.
- Stripped off existing geomembrane liner at south and southwestern slope of landfill cap.
- The stripped off geomembrane liner was properly removed and disposed of in accordance to spec.

The cut-out rain flaps were properly removed and disposed of accordingly.

The removal of the rain flaps and the stripping off of the existing geomembrane liner are in the preparation for the installation of the GDL.

List of Plant	Hours of Operation	Comments
1 x 360 Volvo Digger 1 x CAT D6 Dozer 1 x Volvo A30 Dumper 1 x Bell 30 Dumper 1 x Hitachi 210 Excavator 1 x Smooth Roller 1 x Pad / Sheep foot Roller	07:00 – 18:00	

Prepared by:	Stanley Ugohuckwu	Signed:	

Daily Site Record Sheet

Date:	Wednesday 05/06/2023	Site:	Pwllfawatkin
Weather:	AM: Cloudy & Dry PM: Sunny	CQA Plan Ref:	FCC 479 SW 2016-07

Visitors to Site:	None

Location: Buttress area along the southern toe section of existing landfill cap.

- The V380 excavator loaded the A30 dump trucks with clay material for the buttress.
- The A30 dump trucks then transported the clay material to the front of the D6 bulldozer.
- The D6 bulldozer spread the clay material in 300 mm layers.
- The sheepsfoot roller compacted the clay layers to spec.
- HSV (hand shear vane) test conducted on compacted CLAY liner.
- The PC210 excavator worked with the liners to remove and properly dispose of the cut-out existing geomembrane rain flats..
- JB engineer worked with the D6 operator to give design levels.
- CQA engineer ensured all non-compliant areas were adequately remediated and non-conformance materials /debriis (wood pieces, metal rods, cobble /boulder gravels) removed prior to progressing with works.
- Photographs taken to capture works undertaken.
- All works conducted in accordance to specification.

Location: Southern slope of landfill cap.

- Cut out rain flap from existing geomembrane.
- Properly removed and disposed of cut-out rain flaps.
- Replace rain flap on southern slope to facilitate the diversion works.
- The stripped off geomembrane liner was properly removed and disposed of in accordance to spec.
- Liner technicians stone picked southeastern flank of cap in preparation of GDL Geomembrane installation works.

The cut-out rain flats were properly removed and disposed of accordingly.

The removal of the rain flaps and the stripping off of the existing geomembrane liner are in the preparation for the installation of the GDL.

List of Plant	Hours of Operation	Comments
1 x 360 Volvo Digger 1 x CAT D6 Dozer 1 x Volvo A30 Dumper 1 x Bell 30 Dumper 1 x Hitachi 210 Excavator 1 x Smooth Roller 1 x Pad / Sheep foot Roller	07:00 – 18:00	

Prepared by:	Stanley Ugohuckwu	Signed:	

Daily Site Record Sheet

Date:	Thursday 06/06/2023	Site:	Pwllfawatkin
Weather:	AM: Rain PM: Cloudy and dry	CQA Plan Ref:	FCC 479 SW 2016-07

Visitors to Site:	None

Location: Buttress area along the southern toe section of existing landfill cap.

- The V380 excavator loaded the A30 dump trucks with clay material for the buttress.
- The A30 dump trucks then transported the clay material to the front of the D6 bulldozer.
- The D6 bulldozer spread the clay material in 300 mm layers.
- JB engineer worked with the D6 operator to give design levels.
- The sheepsfoot roller compacted the clay layers to spec.
- HSV (hand shear vane) test conducted on compacted CLAY liner.
- The PC210 excavator worked with the liners to remove and properly dispose of the cut-out existing geomembrane rain flats..
- Anchor trench dug in preparation for GDL and Geomembrane installation works
- CQA engineer ensured all non-compliant areas were adequately remediated and non-conformance materials /debriis (wood pieces, metal rods, cobble /boulder gravels) removed prior to progressing with works.
- Photographs taken to capture works undertaken.
- All works conducted in accordance to specification.

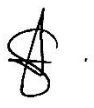
Location: Southern slope of landfill cap.

- Cut out rain flaps from existing geomembrane.
- Properly removed and disposed of cut-out rain flaps.
- Southeastern flank stone picked by liner technicians in preparation for GDL Geomembrane installation works.
- Anchor trench dug in preparation for GDL and Geomembrane installation works.
- Extract 4 x redundant gas wells at the lower section of the southern slope.

The cut-out rain flaps were properly removed and disposed of accordingly.

Anchor trench dug along the southeastern flank of the cap in preparation for GDL & Geomembrane installation works.

List of Plant	Hours of Operation	Comments
1 x 360 Volvo Digger 1 x CAT D6 Dozer 1 x Volvo A30 Dumper 1 x Bell 30 Dumper 1 x Hitachi 210 Excavator 1 x Smooth Roller 1 x Pad / Sheep foot Roller	07:00 – 19:00	

Prepared by:	Stanley Ugohuckwu	Signed:	

Daily Site Record Sheet

Date:	Friday 07/06/2023	Site:	Pwllfawatkin
Weather:	AM: Cloudy and dry. PM: Sunny Intervals.	CQA Plan Ref:	FCC 479 SW 2016 - 07

Visitors to Site:	None

Location: Buttress area along the southern toe section of existing landfill cap.

- The V380 excavator loaded the A30 dump trucks with clay material for the buttress.
- The A30 dump trucks then transported the clay material to the front of the D6 bulldozer.
- The D6 bulldozer spread the clay material in 300 mm layers.
- JB engineer worked with the D6 operator to give design levels.
- The sheepsfoot roller compacted the clay layers to spec.
- HSV (hand shear vane) test conducted on compacted CLAY liner.
- Regulating layer prepped on southeastern slope in preparation for GDL / Geomembrane installation works.
- The PC210 excavator worked with the liners to assist with the installation of GDL panels across the southern lower slope.
- Anchor trench excavated / dug along the toe of the south and southeastern flank of the cap area.
- 1m thick restoration layer cover placed over installed 10 x GDL panels.
- CQA engineer ensured all non-compliant areas were adequately remediated and non-conformance materials /debriis (wood pieces, metal rods, cobble /boulder gravels) removed prior to progressing with works.
- Photographs taken to capture works undertaken.
- All works conducted in accordance to specification.

Location: Southern slope of landfill cap.

- Southeastern flank stone picked by liner technicians in preparation for GDL installation works.
- GDL installed across the southern lower slope. GDL panel's referenced P1 - P10.
- 1m thick restoration layer cover placed over installed 10 x GDL panels.

Installed GDL panels were heat bonded at 300mm overlap.

List of Plant	Hours of Operation	Comments
1 x 360 Volvo Digger 1 x CAT D6 Dozer 1 x Volvo A30 Dumper 1 x Bell 30 Dumper 1 x Hitachi 210 Excavator 1 x Smooth Roller 1 x Pad / Sheep foot Roller	07:00 – 17:00	

Prepared by:	Stanley Ugohuckwu	Signed:	

Daily Site Record Sheet

Date:	Monday 10/07/2023	Site:	Pwllfawatkin
Weather:	AM: Heavy Rain Showers PM: Heavy Rain Showers.	CQA Plan Ref:	FCC 479 SW 2016 - 07

Visitors to Site:	None

Location: Buttress area along the southern toe section of existing landfill cap.

- No works conducted due to persistent heavy rain showers.
- Commenced with the welding of pipe boots. Welding works carried out at FCC warehouse offsite (within very close travelling distance to site).

List of Plant	Hours of Operation	Comments
1 x 360 Volvo Digger 1 x CAT D6 Dozer 1 x Volvo A30 Dumper 1 x Bell 30 Dumper 1 x Hitachi 210 Excavator 1 x Smooth Roller 1 x Pad / Sheep foot Roller	07:00 – 17.00	

Prepared by:	Stanley Ugohuckwu	Signed:	

Daily Site Record Sheet

Date:	Tuesday 11/07/2023	Site:	Pwllfawatkin
Weather:	AM: Heavy Rain Showers PM: Heavy Rain Showers.	CQA Plan Ref:	FCC 479 SW 2016 - 07

Visitors to Site:	None

Location: Buttress area along the southern toe section of existing landfill cap.

- No works conducted due to persistent heavy rain showers.
- Carried out pipe boot welds. Welding works were conducted at the FCC warehouse due to the inclement wet weather conditions.

List of Plant	Hours of Operation	Comments
1 x 360 Volvo Digger 1 x CAT D6 Dozer 1 x Volvo A30 Dumper 1 x Bell 30 Dumper 1 x Hitachi 210 Excavator 1 x Smooth Roller 1 x Pad / Sheep foot Roller	07:00 – 18.00	

Prepared by:	Stanley Ugohuckwu	Signed:	

Daily Site Record Sheet

Date:	Wednesday 1206/2023	Site:	Pwllfawatkin
Weather:	AM: Cloudy and dry. PM: Intermittent light rain showers..	CQA Plan Ref:	FCC 479 SW 2016 07

Visitors to Site:	None

Location: Capping Works.

- The V380 excavator loaded restoration soil material onto the A30 dump trucks for covering/protecting the installed GDL panels.
- The A30 dump trucks then transported the clay material to the front of the D6 bulldozer.
- The D6 bulldozer spread the restoration material to cover/protect the installed GDL panels.
- JB engineer collaborated with the D6 operator to establish design levels.
- The PC210 excavator assisted the liners in installing GDL panels on the southern slope.
- The CQA engineer ensured that non-compliant areas were properly addressed and unsuitable materials were removed before proceeding with the work.
- Photographs were taken to document the completed tasks.
- All the work was carried out according to the specified requirements.
- GDL was installed on the southern slope and referenced P11 and P32.
- Welded pipe boots and due to the adverse wet weather conditions, welding activities took place at the FCC warehouse.
- The welding process was overseen and inspected by a CQA engineer, who also collected a samples.

Welding process was overseen and inspected by a CQA Inspector, who also collected a sample.

List of Plant	Hours of Operation	Comments
1 x 360 Volvo Digger 1 x CAT D6 Dozer 1 x Volvo A30 Dumper 1 x Bell 30 Dumper 1 x Hitachi 210 Excavator 1 x Smooth Roller 1 x Pad / Sheep foot Roller	07:00 – 19:00	

Prepared by:	Stanley .U	Signed:	

Daily Site Record Sheet

Date:	Thursday 13/07/2023	Site:	Pwllfawatkin
Weather:	AM: Heavy Rain Showers PM: Heavy Rain Showers.	CQA Plan Ref:	FCC 479 SW 2016 - 07

Visitors to Site:	Marc Cooper, Sirius

Progress Meeting:

- Works progress meeting conducted by project manager, (FCC, SIRIUS, and Jones Bros).

Location: Buttress area along the southern toe section of existing landfill cap.

- No works conducted due to persistent heavy rain showers.
- CQA Engineer and lining technicians identified and removed unsuitable materials from the restoration soil. 210 excavator was utilized to assist with the removal /adequate disposal of these unsuitable materials.
- Carried out pipe boot welding. Welding works were conducted at the FCC warehouse due to the inclement wet weather conditions.

List of Plant	Hours of Operation	Comments
1 x 360 Volvo Digger 1 x CAT D6 Dozer 1 x Volvo A30 Dumper 1 x Bell 30 Dumper 1 x Hitachi 210 Excavator 1 x Smooth Roller 1 x Pad / Sheep foot Roller	07:00 – 18.00	

Prepared by:	Stanley Ugohuckwu	Signed:	

Daily Site Record Sheet

Date:	Friday 14/07/2023	Site:	Pwllfawatkin
Weather:	AM: Heavy Rain Showers PM: Heavy Rain Showers.	CQA Plan Ref:	FCC 479 SW 2016 - 07

Visitors to Site:	None

Location: Buttress area along the southern toe section of existing landfill cap.

- No works conducted due to persistent heavy rain showers.

List of Plant	Hours of Operation	Comments
1 x 360 Volvo Digger 1 x CAT D6 Dozer 1 x Volvo A30 Dumper 1 x Bell 30 Dumper 1 x Hitachi 210 Excavator 1 x Smooth Roller 1 x Pad / Sheep foot Roller	07:00 – 12:00	

Prepared by:	Stanley .U	Signed:	

Daily Site Record Sheet

Date:	Monday 17/07/2023	Site:	Pwllfawatkin
Weather:	AM: Cloudy and dry. PM: Cloudy and dry.	CQA Plan Ref:	FCC 479 SW 2016 - 07

Visitors to Site:	None

Location: Capping Works.

- The V380 excavator loaded restoration soil material onto the A30 dump trucks for covering/protecting the installed GDL panels.
- The A30 dump trucks then transported the clay material to the front of the D6 bulldozer.
- The D6 bulldozer spread the restoration material to cover/protect the installed GDL panels.
- JB engineer collaborated with the D6 operator to establish design levels.
- The PC210 excavator assisted the liners in installing Geotextile and Geomembrane panels along the western slope.
- The CQA engineer ensured that non-compliant areas were properly addressed and unsuitable materials were removed before proceeding with works.
- Photographs were taken to document the completed tasks.
- All works were carried out in accordance with design specifications.

Location: Geomembrane Capping works along the Western flank.

Assessed the method statement for Lower geotextile & geomembrane installation.

- Geotextile and Geomembrane materials were deployed /installed along the western slope.
- Deployed /installed Geotextile panels were referenced P1 to P5, and heat bonded together.
- Deployed /installed Geomembrane panels were referenced P1 to P8, and fusion welded together.

All Geotextile and Geomembrane deployment /installation works undertaken was overseen and inspected by the CQA Inspector, who also collected conformance and trial weld samples.

List of Plant	Hours of Operation	Comments
1 x 360 Volvo Digger 1 x CAT D6 Dozer 1 x Volvo A30 Dumper 1 x Bell 30 Dumper 1 x Hitachi 210 Excavator 1 x Smooth Roller 1 x Pad / Sheep foot Roller	07:00 – 19:00	

Prepared by:	Stanley .U	Signed:	

Daily Site Record Sheet

Date:	Tuesday 18/07/2023	Site:	Pwllfawatkin
Weather:	AM: Cloudy with light rain showers. PM: Heavy rain showers.	CQA Plan Ref:	FCC 479 SW 2016 - 07

Visitors to Site:	None

Location: Capping Works.

- The V380 excavator loaded restoration soil material onto 2 x dump trucks for covering/protecting the installed GDL panels.
- 2 x dump trucks then transported the clay material to the front of the D6 bulldozer.
- The D6 bulldozer spread the restoration material to cover/protect the installed GDL panels.
- JB engineer collaborated with the D6 operator to establish design levels.
- The PC210 excavator assisted the liners in installing GDL panels across the southern slope.
- The CQA engineer ensured that non-compliant areas were properly addressed and unsuitable materials were removed before proceeding with works.
- Photographs were taken to document the completed tasks.
- All works were carried out in accordance with design specifications.
- Progressed with the deployment and installation of GDL material along the southern flank.
- Deployed /installed GDL panels were referenced P33 to P43, and heat bonded together.
- JB engineer registered the installed GDL panels on GPS.

All GDL deployment /installation works undertaken was overseen and inspected by the CQA Inspector, who also collected a conformance sample.

List of Plant	Hours of Operation	Comments
1 x 360 Volvo Digger 1 x CAT D6 Dozer 1 x Volvo A30 Dumper 1 x Bell 30 Dumper 1 x Hitachi 210 Excavator 1 x Smooth Roller 1 x Pad / Sheep foot Roller	07:00 – 16:00	

Prepared by:	Stanley Ugohuckwu	Signed:	

Daily Site Record Sheet

Date:	Wednesday 19/07/2023	Site:	Pwllfawatkin
Weather:	AM: Cloudy with gusty winds. PM: Sunny intervals and dry.	CQA Plan Ref:	FCC 479 SW 2016 - 07

Visitors to Site:	None

Location: Capping works.

- The V380 excavator loaded restoration soil material onto 2 x dump trucks for covering/protecting the installed GDL panels.
- 2 x dump trucks then transported the clay material to the front of the D6 bulldozer.
- The D6 bulldozer spread the restoration material to cover/protect the installed GDL panels.
- JB engineer collaborated with the D6 operator to establish design levels.
- The PC210 excavator assisted the liners on the installation of GDL panels along the southern slope.
- The CQA engineer ensured that non-compliant areas were properly addressed and unsuitable materials were removed before proceeding with works.
- Photographs were taken to document the completed tasks.
- All works were carried out in accordance to design specifications.

Location: Geomembrane Capping works on the southern flank.

- Conducted extrusion weld to sufficiently seal patches (PR1, PR2, PR3 and PR4) on the installed geomembrane liner material.
- Sandbags deployed to adequately weigh down the installed geomembrane panels.
- PC210 utilized in collaboration with the lining technicians and stripped off existing geomembrane materials across the western flank.
- Regulation layer prepped by PC210 in preparation for subsequent deployment of geomembrane cover.
- Progressed with GDL deployment and installation works. Installed GDL panels were referenced from P43 to P58.

CQA Inspector ensured that non compliant areas were remediated and unsuitable materials removed from the restoration layer.

Installed GDL panels were heat bonded together and conformance sample taken by CQA Inspector.

List of Plant	Hours of Operation	Comments
1 x 360 Volvo Digger 1 x CAT D6 Dozer 1 x Volvo A30 Dumper 1 x Bell 30 Dumper 1 x Hitachi 210 Excavator 1 x Smooth Roller 1 x Pad / Sheep foot Roller	07:00 – 18:00	

Prepared by:	Stanley Ugohuckwu	Signed:	

Daily Site Record Sheet

Date:	Thursday 20/07/2023	Site:	Pwllfawatkin
Weather:	AM: Cloudy with dry. PM: Sunny intervals and dry.	CQA Plan Ref:	FCC 479 SW 2016 - 07

Visitors to Site:	None

Location: Capping works.

- The V380 excavator loaded restoration soil material onto 2 x dump trucks for covering/protecting the installed GDL panels.
- 2 x dump trucks then transported the clay material to the front of the D6 bulldozer.
- The D6 bulldozer spread the restoration material to cover/protect the installed GDL panels.
- JB engineer collaborated with the D6 operator to establish design levels.
- The PC210 excavator assisted the liners on the installation of GDL panels along the southern slope.
- The CQA engineer ensured that non-compliant areas were properly addressed and unsuitable materials were removed before proceeding with works.
- Photographs were taken to document the completed tasks.
- All works were carried out in accordance to design specifications.
- Conductor Conducted repairs on existing geomembrane liner at the bottom edge of the southern slope, to patch and adequately seal the geomembrane material within that section.
- The repairs /patches works on the existing geomembrane was carried out in preparation for the deployment of GDL material to cover and tie into the existing GDL material along the toe of the southern slope.
- PC210 in collaboration with the lining technicians, progressed with the deployment /installation of GDL material cover and tie into the existing GDL material along the toe edge of the southern slope.
- The deployed /installed GDL panels were referenced from P55.to P58.

List of Plant	Hours of Operation	Comments
1 x 360 Volvo Digger 1 x CAT D6 Dozer 1 x Volvo A30 Dumper 1 x Bell 30 Dumper 1 x Hitachi 210 Excavator 1 x Smooth Roller 1 x Pad / Sheep foot Roller	07:00 – 18:00	

Prepared by:	Stanley Ugohuckwu	Signed:	

Daily Site Record Sheet

Date:	Friday 21/07/2023	Site:	Pwllfawatkin
Weather:	AM: Sunny intervals and dry. PM: Sunny intervals and dry.	CQA Plan Ref:	FCC 479 SW 2016 - 07

Visitors to Site:	None

Location: Capping works.

- The V380 excavator loaded restoration soil material onto 2 x dump trucks for covering/protecting the installed GDL panels.
- 2 x dump trucks then transported the clay material to the front of the D6 bulldozer.
- The D6 bulldozer spread the restoration material to cover/protect the installed GDL panels.
- JB engineer collaborated with the D6 operator to establish design levels.
- The PC210 excavator assisted the liners on the installation of Geotextile and Geomembrane panels along the western slope.
- The CQA engineer ensured that non-compliant areas were properly addressed and unsuitable materials were removed before proceeding with works.

- Photographs were taken to document the completed tasks.
- All works were carried out in accordance to design specifications.

GDL & Restoration Works Completed

List of Plant	Hours of Operation	Comments
1 x 360 Volvo Digger 1 x CAT D6 Dozer 1 x Volvo A30 Dumper 1 x Bell 30 Dumper 1 x Hitachi 210 Excavator 1 x Smooth Roller 1 x Pad / Sheep foot Roller	07:00 – 17:00	

Prepared by:	Stanley Ugohuckwu	Signed: