

Certificate of Analysis

Client: Shetland Islands Council

Project: 23031707

Quote: BEC230229115 V1.2

Project Ref: Shetland Islands Council

Site: Shetland Islands Council

Contact: redacted

Address: Lerwick Energy Recovery Plant
Greenhead Base
Gremista Industrial Estate
Lerwick, Shetland
ZE1 0PX

E-Mail: redacted @shetland.gov.uk

Phone: redacted

No. Samples Received: 4

Date Received: 15/03/2023

Analysis Date: 06/04/2023

Date Issued: 06/04/2023

Report Type: Final Version 01

This report supersedes any versions previously issued by the laboratory

redacted



Client: Shetland Islands Council
Project Name: Shetland Islands Council-Shetland Islands Council
Project No: 23031707
Date Issued: 06/04/2023

Samples Analysed

<u>Text ID</u>	<u>Sample Reference</u>	<u>Sampling Date</u>	<u>Sample Type</u>	<u>Sample Description</u>
23031707-001	Bottom Ash	09/03/2023 09:30:00	SOLID	Soil Sample
23031707-002	ESP	09/03/2023 10:00:00	SOLID	Soil Sample
23031707-003	Bag Filter	09/03/2023 10:00:00	SOLID	Soil Sample
23031707-004	Filter Press	09/03/2023 10:00:00	SOLID	Soil Sample

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001		002		003		004
					Customer ID	Bottom Ash		ESP		Bag Filter		Filter Press
					Sample Type	LPL	SOLID	LPL	SOLID	LPL	SOLID	LPL
					Sampling Date	09/03/2023	09/03/2023	09/03/2023	09/03/2023	09/03/2023	09/03/2023	09/03/2023
Antimony as Sb	ICPMSW (Dissolved)	0.01	mg/kg^	N		<0.01		<0.01		<0.01		0.27
Arsenic as As	ICPMSW (Dissolved)	0.01	mg/kg^	N		<0.01		0.22		<0.01		<0.01
Barium as Ba	ICPWATVAR (Dissolved)	0.1	mg/kg^	N		3.0		4.5		7.2		0.2
Cadmium as Cd	ICPMSW (Dissolved)	0.0002	mg/kg^	N		<0.0002		0.233		<0.0002		<0.0002
Chloride as Cl	KONENS	10	mg/kg^	N		3880		149000		3710		5000
Total Chromium as Cr	ICPMSW (Dissolved)	0.01	mg/kg^	N		1.00		0.01		0.64		0.03
Copper as Cu	ICPMSW (Dissolved)	0.01	mg/kg^	N		9.09		2.37		<0.01		<0.01
Lead as Pb	ICPMSW (Dissolved)	0.01	mg/kg^	N		87.0		103		1.11		0.03
Mercury as Hg	ICPMSW (Dissolved)	0.0003	mg/kg^	N		<0.0003		0.0012		<0.0003		<0.0003
Molybdenum as Mo	ICPMSW (Dissolved)	0.01	mg/kg^	N		2.30		6.78		0.30		0.06
Nickel as Ni	ICPMSW (Dissolved)	0.01	mg/kg^	N		0.02		<0.01		<0.01		<0.01
Phenol Index	SFAPI	0.5	mg/kg^	N		<0.5		2.8		<0.5		<0.5
Selenium as Se	ICPMSW (Dissolved)	0.01	mg/kg^	N		0.02		0.15		0.25		<0.01
Total Sulphur as SO4	ICPWATVAR (Dissolved)	30	mg/kg^	N		8630		65600		16700		176000
TDS as mg/kg	PHCONDW	700	mg/kg^	N		68600		323000		78300		29000
Leached Organic Carbon	WSLM13	2	mg/kg^	N		72.8		<4.0		44.0		9.0
Fluoride as F	ISEF	1	mg/kg^	N		6		24		8		52
Zinc as Zn	ICPMSW (Dissolved)	0.02	mg/kg^	N		34.0		8.95		4.51		0.10
Conductivity at 25°C	PHCONDW	100	µS/cm	N		10100		47500		11500		4310

Client: Shetland Islands Council
 Project Name:
 Project No: 23031707
 Date Issued: 06/04/2023



Analysis Results

					Sample ID
					004
					Filter Press
					Customer ID
					Sample Type
					SOLID
					Sampling Date
					09/03/2023
Analysis	Method Code	MDL	Units	Accred.	
Antimony as Sb	ICPMSW (Dissolved)	0.01	mg/kg^	N	
Arsenic as As	ICPMSW (Dissolved)	0.01	mg/kg^	N	
Barium as Ba	ICPWATVAR (Dissolved)	0.1	mg/kg^	N	
Cadmium as Cd	ICPMSW (Dissolved)	0.0002	mg/kg^	N	
Chloride as Cl	KONENS	10	mg/kg^	N	
Total Chromium as Cr	ICPMSW (Dissolved)	0.01	mg/kg^	N	
Copper as Cu	ICPMSW (Dissolved)	0.01	mg/kg^	N	
Lead as Pb	ICPMSW (Dissolved)	0.01	mg/kg^	N	
Mercury as Hg	ICPMSW (Dissolved)	0.0003	mg/kg^	N	
Molybdenum as Mo	ICPMSW (Dissolved)	0.01	mg/kg^	N	
Nickel as Ni	ICPMSW (Dissolved)	0.01	mg/kg^	N	
Phenol Index	SFAPI	0.5	mg/kg^	N	
Selenium as Se	ICPMSW (Dissolved)	0.01	mg/kg^	N	
Total Sulphur as SO4	ICPWATVAR (Dissolved)	30	mg/kg^	N	
TDS as mg/kg	PHCONDW	700	mg/kg^	N	
Leached Organic Carbon	WSLM13	2	mg/kg^	N	
Fluoride as F	ISEF	1	mg/kg^	N	
Zinc as Zn	ICPMSW (Dissolved)	0.02	mg/kg^	N	
Conductivity at 25°C	PHCONDW	100	µS/cm	N	

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001		002		003		004
					Customer ID	Bottom Ash		ESP		Bag Filter		Filter Press
					Sample Type	LPL	SOLID	LPL	SOLID	LPL	SOLID	LPL
					Sampling Date	09/03/2023	09/03/2023	09/03/2023	09/03/2023	09/03/2023	09/03/2023	09/03/2023
pH	PHCONDW	1	pH units	N		>12.0 E		11.4		>12.0 E		8.4
TDS as mg/l	PHCONDW	70	mg/l	N		6880		32300		7830		2930
Chloride as Cl	KONENS	1	mg/l	U		389		14900		371		506
Phenol Index	SFAP1	0.05	mg/l	U		<0.05		0.28		<0.05		<0.05
Fluoride as F	ISEF	0.1	mg/l	U		0.6		2.4		0.8		5.3
Total Organic Carbon	WSLM59	0.02	% m/m	U			0.82*		0.60*		>8.50* E	
LOI @ 450°C	LOI(%MM)	0.2	% m/m	N			1.3		0.6		10.9	
Leached Organic Carbon	TOCW	0.4	mg/l	U		7.30		<0.40		4.40		0.91
Antimony as Sb	ICPMSS	0.1	mg/kg	N			59.8					
Thallium as Tl	ICPMSS	0.1	mg/kg	N			<0.1		3.3		<0.1	
Antimony as Sb	ICPSOIL	20	mg/kg	N					1860		<20.0	
Arsenic as As	ICPSOIL	20	mg/kg	N			<20.0		380		<20.0	
Cadmium as Cd	ICPSOIL	1	mg/kg	N			3.58		1320		8.54	
Cobalt as Co	ICPSOIL	2	mg/kg	N			119		26.1		5.66	
Copper as Cu	ICPSOIL	5	mg/kg	N			12800		2300		47.5	
Lead as Pb	ICPSOIL	10	mg/kg	N			741		9640		93.6	
Manganese as Mn	ICPSOIL	10	mg/kg	N			1440		663		136	
Mercury as Hg	ICPSOIL	10	mg/kg	N			<10.0		<10.0		<10.0	
Nickel as Ni	ICPSOIL	5	mg/kg	N			297		136		7.51	

Client: Shetland Islands Council
 Project Name:
 Project No: 23031707
 Date Issued: 06/04/2023



Analysis Results

					Sample ID
					004
					Filter Press
					Customer ID
					Sample Type
					SOLID
					Sampling Date
					09/03/2023
Analysis	Method Code	MDL	Units	Accred.	
pH	PHCONDW	1	pH units	N	
TDS as mg/l	PHCONDW	70	mg/l	N	
Chloride as Cl	KONENS	1	mg/l	U	
Phenol Index	SFAPI	0.05	mg/l	U	
Fluoride as F	ISEF	0.1	mg/l	U	
Total Organic Carbon	WSLM59	0.02	% m/m	U	
LOI @ 450°C	LOI(%MM)	0.2	% m/m	N	
Leached Organic Carbon	TOCW	0.4	mg/l	U	
Antimony as Sb	ICPMSS	0.1	mg/kg	N	
Thallium as Tl	ICPMSS	0.1	mg/kg	N	<0.1
Antimony as Sb	ICPSOIL	20	mg/kg	N	<20.0
Arsenic as As	ICPSOIL	20	mg/kg	N	<20.0
Cadmium as Cd	ICPSOIL	1	mg/kg	N	4.09
Cobalt as Co	ICPSOIL	2	mg/kg	N	2.08
Copper as Cu	ICPSOIL	5	mg/kg	N	50.5
Lead as Pb	ICPSOIL	10	mg/kg	N	35.5
Manganese as Mn	ICPSOIL	10	mg/kg	N	70.9
Mercury as Hg	ICPSOIL	10	mg/kg	N	50.0
Nickel as Ni	ICPSOIL	5	mg/kg	N	7.84

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001		002		003		004
					Customer ID	Bottom Ash		ESP		Bag Filter		Filter Press
					Sample Type	LPL	SOLID	LPL	SOLID	LPL	SOLID	LPL
					Sampling Date	09/03/2023	09/03/2023	09/03/2023	09/03/2023	09/03/2023	09/03/2023	09/03/2023
Total Chromium as Cr	ICPSOIL	5	mg/kg	N			252		154		<5.00	
Antimony as Sb	ICPMSW (Dissolved)	0.001	mg/l	U		<0.001		<0.001		<0.001		0.027
Arsenic as As	ICPMSW (Dissolved)	0.001	mg/l	U		<0.001		0.022		<0.001		<0.001
Cadmium as Cd	ICPMSW (Dissolved)	0.00002	mg/l	U		<0.00002		0.0233		<0.00002		<0.00002
Total Chromium as Cr	ICPMSW (Dissolved)	0.001	mg/l	U		0.100		0.001		0.064		0.003
Copper as Cu	ICPMSW (Dissolved)	0.001	mg/l	U		0.911		0.237		0.001		<0.001
Lead as Pb	ICPMSW (Dissolved)	0.001	mg/l	U		8.72		10.3		0.111		0.003
Mercury as Hg	ICPMSW (Dissolved)	0.00003	mg/l	U		<0.00003		0.00012		<0.00003		<0.00003
Molybdenum as Mo	ICPMSW (Dissolved)	0.001	mg/l	U		0.231		0.678		0.030		0.006
Nickel as Ni	ICPMSW (Dissolved)	0.001	mg/l	U		0.002		<0.001		<0.001		<0.001
Selenium as Se	ICPMSW (Dissolved)	0.001	mg/l	U		0.002		0.015		0.025		<0.001
Zinc as Zn	ICPMSW (Dissolved)	0.002	mg/l	U		3.41		0.895		0.451		0.010
Barium as Ba	ICPWATVAR (Dissolved)	0.01	mg/l	U		0.30		0.45		0.72		0.02
Total Sulphur as SO4	ICPWATVAR (Dissolved)	3	mg/l	U		865		6560		1670		17800
Acenaphthene	PAHMSUS	0.08	mg/kg	U			<0.08*		<0.08* c		<0.08*	
Acenaphthylene	PAHMSUS	0.08	mg/kg	U			<0.08*		<0.08* c		<0.08*	
Anthracene	PAHMSUS	0.08	mg/kg	U			<0.08*		<0.08* c		<0.08*	
Benzo[a]anthracene	PAHMSUS	0.08	mg/kg	U			<0.08*		<0.08* c		<0.08*	
Benzo[a]pyrene	PAHMSUS	0.08	mg/kg	U			<0.08*		<0.08* c		<0.08*	

Client: Shetland Islands Council
 Project Name:
 Project No: 23031707
 Date Issued: 06/04/2023



Analysis Results

					Sample ID
					004
					Filter Press
					Customer ID
					Sample Type
					SOLID
					Sampling Date
					09/03/2023
Analysis	Method Code	MDL	Units	Accred.	
Total Chromium as Cr	ICPSOIL	5	mg/kg	N	<5.00
Antimony as Sb	ICPMSW (Dissolved)	0.001	mg/l	U	
Arsenic as As	ICPMSW (Dissolved)	0.001	mg/l	U	
Cadmium as Cd	ICPMSW (Dissolved)	0.00002	mg/l	U	
Total Chromium as Cr	ICPMSW (Dissolved)	0.001	mg/l	U	
Copper as Cu	ICPMSW (Dissolved)	0.001	mg/l	U	
Lead as Pb	ICPMSW (Dissolved)	0.001	mg/l	U	
Mercury as Hg	ICPMSW (Dissolved)	0.00003	mg/l	U	
Molybdenum as Mo	ICPMSW (Dissolved)	0.001	mg/l	U	
Nickel as Ni	ICPMSW (Dissolved)	0.001	mg/l	U	
Selenium as Se	ICPMSW (Dissolved)	0.001	mg/l	U	
Zinc as Zn	ICPMSW (Dissolved)	0.002	mg/l	U	
Barium as Ba	ICPWATVAR (Dissolved)	0.01	mg/l	U	
Total Sulphur as SO4	ICPWATVAR (Dissolved)	3	mg/l	U	
Acenaphthene	PAHMSUS	0.08	mg/kg	U	<0.08*
Acenaphthylene	PAHMSUS	0.08	mg/kg	U	<0.08*
Anthracene	PAHMSUS	0.08	mg/kg	U	<0.08*
Benzo[a]anthracene	PAHMSUS	0.08	mg/kg	U	<0.08*
Benzo[a]pyrene	PAHMSUS	0.08	mg/kg	U	<0.08*

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001		002		003		004
					Customer ID	Bottom Ash		ESP		Bag Filter		Filter Press
					Sample Type	LPL	SOLID	LPL	SOLID	LPL	SOLID	LPL
					Sampling Date	09/03/2023	09/03/2023	09/03/2023	09/03/2023	09/03/2023	09/03/2023	09/03/2023
Benzo[b]fluoranthene	PAHMSUS	0.08	mg/kg	U			<0.08*		<0.08* c		<0.08*	
Benzo[g,h,i]perylene	PAHMSUS	0.08	mg/kg	U			<0.08*		<0.08* c		<0.08*	
Benzo[k]fluoranthene	PAHMSUS	0.08	mg/kg	U			<0.08*		<0.08* c		<0.08*	
Chrysene	PAHMSUS	0.08	mg/kg	U			<0.08*		<0.08* c		<0.08*	
Dibenzo[a,h]anthracene	PAHMSUS	0.08	mg/kg	U			<0.08*		<0.08* c		<0.08*	
Fluoranthene	PAHMSUS	0.08	mg/kg	U			<0.08*		<0.08* c		<0.08*	
Fluorene	PAHMSUS	0.08	mg/kg	U			<0.08*		<0.08* c		<0.08*	
Indeno[1,2,3-cd]pyrene	PAHMSUS	0.08	mg/kg	U			<0.08*		<0.08* c		<0.08*	
Naphthalene	PAHMSUS	0.08	mg/kg	U			<0.08*		<0.08* c		<0.08*	
Phenanthrene	PAHMSUS	0.08	mg/kg	U			<0.08*		<0.08* c		<0.08*	
Pyrene	PAHMSUS	0.08	mg/kg	U			<0.08*		<0.08* c		<0.08*	
Total PAH 16	PAHMSUS	1.28	mg/kg	U			1.28*		1.28* c		<1.28*	
Total Moisture at 105°C	TMSS	0.1	%	U					<0.1*		0.1*	
Total Moisture at 35°C	CLANDPREP	0.1	%	N			12.1		<0.1		<0.1	
Description of Solid Material	CLANDPREP		-	N			IBA		ASH		ASH	
Equivalent Weight of Dry Material (kg)	Leachate Prep CEN 10:1		kg	N			0.090		0.090		0.090	
Fraction above 4mm (%)	Leachate Prep CEN 10:1		%	N			0		0		0	
Fraction of non-crushable material (%)	Leachate Prep CEN 10:1		%	N			0		0		0	
Volume of Water for 10:1 Leach (ltr)	Leachate Prep CEN 10:1		l	N			0.884		0.900		0.899	

Client: Shetland Islands Council
 Project Name:
 Project No: 23031707
 Date Issued: 06/04/2023



Analysis Results

					Sample ID
					004
					Filter Press
					Customer ID
					Sample Type
					SOLID
					Sampling Date
					09/03/2023
Analysis	Method Code	MDL	Units	Accred.	
Benzo[b]fluoranthene	PAHMSUS	0.08	mg/kg	U	<0.08*
Benzo[g,h,i]perylene	PAHMSUS	0.08	mg/kg	U	<0.08*
Benzo[k]fluoranthene	PAHMSUS	0.08	mg/kg	U	<0.08*
Chrysene	PAHMSUS	0.08	mg/kg	U	<0.08*
Dibenzo[a,h]anthracene	PAHMSUS	0.08	mg/kg	U	<0.08*
Fluoranthene	PAHMSUS	0.08	mg/kg	U	<0.08*
Fluorene	PAHMSUS	0.08	mg/kg	U	<0.08*
Indeno[1,2,3-cd]pyrene	PAHMSUS	0.08	mg/kg	U	<0.08*
Naphthalene	PAHMSUS	0.08	mg/kg	U	<0.08*
Phenanthrene	PAHMSUS	0.08	mg/kg	U	<0.08*
Pyrene	PAHMSUS	0.08	mg/kg	U	<0.08*
Total PAH 16	PAHMSUS	1.28	mg/kg	U	1.28*
Total Moisture at 105°C	TMSS	0.1	%	U	
Total Moisture at 35°C	CLANDPREP	0.1	%	N	31.0
Description of Solid Material	CLANDPREP		-	N	MISCELLANEOUS
Equivalent Weight of Dry Material (kg)	Leachate Prep CEN 10:1		kg	N	0.090
Fraction above 4mm (%)	Leachate Prep CEN 10:1		%	N	0
Fraction of non-crushable material (%)	Leachate Prep CEN 10:1		%	N	0
Volume of Water for 10:1 Leach (ltr)	Leachate Prep CEN 10:1		l	N	0.864



Client: Shetland Islands Council
 Project Name: Shetland Islands Council-Shetland Islands Council
 Project No: 23031707
 Date Issued: 06/04/2023



Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001		002		003		004
					Customer ID	Bottom Ash		ESP		Bag Filter		Filter Press
					Sample Type	LPL	SOLID	LPL	SOLID	LPL	SOLID	LPL
					Sampling Date	09/03/2023	09/03/2023	09/03/2023	09/03/2023	09/03/2023	09/03/2023	09/03/2023
Weight of Sample Leached (kg)	Leachate Prep CEN 10:1		kg	N			0.106		0.090		0.091	
WAC Report	WAC		-	N			See Attached		See Attached		See Attached	
1,2,3,4,6,7,8-HpCDD	SUB016		ng/kg	N			6.29583		146.99875		624.58558	
1,2,3,4,6,7,8-HpCDF	SUB016		ng/kg	N			6.93559		120.52162		1284.69746	
1,2,3,4,7,8,9-HpCDF	SUB016		ng/kg	N			1.41433		26.90586		399.48471	
1,2,3,4,7,8-HxCDD	SUB016		ng/kg	N			0		3.63581		41.07920	
1,2,3,4,7,8-HxCDF	SUB016		ng/kg	N			1.08408		10.93571		259.51746	
1,2,3,6,7,8-HxCDD	SUB016		ng/kg	N			0.59440		8.46742		108.09275	
1,2,3,6,7,8-HxCDF	SUB016		ng/kg	N			1.56523		13.33342		335.10025	
1,2,3,7,8,9-HxCDD	SUB016		ng/kg	N			0.52565		5.75451		34.07013	
1,2,3,7,8,9-HxCDF	SUB016		ng/kg	N			0		8.20902		236.59099	
1,2,3,7,8-PCDD	SUB016		ng/kg	N			0		2.97727		48.97641	
1,2,3,7,8-PCDF	SUB016		ng/kg	N			0.84734		3.25332		97.93271	
2,3,4,6,7,8-HxCDF	SUB016		ng/kg	N			1.47229		25.70483		653.27314	
2,3,4,7,8-PCDF	SUB016		ng/kg	N			1.00937		5.15550		230.40875	
2,3,7,8-TCDD	SUB016		ng/kg	N			0		0.31503		5.70782	
2,3,7,8-TCDF	SUB016		ng/kg	N			0.62946		1.39024		83.14099	
D&Fs - TEQ (NATO) Lower	SUB016		ng/kg	N			1.30756		16.45237		350.66457	
D&Fs - TEQ (NATO) Upper	SUB016		ng/kg	N			1.68714		16.45237		350.66457	

Client: Shetland Islands Council
Project Name:
Project No: 23031707
Date Issued: 06/04/2023



Analysis Results

					Sample ID
					004
					Filter Press
					Customer ID
					Sample Type
					SOLID
					Sampling Date
					09/03/2023
Analysis	Method Code	MDL	Units	Accred.	
Weight of Sample Leached (kg)	Leachate Prep CEN 10:1		kg	N	0.126
WAC Report	WAC		-	N	See Attached
1,2,3,4,6,7,8-HpCDD	SUB016		ng/kg	N	73.10650
1,2,3,4,6,7,8-HpCDF	SUB016		ng/kg	N	66.64627
1,2,3,4,7,8,9-HpCDF	SUB016		ng/kg	N	34.48919
1,2,3,4,7,8-HxCDD	SUB016		ng/kg	N	0.90077
1,2,3,4,7,8-HxCDF	SUB016		ng/kg	N	3.29573
1,2,3,6,7,8-HxCDD	SUB016		ng/kg	N	2.49661
1,2,3,6,7,8-HxCDF	SUB016		ng/kg	N	4.11954
1,2,3,7,8,9-HxCDD	SUB016		ng/kg	N	2.01947
1,2,3,7,8,9-HxCDF	SUB016		ng/kg	N	4.58609
1,2,3,7,8-PCDD	SUB016		ng/kg	N	0.42379
1,2,3,7,8-PCDF	SUB016		ng/kg	N	0.52416
2,3,4,6,7,8-HxCDF	SUB016		ng/kg	N	11.10225
2,3,4,7,8-PCDF	SUB016		ng/kg	N	1.29294
2,3,7,8-TCDD	SUB016		ng/kg	N	0
2,3,7,8-TCDF	SUB016		ng/kg	N	0
D&Fs - TEQ (NATO) Lower	SUB016		ng/kg	N	6.81281
D&Fs - TEQ (NATO) Upper	SUB016		ng/kg	N	6.93097



Client: Shetland Islands Council
 Project Name: Shetland Islands Council-Shetland Islands Council
 Project No: 23031707
 Date Issued: 06/04/2023



Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001		002		003		004
					Customer ID	Bottom Ash		ESP		Bag Filter		Filter Press
					Sample Type	LPL	SOLID	LPL	SOLID	LPL	SOLID	LPL
					Sampling Date	09/03/2023	09/03/2023	09/03/2023	09/03/2023	09/03/2023	09/03/2023	09/03/2023
D&Fs - TEQ (WHO) Birds - Lower	SUB016		ng/kg	N			2.28672		18.56695		550.70307	
D&Fs - TEQ (WHO) Birds - Upper	SUB016		ng/kg	N			2.83956		18.56695		550.70307	
D&Fs - TEQ (WHO) Fish - Lower	SUB016		ng/kg	N			1.09437		15.62402		367.03745	
D&Fs - TEQ (WHO) Fish - Upper	SUB016		ng/kg	N			1.75171		15.62402		367.03745	
D&Fs - TEQ (WHO) Mammals - Lower	SUB016		ng/kg	N			1.06988		15.99019		325.57701	
D&Fs - TEQ (WHO) Mammals - Upper	SUB016		ng/kg	N			1.63433		15.99019		325.57701	
D&Fs - TEQ SUM - Lower	SUB016		ng/kg	N			1.06988		15.99019		325.57701	
D&Fs - TEQ SUM - Upper	SUB016		ng/kg	N			1.63433		15.99019		325.57701	
OCDD	SUB016		ng/kg	N			14.27017		909.38952		801.58306	
OCDF	SUB016		ng/kg	N			12.67284		311.54369		1391.78238	
PCB-105	SUB016		ng/kg	N			1.47873		2.43958		256.58467	
PCB-114	SUB016		ng/kg	N			0		0.92638		92.49491	
PCB-118	SUB016		ng/kg	N			4.04994		2.50747		177.18004	
PCB-123	SUB016		ng/kg	N			0		0		36.56998	
PCB-126	SUB016		ng/kg	N			0		7.46027		624.17725	
PCB-156	SUB016		ng/kg	N			0.76273		4.52491		345.53650	
PCB-157	SUB016		ng/kg	N			0		2.52546		223.84178	
PCB-167	SUB016		ng/kg	N			0		1.60618		127.06550	
PCB-169	SUB016		ng/kg	N			0		4.33919		262.22674	

Client: Shetland Islands Council
 Project Name:
 Project No: 23031707
 Date Issued: 06/04/2023



Analysis Results

					Sample ID
					004
					Filter Press
					Customer ID
					Sample Type
					SOLID
					Sampling Date
					09/03/2023
Analysis	Method Code	MDL	Units	Accred.	
D&Fs - TEQ (WHO) Birds - Lower	SUB016		ng/kg	N	5.56930
D&Fs - TEQ (WHO) Birds - Upper	SUB016		ng/kg	N	5.86147
D&Fs - TEQ (WHO) Fish - Lower	SUB016		ng/kg	N	5.12021
D&Fs - TEQ (WHO) Fish - Upper	SUB016		ng/kg	N	5.22871
D&Fs - TEQ (WHO) Mammals - Lower	SUB016		ng/kg	N	5.82199
D&Fs - TEQ (WHO) Mammals - Upper	SUB016		ng/kg	N	5.94016
D&Fs - TEQ SUM - Lower	SUB016		ng/kg	N	5.82199
D&Fs - TEQ SUM - Upper	SUB016		ng/kg	N	5.94016
OCDD	SUB016		ng/kg	N	760.42768
OCDF	SUB016		ng/kg	N	573.33948
PCB-105	SUB016		ng/kg	N	0.61262
PCB-114	SUB016		ng/kg	N	0
PCB-118	SUB016		ng/kg	N	1.04061
PCB-123	SUB016		ng/kg	N	0
PCB-126	SUB016		ng/kg	N	0.48031
PCB-156	SUB016		ng/kg	N	0.40163
PCB-157	SUB016		ng/kg	N	0.27787
PCB-167	SUB016		ng/kg	N	0
PCB-169	SUB016		ng/kg	N	0.58286

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001		002		003		004
					Customer ID	Bottom Ash		ESP		Bag Filter		Filter Press
					Sample Type	LPL	SOLID	LPL	SOLID	LPL	SOLID	LPL
					Sampling Date	09/03/2023	09/03/2023	09/03/2023	09/03/2023	09/03/2023	09/03/2023	09/03/2023
PCB-189	SUB016		ng/kg	N			0.41816		6.86682		404.27868	
PCB-77	SUB016		ng/kg	N			1.25002		4.69365		581.37362	
PCB-81	SUB016		ng/kg	N			0.25222		2.12971		210.05571	
PCBs - TEQ (WHO) Birds - Lower	SUB016		ng/kg	N			0.08799		1.19917		112.85350	
PCBs - TEQ (WHO) Birds - Upper	SUB016		ng/kg	N			0.14270		1.19918		112.85350	
PCBs - TEQ (WHO) Fish - Lower	SUB016		ng/kg	N			0.00028		0.03916		3.30548	
PCBs - TEQ (WHO) Fish - Upper	SUB016		ng/kg	N			0.00302		0.03916		3.30548	
PCBs - TEQ (WHO) Mammals - Lower	SUB016		ng/kg	N			0.00040		0.87795		70.45559	
PCBs - TEQ (WHO) Mammals - Upper	SUB016		ng/kg	N			0.05600		0.87797		70.45559	
PCBs - TEQ SUM - Lower	SUB016		ng/kg	N			0.00040		0.87795		70.45559	
PCBs - TEQ SUM - Upper	SUB016		ng/kg	N			0.05600		0.87797		70.45559	
Total 2,3,7,8-Dioxins	SUB016		ng/kg	N			21.68605		1077.53831		1664.09495	
Total 2,3,7,8-Furans	SUB016		ng/kg	N			27.63053		526.95321		4971.92884	
Total PCBs	SUB016		ng/kg	N			8.21180		40.01962		3341.38538	
Free Lime Content	SUB051	0.1	%	N					1.43		9.19	

Client: Shetland Islands Council
 Project Name:
 Project No: 23031707
 Date Issued: 06/04/2023



Analysis Results

					Sample ID
					004
					Filter Press
					Customer ID
					Sample Type
					SOLID
					Sampling Date
					09/03/2023
Analysis	Method Code	MDL	Units	Accred.	
PCB-189	SUB016		ng/kg	N	0.96480
PCB-77	SUB016		ng/kg	N	0.60072
PCB-81	SUB016		ng/kg	N	0.17617
PCBs - TEQ (WHO) Birds - Lower	SUB016		ng/kg	N	0.09642
PCBs - TEQ (WHO) Birds - Upper	SUB016		ng/kg	N	0.09645
PCBs - TEQ (WHO) Fish - Lower	SUB016		ng/kg	N	0.00260
PCBs - TEQ (WHO) Fish - Upper	SUB016		ng/kg	N	0.00260
PCBs - TEQ (WHO) Mammals - Lower	SUB016		ng/kg	N	0.06573
PCBs - TEQ (WHO) Mammals - Upper	SUB016		ng/kg	N	0.06575
PCBs - TEQ SUM - Lower	SUB016		ng/kg	N	0.06573
PCBs - TEQ SUM - Upper	SUB016		ng/kg	N	0.06575
Total 2,3,7,8-Dioxins	SUB016		ng/kg	N	839.37482
Total 2,3,7,8-Furans	SUB016		ng/kg	N	699.39565
Total PCBs	SUB016		ng/kg	N	5.13759
Free Lime Content	SUB051	0.1	%	N	

WASTE ACCEPTANCE CRITERIA TESTING
BSEN 12457/2

Client	Shetland Islands Council	
Site	Shetland Islands Council	
Project	23031707	
Sample No	Sample Description	Issue Date
23031707-001	Bottom Ash	06/04/2023

Leaching Data	
Weight of Sample (kg)	0.106
Moisture content @ 105°C (% Wet Weight)	15.2
Equivalent weight based on drying @ 105°C (kg)	0.090
Volume of Water required for 10:1 stage (litres)	0.884
Fraction of sample above 4mm %	0
Fraction of non-crushable material %	0

Note: The >4mm fraction is crushed using a disc mill

Accreditation	Method Code	Solid Waste Analysis (Dry Basis)	Concentration in Solid (Dry Weight Basis)	Landfill Waste Acceptance Criteria Limit Values		
				Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
		Total Organic Carbon (% M/M)		3	5	6
	LOI450	Loss on Ignition (%)				10
	BTEXHSA	Sum of BTEX (mg/kg)		6		
	PCBUSECD	Sum of 7 Congener PCBs (mg/kg)		1		
	TPHFIDUS	>C10-C40 Aliphatic (mg/kg) EH_1D_AL		500		
	PAHMSUS	Sum of 17 PAHs (mg/kg)		100		
	PHSOIL	pH (pH Units)			>6	
	ANC	Acid Neutralisation Capacity (mol/kg)			To be evaluated	To be evaluated

Accreditation	Method Code	Leachate Analysis	10:1 Single Stage Leachate	Cumulative Amount Leached at 10:1	Landfill Waste Acceptance Criteria Limit Values		
			mg/l except **	mg/kg (dry wt)	Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
N	WSLM3**	pH (pH Units)	>12.0				
N	WSLM2**	Conductivity (µS/cm)	10100				
U	ICPMSW	Arsenic	<0.001	<0.01	0.5	2	25
U	ICPWATVAR	Barium	0.30	3.0	20	100	300
U	ICPMSW	Cadmium	<0.00002	<0.0002	0.04	1	5
U	ICPMSW	Chromium	0.100	1.00	0.5	10	70
U	ICPMSW	Copper	0.911	9.09	2	50	100
U	ICPMSW	Mercury	<0.00003	<0.0003	0.01	0.2	2
U	ICPMSW	Molybdenum	0.231	2.30	0.5	10	30
U	ICPMSW	Nickel	0.002	0.02	0.4	10	40
U	ICPMSW	Lead	8.72	87.0	0.5	10	50
U	ICPMSW	Antimony	<0.001	<0.01	0.06	0.7	5
U	ICPMSW	Selenium	0.002	0.02	0.1	0.5	7
U	ICPMSW	Zinc	3.41	34.0	4	50	200
U	KONENS	Chloride	389	3880	800	15000	25000
U	ISEF	Fluoride	0.6	6	10	150	500
U	ICPWATVAR	Sulphate as SO4	865	8630	1000	20000	50000
N	WSLM27	Total Dissolved Solids	6880	68600	4000	60000	100000
U	SFAPI	Phenol Index	<0.05	<0.5	1		
U	WSLM13	Dissolved Organic Carbon	7.30	72.8	500	800	1000

Tests where the accreditation is set to U are UKAS accredited, those where the accreditation is set to N are not UKAS accredited.

Calculated data is not UKAS accredited

Landfill Waste Acceptance Criteria limit values correct as of 11th March 2009.

WASTE ACCEPTANCE CRITERIA TESTING
BSEN 12457/2

Client	Shetland Islands Council	
Site	Shetland Islands Council	
Project	23031707	
Sample No	Sample Description	Issue Date
23031707-002	ESP	06/04/2023

Leaching Data	
Weight of Sample (kg)	0.090
Moisture content @ 105°C (% Wet Weight)	0.3
Equivalent weight based on drying @ 105°C (kg)	0.090
Volume of Water required for 10:1 stage (litres)	0.900
Fraction of sample above 4mm %	0
Fraction of non-crushable material %	0

Note: The >4mm fraction is crushed using a disc mill

Accreditation	Method Code	Solid Waste Analysis (Dry Basis)	Concentration in Solid (Dry Weight Basis)	Landfill Waste Acceptance Criteria Limit Values		
				Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
		Total Organic Carbon (% M/M)		3	5	6
	LOI450	Loss on Ignition (%)				10
	BTEXHSA	Sum of BTEX (mg/kg)		6		
	PCBUSECD	Sum of 7 Congener PCBs (mg/kg)		1		
	TPHFIDUS	>C10-C40 Aliphatic (mg/kg) EH_1D_AL		500		
	PAHMSUS	Sum of 17 PAHs (mg/kg)		100		
	PHSOIL	pH (pH Units)			>6	
	ANC	Acid Neutralisation Capacity (mol/kg)			To be evaluated	To be evaluated

Accreditation	Method Code	Leachate Analysis	10:1 Single Stage Leachate	Cumulative Amount Leached at 10:1	Landfill Waste Acceptance Criteria Limit Values		
			mg/l except **	mg/kg (dry wt)	Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
N	WSLM3**	pH (pH Units)	11.4				
N	WSLM2**	Conductivity (µS/cm)	47500				
U	ICPMSW	Arsenic	0.022	0.22	0.5	2	25
U	ICPWATVAR	Barium	0.45	4.5	20	100	300
U	ICPMSW	Cadmium	0.0233	0.233	0.04	1	5
U	ICPMSW	Chromium	0.001	0.01	0.5	10	70
U	ICPMSW	Copper	0.237	2.37	2	50	100
U	ICPMSW	Mercury	0.00012	0.0012	0.01	0.2	2
U	ICPMSW	Molybdenum	0.678	6.78	0.5	10	30
U	ICPMSW	Nickel	<0.001	<0.01	0.4	10	40
U	ICPMSW	Lead	10.3	103	0.5	10	50
U	ICPMSW	Antimony	<0.001	<0.01	0.06	0.7	5
U	ICPMSW	Selenium	0.015	0.15	0.1	0.5	7
U	ICPMSW	Zinc	0.895	8.95	4	50	200
U	KONENS	Chloride	14900	149000	800	15000	25000
U	ISEF	Fluoride	2.4	24	10	150	500
U	ICPWATVAR	Sulphate as SO4	6560	65600	1000	20000	50000
N	WSLM27	Total Dissolved Solids	32300	323000	4000	60000	100000
U	SFAPI	Phenol Index	0.28	2.8	1		
U	WSLM13	Dissolved Organic Carbon	<0.40	<4.0	500	800	1000

Tests where the accreditation is set to U are UKAS accredited, those where the accreditation is set to N are not UKAS accredited.

Calculated data is not UKAS accredited

Landfill Waste Acceptance Criteria limit values correct as of 11th March 2009.

WASTE ACCEPTANCE CRITERIA TESTING
BSEN 12457/2

Client	Shetland Islands Council	
Site	Shetland Islands Council	
Project	23031707	
Sample No	Sample Description	Issue Date
23031707-003	Bag Filter	06/04/2023

Leaching Data	
Weight of Sample (kg)	0.091
Moisture content @ 105°C (% Wet Weight)	1.1
Equivalent weight based on drying @ 105°C (kg)	0.090
Volume of Water required for 10:1 stage (litres)	0.899
Fraction of sample above 4mm %	0
Fraction of non-crushable material %	0

Note: The >4mm fraction is crushed using a disc mill

Accreditation	Method Code	Solid Waste Analysis (Dry Basis)	Concentration in Solid (Dry Weight Basis)	Landfill Waste Acceptance Criteria Limit Values		
				Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
		Total Organic Carbon (% M/M)		3	5	6
	LOI450	Loss on Ignition (%)				10
	BTEXHSA	Sum of BTEX (mg/kg)		6		
	PCBUSECD	Sum of 7 Congener PCBs (mg/kg)		1		
	TPHFIDUS	>C10-C40 Aliphatic (mg/kg) EH_1D_AL		500		
	PAHMSUS	Sum of 17 PAHs (mg/kg)		100		
	PHSOIL	pH (pH Units)			>6	
	ANC	Acid Neutralisation Capacity (mol/kg)			To be evaluated	To be evaluated

Accreditation	Method Code	Leachate Analysis	10:1 Single Stage Leachate	Cumulative Amount Leached at 10:1	Landfill Waste Acceptance Criteria Limit Values		
			mg/l except **	mg/kg (dry wt)	Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
N	WSLM3**	pH (pH Units)	>12.0				
N	WSLM2**	Conductivity (µS/cm)	11500				
U	ICPMSW	Arsenic	<0.001	<0.01	0.5	2	25
U	ICPWATVAR	Barium	0.72	7.2	20	100	300
U	ICPMSW	Cadmium	<0.00002	<0.0002	0.04	1	5
U	ICPMSW	Chromium	0.064	0.64	0.5	10	70
U	ICPMSW	Copper	0.001	<0.01	2	50	100
U	ICPMSW	Mercury	<0.00003	<0.0003	0.01	0.2	2
U	ICPMSW	Molybdenum	0.030	0.30	0.5	10	30
U	ICPMSW	Nickel	<0.001	<0.01	0.4	10	40
U	ICPMSW	Lead	0.111	1.11	0.5	10	50
U	ICPMSW	Antimony	<0.001	<0.01	0.06	0.7	5
U	ICPMSW	Selenium	0.025	0.25	0.1	0.5	7
U	ICPMSW	Zinc	0.451	4.51	4	50	200
U	KONENS	Chloride	371	3710	800	15000	25000
U	ISEF	Fluoride	0.8	8	10	150	500
U	ICPWATVAR	Sulphate as SO4	1670	16700	1000	20000	50000
N	WSLM27	Total Dissolved Solids	7830	78300	4000	60000	100000
U	SFAPI	Phenol Index	<0.05	<0.5	1		
U	WSLM13	Dissolved Organic Carbon	4.40	44.0	500	800	1000

Tests where the accreditation is set to U are UKAS accredited, those where the accreditation is set to N are not UKAS accredited.

Calculated data is not UKAS accredited

Landfill Waste Acceptance Criteria limit values correct as of 11th March 2009.

WASTE ACCEPTANCE CRITERIA TESTING
BSEN 12457/2

Client	Shetland Islands Council	
Site	Shetland Islands Council	
Project	23031707	
Sample No	Sample Description	Issue Date
23031707-004	Filter Press	06/04/2023

Leaching Data	
Weight of Sample (kg)	0.126
Moisture content @ 105°C (% Wet Weight)	28.7
Equivalent weight based on drying @ 105°C (kg)	0.090
Volume of Water required for 10:1 stage (litres)	0.864
Fraction of sample above 4mm %	0
Fraction of non-crushable material %	0

Note: The >4mm fraction is crushed using a disc mill

Accreditation	Method Code	Solid Waste Analysis (Dry Basis)	Concentration in Solid (Dry Weight Basis)	Landfill Waste Acceptance Criteria Limit Values		
				Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
		Total Organic Carbon (% M/M)		3	5	6
	LOI450	Loss on Ignition (%)				10
	BTEXHSA	Sum of BTEX (mg/kg)		6		
	PCBUSECD	Sum of 7 Congener PCBs (mg/kg)		1		
	TPHFIDUS	>C10-C40 Aliphatic (mg/kg) EH_1D_AL		500		
	PAHMSUS	Sum of 17 PAHs (mg/kg)		100		
	PHSOIL	pH (pH Units)			>6	
	ANC	Acid Neutralisation Capacity (mol/kg)			To be evaluated	To be evaluated

Accreditation	Method Code	Leachate Analysis	10:1 Single Stage Leachate	Cumulative Amount Leached at 10:1	Landfill Waste Acceptance Criteria Limit Values		
			mg/l except **	mg/kg (dry wt)	Inert Waste Landfill	Stable Non-Reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
N	WSLM3**	pH (pH Units)	8.4				
N	WSLM2**	Conductivity (µS/cm)	4310				
U	ICPMSW	Arsenic	<0.001	<0.01	0.5	2	25
U	ICPWATVAR	Barium	0.02	0.2	20	100	300
U	ICPMSW	Cadmium	<0.00002	<0.0002	0.04	1	5
U	ICPMSW	Chromium	0.003	0.03	0.5	10	70
U	ICPMSW	Copper	<0.001	<0.01	2	50	100
U	ICPMSW	Mercury	<0.00003	<0.0003	0.01	0.2	2
U	ICPMSW	Molybdenum	0.006	0.06	0.5	10	30
U	ICPMSW	Nickel	<0.001	<0.01	0.4	10	40
U	ICPMSW	Lead	0.003	0.03	0.5	10	50
U	ICPMSW	Antimony	0.027	0.27	0.06	0.7	5
U	ICPMSW	Selenium	<0.001	<0.01	0.1	0.5	7
U	ICPMSW	Zinc	0.010	0.10	4	50	200
U	KONENS	Chloride	506	5000	800	15000	25000
U	ISEF	Fluoride	5.3	52	10	150	500
U	ICPWATVAR	Sulphate as SO4	17800	176000	1000	20000	50000
N	WSLM27	Total Dissolved Solids	2930	29000	4000	60000	100000
U	SFAP1	Phenol Index	<0.05	<0.5	1		
U	WSLM13	Dissolved Organic Carbon	0.91	9.0	500	800	1000

Tests where the accreditation is set to U are UKAS accredited, those where the accreditation is set to N are not UKAS accredited.

Calculated data is not UKAS accredited

Landfill Waste Acceptance Criteria limit values correct as of 11th March 2009.

Socotec
ESG
ESG House, Bretby Business Park
Bretby
Burton upon Trent

Attention : Chem Subcon
Date : 4th April, 2023
Your reference : 23031707
Our reference : Test Report 23/4488 Batch 1
Location : Shetlands Island Council
Date samples received : 22nd March, 2023
Status : Final Report
Issue : 1

One sample was received for analysis on 22nd March, 2023 and was 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:

redacted

Please include all sections of this report if it is reproduced

ANALYSIS OF PCDDs and PCDFs

Client Name: Socotec
Reference: 23031707
Location: Shetlands Island Council
Contact: Subcon

Receipt Date: 22/03/23
Analysis Date: 01/04/23
Report Date: 04/04/23

Sample ID: 23031707-003
EMT Job No: 23/4488
EMT Sample No: 2
Matrix: Ash
Method: Dioxins and Furans by HR-GCMS
Instrument: DFS - High Resolution Magnetic Sector MS

Q* - Qualifiers

n.d. less than Limit of detection

Key

LOD Limit of Detection Limit
ISO 17025 (UKAS)
M MCERTS accredited

Results: Expressed ng/Kg dry sample

Compound	Q*	Result	LOD	I-TEFs	TEQ Lower Bound	TEQ Upper Bound	Percent Recovery %
2,3,7,8-TCDD #		5.70782	0.68197	1	5.70782	5.70782	88
1,2,3,7,8-PeCDD #		48.97641	1.16977	1	48.97641	48.97641	65
1,2,3,4,7,8-HeCDD #		41.07920	1.19111	0.1	4.10792	4.10792	39
1,2,3,6,7,8-HeCDD #		108.09275	1.26053	0.1	10.80928	10.80928	37
1,2,3,7,8,9-HeCDD #		34.07013	1.24216	0.1	3.40701	3.40701	
1,2,3,4,6,7,8-HpCDD	SV	624.58558	2.24118	0.01	6.24586	6.24586	15
OCDD	SV	801.58306	2.36164	0.0003	0.24047	0.24047	10
Total 2,3,7,8-Dioxins		1664.09495					
2,3,7,8-TCDF #		83.14099	1.05667	0.1	8.31410	8.31410	67
1,2,3,7,8-PCDF #		97.93271	1.85581	0.03	2.93798	2.93798	45
2,3,4,7,8-PeCDF #		230.40875	1.32742	0.3	69.12263	69.12263	66
1,2,3,4,7,8-HeCDF #		259.51746	1.83604	0.1	25.95175	25.95175	32
1,2,3,6,7,8-HeCDF #		335.10025	2.02448	0.1	33.51003	33.51003	29
2,3,4,6,7,8-HeCDF #		653.27314	2.21290	0.1	65.32731	65.32731	29
1,2,3,7,8,9-HeCDF	SV	236.59099	3.84726	0.1	23.65910	23.65910	16
1,2,3,4,6,7,8-HpCDF	SV	1284.69746	1.19691	0.01	12.84697	12.84697	14
1,2,3,4,7,8,9-HpCDF	SV	399.48471	1.58168	0.01	3.99485	3.99485	15
OCDF	SV	1391.78238	2.74446	0.0003	0.41753	0.41753	9
Total 2,3,7,8-Furans		4971.92884					
SUM - TEQ					325.57701	325.57701	
TEQ (NATO)					350.66457	350.66457	
TEQ (WHO) - Mammals					325.57701	325.57701	
TEQ (WHO)-Birds					550.70307	550.70307	
TEQ (WHO)-Fish					367.03745	367.03745	

Upper-Bound: 'Upper-bound' means the concept which requires using the limit of quantification for the contribution of each non-quantified congener

Lower-Bound: 'Lower-bound' means the concept which requires using zero for the contribution of each non-quantified congener

TEQ: Toxic Equivalent Value

TEF: Toxic Equivalent Factor

Comment:

ANALYSIS OF PCBs

Client Name: Socotec
Reference: 23031707
Location: Shetlands Island Council
Contact: Subcon

Receipt Date: 22/03/23
Analysis Date: 31/03/23
Report Date: 04/04/23

Sample ID: 23031707-003
EMT Job No: 23/4488
EMT Sample No: 2
Matrix: Ash
Method: Dioxins and Furans by HR-GCMS
Instrument: DFS - High Resolution Magnetic Sector MS

Q* - Qualifiers

n.d. less than Limit of detection

Key

LOD Limit of Detection Limit
ISO 17025 (UKAS)
M MCERTS accredited

Results: Expressed ng/Kg dry sample

Compound	Q*	Result	LOD	I-TEFs	TEQ Lower Bound	TEQ Upper Bound	Percent Recovery %
PCB-81 #		210.05571	0.84996	0.0003	0.06302	0.06302	42
PCB-77 #		581.37362	0.38314	0.0001	0.05814	0.05814	71
PCB-123 #		36.56998	2.57064	0.00003	0.00110	0.00110	80
PCB-118 #		177.18004	2.49027	0.00003	0.00532	0.00532	79
PCB-114 #		92.49491	2.88131	0.00003	0.00277	0.00277	71
PCB-105 #		256.58467	2.78672	0.00003	0.00770	0.00770	74
PCB-126 #		624.17725	0.56964	0.1	62.41773	62.41773	67
PCB-167 #		127.06550	1.80737	0.00003	0.00381	0.00381	80
PCB-156 #		345.53650	1.92291	0.00003	0.01037	0.01037	78
PCB-157 #		223.84178	2.34301	0.00003	0.00672	0.00672	64
PCB-169 #		262.22674	1.01519	0.03	7.86680	7.86680	71
PCB-189 #		404.27868	1.08980	0.00003	0.01213	0.01213	81
Total-PCBs		3341.38538					
SUM - TEQ					70.45559	70.45559	
TEQ (WHO) - Mammals					70.45559	70.45559	
TEQ (WHO)-Birds					112.85350	112.85350	
TEQ (WHO)-Fish					3.30548	3.30548	
Upper-Bound: 'Upper-bound' means the concept which requires using the limit of quantification for the contribution of each non-quantified congener Lower-Bound: 'Lower-bound' means the concept which requires using zero for the contribution of each non-quantified congener TEQ: Toxic Equivalent Value TEF: Toxic Equivalent Factor							
Comment:							

Client Name: Socotec
Reference: 23031707
Location: Shetlands Island Council
Contact: Chem Subcon

[illegible]

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.: 23/4488

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.

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 quantitative calibration range. The result should be considered the minimum value and is indicative only. 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

EMT Job No: 23/4488

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
TM206	Analysis of Dioxins, Furans and PCBs in solid samples by HR-GCMS.	PM139	Extraction and clean-up of Dioxins (PCDDs), Furans (PCDFs) and dioxin like PCBs from solid samples using accelerator solvent extractor and clean up system.			AD	Yes

Socotec
ESG
ESG House, Bretby Business Park
Bretby
Burton upon Trent



Attention :	Chem Subcon
Date :	6th April, 2023
Your reference :	23031707
Our reference :	Test Report 23/4496 Batch 1
Location :	Shetland Islands Council
Date samples received :	22nd March, 2023
Status :	Final Report
Issue :	1

Three samples were received for analysis on 22nd March, 2023 of which three 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:

redacted

Please include all sections of this report if it is reproduced

ANALYSIS OF PCDDs and PCDFs

Client Name: Socotec
Reference: 23031707
Location: Shetland Islands Council
Contact: Subcon

Receipt Date: 22/03/23
Analysis Date: 01/04/23
Report Date: 06/04/23

Sample ID: 23031707-001
EMT Job No: 23/4496
EMT Sample No: 1
Matrix: Ash
Method: Dioxins and Furans by HR-GCMS
Instrument: DFS - High Resolution Magnetic Sector MS

Q* - Qualifiers

n.d. less than Limit of detection

Key

LOD Limit of Detection Limit
ISO 17025 (UKAS)
M MCERTS accredited

Results: Expressed ng/Kg dry sample

Compound	Q*	Result	LOD	I-TEFs	TEQ Lower Bound	TEQ Upper Bound	Percent Recovery %
2,3,7,8-TCDD #		n.d.	0.12775	1	0.00000	0.12775	96
1,2,3,7,8-PeCDD #		n.d.	0.36975	1	0.00000	0.36975	87
1,2,3,4,7,8-HeCDD #		n.d.	0.23221	0.1	0.00000	0.02322	84
1,2,3,6,7,8-HeCDD #		0.59440	0.24265	0.1	0.05944	0.05944	80
1,2,3,7,8,9-HeCDD #		0.52565	0.23911	0.1	0.05257	0.05257	
1,2,3,4,6,7,8-HpCDD #		6.29583	0.10402	0.01	0.06296	0.06296	72
OCDD #		14.27017	0.12565	0.0003	0.00428	0.00428	81
Total 2,3,7,8-Dioxins		21.68605					
2,3,7,8-TCDF #		0.62946	0.30229	0.1	0.06295	0.06295	77
1,2,3,7,8-PCDF #		0.84734	0.24311	0.03	0.02542	0.02542	79
2,3,4,7,8-PeCDF #		1.00937	0.25446	0.3	0.30281	0.30281	79
1,2,3,4,7,8-HeCDF #		1.08408	0.31481	0.1	0.10841	0.10841	75
1,2,3,6,7,8-HeCDF #		1.56523	0.31507	0.1	0.15652	0.15652	75
2,3,4,6,7,8-HeCDF #		1.47229	0.34201	0.1	0.14723	0.14723	80
1,2,3,7,8,9-HeCDF #		n.d.	0.43727	0.1	0.00000	0.04373	65
1,2,3,4,6,7,8-HpCDF #		6.93559	0.09284	0.01	0.06936	0.06936	70
1,2,3,4,7,8,9-HpCDF #		1.41433	0.13300	0.01	0.01414	0.01414	68
OCDF #		12.67284	0.13560	0.0003	0.00380	0.00380	73
Total 2,3,7,8-Furans		27.63053					
SUM - TEQ					1.06988	1.63433	
TEQ (NATO)					1.30756	1.68714	
TEQ (WHO) - Mammals					1.06988	1.63433	
TEQ (WHO)-Birds					2.28672	2.83956	
TEQ (WHO)-Fish					1.09437	1.75171	

Upper-Bound: 'Upper-bound' means the concept which requires using the limit of quantification for the contribution of each non-quantified congener
Lower-Bound: 'Lower-bound' means the concept which requires using zero for the contribution of each non-quantified congener

TEQ: Toxic Equivalent Value

TEF: Toxic Equivalent Factor

Comment:

ANALYSIS OF PCBs

Client Name: Socotec
Reference: 23031707
Location: Shetland Islands Council
Contact: Subcon

Receipt Date: 22/03/23
Analysis Date: 31/03/23
Report Date: 06/04/23

Sample ID: 23031707-001
EMT Job No: 23/4496
EMT Sample No: 1
Matrix: Ash
Method: Dioxins and Furans by HR-GCMS
Instrument: DFS - High Resolution Magnetic Sector MS

Q* - Qualifiers

n.d. less than Limit of detection

Key

LOD Limit of Detection Limit
ISO 17025 (UKAS)
M MCERTS accredited

Results: Expressed ng/Kg dry sample

Compound	Q*	Result	LOD	I-TEFs	TEQ Lower Bound	TEQ Upper Bound	Percent Recovery %
PCB-81 #		0.25222	0.11661	0.0003	0.00008	0.00008	81
PCB-77 #		1.25002	0.10046	0.0001	0.00013	0.00013	76
PCB-123 #		n.d.	0.65104	0.00003	0.00000	0.00002	81
PCB-118 #		4.04994	0.64069	0.00003	0.00012	0.00012	80
PCB-114 #		n.d.	0.64577	0.00003	0.00000	0.00002	81
PCB-105 #		1.47873	0.61638	0.00003	0.00004	0.00004	85
PCB-126 #		n.d.	0.54575	0.1	0.00000	0.05458	75
PCB-167 #		n.d.	0.30002	0.00003	0.00000	0.00001	70
PCB-156 #		0.76273	0.26859	0.00003	0.00002	0.00002	79
PCB-157 #		n.d.	0.25869	0.00003	0.00000	0.00001	82
PCB-169 #		n.d.	0.03227	0.03	0.00000	0.00097	77
PCB-189 #		0.41816	0.15419	0.00003	0.00001	0.00001	111
Total-PCBs		8.21180					
SUM - TEQ					0.00040	0.05600	
TEQ (WHO) - Mammals					0.00040	0.05600	
TEQ (WHO)-Birds					0.08799	0.14270	
TEQ (WHO)-Fish					0.00028	0.00302	
Upper-Bound: 'Upper-bound' means the concept which requires using the limit of quantification for the contribution of each non-quantified congener Lower-Bound: 'Lower-bound' means the concept which requires using zero for the contribution of each non-quantified congener TEQ: Toxic Equivalent Value TEF: Toxic Equivalent Factor							
Comment:							

ANALYSIS OF PCDDs and PCDFs

Client Name: Socotec
Reference: 23031707
Location: Shetland Islands Council
Contact: Subcon

Receipt Date: 22/03/23
Analysis Date: 01/04/23
Report Date: 06/04/23

Sample ID: 23031707-002
EMT Job No: 23/4496
EMT Sample No: 2
Matrix: Ash
Method: Dioxins and Furans by HR-GCMS
Instrument: DFS - High Resolution Magnetic Sector MS

Q* - Qualifiers

n.d. less than Limit of detection

Key

LOD Limit of Detection Limit
ISO 17025 (UKAS)
M MCERTS accredited

Results: Expressed ng/Kg dry sample

Compound	Q*	Result	LOD	I-TEFs	TEQ Lower Bound	TEQ Upper Bound	Percent Recovery %
2,3,7,8-TCDD #		0.31503	0.21596	1	0.31503	0.31503	100
1,2,3,7,8-PeCDD #		2.97727	0.44814	1	2.97727	2.97727	86
1,2,3,4,7,8-HeCDD #		3.63581	0.49811	0.1	0.36358	0.36358	82
1,2,3,6,7,8-HeCDD #		8.46742	0.55219	0.1	0.84674	0.84674	77
1,2,3,7,8,9-HeCDD #		5.75451	0.54414	0.1	0.57545	0.57545	
1,2,3,4,6,7,8-HpCDD #		146.99875	0.39146	0.01	1.46999	1.46999	72
OCDD #		909.38952	0.41396	0.0003	0.27282	0.27282	87
Total 2,3,7,8-Dioxins		1077.53831					
2,3,7,8-TCDF #		1.39024	0.49429	0.1	0.13902	0.13902	80
1,2,3,7,8-PCDF #		3.25332	0.55505	0.03	0.09760	0.09760	81
2,3,4,7,8-PeCDF #		5.15550	0.52176	0.3	1.54665	1.54665	85
1,2,3,4,7,8-HeCDF #		10.93571	0.54335	0.1	1.09357	1.09357	75
1,2,3,6,7,8-HeCDF #		13.33342	0.55298	0.1	1.33334	1.33334	73
2,3,4,6,7,8-HeCDF #		25.70483	0.59944	0.1	2.57048	2.57048	76
1,2,3,7,8,9-HeCDF #		8.20902	0.75318	0.1	0.82090	0.82090	68
1,2,3,4,6,7,8-HpCDF #		120.52162	0.21926	0.01	1.20522	1.20522	70
1,2,3,4,7,8,9-HpCDF #		26.90586	0.29733	0.01	0.26906	0.26906	73
OCDF #		311.54369	0.25706	0.0003	0.09346	0.09346	78
Total 2,3,7,8-Furans		526.95321					
SUM - TEQ					15.99019	15.99019	
TEQ (NATO)					16.45237	16.45237	
TEQ (WHO) - Mammals					15.99019	15.99019	
TEQ (WHO)-Birds					18.56695	18.56695	
TEQ (WHO)-Fish					15.62402	15.62402	
Upper-Bound: 'Upper-bound' means the concept which requires using the limit of quantification for the contribution of each non-quantified congener							
Lower-Bound: 'Lower-bound' means the concept which requires using zero for the contribution of each non-quantified congener							
TEQ: Toxic Equivalent Value							
TEF: Toxic Equivalent Factor							
Comment:							

ANALYSIS OF PCBs

Client Name: Socotec
Reference: 23031707
Location: Shetland Islands Council
Contact: Subcon

Receipt Date: 22/03/23
Analysis Date: 31/03/23
Report Date: 06/04/23

Sample ID: 23031707-002
EMT Job No: 23/4496
EMT Sample No: 2
Matrix: Ash
Method: Dioxins and Furans by HR-GCMS
Instrument: DFS - High Resolution Magnetic Sector MS

Q* - Qualifiers

n.d. less than Limit of detection

Key

LOD Limit of Detection Limit
ISO 17025 (UKAS)
M MCERTS accredited

Results: Expressed ng/Kg dry sample

Compound	Q*	Result	LOD	I-TEFs	TEQ Lower Bound	TEQ Upper Bound	Percent Recovery %
PCB-81 #		2.12971	0.11338	0.0003	0.00064	0.00064	80
PCB-77 #		4.69365	0.07423	0.0001	0.00047	0.00047	75
PCB-123 #		n.d.	0.53549	0.00003	0.00000	0.00002	82
PCB-118 #		2.50747	0.57755	0.00003	0.00008	0.00008	77
PCB-114 #		0.92638	0.59595	0.00003	0.00003	0.00003	76
PCB-105 #		2.43958	0.64620	0.00003	0.00007	0.00007	69
PCB-126 #		7.46027	0.25362	0.1	0.74603	0.74603	72
PCB-167 #		1.60618	0.37635	0.00003	0.00005	0.00005	87
PCB-156 #		4.52491	0.35495	0.00003	0.00014	0.00014	91
PCB-157 #		2.52546	0.38559	0.00003	0.00008	0.00008	85
PCB-169 #		4.33919	0.16487	0.03	0.13018	0.13018	73
PCB-189 #		6.86682	0.28810	0.00003	0.00021	0.00021	78
Total-PCBs		40.01962					
SUM - TEQ					0.87795	0.87797	
TEQ (WHO) - Mammals					0.87795	0.87797	
TEQ (WHO)-Birds					1.19917	1.19918	
TEQ (WHO)-Fish					0.03916	0.03916	
Upper-Bound: 'Upper-bound' means the concept which requires using the limit of quantification for the contribution of each non-quantified congener Lower-Bound: 'Lower-bound' means the concept which requires using zero for the contribution of each non-quantified congener TEQ: Toxic Equivalent Value TEF: Toxic Equivalent Factor							
Comment:							

ANALYSIS OF PCDDs and PCDFs

Client Name: Socotec
Reference: 23031707
Location: Shetland Islands Council
Contact: Subcon

Receipt Date: 22/03/23
Analysis Date: 01/04/23
Report Date: 06/04/23

Sample ID: 23031707-004
EMT Job No: 23/4496
EMT Sample No: 3
Matrix: Ash
Method: Dioxins and Furans by HR-GCMS
Instrument: DFS - High Resolution Magnetic Sector MS

Q* - Qualifiers

n.d. less than Limit of detection

Key

LOD Limit of Detection Limit
ISO 17025 (UKAS)
M MCERTS accredited

Results: Expressed ng/Kg dry sample

Compound	Q*	Result	LOD	I-TEFs	TEQ Lower Bound	TEQ Upper Bound	Percent Recovery %
2,3,7,8-TCDD #		n.d.	0.09883	1	0.00000	0.09883	92
1,2,3,7,8-PeCDD #		0.42379	0.31815	1	0.42379	0.42379	86
1,2,3,4,7,8-HeCDD #		0.90077	0.42322	0.1	0.09008	0.09008	82
1,2,3,6,7,8-HeCDD #		2.49661	0.42858	0.1	0.24966	0.24966	76
1,2,3,7,8,9-HeCDD #		2.01947	0.42233	0.1	0.20195	0.20195	
1,2,3,4,6,7,8-HpCDD #		73.10650	0.36566	0.01	0.73107	0.73107	73
OCDD #		760.42768	0.42984	0.0003	0.22813	0.22813	90
Total 2,3,7,8-Dioxins		839.37482					
2,3,7,8-TCDF #		n.d.	0.19334	0.1	0.00000	0.01933	76
1,2,3,7,8-PCDF #		0.52416	0.24872	0.03	0.01572	0.01572	81
2,3,4,7,8-PeCDF #		1.29294	0.26177	0.3	0.38788	0.38788	78
1,2,3,4,7,8-HeCDF #		3.29573	0.49295	0.1	0.32957	0.32957	78
1,2,3,6,7,8-HeCDF #		4.11954	0.51622	0.1	0.41195	0.41195	74
2,3,4,6,7,8-HeCDF #		11.10225	0.52983	0.1	1.11023	1.11023	79
1,2,3,7,8,9-HeCDF #		4.58609	0.65696	0.1	0.45861	0.45861	68
1,2,3,4,6,7,8-HpCDF #		66.64627	0.29477	0.01	0.66646	0.66646	70
1,2,3,4,7,8,9-HpCDF #		34.48919	0.38222	0.01	0.34489	0.34489	74
OCDF #		573.33948	0.34655	0.0003	0.17200	0.17200	81
Total 2,3,7,8-Furans		699.39565					
SUM - TEQ					5.82199	5.94016	
TEQ (NATO)					6.81281	6.93097	
TEQ (WHO) - Mammals					5.82199	5.94016	
TEQ (WHO)-Birds					5.56930	5.86147	
TEQ (WHO)-Fish					5.12021	5.22871	
Upper-Bound: 'Upper-bound' means the concept which requires using the limit of quantification for the contribution of each non-quantified congener Lower-Bound: 'Lower-bound' means the concept which requires using zero for the contribution of each non-quantified congener TEQ: Toxic Equivalent Value TEF: Toxic Equivalent Factor							
Comment:							

ANALYSIS OF PCBs

Client Name: Socotec
Reference: 23031707
Location: Shetland Islands Council
Contact: Subcon

Receipt Date: 22/03/23
Analysis Date: 01/04/23
Report Date: 06/04/23

Sample ID: 23031707-004
EMT Job No: 23/4496
EMT Sample No: 3
Matrix: Ash
Method: Dioxins and Furans by HR-GCMS
Instrument: DFS - High Resolution Magnetic Sector MS

Q* - Qualifiers

n.d. less than Limit of detection

Key

LOD Limit of Detection Limit
ISO 17025 (UKAS)
M MCERTS accredited

Results: Expressed ng/Kg dry sample

Compound	Q*	Result	LOD	I-TEFs	TEQ Lower Bound	TEQ Upper Bound	Percent Recovery %
PCB-81 #		0.17617	0.07302	0.0003	0.00005	0.00005	78
PCB-77 #		0.60072	0.12888	0.0001	0.00006	0.00006	73
PCB-123 #		n.d.	0.30266	0.00003	0.00000	0.00001	68
PCB-118 #		1.04061	0.29993	0.00003	0.00003	0.00003	67
PCB-114 #		n.d.	0.29002	0.00003	0.00000	0.00001	71
PCB-105 #		0.61262	0.30387	0.00003	0.00002	0.00002	66
PCB-126 #		0.48031	0.39012	0.1	0.04803	0.04803	73
PCB-167 #		n.d.	0.15894	0.00003	0.00000	0.00000	72
PCB-156 #		0.40163	0.16159	0.00003	0.00001	0.00001	71
PCB-157 #		0.27787	0.16857	0.00003	0.00001	0.00001	68
PCB-169 #		0.58286	0.03563	0.03	0.01749	0.01749	75
PCB-189 #		0.96480	0.12839	0.00003	0.00003	0.00003	78
Total-PCBs		5.13759					
SUM - TEQ					0.06573	0.06575	
TEQ (WHO) - Mammals					0.06573	0.06575	
TEQ (WHO)-Birds					0.09642	0.09645	
TEQ (WHO)-Fish					0.00260	0.00260	
Upper-Bound: 'Upper-bound' means the concept which requires using the limit of quantification for the contribution of each non-quantified congener Lower-Bound: 'Lower-bound' means the concept which requires using zero for the contribution of each non-quantified congener TEQ: Toxic Equivalent Value TEF: Toxic Equivalent Factor							
Comment:							

Client Name: Socotec
Reference: 23031707
Location: Shetland Islands Council
Contact: Chem Subcon

[illegible]

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.: 23/4496

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.

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 quantitative calibration range. The result should be considered the minimum value and is indicative only. 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

EMT Job No: 23/4496

[illegible]

KIRTON CONCRETE SERVICES LTD

Manor House, Station Road
Hibaldstow DN20 9EB

T: 01652 656931
E: office@kirtonlab.co.uk

www.kirtonlab.co.uk

An independent testing laboratory specialising in the testing of cementitious materials

TEST REPORT PREPARED FOR SOCOTEC

REPORT REFERENCE	SOC	232
Client REFERENCE	23031707-002	2023
JOB NUMBER	23031707	
Purchase Order Number	B163261BEC	
DATE OF RECEIPT OF SAMPLE	21-Mar-23	
DATE OF TESTS	22-Mar-23	to 22-Mar-23
DATE OF REPORT	22-Mar-23	

ALL RESULTS RELATE ONLY TO SAMPLE TESTED

PFA RESULTS TO EN 450: 2012

FREE CALCIUM OXIDE	1.43 %
--------------------	--------

END OF REPORT

redacted

SIGNED:.....

Certificate signed by:

redacted

KIRTON CONCRETE SERVICES LTD

Manor House, Station Road
Hibaldstow DN20 9EB

T: 01652 656931
E: office@kirtonlab.co.uk

www.kirtonlab.co.uk

An independent testing laboratory specialising in the testing of cementitious materials

TEST REPORT PREPARED FOR SOCOTEC

REPORT REFERENCE	SOC	233
Client REFERENCE	23031707-003	2023
JOB NUMBER	23031707	
Purchase Order Number	B163261BEC	
DATE OF RECEIPT OF SAMPLE	21-Mar-23	
DATE OF TESTS	22-Mar-23	to 22-Mar-23
DATE OF REPORT	22-Mar-23	

ALL RESULTS RELATE ONLY TO SAMPLE TESTED

PFA RESULTS TO EN 450: 2012

FREE CALCIUM OXIDE	9.19 %
--------------------	--------

END OF REPORT

redacted

SIGNED:.....

Certificate signed by:

redacted



Client: Shetland Islands Council
Project Name: Shetland Islands Council-Shetland Islands Council
Project No: 23031707
Date Issued: 06/04/2023

Deviating Sample Report

All samples received in an appropriate condition with no deviancies noted with the samples.



Client: Shetland Islands Council
 Project Name: Shetland Islands Council-Shetland Islands Council
 Project No: 23031707
 Date Issued: 06/04/2023

Analysis Method

<u>Method Code</u>	<u>Method Description</u>	<u>Analysis Method</u>
CLANDPREP	Basic Solid Description	As Received
CLANDPREP	CLand Prep Dry Weight Content @ 35°C	As Received
ICPMSS	Antimony in IBA by ICPMS	Air Dried & Ground
ICPMSS	Thallium in IBA by ICPMS	Air Dried & Ground
ICPMSW (Dissolved)	Antimony (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Antimony in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Arsenic (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Arsenic in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Cadmium (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Cadmium in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Chromium (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Chromium in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Copper (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Copper in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Lead (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Lead in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Mercury (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Mercury in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Molybdenum (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Molybdenum in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Nickel (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Nickel in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Selenium (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Selenium in Solids (BSEN 12457-2)	Filtered
ICPMSW (Dissolved)	Zinc (Diss.) in Lab Leachate by ICPMS	Filtered
ICPMSW (Dissolved)	Zinc in Solids (BSEN 12457-2)	Filtered
ICPSOIL	Antimony in IBA by ICPOES	Air Dried & Ground
ICPSOIL	Arsenic in IBA by ICPOES	Air Dried & Ground
ICPSOIL	Cadmium in IBA by ICPOES	Air Dried & Ground
ICPSOIL	Chromium in IBA by ICPOES	Air Dried & Ground
ICPSOIL	Cobalt in IBA by ICPOES	Air Dried & Ground
ICPSOIL	Copper in IBA by ICPOES	Air Dried & Ground
ICPSOIL	Lead in IBA by ICPOES	Air Dried & Ground
ICPSOIL	Manganese in IBA by ICPOES	Air Dried & Ground
ICPSOIL	Mercury in IBA by ICPOES	Air Dried & Ground
ICPSOIL	Nickel in IBA by ICPOES	Air Dried & Ground
ICPWATVAR (Dissolved)	Barium (Diss.) in Lab Leachate by ICPOES	Filtered
ICPWATVAR (Dissolved)	Barium in Solids (BSEN 12457-2)	Filtered
ICPWATVAR (Dissolved)	Total Sulphur as SO ₄ (Diss.) in Lab Leachate	Filtered
ICPWATVAR (Dissolved)	Total Sulphur as SO ₄ in Solids (BSEN 12457-2)	Filtered
ISEF	Fluoride by ISE	Filtered
ISEF	Fluoride in Solids (BSEN 12457-2)	Filtered
KONENS	Chloride by Colorimetry	Filtered
KONENS	Chloride in Solids (BSEN 12457-2)	Filtered
Leachate Prep CEN 10:1	WAC Leachate Prep, 1-Stage 10:1 (BSEN 12457-2)	As Received
LOI(%MM)	LOI: Loss on Ignition @ 450°C	Air Dried & Ground
PAHMSUS	16 PAHs by GCMS	As Received
PHCONDW	Electrical Conductivity @ 25°C	Filtered
PHCONDW	pH	Filtered
PHCONDW	TDS: Total Dissolved Solids (Calc)	Filtered



Client: Shetland Islands Council
 Project Name: Shetland Islands Council-Shetland Islands Council
 Project No: 23031707
 Date Issued: 06/04/2023

PHCONDW	Total Dissolved Solids in Solids (BSEN 12457-2)	Filtered
SFAPI	Phenol Index (Total) by SFA	Filtered
SFAPI	Phenol Index in Solids (BSEN 12457-2)	Filtered
SUB016	Dioxins, Furans & PCBs inc. TEQs in Solids	
SUB051	Free Lime Content (Calcium Oxide) in Ash	
TMSS	Total Moisture @ 105°C	As Received
TOCW	LOC: Leached Organic Carbon	Filtered
WAC	WAC Report	
WSLM13	Leached Organic Carbon in Solids (BSEN 12457-2)	Filtered
WSLM59	TOC: Total Organic Carbon	Air Dried & Ground

Project Report Notes

2303031707-001-12/1

As part of method development the upper calibration limit for the PH Water method has been reduced from pH 13 to pH 12. A result of 12.70 pH units was obtained for this sample. This is outside the new working range of the method and should therefore be used for guidance purposes only. Any accreditation has been removed where applicable.

2303031707-003-12/1

As part of method development the upper calibration limit for the PH Water method has been reduced from pH 13 to pH 12. A result of 12.3 pH units was obtained for this sample. This is outside the new working range of the method and should therefore be used for guidance purposes only. Any accreditation has been removed where applicable.

Result Report Notes

Letters alongside results signify that the result has associated report notes.
 The report notes are as follows:

<u>Letter</u>	<u>Note</u>
A	Due to the matrix of the sample the laboratory has had to deviate from our standard protocols to be able to process the sample and provide a result. Where applicable the accreditation has been removed and this should be taken into consideration when utilising the data.
B	The QC associated with this result has not wholly met the QMS requirements, the accreditation has therefore been removed. However, the Laboratory has confidence in the performance of the method as a whole and that the integrity of the data has not been significantly compromised.
C	Due to matrix interference, the internal standard and/or surrogate has not met the QMS requirements. This should be taken into consideration when utilising the data.
D	A non-standard volume or mass has been used for this test which has resulted in a raised detection limit.
E	Due to the parameter value being beyond our calibration range (and following the maximum size of dilution allowed, where applicable), the result cannot be quantified and as such the result will appear as a greater than symbol (>) with the accreditation removed. This data should be used for indicative purposes only.
F	Based on the sample history, appearance and smell a dilution was applied prior to testing. Unfortunately, the result is either above (>) or below (<) our calibration range. Results above our calibration range have accreditation removed. The data should be used for indicative purposes only.
G	The day 5 oxygen reading was below the capability of the instrument to detect, and therefore the calculated BOD has been reported unaccredited for guidance purposes only.



Client: Shetland Islands Council
Project Name: Shetland Islands Council-Shetland Islands Council
Project No: 23031707
Date Issued: 06/04/2023

HWOL Acronym Key

<u>Acronym</u>	<u>Description</u>
HS	Headspace Analysis
EH	Extractable Hydrocarbons - i.e everything extracted by the solvent(s)
CU	Clean up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
+	Operator to indicate cumulative e.g. EH_CU+HS_1D_Total

Additional Information

This report refers to samples as received. SOCOTEC UK Ltd takes no responsibility for accuracy or competence of sampling by others.

Results within this report relate only to the samples tested.

The accreditation codes are as follows:

U = UKAS accredited analysis
M = MCERT accredited analysis
N = Unaccredited analysis

Any units marked with ^ signify results are reported on a dry weight basis of 105° c.

All Air Dried and Ground Samples (ADG) are oven dried at less than 35° c.

This report shall not be reproduced except in full, without written approval of the laboratory.

Opinions and interpretations given are outside the scope of our UKAS accreditation.

Any samples marked with * are not covered by our scope of UKAS accreditation. If applicable, further report notes have been added.

Any solid samples where the Major Constituents are not one of the following (Sand, Silt, Clay, Made Ground) are not one of our accredited matrix types.

Any samples marked with ‡ have had MCERTS accreditation removed for this result

Any samples marked with a tick in the deviant table is deviant for the specific reason.

Any samples reported as IS, NA, ND mean the following:

IS = Insufficient Sample to complete analysis
NA = Sample is not amenable for the required analysis
ND = Results cannot be determined

Items listed with a 'SUB' method code prefix have been carried out by an external subcontracted laboratory.

Our deviating sample report does not include deviancy information for Subcontracted analysis. Please see the report from the subcontracted lab for information regarding any deviancies for this analysis.

Summaries of analysis methods are available upon request.

End of Certificate of Analysis