

Certificate of Analysis

Client: Shetland Islands Council

Project: 23070409

Quote: BEC230630658 V1.2

Project Ref: Shetland Islands Council

Site: Shetland Islands Council-Energy Recovery Plant

Contact: redacted

Address: Lerwick Energy Recovery Plant
Greenhead Base
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No. Samples Received: 5

Date Received: 06/07/2023

Analysis Date: 15/08/2023

Date Issued: 15/08/2023

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-Energy Recovery
Project No: 23070409
Date Issued: 15/08/2023

Samples Analysed

<u>Text ID</u>	<u>Sample Reference</u>	<u>Sampling Date</u>	<u>Sample Type</u>	<u>Sample Description</u>
23070409-001	Bottom Ash	28/06/2023 08:30:00	SOLID	Soil Sample
23070409-002	ESP	28/06/2023 08:30:00	SOLID	Soil Sample
23070409-003	Bag Filter	28/06/2023 08:30:00	SOLID	Soil Sample
23070409-004	Filter Press	28/06/2023 08:30:00	SOLID	Soil Sample
23070409-005	Effluent Water	28/06/2023 08:30:00	WATER	Unclassified Liquid

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	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Antimony as Sb	ICPMSW (Dissolved)	0.01	mg/kg [^]	N		<0.01		<0.01 c		<0.01		0.14
Arsenic as As	ICPMSW (Dissolved)	0.01	mg/kg [^]	N		<0.01		0.28 c		<0.01		<0.01
Barium as Ba	ICPWATVAR (Dissolved)	0.1	mg/kg [^]	N		6.9		1.1		5.8		<0.1
Cadmium as Cd	ICPMSW (Dissolved)	0.0002	mg/kg [^]	N		0.0004		0.281 c		0.0002		<0.0002
Chloride as Cl	KONENS	10	mg/kg [^]	N		4370		116000		4000		4840
Total Chromium as Cr	ICPMSW (Dissolved)	0.01	mg/kg [^]	N		0.08		0.03		<0.01		<0.01
Copper as Cu	ICPMSW (Dissolved)	0.01	mg/kg [^]	N		3.89		1.58		<0.01		<0.01
Lead as Pb	ICPMSW (Dissolved)	0.01	mg/kg [^]	N		36.2		335		0.63		<0.01
Mercury as Hg	ICPMSW (Dissolved)	0.0003	mg/kg [^]	N		<0.0003		0.0028 c		0.0004		<0.0003
Molybdenum as Mo	ICPMSW (Dissolved)	0.01	mg/kg [^]	N		0.82		6.17		0.24		0.23
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		3.5		<0.5		<0.5
Selenium as Se	ICPMSW (Dissolved)	0.01	mg/kg [^]	N		<0.01		0.18 c		0.29		<0.01
Total Sulphur as SO ₄	ICPWATVAR (Dissolved)	30	mg/kg [^]	N		1980		60100		16400		13200
TDS as mg/kg	PHCONDW	700	mg/kg [^]	N		58900		301000		76000		24300
Leached Organic Carbon	WSLM13	2	mg/kg [^]	N		111		5.7		32.8		9.5
Fluoride as F	ISEF	1	mg/kg [^]	N		4		34		2		53
Zinc as Zn	ICPMSW (Dissolved)	0.02	mg/kg [^]	N		13.6		39.8		2.10		<0.02
Conductivity at 25°C	PHCONDW	100	µS/cm	N		8670		44200		11200		3650

Client: Shetland Islands Council
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Analysis Results

					Sample ID	004	005
					Customer ID	Filter Press	Effluent Water
					Sample Type	SOLID	WATER
					Sampling Date	28/06/2023	28/06/2023
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	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
pH	PHCONDW	1	pH units	N		>12.0 E		>12.0 E		>12.0 E		9.6
TDS as mg/l	PHCONDW	70	mg/l	N		5900		30100		7600		2480
Chloride as Cl	KONENS	1	mg/l	U		437		11600		400		494
Phenol Index	SFAP1	0.05	mg/l	U		<0.05		0.35		<0.05		<0.05
Fluoride as F	ISEF	0.1	mg/l	U		0.4		3.4		0.2		5.4
Total Organic Carbon	WSLM59	0.02	% m/m	U			0.59		0.64*		20.3*	
LOI @ 450°C	LOI(%MM)	0.2	% m/m	N			2.0		<0.2		9.5	
Leached Organic Carbon	TOCW	0.4	mg/l	U		11.1		0.57		3.28		0.97
Antimony as Sb	ICPMSS	0.1	mg/kg	N			48.8					
Thallium as Tl	ICPMSS	0.1	mg/kg	N			<0.1		1.4		<0.1	
Antimony as Sb	ICPSOIL	20	mg/kg	N					156		<20.0	
Arsenic as As	ICPSOIL	20	mg/kg	N			<20.0		25.2		<20.0	
Cadmium as Cd	ICPSOIL	1	mg/kg	N			<1.00		52.1		3.31	
Cobalt as Co	ICPSOIL	2	mg/kg	N			<2.00		4.22		<2.00	
Copper as Cu	ICPSOIL	5	mg/kg	N			164		136		17.3	
Lead as Pb	ICPSOIL	10	mg/kg	N			92.8		708		36.0	
Manganese as Mn	ICPSOIL	10	mg/kg	N			113		132		23.1	
Mercury as Hg	ICPSOIL	10	mg/kg	N			<10.0		<10.0		<10.0	
Nickel as Ni	ICPSOIL	5	mg/kg	N			12.6		13.8		<5.00	

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Analysis Results

					Sample ID	004	005
					Customer ID	Filter Press	Effluent Water
					Sample Type	SOLID	WATER
					Sampling Date	28/06/2023	28/06/2023
					Analysis	Method Code	MDL
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	<1.00		
Cobalt as Co	ICPSOIL	2	mg/kg	N	<2.00		
Copper as Cu	ICPSOIL	5	mg/kg	N	<5.00		
Lead as Pb	ICPSOIL	10	mg/kg	N	<10.0		
Manganese as Mn	ICPSOIL	10	mg/kg	N	<10.0		
Mercury as Hg	ICPSOIL	10	mg/kg	N	<10.0		
Nickel as Ni	ICPSOIL	5	mg/kg	N	<5.00		

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	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Total Chromium as Cr	ICPSOIL	5	mg/kg	N			19.2		29.6		<5.00	
Antimony as Sb	ICPMSW (Dissolved)	0.001	mg/l	U		<0.001		<0.001 c		<0.001		0.014
Arsenic as As	ICPMSW (Dissolved)	0.001	mg/l	U		<0.001		0.028 c		<0.001		<0.001
Cadmium as Cd	ICPMSW (Dissolved)	0.00002	mg/l	U		0.00004		0.0281 c		0.00002		<0.00002
Total Chromium as Cr	ICPMSW (Dissolved)	0.001	mg/l	U		0.008		0.003		<0.001		<0.001
Copper as Cu	ICPMSW (Dissolved)	0.001	mg/l	U		0.389		0.158		<0.001		<0.001
Lead as Pb	ICPMSW (Dissolved)	0.001	mg/l	U		3.62		33.5		0.063		<0.001
Mercury as Hg	ICPMSW (Dissolved)	0.00003	mg/l	U		<0.00003		0.00028 c		0.00004		<0.00003
Molybdenum as Mo	ICPMSW (Dissolved)	0.001	mg/l	U		0.082		0.617		0.024		0.023
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		<0.001		0.018 c		0.029		<0.001
Zinc as Zn	ICPMSW (Dissolved)	0.002	mg/l	U		1.36		3.98		0.210		<0.002
Barium as Ba	ICPWATVAR (Dissolved)	0.01	mg/l	U		0.69		0.11		0.58		<0.01
Total Sulphur as SO4	ICPWATVAR (Dissolved)	3	mg/l	U		198		6010		1640		1350
Acenaphthene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Acenaphthylene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Anthracene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Benzo[a]anthracene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Benzo[a]pyrene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	

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Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	004	005
					Customer ID	Filter Press	Effluent Water
					Sample Type	SOLID	WATER
					Sampling Date	28/06/2023	28/06/2023
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	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Benzo[b]fluoranthene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Benzo[g,h,i]perylene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Benzo[k]fluoranthene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Chrysene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Dibenzo[a,h]anthracene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Fluoranthene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Fluorene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Indeno[1,2,3-cd]pyrene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Naphthalene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Phenanthrene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Pyrene	PAHMSUS	0.08	mg/kg	U			<0.08		<0.08*		<0.08*	
Total PAH 16	PAHMSUS	1.28	mg/kg	U			1.28		1.28*		<1.28*	
Acenaphthene	PAHMSW	0.01	µg/l	U								
Acenaphthylene	PAHMSW	0.01	µg/l	U								
Anthracene	PAHMSW	0.01	µg/l	U								
Benzo[a]anthracene	PAHMSW	0.01	µg/l	U								
Benzo[a]pyrene	PAHMSW	0.01	µg/l	U								
Benzo[b]fluoranthene	PAHMSW	0.01	µg/l	U								
Benzo[g,h,i]perylene	PAHMSW	0.01	µg/l	U								

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 Project No: 23070409
 Date Issued: 15/08/2023



Analysis Results

					Sample ID	004	005	
					Customer ID	Filter Press	Effluent Water	
						Sample Type	SOLID	WATER
						Sampling Date	28/06/2023	28/06/2023
						Analysis	Method Code	MDL
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			
Acenaphthene	PAHMSW	0.01	µg/l	U		<0.01*		
Acenaphthylene	PAHMSW	0.01	µg/l	U		<0.01*		
Anthracene	PAHMSW	0.01	µg/l	U		<0.01*		
Benzo[a]anthracene	PAHMSW	0.01	µg/l	U		<0.01*		
Benzo[a]pyrene	PAHMSW	0.01	µg/l	U		<0.01*		
Benzo[b]fluoranthene	PAHMSW	0.01	µg/l	U		<0.01*		
Benzo[g,h,i]perylene	PAHMSW	0.01	µg/l	U		<0.01*		

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	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Benzo[k]fluoranthene	PAHMSW	0.01	µg/l	U								
Chrysene	PAHMSW	0.01	µg/l	U								
Dibenzo[a,h]anthracene	PAHMSW	0.01	µg/l	U								
Fluoranthene	PAHMSW	0.01	µg/l	U								
Fluorene	PAHMSW	0.01	µg/l	U								
Indeno[1,2,3-cd]pyrene	PAHMSW	0.01	µg/l	U								
Naphthalene	PAHMSW	0.01	µg/l	U								
Phenanthrene	PAHMSW	0.01	µg/l	U								
Pyrene	PAHMSW	0.01	µg/l	U								
Total PAH 16	PAHMSW	0.16	µg/l	U								
Total Moisture at 105°C	TMSS	0.1	%	U					<0.1*		0.4*	
Total Moisture at 35°C	CLANDPREP	0.1	%	N			6.6		<0.1		<0.1	
Description of Solid Material	CLANDPREP		-	N			SILT		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			78.9		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			0.892		0.899		0.899	
Weight of Sample Leached (kg)	Leachate Prep CEN 10:1		kg	N			0.098		0.091		0.091	
WAC Report	WAC		-	N			See Attached		See Attached		See Attached	

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 Date Issued: 15/08/2023



Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	
					Customer ID	
					Sample Type	
					Sampling Date	
Benzo[k]fluoranthene	PAHMSW	0.01	µg/l	U	004	005
Chrysene	PAHMSW	0.01	µg/l	U	Filter Press	Effluent Water
Dibenzo[a,h]anthracene	PAHMSW	0.01	µg/l	U	SOLID	WATER
Fluoranthene	PAHMSW	0.01	µg/l	U	28/06/2023	28/06/2023
Fluorene	PAHMSW	0.01	µg/l	U		
Indeno[1,2,3-cd]pyrene	PAHMSW	0.01	µg/l	U		<0.01*
Naphthalene	PAHMSW	0.01	µg/l	U		<0.01*
Phenanthrene	PAHMSW	0.01	µg/l	U		0.01*
Pyrene	PAHMSW	0.01	µg/l	U		<0.01*
Total PAH 16	PAHMSW	0.16	µg/l	U		0.16*
Total Moisture at 105°C	TMSS	0.1	%	U		
Total Moisture at 35°C	CLANDPREP	0.1	%	N	33.1	
Description of Solid Material	CLANDPREP		-	N	SAND	
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	0.848	
Weight of Sample Leached (kg)	Leachate Prep CEN 10:1		kg	N	0.142	
WAC Report	WAC		-	N	See Attached	

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	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
1,2,3,4,6,7,8-HpCDD	SUB016		ng/kg	N			5.44670		152.12182		NA	
1,2,3,4,6,7,8-HpCDF	SUB016		ng/kg	N			7.17036		141.32597		NA	
1,2,3,4,7,8,9-HpCDF	SUB016		ng/kg	N			1.24227		25.58417		NA	
1,2,3,4,7,8-HxCDD	SUB016		ng/kg	N			0.35390		4.32228		NA	
1,2,3,4,7,8-HxCDF	SUB016		ng/kg	N			1.44071		12.71175		NA	
1,2,3,6,7,8-HxCDD	SUB016		ng/kg	N			<0.31065		10.15723		NA	
1,2,3,6,7,8-HxCDF	SUB016		ng/kg	N			1.79023		16.90878		NA	
1,2,3,7,8,9-HxCDD	SUB016		ng/kg	N			<0.32203		9.63703		NA	
1,2,3,7,8,9-HxCDF	SUB016		ng/kg	N			0.82025		7.67120		NA	
1,2,3,7,8-PCDD	SUB016		ng/kg	N			<0.46263		4.43871		NA	
1,2,3,7,8-PCDF	SUB016		ng/kg	N			1.05053		3.16131		NA	
2,3,4,6,7,8-HxCDF	SUB016		ng/kg	N			1.62477		26.51171		NA	
2,3,4,7,8-PCDF	SUB016		ng/kg	N			<0.53057		5.53597		NA	
2,3,7,8-TCDD	SUB016		ng/kg	N			<0.18304		0.92159		NA	
2,3,7,8-TCDF	SUB016		ng/kg	N			1.05779		1.31489		NA	
D&Fs - TEQ (NATO) Lower	SUB016		ng/kg	N			0.93229		19.19047		NA	
D&Fs - TEQ (NATO) Upper	SUB016		ng/kg	N			1.67519		19.19047		NA	
D&Fs - TEQ (WHO) Birds - Lower	SUB016		ng/kg	N			1.84098		22.11122		NA	
D&Fs - TEQ (WHO) Birds - Upper	SUB016		ng/kg	N			3.05253		22.11122		NA	

Client: Shetland Islands Council
 Project Name: Shetland Islands Council-Shetland Islands Council-Energy Recovery Plant
 Project No: 23070409
 Date Issued: 15/08/2023



Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	004	005
					Customer ID	Filter Press	Effluent Water
					Sample Type	SOLID	WATER
					Sampling Date	28/06/2023	28/06/2023
1,2,3,4,6,7,8-HpCDD	SUB016		ng/kg	N		43.25278	
1,2,3,4,6,7,8-HpCDF	SUB016		ng/kg	N		44.90376	
1,2,3,4,7,8,9-HpCDF	SUB016		ng/kg	N		23.81427	
1,2,3,4,7,8-HxCDD	SUB016		ng/kg	N		0.73891	
1,2,3,4,7,8-HxCDF	SUB016		ng/kg	N		2.70716	
1,2,3,6,7,8-HxCDD	SUB016		ng/kg	N		2.16363	
1,2,3,6,7,8-HxCDF	SUB016		ng/kg	N		4.01382	
1,2,3,7,8,9-HxCDD	SUB016		ng/kg	N		1.42960	
1,2,3,7,8,9-HxCDF	SUB016		ng/kg	N		4.19380	
1,2,3,7,8-PCDD	SUB016		ng/kg	N		<0.48817	
1,2,3,7,8-PCDF	SUB016		ng/kg	N		<0.46801	
2,3,4,6,7,8-HxCDF	SUB016		ng/kg	N		12.34237	
2,3,4,7,8-PCDF	SUB016		ng/kg	N		1.59479	
2,3,7,8-TCDD	SUB016		ng/kg	N		<0.13629	
2,3,7,8-TCDF	SUB016		ng/kg	N		<0.33084	
D&Fs - TEQ (NATO) Lower	SUB016		ng/kg	N		5.19138	
D&Fs - TEQ (NATO) Upper	SUB016		ng/kg	N		5.62824	
D&Fs - TEQ (WHO) Birds - Lower	SUB016		ng/kg	N		4.90404	
D&Fs - TEQ (WHO) Birds - Upper	SUB016		ng/kg	N		5.90610	



Client: Shetland Islands Council
 Project Name: Shetland Islands Council-Shetland Islands Council-Energy Recovery Plant
 Project No: 23070409
 Date Issued: 15/08/2023



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	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
D&Fs - TEQ (WHO) Fish - Lower	SUB016		ng/kg	N			0.94278		19.01372		NA	
D&Fs - TEQ (WHO) Fish - Upper	SUB016		ng/kg	N			1.86006		19.01372		NA	
D&Fs - TEQ (WHO) Mammals - Lower	SUB016		ng/kg	N			0.88860		19.53264		NA	
D&Fs - TEQ (WHO) Mammals - Upper	SUB016		ng/kg	N			1.75670		19.53264		NA	
D&Fs - TEQ SUM - Lower	SUB016		ng/kg	N			0.88860		19.53264		NA	
D&Fs - TEQ SUM - Upper	SUB016		ng/kg	N			1.75670		19.53264		NA	
OCDD	SUB016		ng/kg	N			19.90391		749.82937		NA	
OCDF	SUB016		ng/kg	N			12.49881		259.84130		NA	
PCB-105	SUB016		ng/kg	N			1.49916		2.11835		NA	
PCB-114	SUB016		ng/kg	N			<0.48528		0.75812		NA	
PCB-118	SUB016		ng/kg	N			2.93949		2.99743		NA	
PCB-123	SUB016		ng/kg	N			<0.51509		<0.66756		NA	
PCB-126	SUB016		ng/kg	N			<0.39043		4.29058		NA	
PCB-156	SUB016		ng/kg	N			0.44334		3.51325		NA	
PCB-157	SUB016		ng/kg	N			<0.15170		2.08091		NA	
PCB-167	SUB016		ng/kg	N			0.16864		1.26466		NA	
PCB-169	SUB016		ng/kg	N			<0.03251		2.74716		NA	
PCB-189	SUB016		ng/kg	N			<0.09761		6.71430		NA	
PCB-77	SUB016		ng/kg	N			1.52685		2.80727		NA	

Client: Shetland Islands Council
 Project Name: Shetland Islands Council-Shetland Islands Council-Energy Recovery Plant
 Project No: 23070409
 Date Issued: 15/08/2023



Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	
					Customer ID	
					Sample Type	
					Sampling Date	
D&Fs - TEQ (WHO) Fish - Lower	SUB016		ng/kg	N	004	4.31048
D&Fs - TEQ (WHO) Fish - Upper	SUB016		ng/kg	N	Filter Press	4.97488
D&Fs - TEQ (WHO) Mammals - Lower	SUB016		ng/kg	N	005	4.51168
D&Fs - TEQ (WHO) Mammals - Upper	SUB016		ng/kg	N	Effluent Water	5.18326
D&Fs - TEQ SUM - Lower	SUB016		ng/kg	N	SOLID	4.51168
D&Fs - TEQ SUM - Upper	SUB016		ng/kg	N	WATER	5.18326
OCDD	SUB016		ng/kg	N	28/06/2023	265.35984
OCDF	SUB016		ng/kg	N	28/06/2023	249.98167
PCB-105	SUB016		ng/kg	N		0.81839
PCB-114	SUB016		ng/kg	N		<0.43628
PCB-118	SUB016		ng/kg	N		1.87616
PCB-123	SUB016		ng/kg	N		<0.47521
PCB-126	SUB016		ng/kg	N		0.67490
PCB-156	SUB016		ng/kg	N		0.53373
PCB-157	SUB016		ng/kg	N		0.33215
PCB-167	SUB016		ng/kg	N		<0.22693
PCB-169	SUB016		ng/kg	N		<0.13783
PCB-189	SUB016		ng/kg	N		1.49690
PCB-77	SUB016		ng/kg	N		0.58928



Client: Shetland Islands Council
 Project Name: Shetland Islands Council-Shetland Islands Council-Energy Recovery Plant
 Project No: 23070409
 Date Issued: 15/08/2023



[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	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
PCB-81	SUB016		ng/kg	N			<0.07690		1.37396		NA	
PCBs - TEQ (WHO) Birds - Lower	SUB016		ng/kg	N			0.07519		0.70943		NA	
PCBs - TEQ (WHO) Birds - Upper	SUB016		ng/kg	N			0.12097		0.70944		NA	
PCBs - TEQ (WHO) Fish - Lower	SUB016		ng/kg	N			0.00018		0.02265		NA	
PCBs - TEQ (WHO) Fish - Upper	SUB016		ng/kg	N			0.00216		0.02265		NA	
PCBs - TEQ (WHO) Mammals - Lower	SUB016		ng/kg	N			0.00030		0.51274		NA	
PCBs - TEQ (WHO) Mammals - Upper	SUB016		ng/kg	N			0.04037		0.51276		NA	
PCBs - TEQ SUM - Lower	SUB016		ng/kg	N			0.00030		0.51274		NA	
PCBs - TEQ SUM - Upper	SUB016		ng/kg	N			0.04037		0.51276		NA	
Total 2,3,7,8-Dioxins	SUB016		ng/kg	N			25.70451		931.42803		NA	
Total 2,3,7,8-Furans	SUB016		ng/kg	N			28.69572		500.56705		NA	
Total PCBs	SUB016		ng/kg	N			6.57748		30.66599		NA	
1,2,3,4,6,7,8-HpCDD	SUB016		ng/l	N								
1,2,3,4,6,7,8-HpCDF	SUB016		ng/l	N								
1,2,3,4,7,8,9-HpCDF	SUB016		ng/l	N								
1,2,3,4,7,8-HxCDD	SUB016		ng/l	N								
1,2,3,4,7,8-HxCDF	SUB016		ng/l	N								
1,2,3,6,7,8-HxCDD	SUB016		ng/l	N								
1,2,3,6,7,8-HxCDF	SUB016		ng/l	N								

Client: Shetland Islands Council
 Project Name: Shetland Islands Council-Shetland Islands Council-Energy Recovery Plant
 Project No: 23070409
 Date Issued: 15/08/2023



Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	
					Customer ID	
					Sample Type	
					Sampling Date	
					004	005
					Filter Press	Effluent Water
					SOLID	WATER
					28/06/2023	28/06/2023
PCB-81	SUB016		ng/kg	N	0.08356	
PCBs - TEQ (WHO) Birds - Lower	SUB016		ng/kg	N	0.10769	
PCBs - TEQ (WHO) Birds - Upper	SUB016		ng/kg	N	0.10786	
PCBs - TEQ (WHO) Fish - Lower	SUB016		ng/kg	N	0.00350	
PCBs - TEQ (WHO) Fish - Upper	SUB016		ng/kg	N	0.00351	
PCBs - TEQ (WHO) Mammals - Lower	SUB016		ng/kg	N	0.06773	
PCBs - TEQ (WHO) Mammals - Upper	SUB016		ng/kg	N	0.07189	
PCBs - TEQ SUM - Lower	SUB016		ng/kg	N	0.06773	
PCBs - TEQ SUM - Upper	SUB016		ng/kg	N	0.07189	
Total 2,3,7,8-Dioxins	SUB016		ng/kg	N	312.94476	
Total 2,3,7,8-Furans	SUB016		ng/kg	N	343.55164	
Total PCBs	SUB016		ng/kg	N	6.40507	
1,2,3,4,6,7,8-HpCDD	SUB016		ng/l	N		IS
1,2,3,4,6,7,8-HpCDF	SUB016		ng/l	N		IS
1,2,3,4,7,8,9-HpCDF	SUB016		ng/l	N		IS
1,2,3,4,7,8-HxCDD	SUB016		ng/l	N		IS
1,2,3,4,7,8-HxCDF	SUB016		ng/l	N		IS
1,2,3,6,7,8-HxCDD	SUB016		ng/l	N		IS
1,2,3,6,7,8-HxCDF	SUB016		ng/l	N		IS



Client: Shetland Islands Council
Project Name: Shetland Islands Council-Shetland Islands Council-Energy Recovery Plant
Project No: 23070409
Date Issued: 15/08/2023



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	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
1,2,3,7,8,9-HxCDD	SUB016		ng/l	N								
1,2,3,7,8,9-HxCDF	SUB016		ng/l	N								
1,2,3,7,8-PCDD	SUB016		ng/l	N								
1,2,3,7,8-PCDF	SUB016		ng/l	N								
2,3,4,6,7,8-HxCDF	SUB016		ng/l	N								
2,3,4,7,8-PCDF	SUB016		ng/l	N								
2,3,7,8-TCDD	SUB016		ng/l	N								
2,3,7,8-TCDF	SUB016		ng/l	N								
D&Fs - TEQ SUM - Lower	SUB016		ng/l	N								
D&Fs - TEQ SUM - Upper	SUB016		ng/l	N								
OCDD	SUB016		ng/l	N								
OCDF	SUB016		ng/l	N								
PCB-105	SUB016	0.1	µg/l	N								
PCB-114	SUB016	0.1	µg/l	N								
PCB-118	SUB016	0.1	µg/l	N								
PCB-123	SUB016	0.1	µg/l	N								
PCB-126	SUB016	0.1	µg/l	N								
PCB-156	SUB016	0.1	µg/l	N								
PCB-157	SUB016	0.1	µg/l	N								

Client: Shetland Islands Council
Project Name: Shetland Islands Council-Shetland Islands Council-Energy Recovery Plant
Project No: 23070409
Date Issued: 15/08/2023



Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	
					Customer ID	
					Sample Type	
					Sampling Date	
1,2,3,7,8,9-HxCDD	SUB016		ng/l	N	004 Filter Press	005 Effluent Water
1,2,3,7,8,9-HxCDF	SUB016		ng/l	N	SOLID	WATER
1,2,3,7,8-PCDD	SUB016		ng/l	N	28/06/2023	28/06/2023
1,2,3,7,8-PCDF	SUB016		ng/l	N		
2,3,4,6,7,8-HxCDF	SUB016		ng/l	N		
2,3,4,7,8-PCDF	SUB016		ng/l	N		
2,3,7,8-TCDD	SUB016		ng/l	N		
2,3,7,8-TCDF	SUB016		ng/l	N		
D&Fs - TEQ SUM - Lower	SUB016		ng/l	N		
D&Fs - TEQ SUM - Upper	SUB016		ng/l	N		
OCDD	SUB016		ng/l	N		
OCDF	SUB016		ng/l	N		
PCB-105	SUB016	0.1	µg/l	N		
PCB-114	SUB016	0.1	µg/l	N		
PCB-118	SUB016	0.1	µg/l	N		
PCB-123	SUB016	0.1	µg/l	N		
PCB-126	SUB016	0.1	µg/l	N		
PCB-156	SUB016	0.1	µg/l	N		
PCB-157	SUB016	0.1	µg/l	N		



Client: Shetland Islands Council
 Project Name: Shetland Islands Council-Shetland Islands Council-Energy Recovery Plant
 Project No: 23070409
 Date Issued: 15/08/2023



Analysis Results

					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	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Analysis	Method Code	MDL	Units	Accred.								
PCB-167	SUB016	0.1	µg/l	N								
PCB-169	SUB016	0.1	µg/l	N								
PCB-189	SUB016	0.1	µg/l	N								
PCB-77	SUB016	0.1	µg/l	N								
PCB-81	SUB016	0.1	µg/l	N								
Total 2,3,7,8-Dioxins	SUB016		ng/l	N								
Total 2,3,7,8-Furans	SUB016		ng/l	N								
Total PCBs	SUB016	1.2	µg/l	N								
Free Lime Content	SUB051	0.1	%	N					4.45		24.54	

Client: Shetland Islands Council
 Project Name: Shetland Islands Council-Shetland Islands Council-Energy Recovery Plant
 Project No: 23070409
 Date Issued: 15/08/2023



Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	004	005
					Customer ID	Filter Press	Effluent Water
					Sample Type	SOLID	WATER
					Sampling Date	28/06/2023	28/06/2023
PCB-167	SUB016	0.1	µg/l	N			IS
PCB-169	SUB016	0.1	µg/l	N			IS
PCB-189	SUB016	0.1	µg/l	N			IS
PCB-77	SUB016	0.1	µg/l	N			IS
PCB-81	SUB016	0.1	µg/l	N			IS
Total 2,3,7,8-Dioxins	SUB016		ng/l	N			IS
Total 2,3,7,8-Furans	SUB016		ng/l	N			IS
Total PCBs	SUB016	1.2	µg/l	N			IS
Free Lime Content	SUB051	0.1	%	N			

WASTE ACCEPTANCE CRITERIA TESTING
BSEN 12457/2

Client	Shetland Islands Council	
Site	Shetland Islands Council-Energy	
Project	23070409	
Sample No	Sample Description	Issue Date
23070409-001	Bottom Ash	15/08/2023

Leaching Data	
Weight of Sample (kg)	0.098
Moisture content @ 105°C (% Wet Weight)	8.0
Equivalent weight based on drying @ 105°C (kg)	0.090
Volume of Water required for 10:1 stage (litres)	0.892
Fraction of sample above 4mm %	78.9
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)	8670				
U	ICPMSW	Arsenic	<0.001	<0.01	0.5	2	25
U	ICPWATVAR	Barium	0.69	6.9	20	100	300
U	ICPMSW	Cadmium	0.00004	0.0004	0.04	1	5
U	ICPMSW	Chromium	0.008	0.08	0.5	10	70
U	ICPMSW	Copper	0.389	3.89	2	50	100
U	ICPMSW	Mercury	<0.00003	<0.0003	0.01	0.2	2
U	ICPMSW	Molybdenum	0.082	0.82	0.5	10	30
U	ICPMSW	Nickel	0.002	0.02	0.4	10	40
U	ICPMSW	Lead	3.62	36.2	0.5	10	50
U	ICPMSW	Antimony	<0.001	<0.01	0.06	0.7	5
U	ICPMSW	Selenium	<0.001	<0.01	0.1	0.5	7
U	ICPMSW	Zinc	1.36	13.6	4	50	200
U	KONENS	Chloride	437	4370	800	15000	25000
U	ISEF	Fluoride	0.4	4	10	150	500
U	ICPWATVAR	Sulphate as SO4	198	1980	1000	20000	50000
N	WSLM27	Total Dissolved Solids	5900	58900	4000	60000	100000
U	SFAPI	Phenol Index	<0.05	<0.5	1		
U	WSLM13	Dissolved Organic Carbon	11.1	111	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-Energy	
Project	23070409	
Sample No	Sample Description	Issue Date
23070409-002	ESP	15/08/2023

Leaching Data	
Weight of Sample (kg)	0.091
Moisture content @ 105°C (% Wet Weight)	0.7
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)	44200				
U	ICPMSW	Arsenic	0.028	0.28	0.5	2	25
U	ICPWATVAR	Barium	0.11	1.1	20	100	300
U	ICPMSW	Cadmium	0.0281	0.281	0.04	1	5
U	ICPMSW	Chromium	0.003	0.03	0.5	10	70
U	ICPMSW	Copper	0.158	1.58	2	50	100
U	ICPMSW	Mercury	0.00028	0.0028	0.01	0.2	2
U	ICPMSW	Molybdenum	0.617	6.17	0.5	10	30
U	ICPMSW	Nickel	<0.001	<0.01	0.4	10	40
U	ICPMSW	Lead	33.5	335	0.5	10	50
U	ICPMSW	Antimony	<0.001	<0.01	0.06	0.7	5
U	ICPMSW	Selenium	0.018	0.18	0.1	0.5	7
U	ICPMSW	Zinc	3.98	39.8	4	50	200
U	KONENS	Chloride	11600	116000	800	15000	25000
U	ISEF	Fluoride	3.4	34	10	150	500
U	ICPWATVAR	Sulphate as SO4	6010	60100	1000	20000	50000
N	WSLM27	Total Dissolved Solids	30100	301000	4000	60000	100000
U	SFAP1	Phenol Index	0.35	3.5	1		
U	WSLM13	Dissolved Organic Carbon	0.57	5.7	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-Energy	
Project	23070409	
Sample No	Sample Description	Issue Date
23070409-003	Bag Filter	15/08/2023

Leaching Data	
Weight of Sample (kg)	0.091
Moisture content @ 105°C (% Wet Weight)	1.4
Equivalent weight based on drying @ 105°C (kg)	0.090
Volume of Water required for 10:1 stage (ltres)	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)	11200				
U	ICPMSW	Arsenic	<0.001	<0.01	0.5	2	25
U	ICPWATVAR	Barium	0.58	5.8	20	100	300
U	ICPMSW	Cadmium	0.00002	0.0002	0.04	1	5
U	ICPMSW	Chromium	<0.001	<0.01	0.5	10	70
U	ICPMSW	Copper	<0.001	<0.01	2	50	100
U	ICPMSW	Mercury	0.00004	0.0004	0.01	0.2	2
U	ICPMSW	Molybdenum	0.024	0.24	0.5	10	30
U	ICPMSW	Nickel	<0.001	<0.01	0.4	10	40
U	ICPMSW	Lead	0.063	0.63	0.5	10	50
U	ICPMSW	Antimony	<0.001	<0.01	0.06	0.7	5
U	ICPMSW	Selenium	0.029	0.29	0.1	0.5	7
U	ICPMSW	Zinc	0.210	2.10	4	50	200
U	KONENS	Chloride	400	4000	800	15000	25000
U	ISEF	Fluoride	0.2	2	10	150	500
U	ICPWATVAR	Sulphate as SO4	1640	16400	1000	20000	50000
N	WSLM27	Total Dissolved Solids	7600	76000	4000	60000	100000
U	SFAP1	Phenol Index	<0.05	<0.5	1		
U	WSLM13	Dissolved Organic Carbon	3.28	32.8	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-Energy	
Project	23070409	
Sample No	Sample Description	Issue Date
23070409-004	Filter Press	15/08/2023

Leaching Data	
Weight of Sample (kg)	0.142
Moisture content @ 105°C (% Wet Weight)	36.8
Equivalent weight based on drying @ 105°C (kg)	0.090
Volume of Water required for 10:1 stage (ltres)	0.848
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)	9.6				
N	WSLM2**	Conductivity (µS/cm)	3650				
U	ICPMSW	Arsenic	<0.001	<0.01	0.5	2	25
U	ICPWATVAR	Barium	<0.01	<0.1	20	100	300
U	ICPMSW	Cadmium	<0.00002	<0.0002	0.04	1	5
U	ICPMSW	Chromium	<0.001	<0.01	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	0.023	0.23	0.5	10	30
U	ICPMSW	Nickel	<0.001	<0.01	0.4	10	40
U	ICPMSW	Lead	<0.001	<0.01	0.5	10	50
U	ICPMSW	Antimony	0.014	0.14	0.06	0.7	5
U	ICPMSW	Selenium	<0.001	<0.01	0.1	0.5	7
U	ICPMSW	Zinc	<0.002	<0.02	4	50	200
U	KONENS	Chloride	494	4840	800	15000	25000
U	ISEF	Fluoride	5.4	53	10	150	500
U	ICPWATVAR	Sulphate as SO4	1350	13200	1000	20000	50000
N	WSLM27	Total Dissolved Solids	2480	24300	4000	60000	100000
U	SFAPI	Phenol Index	<0.05	<0.5	1		
U	WSLM13	Dissolved Organic Carbon	0.97	9.5	500	800	1000

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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
United Kingdom



4225



Attention :	Chem Subcon
Date :	10th August, 2023
Your reference :	23070409
Our reference :	Test Report 23/11120 Batch 1
Location :	Shetland Island Council-Energy Recovery Plant
Date samples received :	7th July, 2023
Status :	Final Report
Issue :	1

Four samples were received for analysis on 7th July, 2023 of which four 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

Element Materials Technology

Client Name: Socotec
Reference: 23070409
Location: Shetland Island Council-Energy Recovery Plant
Contact: Chem Subcon

Sample Date: 28 Jun 2023
Date of Receipt: 7 Jul 2023
Date Analysed: 31 Jul 2023

Sample ID: 23070409-001
Depth:
EMT Job No: 23/11120
EMT Sample No: 1
Matrix: Solid (Ash)
Method: TM206/PM139 Dioxins, Furans and PCBs in solid samples by HR-GCMS

ANALYSIS OF PCDDs and PCDFs

Q : Qualifiers

SV Indicates surrogate recovery outside performance criteria
>> Indicates value exceeds calibration range

Key

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

CAS No		Compound	Q	Result ng/kg	LOD	I-TEFs	TEQ Lower Bound	TEQ Upper Bound	% Recovery
1746-01-6	#	2378-TCDD		<0.18304	0.18304	1	0.00000	0.18304	94
40321-76-4	#	12378-PCDD		<0.46263	0.46263	1	0.00000	0.46263	84
39227-28-6	#	123478-HxCDD		0.35390	0.31557	0.1	0.03539	0.03539	70
57653-85-7	#	123678-HxCDD		<0.31065	0.31065	0.1	0.00000	0.03106	69
19408-74-3	#	123789-HxCDD		<0.32203	0.32203	0.1	0.00000	0.03220	
35822-46-9	#	1234678-HpCDD		5.44670	0.11718	0.01	0.05447	0.05447	69
3268-87-9	#	OCDD		19.90391	0.26221	0.0003	0.00597	0.00597	76
		Total 2,3,7,8-Dioxins		25.70451					
51207-31-9	#	2378-TCDF		1.05779	0.44297	0.1	0.10578	0.10578	74
57117-41-6	#	12378-PCDF		1.05053	0.45223	0.03	0.03152	0.03152	79
57117-31-4	#	23478-PCDF		<0.53057	0.53057	0.3	0.00000	0.15917	69
70648-26-9	#	123478-HxCDF		1.44071	0.36469	0.1	0.14407	0.14407	77
57117-44-9	#	123678-HxCDF		1.79023	0.34485	0.1	0.17902	0.17902	76
60851-34-5	#	234678-HxCDF		1.62477	0.43438	0.1	0.16248	0.16248	67
72918-21-9	#	123789-HxCDF		0.82025	0.46927	0.1	0.08203	0.08203	72
67562-39-4	#	1234678-HpCDF		7.17036	0.16629	0.01	0.07170	0.07170	73
55673-89-7	#	1234789-HpCDF		1.24227	0.18930	0.01	0.01242	0.01242	78
39001-02-0	#	OCDF		12.49881	0.17328	0.0003	0.00375	0.00375	70
		Total 2,3,7,8-Furans		28.69572					
		TEQ (WHO) Mammals					0.88860	1.75670	
		TEQ (WHO) Birds					1.84098	3.05253	
		TEQ (WHO) Fish					0.94278	1.86006	
		TEQ (NATO)					0.93229	1.67519	

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

Element Materials Technology

Client Name: Socotec
Reference: 23070409
Location: Shetland Island Council-Energy Recovery Plant
Contact: Chem Subcon

Sample Date: 28 Jun 2023
Date of Receipt: 7 Jul 2023
Date Analysed: 31 Jul 2023

Sample ID: 23070409-001
Depth:
EMT Job No: 23/11120
EMT Sample No: 1
Matrix: Solid (Ash)
Method: TM206/PM139 Dioxins, Furans and PCBs in solid samples by HR-GCMS

ANALYSIS OF PCBs

Q : Qualifiers

SV Indicates surrogate recovery outside performance criteria
>> Indicates value exceeds calibration range

Key

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

CAS No		Compound	Q	Result ng/kg	LOD	I-TEFs	TEQ Lower Bound	TEQ Upper Bound	% Recovery
70362-50-4	#	PCB-81		<0.07690	0.07690	0.0003	0.00000	0.00002	73
32598-13-3	#	PCB-77		1.52685	0.07409	0.0001	0.00015	0.00015	67
65510-44-3	#	PCB-123		<0.51509	0.51509	0.00003	0.00000	0.00002	77
31508-00-6	#	PCB-118		2.93949	0.52413	0.00003	0.00009	0.00009	74
74472-37-0	#	PCB-114		<0.48528	0.48528	0.00003	0.00000	0.00001	80
32598-14-4	#	PCB-105		1.49916	0.53758	0.00003	0.00004	0.00004	75
57465-28-8	#	PCB-126		<0.39043	0.39043	0.1	0.00000	0.03904	66
52663-72-6	#	PCB-167		0.16864	0.14523	0.00003	0.00001	0.00001	70
38380-08-4	#	PCB-156		0.44334	0.14283	0.00003	0.00001	0.00001	73
69782-90-7	#	PCB-157		<0.15170	0.15170	0.00003	0.00000	0.00000	71
32774-16-6	#	PCB-169		<0.03251	0.03251	0.03	0.00000	0.00098	67
39635-31-9	#	PCB-189		<0.09761	0.09761	0.00003	0.00000	0.00000	91
		Total PCBs		6.57748					
		TEQ (WHO) Mammals					0.00030	0.04037	
		TEQ (WHO) Birds					0.07519	0.12097	
		TEQ (WHO) Fish					0.00018	0.00216	

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

Element Materials Technology

Client Name: Socotec
Reference: 23070409
Location: Shetland Island Council-Energy Recovery Plant
Contact: Chem Subcon

Sample Date: 28 Jun 2023
Date of Receipt: 7 Jul 2023
Date Analysed: 31 Jul 2023

Sample ID: 23070409-002
Depth:
EMT Job No: 23/11120
EMT Sample No: 2
Matrix: Solid (Ash)
Method: TM206/PM139 Dioxins, Furans and PCBs in solid samples by HR-GCMS

ANALYSIS OF PCDDs and PCDFs

Q : Qualifiers

SV Indicates surrogate recovery outside performance criteria
>> Indicates value exceeds calibration range

Key

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

CAS No		Compound	Q	Result ng/kg	LOD	I-TEFs	TEQ Lower Bound	TEQ Upper Bound	% Recovery
1746-01-6	#	2378-TCDD		0.92159	0.34218	1	0.92159	0.92159	103
40321-76-4	#	12378-PCDD		4.43871	1.16841	1	4.43871	4.43871	86
39227-28-6	#	123478-HxCDD		4.32228	1.42269	0.1	0.43223	0.43223	91
57653-85-7	#	123678-HxCDD		10.15723	1.43973	0.1	1.01572	1.01572	80
19408-74-3	#	123789-HxCDD		9.63703	1.49247	0.1	0.96370	0.96370	
35822-46-9	#	1234678-HpCDD		152.12182	0.92619	0.01	1.52122	1.52122	85
3268-87-9	#	OCDD		749.82937	0.60017	0.0003	0.22495	0.22495	98
Total 2,3,7,8-Dioxins				931.42803					
51207-31-9	#	2378-TCDF		1.31489	0.84082	0.1	0.13149	0.13149	74
57117-41-6	#	12378-PCDF		3.16131	1.26837	0.03	0.09484	0.09484	84
57117-31-4	#	23478-PCDF		5.53597	1.40454	0.3	1.66079	1.66079	80
70648-26-9	#	123478-HxCDF		12.71175	1.30460	0.1	1.27118	1.27118	89
57117-44-9	#	123678-HxCDF		16.90878	1.26128	0.1	1.69088	1.69088	88
60851-34-5	#	234678-HxCDF		26.51171	1.36803	0.1	2.65117	2.65117	85
72918-21-9	#	123789-HxCDF		7.67120	1.65942	0.1	0.76712	0.76712	82
67562-39-4	#	1234678-HpCDF		141.32597	0.82014	0.01	1.41326	1.41326	84
55673-89-7	#	1234789-HpCDF		25.58417	0.91134	0.01	0.25584	0.25584	88
39001-02-0	#	OCDF		259.84130	0.42253	0.0003	0.07795	0.07795	84
Total 2,3,7,8-Furans				500.56705					
TEQ (WHO) Mammals							19.53264	19.53264	
TEQ (WHO) Birds							22.11122	22.11122	
TEQ (WHO) Fish							19.01372	19.01372	
TEQ (NATO)							19.19047	19.19047	

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

Element Materials Technology

Client Name: Socotec
Reference: 23070409
Location: Shetland Island Council-Energy Recovery Plant
Contact: Chem Subcon

Sample Date: 28 Jun 2023
Date of Receipt: 7 Jul 2023
Date Analysed: 31 Jul 2023

Sample ID: 23070409-002
Depth:
EMT Job No: 23/11120
EMT Sample No: 2
Matrix: Solid (Ash)
Method: TM206/PM139 Dioxins, Furans and PCBs in solid samples by HR-GCMS

ANALYSIS OF PCBs

Q : Qualifiers

SV Indicates surrogate recovery outside performance criteria
>> Indicates value exceeds calibration range

Key

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

CAS No		Compound	Q	Result ng/kg	LOD	I-TEFs	TEQ Lower Bound	TEQ Upper Bound	% Recovery
70362-50-4	#	PCB-81		1.37396	0.16095	0.0003	0.00041	0.00041	73
32598-13-3	#	PCB-77		2.80727	0.28072	0.0001	0.00028	0.00028	71
65510-44-3	#	PCB-123		<0.66756	0.66756	0.00003	0.00000	0.00002	80
31508-00-6	#	PCB-118		2.99743	0.66057	0.00003	0.00009	0.00009	77
74472-37-0	#	PCB-114		0.75812	0.62587	0.00003	0.00002	0.00002	83
32598-14-4	#	PCB-105		2.11835	0.70400	0.00003	0.00006	0.00006	77
57465-28-8	#	PCB-126		4.29058	0.77784	0.1	0.42906	0.42906	72
52663-72-6	#	PCB-167		1.26466	0.45160	0.00003	0.00004	0.00004	74
38380-08-4	#	PCB-156		3.51325	0.44801	0.00003	0.00011	0.00011	76
69782-90-7	#	PCB-157		2.08091	0.47454	0.00003	0.00006	0.00006	74
32774-16-6	#	PCB-169		2.74716	0.32871	0.03	0.08241	0.08241	74
39635-31-9	#	PCB-189		6.71430	0.33529	0.00003	0.00020	0.00020	94
		Total PCBs		30.66599					
		TEQ (WHO) Mammals					0.51274	0.51276	
		TEQ (WHO) Birds					0.70943	0.70944	
		TEQ (WHO) Fish					0.02265	0.02265	

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

Element Materials Technology

Client Name: Socotec
Reference: 23070409
Location: Shetland Island Council-Energy Recovery Plant
Contact: Chem Subcon

Sample Date: 28 Jun 2023
Date of Receipt: 7 Jul 2023
Date Analysed: 10 Aug 2023

Sample ID: 23070409-003
Depth:
EMT Job No: 23/11120
EMT Sample No: 3
Matrix: Solid (Ash)
Method: TM206/PM139 Dioxins, Furans and PCBs in solid samples by HR-GCMS

ANALYSIS OF PCDDs and PCDFs

Q : Qualifiers

SV Indicates surrogate recovery outside performance criteria
>> Indicates value exceeds calibration range

Key

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

CAS No		Compound	Q	Result ng/kg	LOD	I-TEFs	TEQ Lower Bound	TEQ Upper Bound	% Recovery
1746-01-6	#	2378-TCDD		NDP	1.92324	NDP	NDP	NDP	NDP
40321-76-4	#	12378-PCDD		NDP	22.34562	NDP	NDP	NDP	NDP
39227-28-6	#	123478-HxCDD		NDP	81.36631	NDP	NDP	NDP	NDP
57653-85-7	#	123678-HxCDD		NDP	50.21700	NDP	NDP	NDP	NDP
19408-74-3	#	123789-HxCDD		NDP	52.05653	NDP	NDP	NDP	NDP
35822-46-9	#	1234678-HpCDD		NDP	46.11099	NDP	NDP	NDP	NDP
3268-87-9	#	OCDD		NDP	66.19793	NDP	NDP	NDP	NDP
		Total 2,3,7,8-Dioxins		NDP					
51207-31-9	#	2378-TCDF		NDP	4.38978	NDP	NDP	NDP	NDP
57117-41-6	#	12378-PCDF		NDP	62.10627	NDP	NDP	NDP	NDP
57117-31-4	#	23478-PCDF		NDP	19.31760	NDP	NDP	NDP	NDP
70648-26-9	#	123478-HxCDF		NDP	92.43702	NDP	NDP	NDP	NDP
57117-44-9	#	123678-HxCDF		NDP	73.08760	NDP	NDP	NDP	NDP
60851-34-5	#	234678-HxCDF		NDP	93.85686	NDP	NDP	NDP	NDP
72918-21-9	#	123789-HxCDF		NDP	237.51014	NDP	NDP	NDP	NDP
67562-39-4	#	1234678-HpCDF		NDP	66.35514	NDP	NDP	NDP	NDP
55673-89-7	#	1234789-HpCDF		NDP	99.37867	NDP	NDP	NDP	NDP
39001-02-0	#	OCDF		NDP	101.40253	NDP	NDP	NDP	NDP
		Total 2,3,7,8-Furans		NDP					
		TEQ (WHO) Mammals					NDP	NDP	
		TEQ (WHO) Birds					NDP	NDP	
		TEQ (WHO) Fish					NDP	NDP	
		TEQ (NATO)					NDP	NDP	

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

Element Materials Technology

Client Name: Socotec
Reference: 23070409
Location: Shetland Island Council-Energy Recovery Plant
Contact: Chem Subcon

Sample Date: 28 Jun 2023
Date of Receipt: 7 Jul 2023
Date Analysed: 10 Aug 2023

Sample ID: 23070409-003
Depth:
EMT Job No: 23/11120
EMT Sample No: 3
Matrix: Solid (Ash)
Method: TM206/PM139 Dioxins, Furans and PCBs in solid samples by HR-GCMS

ANALYSIS OF PCBs

Q : Qualifiers

SV Indicates surrogate recovery outside performance criteria
>> Indicates value exceeds calibration range

Key

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

CAS No		Compound	Q	Result ng/kg	LOD	I-TEFs	TEQ Lower Bound	TEQ Upper Bound	% Recovery
70362-50-4	#	PCB-81		145.72175	1.84789	0.0003	0.04372	0.04372	29
32598-13-3	#	PCB-77		364.40888	1.35374	0.0001	0.03644	0.03644	45
65510-44-3	#	PCB-123		33.56643	1.38335	0.00003	0.00101	0.00101	63
31508-00-6	#	PCB-118		151.27809	1.30910	0.00003	0.00454	0.00454	63
74472-37-0	#	PCB-114		90.19828	1.38797	0.00003	0.00271	0.00271	63
32598-14-4	#	PCB-105		200.33734	1.43666	0.00003	0.00601	0.00601	61
57465-28-8	#	PCB-126		486.44375	2.75409	0.1	48.64438	48.64438	48
52663-72-6	#	PCB-167		146.37094	1.73307	0.00003	0.00439	0.00439	84
38380-08-4	#	PCB-156		409.25076	1.79639	0.00003	0.01228	0.01228	86
69782-90-7	#	PCB-157		246.44183	1.88016	0.00003	0.00739	0.00739	84
32774-16-6	#	PCB-169		224.14041	3.14084	0.03	6.72421	6.72421	54
39635-31-9	#	PCB-189		493.13766	1.16521	0.00003	0.01479	0.01479	68
		Total PCBs		2991.29612					
		TEQ (WHO) Mammals					55.50187	55.50187	
		TEQ (WHO) Birds					81.76471	81.76471	
		TEQ (WHO) Fish					2.56160	2.56160	

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

Element Materials Technology

Client Name: Socotec
Reference: 23070409
Location: Shetland Island Council-Energy Recovery Plant
Contact: Chem Subcon

Sample Date: 28 Jun 2023
Date of Receipt: 7 Jul 2023
Date Analysed: 31 Jul 2023

Sample ID: 23070409-004
Depth:
EMT Job No: 23/11120
EMT Sample No: 4
Matrix: Solid (Ash)
Method: TM206/PM139 Dioxins, Furans and PCBs in solid samples by HR-GCMS

ANALYSIS OF PCDDs and PCDFs

Q : Qualifiers

SV Indicates surrogate recovery outside performance criteria
>> Indicates value exceeds calibration range

Key

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

CAS No		Compound	Q	Result ng/kg	LOD	I-TEFs	TEQ Lower Bound	TEQ Upper Bound	% Recovery
1746-01-6	#	2378-TCDD		<0.13629	0.13629	1	0.00000	0.13629	95
40321-76-4	#	12378-PCDD		<0.48817	0.48817	1	0.00000	0.48817	89
39227-28-6	#	123478-HxCDD		0.73891	0.63130	0.1	0.07389	0.07389	76
57653-85-7	#	123678-HxCDD		2.16363	0.62141	0.1	0.21636	0.21636	74
19408-74-3	#	123789-HxCDD		1.42960	0.64418	0.1	0.14296	0.14296	
35822-46-9	#	1234678-HpCDD		43.25278	0.46375	0.01	0.43253	0.43253	77
3268-87-9	#	OCDD		265.35984	0.36571	0.0003	0.07961	0.07961	89
Total 2,3,7,8-Dioxins				312.94476					
51207-31-9	#	2378-TCDF		<0.33084	0.33084	0.1	0.00000	0.03308	75
57117-41-6	#	12378-PCDF		<0.46801	0.46801	0.03	0.00000	0.01404	80
57117-31-4	#	23478-PCDF		1.59479	0.44213	0.3	0.47844	0.47844	88
70648-26-9	#	123478-HxCDF		2.70716	0.75435	0.1	0.27072	0.27072	83
57117-44-9	#	123678-HxCDF		4.01382	0.80532	0.1	0.40138	0.40138	76
60851-34-5	#	234678-HxCDF		12.34237	0.92249	0.1	1.23424	1.23424	74
72918-21-9	#	123789-HxCDF		4.19380	1.05699	0.1	0.41938	0.41938	73
67562-39-4	#	1234678-HpCDF		44.90376	0.64264	0.01	0.44904	0.44904	75
55673-89-7	#	1234789-HpCDF		23.81427	0.70937	0.01	0.23814	0.23814	78
39001-02-0	#	OCDF		249.98167	0.32026	0.0003	0.07499	0.07499	78
Total 2,3,7,8-Furans				343.55164					
TEQ (WHO) Mammals							4.51168	5.18326	
TEQ (WHO) Birds							4.90404	5.90610	
TEQ (WHO) Fish							4.31048	4.97488	
TEQ (NATO)							5.19138	5.62824	

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

Element Materials Technology

Client Name: Socotec
Reference: 23070409
Location: Shetland Island Council-Energy Recovery Plant
Contact: Chem Subcon

Sample Date: 28 Jun 2023
Date of Receipt: 7 Jul 2023
Date Analysed: 31 Jul 2023

Sample ID: 23070409-004
Depth:
EMT Job No: 23/11120
EMT Sample No: 4
Matrix: Solid (Ash)
Method: TM206/PM139 Dioxins, Furans and PCBs in solid samples by HR-GCMS

ANALYSIS OF PCBs

Q : Qualifiers

SV Indicates surrogate recovery outside performance criteria
>> Indicates value exceeds calibration range

Key

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

CAS No		Compound	Q	Result ng/kg	LOD	I-TEFs	TEQ Lower Bound	TEQ Upper Bound	% Recovery
70362-50-4	#	PCB-81		0.08356	0.07297	0.0003	0.00003	0.00003	71
32598-13-3	#	PCB-77		0.58928	0.08362	0.0001	0.00006	0.00006	70
65510-44-3	#	PCB-123		<0.47521	0.47521	0.00003	0.00000	0.00001	69
31508-00-6	#	PCB-118		1.87616	0.46495	0.00003	0.00006	0.00006	67
74472-37-0	#	PCB-114		<0.43628	0.43628	0.00003	0.00000	0.00001	73
32598-14-4	#	PCB-105		0.81839	0.52421	0.00003	0.00002	0.00002	63
57465-28-8	#	PCB-126		0.67490	0.50735	0.1	0.06749	0.06749	69
52663-72-6	#	PCB-167		<0.22693	0.22693	0.00003	0.00000	0.00001	65
38380-08-4	#	PCB-156		0.53373	0.22305	0.00003	0.00002	0.00002	67
69782-90-7	#	PCB-157		0.33215	0.24616	0.00003	0.00001	0.00001	63
32774-16-6	#	PCB-169		<0.13783	0.13783	0.03	0.00000	0.00413	70
39635-31-9	#	PCB-189		1.49690	0.17275	0.00003	0.00004	0.00004	86
		Total PCBs		6.40507					
		TEQ (WHO) Mammals					0.06773	0.07189	
		TEQ (WHO) Birds					0.10769	0.10786	
		TEQ (WHO) Fish					0.00350	0.00351	

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

Matrix : Solid

[illegible]

Client Name: Socotec
Reference: 23070409
Location: Shetland Island Council-Energy Recovery Plant
Contact: Chem Subcon

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Client Name: Socotec
Reference: 23070409
Location: Shetland Island Council-Energy Recovery Plant
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.: 23/11120

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 requirement of our Accreditation Body 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: 23/11120

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
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.	Yes		AD	Yes

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	254
Client REFERENCE	23070409-002	2023
JOB NUMBER	23070409	
Purchase Order Number	B174455BEC	
DATE OF RECEIPT OF SAMPLE	10-Jul-23	
DATE OF TESTS	17-Jul-23	to 17-Jul-23
DATE OF REPORT	17-Jul-23	

ALL RESULTS RELATE ONLY TO SAMPLE TESTED

PFA RESULTS TO EN 450: 2012

FREE CALCIUM OXIDE	4.45 %
--------------------	--------

END OF REPORT

KIRTON CONCRETE
SERVICES LTD

redacted

SIGNED:.....

Certificate signed by:

redacted

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An independent testing laboratory specialising in the testing of cementitious materials

TEST REPORT PREPARED FOR SOCOTEC			
REPORT REFERENCE	SOC	255	
Client REFERENCE	23070409-003	2023	
JOB NUMBER	23070409		
Purchase Order Number	B174455BEC		
DATE OF RECEIPT OF SAMPLE	10-Jul-23		
DATE OF TESTS	17-Jul-23	to	17-Jul-23
DATE OF REPORT	17-Jul-23		

ALL RESULTS RELATE ONLY TO SAMPLE TESTED	
PFA RESULTS TO EN 450: 2012	
FREE CALCIUM OXIDE	24.54 %

END OF REPORT

KIRTON CONCRETE SERVICES LTD

redacted

SIGNED:.....

Certificate signed by:

redacted



Client: Shetland Islands Council
Project Name: Shetland Islands Council-Shetland Islands Council-Energy Recovery Plant
Project No: 23070409
Date Issued: 15/08/2023

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-Energy Recovery Plant
 Project No: 23070409
 Date Issued: 15/08/2023

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
PAHMSW	16 PAHs by GCMS	Unfiltered
PHCONDW	Electrical Conductivity @ 25°C	Filtered
PHCONDW	pH	Filtered



Client: Shetland Islands Council
 Project Name: Shetland Islands Council-Shetland Islands Council-Energy Recovery Plant
 Project No: 23070409
 Date Issued: 15/08/2023

PHCONDW	TDS: Total Dissolved Solids (Calc)	Filtered
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 in Water	
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

As part of method development the upper calibration limit for the PHCONDW method has been reduced from pH 13 to pH 12. A result of 12.675 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.
 AR

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-Energy Recovery Plant
Project No: 23070409
Date Issued: 15/08/2023

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