STACK EMISSIONS MONITORING REPORT

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Permit Reference:
EPR Permit: EPR/RP3233CZ/V002

Release Point:
Electrolysis

Sampling Date(s):
26th June 2019

SOCOTEC Job Number:	LNO 15135
Report Date:	11th July 2019
Version:	1
Report By: MCERTS Number: MCERTS Level: Technical Endorsements:	Lawrence Mason MM 07 849 MCERTS Level 2 - Team Leader 1, 2, 3 & 4
Report Approved By: MCERTS Number: Business Title: Technical Endorsements: Signature:	Keith Bird MM 07 825 MCERTS Level 2 - Team Leader 1, 2, 3 & 4 

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EXECUTIVE SUMMARY

MONITORING OBJECTIVES

Less Common Metals Ltd operates a vacuum furnaces process at Ellesmere Port which is subject to EPR Permit EPR/RP3233CZ/V002, under the Environmental Permitting Regulations 2010.

SOCOTEC LTD were commissioned by Less Common Metals Ltd to carry out stack emissions monitoring to determine the release of prescribed pollutants from the following Plant under normal operating conditions.

The results of these tests shall be used to demonstrate compliance with a set of emission limit values for prescribed pollutants as specified in the Plant's EPR Permit, EPR/RP3233CZ/V002.

Plant

Electrolysis

Operator

Less Common Metals Ltd
Unit 2 Vauxhall Supply Park
North Road
Ellesmere Port
Cheshire
CH65 1BL

EPR Permit: EPR/RP3233CZ/V002

Stack Emissions Monitoring Test House

SOCOTEC - Stockport Laboratory
Unit 5 Crown Industrial Estate
Kenwood Road
Stockport
SK5 6PH
UKAS and MCERTS Accreditation Number: 1015

EXECUTIVE SUMMARY

EMISSIONS SUMMARY					
Parameter	**Units**	**Result**	**Calculated Uncertainty +/-**	**Emission Limit Value (ELV)**	**MCERTS accredited result**
Total Particulate Matter	mg/m³	0.91	0.13	5	✓
Particulate Emission Rate	g/hr	7.1	1.0	-	
Hydrogen fluoride	mg/m³	0.17	0.02	0.5	✓
Hydrogen fluoride Emission Rate	g/hr	1.3	0.17	-	
Moisture	%	1.6	0.05	-	✓
Stack Gas Temperature	°C	20	-	-	
Stack Gas Velocity	m/s	13.0	0.31	-	
Gas Volumetric Flow Rate (Actual)	m³/hr	8447	433	-	✓
Gas Volumetric Flow Rate (STP, Wet)	m³/hr	7754	398	-	
Gas Volumetric Flow Rate (STP, Dry)	m³/hr	7628	391	-	
Gas Volumetric Flow Rate at Reference Conditions	m³/hr	7754	398	-	

ND = None Detected,

Results at or below the limit of detection are highlighted by bold italic text.

The above volumetric flow rate is calculated using data from the preliminary survey. Mass emissions for non isokinetic tests are calculated using these values. For all isokinetic testing the mass emission is calculated using test specific flow data and not the above values.

Reference conditions are 273K, 101.3kPa without correction for water vapour

EXECUTIVE SUMMARY

MONITORING TIMES			
Parameter	**Sampling Date(s)**	**Sampling Times**	**Sampling Duration**
Total Particulate Matter Run 1	26 June 2019	09:35 - 13:35	240 minutes
Hydrogen fluoride Run 1	26 June 2019	09:35 - 13:35	240 minutes
Preliminary Stack Traverse	26 June 2019	09:15	-

EXECUTIVE SUMMARY

PROCESS DETAILS

Parameter	Process Details
Description of process	Vacuum Furnaces
Continuous or batch	Continuous
Product Details	Non ferrous metals
Part of batch to be monitored (if applicable)	N/A
Normal load, throughput or continuous rating	Normal Load
Fuel used during monitoring	N/A
Abatement	Wet Scrubber
Plume Appearance	None Visible

EXECUTIVE SUMMARY

Monitoring Methods

The selection of standard reference / alternative methods employed by SOCOTEC is determined, wherever possible by the hierarchy of method selection outlined in Environment Agency Technical Guidance Note (Monitoring) M2.

MONITORING METHODS							
Species	**Method** Standard Reference Method / Alternative Method	**SOCOTEC Technical Procedure**	**UKAS Lab Number**	**MCERTS Accredited Method**	**Limit of Detection (LOD)**	**Calculated MU +/- % Result**	**Calculated MU +/- % ELV**
Total Particulate Matter	SRM - BS EN 13284-1	AE 104	1015	Yes	0.06 mg/m³	13.9%	2.5%
Hydrogen fluoride	SRM - BS ISO 15713	AE 113	1015	Yes	0.0011 mg/m³	12.7%	4.4%
Moisture	SRM - BS EN 14790	AE 105	1015	Yes	0.0037%	2.87%	N/A - No ELV
Velocity	SRM - BS EN ISO 16911-1	AE 154	1015	Yes	5 Pa	2.4%	N/A - No ELV
Volumetric Flow Rate	SRM - BS EN ISO 16911-1	AE 154	1015	Yes	-	5.1%	N/A - No ELV

BS EN 14790 has been validated over a range of 4 - 40%. It is however the prefered method of the Environment Agency for concentrations below 4%

EXECUTIVE SUMMARY

Analytical Methods

The following tables list the analytical methods employed together with the custody details. Unless otherwise stated the samples are archived at the analysis lab location.

SAMPLING METHODS WITH SUBSEQUENT ANALYSIS							
Species	**Analytical Technique**	**Analytical Procedure**	**UKAS Lab Number**	**UKAS Accredited Lab Analysis**	**Analysis Lab**	**Analysis Report number**	**Archive Period**
Total Particulate Matter	Gravimetric	AE 106	1015	Yes	SOCOTEC (Stockport)	N/A	8 Weeks
Hydrogen fluoride	Ion Chromatography	ASC/SOP/110	1252	Yes	SOCOTEC (Bretby)	39750	8 Weeks

ON-SITE TESTING							
Species	**Analytical Technique**	**Analytical Procedure**	**UKAS Lab Number**	**MCERTS Accredited Analysis**	**Laboratory**	**Data Archive Location**	**Archive Period**
Moisture	Gravimetric	AE 105	1015	Yes	SOCOTEC (Stockport)	-	-

EXECUTIVE SUMMARY

SAMPLING LOCATION					
Sampling Plane Validation Criteria	**Value**	**Units**	**Requirement**	**Compliant**	**Method**
Lowest Differential Pressure	132	Pa	>= 5 Pa	Yes	BS EN 15259
Lowest Gas Velocity	12.8	m/s	-	-	-
Highest Gas Velocity	13.1	m/s	-	-	-
Ratio of Gas Velocities	1.0	: 1	< 3 : 1	Yes	BS EN 15259
Mean Velocity	13.0	m/s	-	-	-
Maximum angle of flow with regard to duct axis	<15	°	< 15°	Yes	BS EN 15259
No local negative flow	Yes	-	-	Yes	BS EN 15259

DUCT CHARACTERISTICS		
	Value	**Units**
Shape	Circular	-
Depth	0.48	m
Width	-	m
Area	0.18	m^2
Port Depth	40	mm

SAMPLING LINES & POINTS		
	Isokinetic	**Non-Iso & Gases**
Sample port size	4 inch BSP	-
Number of lines used	1	-
Number of points / line	4	-
Duct orientation	Horizontal	-
Filtration	Out Stack	-
Filtration for TPM	Out Stack	-

SAMPLING PLATFORM	
General Platform Information	
Permanent / Temporary Platform / Ground level / Floor Level / Roof	Ground Level
Inside / Outside	Outside

M1 Platform requirements	
Is there a sufficient working area so work can be performed in a compliant manner	Yes
Platform has 2 levels of handrails (approximately 0.5 m & 1.0 m high)	N/A
Platform has vertical base boards (approximately 0.25 m high)	N/A
Platform has removable chains / self closing gates at the top of ladders	N/A
Handrail / obstructions do not hamper insertion of sampling equipment	N/A
Depth of Platform = >Stack depth / diameter + wall and port thickness + 1.5m	Yes

Sampling Platform Improvement Recommendations (if applicable)

The sampling location meets all the requirements as specified in EA Guidance Note M1.

EXECUTIVE SUMMARY

Sampling & Analytical Method Deviations

Nozzle Size

To maintain an isokinetic ratio a nozzle smaller than the recommended 6mm was used.

APPENDICES

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APPENDIX 1 - Monitoring Schedule, Calibration Checklist & Monitoring Team

MONITORING SCHEDULE					
Species	**Method** Standard Reference Method / Alternative Method	**SOCOTEC Technical Procedure**	**UKAS Lab Number**	**MCERTS Accredited Method**	**Number of Samples**
Total Particulate Matter	SRM - BS EN 13284-1	AE 104	1015	Yes	1
Hydrogen fluoride	SRM - BS ISO 15713	AE 113	1015	Yes	1
Moisture	SRM - BS EN 14790	AE 105	1015	Yes	1
Velocity	SRM - BS EN ISO 16911-1	AE 154	1015	Yes	1

APPENDIX 1 - Monitoring Schedule, Calibration Checklist & Monitoring Team

CALIBRATEABLE EQUIPMENT CHECKLIST

Extractive Sampling		Instrumental Analyser/s		Miscellaneous	
Equipment	**Equipment I.D.**	**Equipment**	**Equipment I.D.**	**Equipment**	**Equipment I.D.**
Control Box DGM	LNO 13-17	Horiba PG-250 Analyser	-	Laboratory Balance	LNO 00-13, 00-12
Box Thermocouples	LNO 03-17	FT-IR Gasmet	-	Tape Measure	LNO 24-LM
Meter In Thermocouple	LNO 03-17	FT-IR Oven Box	-	Stopwatch	-
Meter Out Thermocouple	LNO 03-17	Bernath 3006 FID	-	Protractor	-
Control Box Timer	LNO 17-17	Signal 3030 FID	-	Barometer	LNO 08-LM
Oven Box	LNO 09-68	Servomex	-	Digital Micromanometer	-
Probe	LNO 11-08	JCT Heated Head Filter	-	Digital Temperature Meter	-
Probe Thermocouple	LNO 10-08	Thermo FID	-	Stack Thermocouple	-
Probe	-	Stackmaster	-	Mass Flow Controller	-
Probe Thermocouple	-	FTIR Heater Box for Heated Line	-	MFC Display module	-
S-Pitot	LNO 06-LM	Anemometer	-	1m Heated Line (1)	-
L-Pitot	-	Ecophysics NOx Analyser	-	1m Heated Line (2)	-
Site Balance	LNO 14-05	Chiller (JCT/MAK 10)	-	1m Heated Line (3)	-
Last Impinger Arm	-	Heated Line Controller (1)	-	5m Heated Line (1)	-
Dioxins Cond. Thermocouple	-	Heated Line Controller (2)	-	10m Heated Line (1)	-
Callipers	LNO 31-LM	Site temperature Logger	LNO 12-LM	10m Heated Line (2)	-
Small DGM	-		-	15m Heated Line (1)	-
Heater Controller	-		-	20m Heated Line (1)	-
Inclinometer (Swirl Device)	LNO 23-LM		-	20m Heated Line (2)	-

NOTE: If the equipment I.D is represented by a dash (-), then this piece of equipment has not been used for this test.

CALIBRATION GASES

Gas (traceable to ISO 17025)	Cylinder I.D Number	Supplier	ppm	%	Analytical Tolerance +/- %
-	-	-	-	-	-

STACK EMISSIONS MONITORING TEAM

MONITORING TEAM								
Personnel	**MCERTS Number**	**MCERTS**		**TE / H&S Qualifications and Expiry Date**				
		Level	**Expiry**	**TE1**	**TE2**	**TE3**	**TE4**	**H&S**
Lawrence Mason	MM 07 849	MCERTS Level 2	Sep-20	Jun-23	Dec-20	Sep-21	Sep-20	Jun-22
Joe Saxton	MM 18 1501	MCERTS Level 1	Sep-23	-	-	-	-	Sep-23

APPENDIX 2 - Summaries, Calculations, Raw Data and Charts

TOTAL PARTICULATE MATTER SUMMARY					
Parameter	**Sampling Times**	**Concentration mg/m³**	**Uncertainty mg/m³**	**ELV mg/m³**	**Emission Rate g/hr**
Run 1	09:35 - 13:35 26 June 2019	0.91	0.13	5.0	7.1
Blank	-	0.60	-	-	-

Reference conditions are 273K, 101.3kPa without correction for water vapour

Acetone Blank Value mg/l	Acceptable Value mg/l
2.0	10

FILTER INFORMATION

SAMPLES								
Test	Filter & Probe Rinse Number	Filter Start Weight g	Filter End Weight g	Mass Gained on Filter g	Probe Rinse Start Weight g	Probe Rinse End Weight g	Mass Gained on Probe g	Combined Total Mass Gained g
Run 1	Q0791	0.14641	0.14699	0.00058	183.51880	183.52130	0.00250	0.00308

If total mass gained is less than the LOD then the LOD is reported

BLANKS								
Test	Filter & Probe Number	Filter Start Weight g	Filter End Weight g	Mass Gained Filter g	Probe Start Weight g	Probe End Weight g	Mass Gained Probe g	Combined Total Mass Gained g
Run 1	Q0801	0.14694	0.14928	0.00234	174.78090	174.78060	-0.00030	0.00204

If total mass gained is less than the LOD then the LOD is reported

APPENDIX 2 - Summaries, Calculations, Raw Data and Charts

ISOKINETIC SAMPLING EQUATIONS - RUN 1 — TPM

Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	Kpa	100.9
Stack static pressure, P_{static}	pa	-1100
$P_s = P_b + P_{static}$	Kpa	99.8
Vol. of water vapour collected, V_{wstd}		
Moisture trap weight increase,Vlc	g	44.0
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.054824
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m		3.791
Gas meter correction factor, Y_d		0.969
Mean dry gas meter temperature, T_m		301
Mean pressure drop across orifice, DH	mmH_2O	25.500
$V_{mstd} = \frac{(0.3592)(V_m)(P_b+(DH/13.6))(Y_d)}{T_m}$	m^3	3.325
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = V_{mstd} + V_{wstd}$	m^3	3.3800
Vol. of gas metered at O_2 Ref. Cond., $V_{mstd@X\%O2}$		
Is the process burning hazardous waste? *(If yes, no favourable oxygen correction)*		No
% oxygen measured in gas stream, act%O_2		20.9
% oxygen reference condition		21
O_2 Reference Factor O_2 Ref = $\frac{21.0 - act\%O_2}{21.0 - ref\%O_2}$		No O2 Ref
$V_{mstd@X\%oxygen} = (V_{mstd})(O_{2\ Ref})$	m^3	No O2 Ref
Moisture content, B_{wo}		
$B_{wo} = \frac{V_{wstd}}{V_{mstd} + V_{wstd}}$		0.0162
	%	1.62
Moisture by FTIR	%	-
Velocity of stack gas, V_s		
Velocity pressure coefficient, C_p		0.85
Mean of velocity heads, DP_{avg}	Pa	137.20
Mean stack gas temperature, T_s	K	294
Gas density (wet, ambient), p		
p=(Ms*Ps)/(8.314*Ts)	kg/m^3	1.170
Stack Velocity, Vs $V_s = Cp\sqrt{\frac{\Delta DPavg}{p}}$	m/s	13.05

Molecular weight of dry gas, M_d		
CO_2	%	0.03
O_2	%	20.90
Total	%	20.93
N_2 (100 -Total)	%	79.07
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$		28.84
Molecular weight of wet gas, M_s		
$M_s = M_d(1 - B_{wo}) + 18(B_{wo})$	g/gmol	28.66
Actual flow of stack gas, Q_a		
Area of stack, A_s	m^2	0.18
$Q_a = (60)(A_s)(V_s)$	m^3/min	141.7
Total flow of stack gas, Q		
Conversion factor (K/mm.Hg)		0.3592
$Q_{std} = \frac{(Q_a)P_s(0.3592)(1-B_{wo})}{(T_s)}$	Dry	127.4
$Q_{stdO2} = \frac{(Q_a)P_s(0.3592)(1-B_{wo})(O_2REF)}{(T_s)}$	@O_2ref	No O2 Ref
$Q_{stw} = \frac{(Q_a)P_s(0.3592)}{(T_s)}$	Wet	129.53
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	4.96
Nozzle area, A_n	mm^2	19.35
Total sampling time, q	min	240
$\%I = \frac{(4.6398E6)(T_s)(V_{mstd})}{(P_s)(V_s)(A_n)(q)(1-B_{wo})}$	%	101.7
Acceptable isokinetic range 95% to 115%		Yes
Particulate Concentration, C		
Mass collected on filter, M_f	g	0.00058
Mass collected in probe, M_p	g	0.00250
Total mass collected, M_n	g	0.00308
$C_{wet} = \frac{M_n}{V_{mstw}}$	mg/m^3	0.911
$C_{dry} = \frac{M_n}{V_{mstd}}$	mg/m^3	0.926
$C_{dry@X\%O2} = \frac{M_n}{V_{mstd@X\%oxygen}}$	mg/m^3	No O2 Ref
Particulate Emission Rates, E		
$E = [(C_{wet})(Q_{stw})(60)] / 1000$		7.08

APPENDIX 2 - Summaries, Calculations, Raw Data and Charts

TOTAL PARTICULATE MATTER QUALITY ASSURANCE CHECKLIST

LEAK RATE						
Run	Mean Sampling Rate litre/min	Pre-sampling Leak Rate litre/min	Post-sampling Leak Rate litre/min	Maximum Vacuum mm Hg	Acceptable Leak Rate litre/min	Leak Tests Acceptable?
Run 1	15.30	0.14	0.13	-381	0.31	Yes

ISOKINETICITY		
Run	Isokinetic Variation %	Acceptable Isokineticity
Run 1	101.69	Yes

Acceptable isokinetic range 95% to 115%

WEIGHING BALANCE UNCERTAINTY			
Run	Result mg/m³	5% ELV mg/m³	LOD < 5% ELV
Run 1	0.06	0.3	N/A - ELV <5 mg/m³

The above is based on both the Filter and rinse uncertainty
Where installations have ELVs of 5 mg/m³ or less, it may not be practical to meet the 5% of ELV requirement. Under these circumstances, a minimum one hour sample time shall used.

BLANK VALUE				
Run	Overall Blank Value mg/m^3	Daily Emission Limit Value mg/m^3	Acceptable Blank Value mg/m^3	Overall Blank Acceptable mg/m^3
Blank 1	0.60	5	1.0	Yes

*For ELVs of 5 mg/m3 and lower a blank value must be <20% of the ELV

FILTERS					
Run	Filter Material	Filter Size mm	Max Filtration Temperature °C	Pre-use Filter Conditioning Temperature °C	Post-use Filter Conditioning Temperature °C
Run 1	Quartz Fibre	47	150	180	160

APPENDIX 2 - Summaries, Calculations, Raw Data and Charts

HYDROGEN FLUORIDE SUMMARY					
Test	Sampling Times	Concentration mg/m³	LOD mg/m³	ELV mg/m³	Emission Rate g/hr
Run 1	09:35 - 13:35 26 June 2019	0.17	0.001	0.50	1.3
Field Blank	-	0.001	-	-	-

Reference conditions are 273K, 101.3kPa without correction for water vapour

HYDROGEN FLUORIDE QUALITY ASSURANCE CHECKLIST

Leak Test Results	Total Sample Volume @ ref Conditions m³	Mean Sampling Rate l/min	Pre sampling leak rate l/min	Post sampling leak rate l/min	Acceptable leak rate l/min	Leak Tests Acceptable?
Run 1	3.4	15.3	0.14	0.13	0.31	Yes

	Filter Material	Filter Size mm	Max. Filtration Temp. °C	Temperature during storage / transit <25°C	Type of Absorbers	Absorption Solutions
Run 1	Quartz Fibre	47	150	21	PE	0.1N Sodium Hydroxide

HYDROGEN FLUORIDE ABSORPTION EFFICIENCY

Parameter	Total ug	IMP C ug	Absorption Efficiency %	Acceptable Absorption Efficiency %	Absorption Efficiency Acceptable ?
Run 1	584.92	101.92	83	95	N/A- < 1mg/m³

ND - None Detected

APPENDIX 2 - Summaries, Calculations, Raw Data and Charts

ISOKINETIC SAMPLING EQUATIONS 1 — Hydrogen fluoride

Absolute pressure of stack gas, P_s			**Velocity of stack gas, V_s**		
Barometric pressure, P_b	kPa	100.9	Velocity pressure coefficient, C_p		0.852
Stack static pressure, P_{static}	Pa	-1100	Mean of velocity heads, DP_{avg}	Pa	137.20
$P_s = P_b + (P_{static})$	kPa	99.80	Mean stack gas temperature, T_s	K	294.10
			Gas density $_{(wet, ambient)}$, p		
Vol. of water vapour collected, V_{wstd}			p=(Ms*Ps)/(8.314*Ts)	kg/m^3	1.170
Moisture trap weight increase,Vlc	g	-	Stack Velocity, Vs $V_s = Cp\sqrt{\frac{\Delta DPavg}{p}}$		
$V_{wstd} = (0.001246)(V_{lc})$	m^3	-		m/s	13.05
Volume of gas metered dry, V_{mstd}			**Actual flow of stack gas, Q_a**		
Volume of gas sample through gas meter, V_m	m^3	3.7910	Area of stack, A_s	m^2	0.18
Gas meter correction factor, Y_d		0.9686	$Q_a = (60)(A_s)(V_s)$	m^3/min	142
Mean dry gas meter temperature, T_m	K	300.92	**Dry total flow of stack gas, Q_{std}**		
Mean pressure drop across orifice, DH	mmH_2O	25.50	Conversion factor (K/mm.Hg)		0.3592
$V_{mstd} = \frac{(0.3592)(V_m)(P_b+(DH/13.6))(Y_d)}{T_m}$	m^3	3.33	$Q_{std} = \frac{(Q_a)P_s(0.3592)(1-B_{wo})}{(T_s)}$	m^3/min	127
Volume of gas metered wet, V_{mstw}			**Wet total flow of stack gas, Q_{stw}**		
$V_{mstw} = V_{mstd} + V_{wstd}$	m^3	3.3800	$Q_{stw} = \frac{(Q_a)P_s(0.3592)}{(T_s)}$	m^3/min	130
Vol. of gas metered at O_2 Ref. Cond., $V_{mstd@X\%O2}$			**Dry total flow of stack gas at X% O_2, Q_{stdO2}**		
Is the process burning hazardous waste? *(If yes, no favourable oxygen correction)*		No	$Q_{stdO2} = \frac{(Q_a)P_s(0.3592)(1-B_{wo})(O_2REF)}{(T_s)}$	m^3/min	No O2 Ref
% oxygen measured in gas stream, act%O_2		20.90			
% oxygen reference condition		21	**Percent isokinetic, %I**		
O_2 Reference Factor $\frac{O2\ Ref = 21.0 - act\%O2}{21.0 - ref\%O2}$		No O2 Ref	Nozzle diameter, D_n	mm	4.96
			Nozzle area, A_n	mm^2	19.35
$V_{mstd@X\%oxygen} = (V_{mstd})\ (O_{2\ Ref})$	m^3	No O2 Ref	Total sampling time, q	min	240
Moisture content, B_{wo}			%I = $\frac{(4.6398E6)(T_s)(V_{mstd})}{(P_s)(V_s)(A_n)(q)(1-B_{wo})}$	%	102
$B_{wo} = \frac{V_{wstd}}{V_{mstd} + V_{wstd}}$		0.0162			
	%	1.62	Acceptable isokinetic range 95% to 115%		Yes
Moisture by FTIR	%	-	**Hydrogen fluoride Concentration, C**		
Molecular weight of dry gas, M_d			Mass collected , M	ug	585
CO_2		0.03	$C_{wet} = \frac{M_n}{V_{mstw}}$	mg/m^3	0.173
O_2		20.90			
Total		20.93	$C_{dry} = \frac{M_n}{V_{mstd}}$	mg/m^3	0.176
N_2 (100 -Total)		79.07			
			$C_{dry@X\%O2} = \frac{M_n}{V_{mstd@X\%oxygen}}$	mg/m^3	No O2 Ref
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$		28.84			
Molecular weight of wet gas, M_s			**Hydrogen fluoride Emission Rates, E**		
$M_s = M_d(1 - B_{wo}) + 18(B_{wo})$	g/gmol	28.7	$E = [(C_{wet})(Q_{stw})(60)] / 1000$	g/hr	1.34

APPENDIX 2 - Summaries, Calculations, Raw Data and Charts

MOISTURE CALCULATIONS

Moisture Determination - Isokinetic							
Test Number	Sampling Time and Date	Start Weight kg	End Weight kg	Total gain kg	Concentration %	LOD %	Uncertainty %
Run 1	09:35 - 13:35 26 June 2019	3.3530	3.3970	0.0440	1.6	0.004	2.9

Moisture Quality Assurance							
Test Number	Sampling Duration mins	Total Volume Sampled l	Sampling Rate l/min	Start Leak Rate l/min	End Leak Rate l/min	Acceptable Leak Rate l/min	Leak Tests Acceptable?
Run 1	240	3380	15.3	0.14	0.13	0.31	Yes

PRELIMINARY STACK SURVEY

Stack Characteristics		
Stack Diameter / Depth, D	0.48	m
Stack Width, W	-	m
Stack Area, A	0.18	m^2
Average stack gas temperature	20	^oC
Stack static pressure	-1.1	kPa
Barometric Pressure	100.9	kPa

Stack Gas Composition & Molecular Weights								
Component	Molar Mass M	Density kg/m^3 p	Conc Dry % Vol	Dry Volume Fraction r	Dry Conc kg/m^3 pi	Conc Wet % Vol	Wet Volume Fraction r	Wet Conc kg/m^3 pi
CO_2	44	1.963059	0.028571	0.000286	0.000561	0.028108	0.000281	0.000552
O_2	32	1.427679	20.900000	0.209000	0.298385	20.561004	0.205610	0.293545
N_2	28	1.249219	79.071429	0.790714	0.987775	77.788896	0.777889	0.971754
H_2O	18	0.803070	-	-	-	1.621993	0.016220	0.013026

Where: p = M / 22.41 pi = r x p

Calculation of Stack Gas Densities		
Determinand	Result	Units
Dry Density (STP), P_{STD}	1.2867	kg/m^3
Wet Density (STP), P_{STW}	1.2789	kg/m^3
Dry Density (Actual), P_{Actual}	1.1811	kg/m^3
Average Wet Density (Actual), $P_{ActualW}$	1.174	kg/m^3

Where:

P_{STD} = sum of component concentrations, kg/m^3 (not including water vapour)

$P_{STW} = (P_{STD} + pi \text{ of } H_2O) / (1 + (pi \text{ of } H_2O / 0.8036))$

$P_{Actual} = P_{STD}$ x (Ts / Ps) x (Pa / Ta)

$P_{ActualW} = P_{STW}$ x (Ts / Ps) x (Pa / Ta)

APPENDIX 2 - Summaries, Calculations, Raw Data and Charts

PRELIMINARY STACK SURVEY

TRAVERSE 1

Date of Survey	26 June 2019
Time of Survey	09:15
Velocity Measurement Device:	S-Type Pitot

Sampling Line A								
Traverse Point	Distance into duct (m)	DP pt Pa (average of 3 readings)	DP pt mmH_2O (average of 3 readings)	Temp °C	Velocity m/s	Volumetric Flow Rate (actual) m^3/s	O_2 % Vol	Angle of Swirl °
1	0.05	137.2	14.0	20	13.0	2.4	-	<15
2	0.12	139.2	14.2	20	13.1	2.4	-	<15
3	0.36	135.2	13.8	20	12.9	2.3	-	<15
4	0.43	132.3	13.5	20	12.8	2.3	-	<15
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
Mean	-	136.0	13.9	20	13.0	2.3	-	-

Sampling Line B								
Traverse Point	Distance into duct (m)	DP pt Pa (average of 3 readings)	DP pt mmH_2O (average of 3 readings)	Temp °C	Velocity m/s	Volumetric Flow Rate (actual) m^3/s	O_2 % Vol	Angle of Swirl °
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
Mean	-	-	-	-	-	-	-	-

PRELIMINARY STACK SURVEY QUALITY ASSURANCE CHECKLIST

PITOT LEAK CHECK								
Run	Pre Traverse Leak Rate				Post Traverse Leak Rate			
	Start Value mmH2O	End Value mmH2O	Difference %	Outcome	Start Value mmH2O	End Value mmH2O	Difference %	Outcome
Run 1	114	113	0.9	Pass	129	127	1.6	Pass

To complete a compliant pitot leak check a pressure of over 80 mmH_2O (or 800 Pa) is applied and the pressure drop monitored over 5 mins. A drop of less than 5% must be observed.

S-Type Pitot Stagnation Check				
Run	Stagnation (Pa)	Reference (Pa)	Difference (Pa)	Outcome (Permitted +/- 10 Pa)
Run 1	-1100	-1100	0.0	Pass

APPENDIX 2 - Summaries, Calculations, Raw Data and Charts

PRELIMINARY STACK SURVEY (CONTINUED)

Sampling Plane Validation Criteria				
EA Technical Guidance Note (Monitoring) M1	Result	Units	Requirement	Compliant
Lowest Differential Pressure	132	Pa	>= 5 Pa	Yes
Lowest Gas Velocity	12.8	m/s	-	-
Highest Gas Velocity	13.1	m/s	-	-
Ratio of Gas Velocities	1.0	-	< 3 : 1	Yes
Maximum angle of flow with regard to duct axis	<15	°	< 15°	Yes
No local negative flow	Yes	-	-	Yes

Calculation of Stack Gas Velocity, V		
Velocity at Traverse Point, V = K_{pt} x (1-e) * O(2 * DP_{pt} / $P_{ActualW}$)		
Where:		
K_{pt} = Pitot tube calibration coefficient		
(1-e) = Compressibility correction factor, assumed at a constant 0.998		
Average Stack Gas Velocity, Va	**13.0**	m/s

Calculation of Stack Gas Volumetric Flowrate, Q			
Duct gas flow conditions	Actual	Reference	Units
Temperature	20	0	°C
Total Pressure	99.8	101.3	kPa
Oxygen	20.9	21	%
Moisture	1.62	1.62	%
Pitot tube calibration coefficient, K_{pt}	0.85		

Gas Volumetric Flowrate	Result	Units
Average Stack Gas Velocity (Va)	12.96	m/s
Stack Area (A)	0.18	m^2
Gas Volumetric Flowrate (Actual), Q_{Actual}	8447	m^3/hr
Gas Volumetric Flowrate (STP, Wet), Q_{STP}	7754	m^3/hr
Gas Volumetric Flowrate (STP, Dry), $Q_{STP,Dry}$	7628	m^3/hr
Gas Volumetric Flowrate (REF), Q_{Ref}	7754	m^3/hr

Where:

Q_{Actual} = Va x A x 3600

Q_{STP} = Q (Actual) x (Ts / Ta) x (Pa / Ps) x 3600

$Q_{STP,Dry}$ = Q (STP) / (100 - (100 / Ma)) x 3600

Q_{Ref} = Q (STP) x ((100 - Ma) / (100 - Ms)) x ((21 - O_2a) / (21 - O_2s))

Nomenclature:

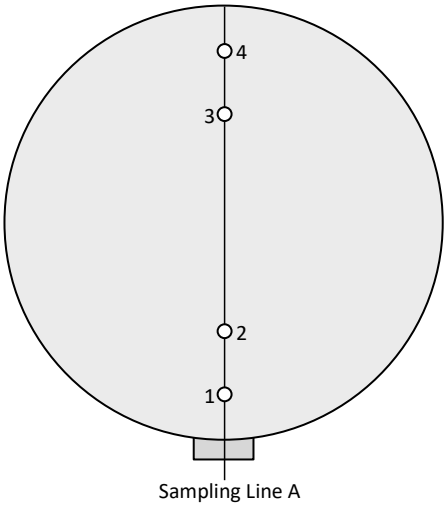
Ts = Absolute Temperature, Standard Conditions, 273 K
Ps = Absolute Pressure, Standard Conditions, 101.3 kPa
Ta = Absolute Temperature, Actual Conditions, K
Pa = Absolute Pressure, Actual Conditions, kPa
Ma = Water vapour, Actual Conditions, % Vol
Ms = Water vapour, Reference Conditions, % Vol
O_2a = Oxygen, Actual Conditions, % Vol
O_2s = Oxygen, Reference Conditions, % Vol

APPENDIX 2 - Summaries, Calculations, Raw Data and Charts

STACK DIAGRAM

	Value	Units
Stack Depth	0.48	m
Stack Width	-	m
Area	0.18	m^2

Non-Isokinetic/Gases Sampling			
Sampling Point	Distance (% of Depth)	Distance into Stack	Units
-	-	-	-



Isokinetic Sampling			
Sampling Point	Distance (% of Depth)	Distance into Stack (m)	Swirl °
1	10.4	0.05	< 15
2	25.0	0.12	< 15
3	75.0	0.36	< 15
4	89.6	0.43	< 15
-	-	-	-
-	-	-	-
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-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
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-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

	Isokinetic sampling point
	Isokinetic sampling points not used
	Non Isokinetic/Gases sampling point

SAMPLING LOCATION

APPENDIX 3 - Measurement Uncertainty Budget Calculations

MEASUREMENT UNCERTAINTY BUDGET - TOTAL PARTICULATE MATTER

Run	Sampled Volume	Sampled Gas Temp	Sampled Gas Pressure	Sampled Gas Humidity	Oxygen Content	Limit of Detection	Leak	Uncollected Mass
	m^3	K	kPa	% by volume	% by volume	% by mass	%	mg
MU required	**≤ 2%**	**≤ 2%**	**≤ 1%**	**≤ 1%**	**≤ 10%**	**≤ 5% of ELV**	**≤ 2%**	**≤ 10% of ELV**
Run 1	0.001	2.0	0.50	1.0	N/A	0.21	-	-
as a %	0.03	0.68	0.50	1.0	N/A	1.24	0.92	0.041
compliant?	**Yes**	**Yes**	**Yes**	**Yes**	**N/A**	**Yes**	**Yes**	**Yes**

*Where installations have ELVs of 5 mg/m³ or less, it may not be practical to meet the 5% of ELV requirement. Under these circumstances, a minimum one hour sample time shall used.

Run	Volume (STP)	Mass of particulate	O_2 Correction	Leak	Uncollected Mass	Combined uncertainty
	m^3	mg	-	mg/m^3	mg	
Run 1	3.07	3.0800	1.0	0.005	0.0012	-
MU as mg/m^3	0.01	0.0621	-	0.005	0.0003	**0.06**
MU as %	1.31	6.8182	-	0.528	0.0382	-

R1 - Uncertainty expressed at a 95% confidence level (where k = 2)	**0.13**	**mg/m^3**	**13.93**	**% Result**	**2.54**	**% ELV**

(k is a coverage factor which gives a 95% confidence in the quoted figures)
Reference – SOCOTEC Technical Procedure AE150 Estimation of Uncertainty of Measurement

APPENDIX 3 - Measurement Uncertainty Budget Calculations

MEASUREMENT UNCERTAINTY BUDGET - ISOKINETIC HYDROGEN FLUORIDE

Run	Sampled Volume m³	Sampled Gas Temp K	Sampled Gas Pressure kPa	Sampled Gas Humidity % by volume	Oxygen Content % by volume	Limit of Detection % by mass	Leak %
MU required	**<=2%**	**<2.5 k**	**<=1%**	**<=1%**	**<=5%**	**≤ 5% of ELV**	**<=2%**
Run 1	3.38	300.92	89.9	1.0	-	1.04	-
as a %	0.03	0.66	0.56	1.0	-	0.34	0.85
compliant?	**Yes**	**Yes**	**Yes**	**Yes**	**N/A**	**Yes**	**Yes**

Run	Volume (STP) m³	Mass of Hydrogen fluoride mg	O2 Correction -	Leak mg/m³	Lab Uncertainty mg	Combined uncertainty
Run 1	2.7214	1.0382	-	0.0008	-	-
MU as mg/m³	0.0023	0.0017	-	0.0008	0.0106	**0.0110**
MU as %	1.3238	0.9909	-	0.4906	6.1	-

R1 - Uncertainty expressed at a 95% confidence level (where k = 2)	**0.02**	**mg/m³**	**12.68**	**% Result**	**4.39**	**% ELV**

(k is a coverage factor which gives a 95% confidence in the quoted figures)
Reference – SOCOTEC Technical Procedure AE150 Estimation of Uncertainty of Measurement

APPENDIX 3 - Measurement Uncertainty Budget Calculations

MEASUREMENT UNCERTAINTY BUDGET - MOISTURE

Run	Sampled Volume m^3	Sampled Gas Temp K	Sampled Gas Pressure kPa	Sampled Gas Humidity % by volume	Oxygen Content % by volume	Leak %
MU required	**≤ 2%**	**≤ 2%**	**≤ 1%**	**≤ 1%**	**≤ 10%**	**≤ 2%**
Run 1	0.001	2.0	0.50	1.0	N/A	-
as a %	0.03	0.68	0.50	1.0	N/A	0.92
compliant?	**Yes**	**Yes**	**Yes**	**Yes**	**N/A**	**Yes**

Run	Volume (STP) m^3	Mass Gained mg	O_2 Correction -	Leak mg/m^3	Uncollected Mass mg	Combined uncertainty
Run 1	3.07	44000	1.0	69.91	58	-
MU as % v/v	0.02	0.00	-	0.01	0.002	**0.02**
MU as %	1.31	0.23	-	0.53	0.13	-

R1 - Uncertainty expressed at a 95% confidence level (where k = 2)	**0.05**	**% v/v**	**2.87**	**%**

APPENDIX 3 - Measurement Uncertainty Budget Calculations

MEASUREMENT UNCERTAINTY BUDGET - VELOCITY & VOLUMETRIC FLOW RATE

Measured Velocity at Actual Conditions	13.0	m/s
Measured Volumetric Flow rate at Actual Conditions	8447	m³/hr

Performance Characteristics & Source of Value	Units	Values	Requirement	Compliant
Uncertainty of Local Gas Velocity Determination				
Uncertainty of pitot tube coefficient	-	0.010		
Uncertainty of mean local dynamic pressures	-	1.14		
Factor loading, function of the number of measurements.	3 readings	0.591	minimum 3	Yes
Range of measurment device	pa	1000		
Resolution	pa	1.00		
Calibration uncertainty	pa	21.55	<1% of Value or 20 Pa whichever is greater	Yes
Drift	% range	0.10		
Linearity	% range	0.06	<2% of value	Yes
Uncertainty of gas density determination				
Uncertainty of molar mass determination	kg/mol	0.00003		
Uncertainty of temperature measurement	K	1.49	<1% of value	Yes
Uncertainty of absolute pressure in the duct	pa	509		
Uncertainty associated with the estimate of density	-	0.007		
Uncertainty associated with the measurement of local velocity	-	0.0001		
Uncertainty associated with the measurement of mean velocity	-	0.0002		

Measurement Uncertainty - Velocity	m/s
Combined uncertainty	0.16
Expanded uncertainty at a 95% Confidence Interval	0.31

Note - The expanded uncertainty uses a coverage factor of k = 2.

Expanded Measurement Uncertainty of Velocity at a 95% Confidence Interval	%
Expressed as a % of the Measured Velocity	1.2
Expanded uncertainty at a 95% Confidence Interval	2.4

Measurement Uncertainty Volumetric Flow Rate	m³/hr
Combined uncertainty	221
Expanded uncertainty at a 95% Confidence Interval	433

Note - The expanded uncertainty uses a coverage factor of k = 2.

Expanded Measurement Uncertainty of Volumetric Flow Rate at a 95% Confidence Interval	%
Expressed as a % of the Measured Volumetric Flow Rate	2.6
Expanded uncertainty at a 95% Confidence Interval	5.1

Reference – SOCOTEC Technical Procedure AE150 Estimation of Uncertainty of Measurement

END OF REPORT

Thank you for choosing SOCOTEC for your environmental monitoring needs. We hope our services have met your requirements and that you are fully satisfied with your experience of working with us, we really do value your custom and would welcome your feedback. We would appreciate it if you could take a moment to complete a short online questionnaire so that we can improve our operations and address any areas that have not met with your expectations, by clicking on the following

https://www.surveymonkey.co.uk/r/CAE_customer_feedback_weblink

Companies House

Companies House does not verify the accuracy of the information filed (http://resources.companieshouse.gov.uk/serviceInformation.shtml#complnfo)

LESS COMMON METALS LIMITED

Company number **02690088**

- Officers
- Persons with significant control (https://beta.companieshouse.gov.uk/company/02690088/persons-with-significant-control)

Filter officers

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31 officers / 25 resignations

BONEHILL, Bridget Anne

Correspondence address
Unit 2, Hooton Park, North Road, Ellesmere Port, United Kingdom, CH65 1BL

Role Active **Secretary**

Appointed on **11 December 2015**

HALL, Christopher William

Correspondence address
Unit 2, Hooton Park, North Road, Ellesmere Port, United Kingdom, CH65 1BL

Role Active **Director**

Date of birth **May 1954**

Appointed on **11 December 2015**

Nationality **British**

Country of residence **Wales**

Occupation **Commercial Director**

HIGGINS, Ian, Dr

Correspondence address
Unit 2, Hooton Park, North Road, Ellesmere Port, United Kingdom, CH65 1BL

Role Active **Director**

Date of birth **July 1961**

Appointed on **1 November 2011**

Nationality **British**

Country of residence **United Kingdom**

Occupation **Managing Director**

JEGADEESAN, Muthurajan

Correspondence address **Unit 2, Hooton Park, North Road, Ellesmere Port, United Kingdom, CH65 1BL**

Role Active **Director**

Date of birth **October 1985**

Appointed on **11 December 2015**

Nationality **Indian**

Country of residence **India**

Occupation **Director**

SMITH, Grant Haydn

Correspondence address
Unit 2, Hooton Park, North Road, Ellesmere Port, United Kingdom, CH65 1BL

Role Active **Director**

Date of birth **January 1959**

Appointed on **11 December 2015**

Nationality **Australian**

Country of residence **Australia**

Occupation **Director**

VAIKUNDARAJAN, Subramanian

Correspondence address
Unit 2, Hooton Park, North Road, Ellesmere Port, United Kingdom, CH65 1BL

Role Active **Director**

Date of birth **June 1982**

Appointed on **11 December 2015**

Nationality **Indian**

Country of residence **India**

Occupation **Director**

BAILEY, Keith Andrew

Correspondence address **Treetop Main Road, Little Haywood, Stafford, ST18 0TR**

Role Resigned **Secretary**

Appointed on **30 June 1999**

Resigned on **31 October 2002**

EASTWOOD, Janet

Correspondence address **81 Norwich Drive, Upton, Wirral, Merseyside, L49 4GJ**

Role Resigned **Secretary**

Appointed on **20 December 2002**

Resigned on **16 August 2004**

KENNEDY, David

Correspondence address
Harvey Cottage, Hollands Lane Kelsall, Tarporley, Cheshire, United Kingdom, CW6 0QT

Role Resigned **Secretary**

Appointed on **27 August 2004**

Resigned on **22 February 2013**

LEADBEATER, Susan Elizabeth

Correspondence address **40 Poplar Drive, Royston, Hertfordshire, SG8 7ER**

Role Resigned **Secretary**

Appointed on **1 March 1997**

Resigned on **30 June 1999**

MIDDLEMASS, John Robert

Correspondence address **19 Chiswick End, Meldreth, Royston, Hertfordshire, SG8 6LZ**

Role Resigned **Secretary**

Appointed on **1 November 2002**

Resigned on **20 December 2002**

WATSON, Peter Gareth

Correspondence address **Eaton Farm, Toft Monks, Beccles, Suffolk, NR34 0ET**

Role Resigned **Secretary**

Appointed on **19 January 1996**

Resigned on **30 June 1999**

WILKINSON, Richard Andrew

Correspondence address **5 Mortimer Street, Birkenhead, Merseyside, CH41 5EU**

Role Resigned **Secretary**

Appointed on **20 March 1992**

Resigned on **19 January 1996**

Nationality **British**

Occupation **Solicitor**

SWIFT INCORPORATIONS LIMITED

Correspondence address **26 Church Street, London, NW8 8EP**

Role Resigned **Nominee Secretary**

Appointed on **24 February 1992**

Resigned on **20 March 1992**

BAILEY, Keith Andrew

Correspondence address
Valley Road Business Park, Valley Road, Birkenhead, Merseyside, CH41 7EL

Role Resigned **Director**

Date of birth **November 1958**

Appointed on **1 December 2011**

Resigned on **22 February 2013**

Nationality **British**

Country of residence **England**

Occupation **Finance Director**

BAILEY, Keith Andrew

Correspondence address **Treetop Main Road, Little Haywood, Stafford, ST18 0TR**

Role Resigned **Director**

Date of birth **November 1958**

Appointed on **1 December 1999**

Resigned on **31 October 2002**

Nationality **British**

Country of residence **England**

Occupation **Financial Director**

BONEHILL, Bridget Anne

Correspondence address **Unit 2, Hooton Park, North Road, Ellesmere Port, Wales, CH65 1BL**

Role Resigned **Director**

Date of birth **February 1960**

Appointed on **11 December 2015**

Resigned on **22 December 2015**

Nationality **British**

Country of residence **England**

Occupation **Finance Director**

DAVIDSON, James George

Correspondence address
Unit 2, Hooton Park, North Road, Ellesmere Port, United Kingdom, CH65 1BL

Role Resigned **Director**

Date of birth **March 1950**

Appointed on **10 December 2010**

Resigned on **4 October 2013**

Nationality **Canadian**

Country of residence **Canada**

Occupation **Chief Financial Officer**

ENGDAHL, James Bruce

Correspondence address **2409 Eastview, Saskatoon, Saskatchewan, S75 3e8, Canada**

Role Resigned **Director**

Date of birth **February 1951**

Appointed on **27 June 2008**

Resigned on **22 November 2012**

Nationality **Canadian**

Country of residence **Canada**

Occupation **Director**

GRANT, Russell Carnegie

Correspondence address **The Old Rectory High Street, Little Eversden, Cambridge, CB3 7HE**

Role Resigned **Director**

Date of birth **January 1958**

Appointed on **19 January 1996**

Resigned on **27 June 2008**

Nationality **British**

Country of residence **England**

Occupation **Metal Trader**

HOLMES, William Brian

Correspondence address **28 Church Road, Birkenhead, Merseyside, L42 0LF**

Role Resigned **Director**

Date of birth **October 1940**

Appointed on **20 March 1992**

Resigned on **31 May 1995**

Nationality **British**

Occupation **Director**

IVORY, Patrick

Correspondence address **6 Childer Crescent, Little Sutton, South Wirral, Merseyside, L66 1RF**

Role Resigned **Director**

Date of birth **August 1933**

Appointed on **20 March 1992**

Resigned on **19 January 1996**

Nationality **British**

Occupation **Company Director**

KENNEDY, David

Correspondence address
Harvey Cottage, Hollands Lane Kelsall, Tarporley, Cheshire, United Kingdom, CW6 0QT

Role Resigned **Director**

Date of birth **June 1954**

Appointed on **19 June 1992**

Resigned on **22 February 2013**

Nationality **British**

Country of residence **United Kingdom**

Occupation **Metallurgist**

LEVIER, Kerry Marc

Correspondence address **Unit 2, Hooton Park, North Road, Ellesmere Port, England, CH65 1BL**

Role Resigned **Director**

Date of birth **May 1949**

Appointed on **22 February 2013**

Resigned on **3 July 2015**

Nationality **Amercian**

Country of residence **Usa**

Occupation **Director**

MCMILLAN, Audrey

Correspondence address **Box 117, Rr6, Site 601, Saskatoon, Saskatchewan, S7k 3j9, Canada**

Role Resigned **Director**

Date of birth **April 1965**

Appointed on **27 June 2008**

Resigned on **10 December 2010**

Nationality **Canadian**

Country of residence **Canada**

Occupation **Chartered Accountant**

MULDER, Gerhardus Johannes

Correspondence address **Duck House Ganges Hill, Fivehead, Somerset, TA3 6PF**

Role Resigned **Director**

Date of birth **March 1941**

Appointed on **27 May 1997**

Resigned on **27 June 2008**

Nationality **British**

Country of residence **United Kingdom**

Occupation **Managing Director**

MURPHY, David William Arthur

Correspondence address
Unit 2, Hooton Park, North Road, Ellesmere Port, United Kingdom, CH65 1BL

Role Resigned **Director**

Date of birth **April 1948**

Appointed on **1 November 2011**

Resigned on **20 April 2015**

Nationality **British**

Country of residence **Uk**

Occupation **Commercial Director**

QUINN, Robert Joseph

Correspondence address
808 Russell Palmer Road, Suite 162, Houston, Harris County, Texas, Usa, 77339

Role Resigned **Director**

Date of birth **December 1955**

Appointed on **28 April 2015**

Resigned on **3 July 2015**

Nationality **American**

Country of residence **Usa**

Occupation **Attorney**

WATSON, Peter Gareth

Correspondence address **21 Eights Marina, Cambridge, CB4 1ZA**

Role Resigned **Director**

Date of birth **February 1950**

Appointed on **19 January 1996**

Resigned on **1 December 1999**

Nationality **British**

Occupation **Management Consultant**

WATSON, Peter Gareth

Correspondence address
89 Birchwood Court, Norton Way North, Letchworth, Hertfordshire, SG6 1BH

Role Resigned **Director**

Date of birth **February 1950**

Appointed on **19 January 1996**

Resigned on **1 March 1997**

Nationality **British**

Occupation **Management Consultant**

INSTANT COMPANIES LIMITED

Correspondence address **1 Mitchell Lane, Bristol, Avon, BS1 6BU**

Role Resigned **Nominee Director**

Appointed on **24 February 1992**

Resigned on **20 March 1992**

(https://beta.companieshouse.gov.uk/help/feedback?sourceurl=https://beta.companieshouse.gov.uk/company/02690088/officers)

Nature and Heritage Conservation

Screening Report: Bespoke installations

Reference	**EPR/RP3233CZ/V005**
NGR	**SJ 37896 79135**
Buffer (m)	**120**
Date report produced	**14 November 2019**
Number of maps enclosed	**9**

The nature conservation sites identified in the table below must be considered in your application.

Nature and heritage conservation sites	Screening distance (km)	Further information
Special Areas of Conservation (cSAC or SAC) **Dee Estuary**	10	Joint Nature Conservation Committee
Special Protection Area (pSPA or SPA) **Liverpool Bay** **Mersey Estuary** **The Dee Estuary**	10	Joint Nature Conservation Committee
Ramsar **Mersey Estuary** **The Dee Estuary**	10	Joint Nature Conservation Committee
Sites of Special Scientific Interest (SSSI) **Mersey Estuary**	2	Natural England
Local Nature Reserve (LNR) **Rivacre Valley**	2	Natural England
Local Wildlife Sites (LWS)	2	Local Record Centre (LRC)

Booston Wood
Rivacre Valley

Ancient Woodland	2	Woodland Trust
Unnamed woodland		Forestry Commission
		Natural England

Protected Species	Screening distance (m)	Further Information
Smelt migratory route **European eel migratory route** **Atlantic salmon migratory route** **River lamprey migratory route**	up to 500m	Environment Agency. Dial 03708 506 506 for your local Fisheries and Biodiversity team

Protected Habitats	Screening distance (m)	Further Information
Mudflats	up to 500m	Natural England

Where protected species are present, a licence may be required from Natural England or the Welsh Government to handle the species or undertake the proposed works.

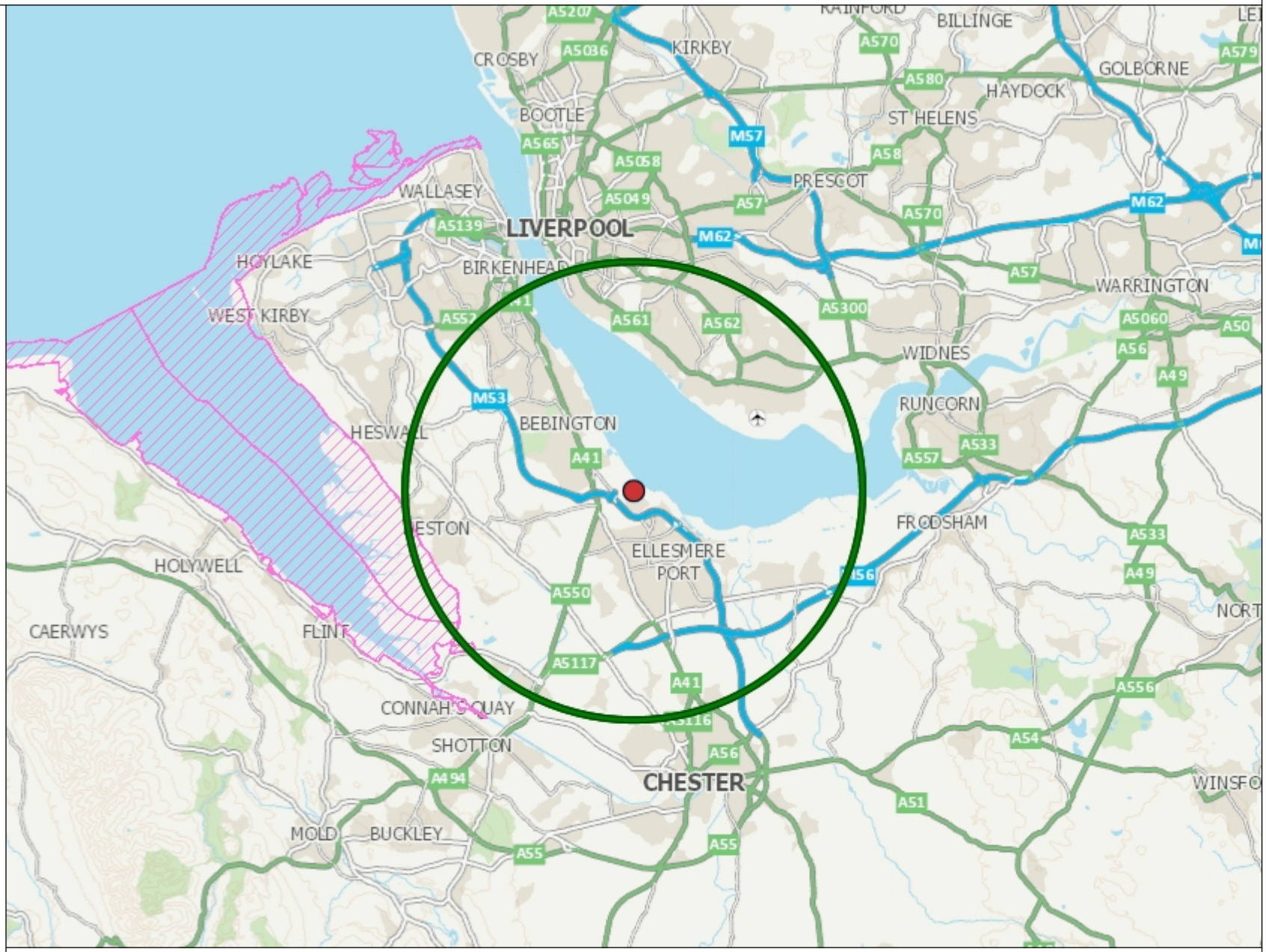
The relevant Local Records Centre must be contacted for information on the features within local wildlife sites. A small administration charge may also be incurred for this service.

Please note we have screened this application for protected and priority sites, habitats and species for which we have information. It is however your responsibility to comply with all environmental and planning legislation, this information does not imply that no other checks or permissions will be required.

Please note, the enclosed pre-application map(s) is valid for a period of **6 months**. If you plan to submit your application more than 6 months after the map(s) was generated, you must request that the screen is re-run. This will ensure that you have used the most current information on heritage and nature conservation interests in your application.

Special Areas of Conservation

Environment Agency

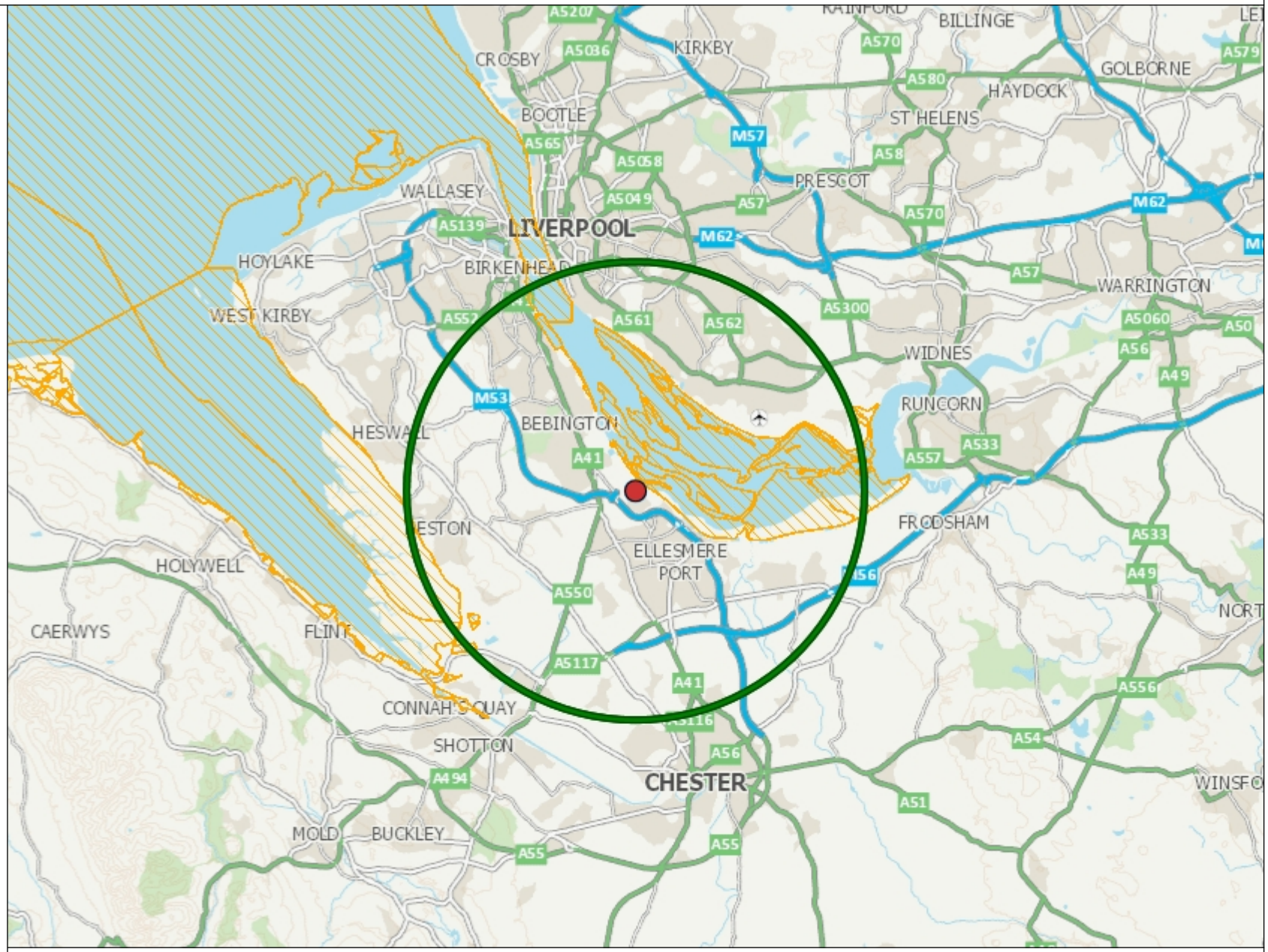


Special Protection Areas

Environment Agency

Legend

- SPA (England)
- SPA (Wales)



1: 250,000

0 6,250

Metres

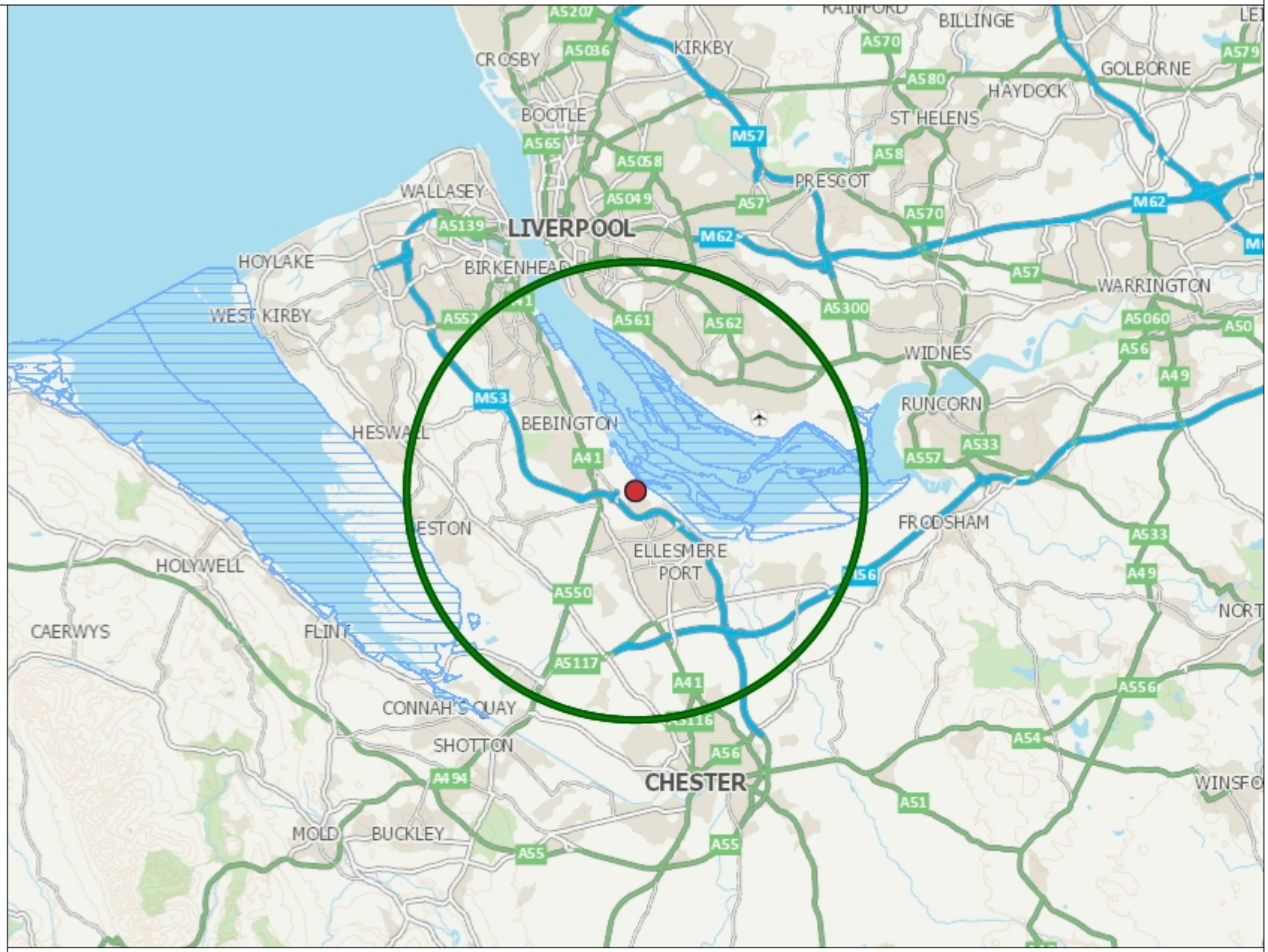
N W E S

Ramsar Sites

Environment Agency

Legend

- Ramsar (England)
- Ramsar (Wales)



1: 250,000

0 6,250

Metres

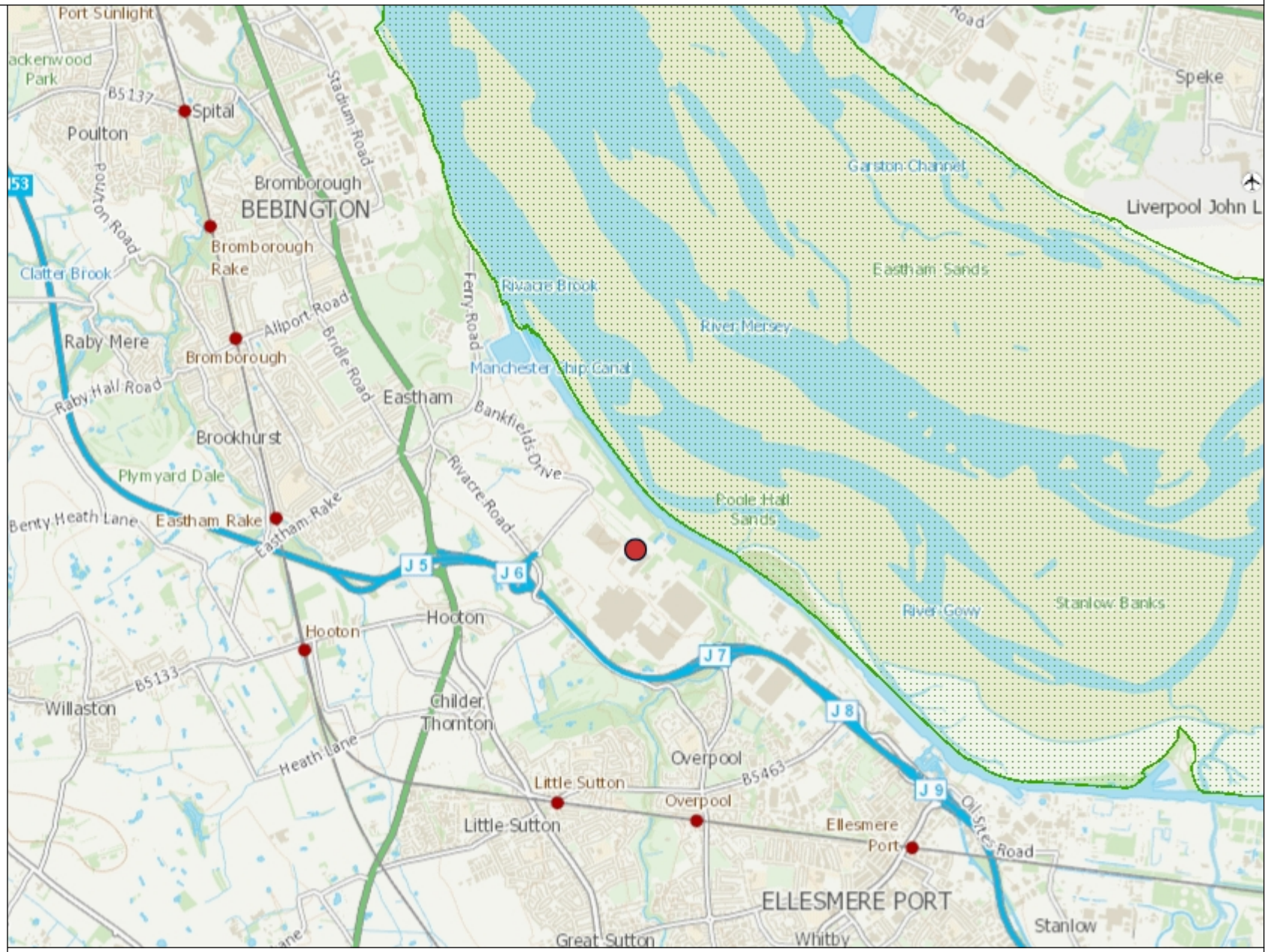
N W E S

Sites of Special Scientific Interest

Environment Agency

Legend

SSSI (England)



1: 50,000

0 1,250

Metres

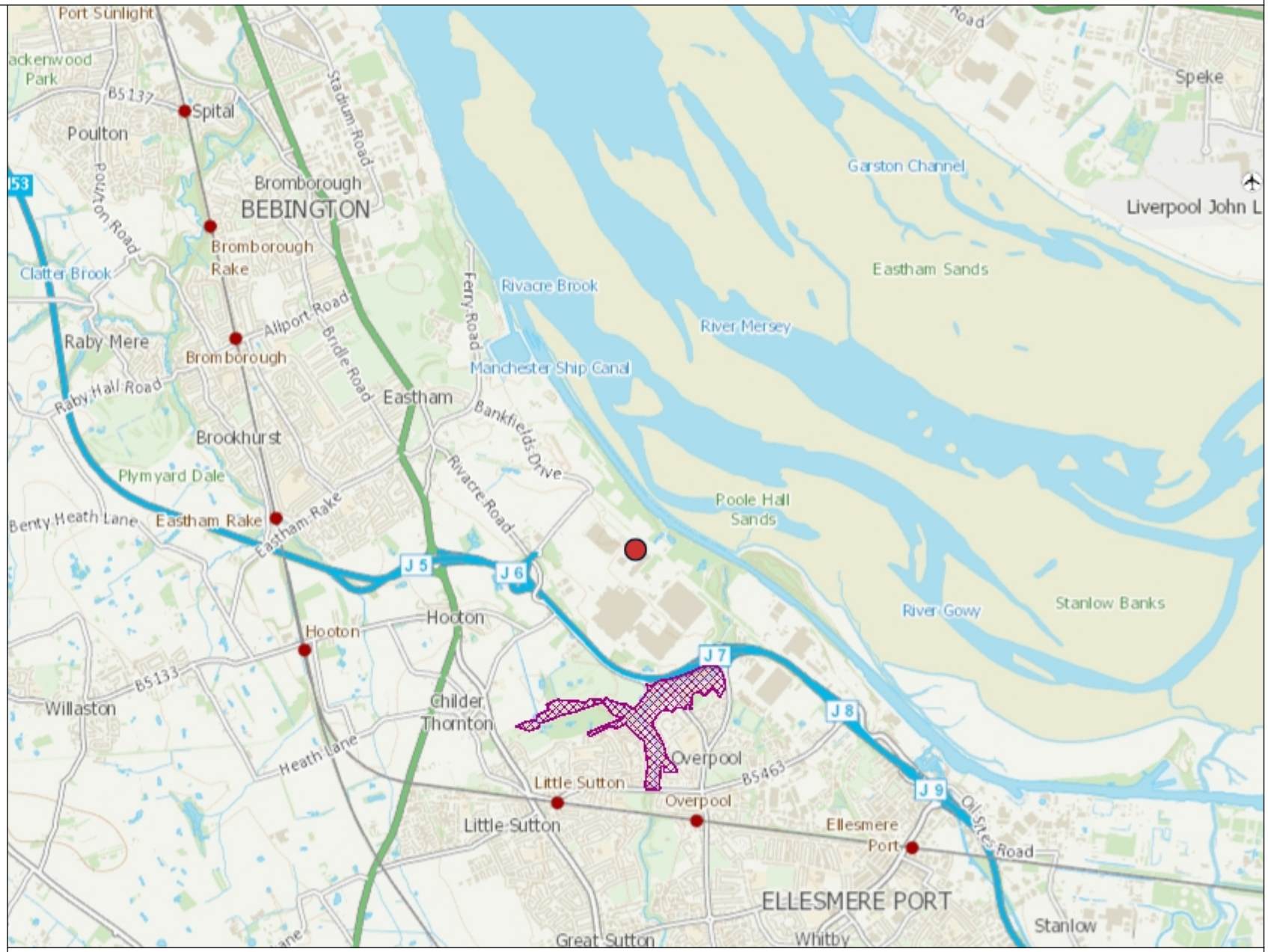
N W E S

Local Nature Reserves

Environment Agency

Legend

LNR (England)



1: 50,000

0 1,250

Metres

N W E S

Local Wildlife Sites

Environment Agency

Legend

Local Wildlife Sites

1: 50,000

0 1,250

Metres

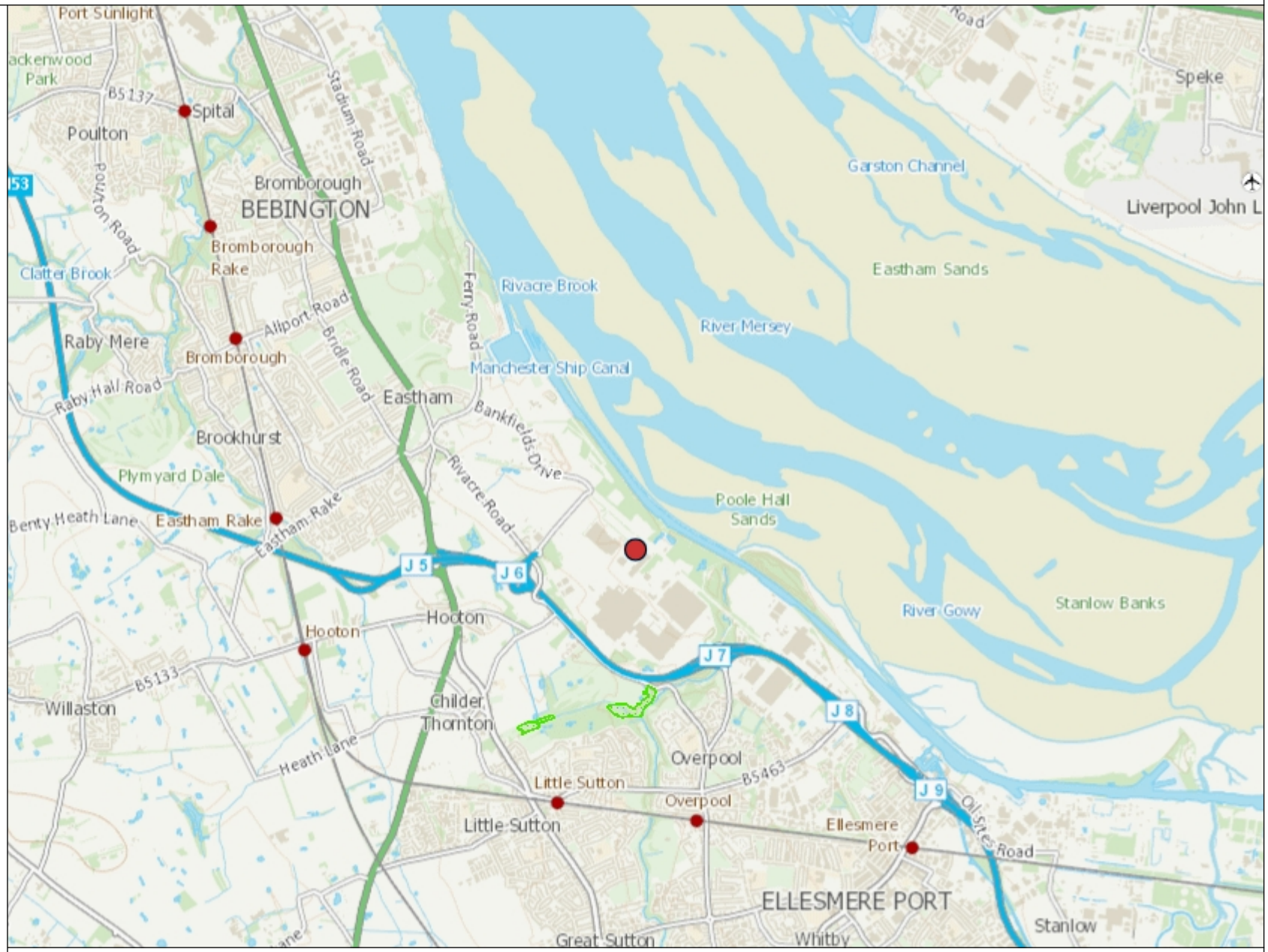
N W E S

Ancient Woodland

Environment Agency

Legend

Ancient Woodland (England)



1: 50,000

0 1,250

Metres

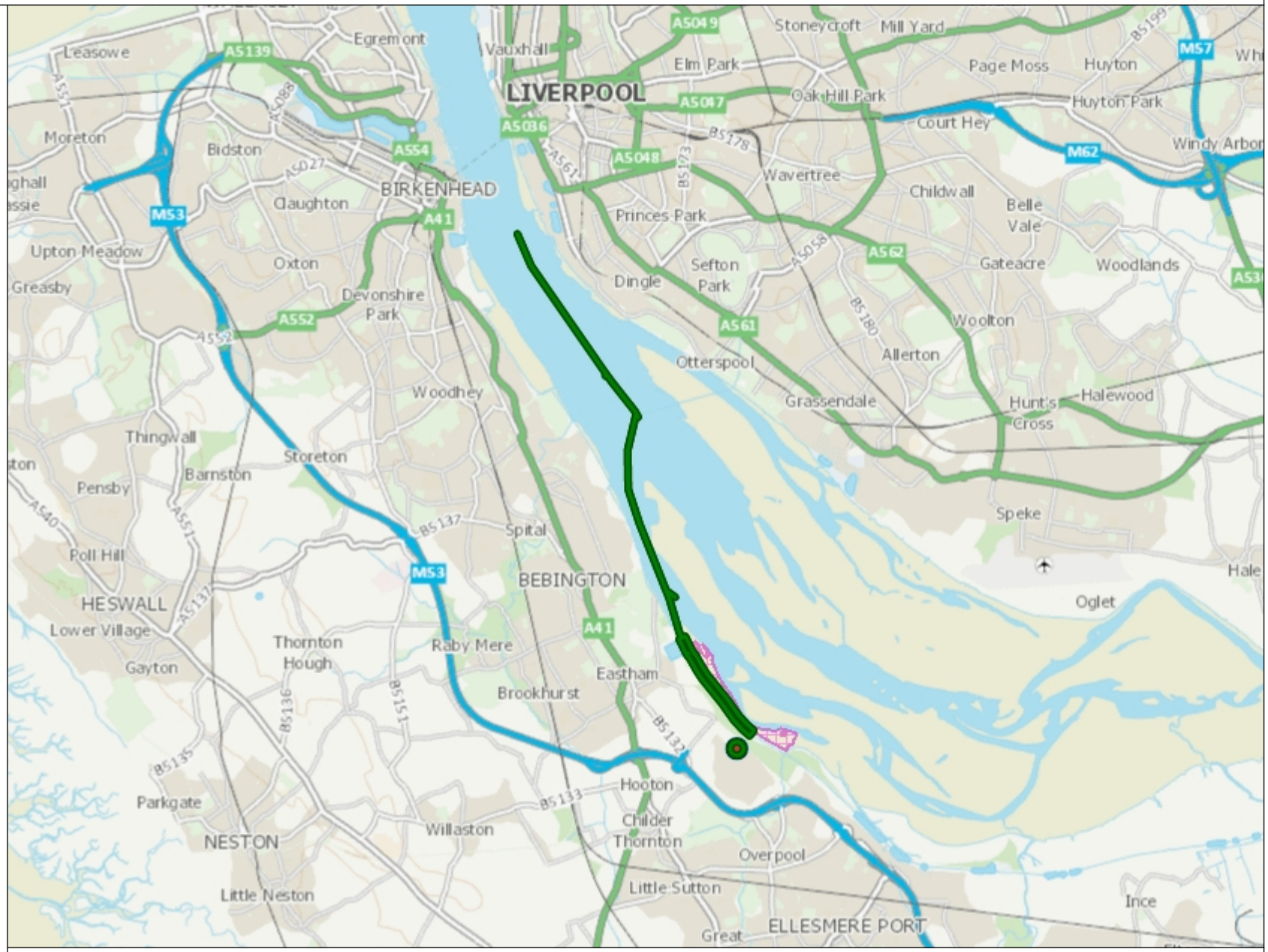
N W E S

Protected Habitats

Environment Agency

Legend

Protected Habitats screened for Env Permits



1: 100,000

0 2,500

Metres

N W E S

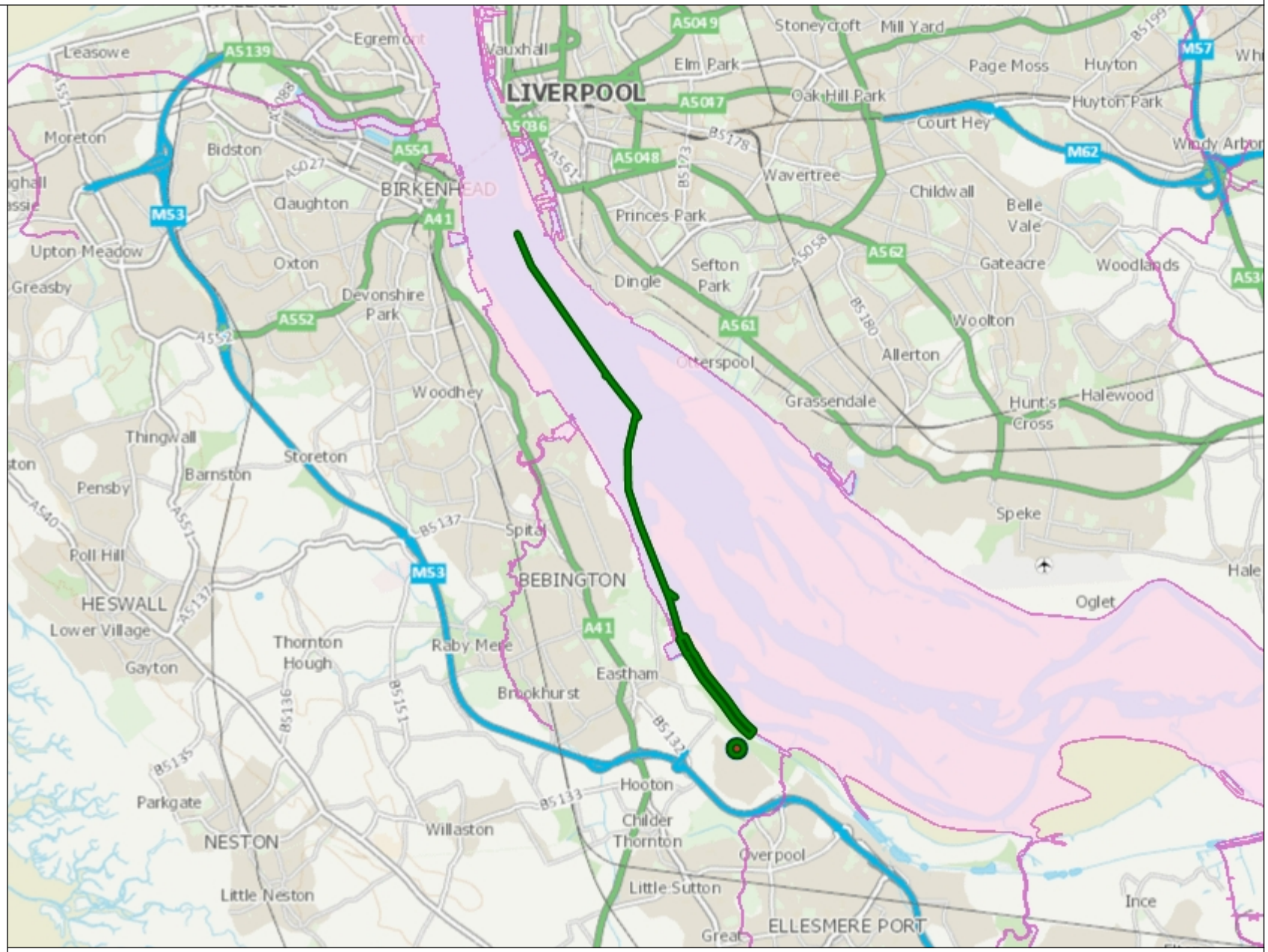
Protected Species

Environment Agency

Legend

Protected species screened for Env Permits - complete set

- Protected species, non fish
- Protected fish
- Protected fish migratory route



1: 100,000

0 2,500

Metres

N W E S

ENVIRONMENTAL MANAGEMENT SYSTEM MANUAL

BS EN ISO 14001: 2015

ENVIRONMENTAL POLICY

Less Common Metals (LCM) Ltd manufactures and supplies a wide range of rare earth metals and high purity alloys by the reduction of salts and oxides, and by the alloying of metals in electrolytic, resistance and induction melting furnaces.

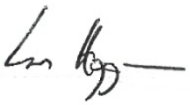
By adopting a life-cycle perspective LCM recognises the impact its activities have on the environment. This includes the sourcing and procurement of our raw materials, to the end of life impacts associated with the consumer products containing our metals and alloys. As a consequence it is our intention to maintain and continually improve our environmental management system, in accordance with ISO 14001: 2015, such that it achieves the goals of protection of the environment (including the prevention of pollution), improved environmental performance and meeting all our compliance obligations.

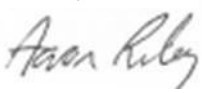
The following policy commitments will allow us to meet these goals:

- Ensure the ethical sourcing, procurement and supply of our raw materials through the use of suppliers that have been fully evaluated and approved
- Actively collaborate with other industry participants in order to achieve more sustainable supplies and diversified market opportunities
- Ensure that our environmental management system objectives and processes are effectively embedded within wider business processes and ensure that the latter respond to the risks and opportunities presented by the changing local and global context within which LCM operates
- Establish and monitor the progress of annual environmental improvement objectives; these will be informed by our significant environmental aspects, compliance obligations and identified risks and opportunities
- Improve our energy efficiency (such as through investment in energy-efficient technology, maximising the efficiency of processes and the use of best available technology) and regularly monitor our effectiveness in achieving this
- Minimise the environmental impact of our waste generation through in-process recycling, increasing resource efficiency and ensuring all possible waste streams are segregated for recycling
- Implement effective communication mechanisms and comprehensive internal training programmes with the aim of establishing and continuing a culture of environmental awareness within the company. This will ensure all staff are aware of their role in maintaining an effective environmental management system and in minimising the risk of adverse environmental impacts from operations

The Management Team is responsible for the implementation of this policy and for ensuring that adequate resources exist to sustain an effective environmental management system. This policy will be communicated to all staff and contractors within LCM and made available to interested parties.

Dated: June 2017

Managing Director: 

Environment Manager: 

Document Title: Operational Control - General			
Ref: EP 8.1a	**Date Issued:** 03/08/17	**Last revised:** 12/12/19	**Revision No:** 01
ISO 14001 References: 8.1			
Related Documents:	• ER 6.1.1 – Risks & Opportunities Register • ER 6.1.2 – Register of Significant Environmental Aspects • ER 6.2.1 – Environmental Objectives Monitoring Record • EP 8.1b – Operational Control – Waste, Energy, Oil & Water • EP 8.2 – Emergency Preparedness & Response Procedures • EP 9.1 – Monitoring & Measurement Procedure		

Operational Control - General

1. Requirements of the Standard

"The organization shall establish, implement, control and maintain the processes needed to meet environmental management system requirements, and to implement the actions identified in 6.1 and 6.2 by:

- *Establishing operating criteria for processes;*
- *Implementing control of the processes, in accordance with the operating criteria*

The organization shall control planned changes and review the consequences of unintended changes, taking action to mitigate any adverse effects as necessary.
The organization shall ensure that outsourced processes are controlled or influenced. The type and extent of control or influence to be applied to the processes shall be defined within the environmental management system.
Consistent with a life cycle perspective, the organization shall:

a) *Establish controls, as appropriate, to ensure that its environmental requirements are addressed in the design and development process for the product or service, considering each life cycle stage;*
b) *Determine its environmental requirements for the procurement of products and services, as appropriate;*
c) *Communicate its relevant environmental requirements to external providers, including contractors;*
d) *Consider the need to provide information about potential significant environmental impacts associated with the transportation or delivery, use, end-of-life treatment and final disposal of its products and services*

The organization shall maintain documented information to the extent necessary to have confidence that the processes have been carried out as planned."

2. Definitions

Life Cycle:

"consecutive and interlinked stages of a product (or service) system, from raw material acquisition or generation from natural resources to final disposal"

Outsource:

"make an arrangement where an external organization performs part of an organisation's function or process"

Process:

"set of interrelated or interacting activities which transforms inputs into outputs"

3. Procedure

3.1 The scope of this operational control procedure will include operational controls as described in 3.2, controls required relating to identified life cycle aspects of LCM's activities (such as raw material procurement, transportation), in addition to contractor control procedures.

3.2 Operational controls will be focused on controlling the impacts from LCM's identified significant aspects (ER 6.1.2 – Register of Significant Environmental Aspects) as well as identified actions to address risks and opportunities (ER 6.1.1 – Risks & Opportunities Register).

3.3 Process operations shall be undertaken so as to minimise and mitigate any potentially adverse impacts on the environment (e.g. from air emissions, hazardous waste arisings, gas migration, waste, water discharge).

General Operational Controls:

3.4 Facility Condition Inspection Audits of the site and process operations are performed on a weekly basis by one of the Team Leaders. A checklist is used to record results and note any non-conformances. Audit checklists have been produced for each operational / process area including the Laboratory, administrative and outside areas. Each area is checked with a frequency varying from 3-weekly (for high risk areas) to quarterly (low risk areas). Checklists include checks on availability of works instructions, safety equipment and signage, LEVs, COSHH data, use of PPE, waste segregation, spill kits. A sample of an Audit Checklist is attached at Appendix I.

3.5 Periodic factory clean-downs are undertaken during within the factory interior during slow production periods in order to minimize risks associated with internal dust generation.

3.6 A preventative maintenance scheduling system in place within Engineering managed by the Engineering Coordinator is used to track the monitoring and maintenance requirements of the EMS, including those specified within this procedure.

3.7 Further information on operational control procedures which specifically concern the monitoring and measurement requirements of the EMS are set out in procedure 'EP 9.1 – Monitoring & Measurement'.

Chemicals Storage & Use:

3.8 Visual checks will be undertaken on the interceptor on a quarterly basis to ascertain the need for emptying and to check the integrity of the chamber.

3.9 Gas bottles (other than when in use) are stored upright in two secure, locked wire mesh cages on the western edge of the site. Gas bottle storage cages will be marked with appropriate warning signs. Full and empty cylinders shall be kept in separate areas and gases segregated with due regard to their potential hazards. LPG should be stored at least 3m from other gases.

3.10 All chemicals in containers over 200 litres (a drum) are to be stored on a hard-standing area, away from drains, within an impermeable bund or suitable containment tray which will contain at least 110% of the volume of the largest container or 25% of the volume stored, whichever is the greatest.

3.11 Chemicals that have hazard labels are controlled by the COSHH regulations and personnel handling such chemicals will be given the appropriate training regarding their potential environmental impact and provided with the recommended personal protective equipment.

3.12 Hazardous liquids used in maintenance operations (such as solvents, paints and aerosols) will be stored securely within the yellow HazChem cupboards when not in use.

3.13 Lids will always be placed securely back on containers immediately after use. Chemical containers will not be left unattended and all containers will be returned to their correct storage location as soon as practicable after use. All chemical containers will be correctly labelled and clearly marked at all times.

3.14 Spill kits will be located in all areas of risk and their contents checked as part of Facility Condition audits. Spill kits are currently located in the following areas: Cast (cobalt), Coreduced (cobalt), Effluent treatment, Metal making, Engineering, Oil storage area, Neodymium; Outside areas – waste acid storage, generators.

Refrigeration Units:

3.15 An F-Gas Register is maintained of all refrigeration units on site specifying the unit location and the quantity and type of refrigerant used. All units will be leak tested in accordance with the required frequency (based on calculated GWP's) specified in the F-Gas Register, and records kept. Contractors employed to undertake leak testing will be Refcom registered and all engineers employed on site will have qualifications to Level 2, City & Guilds 'F-Gas & ODS'. Records of contractor qualifications will be held in the relevant electronic file on the L: drive.

3.16 All detected leaks will be repaired and repeat tested within 1 month. Disposal of all refrigerant will be in accordance with current hazardous waste legislation and records kept.

3.17 All new refrigeration units purchased will be entered on the F-Gas register, the GWP of the refrigerant calculated, in addition to the CO_{2equiv} , to determine leak testing requirements.

Works Instructions:

3.18 The company's significant environmental aspects are centred around four main process areas – electrolysis; metal casting; co-reduction; powder production. For each of these areas detailed 'Works Instructions' (WI's) are maintained in standard format (on the L: drive) which include sections on relevant PPE, COSHH requirements and specific environmental requirements. Significant safety and/or environmental information is contained within highlighted boxes.

3.19 Works Instructions are produced, reviewed and updated on a regular basis by the Health & Safety Coordinator who will involve Team Leaders in agreeing amendments and reviewing them for accuracy prior to being introduced. Once introduced Team Leaders brief their team on relevant changes as part of daily production meetings.

3.20 Works Instructions are used to train all production employees in the relevant task. Copies of Works Instructions are kept on work stations at each of the furnaces (e.g. GMB and VIM furnace) and in the processing areas.

3.21 Argon is used throughout the melting processes to minimise the risk of explosion from the overheating of furnaces in operation.

Contractor Induction & Control:

3.22 All contractors and visitors new to site (and contractors returning after 6 months) are required to watch the LCM site induction video (which contains information on the company's commitment to environmental best practice, reference to environmental policy, segregation and appropriate disposal of different waste types) and sign to confirm induction.

3.23 New contractors to site will be met by the Manager responsible for engaging them. A contractors' authorization form will be completed (LCM Contractors Work Authorisation (CWA)) and signed by the contractor and the LCM Responsible Person; any required risk assessments and method statements for the work will be attached and filed with the form.

Employee Health, Safety & Welfare:

3.24 Comprehensive noise surveys and risk assessments will be carried out, using specialist external contractors, on a periodic basis (as determined by significant changes to plant or operations) and reviewed for applicability to current operating conditions every two years.

3.25 Daily noise exposure levels shall be kept below 87 db with peaks not exceeding 140 db.

3.26 All employees are required to wear supplied CE-marked hearing protectors within the Cast Hall area as exposure levels fall within the high risk category. The specification of supplied hearing protectors will ensure noise is attenuated for the employee to below 70db at all times. Signs indicating the requirement for noise protection will be displayed in all process areas.

3.27 Personal audio tests will be carried on production staff approximately every 3 years.

3.28 All works instructions will be accompanied by relevant risk assessments, specify the PPE required to be worn for the specified task. A COSHH risk assessment (including up-to-date MSDS) will be kept and include reference to the hazard information (in accordance with CLP Regulations 2015) for all substances likely to be encountered. Employees will ensure their familiarity with the works instruction for their area before commencing work.

3.29 LEV will be present, and working, in all production areas at risk from dust. LEV units are checked to be working under Facility condition audits and prior to the start of any process that includes extraction points. LEV condition, bag filter integrity and operational tests are conducted, in accordance with COSHH Regulations, on an annual basis by external contractors.

3.30 An external occupational health professional will be employed to undertake lung function, skin surveillance and urine tests (cobalt) on each employee on an annual basis.

Life Cycle Aspects of Operational Processes:

3.31 LCM will ensure the procurement of raw materials from sources which guarantee the supply of 'non-conflict materials' by purchasing through approved suppliers only. Similarly only approved suppliers will be used to ensure that all raw materials are ethically sourced, by way of officially registered and regulated suppliers which maintain basic environmental and safety standards.

3.32 The company participates in a 'Bike to Work' scheme to encourage greener transport options for employees. The scheme provides employees with tax exempt loans, in the form of 'salary sacrifice', to purchase cycles and associated cycle safety equipment.

3.33 All products manufactured will be supplied with up to date Materials Safety Data Sheets, with information relating to identified hazard properties, in accordance with the CLP Regulations 2015. All products supplied will meet the CLP Regulations requirements on labelling and packaging.

3.34 The transportation of products supplied by LCM comes within the scope of the Carriage of Dangerous Goods & Use of Transportable Pressure Equipment Regulations 2009. Dangerous Good Notes, meeting the requirements of the Regulations, will accompany all consignments of manufactured goods classified under these Regulations. The function of Dangerous Goods Safety Advisor is outsourced to an external contractor. The Environment Manager will ensure the conduct of annual DGSA audits by an external contractor. Production staff will be suitably trained in the packing and handling of dangerous goods.

4. Responsibilities

Senior Management:
Ensure the provision of adequate resources to maintain the operational controls set out in this procedure such that operational processes are effectively controlled so as to minimize risk. Ensure the procurement of raw materials from 'non-conflict material sources'.

Environment Manager:
To ensure process operations meet the requirements of this procedure. To ensure weekly environmental housekeeping audits and facility condition audits are performed, to review the results and implement corrective actions where necessary.

Health, Safety & Production Superintendent:
To review, update and ensure the adequacy of Works Instructions as necessary. Ensure noise surveys and employee health surveillance checks are completed in a timely manner

and that recommendations for remedial actions are implemented.

Engineering Coordinator:
Maintaining and updating the Preventative Maintenance Schedule; ensuring maintenance programmes are carried out in a timely fashion by suitably qualified personnel; ensuring implementation of effective contractor control.

Operational Staff:
To work in accordance with LCM Works Instructions and take responsibility for safe working practices and minimizing any adverse impact on the environment.

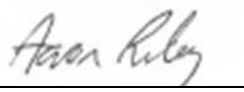
5. Document Locations

LCM Contractors Work Authorisation (CWA)

Facility Condition Inspection Audit Checklists

F-Gas Register

LCM Works Instructions

Approved by:	Title	Date
	Environment Manager	12 December 2019
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APPENDIX I – FACILTY CONDITION INSPECTION REPORT

Document Title: Emergency Preparedness & Response Procedures			
Ref: EP 8.2	**Date Issued:** 10/08/17	**Last revised: 12/08/20**	**Revision No:** 03
ISO 14001 References: 8.2			
Related Documents:	• ER 6.1.1 – Risks & Opportunities Register • ER 6.1.2 – Register of Significant Environmental Aspects • ER 8.2 – Records of Periodic Testing of Emergency Response • LCM Emergency Response Plan Oct 2019		

Emergency Preparedness & Response Procedures

1. Requirements of the Standard

"The organization shall establish, implement and maintain the process(es) needed to prepare for and respond to potential emergency situations identified in 6.1.1.
The organization shall:

a) Prepare to respond by planning actions to prevent or mitigate adverse environmental impacts from emergency situations;
b) Respond to actual emergency situations;
c) Take action to prevent or mitigate the consequences of emergency situations, appropriate to the magnitude of the emergency and the potential environmental impact;
d) Periodically test the planned response actions, where practicable;
e) Periodically review and revise the process(es) and planned response actions, in particular after the occurrence of emergency situations or tests;
f) Provide relevant information and training related to emergency preparedness and response, as appropriate, to relevant interested parties, including persons working under its control

The organization shall maintain documented information to the extent necessary to have confidence that the process(es) is (are) carried out as planned"

2. Definitions

None applicable

3. Procedure

3.1 From a consideration of both the Register of Significant Environmental Aspects (ER 6.1.2) and its Risks & Opportunities Register (ER 6.1.1) LCM has evaluated its potential emergency situations and the possible environmental incidents that might

arise on site. These are summarized below and will be reviewed annually as part of the internal audit of this area:

General Emergency Situations:

- Fire and Evacuation
- Medical Emergency
- Explosion (storage of bulk H_2 gas on site)
- Bomb Threat
- Hostile intruder, employee, contractor or visitor
- Suspicious Package or Object
- Utility Failure: gas, electricity
- Floods
- Adverse Weather Conditions: storm, winds, snow

Environmental Incidents:

- Effluent treatment plant - tank or pipeline rupture
- Fire water run-off
- Accident chemical release e.g. from bulk chemical storage ($Ca(OH)_2$, ethylene glycol, dilute acid waste, bulk diesel, bulk Hydrogen gas)
- Emergency situations on furnaces

3.2 The principal procedures and protocols for managing the above identified emergency scenarios are set out in LCM's Emergency Response Plan, last updated in October 2019

3.3 In addition, up-to-date Fire Safety Risk Assessment and Supporting Documentation is to be found in the 'Fire' folder within the 'Health & Safety Folder' on the L: drive.

3.4 An 'Explosive & Highly Flammable Materials Folder' is held at the security hut / gatehouse. In the event of a major incident requiring attendance by the Emergency Services this folder will be given to their representatives on arrival, by either Site security or the Incident Controller. This contains relevant information such as a list of explosive and flammable materials, their locations, the site plan and relevant MSDS file.

Periodic Testing of Procedures

3.5 Periodic testing of the fire alarm system and integrated call point shall be conducted

weekly by a member of LCM's fire response team, and assisted by an employee who has received training

3.6 Other potential emergency situations, identified within the environmental management system, will be periodically tested using practical and/or desktop training exercises as deemed appropriate to test the effectiveness of response. Emergency communication systems (e.g. radios and public announcement equipment) should also be tested as part of such scenarios

3.7 The need for undertaking periodic tests referred to in 3.5 will be reviewed by the Quality & Environmental Compliance Officer and the Operations Manager each year, and recorded, as part of the internal audit of this procedure.

3.8 Records of the periodic testing of emergency response procedures will be filed under 'ER 8.2 – Records of Periodic Testing of Emergency Response'. This document will also include a plan for future tests of emergency response, this will be reviewed and updated if necessary as part of the procedure in 3.7.

Site Drainage Plan

3.9 An up-to-date site drainage plan can be found at the following link: Site Drainage Plan. A hard copy is also kept on the wall in the Production Office.

Emergency Contacts

3.10 Emergency contacts for LCM are listed below:

Environment Agency	North West Regional Office, PO Box 12, Richard Fairclough House, Knutsford Road, Latchford, Warrington, Cheshire, WA4 1HT Tel: 08708 506506 (Mon-Fri, 8-00am-6-00pm) Tel: **0800 807060** (24hr incident hotline)
Fire Service	Via **999** (or **112**) emergency service, the Fire Service may in turn mobilise their Chemical Incident Response Procedures

United Utilities	United Utilities Group PLC, Haweswater House, Lingley Mere Business Park, Lingley Green Avenue, Great Sankey, Warrington, Cheshire WA5 3LP Tel: **0845 746 2200** (24hr incident hotline)
Cheshire West & Chester Council	Environmental Health, Cheshire West & Chester Council, HQ, Nicholas Street, Chester, CH1 2NP Tel: **0300 123 7 038**
Vauxhall Motors (major effluent spill or flood)	Emma Brady, Site Environmental Engineer, Vauxhall Motors, North Rd, CH65 1AL. emma.brady@opel-vauxhall.com Tel: 0151 350 2025 Mob: 07780 756407
LCM Managing Director	Ian Higgins Tel: 0151 348 5655 Mob: 07976 922052
LCM Operations Manager (Environmental Manager)	Aaron Riley Tel: 0151 348 5641 Mob: 07413 942450
LCM Engineering Coordinator	Duncan Owen Tel: 0151 348 5661
LCM Health & Safety	Steve Jones Tel: 0151 348 5662 Mob: 07742 911598

3.11 The LCM Emergency Response Plan will be reviewed for accuracy and adequacy as part of the annual internal audit of this area of the EMS. Any recommendations for amendment will be agreed by the Operations Manager and, where required, be passed to the Managing Director for prior approval

4. Responsibilities

Senior Management:
Review and updating of the LCM Emergency Response Plan. Directing emergency incident response

Operations Manager:
Dissemination of this procedure and the Emergency Response Plan to all staff as appropriate. Responsibility for the arrangement of periodic emergency response practical testing exercises. Responsibility for coordinating responses to any emergency incident in conjunction with the Managing Director and Health & Safety Coordinator.

Health & Safety Coordinator:
Day to day responsibility for fire safety on site; coordination of fire evacuation and regular testing of evacuation procedure; ensuring up to date Fire Risk Assessments

Quality & Environmental Compliance Officer / Environmental Auditor:
Review of the LCM Emergency Response Plan for accuracy and adequacy. Updating the plan in conjunction with the Operations Manager.

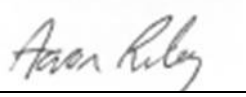
Operational Staff:
Participation in emergency response testing exercises. Awareness of the LCM emergency response procedures, in particular, emergency contact details.

5. Document Locations

LCM Emergency Response Plan Oct 2019

Fire Safety Folder

Site Drainage Plan

Approved by:	Title	Date
	Environment Manager	12 August 2020

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Appendix I – Spillage Response Procedure

Isolate → Contain → Absorb → Clean Up & Dispose → Report & Reorder

Isolation

- Ensure adequate PPE is worn
- Wherever possible try to isolate the area of a spillage with a caution tape or suitable warning device to prevent other people becoming part of the incident.
- Extinguish all naked flames and try to keep upwind of the spillage.
- Stop source of spill if practical / safe

Contain & Absorb

- The spill kits provided have several means of containing liquids:
  - **ABSORBANT SOCKS** are filled with absorbent material and can be used to surround a liquid spillage in isolation or in conjunction with the **PADS**.
  - **PADS / GRANULES** can be used directly on the spilled liquid to absorb it.

Clean Up & Disposal

- Hazard only disposal bags are available in the spill kits that should be used to place any materials used to clean a hazardous spill. Use a hazard tag to seal the bag. If the spent material will not fit into a bag place it into a metal drum and identify the drum as hazardous waste. (See Environmental Manager for correct labelling.
- Never throw hazardous waste onto a general waste skip.
- **If in doubt ask your Team Leader or Department Manager**

Report & Reorder

- Report the incident to the Operations Manager / Environment Manager as soon as possible
- Manager to order replacement spill kit contents

ENVIRONMENTAL MANAGEMENT SYSTEM MANUAL

BS EN ISO 14001: 2015

Document Title: Monitoring & Measurement Procedure			
Ref: EP 9.1	**Date Issued:** 20/07/17	**Last revised:** 04/07/19	**Revision No:** 04
ISO 14001 References: 9.1			
Related Documents:	• ER 4.2 – Interested Parties Record • ER 6.1.1 – Risks & Opportunities Register • ER 6.1.2 – Register of Significant Environmental Aspects • ER 6.1.3 – Register of Compliance Obligations • ER 6.2.1 – Environmental Objectives Monitoring Record • EP 7.4 – Communications Procedure & Plan • EP 9.1.2 – Evaluation of Compliance Procedure • ER 9.3 – Management Review Records		

Monitoring & Measurement Procedure

1. Requirements of the Standard

"The organization shall monitor, measure, analyse and evaluate its environmental performance.

The organization shall determine:

a) *What needs to be monitored and measured*
b) *The methods for monitoring, measurement, analysis and evaluation, as applicable, to ensure valid results;*
c) *The criteria against which the organization will evaluate its environmental performance, and appropriate indicators;*
d) *When the monitoring and measuring shall be performed;*
e) *When the results from monitoring and measurement shall be analysed and evaluated.*

The organization shall ensure that calibrated or verified monitoring and measurement equipment is used and maintained, as appropriate.

The organization shall evaluate its environmental performance and the effectiveness of the environmental management system.

The organization shall communicate relevant environmental performance information both internally and externally, as identified in its communication process(es) and as required by its compliance obligations.

The organization shall retain appropriate documented information as evidence of the monitoring, measurement, analysis and evaluation results."

2. Definitions

Monitoring:
"determining the status of a system, a process or an activity"

Measurement:
"process to determine a value"

Performance:
"measureable result"

Environmental Performance:
"performance related to the management of environmental aspects"

3. Procedure

3.1 The purpose of this procedure is to provide a systematic approach towards monitoring and measurement which will allow the company to track, and accurately report on, its environmental performance, environmental objectives and legal compliance status.

3.2 Monitoring and measurement activities by the company will focus on those areas appropriate to evaluating environmental performance and those areas which reflect the identified significant environmental aspects and environmental objectives.

3.3 Activities will be delineated as either monitoring or measurement activities as follows:

3.4 A measurement activity is generally quantitative in nature and involves the capture of data at a particular point in time. It can involve the use of equipment which may need the application of additional controls e.g. calibration procedures.

3.5 Monitoring activities may be qualitative or quantitative and generally involve the results of observations over a longer time period.

3.6 LCM has determined those activities that require either monitoring or measurement and these are set out in Appendix I.

3.7 The bulk of measurement and monitoring is undertaken using specialist external contractors who supply, maintain and calibrate the monitoring equipment used. However, calibration is undertaken on a periodic basis on the flow meter for the effluent discharge as required by United Utilities. A calibration certificate for this is filed within the EMS documentation.

3.8 Checks will be undertaken on all external contractors utilised for monitoring activities to ensure that applicable accreditations are held and that employees undertaking the monitoring are competent and qualified.

3.9 This list will be reviewed and updated on an annual basis as part of scheduled internal audits of the performance evaluation section of the EMS

4. Responsibilities

Senior Management:
To ensure the provision of adequate resources to carry out all monitoring and measurement as specified within the EMS.

Environment Manager:
To plan and update monitoring schedules as required and ensure that all programmed monitoring and measurement activities are carried out within prescribed timescales by qualified and competent personnel.

Environmental Auditor(s):
To audit, review and update the monitoring schedule, in conjunction with the Environment Manager, on an annual basis.

5. Document Locations

Calibration Certificate for Flow Meter

Approved by:	Title	Date
Aaron Ruby	Environment Manager	04/07/2019

APPENDIX I – MONITORING & MEASUREMENT ACTIVITIES

Measurement Activities:				
Description	**Frequency**	**Data Capture Method**	**Indicators**	**Additional Controls**
Stack emissions monitoring and servicing of abatement equipment - points A1; A2; A3	Annual	In situ sampling using MCERTS certified contractor (Socotec)	Particulate and HF – $mg/m^3/hr$	Permit limits: particulate ≤5mg/m3/hr; HF ≤0.5mg/m3/hr. Copy MCERTS certificates on file.
Effluent discharge composition & flow rate	Quarterly	Auto-sampler ~ 3 samples / month. Off-site testing by United Utilities.	Temperature; daily volume; rate; pH; composition	Consent limits: temperature ≤ 43.3°C; 6 ≤ pH ≤ 12; max daily volume 20m3; flow rate 1 litre/sec
Effluent discharge flow meter calibration	Every 14 months from Aug 19	Calibration against off-site test rig at consultants Norstrom Group	Flow rate litre / sec	N/A
Noise risk assessment and monitoring	Every 2 years	Noise meters placed in production environment and attached to sample employees; external H&S consultants (CEA)	Daily personal noise exposure ($L_{EP,d}$) and likely peak sound pressure (LCpeak) – all in dB	Legal 'exposure action values' are 80-85db for $L_{EP,d}$ & 135-137db for LCpeak
Cobalt dust	Monthly	Air sample pump and filter placed in production environment and/or attached to sample employees over 8 hour period; in-house laboratory analysis	Co mg/m^3	Workplace exposure limit (WEL) for Co = 0.1 mg/m^3 averaged over an 8-hour period
Low Level Employee Health Monitoring	Monthly	External occupational health nurse (Gunning Occupational Health) – tests on all employees	Respiratory function; skin surveillance; audiometry; urine tests	Adverse results trigger referral to GP
Leak testing of F-gas equipment: Units as per Chiller Register	Annual	Refcom registered external contractor (RSM Ltd). Visual inspection of system & components, followed by direct testing (e.g. portable electronic meter or bubble solution / UV fluid)	Pass / Fail	Testing personnel qualified to City & Guilds Level 2 F-Gas & ODS. Contractor Refcom registered. Copy certificates held.

Energy assessment of air-conditioning units over 12kW output	5 years	External energy assessor – Green Zone (last done 29/10/14)	Efficiency Condition Report with recommendations where necessary	Annual servicing and leak testing of air con systems by RSM Ltd
LEV flow rate testing & condition monitoring	6-monthly*	External contractor (Nederman) – LEV COSHH tests on all LEV systems. Visual appraisal of components, digital pressure meter, Hot Wire Thermal Anenometer. Testing conforms to HSE Guidance HSG258.	Flow rates (m^3/hr); static pressure (Pa)	COSHH test compliance report produced and kept for 5 years *Note: COSHH - HSE L5, (Section 4, page 90) states 6 months for 'Processes giving off dust or fume in which nonferrous metal castings are produced', otherwise 14 months.
	Weekly	Max and min flow rates from sample extraction points – in-house monitoring using flowmeter	Flow rates (m^3/hr)	
Groundwater monitoring – required under Environmental Permit	Every 5 years	Not yet undertaken – due for 2023 year end – unless risk assessment indicates otherwise	To be decided	
Soil condition monitoring – required under Environmental Permit	Every 10 years	Not yet undertaken – due for 2028 year end – unless risk assessment indicates otherwise	To be decided	
Monitoring Activities:				
Description	**Frequency**	**Data Capture Method**	**Indicators**	**Additional Controls**
Compliance Evaluations	Annual	Audit against Compliance Register using observation, interview and documentation review	No. of compliant / non-compliant pieces of legislation recorded in 'Compliance Status Summary'	Non-compliance triggers NCR form. Results reported to Management Review.
Environmental Objective progress review	Six-monthly	Management Review	% progress towards achievement (qualitative)	Results recorded on environmental objectives monitoring record (ER 6.2.1)
Legionella Risk Assessment & Audit	Two years	Audit and report – last done Jan 2018	Number of non-conformances	Legionella flushing & monitoring activities added to AR outlook calendar.

Raw material usage	Annual	Usage from database	kg	Annual, year on year comparisons vs actual sales
Energy consumption	Weekly recording – data received quarterly	Meter readings / energy bills	MWh	Submitted to EA in annual report. Energy use spreadsheet. Year on year comparisons vs actual sales
Water consumption	Annually	Utility bills	m^3	Submitted to EA in annual report. Year on year comparisons vs actual sales
Waste arisings	Annual	Returns from Veolia	Tonnes (T)	Environmental Objective set 2014 to reduce waste to landfill vs actual sales
Waste Duty of Care contractor audits	Annual	Documentation – check valid (in-date) waste carrier licences and environmental permits / exemptions	Date; scope of licence	
Facility Condition Inspections	Quarterly	Checklist for recording observations; all areas of factory covered over 3 month period;	N/A - but reviewed at monthly H&S meetings and actions prioritized where necessary	Environmental checks include: PPE usage; storage of chemicals / flammables / oils; waste segregation & storage; LEV operation; MSDS / COSHH data available; WI's availability; generator integrity; oil storage areas
Packaging handled	As considered necessary	Purchase and sales documentation; in-house compilation of data; external review by consultant JM Consultancy Ltd.	Tonnes handled per annum	Last undertaken in 2014
Emergency Response procedures	Annual testing	In-house practical test scenario of potential environmental incident	Observation, feedback from participants	Recorded within EMS (ER 8.2); used to inform review of procedures
Energy, water and raw material efficiency review – required under Environmental Permit	Every 4 years	Next due for March 2022	To be decided	

DGSA compliance audit	Annual	Documentation review by external contractor (Chemfreight Dangerous Goods Training Ltd)	Accuracy and completeness of documentation	Requirements set out in Carriage of Dangerous Goods & Use of Transportable Pressure Equipment Regulations 2009; production staff trained in the packing and handling of dangerous goods.
Legionella	Weekly/ Monthly/ Annually	Water temperatures and running of taps	Degrees C and time	

ENVIRONMENTAL MANAGEMENT SYSTEM MANUAL BS EN ISO 14001: 2015

Document Title: EMS Document Register			
Ref: ER 7.5	**Date Issued:** 22/06/17	**Last revised:** 10/09/20	**Revision No:** 15
ISO 14001 References: 7.5			
Related Documents:	• ER 7.5.2 - EMS Amendment Register		

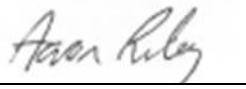
EMS Document Register

ISO 14001 FILE:	**Revision No:**	**Issue/Rev Date:**
01 – EMS Structure:		
ER 7.5 - EMS Document Register	15	10/09/20
ER 7.5.2 – EMS Amendment Register	17	10/09/20
04 – Context:		
EP 4.1 – QEMS Context Determination Procedure	01	13/09/17
EP 4.2 – QEMS Interested Parties Procedure	01	13/09/17
ER 4.1 – QEMS Context Review Record	04	07/04/20
ER 4.2 – QEMS Interested Parties Record	01	17/01/19
ER 4.3 – Scope of QEMS	01	30/01/18
05 – Leadership:		
ER 5.2 – Environmental Policy	00	22/06/17
EP 5.3 – Roles, Responsibilities & Authorities	01	13/09/17
06 – Planning:		
EP 6.1.1 – QEMS Risks & Opportunities Procedure	00	23/08/17
ER 6.1.1 – QEMS Risks & Opportunities Register	10	11/05/20
EP 6.1.2 – Environmental Aspects Evaluation Procedure	00	13/07/17
ER 6.1.2 – Register of Significant Environmental Aspects	08	02/04/20
EP 6.1.3 – Compliance Obligations Procedure	00	29/06/17
ER 6.1.3 – Register of Compliance Obligations	19	10/09/20
EP 6.2.1 – Environmental Objectives Procedure	01	13/09/17
ER 6.2.1 – Environmental Objectives Monitoring Record	05	16/01/20

ENVIRONMENTAL MANAGEMENT SYSTEM MANUAL

BS EN ISO 14001: 2015

07 – Support:		
EP 7.2 – QEMS Competence, Training & Awareness Procedure	01	13/09/17
EP 7.4 – QEMS Communications Procedure & Plan	01	13/09/17
EP 7.5 – Control of Documents & Records	00	03/08/17
08 – Operation:		
EP 8.1a – Operational Control - General	01	12/12/19
EP 8.1b – Operational Control – Waste, Energy, Oil & Water	01	05/12/19
EP 8.2 – Emergency Preparedness & Response Procedures	03	12/08/20
ER 8.2 – Records of Periodic Testing of Emergency Response	03	13/08/20
09 – Performance Evaluation:		
EP 9.1 – Monitoring & Measurement Procedure	04	04/07/19
EP 9.1.2 – Evaluation of Compliance Procedure	00	20/07/17
EP 9.2 – Internal Audit Procedure	00	27/07/17
ER 9.2.2 – Internal Audit Programme & Record of Audits	01	04/01/19
EP 9.3 – Management Review Procedure	01	24/08/20
ER 9.3 – Management Review Records	04	24/08/20
10 – Improvement:		
EP 10.2 – Nonconformance & Corrective Action Procedure	00	27/07/17
F139 – Record of Environmental Nonconformances	02	08/11/18

Approved by:	**Title**	**Date**
	Environment Manager	10/09/20
*** Uncontrolled document if printed – check against electronic master before use ***		

Less Common Metals Ltd Emergency Preparedness and Response Plan

October - 2019

Important Contacts

Call 999 to report any emergency

Managing Director (Ian Higgins)

- 0151 348 5655
- 07976 922052

Operations Manager (Aaron Riley)

- 0151 348 5641
- 07413 942450

Technical Director (Chris Hall)

- 0151 348 5653
- 07818 416000

Engineering Coordinator (Duncan Owen)

- 07721 498650

Health & Safety (Steve Jones)

- 0151 348 5662
- 07742 911598

Site Security

- 0151 348 5667

Emergency Evacuation Meeting Location:

Muster Point Opposite Site Security Cabin

Contents

Introduction and Purpose

LCM is committed to the safety and well-being of its staff, contractors, and visitors. Upholding this commitment requires planning and practice. This plan exists to satisfy those needs, and to meet the statutory requirements to outline the steps to be taken to prepare for and respond to an emergency affecting LCM. This plan also meets the requirements of ISO14001, with respect to emergency response, within LCM's accredited environmental management system.

The employer must, at all times, ensure that employees and other persons who are not employees are not put at risk by any work activities (ss.2 (2), 2(3) and 3 of the Health and Safety at Work Act 1974 (HSW Act)). In addition to this, the Management of Health and Safety at Work Regulations 1999 (MHSWR) require that assessments are made of all risks to which employees are exposed while at work. Further employers are required to have arrangements in place to cover health and safety, not only for employees but also for others who may be affected by the work activities, and these should be integrated with all the company's management systems.

MHSWR also concerns procedures for serious and imminent danger, and for danger areas. An employer must:

- Establish procedures to follow in the event of serious and imminent danger to persons at work, including risks from non-occupational sources such as bomb alerts.
- Nominate competent persons to implement the above as regards evacuation of premises.
- ensure that no employee has access to a restricted area unless that employee has been appropriately trained

Goals

The goals of LCM in responding to an emergency situation include:

- The safety of all staff, contractors & visitors.
- The physical and emotional well-being of staff, contractors & visitors.
- The timely stabilization of an emergency situation.
- The protection of the LCM facility, property, and the belongings of staff, contractors & visitors.

Applicability and Scope

This plan applies to all employees of LCM and any person working on, or visiting, the site.

The scope of this plan is intended to encompass relevant procedures for all potential hazards identified for the site. This procedure is displayed in various strategic positions around the site All employees, visitors and contractors shall familiarize themselves with its contents by way of the relevant site induction procedures at LCM.

Responsibility

The LCM emergency plan is the responsibility of Managing Director. The Managing Director will review and update this plan at least once annually. Revisions will be made as needed throughout the year. Any suggestions, comments, or questions should be directed to the Operations Manager.

Order of Succession

Leadership authority during an emergency shall flow downward through the following list of people:

1. Managing Director
2. Operations Manager
3. Production, Health and Safety Superintendent

Emergency Communications

During an emergency, LCM will use the following means and methods of communication.

Radio communication will be used by the LCM designated fire response team in the event of fire or evacuation.

Telephone / mobile will be the prime communication system of management.

Media Inquiries

Inquiries from the media during or after an emergency will be addressed by the Managing Director.

Test, Training, and Exercises

Staff must receive adequate training, information, instruction, and supervision to ensure responsibilities are conducted competently.

Testing and validation

Periodic testing of the fire alarm system and integrated call point shall be conducted on weekly bases by a member of LCM's fire response team, and assisted by an employee who has received training.

In terms of other potential emergency situations, identified within the environmental management system, these will be periodically tested using practical and/or desktop training

exercises as deemed appropriate to test the effectiveness of response. Emergency communication systems (e.g. radios and public announcement equipment) should also be tested as part of such scenarios.

The responsibility for carrying out drills and exercises rests with the employer (Managing Director) of the premises. The drills are intended to ensure by means of training and rehearsal that in the event of an incident such as fire evacuation that-.

- The people who may be in danger act in a calm and orderly manner.
- Those designated to carry out their allocated duties to ensure the safety of all concerned.
- The means of evacuation are used in accordance with the pre-determined procedure.
- If evacuation of the building becomes necessary, it is speedy and orderly

Employees (without special responsibilities) should:-

- **not** attempt firefighting or other emergency action for which they have not been trained
- evacuate the building as soon as the alarm is heard
- assist (if possible) any disabled employees to evacuate the area
- switch off equipment which could further compound the risk
- report to the designated assembly points

Emergency Contact Directory - Internal:

Name	Position	Primary Phone	Secondary Phone
Ian Higgins	Managing Director	0151 348 5655	07976 922052
Chris Hall	Technical Director	0151 348 5653	07818 416000
Duncan Owen	Engineering Coordinator	0151 348 5661	07721 498650
Aaron Riley	Operations Manager	0151 348 5641	07413 942450
Steve Jones	Health & Safety	0151 348 5657	07742 911598
Site Security		0151 348 5667	

Emergency Contact Directory - External:

Organisation	Address	Telephone No.
Environment Agency	North West Regional Office, PO Box 12, Richard Fairclough House, Knutsford Road, Latchford, Warrington, Cheshire, WA4 1HT	Tel: 08708 506506 (Mon-Fri, 8-00am-6-00pm) Tel: **0800 807060** (24hr incident hotline)
Fire Service	Via **999** (or **112**) emergency service, the Fire Service may in turn mobilise their Chemical Incident Response Procedures	

United Utilities	United Utilities Group PLC, Haweswater House, Lingley Mere Business Park, Lingley Green Avenue, Great Sankey, Warrington, Cheshire WA5 3LP	Tel: **0845 746 2200** (24hr incident hotline)
Cheshire West & Chester Council	Environmental Health, Cheshire West & Chester Council, HQ, Nicholas Street, Chester, CH1 2NP	Tel: **0300 123 7 038**
Vauxhall Motors (in event of major effluent spill or flooding)	Emma Brady, Site Environmental Engineer, Vauxhall Motors, North Rd, CH65 1AL emma.brady@opel-vauxhall.com	Tel: 0151 350 2025 Mob: **07780 756407**
AMI Metals	Richard Abbott, Production Manager, Hooton Park Matt Pawlowski, Production Supervisor	Tel: 0151 355 6035 Mob: 07591203269 Mob: 07568196415
Adient	John Wood, Plant Manager	Tel: 0151 357 4302 Mob: 07805917002

Information for the Fire Service

For the information of the Fire Service, and any other emergency services likely to come into contact with hazardous chemicals following an incident, an 'Explosive & Highly Flammable Materials' folder is kept for information in the Site Security Cabin. This contains relevant information such as a list of explosive and flammable materials, their locations, the site plan and relevant MSDS.

This should be passed to representatives of the Emergency Services as soon as they attend on site.

Emergency Protocols

The following emergency protocols have been established for use in relevant situations:

1. Fire and Evacuation
2. Medical Emergency
3. Bomb Threat
4. Hostile intruder, employee, contractor or visitor
5. Suspicious Package or Object
6. Utility Failure: gas, electricity
7. Floods
8. Adverse Weather Conditions: storm, winds, snow
9. Environmental Releases
10. Emergency Situations on Furnaces

1. Fire and Evacuation

SITE EVACUATION & EMERGENCY PROCEDURE

In order to ensure the health and safety of all employees the following site evacuation/emergency procedure shall be adhered to. ***This procedure is mandatory for all employees, contractors & visitors and failure to comply will result in disciplinary action being taken or removal from site.***

1. In the event of a fire, or other dangerous incident, the fire alarm is to be sounded by the person discovering the incident. On hearing the fire alarm all employees, visitors & contractors should leave the building immediately by the nearest fire exit and report to the signed, designated assembly point at the front of the LCM building opposite the Site Security Cabin.
2. A fire warden will (if safe to do so) make his/her way to the Disability waiting area at the top of both staircases and assist persons who require assistance via the disability evacuation chair.
3. Any one of LCM's trained Fire Wardens shall assume responsibility as Incident Controller. In the absence of a Fire Warden this role will be assumed either by a Fire Marshall or member of the Management Team.
4. The Incident Controller will obtain a print out of the "Signing in" Register from the Security Cabin.
5. The roll call shall then be taken by the Incident Controller. The roll call shall include all employees, visitors and contractors on site.
6. Employees who have visitors on the premises are responsible for ensuring the visitor(s) have signed the visitor's book. When the visitor leaves the factory, the employee is also responsible for ensuring that the visitor is signed "Out" in the visitor's book.
7. If any members of staff, visitors or contractors are missing from the roll-call, and if it is considered safe to do so, the Incident Controller shall organise two staff, preferably other Fire Wardens or Marshalls to conduct a sweep of the building.
8. On completion of the roll call, the Incident Controller, Senior Manager or Fire Warden shall establish the nature of the incident and if necessary the Fire brigade will be called as detailed in the Fire Warden Duties Policy.
9. Once it has been established that the building is safe. The alarms will be silenced and the all clear given to return to work. The all clear signal will be given by the Fire Warden or the emergency services.

To ensure compliance with this procedure, site evacuation drills will be carried out at least twice during each year.

Designated LCM Fire Wardens: Steve Jones, Nigel Evans & Darren Henvey

Designated Fire Marshalls: Johnny Price, Steve Stormes, Steve Boyd, Darren Smith, Chris Bailey, John Light, Nick Shelly, Duncan Owen, Pete Dutton

2. Medical Emergency

If someone is seriously injured, or becomes seriously ill:

- Stay calm and call for assistance, if possible contact the site first aid responder
- Dial **999** and explain the type of emergency, the location, condition, and number of victims
- Do not move the victim unless there is danger of further injury if s/he is not moved.
- Render first-aid or CPR **only** if you have been trained first aid station/provision can be found in the following locations:
    - The main canteen
    - Metal making
    - SmCo Cast area (next to the GNB Furnace)
    - Strip Casting hall
    - 1st floor at the top of stairwell (adjacent to the Lab entrance)
- An Automated External Defibrillator is located in the main canteen. This can be operated by any member of staff by following the taped instructions
- Do not leave the injured person except to summon help
- If possible inform site security of imminent arrival of emergency medical services
- If possible instruct a fellow employee to wait at the main site gate to direct or assist the emergency services to the injured person's location
- Comfort the victim until emergency medical services arrive
- Liaise with the emergency services and inform them of any known hazards en-route or within the immediate area of the injured person

Designated LCM First Aiders: Steve Jones, Nigel Evans, Darren Henvey, Steve Davies, Steve Stormes, Steve Boyd, Darren Smith, John Timmins, Neil Johnston. Jake Johnson,

3. Bomb Threat

In the unlikely event you receive a bomb threat, remain calm and write down as much detail as you can, making notes of the following:

- Time of the call
- Callers number (Caller ID display)
- Male or female and accent
- Background noise
- Instructions you may be given by the caller

When the caller hangs up inform your manager immediately and hand them any notes and instructions you have obtained during the call, they will phone the Emergency Services and raise the alarm to evacuate the building if necessary.

4. Hostile Intruder, employee, contractor or visitor

In the event you are confronted with hostility from persons known or unknown to you, you must:

- Inform security or a member of staff as soon as possible (who will inform the Emergency services if necessary)
- Stay calm and don't engage in conversation
- Do not confront or provoke the person
- Get to a secure place of safety (lockable office)
- Inform others of the danger
- Wait for the police to control the situation

5. Suspicious Package or Object

If you have any reason to believe that a letter or parcel is suspicious, DO NOT take any risks and evacuate the building by following the Emergency & Evacuation Procedure, ensuring you:

- Inform the security personnel and your Manager
- DO NOT touch or attempt to move the package or object
- Evacuate the immediate area
- Wait at the assembly point for further instructions

6. Utility Failure and Natural Disaster

This could include electrical outages, plumbing failure, gas leaks, ventilation problems, elevator failures, etc. For your personal safety, in the event of a utility failure:

- Remain calm.
- Notify the Engineering Coordinator on 0151 348 5661, Internal 661 or mobile 07721 498650.
- If the building is to be evacuated, follow the instructions on Site Emergency & Evacuation Procedure (L:\Health & Safety\Fire\02-07-01 - Hooton Park\Site Evacuation Procedure)
- If safe to do so - unplug all electrical equipment (including computers) and turn off light switches.

  Laboratory personnel: Secure all experiments, unplug electrical equipment, and shut off research gases prior to evacuating. Close all fume hoods and chemical containers.
- If you are trapped in the lift, help will arrive shortly:
  - Remain calm.
  - Use the Call Button or Phone to call for help.
  - Do not try to climb out or exit the lift without assistance.

7. Floods

Minor or area flooding on site could occur as a result of a water main break, loss of power to sump pumps, or major multiple rainstorms. For imminent or actual flooding, and only if you can safely do so:

- Secure vital equipment, records, and other important papers.
- If the building must be evacuated, follow the instructions on Site Emergency & Evacuation Procedure.
- Assemble in the fire muster area.
- Shut off all electrical equipment (Contact number for Engineering Coordinator on 0151 348 5661, Internal 661 or mobile 07721 498650)
- Wait for further instructions from the Incident Controller or LCM Management.
- Report immediately to the Operations Manager or Health, Safety & Production Superintendent for appropriate Personal Protective Equipment to be issued as oil, chemical, or other substance pose a significant risk to health if suitable preventative measures are absent.

8. Adverse Weather Conditions

A "**Storm Watch**" means that a storm could potentially develop or increase in severity. The safety of personnel on site will be evaluated by the senior management team. If precautionary measures have been agreed the following must be implemented and followed:

- If necessary, send personnel home if it has deemed safe to do so.
- Lock all windows and doors.
- Evacuate personnel from the first floor and areas with windows or glass panel doors i.e. Main canteen, lab, main office visitor's reception (anywhere where there remain a potential risk of glass being broken, that could contact people.
- If weather conditions pose a risk of roof damage and falling debris, secure factory processes to safe conditions and instruct operators to evacuate the factory floor and assemble within the amenities areas

9. Environmental Releases

The following potential environmental incidents have been identified for the LCM site:

- Effluent tank or pipeline rupture
- Fire water runoff
- Accident chemical release

Effluent tank or pipeline rupture

In the event of an uncontrolled release of effluent the following action must be taken:

- Contact the Engineering Coordinator on 0151 348 5661, Internal 661 or mobile 07721 498650 – the Engineering Coordinator may need the caller to carry out certain checks whilst on the phone, please stay on line

- Switch the Co Reduction effluent pump off. (This can be located adjacent to the effluent pump in the form of an isolation switch next to the effluent tank)
- Contact the Operations Manager on 07413 942450

Fire Water Runoff

- All fire water runoff enter the surface water drains prior to discharging into the Vauxhall lagoon.
- The Operations Manager will contact Vauxhall Motors to inform them of the incident in order that they may isolate the run-off within the lagoon
- Following any incident which generates fire water run-off, the effluent would be analysed and arrangements made with a specialist disposal contractor to pump out and tanker off site for appropriate disposal

Accidental Chemical Releases

None of the LCM's processes permit accidental release of chemicals under normal operating conditions. However under emergency situations the following potential releases have been identified and require the following remedial actions:

- If the fume treatment plants have failed whilst the equipment is in use contact Engineering Coordinator on 0151 348 5661, Internal 661 or mobile 07721 498650, the equipment must not be used until the fume treatment plant has been repaired and functioning correctly.
- In the event of fire or explosion hazardous chemicals maybe released to atmosphere. Follow the emergency and evacuation procedure. Site security, or the Incident Controller, must hand the Explosive & Highly Flammable Materials Folder to the Emergency Services on their arrival on site. This contains relevant information such as a list of explosive and flammable materials, their locations, the site plan and relevant MSDS
- Breaching of substances such as oils and process coolants will be isolated by using portable bunding kits that can be found in the yellow wheeled containers strategically placed around the site. A bunding kit can also be found in the security cabin whereby security personnel have been trained to deal with events that could arise out of normal working hours.

10. Emergency Situations on Furnaces

A set of emergency response protocols have been established, in the event of an emergency situation arising during the operation of one of the furnaces. For each of the furnaces the following emergency situations and protocols have been identified:

EMPRO 0 – Water in Chamber

EMPRO 1 – Crucible Failure

EMPRO 2 – Main Cooling Water Failure

EMPRO 3 – Main Power Failure

EMPRO 4 – Mould Failure / Tundish Failure

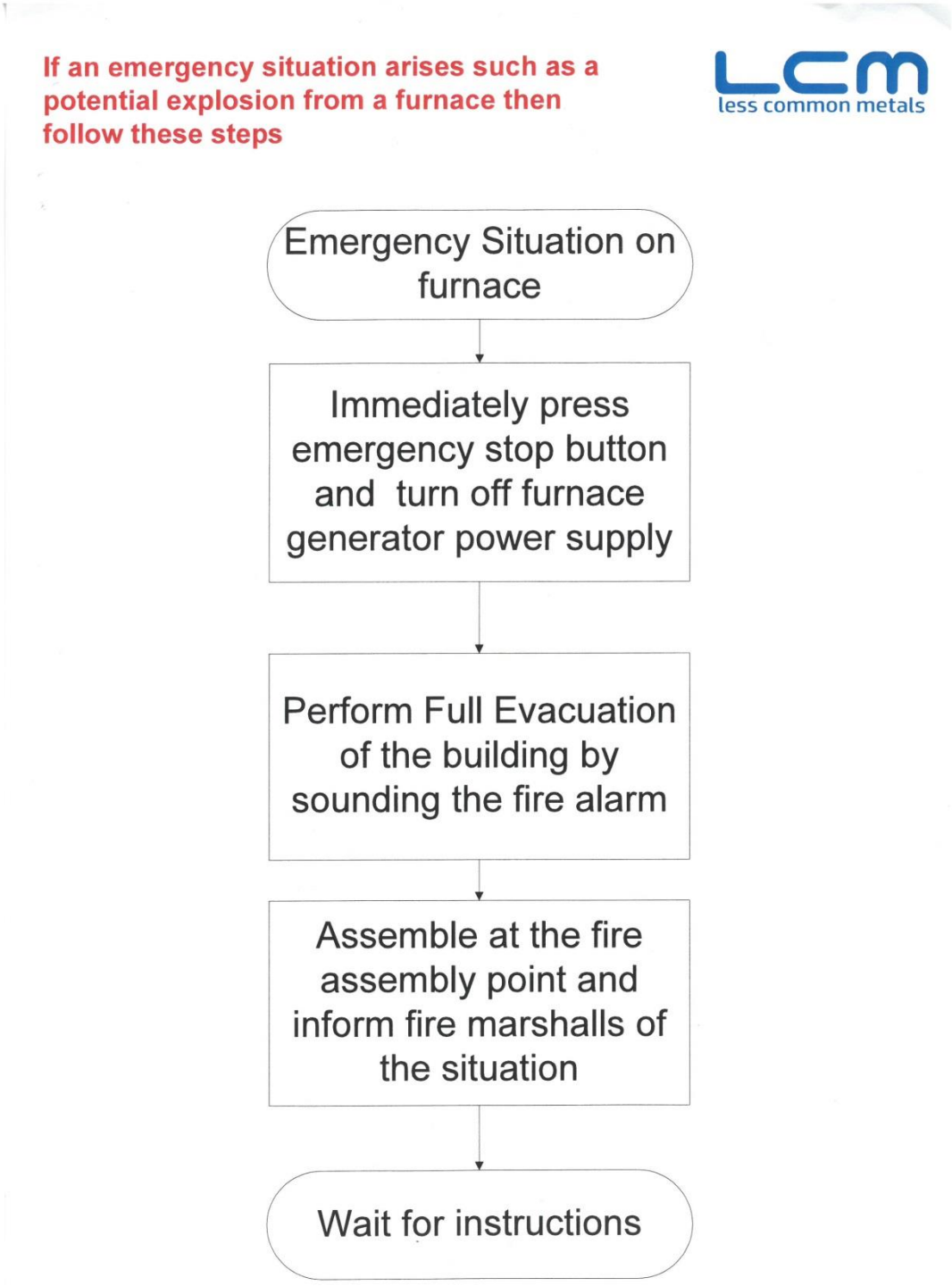
EMPRO 5 – Fire Alarm Sounding

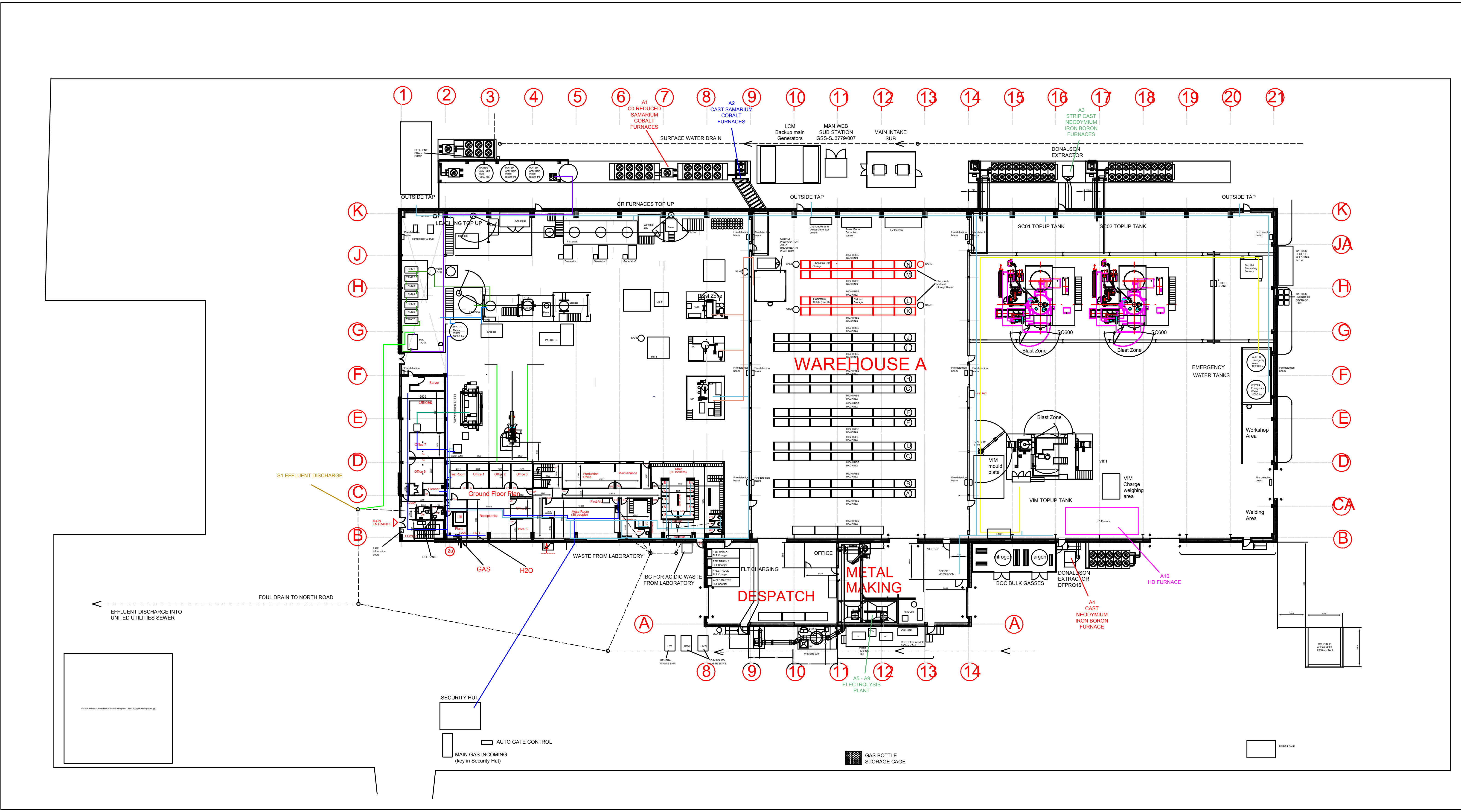
EMPRO 6 – Tilt Drive Failure (GNB & VIM) / Hydraulic Failure (IS5 & Strip Caster)

The protocol relevant to each situation-type and furnace-type are held at:

L:\Health & Safety\Emergency procedures

In the event of fire or explosion arising from furnace operation the following steps should be taken:





A1 C0-REDUCED SAMARIUM COBALT FURNACES
A2 CAST SAMARIUM COBALT FURNACES
A3 STRIP CAST NEODYMIUM IRON BORON FURNACES
A4 CAST NEODYMIUM IRON BORON FURNACE
A5 - A9 ELECTROLYSIS PLANT
A10 HD FURNACE
SURFACE WATER DRAIN
LCM Backup main Generators
MAN WEB SUB STATION GSS-SJ3779/007
MAIN INTAKE SUB
DONALSON EXTRACTOR
OUTSIDE TAP
CR FURNACES TOP UP
LEACHING TOP UP
SC01 TOPUP TANK
SC02 TOPUP TANK
SC600
Blast Zone
WAREHOUSE A
EMERGENCY WATER TANKS
Workshop Area
Welding Area
VIM mould plate
VIM Charge weighing area
VIM TOPUP TANK
Ground Floor Plan
S1 EFFLUENT DISCHARGE
MAIN ENTRANCE
GAS
H2O
WASTE FROM LABORATORY
IBC FOR ACIDIC WASTE FROM LABORATORY
FLT CHARGING
OFFICE
DESPATCH
METAL MAKING
BOC BULK GASSES
nitrogen
argon
DONALDSON EXTRACTOR DFPRO16
FOUL DRAIN TO NORTH ROAD
EFFLUENT DISCHARGE INTO UNITED UTILITIES SEWER
SECURITY HUT
AUTO GATE CONTROL
MAIN GAS INCOMING (key in Security Hut)
GAS BOTTLE STORAGE CAGE
HIGH RISE RACKING

ENVIRONMENTAL PERMIT

VARIATION APPLICATION

Supporting Information

Hydrogen Fluoride Fluidised Bed Process

November 2020

Less Common Metals Ltd
Unit 2, Hooton Park
North Road
Ellesmere Port
Merseyside CH65 1BL

Environmental Permit No.: EPR/RP3233CZ
Company Registration No.: 02690088

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1. Introduction

The Company's core business is the manufacture of rare earth metal alloys, principally samarium cobalt but also alloys of other rare earths such as neodymium, praseodymium, cerium and lanthanum. Its products are used as vital raw materials in providing hi-tech magnets for powering green technologies, such as wind turbines and hybrid electric vehicles. The Company's activities are currently prescribed under The Environmental Permitting (England and Wales) Regulations 2016, Schedule I as follows:

- Section 2.2 Part A(1)(a): "*producing non-ferrous metals from ore, concentrates or secondary raw materials by metallurgical, chemical or electrolytic activities*", and
- Section 2.2 Part B(a): "*Melting, including making alloys of, non-ferrous metals … in plant with a melting capacity of … 20 tonnes or less per day for all other metals*".

The Company operates under a consolidated Environmental Permit (RP3233CZ V004). The latest variation, dated March 2018, reflects the BAT conclusions published for the non-ferrous metals sector. An additional variation application (ref: EPR/RP3233CZ/V005) has now been determined.

2. Additional Activity – Process Overview

This document provides supporting information in respect of an application to vary the Company's Environmental Permit to include an additional activity which would come under Schedule 1 Part 2 Chapter 4.2 'Inorganic Chemicals' (Part A(1)(a)(iv)). In summary the additional activity is:

(i) The conversion of rare earth metal oxides into rare earth metal fluorides using a reaction with hydrogen fluoride within a fluidised bed reactor by a batch process.

Background:

The intended activity is a pilot project that forms part of a €17m European funded project entitled Secure European Critical Rare Earth Elements (SecREEts). This is aimed at securing a viable and integrated European supply chain for rare earth permanent magnets that is competitive with established Chinese supply, but which meets higher European environmental standards. The rare earth metal fluorides produced in this process will feed into the existing electrolysis process on site

which manufactures Neodymium metal. This latter activity is an activity prescribed under Section 2.2 Part A(1)(a) within the scope of LCM's current environmental permit.

Process Description:

A fluidised bed reactor converts rare earth oxides (principally Neodymium oxide, Nd_2O_3, and Neodymium praseodymium oxide, $((NdPr)_2O_3)$ into rare earth fluorides (principally Neodymium fluoride, NdF_3, and Neodymium praseodymium fluoride, $NdPrF_3$) in a batch process using a fluidising medium composed of anhydrous hydrogen fluoride gas (HF) and Argon (Ar). The process operates within an enclosed, leak-proof container and has a conversion rate of Oxide to Fluoride of approximately 99%. The fluidising gases are recirculated to maximise resource use, any excess HF that is produced will be treated by an *in situ* wet scrubber and then extracted to pass through the existing potassium hydroxide wet scrubber on site, to ensure compliance with existing HF emission consent limits. The existing wet scrubber is the subject of a recent permit variation that has recently been determined (ref: EPR/RP3233CZ/V005). The exhaust gases will vent to atmosphere through an existing stack (point A5 in the attached document: Site-Plan-Emission Points_EA_01_20191105.pdf).

Process Operating Parameters:

The fluidised bed process is contained within a sealed container, as shown in Figure 1. A series of pre-start checks are conducted prior to process start-up. These include leak checks, checking the functioning of valves, correct operation of the blower, and that the values of all transmitters are within the specified range.

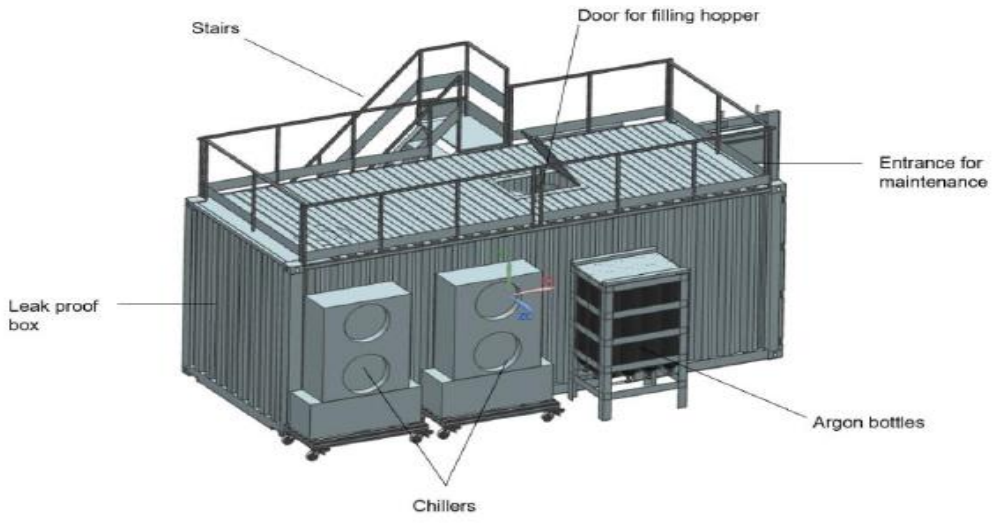


Figure 1 - Fluoride plant inside container

The major components of the system are:

1. HF Evaporator
2. Mixing box
3. Argon Heater
4. Fluidised bed reactor
5. 1st stage Condenser
6. 2nd stage Condenser
7. Scrubber
8. Induced draft fan

Hydrogen fluoride (HF) in a liquid state, stored in drums (19-20°C), enters the HF evaporator, and is heated up to its design pressure related to its temperature as a saturated vapor, and enters the mixing box. Argon is supplied to the system and serves three purposes:

- To efficiently heat up the powder bed during the start-up phase. The argon is passed through a heat exchanger before flowing through the reactor.

- To provide a means of controlling the temperature of the reaction while maintaining fluidisation. The temperature is controlled through the HF: Argon ratio and temperature of the Argon itself.

- Argon is also used to flush the system in case of emergency and cool it down after the batch process is complete.

Once the flow rate of the two supply gases is set, they are mixed in mixing box. The gas mixture flows into the reactor, via the nozzles, the rare earth powder is fluidized, and the reaction begins. The reactor is heated to a set temperature - most of the heat required is produced from electrical trace heaters that surround the reactor. Safeguards are in place for potential overpressures during the process such as pressure transmitters (measures and gives feedback to the pressure controller), bypass line in reactor (in case of blockages), alarms/warnings, automatic safety shutdowns and the design integrity of the reactor itself. The reaction in reactor is as follows:

$HF + REO \rightarrow REF + H_20$ (where REO = Rare Earth Oxide; REF = Rare Earth Fluoride)

The fluidised bed reactor can be vibrated, if necessary, to improve the fluidisation of certain rare earth powders.

The reaction in the fluidised bed reactor occurs with an excess of HF compared to the stoichiometric value. The products of the reaction are the desired rare earth fluoride powder and water (H_2O). Reacted rare earth fluoride powder remains in the reactor while the H_2O produced leaves the reactor as part of the flue gas. The remainder of the flue gas is composed of Argon and unreacted, excess HF.

The flue gas from the reactor flows through the 1st stage and then the 2nd stage condenser in order to remove HF and water.

The HF is recirculated for two reasons: 1) To reduce HF emissions and 2) to increase cost efficiency of the process.

The remaining flue gas flows through to the *in-situ* scrubber which uses potassium hydroxide as the scrubbing fluid. An HF detector is located on the scrubber outlet to ensure the HF concentration is below the permitted value. If the HF concentration is too high, the flue gas is recirculated to scrubber. When the flue gas clean-up is complete it is released into the existing on-site wet scrubber or recirculated to the argon line as required.

3. Production Capacity

The proposed process is part of a European research project which will run for a trial period until June 2022. If the process proves feasible it will be continued and scaled up.

The process has a theoretical maximum capacity of one batch per day (a run time of between 5-10 hours) which can produce 36-38kg of rare earth fluoride (REF), depending on the ratio of NdF_3 to $NdPrF_3$ produced. Following an evaluation of the trial in June 2022, if the process has proved successful it is intended to continue with production on a full-time basis with the aim of producing a maximum of 12 tonnes of REF per annum.

The product will be used, as required, to feed into the existing electrolysis process on site which manufactures Neodymium metal from Neodymium fluorides.

4. Raw Material Storage, Consumption & Conversion

To produce one batch of rare earth fluoride (principally Neodymium fluoride, NdF_3, and Neodymium praseodymium fluoride, $NdPrF_3$) stoichiometry values for HF indicate that production of 36kg NdF_3 requires 30kg Nd_2O_3 and 10.7 kg of HF. The production of 38kg $NdPrF_3$ requires 30kg of $(NdPr)_2O_3$ and 11.65 kg of HF. The process has a conversion rate of approximately 99%.

The process operates with an excess of HF which is recirculated through the process and ultimately treated through both the *in-situ* and external wet scrubbers. Consequently, the HF needs to be replenished from the external HF storage during the process.

The estimated maximum annual quantities used of each of the process raw materials based on total production of 12tpa of REF are calculated as follows:

Substance	**Full Operational Capacity kg / pa**
Nd_2O_3	5,000 – 10,000
$(NdPr)_2O_3$	4,750 – 9,500

The exact quantities of Argon and HF required can only be determined after commissioning of the plant. The actual amount of each of the oxides used will depend upon the ratio of NdF_3 to $NdPrF_3$ produced. The maximum storage of HF on site at any one time will be less than 5T.

The maximum quantities of all raw materials stored on the LCM site (for all processes) is 70 tonnes. Annual throughput of all manufactured product, in total, is less than 1500 tonnes.

Raw material reviews are undertaken each year for all operations on site, as part of permit conditions. The quantities recorded to date are as follows:

Year	Raw material Purchased Kg	Raw material used Kg	Product sold Kg
2014	487,367.80	443,774.10	350,352.93
2015	289,253.40	329,374.00	223,767.24
2016	276,912.07	242,877.14	194,487.58
2017	306,407.93	353,085.20	236,026.79
2018	392,712.00	393,223.11	338,857.67
2019	233,056.10	218,209.47	211,697.20

5. Emissions to Air

This section describes the emissions to air expected from the proposed activity and the mechanisms used to minimise them. There are no emissions to water from the process.

Gases:

The flue gas from the process consists of HF and Ar and is treated through a combination of an *in situ* reactor wet scrubber (KOH) and an existing, external wet scrubber which also serves the electrolysis process on site. The external wet scrubber on site is designed to ensure HF emissions from both processes are within current consented limits of 0.5 mg/m^3. The point of discharge to air from the wet scrubber abatement system is shown as point A5 on the attached site plan: Site-Plan-Emission Points_EA_01_20191105.pdf.

If HF gas is detected within the container, potentially arising from leaks within the process, a line is used for the aspiration and removal of the gas. This line is connected to the reactor's *in-situ* wet scrubber and passes from there into the external site wet scrubber.

HF emissions, from stack monitoring point A5, were tested during commissioning of the wet scrubber system in June 2019, by an MCERTS accredited company (Socotec Ltd), in accordance with Environment Agency Technical Guidance Note (Monitoring) M2 and are tested annually as part of the reporting to the Environment Agency required under the terms of the environmental permit. The latest analytical results, sampled on 26/06/19 (pdf attached with this application: '260619-HF Emissions Testing Results'), are as follows:

HF (emission point A5): **0.17 mg/m^3** (Consented Limit: 0.5 mg/m^3)

Testing of the emissions will also be undertaken during commissioning of the proposed activity.

Particulates:

The process occurs within a sealed unit. All solid particulates produced are discharged back into the process. A cyclone is used to separate entrained particles contained in the flue gas and return them to the reactor. This cyclone is placed at the top of the reactor.

6. Waste Arisings

No solid waste is produced from this process. All particulate is captured by the cyclone and returned into the plant; any excess, unreacted oxide is reused within the process.

Additional liquid wastes will be expected to arise from the capture of the HF emissions by the wet scrubber on site. The detail of this process is described in the previous variation application document. The waste potassium hydroxide solution produced from the wet scrubber is consigned off-site as hazardous waste.

The sustainable management of waste, in line with the waste hierarchy, is represented as a core commitment within the company's current environmental policy (attached as part of the company's EMS documents):

> 'Minimise the environmental impact of our waste generation through in-process recycling, increasing resource efficiency and ensuring all possible waste streams are segregated for recycling'

Waste reduction is emphasised in works instructions to ensure that the recycling of process / dross waste back into production occurs whenever possible. Dedicated, labelled bins for dross waste are located beside furnaces. Pallets are sent for reuse (or recycling if damaged). Old equipment is stripped down, and parts reused where possible prior to disposal as scrap metal.

A large number of dedicated containers for the separate collection of recyclable wastes are located inside within production areas and on the outside car park. These include facilities for the collection of cardboard, wood, scrap metal, wastepaper, dry recyclables, WEEE (including batteries) and waste oil.

Hazardous wastes produced are kept in segregated, labelled containers under cover within the factory prior to collection by a licensed waste contractor and consigned off site as hazardous waste.

Quantities of waste generated on site are reviewed each year as part of permit conditions, and as part of continual improvement indicators under the EMS. Waste production decreased between 2014 and 2016 due to the implementation of more comprehensive recycling facilities and reduction

measures. Waste levels showed an increase in 2019 largely as a result of a clean-up of old refractory linings and additional rubble disposed of as part of building work on site:

	2019	2018	2017	2016	2015	2014
Non-Hazardous Industrial	6.141	6.964	7.57	6.975	9.51	14.195
Lining & Refractors	26.9	12.06	11.28	7.1	6.46	6

7. Assessment of Environmental Risks

The environmental aspects of this process and their associated risks have been identified. These are listed together with the relevant controls as follows:

1. *Storage of HF on site*

HF has the following hazardous properties: Fatal if swallowed (H300), fatal in contact with the skin (H310), fatal if inhaled (H330), causes severe skin burns and eye damage (H314); the substance therefore presents a risk to human health. A HAZOP will be prepared in addition to both COSHH and process risk assessments to address the risks posed. Currently the company is awaiting detail of an engineering proposal from BOC who will supply and install the HF gas in accordance with current Regulations and HSE guidance. Measures being considered to minimise harm to human health and the environment are:

1) Warning of alarm by audible horn and visual indication of triggering condition

2) Shut down alarms monitors which include low supply pressure, high delivery pressure, gas detection sensor, exhaust failure

3) Automatic changeover between drums

4) Emergency shut down button to shut all valves in system in cases of emergency

5) Visual display of status of related destination systems showing standby, filling, purge, manual of shutdown mode

To minimise risk further the maximum storage of HF on site at any one time will be less than 5T. The HF storage forms part of a closed system with the reactor, and the HF is pumped through a line

from the drums into the fluidised bed. The exact mechanism for replenishment of the drums will be determined by the BOC engineering proposal.

2. *Storage of finished product on site*

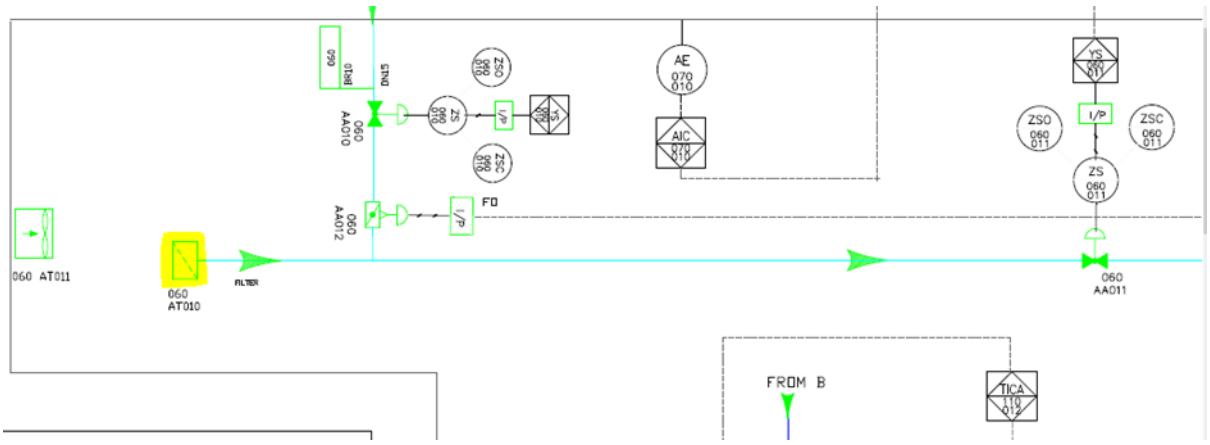
The finished product (NdF_3 and $NdPrF_3$) will be used as a raw material for the existing electrolysis process on site which manufactures Neodymium metal. The rare earth metal fluorides have health hazard classifications for skin, eye and respiratory irritation and their use is controlled by existing COSHH risk assessments.

The products will be stored in sealed containers, under cover within the factory buildings, prior to use in the process, to minimise the risk of escape.

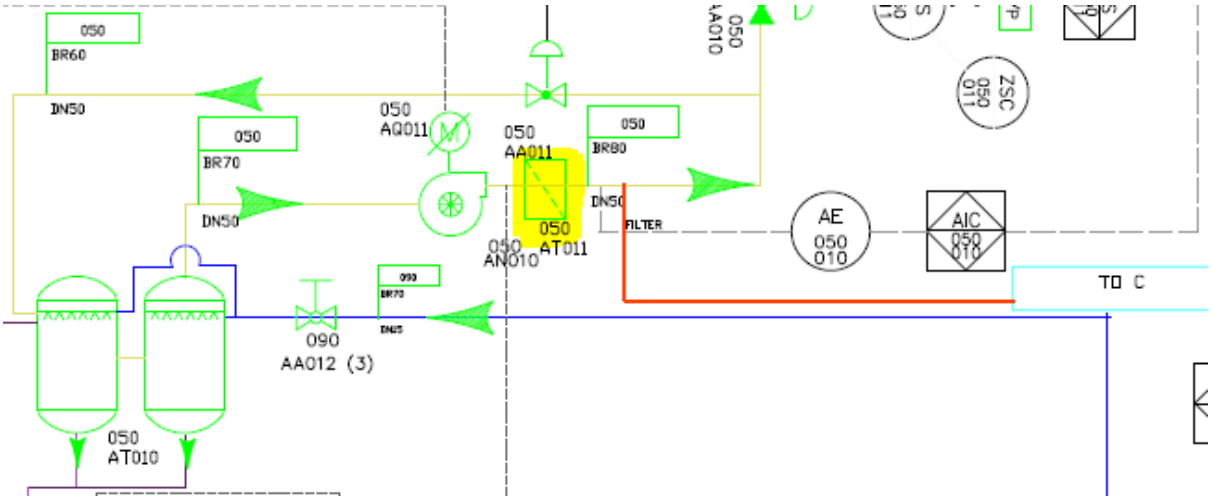
3. *Process Emissions of HF*

Emissions of HF potentially arise from either a leak within the container or by process discharge to the environment. These risks are addressed as follows to ensure no emissions exceed consented values.

An HF sensor is located within the reactor itself to detect leaks within the container. If this occurs a line is used for the aspiration and removal of the gas. This line is connected to the reactor's *in-situ* wet scrubber and passes from there into the external site wet scrubber. The location of the sensor is highlighted on the P&ID below.



In addition, an HF sensor is located on the outlet from the *in situ* wet scrubber feed line. This is highlighted in the portion of the P&ID below. This ensures that the HF concentration is below permitted values. If the HF concentration is above this the flue gas is recirculated through the *in situ* scrubber. Once the concentration is below the threshold the flue gas is released into the external on-site wet scrubber, for additional abatement prior to discharge to the environment.



Storage and Disposal of Wet Scrubber Waste

The existing on-site wet scrubber system is a Vertical Tower Fume Scrubber automatically dosed with 30% potassium hydroxide (KOH) solution, within a closed system, which captures and neutralises the HF gas producing waste potassium fluoride (KF) solution:

Neutralisation equation: $HF + KOH = KF + H_2O$

The KF solution accumulates within a closed IBC installed on a purpose-built concrete platform with a built-in concrete bund. Once full the IBC is exchanged for an empty container; the full container is stored inside the factory, on a bunded IBC pallet, awaiting collection and consignment off-site, to be disposed of as hazardous waste.

8. Environmental Management System

The company's activities are conducted within the framework of an environmental management system externally accredited by BSi to ISO 14001:2015 and a quality management system accredited to ISO 9001:2015.

The following documents from the EMS have been attached with this application:

(i) Current Certificate of Registration to ISO14001:2015
(ii) EMS Document Register – this provides a list of the main documents comprising the EMS
(iii) LCM Ltd Environmental Policy
(iv) Operational Control – General
(v) Emergency Preparedness Procedure
(vi) LCM Emergency Response Plan Oct 2019
(vii) Monitoring & Measurement Procedure

Other documents (as indicated in the attached EMS Document Register) are available upon request.

The following changes will be made to the EMS as a consequence of the varied activity:

(i) Environmental Aspects

The environmental aspects arising from the process have been assessed are listed in the following and will be added to the Environmental Aspects Register (ER 6.1.2), where they are not already present because of existing activities.

- storage and use of HF on site.
- generation and storage of hazardous liquid waste (KF) for disposal
- emissions of HF gas
- procurement, transport and use of raw materials
- energy use
- storage of hazardous finished product

(ii) Environmental Risks & Opportunities

The principal environmental risks and opportunities are identified in the following and will be added to the Register of Risks & Opportunities (ER 6.1.1). Control procedures will be put in place to mitigate the risk where these are not already covered by existing EMS procedures e.g. Waste Management Procedure (EP 8.1b), Emergency Response Procedure (EP 8.2), Spillage Procedure (EP 8.1b) and Monitoring & Measurement Procedure (EP 9.1).

- Leakage of HF from storage drums or plant
- Spillage of hazardous liquids during storage or handling
- Reduction in raw material use, procurement and transport for the electrolysis process (opportunity / positive environmental aspect)

Controls will include a written works instruction for the HF plant, monitoring of HF during commissioning of plant and annually under permit conditions, COSHH and process risk assessments, operator training, specified PPE, HF detection monitors and HAZOP report.

9. Ecological Impact Assessment

A Nature and Conservation Screening Report (produced for the previous variation application ref: EPR/RP3233CZ/V005, dated 14/11/19) is attached with this application, for information ('Conservation Screening Report and Maps').

There are two statutory sensitive ecological receptors within 10km of the site: the Dee Estuary (SAC, SPA and Ramsar) and the Mersey Estuary (SPA and Ramsar) and the Mersey Estuary SSSI is within 2 km.

Currently process effluent, from the Samarium cobalt coreduction process, discharges (from emission point S1, shown on 'Site-Plan-Emission Points_EA_01_20191105.pdf') into the Wastewater Treatment Works at Ellesmere Port following effluent treatment using neutralisation and organo-sulphide precipitation to reduce the concentration of hazardous metal ions to within environmentally acceptable levels. From there it discharges into the River Gowy (Thornton Brook) and ultimately into the River Mersey. The proposed additional activity does not involve discharges to water and will therefore have no additional impact on the above receptors.

There are 5 non-statutory sites within 2km of the site, the nearest being Booston Wood Local Wildlife Site (approximately 0.6km to the East) which lies within with the Hooton Park LDO. Emissions to air from the site have the potential to impact these receptors. Emissions to air arise from the proposed activity following abatement of the HF by the wet scrubber treatment plant, through emission point A5. Emissions of HF from this point are prescribed at ≤0.5 mg/m^3 under the existing environmental permit. Emissions testing results (section 5) show that the consent limit is met and so indicates that no additional adverse ecological impact will arise from the varied activity.

10. Dust, Odour & Noise

All dust-producing process activities on site are confined to the enclosed factory building which is served by bag filter extraction units. Emissions of particulate from points A1-A9 are prescribed under the existing environmental permit at levels of ≤5 mg/m^3. Monitoring of particulate, from points A1-A9, is undertaken annually by an MCERTS accredited company in accordance with Environment Agency Technical Guidance Note (Monitoring) M2. No additional contribution to particulate levels will arise from the proposed process variation.

No processes currently undertaken on site produce odour at the site boundary. The varied activity described does not involve substances that have the potential to create odour.

No noise, exceeding statutory limits, is produced at the site boundary from existing operations on site. All process activities are carried out within the enclosed factory unit. The proposed activity may contribute to additional noise levels within the factory itself, and noise levels will be monitored on commissioning to ensure that the exposure of employees is kept within statutory limits as specified in The Control of Noise at Work Regulations 2005, using control measures as necessary. It is not expected that the process will cause permissible noise levels at the site boundary to be exceeded.

11. Non-Technical Summary of Application

The company manufactures a range of rare earth metal alloys from raw materials. The main product is samarium cobalt which is produced by heating the raw materials in a sealed electric furnace at high temperature. An additional process manufactures a rare earth metal by electrolysis in a bath of the molten raw materials. The alloys are used in the manufacture of a range of green technologies, such as wind turbines and hybrid electric vehicles.

The company's processes are operated to the following standards:

- EU guidance document 'Best Available Techniques Reference Document for the Non-Ferrous Metals Industries, 2017'

- Conditions specified within an environmental permit (ref: EPR/RP3233CZ/V004) issued by the Environment Agency under The Environmental Permitting (England & Wales) Regulations 2016
- Conditions specified within a water discharge consent (ref: 551800300601) issued by United Utilities
- Requirements set out in the company's Environmental Management System which is externally accredited to international standard ISO14001:2015

The company monitors and controls its emissions to the environment to minimise impact in the following ways:

- Treatment plants to treat both wastewater and air emissions prior to discharge
- Monitoring of air emissions to ensure levels are within prescribed ranges
- Regular monitoring (approximately 6-weekly) of waste process water to ensure compliance with water discharge consent
- Annual reporting of waste production, energy and raw material use to measure improvement
- Maximising the recovery and recycling of solid waste
- Implementation of energy efficiency measures and reuse of collected rainwater into process operations

The company is applying to vary its environmental permit to include the following additional activity:

(i) The production of raw materials for use within an existing process by reacting rare earth metal oxides with hydrogen fluoride gas within an enclosed container

This activity will result in a reduction in reliance on imports of these raw materials from China where environmental standards in production can be lower than those required in Europe. The activity is part of a European project aimed at securing a sustainable European supply chain for magnets used in renewable energy technologies. This additional activity should not result in any

increase in potentially harmful emissions. Regular monitoring of air emissions is currently undertaken, and this will continue.

12. Site Maps & Plans

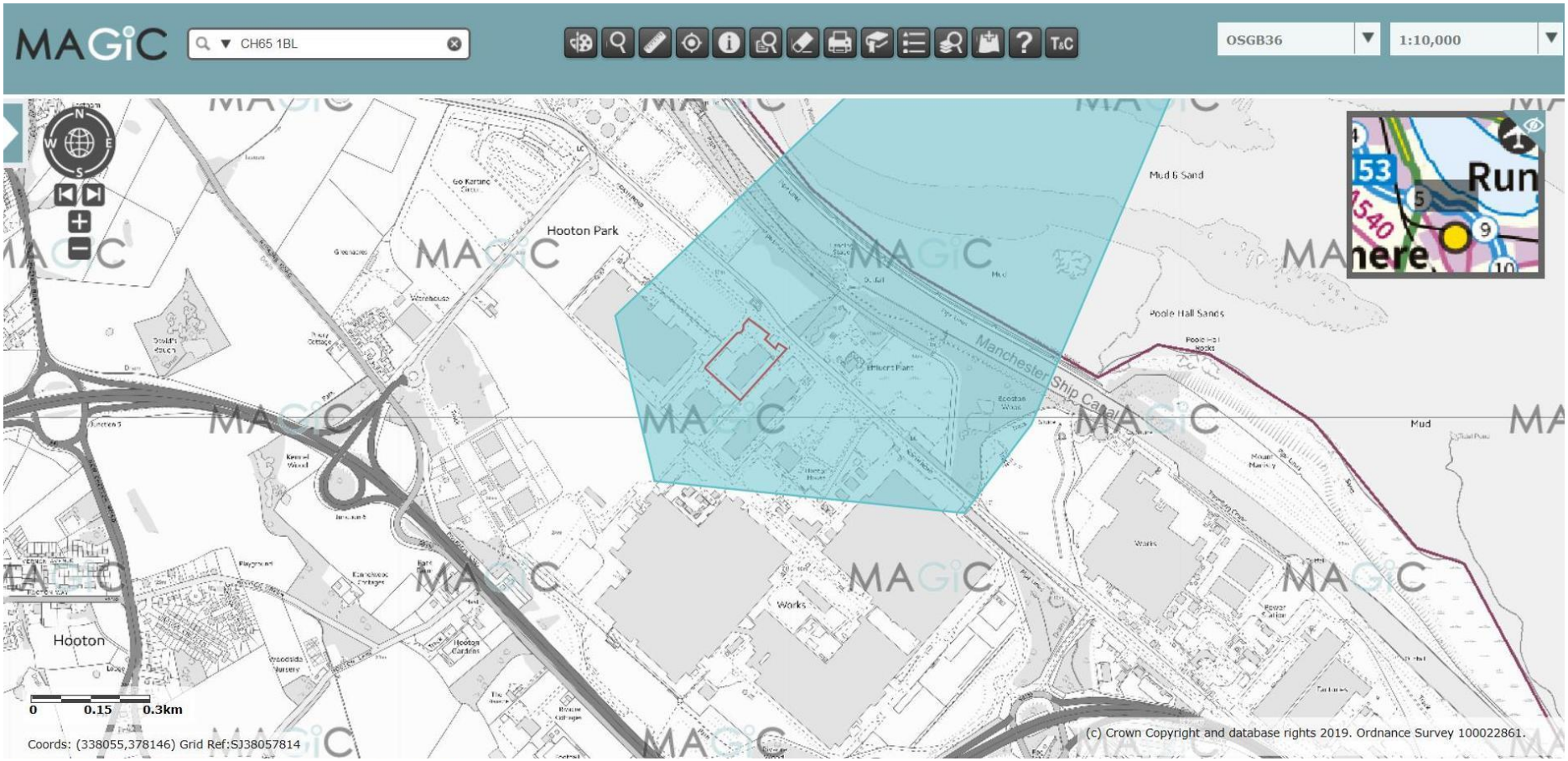
A 1:10,000 O.S. map, showing the outline of the site boundary in red, is attached at Appendix I (i).

A 1:1250 site plan is attached at Appendix I (ii).

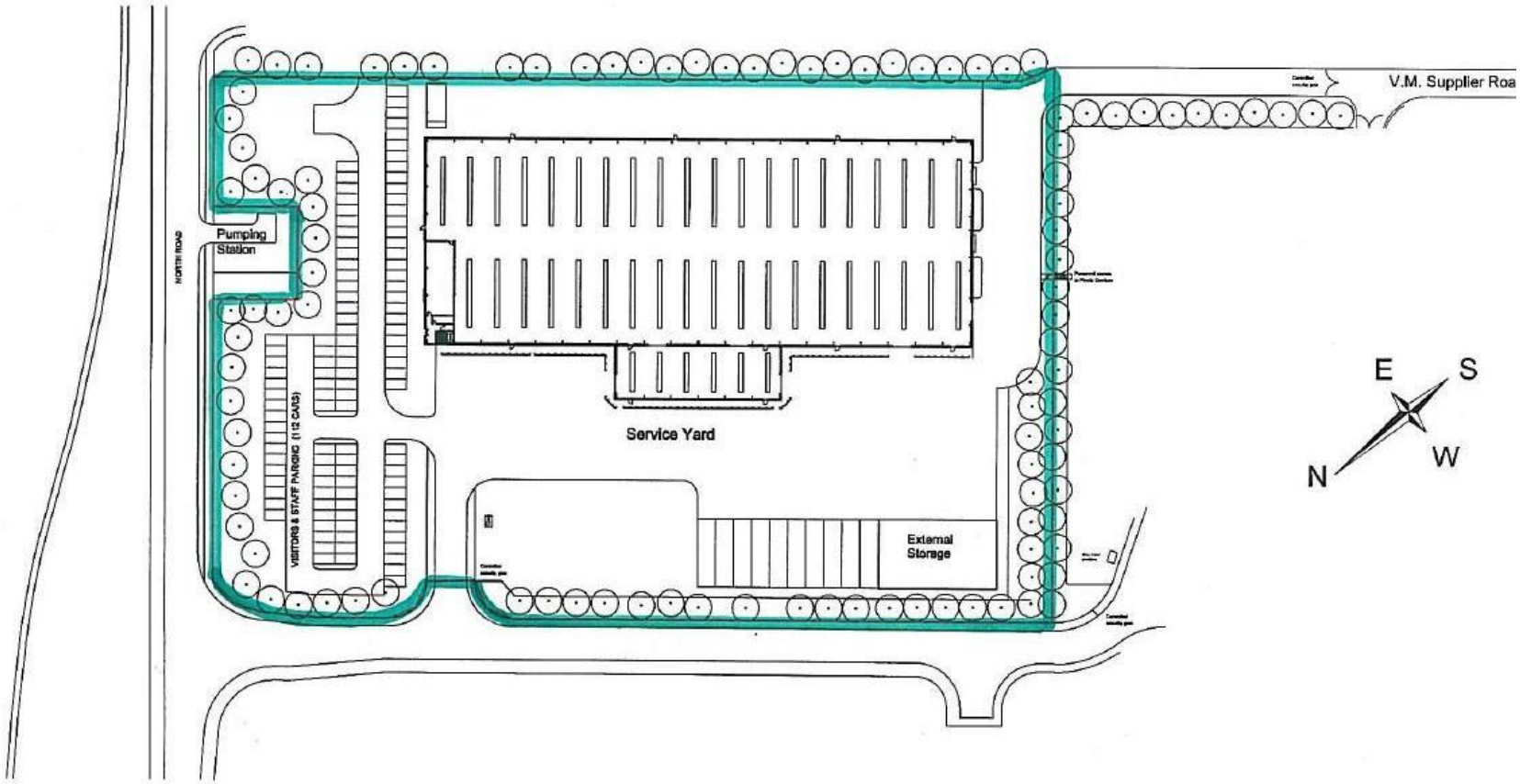
A detailed site layout diagram (ref: Site-Plan-Emission Points_EA_01_20191105.pdf) is submitted separately with the application. This shows the locations of the emission points A1-A10 and S1, referred to in this application.

APPENDIX I – LOCATION MAPS AND SITE PLANS

(i) 1:10,000 O.S. Map



(ii) 1:1250 Site Location Plan



Site Location Plan
Scale 1:1250