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ALTILIUM METALS LTD

BLACK MASS PROCESSING AND THE PRODUCTION OF INORGANIC METALS

OPERATING TECHNIQUES

JUNE 2025

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Wardell Armstrong
Sir Henry Doulton House, Forge Lane, Etruria, Stoke-on-Trent, ST1 5BD, United Kingdom
Telephone: +44 (0)1782 276 700 www.wardell-armstrong.com

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OPERATING TECHNIQUES

JUNE 2025

PREPARED BY:

Arabella Sharrock — Principal Waste Permitting Consultant

REVIEWED BY:

Alison Cook — Technical Director

APPROVED BY:

Luke Prazsky — Regional Director

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APPENDICES

DRAWINGS	TITLE	SCALE
BM12446-002	Environmental Permit Boundary	1:1,250 @ A3
BM12446-003	Indicative Facility Layout	Not to Scale – Indicative Plan

1 INTRODUCTION

1.1.1 Altilium Metals Ltd (Altilium) have commissioned Wardell Armstrong LLP to prepare a Permit Application for their site (ACT 2) located at Estover Road, Plymouth.

1.1.2 The address of the unit (hereafter referred to as the 'Site') is Unit 2 Plymbridge House, Estover Road, Plymouth, PL6 7PY. The National Grid Reference (NGR) for the site is SX 51606 59801. The site location and permit boundary are shown on drawing BM12446-001-P0.

1.2 Background

1.2.1 As older Electric Vehicles reach end-of-life, millions of batteries will need to be recycled in the coming decade (over one million tonnes a year by 2030, growing to nearly 20 million by 2040). The ability to recycle these batteries and 'close the loop' on their life cycle reduces the need for virgin mined materials and leads to significant reductions in the carbon footprint of new lithium-ion EV batteries. By building a circular domestic supply chain, we will reduce our reliance on global supply chains and imported materials[1].

1.2.2 Using state-of-the-art equipment and techniques in their ACT 1 facility, Altilium have designed their innovative process to treat waste black mass from end-of-life lithium-ion Electric Vehicle (EV) batteries to recover the constituent materials via sequential hydrometallurgical processes, and subsequently use the recovered materials in the production of mixed-metal oxides, namely cathode active material, for trial-scale supply to manufacturers of new EV batteries.

1.2.3 The recovery of critical minerals such as lithium and the production of cathode active material (also referred to as 'CAM') fall within the scope of the Government's Critical Minerals Strategy, and the scheme will support a circular economy of critical minerals. Lithium, cobalt and graphite have been identified as high criticality for the UK. Additionally, the processes recover minerals on the UK watch list, including manganese and nickel.

1.2.4 The process was trialled at laboratory scale under a Regulatory Position Statement granted by the Environment Agency for their ACT 1 site in Tavistock, Devon. Through the success of this trial, Altilium are looking to expand the scale and further refine the R&D processes at a new pilot plant (ACT 2), in Plymouth. Altilium intend on using ACT2

[1] Purpose - Altilium

as a test-bed for our first scaled processing operation; and have designed an integrated system of reaction stages, separation stages and recovery stages.

1.2.5 An Amenity and Accident Risk Assessment has been prepared which identifies the potential environmental hazards that may arise through site activities and the mitigation measures that will be implemented. The risk assessment follows the source-pathway-receptor model, as outlined in the Environment Agency guidance[2] on 'Risk Assessments for your Environmental Permit' .

1.2.6 The facility and equipment have been designed in accordance with the Best Available Techniques, using state-of-the-art equipment and material processing carried out under laboratory conditions. The following reference documents and guidance notes have been followed in the design of the facility, ensuring that the appropriate measures are followed:

- Guidance for the Recovery and Disposal of Hazardous and Non Hazardous waste (S5.06);
- European Commission BREF Note on Speciality Inorganic Chemicals;
- How to Comply with your environmental permit: Additional Guidance for the inorganic chemicals sector (EPR4.03)[3].

1.2.7 The site will be operated in accordance with Altilium's Environmental Management System (EMS), a summary of which has been provided as part of the permit application. The intention is to gain ISO14001 accreditation in due course.

[2] https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit
[3] How to comply (publishing.service.gov.uk)

2 REGULATED ACTIVITIES

2.1.1 Whilst black mass is considered a waste, the process produces chemicals and it is the Environment Agency's view[4] that the permitted activities should be solely chemical activities rather than waste treatment. Black mass will be accepted according to strict waste acceptance procedure, which is provided in Appendix 1.

2.1.2 The principal purpose of the process is to produce metal salts from the production of CAM, and the production of CAM itself (production of mixed metal oxide).

2.1.3 The production of inorganic chemicals is a listed activity within the Environmental Permitting Regulations (England and Wales) 2016. The following activities will be carried out:

- Schedule 1, Section 4.2 Part A(1)(v) - Production of inorganic chemicals: metal oxides;
- Schedule 1, Section 4.2 Part A(1)(iii) - Production of inorganic chemicals: bases;
- Schedule 1, Section 4.2 Part A(1)(iv) – Production of inorganic chemicals: salts.

2.1.4 Table 2.1 below provides the activities table, along with each stage of the process.

[4] Following assessment of the environmental permit application by the Environment Agency's National Permitting Service Team, the permitted activities will be limited to those specified in Table 2.1 below and comprise solely of chemical processes. The Technically Competent Manager requirements therefore do not apply, but the black mass will be accepted and stored in accordance with the Environment Agency's Appropriate Measures guidance.

Table 2.1: Permitted Activities			
Phase of Process	**Description of Activity**	**Listed Activity in EPR 2016**	**Process Outputs**
1	[redacted]	Section 4.2A(1)(a)(iv) Production of inorganic chemicals: salts	[redacted] Significant reduction of the overall hazard profile of Black Mass, through systematic extraction of contents in a linear routing
	[redacted]	Section 4.2A(1)(a)(iii) Production of inorganic chemicals: bases	[redacted]
	[redacted]	Section 4.2A(1)(a)(v) Production of inorganic chemicals: metal oxides	[redacted]
	[redacted]	Section 4.2A(1)(a)(v) Production of inorganic chemicals: metal oxides	[redacted]
2	[redacted]	Section 4.2A(1)(a)(iv) Production of inorganic chemicals: salts	[redacted]
	[redacted]		[redacted]
	[redacted]	Section 4.2A(1)(a)(iii) Production of inorganic chemicals: bases	[redacted]
3	[redacted]	Directly Associated Activities	[redacted]
	[redacted]		[redacted]
	[redacted]	Section 4.2A(1)(a)(iv) Production of inorganic chemicals: salts	[redacted]
4	[redacted]	Section 4.2A(1)(a)(iv) Production of inorganic chemicals: salts	Production of CAM ([redacted] from Phase 2)
	[redacted]	Section 4.2A(1)(a)(v) Production of inorganic chemicals: metal oxides	

2.2 Waste Acceptance

2.2.1 Two waste types are proposed to be accepted to the pilot facility, comprising black mass and 'gigafactory scrap'.

2.2.2 With reference to gigafactory scrap (16 03 03*), Altilium will only accept black mass under this EWC code in the same form as black mass recovered from end-of-life batteries (19 12 11*). They are ostensibly the same material, the difference being where the waste stream originates, i.e. gigafactory scrap arises from off specification waste from the production of EV batteries, whereas 'standard' black mass is sourced from the shredding of end of life batteries. Under 16 03 03* only powdered materials will be accepted to the facility (e.g. no foils or battery casings will be accepted).

2.2.3 There will be no pre-treatment (e.g. manually picking factions from the black mass/gigafactory scrap) prior to processing. Black Mass will be dispensed into 10kg aliquots prior to processing.

2.2.4 The waste materials to be accepted are listed according to their EWC codes in Table 2.2 below.

Table 2.2: Waste to be Accepted for Processing and Treatment	
16	**WASTES NOT OTHERWISE SPECIFIED IN THE LIST**
16 03	**Off specification batches and unused products**
16 03 03*	Inorganic wastes containing dangerous substances
16 03 04	Inorganic wastes other than those mentioned in 16 03 03
19	**WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SIRE WASTE WATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE**
19 12	**Wastes from the mechanical treatment of waste (for example sorting, crushing, compacting, pelletising) not otherwise specified**
19 12 11*	Other wastes (including mixtures of materials) from mechanical treatment of waste containing hazardous substances

2.3 Volumes

2.3.1 The facility will accept a maximum of 100 tonnes of black mass per annum. No more than 40 tonnes will be stored on site at any one time.

2.3.2 It is expected that approximately 15-25 tonnes of CAM will be produced annually. It is expected that during typical operations, up to 100 tonnes of black mass feedstock will be processed per annum (a maximum of 750kg per day).

2.3.3 A typical Black Mass chemical contents model is presented in Table 2.3 below, which is used to estimate outputs.

2.3.4 These materials are inherently variable and so individual batches may not match, but align to this model.

Table 2.3: Typical Outputs from Black Mass Processing based on Reasonable Model Black Mass Contents (per kg of Black Mass)			
Chemical Content	**Composition**	**Molar Mass (INPUT)**	**Moles per kg Black Mass**
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

2.3.5 Black Mass is a term which covers the sorted output from Li-ion battery shredding processes, and it typically presents a dense, friable, black powder, often containing small volumes of foils and plastics which were not successfully removed through preparatory shredding/sorting process. The chemical composition of the Black Mass is directly influenced by the chemistry of the batteries used to produce.

2.3.6 The hydrometallurgical extraction process devised by Altilium is able to be applied to a number of different battery feedstocks including end-of-life NMC (Lithium Nickel Manganese Cobalt Oxide ($LiNiMnCoO_2$)), LCO (Lithium Cobalt Oxide ($LiCoO_2$)) and LFP (Lithium Iron Phosphate ($LiFePO_4$ or LFP)) batteries. The process has been deliberately designed to utilise commodity chemicals which are both available in significant volumes and scalable in economy, and the various stages have been heavily influenced by the mature chemistries around mining and primary extraction and refining.

3 BLACK MASS PROCESSESSING AND TREATMENT

3.1.1 The following sections briefly describe Phases 1, 2, 3 and of the process.

3.2 Phase 1 – Impurity Removal

3.2.1 [redacted] one tank for each step, consisting of:

- One [redacted] tank (~1000l);
- Two ~750l tanks;
- One ~800l tank.

3.2.2 Black mass is placed into the main tank. It is then processed in different steps in the other listed tanks:

[redacted]

3.2.4 The outputs from stages 1-4 comprise:

[redacted]

3.2.5 Acid vapour and hydrogen gas are extracted from each step in the process and suitable diluted before being directed to the scrubber.

3.3 Phase 2 – Solvent Extraction

3.3.1 [redacted] Commissioning of each of these processes will entail achieving a number of success criteria which are summarised herein.

3.3.2 The end solution from Phase 1 is first treated to [redacted] via a total of nine steps:

[redacted]

- Regeneration (organic solvent and extractant molecules used during the process are not consumed, but regenerated and recycled for future use).

[redacted]

3.3.4 The second extraction circuit is designed for [redacted] and similarly consists of 9 steps, like the above circuit:

[redacted]

- Regeneration (organic solvent and extractant molecules used during the process are not consumed, but regenerated and recycled for future use).

3.3.5 [redacted] is used as the reagent, [redacted]

3.3.6 The process is a closed flow system and a very small amount of acid vapour and some VOCs are extracted from this stage and released to air through the abatement equipment.

[redacted]

3.3.8 [redacted]

At this point excess washings are diverted to the combined aqueous waste overflow or for reuse in upstream processes.

3.4 Phase 3 – Evaporation and Crystallisation

3.4.1 [redacted] solution from Phase 2 then enters Phase 3 for the extraction of [redacted] yielding demineralised water, suitable for reuse or disposal.

[redacted]

that the order of steps 3.4.2 and 3.4.3 will be reversed. This change will not materially affect the sum total outputs or emissions from the process, but may improve yields and purities.

3.4.5 Residual Vapours are produced, although there are no regulated chemicals expected to be present. Local extraction and air purification will be employed to manage powders.

3.4.6 Any emissions from Phase 3 will be directed for release through the Phase 1 abatement and stack. This is not a typical process and releases will only be made from Phase 3 during critical/emergency circumstances.

3.4.7 Phase 3 extraction points will tie into a common line which, in turn, ties into the Phase 1 suction to the scrubber. The fan/blower feeding the scrubber will supply the suction for both Phases.

3.5 Phase 4 –New CAM Manufacture

3.5.1 The production of CAM begins in Phase 4 and yields mixed metal oxides.

[redacted]

3.5.5 Aerosolised hazardous powders from mixing and milling are extracted from enclosed containers with controlled external atmosphere and directed to air abatement comprising a HEPA filter.

3.5.6 Emissions from the furnace for calcination will comprise oxygen and carbon dioxide as treatment will take place in an oxygen enriched atmosphere.

3.6 Output Volumes and Storage Methods

3.6.1 Table 3.1 below provides the outputs across all three phases of the process, along with the approximate volume and weight, and storage method of the various outputs.

Table 3.1: Expected outputs per kg black mass/gigafactory scrap processed – typical chemical content model proposed in Section 2.1.9.
Batches are proposed for approx. 100kg Black mass input

Phase	Output	Approximate Weight / kg	Storage method and Storage Location
1	[redacted]	~0.4	UN approved blue barrels
	[redacted]	Variable; <10% of [redacted]	UN approved blue barrels
	[redacted]	~0.2	UN approved blue barrels
	[redacted]	~0.05	UN approved blue barrels
	[redacted]	~0.1	UN approved blue barrels
2	[redacted]	~0.30	UN approved blue barrels
	[redacted]	~0.50	UN approved blue barrels
	[redacted]	~0.20	UN approved blue barrels
3	[redacted]	~0.20	UN approved blue barrels
	[redacted]	~0.80	UN approved blue barrels
	[redacted]	8-10	IBC
4	[redacted]	~0.5	Sealed OXBAR Packaging

Table 3.1: Expected outputs per kg black mass/gigafactory scrap processed – typical chemical content model proposed in Section 2.1.9. Batches are proposed for approx. 100kg Black mass input			
Phase	**Output**	**Approximate Weight / kg**	**Storage method and Storage Location**
	[redacted]	~0.4	Sealed OXBAR Packaging

4 STORAGE OF CHEMICALS

4.1.1 Safe systems of work will govern this area. All chemicals will be stored in sealed containers appropriate for transport, such as of polyethylene drums and/or sacks. Chemicals will be stored separately within these containers according to their properties and mutual compatibilities. Chemicals will be stored and handled in accordance with the appropriate Chemical Safety Data Sheet which will detail the physical and chemical properties, physical and health hazards, routes of exposure, precautions for safe handling and use, emergency and first aid procedures and control measures.

4.1.2 Bunding will be necessary for all hazardous chemicals, but principally for liquids. Bunding may take the form of local construction or tooling within the facility, or a capability built into the storage container, such as a double-skinned IBC. Solid chemicals will be stored above ground level (palletised). Further, the entire operations floor will be treated with a chemical-resistant (including to concentrated acid) paint/resin to minimise the risk of damage to the impermeable surface as a result of leaks.

4.1.3 [redacted] has a limited shelf life for up to 1 year, due to the slow but steady spontaneous decomposition to oxygen and water. Inappropriate storage protocols may lead to catalytic decomposition causing damage to containers and risk of release.

4.1.4 If exposed to air, [redacted] may degrade to a sodium bicarbonate by absorbing environmental carbon dioxide, however this is a slow process.

4.1.5 A strict inventory system of all materials on site will be kept, comprising dates substances were received along with their shelf life/expiration dates, to ensure that stocks are appropriately managed for use, as well as disposal at end of shelf-life.

4.1.6 As set out in Table 4.1 below, the reagents are listed along with the major hazard class and projected storage capacity for each item.

Table 4.1: Reagent Inventory				
Reagent	**Container**	**Major Hazard Class**	**Projected Storage (units)**	**Total Maximum Storage Capacity**
[redacted]	IBC 1000L	N/A	Up to 4 units	4000L
[redacted]	IBC 1000L	Corrosive; liquid (acidic)	Up to 2 units	2000L
[redacted]	IBC 1000L	Oxidizing; liquid	Up to 1 unit	1000L
[redacted]	FIBC 25kg	Corrosive; solid (basic)	Up to 80 units	2 tonne
Air	Pump	N/A	N/A	N/A
[redacted]	FIBC 25kg	Toxic/flammable; solid	Up to 10 units	250kg
[redacted]	IBC 1000L	Corrosive; liquid (basic)	Up to 2 units	2000L
[redacted]	IBC 1000L	Corrosive; liquid (basic)	Up to 2 units	2000L
[redacted]	FIBC 25kg	Irritant; solid (basic)	Up to 20 units	500kg
[redacted]	FIBC 25kg	Irritant; solid (basic)	Up to 20 units	500kg
[redacted]	44L / 200bar Cylinder	Oxidising; gas	Up to 12 units	12 cylinders
[redacted]	IBC 1000L	Corrosive; liquid (acidic)	Up to 1 unit	1000L
[redacted]	IBC 1000L	Corrosive; liquid (acidic)	Up to 1 unit	1000L
[redacted]	IBC 1000L	Flammable; liquid	Up to 2 units	2000L
[redacted]	IBC 1000L	Flammable, skin irritant, probable carcinogen liquid	Up to 2 units	2000L
[redacted]				

5 OUTGOING PRODUCT

5.1 End of Waste Assessment

5.1.1 The raw materials generated will be the required specification and quality that would be suitable for Phase 4 of the processes where the production of CAM begins. The materials will be quality controlled internally, however it expected that these will be of sufficient quality to be of external commercial interest in their output states.

5.1.2 An End of Waste Assessment has been prepared to clearly delineate when the black mass has been sufficiently processed and treated, so constituent materials are recovered. The materials then cease to be waste and the production of CAM product begins. This assessment has been included as part of the permit application.

5.2 Cathode Active Material (CAM)

5.2.1 CAM will be produced using battery grade lithium, cobalt, nickel and manganese and produced in a format and to a specification -requested by Altilium's technical partners. Once manufactured, CAM will be collected, analysed, packaged and documented for shipping and removed from site – typically in the form of pilot scale test-batches for gigafactories and/or Automotive Original Equipment Manufacturers (OEMs).

5.2.2 By-products, such as graphite, will also be sent off site for use as a raw material by third parties.

5.2.3 Any residual waste materials, such as small quantities of plastic recovered from the process, will be stored in an appropriate container and will be sent off site to a permitted site for disposal or recycling.

6 ENVIRONMENTAL PROTECTION MEASURES

6.1 General

6.1.1 The purpose of the permit application is to permit Altilium Metals Ltd to carry out activities which will enable the processing of black mass and the production of a material which can be recirculated back into the automotive sector, feeding into a circular economy. There will be an overall environmental benefit in reduced use of raw materials, some of which have been assigned a critical status by the UK Government, and reduced carbon emissions by recycling materials and avoiding emissions associated with mining.

6.1.2 Nevertheless, it is important that the activities are carried out without harm to the local environment. In order to minimise emissions, the activities will be carried out inside a fully enclosed building, and strict control measures have been put into place.

6.1.3 The site will operate in laboratory-like conditions meaning it is essential that the site be kept clean, uncontaminated and safe.

6.1.4 All equipment will be properly maintained so that it is fit for purpose and operates without excessive noise.

6.1.5 Even though the Environment Agency has confirmed it's position for permitting the facility, the site will be managed by a Technically Competent Manager who will hold the relevant waste management certification and attend site at a minimum frequency and duration as specified in the Environment Agency's guidance on TCM attendance. As Technical Competence is critical to the administration of the permitted site and activities, more than one Altilium employee will be qualified and provide supervision as required

7 ENVIRONMENTAL RISK AND PROTECTION

7.1 Point Source Emissions to Air

7.1.1 A H1 Technical Note has been prepared as part of the Permit application, which sets out the emissions to air in further detail. As the site is not operational or been commissioned, exact concentrations of releases are unknown. To be conservative, the BAT AELs from the BREF Document for Common Waste Gas Management and Treatment Systems in the Chemical Sector[5] have been utilised where appropriate

7.1.2 Emissions from the three release points are in summary:

- [redacted] emissions of sulphuric acid and hydrogen fluoride as well as trace VOCs may be present. [redacted] Benzene has also been included as a worst case but is not expected to be emitted and was not observed in laboratory testing above the limit of detection.
- [redacted] emissions will be within the BAT AEL for low concentrations of ammonia, sulphuric acid, and benzene [redacted] Trace VOCs may be present, these have been speciated based on similar emissions from Altilium's laboratory facility.
- [redacted] released via [redacted] Sulphuric acid, ammonia, nickel and particulates (PM10 and PM2.5) released via [redacted]
- [redacted] Carbon monoxide, sulphur dioxide, nickel, manganese, cobalt, lithium and particulates (PM10 and PM2.5).

7.1.3 Table 2 details each emission expected from each stack and provides the results of the H1 screening. Further air dispersion modelling will be undertaken due to the sites proximity to potentially sensitive ecological receptors.

Table 2: Substances, Concentrations and Long and Short-Term PC

Process Phase	Substance	BAT AEL	Long- and Short-term Concentrations (mg/m³)	Long term PC (ug/m3)	Short term PC (ug/m3)
[redacted]	Sulphuric acid	10 – 35 mg/Nm³	35	6.2	204.98
	Hydrogen Fluoride	≤ 1 mg/Nm³	1	0.32	0.61

[5] https://eippcb.jrc.ec.europa.eu/reference/common-waste-gas-treatment-chemical-sector

Table 2: Substances, Concentrations and Long and Short-Term PC					
Process Phase	**Substance**	**BAT AEL**	**Long- and Short-term Concentrations (mg/m³)**	**Long term PC (ug/m3)**	**Short term PC (ug/m3)**
	Benzene	<0.5-1 mg/Nm³	1	0.03	0.61
	Toluene	<0.5-1 mg/Nm³	1	1.82	5.86
	Tetrachloroethylene	No BAT AEL Used Benzene <0.5-1 mg/Nm³	1	0.24	5.86
	n-Hexane	No BAT AEL Used Benzene <0.5-1 mg/Nm³	1	0.18	5.86
[redacted]	Sulphuric acid	10 – 35 mg/Nm³	35	6.2	205.00
	n-Hexane[1]	No BAT AEL Used Benzene <0.5-1 mg/Nm³	1	0.18	5.86
	Ammonia	2-10 mg/Nm³	10	1.77	58.57
	Toluene	<0.5-1 mg/Nm³	1	1.82	5.86
	Tetrachloroethylene	No BAT AEL Used Benzene <0.5-1 mg/Nm³	1	0.24	5.86
[redacted]	Sulphuric acid	10 – 35 mg/Nm³	35	6.2	204.98
[redacted]	Ammonia	2-10 mg/Nm³	10	1.77	58.57
[redacted]	Nickel	< 0.02-0.1 mg/Nm³	0.1	0.004	0.12
	Particulates (PM10)	5 mg/Nm³	5	0.19	3.67
	Particulates (PM2.5)	5 mg/Nm³	5	0.19	6.22
[redacted]	Carbon monoxide	No BAT AEL – as an indication, the emission levels for carbon monoxide are 4-50 mg/Nm³, as a daily average or average over the sampling period.	50	0.32	7.61
	Nickel	< 0.02-0.1 mg/Nm³	0.1	0.004	0.12

Table 2: Substances, Concentrations and Long and Short-Term PC					
Process Phase	**Substance**	**BAT AEL**	**Long- and Short-term Concentrations (mg/m³)**	**Long term PC (ug/m3)**	**Short term PC (ug/m3)**
	Manganese and compounds[2]	No BAT AEL – same AEL as Nickel applied < 0.02-0.1 mg/Nm³	0.1	0.0007	0.022
	Cobalt[2]	No BAT AEL – same AEL as Nickel applied < 0.02-0.1 mg/Nm³	0.1	0.0009	0.021
	Lithium[3]	No BAT AEL – same AEL as Nickel applied < 0.02-0.1 mg/Nm³	0.1	0.013	0.43
	Particulates (PM10)	5 mg/Nm³	5	0.19	3.67
	Particulates (PM2.5)	5 mg/Nm³	5	0.19	6.22
	Sulphur Dioxide	<3-150mg/Nm³	35	0.23	4.49
Notes [redacted]					

7.2 Emissions to Water

7.2.1 There are no point source emissions to water. No waste liquids will be tipped down any drains without prior approval for the local utility provider and a suitable Trade Effluent consent.

7.2.2 Liquids generated from the chemical processing which are not recirculated back into the system are collected and stored in the combined aqueous waste overflow. Wastewater will be held in a bunded tank pending removal to a permitted treatment site.

7.3 Litter

7.3.1 The site will only be permitted to accept Li-ion battery-derived waste streams; black mass and gigafactory waste which will arrive in suitable containment. Due to the very specific nature of the facility, there will be little to no risk of litter generation from incoming waste.

7.3.2 Any used containers, cardboard, paper and plastic packaging for which feedstock and reagent materials arrive to the site in will be stored securely in a suitable container so as not to present a risk of wastes becoming swept beyond the boundary of the site.

7.3.3 Any waste generated by Altilium staff will be placed in an appropriate receptacle, awaiting suitable disposal, and the site will be kept clean and tidy at all times.

7.4 Odour

7.4.1 Incoming Li-ion battery-derived wastes such as black mass will arrive in secure bags/containers. Due to the specific nature of the operations and the highly selective waste being bought to site, the risk of malodourous wastes is negligible.

7.4.2 Some chemicals and gasses may have odours, however these will be fully contained within the various reaction vessels and extraction / scrubbing services and will not produce fugitive odour emissions beyond the facility boundary.

7.5 Noise

7.5.1 All operations are carried out inside an enclosed building, which will provide a degree of attenuation. Levels of noise from site plant are expected to be generally low. If equipment is stored outside it will be enclosed in noise attenuative housing

7.6 Pests and Vermin

7.6.1 Due to the strict waste acceptance procedures, no putrescible wastes will be accepted onto site which may attract pests or vermin. Nor is it likely that the process feedstocks, such as chemicals, would attract pests or vermin due to their nature.

7.6.2 Any waste generated by Altilium staff will be placed in an appropriate receptacle, awaiting suitable disposal, and the site will be kept clean and tidy at all times.

7.6.3 Should there be an indication of pests or vermin present at the site, a pest controller will be contacted as soon as possible to investigate, and where required, remedy the issue.

8 ENVIRONMENTAL MONITORING

8.1.1 A visual/olfactory assessment will be made around the site at least once a day to ensure that there are no unusual emissions, such as noticeable odour or visible dust.

8.1.2 Emissions from all stacks will be sampled and tested once a year to ensure that emissions are below the BAT AELs as set out below:

Table 8.1 Monitoring of Emissions to Air

Process Phase	Substance	BAT AEL
[redacted]	Sulphuric acid	10 – 35 mg/Nm³
	Hydrogen Fluoride	≤ 1 mg/Nm³
	Trace VOCs	
[redacted]	Sulphuric acid	10 – 35 mg/Nm³
	Benzene	<0.5-1 mg/Nm³
	VOCs/ VOC breakdown Products	
	Ammonia	2-10 mg/Nm³
[redacted]	Sulphuric acid	10 – 35 mg/Nm³
	Ammonia	2-10 mg/Nm³
[redacted]	Carbon monoxide	No BAT AEL – As an indication, the emission levels for carbon monoxide are 4-50 mg/Nm³, as a daily average or average over the sampling period.
	Nickel	< 0.02-0.1 mg/Nm³
	Manganese and compounds	No BAT AEL
	Cobalt	No BAT AEL
	Lithium	No BAT AEL
	Particulates (PM10)	5 mg/Nm³
	Particulates (PM2.5)	5 mg/Nm³
[redacted]		

9 RECORD KEEPING AND COMPLAINT PROCEDURE

9.1.1 The records described below will be maintained at the site office and will be made available to warranted officers of the Environment Agency upon request.

- The pre-acceptance record for each waste stream and copies of related transfer notes.
- Details of all waste taken off site, where applicable, with a copy of the appropriate transfer note.
- Records of all by-products sent off site for use by third parties,
- Records that the end product specification has been met for the CAM.

9.1.2 A copy of the preventative maintenance programme will be kept on site, showing plant has been properly inspected and maintained and when this was carried out.

9.1.3 A log will be maintained detailing any complaints received and the actions taken to resolve them.

9.1.4 A log will be maintained detailing any complaints received and the actions taken to resolve them.

9.1.5 Records will be kept regarding staff training, including any refresher training or toolbox talks delivered.

9.1.6 Records will be kept for a minimum of two years and in line with any statutory requirements. Records of any pollution incidents should one occur will be maintained indefinitely in order to inform any eventual permit surrender application.

APPENDICES

APPENDIX 1

Waste Acceptance Procedure

APPENDIX 2

Process Flow Schematics

APPENDIX 3

Feedstock Inventory

APPENDIX 4

Intermediate Streams Inventory

APPENDIX 5

Co-products and Collected Waste Streams Inventory

APPENDIX 6

Primary and Secondary Product Steam Inventory

DRAWINGS

wardell-armstrong.com

STOKE-ON-TRENT
Sir Henry Doulton House
Forge Lane
Etruria
Stoke-on-Trent
ST1 5BD
Tel: +44 (0)1782 276 700

BIRMINGHAM
Two Devon Way
Longbridge Technology Park
Longbridge
Birmingham
B31 2TS
Tel: +44 (0)121 580 0909

BOLTON
41-50 Futura Park
Aspinall Way
Middlebrook
Bolton
BL6 6SU
Tel: +44 (0)1204 227 227

BRISTOL
3rd Floor
Brew House
Jacob Street
Tower Hill
Bristol
BS2 0EQ
Tel: +44 (0)117 203 4477

BURY ST EDMUNDS
Armstrong House
Lamdin Road
Bury St Edmunds
Suffolk
IP32 6NU
Tel: +44 (0)1284 765 210

CARDIFF
Tudor House
16 Cathedral Road
Cardiff
CF11 9LJ
Tel: +44 (0)292 072 9191

CARLISLE
Marconi Road
Burgh Road Industrial Estate
Carlisle
Cumbria
CA2 7NA
Tel: +44 (0)1228 550 575

EDINBURGH
The Tun
4 Jackson's Entry
Edinburgh
EH8 8PJ
Tel: +44 (0)131 555 3311

GLASGOW
24 St Vincent Place
Glasgow
G1 2EU
Tel: +44 (0)141 428 4499

LEEDS
36 Park Row
Leeds
LS1 5JL
Tel: +44 (0)113 831 5533

LONDON
Summit House
12 Red Lion Square
London
WC1R 4QH
Tel: +44 (0)207 242 3243

NEWCASTLE UPON TYNE
City Quadrant
11 Waterloo Square
Newcastle upon Tyne
NE1 4DP
Tel: +44 (0)191 232 0943

TRURO
Baldhu House
Wheal Jane Earth Science Park
Baldhu
Truro
TR3 6EH
Tel: +44 (0)187 256 0738

International office:

ALMATY
29/6 Satpaev Avenue
Hyatt Regency Hotel
Office Tower
Almaty
Kazakhstan
050040
Tel: +7(727) 334 1310

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PART OF SLR