

APPENDIX 7 – AIR QUALITY

Appendix 7.1 – Model Input Parameters

Table 7.1.1: Emission Parameters				
Parameter	Stack EP4 Kiln	Stack EP4 Cooler	Stack EP6	Stack EP9
Stack Height (m)	35	35	47	20
Flue exit diameter (m)	1.8	0.2	0.4	0.5
Emission velocity fired (m/s)	2.8	2.4	23.5	19.6
Actual flow rate (Am ³ /s)	7.24	0.08	2.95	3.85
Temperature of exhaust (°C)	70	80	80	135
Normalised flow rate (Nm ³ /s)	5.77	0.06	2.28	2.58
Emission Concentration (mg/Nm³) (a)				
Dust	20	20	20	-
NOx	200	-	-	100
CO	100	-	-	100
Emission Rate (g/s)				
Dust	0.1153	0.0012	0.0456	-
NOx	1.1531	--	-	0.2579
CO	0.5766	-	-	0.2579

(a) At 273K, at stack conditions for H₂O & O₂

Table 7.1.2: Building Downwash Structures

Building	Easting	Northing	Effective Height (m)	Length (m)	Width (m)	Angle (°)
Building A	455635.15	523626.11	43	317.3	69.18	135.15
Building B	455570.52	523563.32	43	318.97	67.11	135.15
Building C	455493.23	523508.29	43	315.33	67.83	134.91
Admin	455812.74	523489.26	17	63.9	38.62	134.76
Store/Welfare	455732.78	523433.12	35	35.09	84.82	136.33
Spodumene Storage	455881.18	523275.23	25	41.34	120.03	133.79
Analcine Storage	455782.03	523193.74	25	36.55	76.57	135.68
Future Analcine Silo	455823.65	523181.8	25	22.62	31.54	135
Utilities	455730.09	523247.07	25	34.59	84.39	134.64

Appendix 7.2 – Air Quality Standards and Objectives

Pollutant	Averaging Period	AQAL ($\mu\text{g}/\text{m}^3$)	Comments
Nitrogen dioxide (NO_2)	annual	40	UK AQO
	1-hour	200	UK AQO, not to be exceeded more than 18 times per annum, equivalent to the 99.8th percentile of 1-hour means
Carbon monoxide (CO)	8-hour	10,000	UK AQO and EU Limit Value
	1-hour	30,000	Environmental Assessment Level (EAL)
Particulate Matter (as PM_{10})	annual	40	UK AQO
	24-hour	50	UK AQO not to be exceeded more than 35 times per annum, equivalent to the 90.4 th percentile of 24 hour means
Particulate Matter (as $\text{PM}_{2.5}$)	annual	20	UK Limit Value
	annual	10	UK Target Value (to be achieved by 31 st December 2040)

Appendix 7.3 – Environmental Assessment Levels for the Protection of Vegetation and Ecosystems

Critical Levels

Critical levels are thresholds of airborne pollutant concentrations above which damage may be sustained to sensitive plants and animals.

The critical levels for the protection of vegetation and ecosystems that are relevant to the assessment are summarised in Table 7.3.1.

Table 7.3.1: Critical Levels for the Protection of Vegetation and Ecosystems		
Pollutant	Averaging Period	Critical Level ($\mu\text{g}/\text{m}^3$)
Oxides of Nitrogen (NO _x)	Annual Mean	30
	24-Hour Mean	75

Background annual mean concentrations of NO_x have been obtained from APIS. These are detailed in Table 7.3.2 below.

Table 7.3.2: Background concentrations	
Pollutant	NO _x
E1 (Ramsar & SPA)	16.5
E2 (Ramsar & SPA)	17.0
E3 (Ramsar & SPA)	18.1
E4 (Ramsar & SPA)	19.0
E5 (Ramsar & SPA)	19.0
E6 (Ramsar & SPA)	23.7
E7 (Ramsar & SPA)	33.6
E8 (Ramsar & SPA)	33.6
E9 (Ramsar & SPA)	33.6
E10 (Ramsar & SPA)	37.5
E11 (Ramsar & SPA)	22.2
E12 (Ramsar & SPA)	19.1
E13 (Ramsar & SPA)	18.3
E14 (Ramsar & SPA)	19.9
E15 (Ramsar & SPA)	20.0
E16 (Ramsar & SPA)	19.8
E17 (Ramsar & SPA)	22.2
E18 (Ramsar & SPA)	22.2
E19 (Ramsar & SPA)	25.7
E20 (Ramsar & SPA)	19.0
E21 (SPA & SSSI)	45.9
E22 (SPA & SSSI)	25.2
E23 (SPA & SSSI)	44.2
E24 (SPA & SSSI)	33.2
E25 (SPA & SSSI)	33.2
E26 (SPA & SSSI)	24.4

Table 7.3.2: Background concentrations

Pollutant	NO _x
E27 (SPA & SSSI)	26.5
E28 (SPA)	22.2
E29 (SPA)	30.2
E30 (SPA)	24.7
E31 (SPA)	11.9
E32 (SPA)	16.0
E33 (SPA & SSSI)	20.0
E34 (SPA & SSSI)	25.2
E35 (SPA & SSSI)	25.2

Daily mean NO_x background concentrations are assumed to be twice the annual mean background concentration.

Critical Loads

Critical loads refer to the threshold beyond which deposition of pollutants to water or land results in measurable damage to vegetation and habitats. This takes the form of either gravitational settling of particulate matter (dry deposition) or wet deposition, where atmospheric pollutants dissolve in water vapour and then precipitate to the ground (e.g. as rain, snow, fog etc.).

Critical loads for eutrophication (nutrient nitrogen deposition) and background nutrient nitrogen deposition rates have been obtained from the Air Pollution Information System (APIS) and are summarised in Table 7.3.3 for the identified habitat sites.

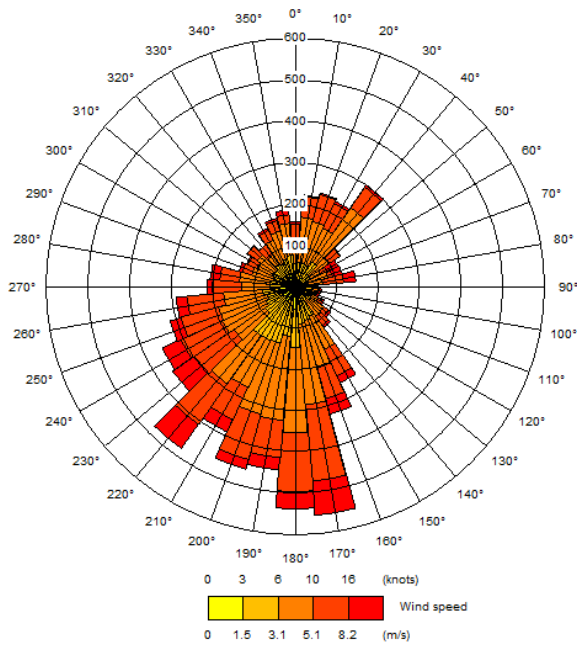
Table 7.3.3: Critical Loads (Eutrophication) and Background Nutrient Nitrogen Deposition

Habitat Site	Critical Load Category	Critical Load (kg N/ha/a)	Background N Deposition (kg N/ha/a)
E1 (Ramsar & SPA)	Coastal Stable Sand Dune - calcareous type	10 to 15	15.3
E2 (Ramsar & SPA)	Coastal Stable Sand Dune - calcareous type	10 to 15	15.5
E3 (Ramsar & SPA)	Coastal Stable Sand Dune - calcareous type	10 to 15	15.8
E4 (Ramsar & SPA)	Coastal Stable Sand Dune - calcareous type	10 to 15	15.8
E5 (Ramsar & SPA)	Coastal Stable Sand Dune - calcareous type	10 to 15	15.8
E6 (Ramsar & SPA)	Coastal Stable Sand Dune - calcareous type	10 to 15	15.8
E7 (Ramsar & SPA)	Coastal Stable Sand Dune - calcareous type	10 to 15	16.3
E8 (Ramsar & SPA)	Coastal Stable Sand Dune - calcareous type	10 to 15	16.3
E9 (Ramsar & SPA)	Coastal Stable Sand Dune - calcareous type	10 to 15	16.3
E10 (Ramsar & SPA)	Pioneer, low-mid, mid-upper saltmarsh	20 to 30	16.3
E11 (Ramsar & SPA)	Pioneer, low-mid, mid-upper saltmarsh	20 to 30	16.3
E12 (Ramsar & SPA)	Pioneer, low-mid, mid-upper saltmarsh	20 to 30	17.3
E13 (Ramsar & SPA)	Pioneer, low-mid, mid-upper saltmarsh	20 to 30	17.8
E14 (Ramsar & SPA)	Pioneer, low-mid, mid-upper saltmarsh	20 to 30	17.3
E15 (Ramsar & SPA)	Pioneer, low-mid, mid-upper saltmarsh	20 to 30	17.3
E16 (Ramsar & SPA)	Pioneer, low-mid, mid-upper saltmarsh	20 to 30	18
E17 (Ramsar & SPA)	Pioneer, low-mid, mid-upper saltmarsh	20 to 30	16.7
E18 (Ramsar & SPA)	Pioneer, low-mid, mid-upper saltmarsh	20 to 30	16.7
E19 (Ramsar & SPA)	Pioneer, low-mid, mid-upper saltmarsh	20 to 30	16.7
E20 (Ramsar & SPA)	Pioneer, low-mid, mid-upper saltmarsh	20 to 30	18.4
E21 (SPA & SSSI)	River	NA	16.3
E22 (SPA & SSSI)	River	NA	16.4
E23 (SPA & SSSI)	River	NA	16.6
E24 (SPA & SSSI)	River	NA	16.6
E25 (SPA & SSSI)	River	NA	16.6
E26 (SPA & SSSI)	River	NA	16.6
E27 (SPA & SSSI)	River		16.8

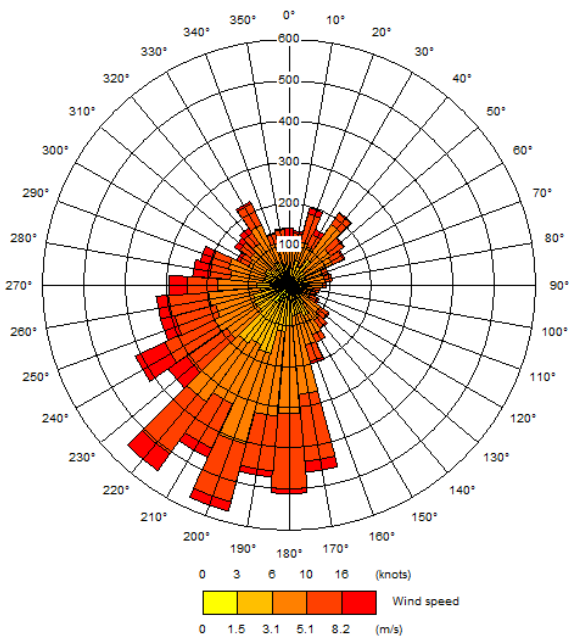
E28 (SPA)	River	NA	18
E29 (SPA)	River	NA	18.6
E30 (SPA)	River	NA	19.1
E31 (SPA)	Coastal Stable Sand Dune - calcareous type	10 to 15	15.5
E32 (SPA)	Coastal Stable Sand Dune - calcareous type	10 to 15	15.2
E33 (SPA & SSSI)	Pioneer, low-mid, mid-upper saltmarsh	20 to 30	16.3
E34 (SPA & SSSI)	Pioneer, low-mid, mid-upper saltmarsh	20 to 30	16.4
E35 (SPA & SSSI)	Pioneer, low-mid, mid-upper saltmarsh	20 to 30	16.4

Appendix 7.4 – Wind Roses

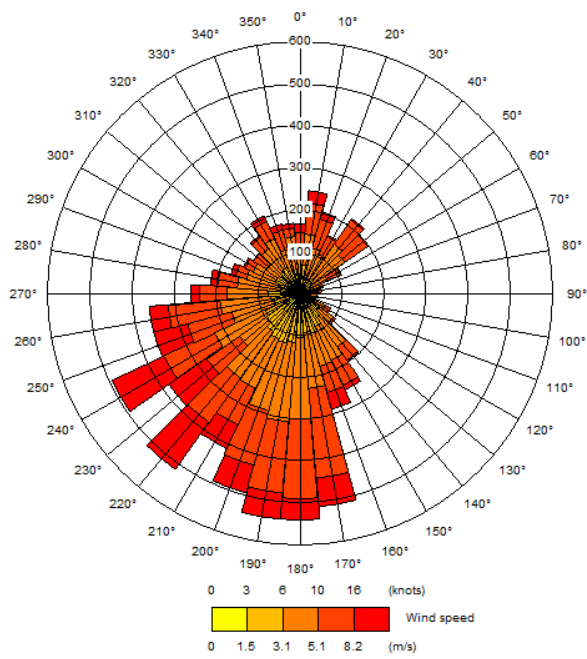
2018



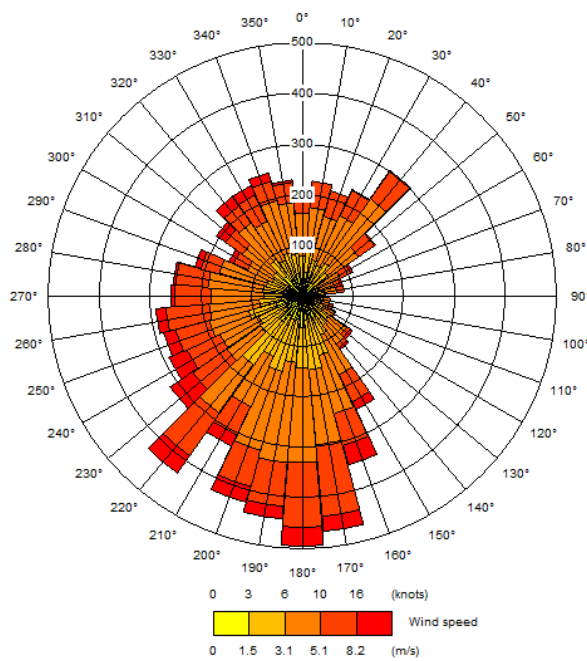
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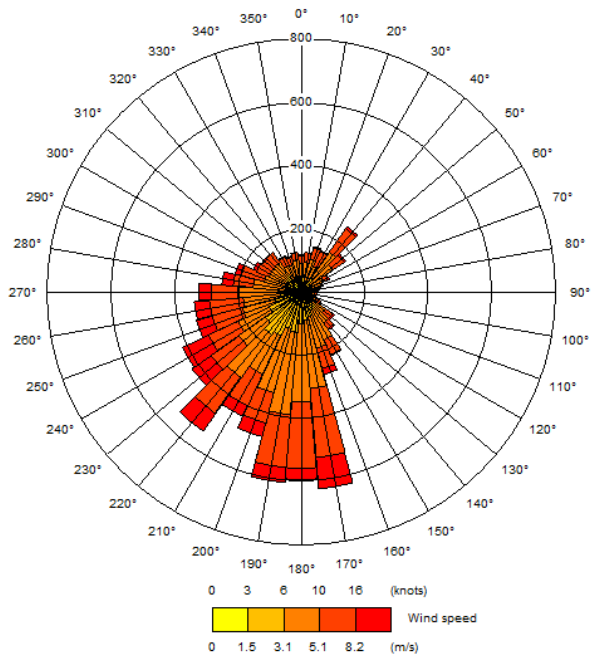
2020



2021



2022



Appendix 7.5 – Construction Mitigation Measures

‘Highly Recommended’ Measures

- display the name and contact details of the person accountable for air quality and dust issues on the site boundary (i.e. the environment manager/engineer or site manager);
- display the head or regional office contact information on the site boundary;
- record all dust and air quality complaints, identify cause, take appropriate measures to reduce emissions in a timely manner and record the measures taken;
- make the complaints log available to the local authority when asked;
- record any exceptional incidents that cause dust and/or air emissions, either on- or off- site and the action taken to resolve the situation in the log book;
- carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked;
- increase frequency of site inspection by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged periods of dry or windy conditions;
- plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;
- erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles;
- avoid site runoff of water or mud;
- ensure all vehicles switch off engines when stationary - no idling vehicles;
- avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable;
- only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction e.g. suitable local exhaust ventilation systems;
- ensure an adequate water supply on site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
- use enclosed chutes and conveyors and covered skips;
- minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate;
- avoid bonfires and burning of waste materials;

In addition to the 'highly recommended' measures, the IAQM guidance also sets out 'desirable' measures which should also be considered for inclusion within the DMP:

‘Desirable’ Measures

- Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority;
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- Undertake daily on-site and off-site inspections, where receptors (including roads) are nearby, to monitor dust, record inspections results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided in necessary.
 - Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period;
 - Keep site fencing, barriers and scaffolding clean using wet methods;
 - Remove materials that have a potential to produce dust from site as soon as possible unless being re-used on site. If they are being re-used on-site cover as described below;
 - Cover, seed or fence stockpiles to prevent wind whipping;
 - Impose and signpost a maximum-speed limit of 15mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
 - Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods;
 - Avoid scabbling (roughening of concrete surfaces) if possible;
 - Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;
 - Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use;
 - Avoid dry sweeping of large areas;
 - Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport;
 - Record all inspections of haul routes and any subsequent action in a site log book;
 - Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
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