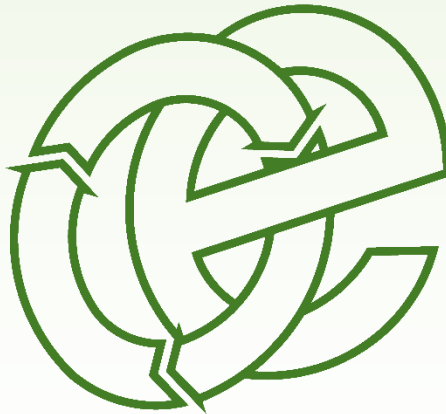


PRECIOUS METALS RECOVERY FACILITY, MERSE ROAD - PERMIT APPLICATION SUPPORTING DOCUMENT

Kaug Refinery Services Limited

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1 Introduction

1.1 Overview

1.1.1 This document contains supporting information which accompanies the Environmental Permit (EP) application being submitted for the operation of a facility for the recovery of precious metals from wastes at 10 Merse Road, North Moons Moat, Redditch, B98 9HL. This application has been completed on behalf of Kaug Refinery Services Limited by Oaktree Environmental Ltd.

1.2 Background/context of application

1.2.1 The proposed operations are the same as those which have been undertaken for over 40 years by the applicant at their existing site, which have been regulated by the Environment Agency (EA) for over two decades under a waste Environmental Permit (EP) permit/license. To the present day, these have not been regulated as installation activities.

1.2.2 This application was previously submitted on 25/01/2023 which was prioritised for fast tracking. The activities previously applied for were Physical & Chemical treatment of Waste based on pre-application advice provided by the EA in 2020 for the same activities.

1.2.3 After submission of the application, the EA subsequently changed their position and directed that installation activities would now have to be applied for. It was advised by the EA that activities falling under Schedule 1 Part 2 of The Environmental Permitting (England and Wales) Regulations 2016, namely activities under Section 2.2 Part A (1) (a) and Section 4.2 Part A (1) (f) were required to be applied for as the EA considered the operations to be installation activities. It is important to note that the applicant's existing operation, which includes the same activities and is of the same scale, is not currently regulated as installation activities.

1.2.4 Upon returning the application on the 18/05/2023, the EA did not provide any specific technical reasons as to why the activities were considered to fall under Schedule 1 Part 2 Section 2.2 Part A (1) (a) and/or Section 4.2 Part A (1) (f) of the permitting regulations,

despite request, and therefore this information was subject to a Freedom of Information (FOI) request which was submitted to the EA.

- 1.2.5 The FOI response was received from the EA on 05/07/2023, within which they maintained their opinion that the activities are described under Schedule 1 Part 2 Section 2.2 and 4.2 of the permitting regulations. However, this was based on an officer opinion on what was 'likely' to be the case for each activity and therefore crucially lacked substantive evidence to qualify their opinion. Furthermore, this is a major change in regulatory position taken by the EA compared to the way they have regulated the existing operations for over two decades and also in contrast to the pre-application advice received in 2020.
- 1.2.6 The applicant and agent disagree with the EA interpretation of the permitting regulations, since the proposals are for the extraction of precious metals from wastes and are not therefore described under Section 2.2 Part (A1)(a) or Section 4.2 Part A(1)(f). However, the applicant has applied for installation activities as they are under pressure to advance the development.
- 1.2.7 All processes to be undertaken at the facility are for the recovery of non-ferrous metals from wastes and as such, the activity within Section 4.2 Part A (1) (f) hasn't been applied for in this application as this specifically excludes activities undertaken as part of any other activity listed within the permitting regulations. The use of acids are for recovery of precious metals. Therefore, as the Section 2.2 Part (A1)(a) activity is being applied for, which covers the production of non-ferrous metals, it is not appropriate to apply for the Section 4.2 activity as well. The EA consider that the acid processing operation should be split into two parts such that two separate installation activities (and charges) should apply. We disagree that this is appropriate or reasonable, as an activity should be described based on the primary purpose, in this instance, to recover precious metals from wastes. Given the significant additional fee and subsistence fee implication, insufficient evidence has been provided by the EA to back up their assertion that the Section 4.2 activity also needs to be applied for.

1.3 Proposed Activities

1.3.1 A bespoke Environmental Permit (EP) is required under the Environmental Permitting (England and Wales) Regulations 2016 (“the regulations”). The activity being applied for is summarised in the table below.

Table 1.1 – Proposed Activities

Site Name	Description of the Activity	Activity Description under EA Fees and Charges Scheme	Activity Capacity	Waste Framework Annex I and II Description
Merse Road Precious Metals Recovery Facility	Recovery of precious metals from wastes	Section 2.2 - non-ferrous metal production & 1.16.12 – Physical treatment of waste	250 tonnes/annum	R4: Recycling/reclamation of metals and metal compounds R13: Storage of wastes pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced) D15 Storage pending any of the operations numbered D1 to D14 (excluding temporary storage, pending collection, on the site where it is produced)

1.4 Details of Site Operator

1.4.1 This permit has been applied for by Kaug Refinery Services Limited.

1.5 Permit Boundary

1.5.1 Reference should be made to Appendix I for a map showing the proposed permit boundary for the site.

1.6 Technical Standards

1.6.1 The following Technical Standards and guidance documents have been consulted for the purpose of completing the application and this supporting document:

- The Environment Agency (Environmental Permitting and Abstraction Licensing) (England) Charging Scheme 2022;
- The Environmental Permitting (England and Wales) Regulations 2016;
- Best Available Techniques (BAT) Reference Document for the Non-Ferrous Metals Industries, European Commission, 2017;
- COMMISSION IMPLEMENTING DECISION (EU) 2016/1032 of 13 June 2016 establishing best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for the non-ferrous metals industries; and,
- Environmental Permitting Regulations: Guidance for Applicants H5, Site Condition Report – Guidance and Templates, EA, April, 2013.

2 Operating Techniques

2.1 Overview

2.1.1 The proposals are for the development of a facility for the recovery of precious metals from wastes at Merse Road, Redditch. A series of chemical, physical and thermal treatment processes will be used.

2.1.2 Reference should be made to Appendix I for the proposed site layout plan.

2.2 Detailed Description of Process

2.2.1 The proposals are for the operation of a specialist facility for the recovery of precious metals from various metal containing wastes.

2.2.2 Please refer to Appendix VII which provides a detailed description of the processes along with the relevant Process Flow Diagrams.

2.2.3 The types of wastes accepted will typically include the following:

- Printed circuit scrap and edge connectors;
- Connectors, switches and pins;
- Reel to reel;
- Webbing & stamping scrap;
- Gold rags, wipes, bottles etc;
- Screen printing waste;
- Lithographic waste;
- China;
- Gold colour;
- Gold plating solutions and dragouts;
- Gold stripping solutions;
- Silver solutions;
- Platinum, Palladium and Rhodium solutions;

- Ion exchange resins;
- Filters;
- Carbon packs;
- Anodes;
- Polishings and sweeps;
- Lemels and cuttings;
- Bombing (stripping) solutions;
- De-burring;
- Fan dust;
- Polishing grain;
- Casting scrap;
- Crucibles; and,
- Clean scrap.

2.2.4 Due to the nature of the waste to be received at site, the quantity will be relatively modest, with up to 250 tonnes per annum to be accepted on site. A proportion of the waste received (approximately 165 tonnes), which originates from the UK printed circuit board manufacturing industry, will not be subject to thermal or chemical treatment on site and will either be sorted/batched, or shredded/sorted/batched and shipped on for further recovery.

2.2.5 The site will include a number of processes to extract and recover various precious metals. including processes such as shredding, acid and alkali digestion, operation of a small scale thermal appliance for removal of non-metal contaminants and small scale metal smelting processes. Some of these thermal processes will be regulated under a separate Part B permit, regulated by the Local Authority, as detailed in the table below. A Part B permit has already been issued by Worcestershire Regulatory Services (WRS).

2.2.6 A portion of circuit boards will be shredded to aid in more efficient transport, the shredded waste at site will be sent outside of the UK for further recovery, as is currently the case at the operator's existing site.

- 2.2.7 Acid and alkaline solutions will be stored in appropriately bunded areas, as shown on the layout plan. Waste acids and alkaline solutions will be pumped to bunded tanks, prior to collection by specialist tanker. The waste alkaline solution tanks have an anticipated total storage capacity of 20,000 litres across three tanks. It is anticipated that up to 16,000 litres of acids may be stored prior to removal from site.
- 2.2.8 Cyanide containing solutions will be processed within the alkaline processing area. Prior to storage of waste effluents from this process, cyanide within the mixtures will be neutralised through the addition of sodium hypochlorite. Verification testing will be undertaken on a regular basis.
- 2.2.9 Essentially, the processes undertaken on site will be the same as currently undertaken by the permit applicant at their existing site, operated under permit no. FP3691FN/V004, which is regulated by the EA.
- 2.2.10 The following table summarises plant and equipment to be used and function.

Table 2.1 – Unit Operations

Plant Description	Purpose/Function
Two steam boilers (each 200KWh rated thermal input), anticipated max operational hours per annum = 2876 hours	Steam raising for acid and alkaline digestion processes
225 litre glass lined steam jacketed vessel (x 4)	Dissolution of precious metal away from previous metal bearing material using acid
Acid solution precipitation tanks	Precipitation of precious metals from acid solutions
Acid scrubber	Fume abatement from acid dissolution process
1000 litre stainless steel steam jacketed kettle 450 litre stainless steel steam jacketed kettle 80 litre stainless steel steam jacketed kettle	Chemical precipitation of precious metals from alkaline solutions, predominantly cyanide based solutions
Alkaline strip line	Surface stripping of precious metals within alkaline solutions
Chiller	Provides cooled water for condensers
1KW electric oven 12KW electric oven	Drying of precious metal precipitates

Plant Description	Purpose/Function
50kg crushing and grinding mill (x2) 100kg crushing and grinding mill	Grinding and crushing of precious metal bearing material
Thermal appliance for decontamination of metals (500KWh rated thermal input), anticipated max operational hours per annum = 2876 hours	Combustion of precious metal bearing material to remove organic material (regulated under Part B permit)
60KW electrical induction furnace 112KW gas fired induction furnace, anticipated max operational hours per annum = 2876 hours	Melting of precious metals to form ingots (regulated under Part B permit)
Shredder	Shredding of frames and circuit board scrap from UK PCB manufacturing industry
Laboratory	Precious metal analysis

2.3 Waste Codes

2.3.1 The following outlines the list of EWC codes which may be accepted by the facility.

Permitted waste types and quantities	
Maximum Quantities	The total quantity of waste accepted for activity shall be less than 250 tonnes a year.
Waste Code	Description
06	Inorganic Chemical Processing
06 01	wastes from the manufacture, formulation, supply and use (MFSU) of acids
06 01 06*	Other acids
06 03	Manufacture – formulation – supply and use of salts and their solutions and metallic oxides
06 03 13*	Solid salts and solutions containing heavy metals
08	MFSU of Coatings/Adhesives/Inks
08 01	Manufacture – formulation – supply and use and removal of paint and varnish
08 01 11*	Waste paint and varnish containing organic solvents or other hazardous substances
08 01 12	Waste paint and varnish other than those mentioned in 08 01 11
08 01 13*	Sludges from paint or varnish containing organic solvents or other hazardous substances
08 01 14	sludges from paint or varnish other than those mentioned in 08 01 13
08 01 99	wastes not otherwise specified
08 02	Manufacture – formulation – supply and use of other coatings (including ceramic materials)
08 02 01	Waste coating powders
08 02 99	Wastes not otherwise specified
08 03	Manufacture – formulation – supply and use of printing inks

Permitted waste types and quantities	
Maximum Quantities	The total quantity of waste accepted for activity shall be less than 250 tonnes a year.
Waste Code	Description
08 03 12*	Waste ink containing hazardous substances
08 03 13	Waste ink other than those mentioned in 08 03 12
09	Photographic Industry
09 01	Photographic industry
09 01 07	Photographic film and paper containing silver or silver compounds
10	Thermal Processes
10 07	Silver – gold and platinum thermal metallurgy
10 07 01	slags from primary and secondary production
10 07 02	dross and skimmings from primary and secondary production
10 07 04	other particulates and dust
10 07 99	Wastes not otherwise specified
10 08	Other non-ferrous thermal metallurgy
10 08 11	dross and skimmings other than those mentioned in 10 08 10
10 08 14	anode scrap
10 12	
10 12 08	Waste ceramics, bricks, tiles and construction products (after thermal processing)
10 12 99	Wastes not otherwise specified
11	Chemical Surface Treatment of Metals/Plastic
11 01	Chemical surface treatment and coating of metals and other materials
11 01 06*	acids not otherwise specified
11 01 09*	sludges and filter cakes containing hazardous substances
11 01 10	sludges and filter cakes other than those mentioned in 11 01 09
11 01 11*	aqueous rinsing liquids containing hazardous substances
11 01 12	aqueous rinsing liquids other than those mentioned in 11 01 11
11 01 98*	other wastes containing hazardous substances
11 01 99	wastes not otherwise specified
12	Shaping/Physical Treatment of Metals/Plastic
12 01	Wastes from shaping and physical and mechanical surface treatment of metals and plastics
12 01 04	non-ferrous metal dust and particles
12 01 17	Waste blasting material other than those mentioned in 12 01 16
12 01 99	Wastes not otherwise specified
15	Packaging, Absorbents, Wiping Cloths and Filters
15 02	Absorbants – filter materials – wiping cloths and protective clothing
15 02 02*	Absorbants, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by hazardous substances
15 02 03	Absorbants, filter materials, wiping cloths and protective clothing other than those mentioned in 15 02 02
16	Other wastes from Industrial Processes
16 01	end-of-life vehicles from different means of transport (including off-road machinery) and wastes from dismantling of end-of-life vehicles and vehicle maintenance (except 13, 14, 16 06 and 16 08)
16 01 18	non-ferrous metal

Permitted waste types and quantities	
Maximum Quantities	The total quantity of waste accepted for activity shall be less than 250 tonnes a year.
Waste Code	Description
16 02	Electrical and electronic equipment
16 02 15*	hazardous components removed from discarded equipment
16 02 16	Components removed from discarded equipment other than those mentioned in 16 02 15
16 08	Spent catalysts
16 08 01	spent catalysts containing gold, silver, rhenium, rhodium, palladium, iridium or platinum (except 16 08 07)
16 08 07*	spent catalysts contaminated with hazardous substances
17	Construction and Demolition Waste
17 04	Metals (including their alloys)
17 04 11	Cables other than those mentioned in 17 04 10
19	Materials from Waste and Water Treatment
19 09	municipal wastes including separately collected fractions
19 09 05	Saturated or spent ion exchange resins
20	Municipal Waste and Similar Materials from Commerce and Industry
20 01	
20 01 40	metals

2.4 Environmental Management System

2.4.1 An Environmental Management System (EMS) will be implemented on a day to day basis at the site. This will contain measures and procedures to ensure operations and associated emissions are sufficiently controlled to prevent potential for adverse impacts on air, land or water and to ensure that site staff are appropriately trained to carry out their duties with protection of the environment as a fundamental requirement. Reference should be made to Appendix V for a copy of the EMS.

2.5 Fire Prevention Plan

2.5.1 A Fire Prevention Plan (FPP) is included within Appendix VI.

3 Wastes

3.1 EC Directive 2006/12/EC consolidated and replaced directive 75/442/EC but maintained the duty on member states to encourage the hierarchy approach to managing waste whereby the most desirable option is to prevent/minimise waste. The site operator is committed to following the above requirements at Kaug Refinery Services Limited. The operator will carry out a review at least every four years to confirm that the best environmental options are being used for dealing with the waste from the installation and to ensure that resource efficiency is maximised.

3.2 The waste outputs arising from the process will predominantly include the following:

- Waste alkaline solutions;
- Waste acid solutions;
- Base metal scrap (*sent for further recovery in the UK*);
- Shredded circuit board manufacturing scrap – frames and boards (*sent for further recovery in Belgium*);
- Precious metal ingots/scrap and precious metal powder (sent for further recovery);
and,
- Maintenance oils.

3.3 The majority of the above wastes will be sent on for further recovery with disposal being the last resort. It should be noted that the majority of metals recovered from the chemical and thermal treatment processes on site are likely to be classed as products rather than wastes.

4 Raw Materials and Resources

- 4.1 Table 4.1 outlines the raw materials that will be used along with expected quantities and any relevant hazard codes. Reference should be made to relevant Materials Safety Data Sheets (MSDS) for full lists of hazards. Justification for raw materials and resources used has also been provided in the table. The site operator will use appropriate measures to ensure that raw materials and resources are used efficiently, and records will be maintained of raw material and resource use.
- 4.2 Manufacturer's guidelines will be followed when using raw materials and consideration will be given to environmental impacts when purchasing new plant and equipment for the site. Any compounds utilised as described below will be used as recommended by specialist suppliers. Any quantities of materials used will be the minimum necessary to undertake the required process. A review of raw and auxiliary materials used on site will be carried out at least every four years to assess whether any alternative materials can be used which would result in improved environmental performance. The reviews will ensure raw materials and resources used are appropriate, are used efficiently and any options for reduction in use identified, as applicable.
- 4.3 Water use will be regularly monitored and will be kept to a minimum as far as is practicably possible. Opportunities for reduction in water use will be regularly reviewed.

Table 4.1 – Raw Materials

Raw Material	Nature	Approximate Annual Throughput	Storage Details	Potential Hazards (Summary) ^(a)	Alternatives	Justification for Raw Material Used
Water	Liquid	591m ³	N/A – mains supply	N/A – non-hazardous	No suitable alternative	Required for successful operation of process
Lubricant Oil	Liquid	Variable	Stored in sealed containers	Irritant to skin and eyes. May cause respiratory irritation or other pulmonary effects following prolonged or repeated inhalation of oil mist at airborne levels above the recommended oil mist exposure limit.	No suitable alternative	Required as part of the preventative maintenance of the plant
Activated Carbon	Solid / Filter	Variable as required for efficient control of air emissions	N/A	Flammable solid. Irritant to eyes. May cause respiratory irritation.	No suitable alternative	Required for abatement plant serving thermal appliances to control air emissions
Sodium bicarbonate	Solid	1,900kg/annum	N/A	Causes eye and skin irritation. May be harmful if Absorbed through skin or ingested. May be harmful if inhaled.	No suitable alternative	Required for abatement plant serving thermal appliances to control air emissions

Raw Material	Nature	Approximate Annual Throughput	Storage Details	Potential Hazards (Summary) ^(a)	Alternatives	Justification for Raw Material Used
Sulphuric acid (96%)	Liquid	450 litres/annum	Stored in accordance with manufacturer and health & safety requirements	Corrosive. Irritant to skin and eyes May cause respiratory irritation or other pulmonary effects following prolonged or repeated inhalation of mist	No suitable alternative	Required as part of the process to extract precious metals from wastes
Hydrochloric acid (28%)	Liquid	4,850 litres/annum	Stored in accordance with manufacturer and health & safety requirements	Irritant to skin and eyes. May cause respiratory irritation or other pulmonary effects following prolonged or repeated inhalation of mist	No suitable alternative	Required as part of the process to extract precious metals from wastes
Nitric acid (60%)	Liquid	3,650 litres/annum	Stored in accordance with manufacturer and health & safety requirements	Acute toxic via inhalation Irritant to skin and eyes. May cause respiratory irritation or other pulmonary effects following prolonged or repeated inhalation of mist	No suitable alternative	Required as part of the process to extract precious metals from wastes
Sodium chloride	Solid	450kg/annum	Stored in accordance with manufacturer and health & safety requirements	Toxic to freshwater systems	No suitable alternative	Required as part of the process to extract precious metals from wastes

Raw Material	Nature	Approximate Annual Throughput	Storage Details	Potential Hazards (Summary) ^(a)	Alternatives	Justification for Raw Material Used
Sodium hydroxide	Solid	1,350 litres/annum	Stored in accordance with manufacturer and health & safety requirements	Severe burns to the eyes, skin, digestive system or lungs	No suitable alternative	Required for use in acid scrubber for abatement
Ferrous sulphate	Solid	400kg/annum	Stored in accordance with manufacturer and health & safety requirements	Irritant resulting in causing nausea, vomiting, stomach pain etc.	No suitable alternative	Required as part of the process to extract precious metals from wastes
Urea	Solid	133kg/annum	Stored in accordance with manufacturer and health & safety requirements	Irritant to skin, eyes, and the respiratory tract	No suitable alternative	Required as part of the process to extract precious metals from wastes
Sodium cyanide	Solid	200kg/annum	Stored in accordance with manufacturer and health & safety requirements	Acute toxic, all exposure routes. Irritant to respiratory system	No suitable alternative	Required as part of the process to extract precious metals from wastes
Sodium hydroxide	Solid	2,906kg/annum	Stored in accordance with manufacturer and health & safety requirements	Severe burns to the eyes, skin, digestive system or lungs	No suitable alternative	Required as part of the process to extract precious metals from wastes
Sodium dithionite	Solid	1,680kg/annum	Stored in accordance with manufacturer and health & safety requirements	Irritant to respiratory system	No suitable alternative	Required as part of the process to extract precious metals from wastes

Raw Material	Nature	Approximate Annual Throughput	Storage Details	Potential Hazards (Summary) ^(a)	Alternatives	Justification for Raw Material Used
Sodium hypochlorite	Liquid	17,000 litres	Stored in accordance with manufacturer and health & safety requirements	Corrosive to metals, causes severe skin burns and eye damage, very toxic to aquatic life, contact with acids liberates toxic gas	Hydrogen peroxide, Peroxymonosulfuric acid	Required to neutralize cyanide in waste alkaline solutions. The use of sodium hypochlorite achieves efficient neutralization of cyanide compounds
Sodium m-nitrobenzene sulfonate	Solid	400kg/annum	Stored in accordance with manufacturer and health & safety requirements	Irritant to skin and eyes	No suitable alternative	Required as part of the process to extract precious metals from wastes
Sodium carbonate	Solid	133kg/annum	Stored in accordance with manufacturer and health & safety requirements	Direct skin or eye contact, or inhalation of powder or crystals can produce irritation, rash and sometimes burns	No suitable alternative	Required as part of the process to extract precious metals from wastes
Borax	Solid	400kg/annum	Stored in accordance with manufacturer and health & safety requirements	Nausea, persistent vomiting, abdominal pain, diarrhea, erythematous and exfoliative rash if ingested. Irritant to skin, eyes, and the respiratory system	No suitable alternative	Required as part of the process to extract precious metals from wastes

N.B (a) Refer to relevant Materials Safety Data Sheets for full list of hazards.

5 Emissions to Air, Land and Water and Monitoring

5.1 Fugitive Emissions to Air

5.1.1 The process will be contained within a building and also be very small scale in nature. As such, fugitive emissions will not be significant.

5.2 Point Source Emissions to Air

5.2.1 There will a number of point source (channelled) emissions to air associated with the process, including the following:

- Emission point A1 – Exhaust from scrubber which abates emissions from acid processing area;
- Emission point A2 - Exhaust from steam boiler(s);
- Emission point A3 – Alkaline process exhaust; and,
- Emission point A4 – Exhaust from small scale thermal appliance for metal decontamination, drying ovens and melting furnaces (regulated separately under Part B permit)

5.2.2 Reference should be made to the layout plan in Appendix I for details of point source emission (stack) locations and the processes which are served.

5.2.3 The same processes have been operated at the permit applicant's site in Deritend, Birmingham within a clean air zone, for over 40 years and since 1996 has been regulated by the EA. The process is very small scale and therefore emissions from the above air emission point sources are not predicted to be significant. The EA have not imposed emission limits, nor have they required emissions monitoring at the operator's current site in over two decades of regulating the site, which they have powers to do if it is considered a process is giving rise to unacceptable impacts.

5.2.4 Abatement plant will be used throughout the process to control potential emissions. An alkaline scrubbing unit using caustic soda will be used to control emissions from emission

point A1. Exhaust air from thermal appliances, including the drying ovens, will be directed to an abatement plant which will include baghouse filtration for dust control and sorbent injection, including activated carbon and sodium bicarbonate for control of organic compounds and acid gases, prior to release of exhaust air via emission point A4. A filtration system will be used to contain dust from the shredding operation.

5.2.5 In accordance with the BAT conclusions document for the non-ferrous metals sector, emissions monitoring is proposed for emission point A1. Exhaust air from the melting furnaces and thermal appliance for metal decontamination will be regulated by the Local Authority under a Part B permit and therefore falls outside the scope of this application. No monitoring is proposed for emissions points A2 and A3.

5.2.6 Modelling has been undertaken to assess potential impacts from point source emissions. Reference should be made to Appendix IX for this assessment, previously prepared for the proposals.

5.2.7 The table below outlines proposed emissions monitoring for emission point A1. Stack sampling arrangements will be subject to detailed design to ensure compliance with the permit and relevant guidance. Stack sampling arrangements will be designed to accord with the following, as far as is practicably possible:

- Sampling locations will be designed to meet BS EN 15259 Clause 6.2 and 6.3;
- Sample ports will be large enough for monitoring equipment and positioned in accordance with the relevant requirements of BS EN 15259;
- Access will be provided adjacent to sampling ports, such that sufficient working area, support and clearance is provided for sampling team to work safely with equipment;
- Sample locations will be at least 5 Hydraulic Diameters (HD) from the stack exit;
- Sample locations will be at least 2 HD upstream from any bend or obstruction; and,
- Sample locations will be at least 5 HD downstream from any bend or obstruction; and;
- The sample plane will have constant cross-sectional area.

- 5.2.8 It is anticipated that the sample ducts will be vertical.
- 5.2.9 Periodic emissions testing outlined in the table below will be undertaken by an MCERTS accredited company.

Table 5.1 – Emission Limits and Monitoring Requirements – Emission Point A1

Pollutant	Emission Limits (mg.Nm ⁻³) Expressed at Reference Conditions of 273.15K, 101.3kPa, dry gas	Monitoring Frequency	Monitoring Method
Nitrogen Oxides (NO _x)	150	Annual extractive test	Manual extractive test – EN14792
Sulphur dioxide (SO ₂)	100	Annual extractive test	Manual extractive test – EN14791
Hydrogen Chloride (HCL)	10	Annual extractive test	Manual extractive test - EN 1911 or EN 16429
Chlorine	2	Annual extractive test	Manual extractive test – USEPA Method 26 A

5.3 Point Source Emissions to Water

- 5.3.1 There will be no point source emissions to water from the process.

5.4 Point Source Emissions to Land

- 5.4.1 There will be no point source emissions to land from the process.

5.5 Point Source Emissions to Sewer

- 5.5.1 There will be no point source emissions to sewer from the process.

5.6 Odour Emissions

- 5.6.1 All processing will be undertaken within the building, wastes to be handled will be of very low odour potential and the operations of very small scale. As such, an Odour Management Plan (OMP) is not required.

5.7 Noise Emissions

- 5.7.1 A detailed noise assessment has been undertaken supported by background monitoring. Reference should be made to Appendix II for the noise assessment and accompanying Noise Management Plan (NMP). This confirms that potential noise impacts will not be significant.

6 Environmental Risk Assessment

6.1 General

6.1.1 Reference should be made to the Environmental Risk Assessment (ERA) within Appendix IV for a summary of potential risks to the environment and summary of mitigation that will be used to control potential impacts to an acceptable level.

6.2 Point Source Emissions to Air

6.2.1 Reference should be made to Appendix IX for a detailed assessment (modelling) of potential point source emissions to air from the process, which has considered emissions from emission points A1, A2 and A4.

6.2.2 Emission point A3 will extract residual heat from the alkaline extraction process. The alkaline chemical processing will predominantly include the stripping and precipitation of precious metals from cyanide based solutions. These are not anticipated to include high concentrations of cyanide. Hydrogen Cyanide (HCN) is identified as a potential emission from hydrometallurgical processes within the European Commission BREF document for the Non-Ferrous metals industries¹, which states the following:

“Gold is also removed from solid and liquid cyanide solutions such as plating baths. Solutions of sodium or potassium cyanide can be used to remove gold from surface-coated material such as electronic contacts or plated materials. Gold is recovered from the cyanide solutions by electrolysis. Cyanides react with acids to form hydrogen cyanide (HCN) and therefore careful segregation of these materials is practised”

6.2.3 Typical formation mechanisms for HCN would be through reaction of ammonia with methane, such as during fertiliser production, as a by-product in the manufacture of

¹ Best Available Techniques (BAT) Reference Document for the Non-Ferrous Metals Industries, European Commission, 2017

acrylonitrile or from combustion of nitrogen and carbon containing substances. HCN can also be formed by reaction of cyanide with other acid gases. No ammonia or methane will be used in the alkaline chemical processing area, nor will combustion processes be used within this part of the site. Acid and alkaline chemical processing areas will also be kept completely separate on-site. As such, the potential for formation of HCN is anticipated to be insignificant. No other emissions are anticipated to be significant from emission point A3.

- 6.2.4 In order to further inform this conclusion, the operator commissioned emissions monitoring of the extraction systems serving their alkaline processing lines at their existing permitted site. Testing was undertaken on the alkaline strip line, precipitation process as well as extraction systems serving drying ovens. The reports are included within Appendix X. Monitoring was undertaken for HCN and Volatile Organic Compounds (VOCs). As is shown, HCN emissions were insignificant, being below the Limit of Detection (LOD) for all three extraction points.
- 6.2.5 Emissions of VOCs from the alkaline extraction processes (emissions point A3) are also shown not to be highly significant. However, these have been screened using data from the monitoring reports in Appendix X. Dispersion factors used have been precautionary, assuming an effective stack height of zero. VOC emissions have been considered in combination with the thermal treatment process exhaust (emission point A2). The tables below present the screening results. VOC emissions have been assumed to be 100% benzene, providing a precautionary assessment.
- 6.2.6 As is shown by the tables below, long term VOC emissions screen out as insignificant since the Predicted Environmental Concentration (PEC) is less than 70% of the annual mean AQLV. Short term impacts do not screen out in the initial assessment. However, the initial assessment was based on the assumption that the processes will operate for 24-hours per day, which will not be the case in reality. The abatement plant serving the acid processing area (scrubber) and the alkaline process area extraction system will both be run for 24 hours per day, consistent with operations at the applicant's existing site. This is to ensure that any residual fumes are abated/dispersed whilst the system is cooling down. However, there will

be no operation of waste processing plant, including chemical, physical and thermal processing, nor delivery or export of materials to and from site outside of the hours of 06:00 and 17:00, Monday to Friday (11 hours per day). As such, potential for emissions will not be significant outside of these hours. Furthermore, not all processing plant will always operate simultaneously nor for 11 hours per day. On the precautionary assumption that all processes would be operated simultaneously for 11 hours a day, screening results for 24-hour mean concentrations have been factored by 0.458. This still provides a precautionary assessment for the reasons outlined above. On this basis, the process contribution (PC) to 24-hour mean EAL for benzene is less than 20% of the EAL minus twice the annual mean background concentration. Therefore, VOC emissions screen out as insignificant, in accordance with the relevant guidance.

Table 6.1 – VOC Emissions Screening Results

Process	Emission Rate (g.s ⁻¹)	PC to Annual Mean Concentration (µg.m ⁻³)	PC to 24-Hour Mean Concentration (µg.m ⁻³)	Annual Mean PC (As Percentage of AQLV, %)	24-Hour Mean PC (As Percentage of EAL, %)	Annual Mean PEC (µg.m ⁻³)	24-Hour Mean PEC (µg.m ⁻³)	Annual Mean PEC (As Percentage of AQLV, %)	24-Hour Mean PEC (As Percentage of EAL,%)	24-Hour Mean PC (As Percentage of EAL Minus Twice Annual Mean Background Concentration, %)
Strip Line	0.00183	0.271	4.211	5.42	14.037	0.871	4.921	17.42	16.403	14.622
Kettle Line	0.0001	0.0148	0.230	0.296	0.767	0.615	0.94	12.3	3.133	0.799
Drying Oven	0.000528	0.0781	1.215	1.562	4.05	0.678	1.925	13.56	6.417	4.219
Thermal Treatment Processes	0.00171	0.253	3.935	5.06	13.117	0.853	4.645	17.06	15.483	13.633
Total	0.00417	0.617	9.595	12.34	31.983	1.217	10.305	24.34	34.35	33.316

Table 6.2 – VOC Emissions Screening – Further Assessment of 24-Hour Mean Results

PC to 24-Hour Mean Concentration (µg.m ⁻³), Factored by Percentage Operational Hours Each Day	24-Hour Mean PC (As Percentage of EAL Minus Twice Annual Mean Background Concentration, %)
4.398	15.271

7 Site Condition

- 7.1 Reference should be made to Appendix III for a Site Condition Report which includes an assessment of current ground conditions at the site.

8 Energy Efficiency

- 8.1 All mobile and stationary plant and equipment utilised at the site will be subject to regular maintenance to optimise operating efficiency. A record of fuel consumption will be maintained and will be used to identify any abnormal fuel consumption that requires investigation.
- 8.2 All staff will receive appropriate training for operations at the site which will include maintenance procedures and basic housekeeping (e.g. switching lights and equipment off when not in use).
- 8.3 The operator will review and record opportunities to improve energy efficiency at least every four years and take any appropriate action as deemed necessary by the review.
- 8.4 The table below summarises expected energy use at the installation:

Table 8.1 – Energy Use

Energy Type	Anticipated Quantity ^(a)
Electricity	165,000 kWh
Gas	260,000 kWh
TOTAL	425,000 kWh per annum

N.B (a) Based on annual projected electricity/gas use from current consumption at existing site

9 **Best Available Techniques Assessment**

9.1 An assessment of Best Available Techniques (BAT) has been undertaken against the relevant BAT measures within the following document:

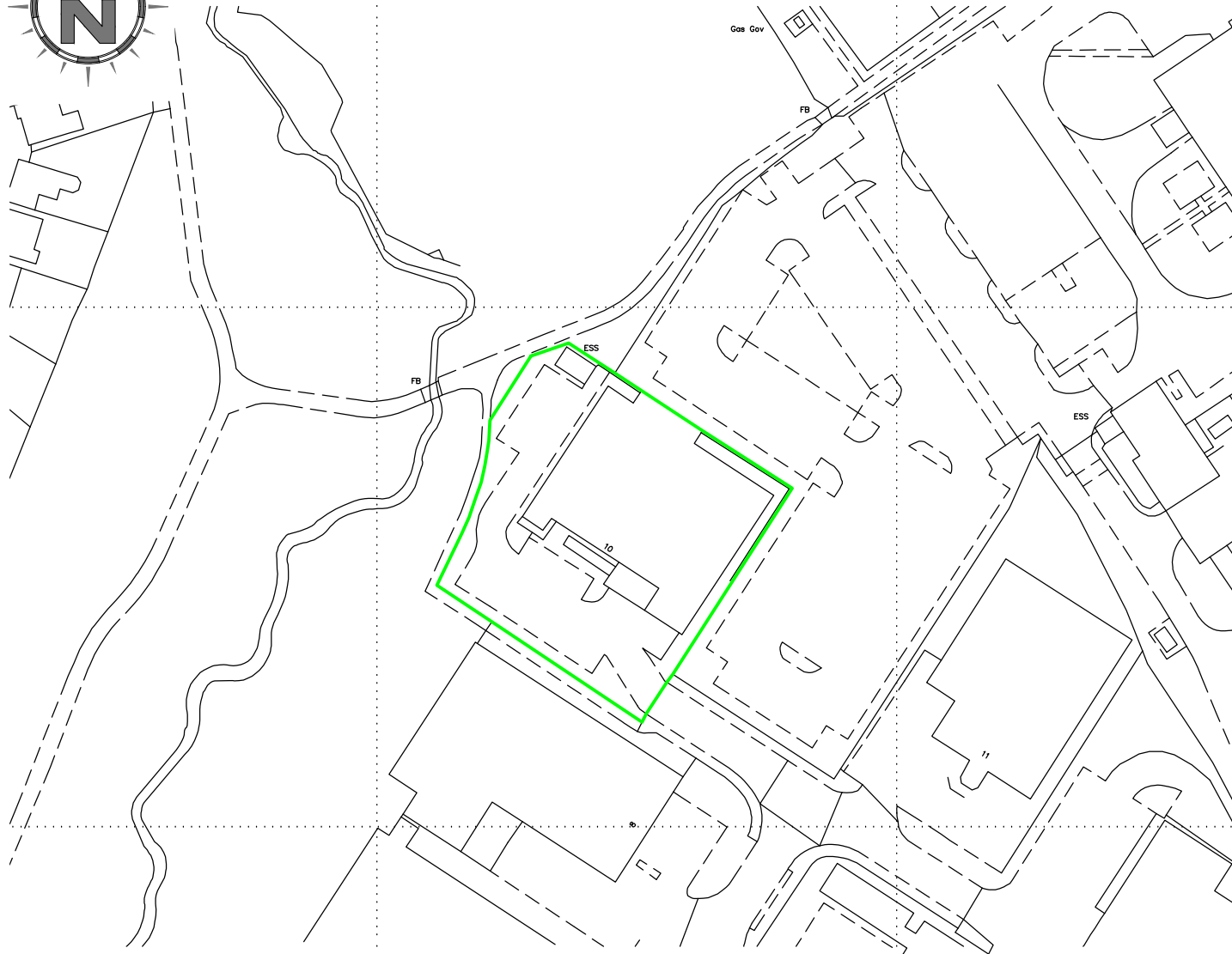
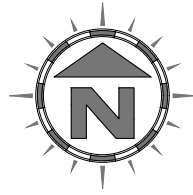
- Commission Implementing Decision (EU) 2016/1032 of 13 June 2016 Establishing Best Available Techniques (BAT) Conclusions, Under Directive 2010/75/EU of the European Parliament and of the Council, for the Non-Ferrous Metals Industries².

9.2 Reference should be made to Appendix VIII for a copy of the BAT Assessment

² Commission Implementing Decision (EU) 2018/1032 of 13 June 2016 Establishing Best Available Techniques (BAT) Conclusions, Under Directive 2010/75/EU of the European Parliament and of the Council, for the Non-Ferrous Metals Industries.

Appendix I

Site Location Plan, Permit Boundary Plan and Site Layout Plans



NOTES

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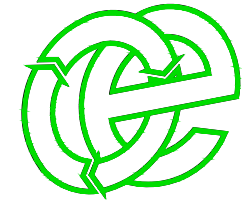
REVISION HISTORY

Rev:	Date:	Init:	Description:
-	05.12.22	JH	Initial drawing
A	05.01.23	IA	Address update
B	17.04.23	IA	Drawing title change

KEY:

Waste EP Permit boundary

Oaktree Environmental Ltd
Waste, Planning and Environmental Consultants



DRAWING TITLE
EP PERMIT BOUNDARY PLAN

CLIENT
Kaug Refinery Services Ltd

PROJECT/SITE
10 Merse Road, North Moons Moat, Redditch, B98 9HL

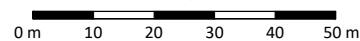
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1:1,250	2765	010

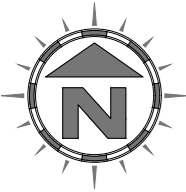
DRAWING NUMBER	REV	STATUS
2765-010-02	B	Issued

DRAWN BY	CHECKED	DATE
JH/IA	RS	17.04.23

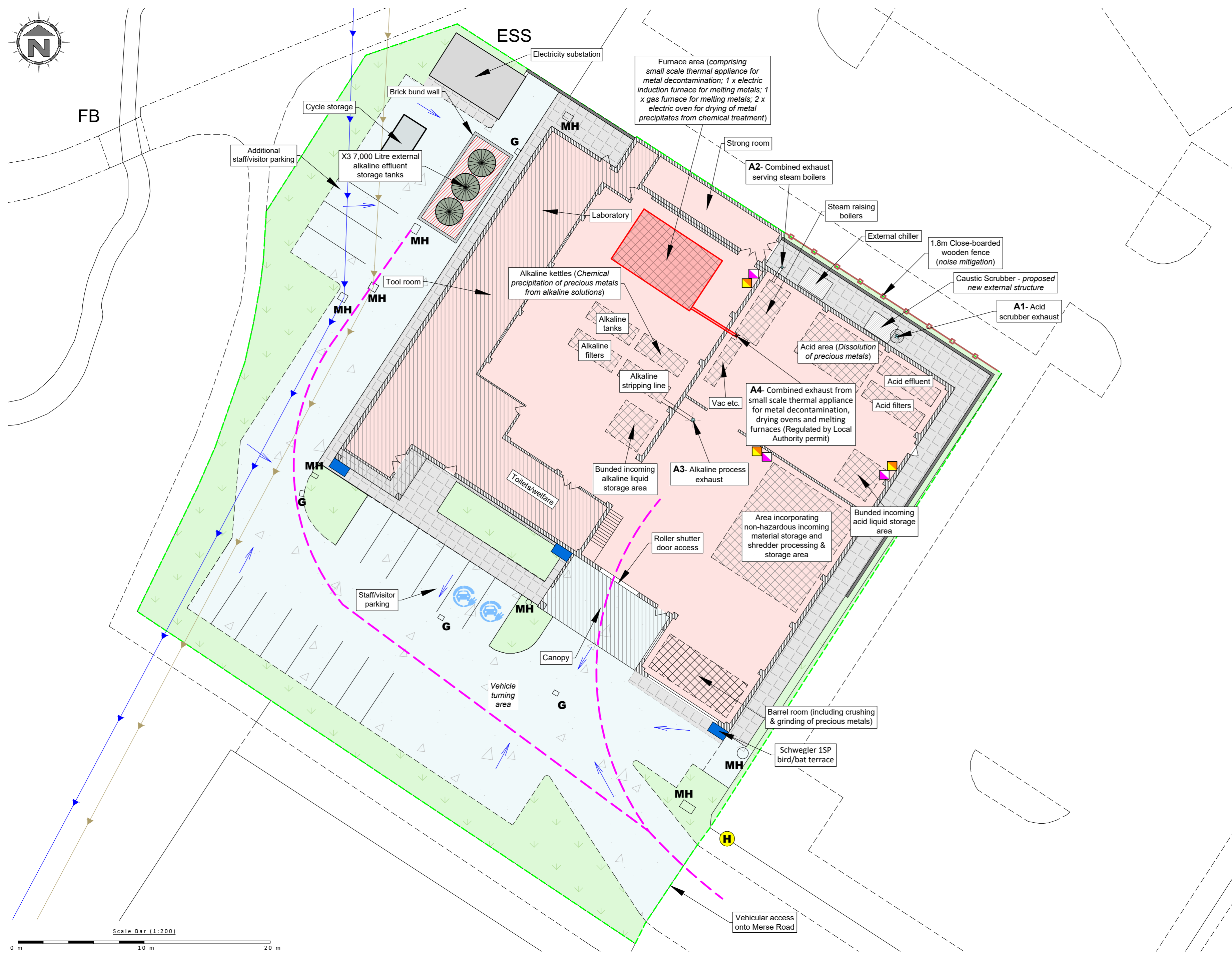
Lime House, Road Two, Winsford, Cheshire, CW7 3QZ
t: 01606 558833 | e: sales@oaktree-environmental.co.uk

Scale Bar (1:1,250)





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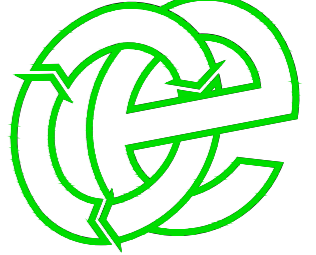


NOTES
Site survey undertaken using Intel Falcon 8+ drone in September 2022. Ordnance Survey data reproduced with the permission of the controller of H.M.S.O. Crown copyright licence No. 100022432. This drawing is copyright and property of Oaktree Environmental Ltd.

Rev:	Date:	Init:	Description:
-	05.12.22	JH	Initial drawing
A	15.12.22	IA/JH	Drawing amendments
B	05.01.23	IA	Address update
C	22.03.23	IA	Layout changes
D	17.04.23	IA	Drawing amendments
E	04.05.23	IA	EA comments
F	28.07.23	IA	Drawing amendments
G	22.01.24	IA	Application resubmission

- KEY:**
- Waste EP Permit boundary (regulated by Environment Agency)
 - Part B Permit boundary (regulated by Local Authority)
 - Sealed buildings
 - Concreted areas
 - Spill kit
 - Firefighting equipment
 - - - Access routes for emergency vehicles
 - H Hydrant
 - MH** Manhole
 - G** Gully
 - Fall direction arrows
 - Paved areas
 - Un-surfaced areas

Oaktree Environmental Ltd
Waste, Planning and Environmental Consultants



DRAWING TITLE
SITE LAYOUT PLAN

CLIENT
Kaug Refinery Services Ltd

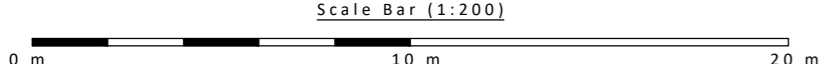
PROJECT/SITE
10 Merse Road, North Moons Moat, Redditch, B98 9HL

SCALE @ A2 1:200 **CLIENT NO** 2765 **JOB NO** 010

DRAWING NUMBER 2765-010-03 **REV** G **STATUS** Issued

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Appendix II

Environmental Noise Assessment and Noise Management Plan

NOISE IMPACT ASSESSMENT

Kaug Refinery Services Ltd

Version:	1.4	Date:	17 August 2023		
Doc. Ref:	2765-009-NIA	Author(s):	TB	Checked:	DY
Client No:	2765	Job No:	009		



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Document History:

Version	Issue date	Author	Checked	Description
1.0	13/12/2022	TB	DY	Internal draft
1.1	06/01/2023	TB	DY	Application copy
1.2	15/03/2023	TB	DY	Limited revisions to model
1.3	14/04/2023	TB	DY	Submitted to LPA with planning application
1.4	17/08/2023	TB	DY	Revisions to model and proposed operating hours

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Appendix I - Drawings

1 Introduction

- 1.1.1 Oaktree Environmental have been commissioned by Kaug Refinery Services Ltd to undertake a Noise Impact Assessment (NIA) for their proposed waste management site at 10 Merse Road, Redditch.
- 1.1.2 The report has been produced by Thomas Benson of Oaktree Environmental, an associate member of the Institute of Acoustics. Full credentials can be provided under separate cover, if required.
- 1.1.3 The operation comprises a specialist facility for the recovery and recycling of precious metals from various metal containing wastes. Up to a maximum of 250 tonnes per annum of metal containing wastes will be imported to site. Various processing operations will be undertaken to recover precious metals from the waste streams.
- 1.1.4 The purpose of this document is to accompany an application for the sites Environmental Permit (EP) and also the associated planning application. The title of the planning application is as follows:

“Change of use to sui generis waste use for development of a facility for recovery of precious metals from metal containing wastes, minor modifications to existing building, including the installation of exhaust flues and addition of other minor ancillary structures to support development.”

1.2 Site Description and Location

- 1.2.1 The application site is located at 10 Merse Road, Redditch, B98 9HL. The site consists of an existing building comprising industrial and office use with associated parking area. The site is located within a wider industrial estate/area and therefore suitable for this type of development. It is understood that the existing building has been in recent active industrial/commercial use. At present, parking for staff and visitors is provided to the South-Western and North-Western side of the building. The site is accessed via Merse Road, via a dedicated access point.

1.2.2 Reference should be made to Drawing No. 2765-009-02 for the general location of the site and red-line planning application boundary. All references to 'the site' in this statement shall mean this area.

1.3 **Hours of Operation**

1.3.1 The site will routinely operate during the following hours:

Monday to Friday	06:00 – 17:00
Saturdays	No operations
Sundays and Bank Holidays	No operations

1.3.2 The abatement plant (scrubber) serving the acid processing area and the alkaline process area extraction system will both be run for 24 hours per day, consistent with operations at the applicant's existing site. This is to ensure that any residual fumes are abated/dispersed whilst the system is cooling down. However, there will be no operation of waste processing plant, including chemical, physical and thermal processing, nor delivery or export of materials to and from site outside of the above hours.

1.4 **Environmental Regulation**

1.4.1 An Environmental Permit (EP) will be required to be in place for the site, with day-to-day operations regulated by the Environment Agency (EA). In addition, a Part B EP will also be required, regulated by Worcestershire Regulatory Services (WRS). Potential impacts on air, land and water will be fully controlled and regulated under the EPs.

2 Planning Policy

2.1 Environment Agency Guidance

2.1.1 This document has been produced in accordance with the EA's guidance "Noise and vibration management: environmental permits" updated 31 January 2022.

2.2 Noise Policy Statement for England

2.2.1 The Noise Policy Statement for England (NPSE), March 2010, sets out the Government's long-term noise policy, the aims of which are:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *Avoid significant adverse effects on health and quality of life;*
- *Mitigate and minimise adverse effects on health and quality of life;*
- *Where possible, contribute to the improvement of health and quality of life."*

2.2.2 The first aim of the NPSE is to avoid significant adverse effects, considering the shared UK principles of sustainable development.

2.2.3 The second aim provides guidance on the scenario when the potential noise impact falls between the LOAEL (Lowest Observed Adverse Effect Level) and the SOAEL (Significant Observed Adverse Effect Level), in which case it is stated, *"all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development"*. However, it is also stated, *"This does not mean that such adverse effects cannot occur"*.

2.2.4 With regards to the SOAEL, the document states, *"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations"*, thus acknowledging that this is very much dependent on the noise

source, the receptor, and the time of day. Therefore, the NPSE provides the necessary policy flexibility until further guidance / evidence is available.

2.2.5 Other guidance will need to be taken into account when applying the principles of the NPSE, as well the nature of the proposed development and its specific circumstances.

2.3 **National Planning Policy Framework**

2.3.1 The NPPF, revised in July 2021, states that Planning policies and decisions should also ensure that new development is appropriate for its location, taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- Mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
- Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

2.3.2 Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

2.3.3 The revised document also makes reference to the Noise Policy Statement for England.

2.4 **Planning Practice Guidance – Noise**

2.4.1 Further to the guidance set out in the NPPF, Planning Practice Guidance for Noise advises that the Local Authority should consider the following when decision making:

- Whether or not a significant adverse effect is occurring or likely to occur.
- Whether or not an adverse effect is occurring or likely to occur.
- Whether or not a good standard of amenity can be achieved.

2.4.2 As previously discussed within the NPSE, the guidance discusses the LOAEL and SOAEL and provides scenarios that could be expected for the perception level of noise, plus the associated activities that may be required to bring about the desired outcome. Again, as with the NPSE, no objective noise levels are provided for LOAEL or SOAEL.

2.4.3 It is stated that “the subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation”. These factors include:

- The absolute noise level of the source and the time of day it occurs.
- Where the noise is non-continuous (intermittent), the number of noise events along with any patterns of occurrence.
- The frequency of content and acoustic characteristics (tonality etc.) of the noise.
- The effects of noise on the surrounding wildlife.
- The acoustic environment of external amenity areas provided as an intrinsic part of the overall design.
- The impact of noise from certain commercial developments such as night clubs and pubs where activities are often at their peak during the evening and night.

3 Noise Assessment Criteria

3.1 In order to assess the impacts of existing road traffic and industrial noise from the proposed development, the following documents have been used:

- BS8233:2014
- BS4142:2014
- World Health Organisation (WHO) Guidelines on Community Noise

3.2 BS8233:2014

3.2.1 This document provides guidance on the relevant level of sound insulation required by a variety of building types affected by general environmental noise and provides recommendations for appropriate internal ambient noise level criteria for a variety of different situations including residential dwellings. The table below includes the proposed noise criteria within BS8233:2014 with regards to residential properties:

Table 3.1 - BS8233:2014 Internal Criteria

Activity	Location	07:00 – 23:00	23:00 – 7:00
Resting	Living rooms	35 LAeq, 16hour	-
Dining	Dining room	40 LAeq, 16hour	-
Sleeping	Bedroom	35 LAeq, 16hour	30 LAeq, 16hour

3.3 BS4142:2014

3.3.1 BS4142:2014 provides a method for “assessing and rating industrial sound” of an industrial/commercial nature. The method described in the standard uses the rating level from a noise source and the existing background noise level to assess the potential effects of sound on the residential premises upon which sound is incident.

3.3.2 Using this method, the background sound level is subtracted from the rating level. The resulting figure is assessed using the following guidance from the document:

- The greater the difference between the background sound level and the rating level, the greater the impact on the receptor.
- An exceedance of the background level of around 10dB, or more, is likely to be an indication of a significant adverse impact, dependent on the context.
- An exceedance of the background level of around 5dB is likely to be an indication of an adverse impact, dependent on the context.
- The lower the rating level compared to the existing background level, the less likely an adverse impact, or a significant adverse impact. Where the rating level does not exceed the background level, this is indicative of a low impact, dependent on context.

3.3.3 The document introduces a requirement to consider and report the uncertainty in the data as well as also including guidance for applying a correction/penalty for certain adverse acoustic features such as tonality, impulsivity or intermittency. The following table summarises the corrections based on the subjective assessment of the noise.

Table 3.2 - BS4142:2014 Corrections and Penalties

	Tonality	Impulsivity	Other characteristics
Just perceptible	+ 2dB	+ 3dB	
Clearly perceptible	+ 4dB	+ 6dB	
Highly perceptible	+ 6dB	+ 9dB	
Readily Distinctive against Residual Environment			+ 3Db

3.4 WHO Guidelines for Community Noise

3.4.1 The WHO Guidelines (1999) recommends indoor night-time guidelines in order to avoid sleep disturbance, the document states these to be 30 dB (LAeq) and 45 dB (LA_{fmax}) for continuous and individual noise events respectively.

- 3.4.2 The document states that the number of noise events should also be considered and that individual noise events should not exceed 45 dB (LA_{fmax}) more than 10 – 15 times per night.
- 3.4.3 The WHO document also recommends that steady, continuous noise levels should not exceed 55 dB (LA_{eq}) for outdoor living areas (balconies, terraces etc.). However, in order to protect the majority of individuals from moderate annoyance, external noise levels should not exceed 50 dB (LA_{eq}).

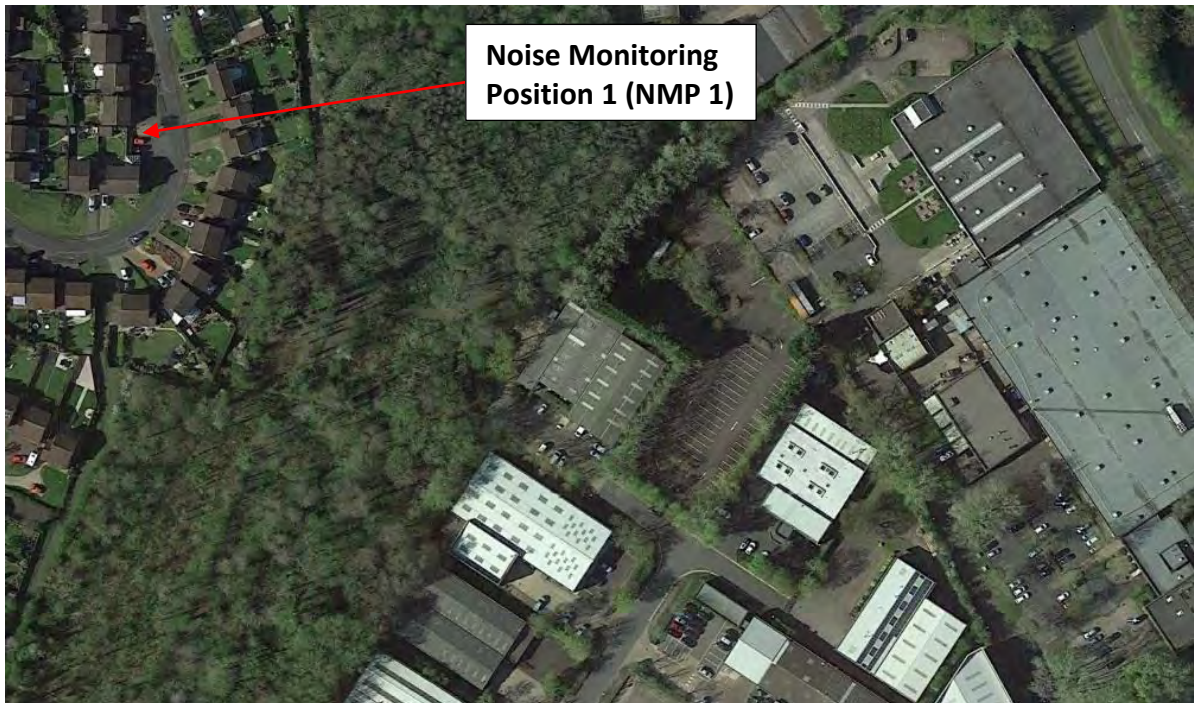
4 Background Noise Monitoring

4.1 Procedure and Monitoring Locations

4.1.1 A background noise survey was completed on the 27th July, 5th August 25th September 2022 as well as 14-15th August 2023 in accordance with BS 7445-1: 2003 by Thomas Benson of Oaktree Environmental Ltd.

4.1.2 Figure 4.1 below details the location of the monitoring positions.

Figure 4.1 - Site location and noise monitoring positions



4.1.3 Locations chosen were chosen to be representative of the nearest noise sensitive receptors. These being the dwelling located directly to the west off Hillmorton Close. Locations were agreed with the relevant planning consultees prior to the commencement of the survey.

4.2 Equipment Used During the Survey

4.2.1 Details of the equipment used during the survey are shown in the table below:

Table 4.1- Survey Equipment

Description	Model	Manufacturer	Serial No.	Calibration Date
Class 1 Sound Analyser	NOR 150	Norsonic	15030504	October 2020
Microphone	Norsonic Type 1225	Norsonic	305208	October 2020
Field Calibrator	NOR 1251	Norsonic	35205	March 2022

4.3 Weather

4.3.1 The weather during the background surveys is summarised in the table below:

Table 4.2 – Weather Conditions during noise monitoring

Date	Wind Speed (max)	Cloud Cover	Temperature	Precipitation
Wednesday 27/07/2022	Generally very still, max gusts of 1.3m/s	100%	17°C-19°C	None recorded whilst onsite.
Friday 05/08/2022	Generally still, max gusts of 3.9m/s	5-10%	15°C-17°C	None recorded whilst onsite.
Sunday 25/09/2022	Generally vstill, max gusts of 4.4m/s	80-100%	10°C-12°C	None recorded whilst onsite.
Monday 14/08/2023	Generally very still, max gusts of 2.2m/s	50-75%	12°C-15°C	None recorded whilst onsite.

4.4 Results

4.4.1 The results of the background noise monitoring survey are tabulated below in Table 4.3-4.5. Commentary on the background level and survey is included further on in Section 4.5.

Table 4.3 -Weekday background monitoring results for NMP 1

Measurement Time	LA _{eq}	LA ₉₀	LA ₁₀	LA _{max}
06:10-07:10	43.3	36.7	43.7	65.7
07:10-08:10	57.4	37.7	49.9	88.5
08:10-09:10	52.1	37.8	49.4	77.0
09:14-10:14	45.9	36.7	44.1	76.1
18:20-19:20	46.0	33.8	42.1	72.2
19:42-20:42	41.8	32.2	39.3	67.3
20:45-21:45	42.8	31.5	37.6	68.4
21:45-22:45	34.8	31.4	34.9	67.3

Table 4.4 -Weekend background monitoring results for NMP 1

Measurement Time	LA _{eq}	LA ₉₀	LA ₁₀	LA _{max}
19:10-20:10	41.7	37.4	42.7	63.7
20:10-21:10	39.1	35.6	39.7	60.5
21:10-22:10	40.7	35.5	40.8	64.1

Table 4.5 -Weeknight background monitoring results for NMP 1

Measurement Time	LA _{eq}	LA ₉₀	LA ₁₀	LA _{max}
19:10-20:10	36.0	28.9	37.0	66.9
20:10-21:10	33.9	28.5	34.3	73.5
21:10-22:10	32.9	29.0	34.2	65.2

4.5 Existing Noise Climate at NMP 1

4.5.1 During the monitoring contributors to the background sound level were observed to comprise primarily road traffic from the surrounding road network, birdsong, movements within local gardens and occasional impulsive events from the industrial estate to the east.

- 4.5.2 Should It be required, photographs and videos can be provided, along with the noise measurement files in order to corroborate the above observations. These are available upon request by the LA/EA.

5 Noise Impact Assessment

5.1 Introduction

5.1.1 It is considered the most significant noise sources associated with the development are:

- The loading and operation of the printed circuit board (PCB) shredder,
- Noise arising from the 4no. flues associated with internal extraction systems and acid scrubbing unit,
- Operation of the internal forklift.

5.1.2 Additional noise sources are located within the building such as grinders and gas scrubbers, however these have been measured by Oaktree Environmental and their contribution is considered to be insignificant when compared to those listed above.

5.1.3 The majority of the noise sources will be operated between the hours of 06:00-17:00, however the 2no. flues associated with the acid scrubbing unit and alkali unit will operate 24/7 as will the external acid scrubbing unit.

5.2 Background Levels

5.2.1 With regards to background levels, BS4142:2014 states that *“the objective is not simply to ascertain a lowest measured background sound level, but to quantify what is typical during particular time periods”* and also *“In practice there is no “single” background sound level as this is a fluctuating parameter. However, the level for the assessment should be representative of the period being assessed”*.

5.2.2 With this in mind, the assessment will utilise the range of levels from Tables 4.3-4.5.

5.3 BS4142: Assessment

5.3.1 The CadnaA noise models were constructed using OS mapping Opendata and Google Earth satellite imagery, whilst topographical data was downloaded from DEFRA in the form of a digital terrain model.

5.3.2 The following assumptions/parameters are made within the models:

- The intervening land between the site boundary and residential properties was modelled with $G = 1.0$ as it was considered that the land is predominantly acoustically absorbent.
- Buildings were set as acoustically reflective, with a reflection loss of 1 dB.
- The predicted grid noise levels were also calculated as free-field, A-weighted, sound pressure levels. The noise contours generated within the model are also at a height of 2.0 m, assumed to be the worst-case scenario.
- A receiver of height 2m is included within external amenity areas. This includes the garden whereby noise levels from the proposed development are highest, as determined by the grid calculation.
- Surrounding residential properties were modelled at a height of between 4.0m for the majority of residential dwellings whilst surrounding commercial/agricultural buildings are based on onsite observations.
- The building fabric has been assumed to comprise brick to a height of 2m with trapezoidal sheet sheeting (45mm) for the remainder of the façade. For the roller shutters, 1mm Steel sheeting has been assumed whilst double glazing has been assumed for window elements. No internal walls have been assumed.
- A 2.5m barrier has been included to the north of the acid scrubbing unit. This has been modelled with a reflection loss of 0.1dB.
- The internal surface area has been assumed to 2500m² and absorption has been considered to be low.

5.3.3 Table 5.1 below includes the associated noise levels for the proposed noise sources.

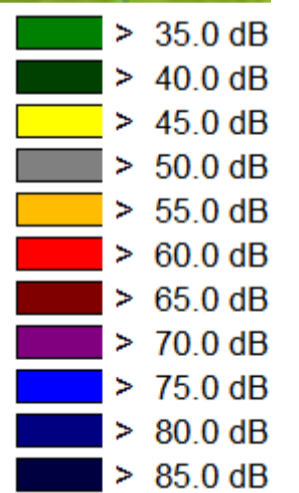
Table 5.1 – Measured levels of activities

Activity	Sound Power Level (dB A)	Source/Notes	Notes on Geometry etc. within the model
Operation of the PCB shredder	84	Provided by the technology provider. Equivalent to 73.0dB (A) at 1m.	Modelled within the building referred to in section 5.3.2.

Flue	61	<p>Equivalent to 50dB at 1m.</p> <p>Noise from the flues at the applicants existing operations has been measured at 77.1dB at 0.5m, however this comprises an aged system with no acoustic attenuation.</p> <p>50dB is considered to be easily achievable based on proposed attenuation and would still be considered precautionary.</p>	<p>4no. Flues modelled as a point source at heights between 9.44-10.44m.</p> <p>The 2no. flues associated with the acid scrubber and alkali unit will run 24/7 whilst the remaining 2no. flues will run from 06:00-17:00.</p>
Acid scrubbing Unit	93	<p>Calculated following provision of SWL data in octave bands from the technology provider.</p> <p>Equivalent to 85.0dB at 1m.</p>	<p>Modelled as a point source at 0.5m height. Noise source is assumed to operate 24/7.</p>

5.3.4 Table 5.3 details the predicted noise levels (in dB A) associated with the application site at the relevant receptors. These are based on the results of the modelling provided overleaf in Figure 5.1.

Figure 5.1 – Calculated noise levels (LAeq) associated with the typical operation the site (06:00-17:00)



- 5.3.5 With regards to impulsive and tonal penalties as per BS4142:2014, some occasional bangs/crashes are associated with the operation of the sites forklift (scrapping on the floor, reversing alarms, falling material etc.), however considering that the forklift will be located within the building with roller shutters shut at all times (mainly for security reasons), this is considered to be inaudible at the nearest residential receptors. However, the internal shredding and external flue systems may have a tonal element which is just perceptible, and therefore a 2dB (A) penalty has been applied.
- 5.3.6 As stated previously, the range of background figures will be utilised within the assessment. These include those measured between 06:00-17:00, indicative of typical operating hours during the week and those between 23:00-00:00 for the external plant which will run 24/7.
- 5.3.7 The worst-case scenario noise level has been used within the report.

Table 5.2 – Assessment of typical daytime noise sources associated with the site as per BS4142:2014

	Calculated noise level at dwellings, 95m west	Comments
Calculated noise level as per figure 5.1	25.6	As per Figure 5.1
Addition of relevant penalties as per BS4142:2014	+2 = 27.6	As per Sections 5.3.5-5.3.7
Comparison to weekday background levels between 06:00-17:00	27.6 – 36.7 to 37.8 = 9.1-10.2dB below	Low impact as per BS4142:2014

Table 5.2 – Assessment of typical nighttime noise sources associated with the site as per BS4142:2014

	Calculated noise level at dwellings, 95m west	Comments
Calculated noise level as per figure 5.1	25.0	As per Figure 5.1
Addition of relevant penalties as per BS4142:2014	+2 = 27.0	As per Sections 5.3.5-5.3.7
Comparison to weekday background levels between 06:00-17:00	27.0 – 28.5 to 29.0 = 1.5-2.0dB below	Low impact as per BS4142:2014

5.3.8 As per Table 5.2 to 5.3, the rating level associated with the operation of the site is below the measured LA90 figures and therefore the associated impact is considered to be low.

5.3.9 It should of course be noted that the modelling likely comprises an over-assessment, based on the “on-times” assumed within the modelling and associated parameters/assumptions. The parameters/assumptions made within the model are based on those agreed with the Environment Agency during the process of numerous waste related environmental permit applications and are considerably more stringent than would normally be assumed. For example, an order of reflection of 3.0 has been utilised, whereas 1.0 is likely to be representative of most scenarios.

5.4 **Control of Uncertainty**

5.4.1 Uncertainty in this assessment was controlled via the following precautions/procedures:

- Both the sound level meter and calibrator have a traceable laboratory calibration and the meter was field-calibrated both before and after the measurements.
- The measurement locations are considered representative of the existing noise climate outside the nearest residential dwellings to the proposed development.
- Background monitoring was undertaken during favourable weather conditions (e.g. dry and under 5m/s wind speed).
- The parameters/assumptions made within the model are based on those agreed with the Environment Agency during the process of numerous waste related environmental permit applications and are considerably more stringent than would normally be assumed. For example, an order of reflection of 3.0 has been utilised, where as 1.0 is likely to be representative of most scenarios.

6 Conclusion

6.1 Summary & Recommendations

- 6.1.1 Oaktree Environmental Limited have undertaken a Noise Impact Assessment for the proposed refinery operations at Merse Road.
- 6.1.2 The primary receptors are the residential dwellings to the west off Hillmorton Close
- 6.1.3 The site has been assessed with regards to BS4142:2014 and it is considered that the impacts associated with the proposed operation of the site are acceptable based on the comparison of the calculated rating level to the proposed background level.
- 6.1.4 In addition, noise emissions will be controlled and regulated via the site Noise Management Plan.
- 6.1.5 Therefore, considering the above, noise levels associated with the proposed development are acceptable and noise should not be considered an impediment to the grant of the environmental permit or planning permission.

APPENDIX I

DRAWINGS


NOTES

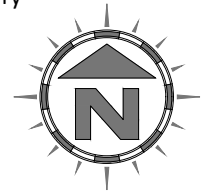
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REVISION HISTORY

Rev:	Date:	Init:	Description:
-	20.05.22	RS	Initial drawing

KEY:

 Planning boundary



Oaktree Environmental Ltd
Waste, Planning and Environmental Consultants



DRAWING TITLE

SITE LOCATION PLAN

CLIENT

Kaug Refinery Services Ltd

PROJECT/SITE

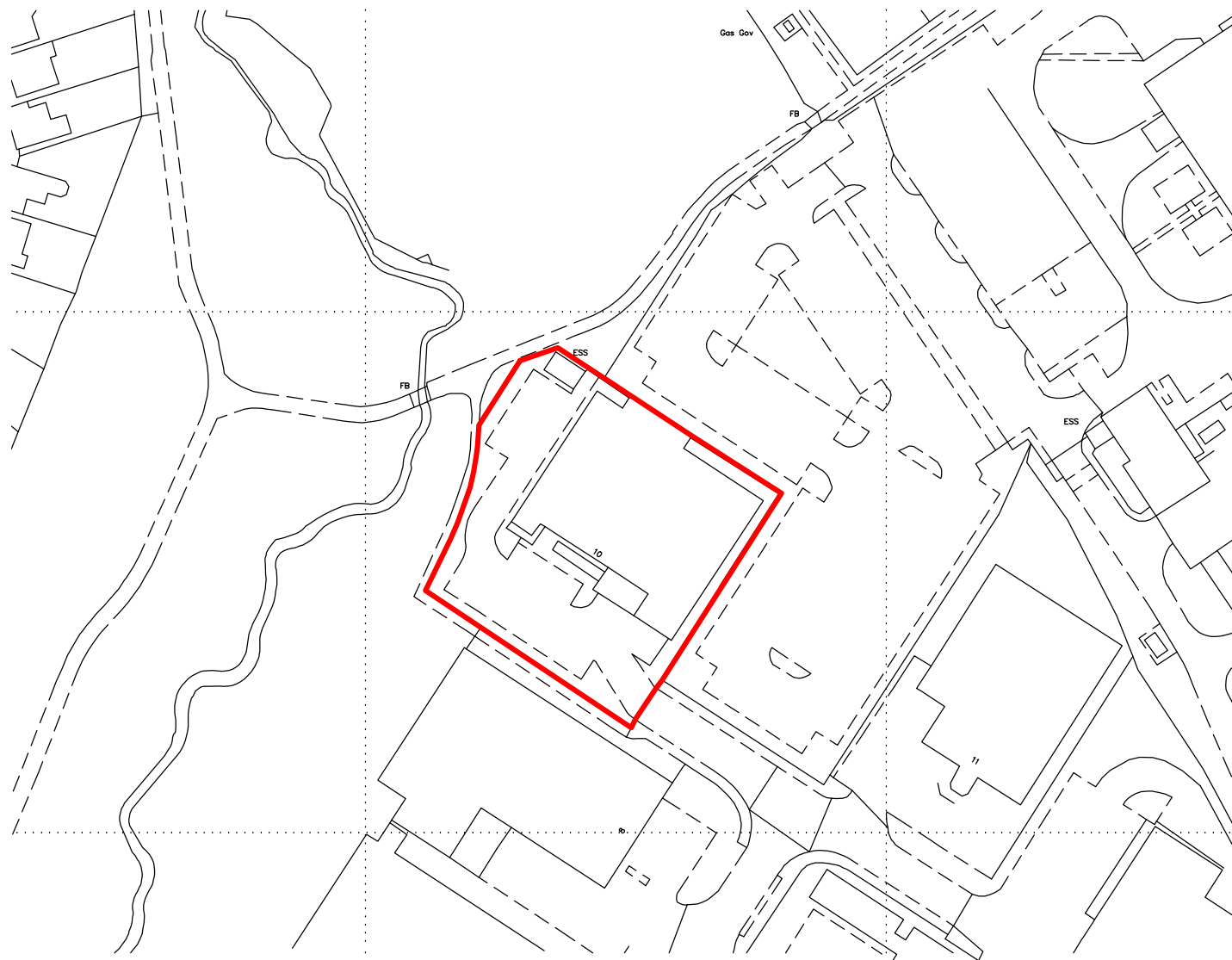
10 Merse Road, Moons Moat North
Industrial Estate, Redditch B98 9HL

SCALE @ A4	CLIENT NO	JOB NO
1:1,250	2765	009

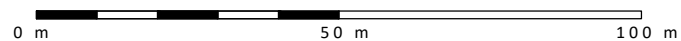
DRAWING NUMBER	REV	STATUS
2765-009-02	-	Issued

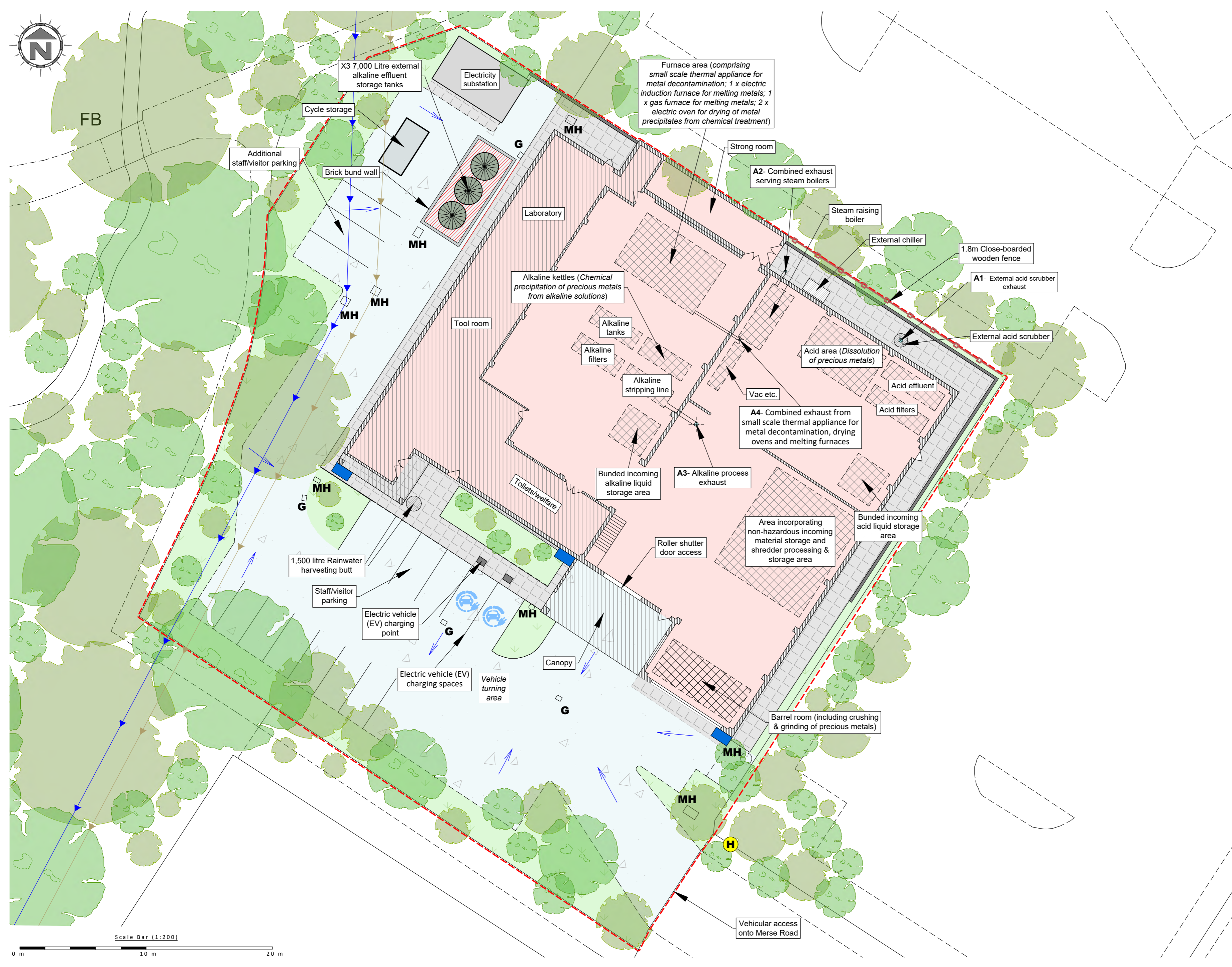
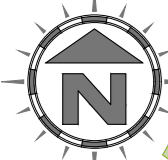
DRAWN BY	CHECKED	DATE
RS	RS	20.05.22

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Scale Bar (1:1,250)



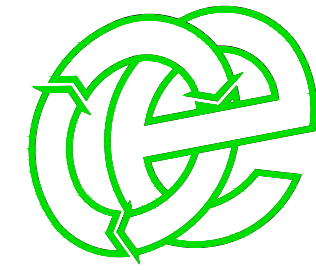


NOTES
 Site survey undertaken using Intel Falcon 8+ drone in September 2022. Ordnance Survey data reproduced with the permission of the controller of H.M.S.O. Crown copyright licence No. 100022432. This drawing is copyright and property of Oaktree Environmental Ltd.

Rev:	Date:	Init:	Description:
-	14.03.23	JH	Initial drawing
A	14.04.23	IA	Layout amendments
B	04.05.23	IA	Layout changes as required by EA
C	17.07.23	JH	Parking amended
D	17.08.23	JH	Fence added

- KEY:**
- Planning boundary
 - Sealed buildings
 - Concreted areas
 - H Hydrant
 - MH Manhole
 - G Gully
 - Fall direction arrows
 - Paved areas
 - Un-surfaced areas
 - Schwegler 1SP bird/bat terrace
 - Surface water drainage
 - Foul drainage

Oaktree Environmental Ltd
 Waste, Planning and Environmental Consultants



DRAWING TITLE
 PROPOSED LAYOUT PLAN

CLIENT
 Kaug Refinery Services Ltd

PROJECT/SITE
 10 Merse Road, North Moons Moat, Redditch, B98 9HL

SCALE @ A2 1:200	CLIENT NO 2765	JOB NO 009
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DRAWING NUMBER 2765-009-04	REV D	STATUS Issued
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DRAWN BY JH/IA	CHECKED RS/DY	DATE 17.08.23
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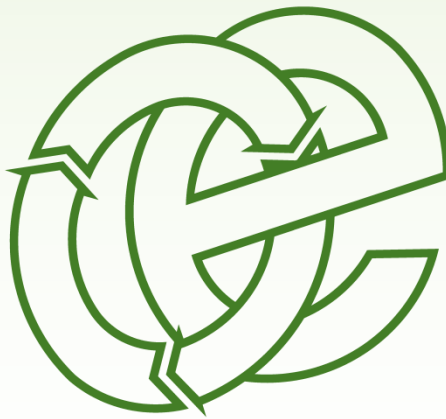
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NOISE & VIBRATION MANAGEMENT PLAN

10 Merse Road, Redditch

Kaug Refinery Services Limited

Version:	1.6	Date:	01/03/2024		
Doc. Ref:	2765-009-NVMP	Author(s):	TB	Checked:	DY
Client No:	2765	Job No:	009		



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Document History:

Version	Issue date	Author	Checked	Description
1.0	15/12/2022	TB	DY	Internal draft
1.1	06/01/2023	TB	DY	Amended following client comment
1.2	14/04/2023	TB	DY	Submitted to LPA with planning application
1.3	13/07/2023	IA/TB	DY	Submitted to EA
1.4	18/08/2023	TB	DY	Operational hours amended Noise management table amended
1.5	29/08/2023	TB	DY	Submitted to LPA
1.6	01/03/2024	TB	DY	Updated for permit application

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		Drawing No. 2765/010/04 – Receptor Plan
Appendix II	-	Complaints Procedure and Recording Form

1 Introduction

1.1 Site history / background

1.1.1 Oaktree Environmental Ltd have prepared a Noise & Vibration Management Plan (NVMP) for a site situated at 10 Merse Road, Redditch.

1.1.2 The operation comprises a specialist facility for the recovery and recycling of precious metals from various metal containing wastes. Approximately 250 tonnes per annum of metal containing wastes will be imported to site. Various processing operations will be undertaken to recover precious metals from the waste streams.

1.1.3 This NVMP will therefore assess further risks arising from the section above and allow Kaug Refinery Services Limited to provide mitigation measures. The measures outlined in this NVMP will be put in place by site management of Kaug Refinery Services Limited to ensure noise and vibration is controlled using Best practicable means (BPM) to ensure the receptors listed in Section 2.2 below are not affected by the above proposals.

1.2 Site location

1.2.1 The site includes an existing building comprising industrial and office use with associated parking area. The site is located within a wider industrial estate/area and therefore suitable for this type of development. It is understood that the existing building has been in recent active industrial/commercial use. At present, parking for staff and visitors is provided to the South-Western and North-Western side of the building. The site is accessed via Merse Road, via a dedicated access point.

1.2.2 Reference should be made to Drawing No. 2765-010-02 for the general location of the site and permit boundary. All references to 'the site' in this statement shall mean this area.

1.3 Hours of Operation

1.3.1 The site will routinely operate during the following hours:

Monday to Friday	06:00 – 17:00
Saturdays	No operations
Sundays and Bank Holidays	No operations

1.3.2 The abatement plant (scrubber) serving the acid processing area and the alkaline process area extraction system will both be run for 24 hours per day, consistent with operations at the applicant's existing site. This is to ensure that any residual fumes are abated/dispersed whilst the system is cooling down. However, there will be no operation of waste processing plant, including chemical, physical and thermal processing, nor delivery or export of materials to and from site outside of the above hours.

1.4 Environmental Regulation

1.4.1 An Environmental Permit (EP) will be required to be in place for the site, with day-to-day operations regulated by the Environment Agency (EA). Potential impacts on air, land and water will be fully controlled and regulated under the EP.

2 Sensitive Receptors

2.1 Site receptors

2.1.1 The receptors are detailed in the table below with approximate distances to them. Receptors which are over 500m have not been included within the table below as it is considered that they will not be affected by any noise pollution arising from the site.

Table 2.1 – Distances to Selected, Representative Sensitive Locations

Boundary	Receptor	Approximate distance from boundary of site (m)
West	Dwellings off Hillmorton Close	90
West	Dwellings off Latchford Close	140
West	Dwellings off Fairford Close	225

2.2 Other noise sources

2.2.1 There are numerous additional noise sources within the vicinity of the site given its location within the Moons Moat North Industrial Estate. These include but are not limited to; several warehouses, manufacturing processes, metal fabricators and truck repair services.

3 Site Operations

3.1 Waste deliveries

3.1.1 Waste will be delivered and removed from the site via the existing access to the south of the site. Upon arrival, an operative will direct the driver to access the building via the roller shutter along the southern façade.

3.1.2 Deliveries/removals from the site will primarily consist of Kaug Refinery Services Limited’s own vehicles/contracts in the form of transit vans and LGVs.

3.2 Plant and equipment

3.2.1 The table below details the plant/equipment to be used on site. Only trained operators will be permitted to drive/operate the plant/equipment listed below.

Table 3.1 – Plant and Machinery to be Used on Site

Type of plant/equipment	No.
Air compressor	1
Steam raising boiler	2
Shredder	1
Barrelling/sieving equipment	1
Acid reflux kettle (steam jacketed)	4
Acid fume scrubbing system	1
Acid effluent storage tanks	5
Water chilling system	1
Water cooled vacuum pumps for filtration system	1
Gas fired thermal appliance for metal contamination with fume scrubbing system	1
Gas fired furnace	1
Induction furnace	1
Electric drying oven	1
Alkali extraction system	1
Alkali cyanide processing kettles (steam jacketed)	3
Alkali cyanide stripping line with barrel and hoist	1
Alkaline effluent storage tanks	3
Exhaust flues	4

- 3.2.2 The vast majority of plant is considered negligible in terms of noise levels, with the exception of the PCB shredder and 4no. flues associated with the extraction system.

- 3.2.3 All plant on site will be subject to annual manufacturer maintenance to ensure proper working order in the form of service contracts.

4 Noise Management and Controls

4.1 Noise Sensitive Receptors

4.1.1 The site lies within an industrial setting with the nearest noise sensitive residential receptors located 90m to the west. The layout of the site has been planned in order to contain all the required operations and activities within the site, thus limiting the impacts from noise on the above receptors.

4.1.2 In terms of potential noise impact, whilst the development proposed will be operated using the Best Practicable Means at all times, this site-specific NVMP has been prepared in order to ensure the noise levels at the site can be managed appropriately and reduce any impact on the surrounding receptors.

4.2 Noise Sources

4.2.1 The main sources of noise which could arise from the site operations are as follows:

- a) HGVs/LGVs travelling to and from the site for delivery / collection of waste
- b) Ventilation noise associated with the 4no. flues.
- c) Operation of the PCB shredder,
- d) Small vehicles travelling to and from the site (e.g. staff and visitor's cars, courier van deliveries etc.)
- e) Repairs

4.3 Noise Management Table

4.3.1 A site-specific NVMP table overleaf details the above noise sources and how the current and proposed infrastructure on site will reduce the impact of noise to surrounding properties.

4.3.2 In addition to the existing controls in this NVMP, the complaints procedure further discussed in section 5 will be used if any noise complaints are received. If a noise complaint is received and the applicant has been made aware, immediate action will

take place reviewing and identifying whether any changes to existing procedures are required or if new procedures need to be put in place. Any changes which may be required will be implemented immediately.

Source(s)	Receptor(s)	Consequence	Magnitude of noise source	Characteristic of noise source	Probability of noise disturbance	Remedial Action / Recommendations / Comments	Assessment Outcome following actions / recommendations
HGVs/LGVs travelling to and from the site for delivery / collection of waste	See Section 2	Noise pollution	Low	Continuous (Low Pitch)	Low	<p>Engines will be switched off when the vehicles are not being used.</p> <p>The existing access road to the operational area site will be maintained in good state of repair to prevent unnecessary noise being generated.</p> <p>Implementation of a 5mph speed limit onsite.</p> <p>All drivers are required to enter and exit the site with due consideration for neighbours.</p> <p>All mobile plant and other vehicles used will benefit from white noise reverse alarms.</p> <p>A no idling policy will be in place and staff/third party drivers will be told not to rev engines.</p>	Low
Operation of the PCB shredder	See Section 2	Noise pollution	Low	Continuous (Low Pitch)	Low	<p>Management will ensure that all plant operated by Kaug Refinery Services Limited is functioning suitably i.e. moving parts to be regularly lubricated.</p> <p>Any malfunctions in plant i.e. missing screws/bolts which result in excessive noise will be de-commissioned until an alternative loading plant sourced.</p> <p>Roller shutter doors to remain closed outside of times when materials are delivered/exported to and from site.</p>	Low

Source(s)	Receptor(s)	Consequence	Magnitude of noise source	Characteristic of noise source	Probability of noise disturbance	Remedial Action / Recommendations / Comments	Assessment Outcome following actions / recommendations
Extraction system	See Section 2	Noise pollution	Low	Continuous (Low Pitch)	Low	<p>A 50dB (A) at 1m limit for the flues will be ensured by site management during the procuring of the extraction system.</p> <p>Any malfunctions in plant i.e. missing screws/bolts which result in excessive noise will be de-commissioned until an alternative loading plant sourced.</p>	Low
Small vehicles travelling to and from the site (e.g. staff and visitor's cars, courier van deliveries etc.)	See Section 2	Noise pollution	Low – Very Low	Intermittent (Low Pitch)	Low	<p>All those working on and visiting the site to be made aware of need for considerate driving and keeping vehicles well maintained.</p> <p>Small vehicles are not considered to be an issue in relation to excessive noise which could cause a complaint.</p> <p>Implementation of a 5mph speed limit onsite.</p> <p>All drivers are required to enter and exit the site with due consideration for neighbours.</p>	Very Low / Negligible
Repairs	See Section 2	Noise pollution	Very Low	Occur at a specific time (Low Pitch)	Low	<p>If repairs to the site are required, the work is to be undertaken with due regard for the possible noise nuisance and during working day hours.</p> <p>In the event of major repair work being undertaken which is likely to cause significant noise and disruption, neighbouring residents and the Environment Agency will be notified in advance and would not commence without agreement unless in extenuating circumstances i.e. to minimise a fire occurring.</p>	Very Low / Negligible

4.4 Monitoring

4.4.1 It is proposed that any offsite monitoring would primarily comprise the subjective onsite observations by site management. Given that the noise assessment has determined that proposed noise levels associated with the proposed operations are unlikely to significantly exceed the background level it is difficult to justify the requirement to undertake routine pro-active offsite monitoring.

4.4.2 To have any certainty in evaluating the true noise level as a result of the operations at the receptor, measurements would have to be made during time of inactivity at neighbouring sites. This would introduce a great level of difficulty and eradicates the opportunity to arrange for a routine, weekly time for noise monitoring.

4.4.3 It is reasonable to propose that noise levels are subjectively monitored by site management. Site management will be able to monitor noise levels throughout the day whilst onsite and would notice a rise in noise levels because of plant failure, staff negligence, incompatible loads or other extenuating circumstances. If site management identify these issues, they can then take steps to remedy the situation (i.e. cease the activity if needed). Should a noise a complaint be received, site management would review the nature of the complaint, and should it be deemed necessary (i.e. numerous complaints relating to a particular item of plant) then an investigation may be commenced and advice sought from a professional acoustician.

4.5 Recording

4.5.1 Site management will record complaints in the site diary or complaints report from in Appendix II and contract the EA within 24 hours if a complaint is received.

4.5.2 Site management will be required to make a note of any unavoidable events such as plant failure, in the site diary, rather than just actual complaints received and notify the EA within 24 hours. This will ensure that if complaints are received retrospectively from either the EA or directly, any circumstances which led to that complaint as a result of elements outside of the operator's control would be able to be attributed (or, at least, in part) to the cause of the complaint. Where all appropriate measures fail to

prevent an activity causing unacceptable levels of noise pollution, the activity will be stopped.

4.6 Emergencies

4.6.1 In the event of any unforeseen circumstances i.e. faulty equipment, the site manager will make an assessment of whether to cease activities/all operations with the main emphasis on site being to reduce any noise impacts.

5 Actions when complaints are received

5.1 Complaints procedure

- 5.1.1 If any noise complaints are received, site management will complete a 'complaints and events log' using complaints forms (in Appendix II), both of which will be kept for inspection on request by the LA, EA or third parties. Details of information to be completed are dates, nature of complaint, weather conditions at the time of the complaint, investigation details, action taken and a signature (as a minimum).
- 5.1.2 Noise complaints will be prioritised and investigated without delay or by end of working day only in extenuating circumstances. This will also apply to complaints received both directly and via other sources (e.g. EA or local authority). Where investigation substantiates the complaint, fully or partially, then remedial action will be taken immediately and if measures taken fail to stop the pollution, then the activity must be stopped and not restarted unless and until additional measures have been implemented to prevent the emission causing pollution. The EA will be contacted in the event the complaint cannot be escalated. Following a complaint and if it is deemed correct following investigation, the appropriate action will be taken to prevent the issue from reoccurring i.e. evaluation of current abatement measures, site operations, additional abatement measures and re-training of staff via toolbox talks.
- 5.1.3 The operator will make a note of any unavoidable events plant/equipment malfunctions in the site diary, rather than just actual complaints received. This will ensure that if complaints are received retrospectively from either the Council/EA or third parties, any circumstances which led to that complaint as a result of elements outside of the operator's control would be able to be attributed to the cause of the complaint.
- 5.1.4 It must be noted that the site lies adjacent to several activities with potential for noise generation, so in the event of a complaint, the operator will substantiate the complaint to identify whether the complaint is valid. If the complaint is valid, the site will implement the complaint procedures check and if required, amend site operations,

and provide additional attenuation around the site. This would typically involve using a level 2 sound meter and comparing this information from the background levels recorded from the recent Noise Impact Assessment.

5.1.5 If the source cannot be ascertained with 100% confidence, site management will either suspend or reduce the likely noise generating activities, i.e. mechanical treatment plant.

5.1.6 If the source is within the site's control, site management will take appropriate action to ensure the issue has been rectified. This may take the form of the following:

a) Investigating the source to prevent a re-occurrence.

b) Suspending operations which are giving rise to excessive noise due to potential plant malfunction

c) Investigate noise mitigation measures

d) Logging findings of a – c in the site diary / complaints form and also in the reporting template within the EP.

e) Report actions to the complainant and/or EA within 24 hours.

f) If following the above complaints are still received, the site will cease operations until the issues have been rectified.

5.1.7 The EA will be notified by email of any third-party noise complaints received within 24 hours including the complainant and the outcome of the investigation. Where complaints are substantiated as causing or likely to cause significant noise pollution, then the EA will be notified.

5.2 Complaints recording

5.2.1 Any complaints received in relation to noise and vibration will be recorded on the form shown in Appendix II. This form will normally be completed, signed and dated by site management, if they are not available, another suitably trained staff member.

5.2.2 The following details as a minimum will be completed on the form:

- a) The name, address and telephone number of the caller will be requested.
- b) Each complaint will be given a reference number.
- c) The caller will be asked to give details of:
 - the nature of the complaint;
 - the time;
 - how long it lasted;
 - how often it occurs;
 - is this the first time the problem has been noticed; and,
 - what prompted them to complain.
- d) The person completing the form will then, if possible, make a note of:
 - the weather conditions at the time of the problem (rain snow fog etc.)
 - strength and direction of the wind; and,
 - the activity on the installation at the time the noise, dust or odour was detected, particularly anything unusual.
- e) The reason for the complaint will be investigated and a note of the findings added to the report.
- f) The caller will then be contacted with an explanation of the source of the complaint if identified and the action taken to prevent a recurrence of the problem in future.
- g) If the caller is unhappy about the outcome or unwilling to identify themselves the caller will be referred to the appropriate department of the EA or Local Council.
- h) Following any complaint, the complaints procedure will be reviewed to see if any changes are required or if new procedures need to be put in place.

6 Training

6.1 Training regime

- 6.1.1 All employees and sub-contractors of Kaug Refinery Services Limited involved with potentially noisy operations will receive training in noise and vibration monitoring and complaint reporting.
- 6.1.2 Training will be given to all relevant persons to make sure they are competent in completing noise and vibration survey forms, noise and vibration complaint report forms and the site diary to ensure sufficient monitoring of noise and vibration can be carried out and any problems addressed correctly.
- 6.1.3 When selecting new plant and equipment, consideration shall be given to the need to meet all legislation and statutory guidance on noise levels and to minimise levels of noise from selected equipment.

6.2 Vehicle / plant preventative maintenance training

- 6.2.1 This training is provided specifically for the vehicle and plant operators in order to ensure that all plant and machinery is checked regularly to prevent any occurrences which may lead to any adverse impacts on the environment or human health.
- 6.2.2 Training will be based on the preventative maintenance schedule supplied by the plant/equipment manufacturer.
- 6.2.3 The same training will be provided to senior management enabling a dual-level maintenance programme.

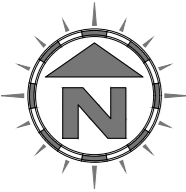
6.3 Liaison with Neighbours

- 6.3.1 In the extreme event of a significant, but temporary, increase in noise and vibration from the site, neighbours will be contacted to advise them of the occurrence and action being taken to remediate the issue on site.

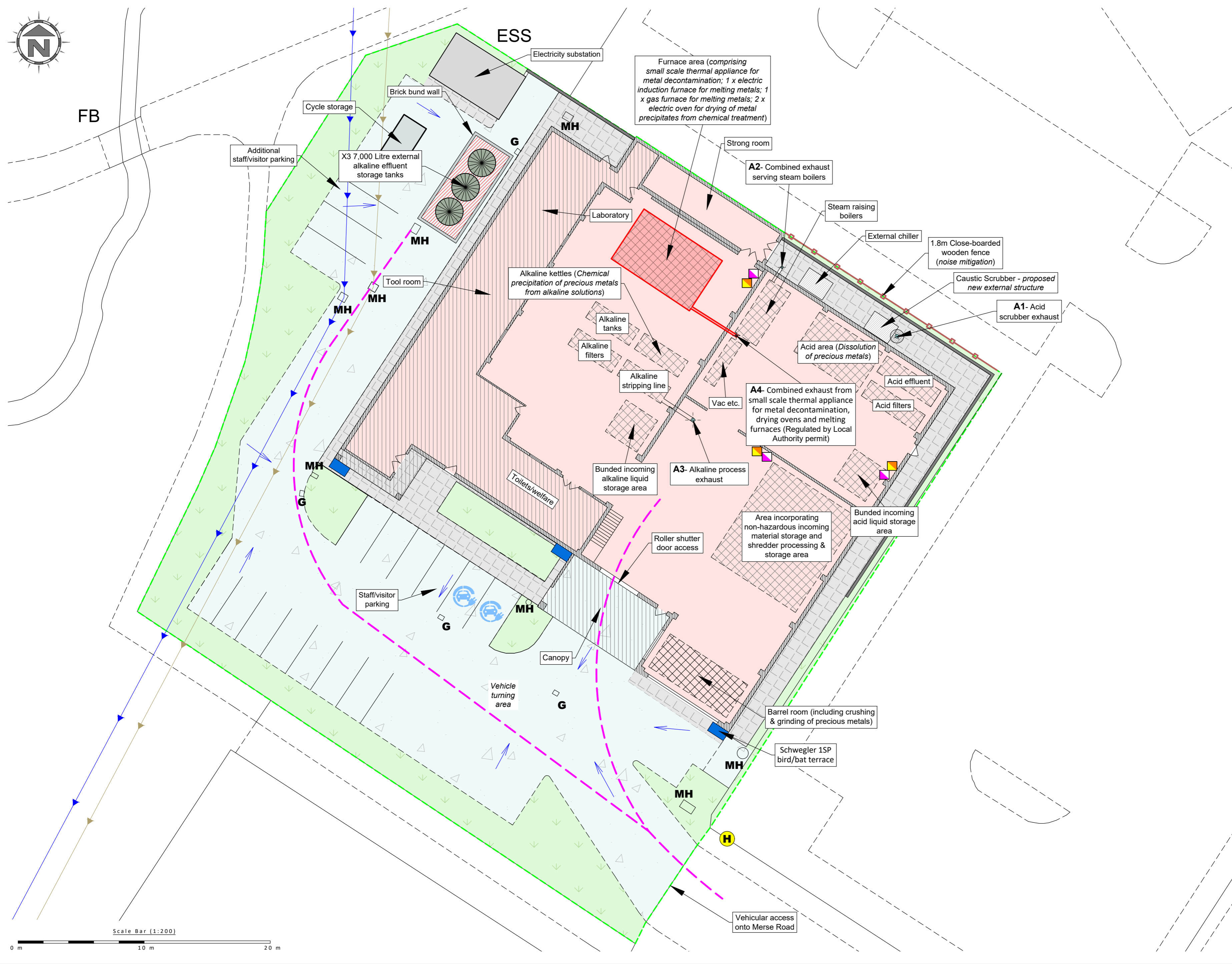
- 6.3.2 An open-door policy will be encouraged by the operator to enable any complaints from neighbouring premises (if received) to be dealt with immediately. The complainant will then be supplied with remedial actions taken and any procedures or measures put in place by the operator to reduce or ideally eradicate the likelihood of a subsequent complaint.

Appendix I

Drawings



FB

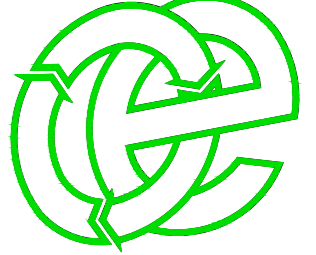


NOTES
Site survey undertaken using Intel Falcon 8+ drone in September 2022. Ordnance Survey data reproduced with the permission of the controller of H.M.S.O. Crown copyright licence No. 100022432. This drawing is copyright and property of Oaktree Environmental Ltd.

Rev:	Date:	Init:	Description:
-	05.12.22	JH	Initial drawing
A	15.12.22	IA/JH	Drawing amendments
B	05.01.23	IA	Address update
C	22.03.23	IA	Layout changes
D	17.04.23	IA	Drawing amendments
E	04.05.23	IA	EA comments
F	28.07.23	IA	Drawing amendments
G	22.01.24	IA	Application resubmission

- KEY:**
- Waste EP Permit boundary (regulated by Environment Agency)
 - Part B Permit boundary (regulated by Local Authority)
 - Sealed buildings
 - Concreted areas
 - Spill kit
 - Firefighting equipment
 - Access routes for emergency vehicles
 - H Hydrant
 - MH** Manhole
 - G** Gully
 - Fall direction arrows
 - Paved areas
 - Un-surfaced areas

Oaktree Environmental Ltd
Waste, Planning and Environmental Consultants



DRAWING TITLE
SITE LAYOUT PLAN

CLIENT
Kaug Refinery Services Ltd

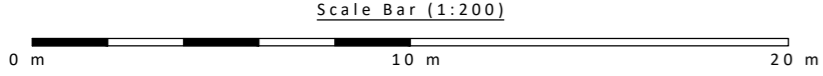
PROJECT/SITE
10 Merse Road, North Moons Moat, Redditch, B98 9HL

SCALE @ A2 1:200 **CLIENT NO** 2765 **JOB NO** 010
















DRAWING NUMBER 2765-010-03 **REV** G **STATUS** Issued

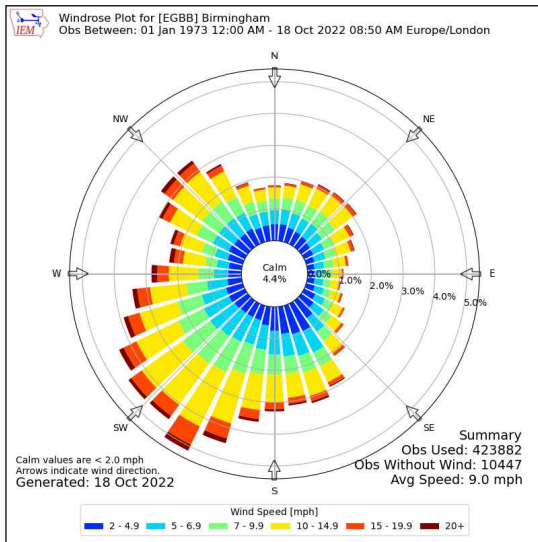
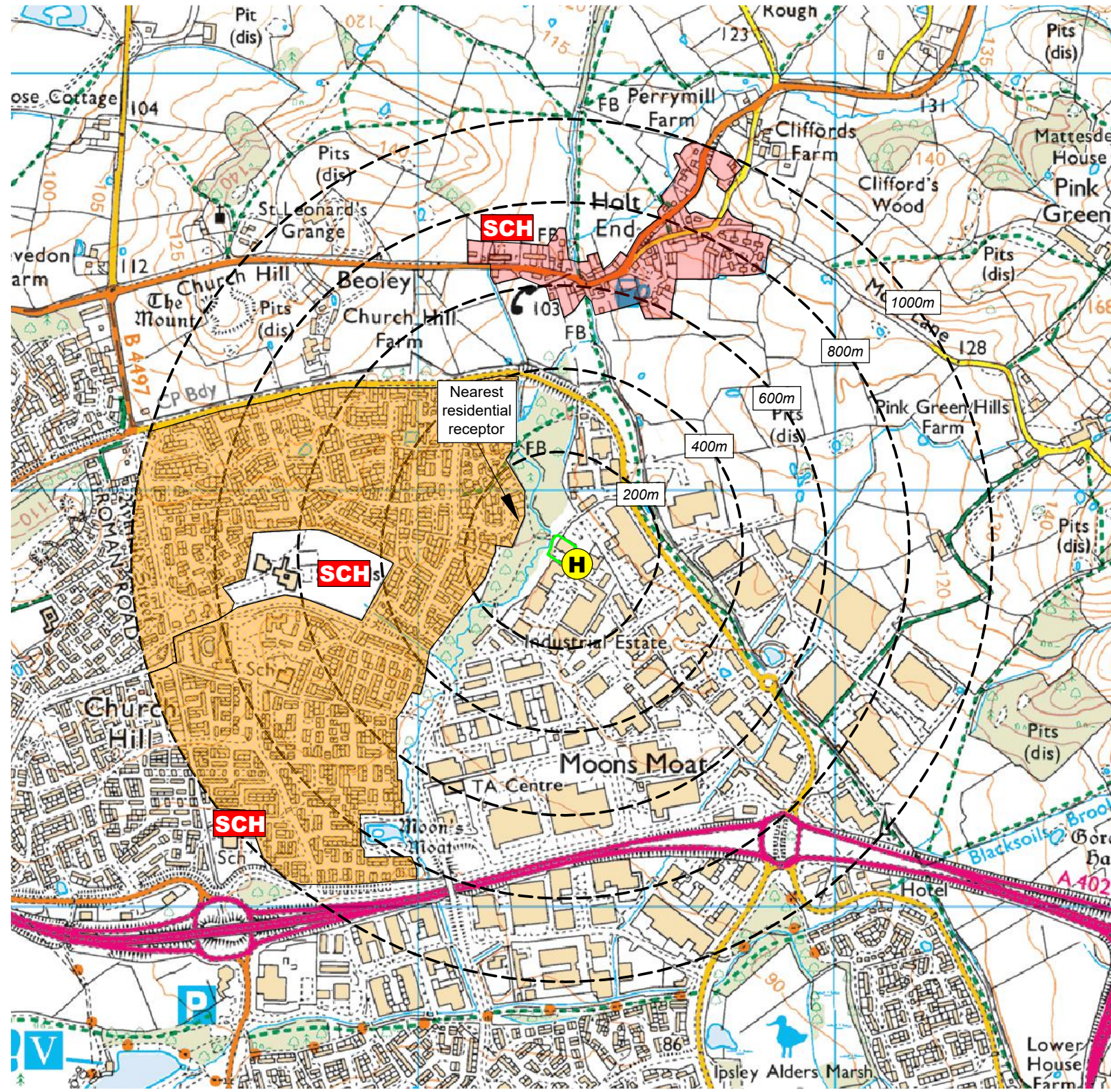
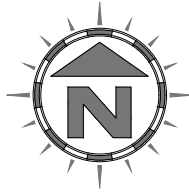
DRAWN BY JH/IA **CHECKED** RS/DY **DATE** 22.01.24

Lime House, Road Two, Winsford, Cheshire, CW7 3QZ
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KEY:

-  Permit boundary
-  Main River
-  Surface water body (river / stream / pond / pool / lake)
-  Workplaces (includes agriculture industry, commerce and retail)
-  Areas with mix of residential, retail and commercial properties
-  Residential blocks
-  Class A roads
-  Class B roads
-  Class C roads
-  Nearest fire hydrant
-  Railway line
-  School
-  Woodland areas
-  Protected sites (Ramsar, SSSI, SPA, SAC)
-  Nature reserves



Compass Wind Rose for Birmingham (EGBB) Period 1973-2022
- source: Iowa State University

NOTES

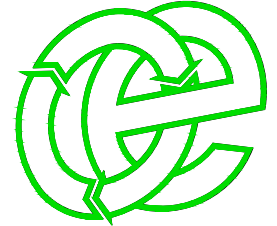
1. Boundaries are shown indicatively.
2. Wind rose data shows the prevailing wind direction to be Southerly.

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REVISION HISTORY

Rev:	Date:	Init:	Description:
-	13.12.22	IA	Initial drawing
A	05.01.23	IA	Address update

Oaktree Environmental Ltd
Waste, Planning and Environmental Consultants



DRAWING TITLE
RECEPTOR PLAN

CLIENT
Kaug Refinery Services Ltd

PROJECT/SITE
10 Merse Road, North Moons Moat, Redditch, B98 9HL

SCALE @ A3	CLIENT NO	JOB NO
1:12,500	2765	010

DRAWING NUMBER	REV	STATUS
2765-010-04	A	Issued

DRAWN BY	CHECKED	DATE
IA	IA	05.01.23

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Appendix II

Complaints Report Form

COMPLAINTS PROCEDURE

- 1) Any complaints received in relation to noise and vibration will be recorded on the form below. This form will normally be completed, signed and dated by the site operator, if they are not available, the Office Manager will complete the form.
- 2) The name, address and telephone number of the caller will be requested.
- 3) Each complaint will be given a reference number.
- 4) The caller will be asked to give details of:
 - the nature of the complaint;
 - the time;
 - how long it lasted;
 - how often it occurs;
 - is this the first time the problem has been noticed; and,
 - what prompted them to complain.
- 5) The person completing the form will then, if possible, make a note of:
 - the weather conditions at the time of the problem (rain snow fog etc.)
 - strength and direction of the wind; and,
 - the activity on the site at the time the noise was detected, particularly anything unusual.
- 6) The reason for the complaint will be investigated and a note of the findings added to the report.
- 7) The caller will then be contacted with an explanation of the source of the complaint if identified and the action taken to prevent a recurrence of the problem in future.
- 8) If the caller is unhappy about the outcome or unwilling to identify themselves the caller will be referred to the EA.
- 9) Following any complaint the complaints procedure will be reviewed to see if any changes are required or if new procedures need to be put in place.

Complaints Report Form	
Date Recorded	Reference Number
Name and address of caller	
Telephone number of caller	
Time and Date of call	
Nature of complaint (noise, vibration) (date, time, duration)	
Weather at the time of complaint (rain, snow, fog, etc.)	
Wind (strength, direction)	
Any other complaints relating to this report	
Any other relevant information	
Potential reasons for complaint	
The operations being carried out on site at the time of the complaint	
Follow Up	
Actions taken	
Date of call back to complainant	
Summary of call back conversation	
Recommendations	
Change in procedures	
Changes to Noise & Vibration Management Plan	
Date changes implemented	
Form completed by	
Signed	
Date completed	

Appendix III

Site Condition Report

SITE CONDITION REPORT (FROM H5 TEMPLATE)

10 Merse Road, North Moons Moat, Redditch, B98 9HL

Kaug Refinery Services Limited

Version:	1.2	Date:	17th May 2024		
Doc. Ref:	2765-010-E	Author:	IA	Checked:	KRS
Client No:	2765	Job No:	010		



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REGISTERED IN THE UK | COMPANY NO. 4850754

Document History:

Version	Issue date	Author	Checked	Description
1.0	02/08/2022	IA	--	Draft for client
1.1	05/01/2023	IA	--	Application Copy
1.2	17/05/2024	IA/DY	--	Updated in response to EA request for additional information

SITE CONDITION REPORT TEMPLATE

For full details, see H5 *SCR guide for applicants* v3.0 May 2013

COMPLETE SECTIONS 1-3 AND SUBMIT WITH APPLICATION

DURING THE LIFE OF THE PERMIT: MAINTAIN SECTIONS 4-7

AT SURRENDER: ADD NEW DOC REFERENCE IN 1.0; COMPLETE SECTIONS 8-10; & SUBMIT WITH YOUR SURRENDER APPLICATION.

1.0 SITE DETAILS	
Name of the applicant	Kaug Refinery Services Limited
Activity address	10 Merse Road, North Moons Moat, Redditch, B98 9HL
National grid reference	Please refer to Permit-
Document reference and dates for Site Condition Report at permit application and surrender	2765-010-E Dated 17th May 2024
Document references for site plans (including location and boundaries)	Permit Boundary Plan 2765-010-02 Site Layout Plan 2765-010-03

Note:

In Part A of the application form you must give us details of the site's location and provide us with a site plan. We need a detailed site plan (or plans) showing:

- Site location, the area covered by the site condition report, and the location and nature of the activities and/or waste facilities on the site.
- Locations of receptors, sources of emissions/releases, and monitoring points.
- Site drainage.
- Site surfacing.

If this information is not shown on the site plan required by Part A of the application form then you should submit the additional plan or plans with this site condition report.

2.0 Condition of the land at permit issue	
Environmental setting including: • geology	<p>No artificial ground is recorded as present at the site based on information from the British Geological Survey (BGS).</p> <p>The bedrock geology comprises the Mercia Mudstone Group - Mudstone. Sedimentary bedrock formed between 252.2 and 201.3 million years ago during the Triassic period</p> <p>There are no recorded superficial deposits.</p> <p>Based on the nearest available borehole log in the general vicinity of the site (SP06NE498), the ground comprises soft brown peat to 0.35mbgl; underlain by soft red brown silty clay with pebbles to 1.20mbgl;</p>

<ul style="list-style-type: none"> hydrogeology 	<p>underlain by firm red brown/grey silty clay to 2.95mbgl; this is underlain by firm to stiff red brown/grey silty marly clay to 6.0mbgl; underlain by completely weather grey laminated silty mudstone (Keuper Marl) to 7.0mbgl at which the borehole was completed.</p> <p>Another nearby borehole (SP06NE646) shows that the ground comprises topsoil to 0.25mbgl; underlain by firm grey/brown silty clay to 1.20mbgl; underlain by highly weathered red/brown Keuper Marl to 3.0mbgl at which the borehole was completed.</p> <p>The site is not within a groundwater source protection zone or drinking water safeguard zone with respect to groundwater or surface water.</p> <p>There are no recorded Environmental Permits to discharge to surface or ground water within <250m of the site.</p> <p>The nearest surface water is a small stream/drainage ditch which is approximately 50m from the site.</p>
<ul style="list-style-type: none"> surface waters 	<p>Due to the removal of publicly viewable information from the EA's "What's In My Backyard", the Environment Agency were contacted with regards to;</p> <ul style="list-style-type: none"> - Location groundwater/surface water abstractions, - Chemical and biological surface water quality designations or; - Water quality monitoring <p>The information provided by the EA and Gov.UK Flood Mapping indicated that the site does not lie within a flood zone.</p>

<p>Pollution history including:</p> <ul style="list-style-type: none"> • historical land-uses and associated contaminants • pollution incidents that may have affected land • any visual/olfactory evidence of existing contamination • evidence of damage to pollution prevention measures 	<p>The review of publicly available mapping is summarised below:</p> <ul style="list-style-type: none"> • The earliest available mapping indicates that the site itself was undeveloped and immediately surrounded by rural land. • The site and surrounding area continued to be developed throughout the years; the site started to be developed into an industrial/commercial estate i.e. Moons Moat North Industrial Estate. • In the present day the site and surrounding land continues to be used for industrial & commercial purposes. <p>There is no available data with regards to recorded pollution incidents within 250m of the site.</p> <p>A site walkover survey was undertaken, and the ground appeared to be intact with no damage to the surface.</p> <p>The access arrangements for the site and overall site layout detailing site infrastructure have been detailed on Drawing No 2765-010-03.</p> <p>During the site visit there was no evidence of disturbed land, discoloured water/soil or subsidence.</p> <p>An olfactory assessment was carried out during the survey. At the time of the assessment there was no visual or olfactory evidence of contamination recorded.</p> <p>During the time of the survey there was no evidence of ponding at the site. There were no presence of any surface water features.</p> <p>The land uses surrounding the site comprised industrial and commercial land uses.</p> <p>During the site walkover survey the site surface was observed to be intact and no damage was observed. On this basis there is no evidence of damage to pollution prevention measures.</p>
<p>Evidence of historic contamination, for example, historical site investigation, assessment, remediation and verification reports (where available)</p>	<p>None available</p>
<p>Baseline soil and groundwater reference data</p>	<p>None</p>
<p>Supporting information</p>	<p>N/A</p>

3.0 Permitted activities	
Permitted activities	Proposed Bespoke Environmental Permit
Non-permitted activities undertaken	N/A
Substances to be used/stored on-site and Pollution Prevention Measures	<p>Various substances and raw materials will be utilised and stored on-site as part of the process. These are listed below, together with details of proposed storage arrangements, designed to prevent risk of pollution to ground.</p> <p>Lubricant oil – very small quantity stored in banded general storage area.</p> <p>Activated carbon – stored in flammable materials storage cupboard, within building</p> <p>Sodium bicarbonate – stored in banded general storage area</p> <p>Sulphuric acid / hydrochloric acid / nitric acid – relatively small volumes purchased in 25 litre drums stored in banded area in acid processing area of site</p> <p>Sodium chloride - stored in banded general storage area</p> <p>Sodium hydroxide - stored in banded area in alkaline processing area of site</p> <p>Ferrous sulphate - stored in banded general storage area</p> <p>Urea - stored in banded general storage area</p> <p>Sodium cyanide – stored in toxic chemical storage cupboard, within building</p> <p>Sodium dithionite - stored in flammable materials storage cupboard, within building</p> <p>Sodium hypochlorite / sodium m-nitrobenzene sulfonate / sodium carbonate - stored in banded area in alkaline processing area of site</p> <p>Borax - stored in banded general storage area</p> <p>Acid effluent – stored in banded area within building</p> <p>Alkaline effluent - stored in external tank, appropriately banded.</p>

<p>Document references for:</p> <ul style="list-style-type: none">• plan showing activity layout; and• environmental risk assessment.	<p>Plans located in Appendix I of EMS (Doc. Ref. 2765-010-A)</p> <p>Environmental Risk Assessment (2765-010-D)</p>
--	--

Note:

In Part B of the application form you must tell us about the activities that you will undertake at the site. You must also give us an environmental risk assessment. This risk assessment must be based on our guidance (*Environmental Risk Assessment - EPR H1*) or use an equivalent approach.

It is essential that you identify in your environmental risk assessment all the substances used and produced that could pollute the soil or groundwater if there were an accident, or if measures to protect land fail.

These include substances that would be classified as 'dangerous' under the Control of Major Accident Hazards (COMAH) regulations and also raw materials, fuels, intermediates, products, wastes and effluents.

If your submitted environmental risk assessment does not adequately address the risks to soil and groundwater we may need to request further information from you or even refuse your permit application.

4.0 Changes to the activity	
Have there been any changes to the activity boundary?	If yes, provide a plan showing the changes to the activity boundary.
Have there been any changes to the permitted activities?	If yes, provide a description of the changes to the permitted activities
Have any 'dangerous substances' not identified in the Application Site Condition Report been used or produced as a result of the permitted activities?	If yes, list of them
Checklist of supporting information	<ul style="list-style-type: none"> Plan showing any changes to the boundary (where relevant) Description of the changes to the permitted activities (where relevant) List of 'dangerous substances' used/produced by the permitted activities that were not identified in the Application Site Condition Report (where relevant)

5.0 Measures taken to protect land	
Use records that you collected during the life of the permit to summarise whether pollution prevention measures worked. If you can't, you need to collect land and/or groundwater data to assess whether the land has deteriorated.	
Checklist of supporting information	<ul style="list-style-type: none"> Inspection records and summary of findings of inspections for all pollution prevention measures Records of maintenance, repair and replacement of pollution prevention measures

6.0 Pollution incidents that may have had an impact on land, and their remediation	
Summarise any pollution incidents that may have damaged the land. Describe how you investigated and remedied each one. If you can't, you need to collect land and /or groundwater reference data to assess whether the land has deteriorated while you've been there.	
Checklist of supporting information	<ul style="list-style-type: none"> Records of pollution incidents that may have impacted on land Records of their investigation and remediation

7.0 Soil gas and water quality monitoring (where undertaken)	
Provide details of any soil gas and/or water monitoring you did. Include a summary of the findings. Say whether it shows that the land deteriorated as a result of the permitted activities. If it did, outline how you investigated and remedied this.	
Checklist of supporting information	<ul style="list-style-type: none"> Description of soil gas and/or water monitoring undertaken Monitoring results (including graphs)

8.0 Decommissioning and removal of pollution risk	
<p>Describe how the site was decommissioned. Demonstrate that all sources of pollution risk have been removed. Describe whether the decommissioning had any impact on the land. Outline how you investigated and remedied this.</p>	
Checklist of supporting information	<ul style="list-style-type: none"> • Site closure plan • List of potential sources of pollution risk • Investigation and remediation reports (where relevant)

9.0 Reference data and remediation (where relevant)	
<p>Say whether you had to collect land and/or groundwater data. Or say that you didn't need to because the information from sections 3, 4, 5 and 6 of the Surrender Site Condition Report shows that the land has not deteriorated.</p> <p>If you did collect land and/or groundwater reference data, summarise what this entailed, and what your data found. Say whether the data shows that the condition of the land has deteriorated, or whether the land at the site is in a "satisfactory state". If it isn't, summarise what you did to remedy this. Confirm that the land is now in a "satisfactory state" at surrender.</p>	
Checklist of supporting information	<ul style="list-style-type: none"> • Land and/or groundwater data collected at application (if collected) • Land and/or groundwater data collected at surrender (where needed) • Assessment of satisfactory state • Remediation and verification reports (where undertaken)

10.0 Statement of site condition	
<p>Using the information from sections 3 to 7, give a statement about the condition of the land at the site. This should confirm that:</p> <ul style="list-style-type: none"> • the permitted activities have stopped • decommissioning is complete, and the pollution risk has been removed • the land is in a satisfactory condition. 	

Appendix IV

Environmental Risk Assessment

ENVIRONMENTAL RISK ASSESSMENT

10 Merse Road, North Moons Moat, Redditch, B98 9HL

Kaug Refinery Services Limited

Version:	1.4	Date:	22/01/2024		
Doc. Ref:	2765-010-D	Author(s):	IA	Checked:	DY
Client No:	2765	Job No:	010		



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REGISTERED IN THE UK | COMPANY NO. 4850754

Document History:

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1.0	15/12/2022	IA	DY	Draft for client review
1.1	05/01/2023	IA	DY	Updated draft
1.2	18/01/2023	IA	DY	Application copy
1.3	07/06/2023	IA	DY	Application resubmission
1.4	22/01/2024	IA	DY	Minor amendments

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Appendix I - Receptor Plan

1 Introduction

- 1.1 This Environmental Risk Assessment (ERA) considers the potential and actual risks associated with the use of the site at 10 Merse Road, North Moons Moat, Redditch, B98 9HL.
- 1.2 The site will be operated by Kaug Refinery Services Limited in accordance with a fully comprehensive Environmental Management System (EMS) and Environmental Permit (EP). The site will be operated as a facility to allow for the recovery of precious metals from waste.
- 1.3 All site staff should be provided with a copy of this ERA and be aware of where it is located on site.
- 1.4 All environmental risks identified in this document should be acted upon accordingly by site management to ensure all environmental risks can be appropriately managed/controlled.
- 1.5 This document primarily considers environmental risks associated with the site. This does not aim to provide detailed Health and Safety risk assessments as required separately through the necessary legislation.

2 Site Receptors

- 2.1 A Receptor Plan (Drawing No. 2765-010-04) has been provided to highlight all key receptors within 1 km of the site as is shown in Appendix I.

3 Environmental Risk Assessment Model

3.1 Fundamental considerations

3.1.1 **Source/Hazard:** A property or situation that in particular circumstances could lead to harm.

3.1.2 **Consequences:** The adverse effects or harm as the result of realising a hazard which causes the quality of human health or the environment to be impaired in the short or long term.

3.1.3 **Risk:** A combination of the probability of occurrence of a defined hazard and the magnitude of the consequences of the occurrence.

3.2 Pathway

3.2.1 Important in the assessment of a particular risk(s) and to inform the subsequent management of the risk(s) is the identification of the pathway(s) through which the risk may affect the identified receptor(s). The following are examples of pathways:

- Air
- Ground
- Water
- Direct contact / exposure

3.3 **Consequences**

3.3.1 The following table highlights the consequences of the hazard(s) identified and the abbreviations for each as used in the Risk Assessment Table in Section 3:

Abbreviation	Consequences
A	Minor Injury
B	Major Injury
C	Death
D	Air Pollution
E	Water Pollution
F	Pollution of Land

3.4 **Effects of consequences**

3.4.1 In order to quantify the level of risk and identify the appropriate management procedures, the potential effects must be considered, as outlined in the table below:

Abbreviation	Consequences	Management Requirements
S	SEVERE	In all cases
Mo	MODERATE	In most cases
Mi	MILD	Occasionally
N	NEGLIGIBLE	No

3.4.2 Note: “Management” is the action required to reduce the risk of a hazard causing a problem on site. Contingency measures are procedures which are in place to reduce the consequences of a hazard.

3.5 Risk estimation and evaluation (probability/frequency of occurring hazard)

3.5.1 The following table allows the likelihood of an occurrence of an identified risk to be assessed:

Abbreviation	Probability	Evaluation
1	Very likely	Could occur during any working day
2	Likely	Could occur regularly
3	Possible	Event possible
4	Unlikely	Event very unlikely

3.6 Risk assessment outcome (combination of probability & consequence)

3.6.1 The following table shows the resultant risk of an identified hazard or potential situation. This uses the hierarchy of both probability and consequence to assess the level of risk. The level of risk determines what level of management would be required in order to reduce the risk of occurrence and/or scale.

		Consequence			
		S	Mo	Mi	N
Probability	1	High	High	Medium	Low
	2	High	Medium	Low	Near-Zero
	3	Medium	Low	Near-Zero	N/A
	4	Low	Near-Zero	N/A	N/A

3.6.2 Where the risk assessment outcome is high, first-level management of the risk is essential, i.e. removal of hazard, implementation of major infrastructure/structural design measures to contain the risk/hazard and company policy changes to incorporate the management of the risk. All risk management measures must be supplemented with detailed induction training, spot training and tool-box talks to ensure all site staff

and users are made fully aware of the risk/hazard, all potential consequences and necessary management and contingency procedures.

- 3.6.3 Where the risk assessment outcome is medium, the management of the risk should be tackled by management or delegates. If removal of the hazard is not possible, management will normally be met through implementing minor structural design measures or by imposing procedures for the prevention of occurrences which will be conveyed to all site staff through the appropriate training, including any contingency measures/procedures.
- 3.6.4 Where the risk assessment outcome is low, the management of the risk can be done wholly through appropriate training to site staff including any contingency measures/procedures.
- 3.6.5 Where the risk assessment outcome is near-zero, site staff should be made aware of the possibility of an occurrence and contingency measures should be readily available to all staff should they be required.

4 Risk assessment table

- 4.1 The following pages contain the site-specific risk assessment for the site with appropriate remedial actions, recommendations and comments included for each identified hazard, potential contaminant, or situation.
- 4.2 As discussed in Section 3.6 above, all situations which identify a risk from Low –High should be incorporated into the staff/visitor training schedule, where appropriate and acted on as required.

SEE TABLES BELOW

Hazard / Potential Contaminant or Situation	Source(s)	Pathway	Receptor(s)	Consequences	Effect	Probability	Assessment Outcome	Remedial Action/ Recommendations/ Comments
DUST / PARTICULATES	SITE SURFACES (DRY AND WINDY WEATHER) RECEPTION OF WASTE OPERATING PLANT	AIR	SITE PERSONNEL / VISITORS SURROUNDING SITE USERS / OCCUPIERS SURFACE WATERS FLORA & FAUNA (ECOLOGY) NEAREST RESIDENTIAL RECEPTOR	D,E,F	Mi	4	Near-Zero	DUST IS NOT EXPECTED TO BE AN ISSUE GIVEN THE NATURE OF THE WASTES TO BE ACCEPTED AND SCALE OF FACILITY. HOWEVER, THE MEASURES BELOW WILL BE CONSIDERED IN THE UNLIKELY EVENT THAT DUST ISSUES ARISE DAMP SITE SURFACES & WASTES DOWN USING HOSEPIPES THE MAIN RECEPTION AREA FOR WASTES IS SITUATED WITHIN A BUILDING SITE SURFACE WILL BE IMPERMEABLE CONCRETE THEREFORE REDUCING THE RISK OF DUST ARISING FROM UNSURFACED AREAS DROP HEIGHTS WILL BE KEPT TO A MINIMUM CLEANING OF ANY SPILLAGES USING WET CLEANING METHOD COMPLAINTS PROCEDURE WILL BE IN PLACE
ODOUR	STORED WASTE CRACKS IN CONCRETE LEADING TO TRAPPED WASTE WARM WEATHER	AIR	SITE PERSONNEL / VISITORS SURROUNDING SITE USERS / OCCUPIERS NEAREST RESIDENTIAL RECEPTOR	D	Mi	4	Near-Zero	ODOUR IS NOT EXPECETED TO BE AN ISSUE GIVEN THE TYPES OF WASTES TO BE PROCESSED, WHICH WILL NOT HAVE HIGH ODOUR POTENTIAL, AND SCALE OF FACILITY STRICT WASTE ACCEPTANCE PROCEDURES TO BE IN PLACE ALL WASTES TO BE STORED AND PROCESSED WITHIN AN ENCLOSED BUILDING DRAINAGE CHANNELS AND SITE INFRASTRUCTUERE WILL BE CHECKED DAILY WITH ANY ISSUES RECTIFIED AS SOON AS PRACTICABLE IF MALODOROUS WASTE IS DEPOSITED ON SITE IT WILL BE CONSIGNED TO A SEALED REJETCED WASTE SKIP COMPLAINTS PROCEDURE WILL BE IN PLACE.
LITTER	POOR HOUSEKEEPING	AIR	SITE PERSONNEL / VISITORS SURROUNDING SITE USERS / OCCUPIERS SURFACE WATERS FLORA & FAUNA (ECOLOGY) NEAREST RESIDENTIAL RECEPTOR	A to C E,F	Mi	4	Near-Zero	GIVEN THE NATURE OF WASTES TO BE ACCEPTED, LITTER NOT EXPECTED TO BE AN ISSUE ALL DRIVERS WILL ENSURE THEIR LOADS ARE SECURELY CONTAINED PRIOR TO CARRIAGE OF WASTE LOADS DAILY INSPECTIONS OF THE SITE AND AREAS IN THE IMMEDIATE VICINITY OF THE SITE BOUNDARY FOR LITTER ALL UNLOADING OF WASTE ON RECEPTION WILL TAKE PLACE INSIDE THE BUILDING

Hazard / Potential Contaminant or Situation	Source(s)	Pathway	Receptor(s)	Consequences	Effect	Probability	Assessment Outcome	Remedial Action/ Recommendations/ Comments
NOISE/VIBRATION	PLANT AND MACHINERY OPERATING PLANT UNLOADING / LOADING WASTE INTO VEHICLES	AIR	SITE PERSONNEL / VISITORS SURROUNDING SITE USERS / OCCUPIERS FLORA & FAUNA (ECOLOGY) NEAREST RESIDENTIAL RECEPTOR	A, D	Mi to Mo	3	Low – Near Zero	<p>REFERENCE SHOULD BE MADE TO THE OPERATOR'S NOISE MANAGEMENT PLAN</p> <p>SIGNIFICANT NOISE ISSUES NOT ANTICIPATED DUE TO LOCATION OF THE SITE WITHIN AN ESTABLISHED INDUSTRIAL AREA AND ENCLOSURE OF OPERATIONS WITHIN A BUILDING</p> <p>NOISY ACTIVITIES CONTROLLED BY REASONABLE HOURS OF OPERATION</p> <p>DROP HEIGHTS WILL BE KEPT TO A MINIMISE NOISE / VIBRATION</p> <p>MANAGEMENT WILL ENSURE THAT ALL PLANT OPERATED IS FUNCTIONING SUITABLY I.E. MOVING PARTS TO BE REGULARLY LUBRICATED.</p> <p>OPERATIVES WILL BE INFORMED TO TURN OFF ENGINES WHEN PLANT IS NOT IN USE. NO REVING OF ENGINES WILL BE PERMITTED AT THE SITE.</p> <p>ANY MALFUNCTIONS IN PLANT I.E. MISSING SCREWS/BOLTS WHICH RESULT IN EXCESSIVE NOISE WILL BE DECOMMISSIONED UNTIL AN ALTERNATIVE LOADING PLANT SOURCED.</p> <p>COMPLAINTS PROCEDURE TO BE IN PLACE</p> <p>IF REPAIRS TO THE SITE ARE REQUIRED, THE WORK IS TO BE UNDERTAKEN WITH DUE REGARD FOR THE POSSIBLE NOISE NUISANCE AND DURING THE NORMAL WORKING DAY.</p> <p>IN THE EVENT OF MAJOR REPAIR WORK BEING UNDERTAKEN WHICH IS LIKELY TO CAUSE SIGNIFICANT NOISE AND DISRUPTION, NEIGHBOURING RESIDENTS AND THE LOCAL PLANNING AUTHORITY WILL BE NOTIFIED IN ADVANCE.</p>
FIRE/ SMOKE / PARTICULATES	STORAGE AND COMBUSTION OF WASTES ARSON OR VANDALISM FAULTY PLANT OR EQUIPMENT ELECTRICAL APPLIANCES AND CABLING DISCARDED SMOKING MATERIALS OPEN BURNING ON SITE OR ON ADJACENT SITES OVERHEATING OF STORED WASTE	AIR, DIRECT CONTACT	SITE PERSONNEL / VISITORS SURROUNDING SITE USERS / OCCUPIERS SURFACE WATERS FLORA & FAUNA (ECOLOGY) NEAREST RESIDENTIAL RECEPTOR	A to F	Mo to S	3	Medium to Near-Zero	<p>REFERENCE SHOULD BE MADE TO THE OPERATOR'S FIRE PREVENTION PLAN (2765-010-B)</p> <p>NO FIRES ON SITE</p> <p>NO SMOKING PERMITTED ON SITE</p> <p>GOOD SITE SECURITY</p> <p>LOW STORAGE VOLUMES AND RETENTION TIMES REDUCES RISK OF FIRE</p> <p>PREVENTATIVE MAINTENANCE PROCEDURES</p>

Hazard / Potential Contaminant or Situation	Source(s)	Pathway	Receptor(s)	Consequences	Effect	Probability	Assessment Outcome	Remedial Action/ Recommendations/ Comments
	<p>SPARKS FROM LOADING BUCKETS/SHOVELS</p> <p>HOT WORKS</p> <p>LOOSE MATERIAL BUILD UP AROUND PLANT/MACHINERY AND EXHAUSTS</p> <p>HOT LOADS</p> <p>OTHER COMBUSTIBLE NON-WASTE MATERIALS ON OR NEAR THE SITE NOT MENTIONED ABOVE</p> <p>BATTERIES WITHIN WASTE DEPOSITS</p> <p>VISITORS OR CONTRACTORS</p> <p>REACTION BETWEEN WASTES</p> <p>“TRAMP” METAL</p> <p>LEAKS AND SPILLAGES</p>							
VEHICLE COLLISION/ ACCIDENT	<p>MUD ON ROADS FROM WASTE STORAGE & VEHICLE BODIES</p> <p>POOR VISIBILITY</p>	DIRECT CONTACT	<p>VEHICLE USERS</p> <p>PEDESTRIANS</p>	A to F	Mi to S	3	Medium to Near-Zero	<p>GOOD HOUSEKEEPING/ VEHICLE MANAGEMENT</p> <p>AN ACCIDENT LOGBOOK SHOULD BE KEPT FOR ALL INCIDENTS</p> <p>ENCOURAGEMENT FOR STAFF FOR GREATER NUMBER OF “ACCIDENT-FREE DAYS” TO ENCOURAGE A SAFER WORKING ENVIRONMENT</p> <p>HSE COMPLIANT RISK ASSESSMENTS FOR ALL SITE ACTIVITIES TO IDENTIFY SITUATIONS WHICH MAY LEAD TO HARM FOR SITE USERS (EMPLOYEES, VISITORS AND MANAGEMENT)</p>
LEACHATE	STORED WASTES	GROUND	<p>SURFACE WATERS (MAIN RIVERS)</p> <p>FLORA & FAUNA (ECOLOGY)</p>	E, F	Mi to S	3	Medium to Near-Zero	<p>ALL WASTE IS TO BE STORED AND PROCESSED ON AN IMPERMEABLE CONCRETE SURFACE WITH A SEALED DRAINAGE SYSTEM, INSIDE A ENCLOSED BUILDING</p> <p>ALL WASTES WHICH ARE LIABLE TO GIVE RISE TO CONTAMINATION WILL BE REMOVED FROM SITE IF THE SITE IS NOT SECURE OR OPERATIONS AT THE SITE ARE SUSPENDED.</p> <p>REGULAR (MINIMUM DAILY) CHECKS OF SITE SURFACE INFRASTRUCTURE</p> <p>ANY SPILLAGES IDENTIFIED WILL BE DEALT WITH IN ACCORDANCE WITH SPILLAGE PROCEDURES AND SILL KITS WILL BE AVAILABLE AT THE SITE</p>

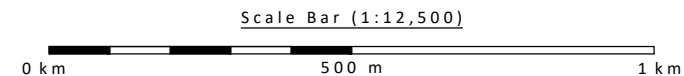
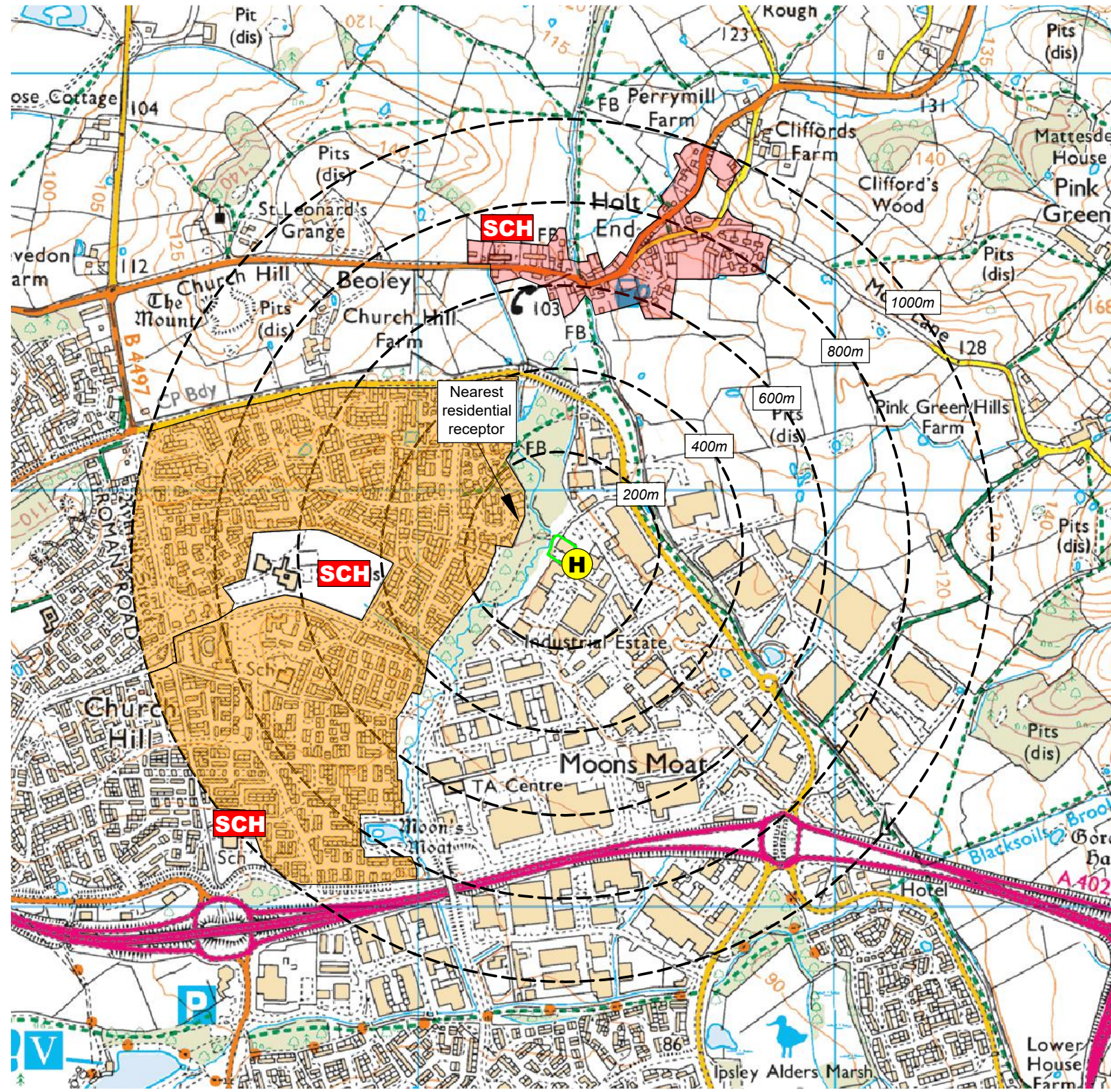
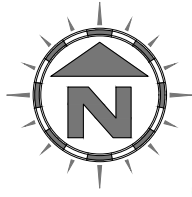
Hazard / Potential Contaminant or Situation	Source(s)	Pathway	Receptor(s)	Consequences	Effect	Probability	Assessment Outcome	Remedial Action/ Recommendations/ Comments
IMPACT/INJURY	COLLAPSE OF STORED MATERIALS/ FALLING MATERIALS	DIRECT CONTACT	SITE PERSONNEL/ VISITORS	A to C	Mi to S	3	Medium to Near-Zero	DROP HEIGHTS WILL ALWAYS BE KEPT TO A MINIMUM. APPROPRIATE PPE ISSUED TO ALL SITE STAFF AND AVAILABLE IN THE MAIN SITE OFFICE. STAFF TRAINING AND HANDLING PROCEDURES IN PLACE. APPROPRIATE SIGNAGE THROUGHOUT THE SITE. DEDICATED PARKING AREAS FOR HGV'S AND SMALLER VEHICLES.
HYDROCARBONS	LEAKAGE FROM STORED DRUMS PLANT FAILURE	GROUND - DIRECT CONTACT, INGESTION INHALATION (OF VOLATILES)	SITE PERSONNEL / VISITORS SURROUNDING SITE USERS / OCCUPIERS SURFACE WATERS FLORA & FAUNA (ECOLOGY) NEAREST RESIDENTIAL RECEPTOR	A, B, D, E, F	Mi to S	3	Medium to Near-Zero	SPILL KITS KEPT CLOSE TO SOURCE(S) OF HAZARDS PREVENTATIVE MAINTENANCE SCHEDULE FOR PLANT/MACHINERY ANY SPILLAGES IDENTIFIED WILL BE DEALT WITH IN ACCORDANCE WITH SPILLAGE PROCEDURES AND SILL KITS WILL BE AVAILABLE AT THE SITE CONCRETE SURFACED YARD AND SEALED DRAINAGE SYSTEM WILL REDUCE THE IMPACTS OF ANY SPILLS
RELEASE OF GASES/FUMES/ VAPOURS/VOLATILES	MIXING OF WASTE/ CHEMICALS SPILLAGE OF CHEMICALS OVERTURNED VEHICLE PLANT/PLANT FAILURE REACTION BETWEEN STORED WASTES POINT SOURCE EMISSIONS	AIR GROUND WATER CONFINED SPACES	SITE PERSONNEL / VISITORS SURROUNDING SITE USERS / OCCUPIERS SURFACE WATERS FLORA & FAUNA (ECOLOGY) NEAREST RESIDENTIAL RECEPTOR	A to F	Mi to S	3	Medium to Near-Zero	ENSURE ANY STORAGE AND HANDLING OF HAZARDOUS SUBSTANCES IN PROPERLY DESIGNATED AREAS ACID AND ALKALINE CHEMICAL STORAGE AREAS SEPARATED PREVENTATIVE MAINTENANCE SCHEDULE FOR PLANT/MACHINERY QUARANTINE OF REJECTED WASTES THERMAL TREATMENT, ACID AND ALKALINE TREATMENT PROCESSES WILL BE VENTED VIA ELEVATED FLUES FOR DILUTION AND DISPERSION OF RESIDUAL EMISSIONS EMISSION LIMITS IN PLACE

Appendix I

Receptor Plan

KEY:

- Permit boundary
- Main River
- Surface water body (river / stream / pond / pool / lake)
- Workplaces (includes agriculture industry, commerce and retail)
- Areas with mix of residential, retail and commercial properties
- Residential blocks
- Class A roads
- Class B roads
- Class C roads
- H Nearest fire hydrant
- Railway line
- SCH School
- Woodland areas
- Protected sites (Ramsar, SSSI, SPA, SAC)
- Nature reserves



NOTES

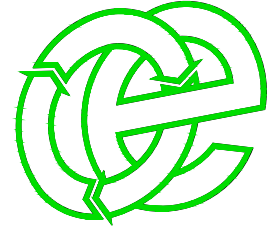
1. Boundaries are shown indicatively.
2. Wind rose data shows the prevailing wind direction to be Southerly.

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REVISION HISTORY

Rev:	Date:	Init:	Description:
-	13.12.22	IA	Initial drawing
A	05.01.23	IA	Address update

Oaktree Environmental Ltd
Waste, Planning and Environmental Consultants



DRAWING TITLE
RECEPTOR PLAN

CLIENT
Kaug Refinery Services Ltd

PROJECT/SITE
10 Merse Road, North Moons Moat, Redditch, B98 9HL

SCALE @ A3 1:12,500	CLIENT NO 2765	JOB NO 010
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DRAWING NUMBER 2765-010-04	REV A	STATUS Issued
--------------------------------------	-----------------	-------------------------

DRAWN BY IA	CHECKED IA	DATE 05.01.23
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Lime House, Road Two, Winsford, Cheshire, CW7 3QZ
t: 01606 558833 | e: sales@oaktree-environmental.co.uk

Appendix V

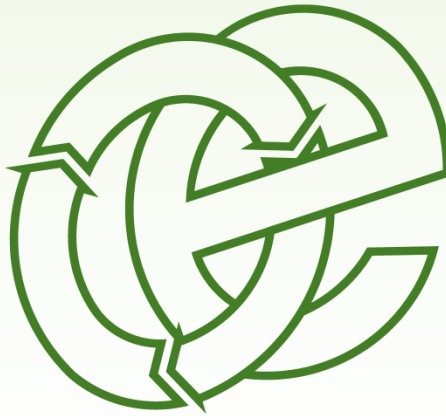
Environmental Management System (Summary)

ENVIRONMENTAL MANAGEMENT SYSTEM

10 Merse Road, Moons Moat North Industrial Estate, Redditch B98 9HL

Kaug Refinery Services Limited

Version:	1.6	Date:	22/01/2024		
Doc. Ref:	2765-010-A	Author(s):	IA	Checked:	KRS
Client No:	2765	Job No:	010		



Oaktree Environmental Ltd

Waste, Planning & Environmental Consultants



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1.0	03/08/2022	IA	DY	Internal draft
1.1	04/01/2023	IA	DY	Updated draft
1.2	18/01/2023	IA	DY	Summary submitted with waste EP application
1.3	17/04/2023	IA	DY	Updated for Part B Permit Application
1.4	04/05/2023	IA	DY	Amended following client comment
1.5	17/05/2023	IA	DY	Further amendment following client comment
1.6	22/01/2024	IA	DY	Minor amendments

THIS DOCUMENT IS DUE FOR REVIEW IN **JANUARY 2026** OR AS A RESULT OF ANY INCIDENTS WHICH MAY LEAD TO THE REQUIREMENT FOR IMMEDIATE REVIEW, WHICHEVER IS THE SOONER

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Drawing No. 2765-010-03 – Site Layout and Fire Plan

Appendix II - Record Keeping Forms (advisory only)

KRS/RF/2 - Rejected Waste

KRS/RF/4 - Site Diary/Inspection Form

KRS/RF/6 - Employee Training Needs Assessment / Review

KRS/RF/7 - Complaints Form

****The above forms are advisory only, alternative forms of the operator may be used electronically**

Appendix III - Environmental Permits

Appendix IV - Health & Safety – Conditions of Site Use for Staff and Visitors

Appendix V - Permitted Waste Codes

Site Information & Key Contacts List

Site Address:	10 Merse Road, Moons Moat North Industrial Estate, Redditch B98 9HL		
Site Operator:	Kaug Refinery Services Limited	National Grid Ref:	407336, 268807

CONTACT	DESCRIPTION	OFFICE HOURS	OUT OF HOURS
Adrian Coldicutt	TCM	(0121) 7724029	N/A
<u>Alexandra Hospital</u> Woodrow Dr, Redditch B98 7UB	Local NHS Hospital (Main)	01527 503030	999
<u>Redditch Police Station</u> 105 Archer Rd, Redditch B98 8DJ	Local Police Non-Emergency	03003333000 or 101	999 or 112
<u>Hereford and Worcester Fire & Rescue Service</u> Redditch Fire station, 226 Birmingham Rd, Redditch B97 6EL	Fire and Rescue Service (in Emergency Dial 999)	01527 62223	999
<u>Environment Agency</u>	Environmental Regulator	03708 506506	0800 807060
<u>Redditch Borough Council</u> The Town Hall, Walter Stranz Square, Worcestershire, B98 8AH	County Council General Enquiries	01527 881770	999 or 112
<u>Severn Trent Water</u>	Mains water supplier	0800 783 4444	0800 783 4444
<u>Oaktree Environmental Ltd</u> Lime House, 2 Road Two, Winsford, Cheshire CW7 3QZ	Specialist Advisor (Waste and Planning Issues)	01606 558833	999 or 112 or 0800 807060

1 General Considerations

1.1 Site operator/permit holder

1.1.1 Kaug Refinery Services Limited are the operator of the permitted site. The site will be operated predominantly under two bespoke Environmental Permits (EPs), regulated by the Environment Agency (EA) and Worcestershire Regulatory Services (WSS) under the Environmental Permitting (England & Wales) Regulations 2016, in accordance with a Part A1 and Part B EP. An Environmental Management System (EMS) has been created to enable the operator to achieve compliance with both EPs.

1.2 Relevant contacts

1.2.1 The contact details for the operator are as follows:

Kaug Refinery Services Limited	Contact: Adrian Coldicutt
10 Merse Road, Moons Moat	Position: Director
North Industrial Estate, Redditch	E-mail: adrian@kaugrefinery.co.uk
B98 9HL	

1.2.2 Oaktree Environmental Ltd have been engaged to act as consultants for Kaug Refinery Services Limited to assist in the preparation of this EMS. This EMS has been prepared to meet the requirements of the Environmental Permitting (England and Wales) Regulations 2016.

1.2.3 Contact details for Oaktree Environmental are as follows:

Oaktree Environmental Ltd	Contact: David Young
Lime House	Position: Principal Consultant
2 Road Two	Tel: 01606 558833
Winsford	E-mail: david@oaktree-environmental.co.uk
Cheshire CW7 3QZ	

1.2.4 A full list of relevant contacts (including key emergency contact numbers) are provided in the Site Information & Key Contacts List section in the pre-pages of this document.

1.3 Site location

1.3.1 The site is located on Land at 10 Merse Road, Moons Moat North Industrial Estate, Redditch B98 9HL as shown on Drawing No. 2765-010-02.

1.4 Permit area/waste management operations

1.4.1 The operations will be regulated in accordance with two separate permits, a Part A1 permit regulated by the EA and Part B permit regulated by WRS. The permit boundaries are outlined on Drawing Nos 2765-010-02 and Drawing No. 2765-011-02. This EMS should be read in conjunction with the site's Fire Prevention Plan (FPP) which is referenced as 2765-010-B.

1.4.2 An EP is required for the storage (keeping) prior to removal, and treatment (all types of handling/processing) of waste and also for the operation of small-scale thermal appliances.

1.4.3 Specified waste management operations include waste disposal and waste recovery operations listed within Annex IIA and IIB of The Waste Framework Directive 2008/98/EC.

1.5 Hours of operation

1.5.1 The site will typically be operated in accordance with the following hours for the delivery and receipt of waste on site; including depositing, sorting, moving, storing, treating and removing waste:

Monday to Friday	06:00 – 17:00
Saturday	No operations
Sundays, Bank/Public holidays	No operations

1.5.2 The only activities on site which will be permitted outside of operational hours, will be maintenance works, emergency deliveries of waste/ plant machinery and general office use.

1.5.3 During the times when the site is closed and not operating, the site buildings will be locked and secured to prevent unauthorised vehicle and/or pedestrian access.

1.6 Waste Storage, Types and Quantities

- 1.6.1 The locations of the operational and storage areas are shown on Drawing No. 2765-010-03.
- 1.6.2 A detailed breakdown of the waste types allowed for acceptance at the site will be shown in the environmental permit.
- 1.6.3 The site will accept a maximum of 250 tonnes of precious metal containing wastes per annum.

1.7 Exempt waste activities

- 1.7.1 Activities which are outside the scope of the waste EP for the site (listed in Schedule 3 of The Environmental Permitting (England and Wales) Regulations 2016) may be carried out at the site and the relevant details would be registered with the EA prior to commencement.
- 1.7.2 Current and future exemption notifications and register entries will be held in the site office. Registered exemptions are valid for a period of 3 years. If the activity is to be carried on after 3 years, a renewal will be submitted to the EA.
- 1.7.3 Wastes brought onto site as part of any exempt waste activities will be kept clearly segregated and identified from those wastes imported for the specified waste management operations and be shown on Drawing No. 2765-010-03.

1.8 Staffing and management

- 1.8.1 The table below details the staff structure of the site when operating at full capacity.

Table 1.1 - Staffing numbers and responsibilities

Position	Employees	Responsibilities
Directors	2	Overseeing management of the site
Factory Manager	1	Management of the site and responsible for day-to-day operations
Deputy Factory Manager	1	Responsible for day-to-day operations
General operatives	7	Responsible for day-to-day operations

1.9 Health and safety

1.9.1 All operations on site will be carried out in accordance with the relevant requirements of the Health and Safety at Work Act 1974. Conditions of site use for employees, visitors and contractors are shown in Appendix IV. These conditions will be shown to all site users and must be signed prior to using the site. Anyone refusing to comply with the conditions of use will be asked to leave the site.

1.10 Fit and proper persons

1.10.1 The site will assign a Technically Competent Manager (TCM) who will provide the required attendance time at the facility as required by guidance periodically issued by the EA. A copy of the appointed TCM's Certificate of Technical Competence (COTC) will always be made available in the site office.

1.10.2 The company, through the TCM, will ensure that a nominated deputy is sufficiently trained and familiar with the EP and this EMS document in addition to all relevant company procedures who, in the absence of the TCM, will act the competent person. If either the TCM or deputy is changed, the EA will be informed of the change and the relevant details of the replacement as soon as possible.

1.11 Convictions

1.11.1 At the time of application, neither Kaug Refinery Services Limited nor any of the relevant people within the company had been convicted of a relevant offence.

2 Site Engineering and Infrastructure

2.1 Site description

2.1.1 The site is located as shown on Drawing No. 2765-010-02. The site benefits from a number of parking spaces for staff, visitors, HGV's and trailers, as shown on Drawing No. 2765-010-03.

2.2 Access and parking

2.2.1 The site is accessed from Merse Road and parking is also available on site as shown on Drawing No. 2765-010-03.

2.3 Site office

2.3.1 The site office will be located as shown on Drawing No. 2765-010-03. The documents listed below will be retained in the site office.

Documents to be retained in site office
Environmental Permits (original & any subsequent variations)
This Environmental Management System
Current site diary (to record all inspections/visitors to the site)
Environment Agency Inspection (CAR) forms
Local Authority Inspection forms
In-house inspection sheets/recording forms
Duty of care transfer notes (for 2 years minimum)
Hazardous waste consignment notes (kept for 5 years)
Waste delivery tickets
Accident book (& 1st aid kit)

2.4 Notice board and signs

2.4.1 A notice board will be erected at the site entrance displaying the following information:

- The site name and address.
- The name of the permit holder and operator.
- The Environmental Permit numbers and accompanying statement stating that the site is permitted by the EA and WRS.
- EA contact details,
- WRS contact details.
- Operator's "out of hours" emergency contact details.
- Operating hours.

2.4.2 Additional signs will be displayed around the site for operational / health & safety purposes. All staff and visitors will be required to comply with the requirements of all signs whilst on site.

2.5 Site security

2.5.1 The main entrance/exit gates are located as shown on Drawing No. 2765-010-03 and are of steel construction. The gates are padlocked at all times when the site is unmanned to prevent vehicular access.

2.5.2 The site security measures will be inspected on a daily basis and any defects which impair the effectiveness of the security will be repaired by the end of the working day. If this is not possible, temporary measures will be put in place to ensure no unauthorised access to the site can be gained until the proper repairs can be carried out as soon as practicably possible.

2.5.3 The site will include a fully monitored 24hr CCTV and alarm system.

2.5.4 If unauthorised access becomes apparent as a problem at the site the security measures will be reviewed and improvements implemented.

2.6 Fuel storage

2.6.1 No fuel storage is currently proposed, but in the event that fuel is to be stored, procedures for fuel storage on site will be as follows:

- Tanks will be surrounded by a bund capable of containing a minimum of 110% of the volume of fuel stored in the tank.
- All pipework and associated infrastructure will be enclosed within the bund.
- A lock will be fitted to the tank valve to prevent unauthorised operation.
- All valves and gauges on the bund will be constructed to prevent damage caused by frost.
- No combustible waste will be stored within 6 metres of the tank.

2.6.2 The tank will be clearly marked showing the product within and also its capacity.

2.7 Rejected Waste

2.7.1 Any waste which is rejected will be stored in the quarantine area and removed from the site as soon as practicably possible.

2.8 Drainage

2.8.1 The drainage for the site is clearly shown on Drawing No. 2765-010-03.

2.9 Vehicles, plant and equipment

2.9.1 Waste will be handled using the plant listed below. Only trained operators will be permitted to drive/operate the plant listed below. Any changes to the list will be notified to the regulator prior to implementation.

Table 2.1 – Mobile Plant & Equipment

Item	Number	Function
Fork lift truck	1	Movement of waste/containers

2.10 Mobile and fixed plant maintenance

2.10.1 All mobile and fixed plant on site including vehicles in the fleet will be subject to annual manufacturer maintenance to ensure proper working order in the form of service contracts.

2.10.2 Site management will undertake or delegate additional preventative maintenance checks on a more frequent basis i.e. daily, before, during and 1 hour at the end of each working day using a checklist similar to that in Appendix II to ensure the following:

- Machinery is mechanically sound for use and no presence of black fumes or trailing liquids visible prior to use or following shutoff of plant/equipment.
- All plant will be powered-down and completely shut off prior to cessation of operations on any given day.
- Plant which is not in use for any extended period is stored at least 6 metres from combustible waste.
- All vehicles will be fitted with fire extinguishers in the cab. Rubber strips are not considered appropriate as they are usually removed via uneven and bumpy ground.

2.10.3 A 'no-idling' policy will be in place which ensures that engines are switched off when vehicles or plant are not in use. This policy will ensure that tail pipe emissions are significantly reduced.

3 Site Operations

3.1 Preliminary procedures - general

3.1.1 Guidance will be given by the site management to all employees, sub-contractors, other waste carriers and customers regarding the waste types and operations which are acceptable at the site i.e. a copy of Appendix III of this document. The site will be used for the acceptance, storage and processing of waste using Kaug Refinery Services Limited's own vehicles/contracts and also for third-party users/hauliers whose details would be checked prior to the delivery/collection of waste.

3.1.2 The procedures below would be followed prior to the receipt of waste on site.

3.1.3 When a driver employed by the permit holder arrives at the waste producers premises he/she will inspect the load for conformity with relevant regulations and safety procedures.

- a) If the load is satisfactory the driver will sign the relevant paperwork (Duty of Care transfer note/delivery ticket) and remove the load from the premises.
- b) If the waste does not meet the description stated on the controlled waste transfer note the customer is advised to check the note and give a more detailed description of the waste.
- c) If the more detailed description of the waste reveals that the waste is not/permited at the recycling centre then the customer is advised that the waste must be taken to another site which is appropriately permitted to accept the waste(s).
- d) If further instructions are needed the driver may also report back to the site manager.
- e) Where it is suspected that the details given on the transfer note are incorrect the EA may be contacted for advice.

3.2 Preliminary procedures - hazardous wastes

3.2.1 The following procedures will be implemented on site to ensure hazardous waste is accepted, handled, stored and removed safely and without risk:

- a) In conjunction with a Duty of Care Waste Transfer Note, all incoming hazardous waste loads will be accompanied by a Hazardous Waste Consignment Note (HWCN) in accordance with the Hazardous Waste (England and Wales) Regulations 2005.
- b) Staff involved with the acceptance of incoming loads of hazardous waste will ensure the appropriate sections of the HWCN have been completed correctly.
- c) The site will store a maximum of 50 tonnes of hazardous waste at any one time.

3.3 Checking in & inspection of loads

- 3.3.1 All incoming vehicles are required to report to the site office. The details of the load will be recorded, and the transfer note and company documentation will be further checked by the operator to ensure that the load is acceptable at the site. The weight of all loads will be recorded using a weighbridge or agreed WRAP conversion weights for loads where the weight is not known upon receipt at the site. Any deviation from these procedures or problems with any loads will be reported to the site manager.
- 3.3.2 All vehicle drivers must report to the site office upon arrival at the site. All waste accepted on site will be directed to the appropriate reception area.
- 3.3.3 Once a load has been accepted, a visual inspection of the contents will be carried out to ensure that the material complies with the EP. If non-compliant waste is discovered before deposit, the load will not be accepted and disposed of at an approved facility. In cases where the presence of unauthorised waste is likely to lead to a breach of permit conditions, the EA will be contacted immediately to agree a course of action.
- 3.3.4 Loads are also examined at the point of unloading. If they are found to be unacceptable at this point the load will be reloaded and returned to source.

3.4 Hazardous waste storage procedure

- 3.4.1 The following measures will be in place on site to reduce the risk associated with storing hazardous waste:

- a) At any one time, the maximum amount of hazardous stored on site will not exceed 50 tonnes.
- b) Hazardous wastes will be stored within enclosed IBCs or bins.
- c) Hazardous wastes will not be stored on site for longer than 12 months.
- d) Hazardous wastes will not be kept in unsecured locations, such as bays or open containers.

3.5 Waste acceptance procedure

- 3.5.1 All incoming vehicles upon arrival are required to report to the person in charge of waste acceptance at the site. The details of the load will be recorded and the duty of care note/company documentation will be further checked by the operator to ensure that the load is acceptable at the site, including a visual check prior to the vehicle proceeding to the unloading area.

3.6 Waste deposit & handling

- 3.6.1 Once a load has been accepted by the operator, this will be transferred into the appropriate reception, storage and treatment area as shown on Drawing No. 2765-010-03.

3.7 Waste/product removal and export

- 3.7.1 When a collection vehicle arrives at the site the driver will be instructed to report to the site office on arrival. All relevant documentation will be completed, and the vehicle will be passed to pick up the load and take it to the designated customer, recycler/disposal site. The product or waste material will be loaded onto the vehicle and quantified prior to egress from the site.

3.8 Record keeping

- 3.8.1 Kaug Refinery Services Limited use detailed waste transfer and product notes in paper and electronic form to ensure compliance with the Waste Duty of Care Code of Practice - March 2016 (Section 34(9) of the Environmental Protection Act 1990). The following points detail

the correct information required in order to comply with the Waste Duty of Care Code of Practice which the operator will provide on all documentation:

- a written description of the waste which has been agreed and signed by the operator and the next holder. The description is part of the waste information the operator will provide.
- a statement confirming that the operator has fulfilled the duty to apply the waste hierarchy as required by regulation 12 of the Waste (England and Wales) Regulations 2011 (see Waste Hierarchy Guidance for England and Wales)
- the description of the waste is accurate and contains all the information required to ensure the lawful and safe handling, transport, treatment, recovery or disposal by subsequent holders, including classification of the waste by using the appropriate codes (referred to as the List of Wastes (LoW) or European Waste Catalogue (EWC)) - Appendix A of the Waste Classification Technical Guidance provides a list of the codes as well as advice on how to assess and classify waste.
- the quantity and nature and whether it is loose or in a container, if in a container, the type of container
- the time and place of transfer
- the SIC code of the transferor (current holder of the waste)
- the name and address of the transferor and transferee (person receiving the waste) and their signatures (the signature can be electronic as long as an enforcement officer can view it)
- the capacity in which the transferor and transferee are acting (e.g. as a producer, importer or registered waste carrier, broker or dealer) and their relevant authorisation to act in that capacity (e.g. their permit number or registration number)

3.8.2 For non-hazardous waste this will be done by using a paper WTN and form to fill in or alternative documentation e.g. an invoice, as long as it contains all the required information.

3.8.3 A waste information note will not be required for non-hazardous waste if the waste holder does not change on the transfer of waste e.g. the waste is moved to other premises belonging to the same business. However, it is best practice that the business understands

who has responsibility for that waste and a record is kept of internal transfers for audit purposes.

3.8.4 **Hazardous waste:** Hazardous waste acceptance will be done using a fully completed HWCN and sent to a suitably permitted site, the records of which will be kept for 5 years.

3.8.5 A summary of waste types and quantities deposited at and removed from the site and origin and destination details are then forwarded to the EA using the standard Generic Operator Returns electronic spreadsheet(s), with submission due within one month of the end of each quarter as below:

- a) Quarter 1: January to March (due on or before 30th April)
- b) Quarter 2: April to June (due on or before 31st July)
- c) Quarter 3: July - September (due on or before 31st October)
- d) Quarter 4: October - December (due on or before 31st January of the following year)

3.8.6 Outcomes of inspections of waste types, hardstanding areas, transfer/treatment areas, storage areas, drainage channels, etc. are recorded using the site inspection form or similar document and detailed comments are entered into the site's diary (including action taken or proposed).

3.8.7 Visitors to the site are made to sign the visitor's book upon arrival and exit stating the purpose of their visit and whom they represent.

3.9 Management techniques

3.9.1 All measures necessary to achieve a high level of protection of the environment and to ensure that the site is operated in accordance with the various management systems and permit conditions will be strictly adhered to.

3.9.2 The manner in which the facility is managed is a critical element in ensuring emissions from the site operations are minimised. Therefore, management of this facility ensures:

- a) Staff are competent to manage and operate the facility i.e. fit and proper persons;

- b) Waste acceptance procedures are in place;
- c) Appropriate storage and handling procedures are in place;
- d) Waste/product dispatch procedures are in place;
- e) Procedures and control techniques in place to minimise potential emissions to air, land and water;
- f) There is an EMS, i.e. this document, in place to ensure standards are maintained, including incidents and complaints management procedures;
- g) A communication programme is in place; and,
- h) A health and safety programme is in place and is coherently conveyed to all staff and rigorously enforced throughout the whole of the organisation.

3.10 Site closure plan

3.10.1 In the event that the site ceases to operate as a waste transfer/treatment facility as set out in the site's EP, the following steps will be followed to achieve site closure:

- a) Contact the EA and WRS to advise the Environment Officer(s) that the site is planned to cease/has ceased the acceptance of wastes under the permits.
- b) The amount of residual processed & unprocessed waste on site will be assessed by the TCM to set a timetable for the final processing and timely removal of waste from site.
- c) Following removal of all waste, plant and machinery from site a Site Investigation will be undertaken to ascertain the ground conditions of the land to which the site relates. Surrender applications will then be submitted to the EA and WRS for determination.

4 Environmental Control, Monitoring and Reporting

4.1 Breakdowns and spillages

- 4.1.1 In the event of breakdown of mobile plant, an alternative machine will be brought on site until it is repaired.
- 4.1.2 All site surfaces will be inspected daily when the site is in operation.
- 4.1.3 Any spillages of fuel/oil will be cleared immediately by depositing sand or absorbents on the affected area. The sand or absorbents will be placed in a skip to be taken to a suitably permitted site for disposal. All spillages of waste and windblown litter will be cleared by the end of the working day in which they occur. Spillage clearance procedures are detailed in Section 5.4.
- 4.1.4 All wastes liable to give rise to contamination will be removed from the site if the site is not secure or if operations cease or are temporarily suspended.

4.2 Site inspections and maintenance

- 4.2.1 The type and inspection frequencies for maintenance/housekeeping are listed on record form KRS/RF/4 as an advisory. The inspection form will be completed by a person who is familiar with the requirements of the EMS and EPs for the site. All details of defects, problems and repairs carried out will be recorded on the form on the day that each event occurs. Detailed comments may also be recorded in a site diary. All repairs will be carried out as soon as practically possible.
- 4.2.2 All repairs to site security will take place as soon as practically possible and the site will be made secure until the repair has been carried out. Any major defects found during the daily site inspection will be repaired as soon as practically possible.

4.3 Control of dust

4.3.1 The operator is aware that the containment of dust on site and the prevention of its escape is paramount to operational compatibility with local businesses and residents.

4.3.2 Given the nature of the operations, scale of facility and location of all processing operations inside a building, dust is not expected to be a significant issue.

4.4 Odour control

4.4.1 Odour is not expected to present an issue, given the small quantities of wastes to be handled, the types of wastes to be treated and enclosure of all operations within a building.

4.4.2 The complaints procedure in record form KRS/RF/7 will be rigorously enforced should a third-party complaint be received from a public or private source.

4.5 Litter control

4.5.1 Given the storage procedures and nature of wastes to be accepted at the site, the risk of litter escaping the site boundary is deemed very low/negligible.

4.6 Control of pests, birds and other scavengers

4.6.1 Given the types of wastes to be accepted, pests are not anticipated to pose an issue. If any occurrences are noted, a pest controller will be called to site to eradicate the problem.

4.7 Control and monitoring of noise & vibration

4.7.1 The location and surrounding land uses means noise associated with the operations will not greatly increase the existing noise level in the surrounding area. The waste operations will be carried out using the best practicable means at all times.

4.7.2 Reference should be made to the operator’s Noise and Vibration Management Plan (NVMP) for details of measures that will be implemented to control noise to an acceptable level.

4.8 Point Source Emissions Monitoring

4.8.1 In accordance with the Part B EP, periodic emissions monitoring is required on the exhaust serving the thermal appliances used on site, including metal decontamination unit and melting furnaces. Residual emissions from these processes will be released via emission point A4, location shown on the layout plan in Appendix I. The emission limits which apply and monitoring requirements are outlined in the tables below

Table 4.1 – Emission Limits and Monitoring Requirements – Metal Decontamination Unit (Emission Point A4)

Pollutant	Emission Limits (mg.Nm⁻³) Expressed at Reference Conditions of 11% O₂, 273.15K, 101.3kPa, dry gas	Monitoring Frequency	Monitoring Method
Total particulate matter	20	Continuous indicative	Dust opacity meter
		Annual extractive test	EN 13284-1
Organic compounds excluding particulate matter	20	Annual extractive test	EN 12619:2013
Chloride compounds excluding particulate matter	10	Annual extractive test	EN 1911

Table 4.2 – Emission Limits and Monitoring Requirements – Electric and gas Fired Melting Furnaces (Emission Point A4)

Pollutant	Emission Limits (mg.m⁻³) Expressed at Reference Conditions of 273.1K, 101.3kPa, no correction for oxygen and moisture content	Monitoring Frequency	Monitoring Method
Total particulate matter	20	Annual extractive test	EN 13284-1

Table 4.3 – Emission Limits and Monitoring Requirements – Acid Scrubber (Emission Point A1)

Pollutant	Emission Limits (mg.Nm ⁻³) Expressed at Reference Conditions of 273.15K, 101.3kPa, dry gas	Monitoring Frequency	Monitoring Method
Nitrogen Oxides (NO _x)	150	Annual extractive test	Manual extractive test – EN14792
Sulphur dioxide (SO ₂)	100	Annual extractive test	Manual extractive test – EN14791
Hydrogen Chloride (HCL)	10	Annual extractive test	Manual extractive test - EN 1911 or EN 16429
Chlorine	2	Annual extractive test	Manual extractive test – USEPA Method 26 A

4.8.2 All monitoring results and subsequent actions will be recorded in the site log book and kept on-site and made available for the regulators to examine for a minimum period of two years. Any records of monitoring kept off-site should be made available for inspection by the regulators within one working week of request.

4.8.3 In the event of adverse results (non-compliance) for both continuous and non-continuous emissions monitoring, investigation will be immediately undertaken by the site operator, who will:

- Identify the cause and take corrective action;
- Clearly record as much detail as possible regarding the cause and extent of the problem, and the remedial action taken; and,
- Re-test to demonstrate compliance as soon as possible and inform the regulator of the steps taken and the re-test results.

4.9 Complaints procedure

4.9.1 Any third-party complaints received will be recorded on form KRS/RF/7 and will include a record of the complaint, particulars of the complainant and details of any action taken to alleviate the problem to ensure the likelihood of a future third party complaint is minimised.

5 Emergency Procedures

5.1 General

5.1.1 In addition to obligations imposed by RIDDOR '13 (Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013) the permit holder will notify the EA of any serious injuries to employees of Kaug Refinery Services Limited, other site users or members of the public arising as a result of operations on site. Minor injuries such as cuts and grazes etc. will be recorded in the accident book on site. Separate procedures will be used for different types of emergency. An emergency at the site is defined by the site management as follows:

“Any incident which is likely to result in harm to human health or pollution of the environment or serious breach of permit conditions and serious detriment to the amenities of the locality.”

5.1.2 For all emergency situations, the deposit of any further waste will be suspended where necessary to allow action to be taken safely. If necessary, staff and other users of the site will be evacuated to an area which is a safe distance away from the hazards. Staff handling the emergency will be provided with and trained to use the necessary PPE (personal protective equipment) unless the manager instructs them that the hazard is too severe and outside help is needed from the emergency services or specialist waste contractors. A visitor's book will be kept to check who is on site at all times.

5.2 Fire

5.2.1 Other than permitted combustion/thermal treatment activities, no waste will be burnt, and no fires will be allowed on site. In the event of a fire occurring on site, the operator/site supervisor will exercise his judgement and extinguish the fire with the water hose or suitable fire extinguisher and/or call the fire service for assistance. Any fires will be reported to the EA on the working day that they occur. All staff will be evacuated from the site if necessary. Smoking is not permitted on site. Firefighting residues will be disposed of to a permitted waste management facility.

5.2.2 The site has a fire prevention plan (FPP) in place which has been prepared to in accordance with EA guidance to meet the following objectives:

- To minimise the likelihood of a fire happening;
- To aim for a fire to be extinguished within 4 hours;
- To minimise the spread of a fire within the site and to surrounding neighbouring sites; and,
- To minimise impact of fire on people, environment and businesses.

5.2.3 The FPP is referenced as 2765-010-B.

5.2.4 For quick reference, the following actions will be taken when fire is detected or suspected (Site operatives):

- a) DON'T PANIC
- b) RAISE THE ALARM (IF NOT DONE SO ALREADY)
- c) NOTIFY THE SITE MANAGER (IF SAFE TO DO SO)
- d) **DO NOT TRY TO TACKLE THE FIRE YOURSELF UNLESS YOU ARE TRAINED IN DOING SO AND YOU ARE SURE OF THE NATURE OF THE FIRE**
- e) LEAVE USING THE MAIN ACCESS GATES AS QUICKLY AND AS ORDERLY AS POSSIBLE
- f) ASSEMBLE AT THE SPECIFIED FIRE ASSEMBLY POINT WHICH IS LOCATED BY THE SITE ACCESS GATES.
- g) THE SITE MANAGER OR DELEGATED OPERATIVE WILL BE IN CHARGE OF CALLING THE EMERGENCY SERVICES ON "999" AND ENSURING THAT ALL PERSONS WHO WERE WORKING ON THE SITE OR WHO SIGNED IN TO THE VISITOR'S BOOK ARE ASSEMBLED SAFELY
- h) INFORM ALL NEIGHBOURING PREMISES WHO ARE LIKELY TO BE AFFECTED
- i) INFORM THE ENVIRONMENT AGENCY
- j) DO NOT RETURN TO THE SITE UNTIL YOU HAVE BEEN GIVEN THE ALL CLEAR BY THE EMERGENCY SERVICES AND THE SITE MANAGER

5.3 Breakdowns

- 5.3.1 In the event of plant breakdowns, alternative plant will be sourced until the existing plant is repaired.
- 5.3.2 Essential spares for plant maintenance will be kept on site to ensure a repair can be carried out efficiently.

5.4 Spillages

- 5.4.1 If any oil and vehicle maintenance chemicals are kept on site, they will be stored securely. All chemicals required for use in the process will be stored securely.
- 5.4.2 Any wastes which would be classified as having the potential to cause polluting runoff will be stored on impermeable surfaces.
- 5.4.3 All site surfaces will be inspected daily for the presence of spillages when the site is in operation.
- 5.4.4 All wastes liable to give rise to contamination will be removed from the site within an EA agreed timescale.

5.5 Adverse reactions

- 5.5.1 The site will use a variety of acid and alkaline chemicals as part of the metal recovery process. Acid and alkaline chemicals will be stored in separate designated areas in appropriately sealed containers. COSHH Risk Assessments will be undertaken for storage of chemicals. Waste acid alkaline effluents will be stored in separate designated bunded areas.

5.6 Staff shortages

- 5.6.1 In the event of unforeseen staff shortages arising from illness, suspension or no shows, the operator will make a judgement whether to reduce the number of incoming loads and divert

material to an alternative site. The operator will then seek further employment within a timely manner to ensure the site can continue to operate at its required capacity.

5.7 Operational failure

- 5.7.1 The manager will be contacted by staff in the event of any operational failure such as the breakdown of plant, systems or equipment and will decide whether operations are to continue or be suspended prior to corrective action being taken. Serious operational failures, which result in the closure of the site, will be recorded in the site diary.

6 Training for Site Staff

6.1 Training needs assessment

6.1.1 All new and existing site staff are subject to a specific training regime based on their responsibilities at the site to ensure all operations are carried out without harm to the environment or amenity of the surrounding area. Training in all aspects of the site and waste operations at the site with regard to the individual responsibilities of the site staff will help to prevent incidents occurring which may have an adverse impact on the environment and/or the employees and their co-workers.

6.1.2 An employee training record will be available at the site detailing information similar to form KRS/RF/6 in Appendix II and shall provide a comprehensive checklist for the training needs of all new site staff and also serves as a training review for existing site staff which will be carried out annually or a period set at the operator's preference.

6.2 Site rules and infrastructure training

6.2.1 This information is provided to all employees, visitors and contractors with a full understanding of the site's conditions of use, which is communicated and documented at induction for all staff with specific induction for visitors and contractors.

6.2.2 Competency should be demonstrated within this field to ensure the employee is fully aware of the site's surroundings and operations to ensure their safety and compliance with specific operating conditions at the site.

6.3 Emergency procedures training

6.3.1 All employees are required to be familiar with the Environmental Controls in Section 4.0 and the Emergency Procedures as detailed in the Section 5.0.

- 6.3.2 In addition to normal operating conditions as specified in the site rules, employees must also be trained in dealing with eventualities which may occur outside the scope of normal operating conditions, so they are aware of how to deal with these situations in advance of an occurrence.

6.4 Fire safety / firefighting training

- 6.4.1 Management must provide all employees with appropriate fire safety training with regard to their individual responsibilities.
- 6.4.2 Emergency procedures detailing what measures employees should adopt should a fire occur at the site are detailed in Section 5.2 and are covered by the 'emergency procedures' training (see Section 6.3).
- 6.4.3 Regular fire drills are undertaken by site management to ensure proper procedures are followed by employees in the unlikely event that a fire incident occurs. These will be unannounced drills and will not form part of the induction or review training as specified in Section 6.1.

6.5 Recognition of waste types training

- 6.5.1 All employees are given induction training and subsequent regular training to identify those waste types which are permitted for acceptance at the site under the site's EP and those wastes which are not. This will include specific training to identify those common wastes which may be found following deposit and are not permitted at the site and will also include more obscure wastes and how to handle these wastes safely. All employees are advised that they should refer any unrecognisable or unknown wastes to senior management, who should, in turn, follow procedures outlined in the EMS and/or contact the EA to agree a suitable method for removal.
- 6.5.2 Training is provided to all site users who handle waste on site and those in charge of administration and reporting. In-depth training will also be provided to drivers responsible

for collecting wastes from the site of production in accordance with Section 3.0. They will be trained to identify any wastes not covered by the EP for the site and inform the producer that an alternative facility must be sought for any non-compliant wastes.

6.6 Storage areas / limits training

6.6.1 Those employees who carry out their responsibilities at the site and those in senior posts must be trained to identify appropriate waste storage areas to ensure that waste storage operations comply with the requirements of the EPs for the site.

6.6.2 Employees in these roles must also be trained to recognise storage limits to ensure that they are in accordance with those specified in the EP.

6.7 Vehicle / plant preventative maintenance training

6.7.1 This training is provided specifically for the vehicle and plant operators in order to ensure that all plant and machinery is checked regularly to prevent any occurrences which may lead to any adverse impacts on the environment or human health.

6.7.2 Training will be in accordance with this document and will be based on the preventative maintenance schedule supplied by the plant/equipment manufacturer.

6.7.3 The same training will be provided to senior management enabling a dual-level maintenance programme.

6.8 Duty of care training

6.8.1 All employees dealing with consignments of waste are trained in the completion of Duty of Care Waste Transfer Notes and the appropriate auditing of destination sites and/or contractors to ensure compliance.

6.9 Plant operation training

6.9.1 Any employees who are required to operate loading or treatment plant for the movement or processing of waste will be required to undertake the necessary qualifications for the operation of the specific item of plant in question. This will be required prior to operating the plant and will be obtained through necessary external certification programmes.

6.9.2 Regardless of general plant operation certification, all operatives will be fully inducted in the operation of the specific make and/or model of plant used on site.

6.10 Permit / management System

6.10.1 All employees will be inducted into the operating conditions as prescribed in the EPs for the site. Whilst much of the above training will provide specific guidance on many aspects of these documents, all employees will be made aware of the location of the EPs and EMS in the site office. All managerial positions will be made fully aware of the site's operating conditions.

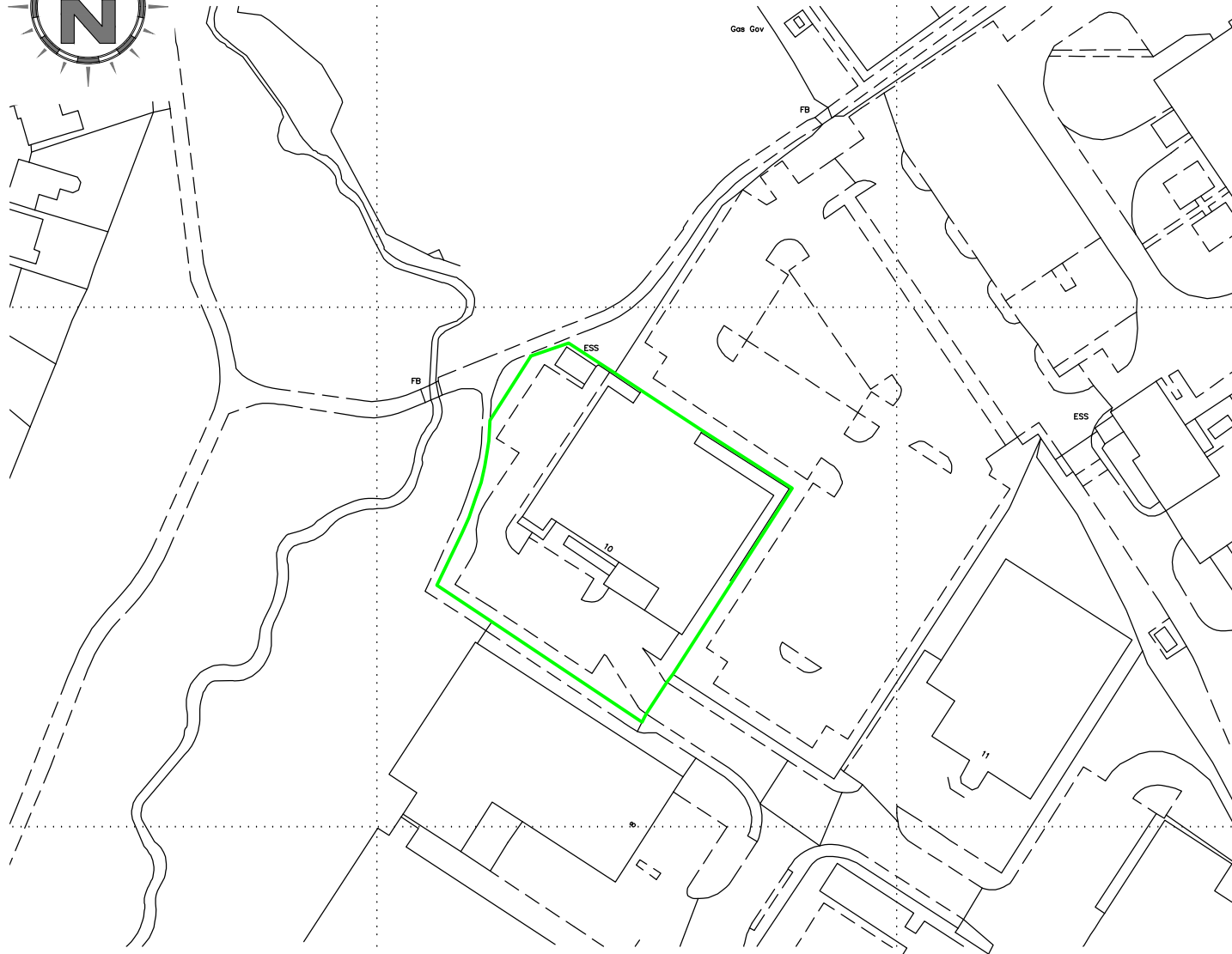
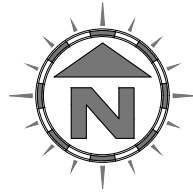
6.11 Training for contractors

6.11.1 General site training will be provided to any contractors who are working on the site on a temporary basis as described in Sections 6.2, 6.3 and 6.4 above.

6.11.2 Additional training will be provided to contractors in their area of expertise. If they are dealing with specific items of plant/machinery, site operating conditions and a general understanding of the EP conditions will be provided to prevent any adverse impacts on the environment.

Appendix I

Drawings



NOTES

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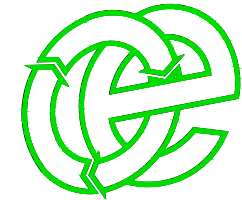
REVISION HISTORY

Rev:	Date:	Init:	Description:
-	05.12.22	JH	Initial drawing
A	05.01.23	IA	Address update
B	17.04.23	IA	Drawing title change

KEY:

 Waste EP Permit boundary

Oaktree Environmental Ltd
Waste, Planning and Environmental Consultants



DRAWING TITLE
EP PERMIT BOUNDARY PLAN

CLIENT
Kaug Refinery Services Ltd

PROJECT/SITE
10 Merse Road, North Moons Moat, Redditch, B98 9HL

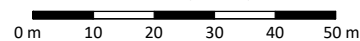
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1:1,250	2765	010

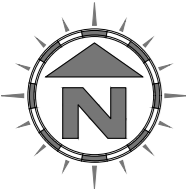
DRAWING NUMBER	REV	STATUS
2765-010-02	B	Issued

DRAWN BY	CHECKED	DATE
JH/IA	RS	17.04.23

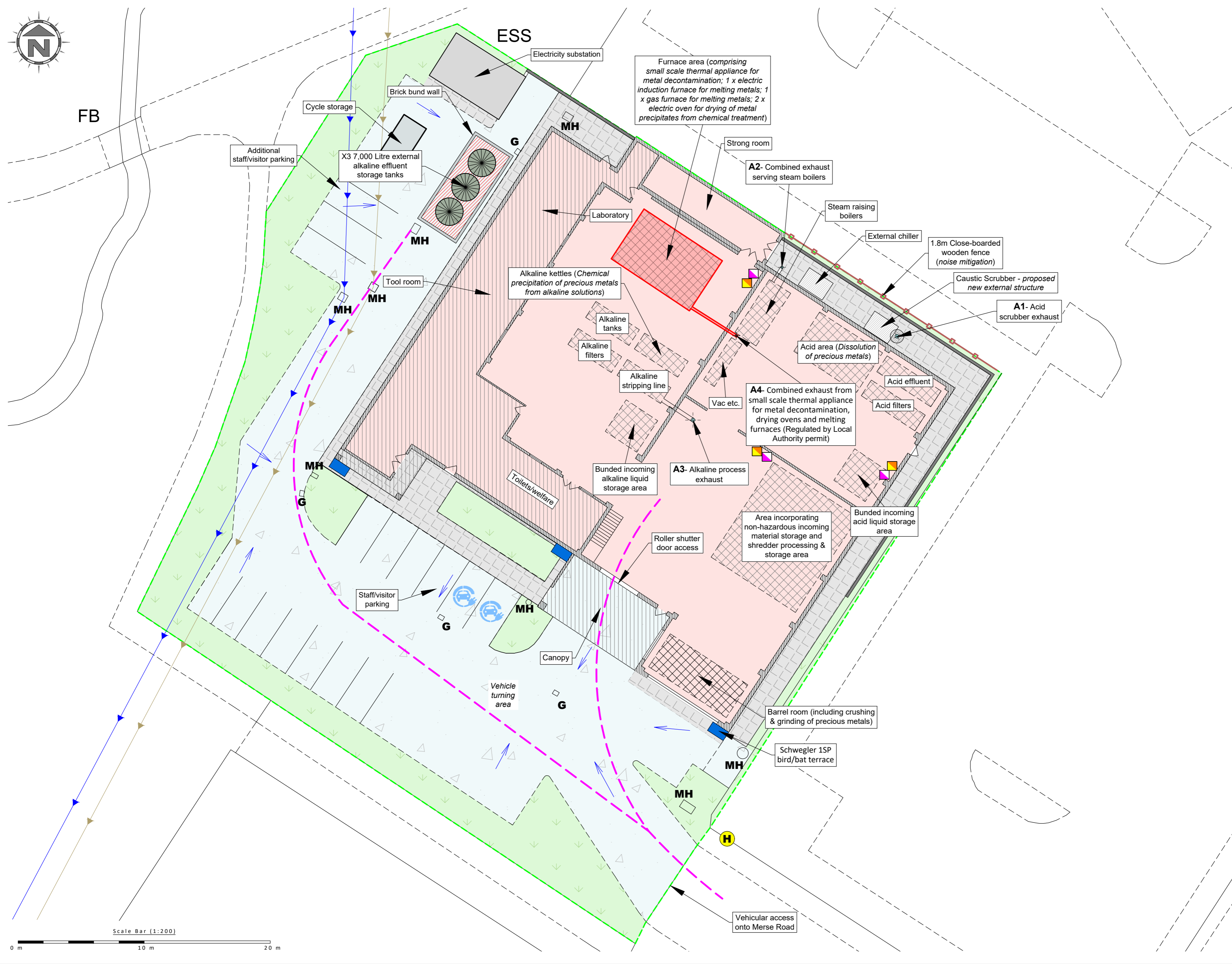
Lime House, Road Two, Winsford, Cheshire, CW7 3QZ
t: 01606 558833 | e: sales@oaktree-environmental.co.uk

Scale Bar (1:1,250)





FB

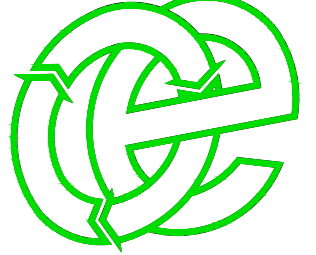


NOTES
 Site survey undertaken using Intel Falcon 8+ drone in September 2022. Ordnance Survey data reproduced with the permission of the controller of H.M.S.O. Crown copyright licence No. 100022432. This drawing is copyright and property of Oaktree Environmental Ltd.

Rev:	Date:	Init:	Description:
-	05.12.22	JH	Initial drawing
A	15.12.22	IA/JH	Drawing amendments
B	05.01.23	IA	Address update
C	22.03.23	IA	Layout changes
D	17.04.23	IA	Drawing amendments
E	04.05.23	IA	EA comments
F	28.07.23	IA	Drawing amendments
G	22.01.24	IA	Application resubmission

- KEY:**
- Waste EP Permit boundary (regulated by Environment Agency)
 - Part B Permit boundary (regulated by Local Authority)
 - Sealed buildings
 - Concreted areas
 - Spill kit
 - Firefighting equipment
 - Access routes for emergency vehicles
 - H Hydrant
 - MH** Manhole
 - G** Gully
 - Fall direction arrows
 - Paved areas
 - Un-surfaced areas

Oaktree Environmental Ltd
 Waste, Planning and Environmental Consultants



DRAWING TITLE
 SITE LAYOUT PLAN

CLIENT
 Kaug Refinery Services Ltd

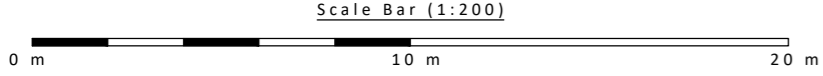
PROJECT/SITE
 10 Merse Road, North Moons Moat, Redditch, B98 9HL

SCALE @ A2 1:200 **CLIENT NO** 2765 **JOB NO** 010

DRAWING NUMBER 2765-010-03 **REV** G **STATUS** Issued

DRAWN BY JH/IA **CHECKED** RS/DY **DATE** 22.01.24

Lime House, Road Two, Winsford, Cheshire, CW7 3QZ
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Appendix II

Record Keeping Forms

**KAUG REFINERY SERVICES LIMITED
REJECTED WASTE - RECORD FORM KRS/RF/2**

DATE	
TIME	
WASTE DESCRIPTION	
QUANTITY OF WASTE	
PRODUCER/HOLDER'S NAME, ADDRESS & TELEPHONE No.	
NAME OF CARRIER	
VEHICLE REGISTRATION	
CARRIER REG. No.	
REASON FOR REJECTION OF WASTE	
ACTION TAKEN	

**KAUG REFINERY SERVICES LIMITED
SITE INSPECTION FORM (DAILY INSPECTIONS) – KRS/RF/4**

WEEK STARTING								
TYPE OF INSPECTION		DAY						
		M	T	W	T	F	S	S
SITE ENTRANCE/NOTICE BOARD								
SECURITY - GATES								
SECURITY - FENCING								
SITE ROADS (CLEAR FROM HAZARDS)								
IMPERMEABLE CONCRETE AREAS (INTEGRITY)								
DRAINAGE SYSTEM FOR CONCRETE PADS								
WASTE CONTAINERS & BAY WALLS								
WASTE STORAGE LIMITS	INERT							
WASTE STORAGE LIMITS	BIODEGRADABLE							
WASTE STORAGE LIMITS	COMBUSTIBLE							
WASTE STORAGE LIMITS	EXEMPTIONS							
CONTAINMENT OF REJECTED WASTE								
NOISE LEVELS								
FIRES (ANY INCIDENTS REPORTED)								
NO SMOKING SIGNS IN PLACE								
FUEL TANK/BUND								
LITTER (ON SITE AND OUTSIDE SITE BOUNDARY)								
DUST (VISUAL INSPECTIONS)								
VERMIN								
RECORDS								
COMPLAINTS RECEIVED								
OTHER (SEE NOTES BELOW)								
INSPECTION CARRIED OUT BY								
NOTES/ACTION (CONTINUE ON A SEPARATE SHEET IF NECESSARY):								
CHECKED BY		SIGNATURE						
POSITION		DATE						
<i>Sheet</i>		<i>of</i>						

KAUG REFINERY SERVICES LIMITED

EMPLOYEE TRAINING NEEDS ASSESSMENT / REVIEW - KRS/RF/6

EMPLOYEE NAME					DATE					
POSITION					REVIEW DUE					
TRAINING CARRIED OUT BY										
POSITION										
TRAINING REQUIRED	GENERAL OPERATIVES		HGV DRIVER		PLANT OPERATOR		YARD MANAGER		TECHNICALLY COMPETENT MANAGER	
CARRIED OUT?	Y/N	SIGNED BY EMPLOYEE	Y/N	SIGNED BY EMPLOYEE	Y/N	SIGNED BY EMPLOYEE	Y/N	SIGNED BY EMPLOYEE	Y/N	SIGNED BY EMPLOYEE
SITE RULES AND INFRASTRUCTURE										
EMERGENCY PROCEDURES										
FIRE SAFETY/ FIRE FIGHTING										
RECOGNITION OF WASTE TYPES										
STORAGE AREAS/LIMITS										
RECORD KEEPING										
VEHICLE CHECKS (Preventative Maintenance)										
PLANT CHECKS (Preventative Maintenance)										
DUTY OF CARE WASTE TRANSFER NOTES										
PLANT OPERATION - LOADING PLANT										
PLANT OPERATION - TREATMENT PLANT										
MANAGEMENT SYSTEM & PERMIT										
OTHER 1 (PLEASE SPECIFY)										
OTHER 2 (PLEASE SPECIFY)										

**KAUG REFINERY SERVICES LIMITED
COMPLAINTS REPORT FORM (KRS/RF/7)**

Date Recorded:	Reference Number:
Name and address of caller	
Telephone number of caller	
Time and Date of call	
Nature of complaint (noise, odour, dust, other) (date, time, duration)	
Weather at the time of complaint (rain, snow, fog, etc.)	
Wind (strength, direction)	
Any other complaints relating to this report	
Any other relevant information	
Potential reasons for complaint	
The operations being carried out on site at the time of the complaint	
Follow Up	
Actions taken	
Date of call back to complainant	
Summary of call back conversation	
Recommendations	
Change in procedures	
Changes to Environmental Management System (EMS)	
Date changes implemented	
Form completed by	
Signed	
Date completed	

COMPLAINT RECORDING PROCEDURE:

Any complaints received will be recorded on form KRS/RF/7. This form will normally be completed, signed and dated by the Site Manager; if they are not available the Office Manager will complete the form.

- 1) The name, address and telephone number of the caller will be requested.
- 2) Each complaint will be given a reference number.
- 3) The caller will be asked to give details of:
 - a) the nature of the complaint;
 - b) the time;
 - c) how long it lasted;
 - d) how often it occurs;
 - e) Is this the first time the problem has been noticed; and
 - f) what prompted them to complain.
- 4) The person completing the form will then, if possible, make a note of:
 - a) the weather conditions at the time of the problem (rain, snow, fog etc.);
 - b) strength and direction of the wind; and
 - c) the activity or activities taken place on the site at the time the noise was detected, particularly anything unusual.
- 5) The reason for the complaint will be investigated and a note of the findings added to the report.
- 6) The caller will then be contacted with an explanation of the source of the complaint if identified and the action taken to prevent a recurrence of the problem in future.
- 7) If the caller is unhappy about the outcome or unwilling to identify themselves the caller will be invited to contact the EA and or the Local Authority.

Note: Following any complaint the relevant management plan(s) will be reviewed to ensure appropriate actions are in place to counter any problems.

Appendix III

Environmental Permit (to be added later)

Appendix IV

Health & Safety – Conditions of Site Use

HEALTH AND SAFETY - CONDITIONS OF SITE USE

The following guidelines apply to all site personnel, contractors and visitors using the site (where applicable).

- 1) The site is covered by the Health and Safety at Work Act 1974 and its associated regulations and all users must abide by any relevant provisions. Any person found to be in contravention of the requirements of this Health and Safety Statement will be asked to leave the site.
- 2) All visitors and contractors must sign the visitor's book upon entry to and exit from the site. All vehicle drivers must report to the office and await instruction from the site manager/deputy before proceeding to deposit waste at the site.
- 3) All accidents, diseases, injuries or dangerous occurrences shall be reported to the site manager. All instructions issued by the site manager in respect of health and safety at the site must be followed by all site users.
- 4) A first aid box (including eye-wash bottles) is kept in the site office. If you are injured on site please alert a member of staff/trained first-aider for assistance.
- 5) All persons must wear the appropriate PPE on site including high visibility jackets and hard hat.
- 6) Safety boots must be worn by all persons in the waste treatment/storage areas.
- 7) Protective gloves must be worn for any operations which present a hazard of puncture to or laceration of the skin or for any manual handling work carried out on site.
- 8) Ear defenders, safety helmets (hard hats) and eye protection will be issued when deemed necessary and must be worn by all employees and contractors where required by the site manager or other site representatives.
- 9) Fire extinguishers are kept on site to deal with any fires - fires shall only be dealt with by employees of Kaug Refinery Services Limited unless alternative instructions are given by the site manager. Access to fire exits and firefighting equipment must be kept clear at all times. When the fire alarm sounds please follow instructions and leave the site in an orderly fashion.
- 10) Persons who are suspected to be under the influence of drugs or alcohol will be removed from the site.
- 11) Smoking is not permitted on the site.
- 12) Observe and follow all traffic directions and traffic/safety signs.
- 13) Drivers must comply with all safety instructions given by the site manager or appointed deputy.
- 14) All drivers are responsible for ensuring that their vehicle is safely loaded. Unsafe loads will not be accepted at the site and will not be allowed to leave the site until they have been made safe.

Declaration: To be completed by site users

I have read and understand the conditions of use for this site and agree to comply with them at all times. I accept that neither Kaug Refinery Services Limited nor their employees shall be liable for any loss or injury arising from my non-compliance with the above conditions.

Signed.....

Print name.....

Company/Organisation.....

Date.....

Note: these conditions are included in the EMS for information only and may be revised regularly as part of the site health and safety policy.

Appendix V

Permitted Waste Codes

Permitted waste types and quantities	
Maximum Quantities	The total quantity of waste accepted for activity shall be less than 250 tonnes a year.
Waste Code	Description
06	Inorganic Chemical Processing
06 01	wastes from the manufacture, formulation, supply and use (MFSU) of acids
06 01 06*	Other acids
06 03	Manufacture – formulation – supply and use of salts and their solutions and metallic oxides
06 03 13*	Solid salts and solutions containing heavy metals
08	MFSU of Coatings/Adhesives/Inks
08 01	Manufacture – formulation – supply and use and removal of paint and varnish
08 01 11*	Waste paint and varnish containing organic solvents or other hazardous substances
08 01 12	Waste paint and varnish other than those mentioned in 08 01 11
08 01 13*	Sludges from paint or varnish containing organic solvents or other hazardous substances
08 01 14	sludges from paint or varnish other than those mentioned in 08 01 13
08 01 99	wastes not otherwise specified
08 02	Manufacture – formulation – supply and use of other coatings (including ceramic materials)
08 02 01	Waste coating powders
08 02 99	Wastes not otherwise specified
08 03	Manufacture – formulation – supply and use of printing inks
08 03 12*	Waste ink containing hazardous substances
08 03 13	Waste ink other than those mentioned in 08 03 12
09	Photographic Industry
09 01	Photographic industry
09 01 07	Photographic film and paper containing silver or silver compounds
10	Thermal Processes
10 07	Silver – gold and platinum thermal metallurgy
10 07 01	slags from primary and secondary production
10 07 02	dross and skimmings from primary and secondary production
10 07 04	other particulates and dust
10 07 99	Wastes not otherwise specified
10 08	Other non-ferrous thermal metallurgy
10 08 11	dross and skimmings other than those mentioned in 10 08 10
10 08 14	anode scrap
10 12	

Permitted waste types and quantities	
Maximum Quantities	The total quantity of waste accepted for activity shall be less than 250 tonnes a year.
Waste Code	Description
10 12 08	Waste ceramics, bricks, tiles and construction products (after thermal processing)
10 12 99	Wastes not otherwise specified
11	Chemical Surface Treatment of Metals/Plastic
11 01	Chemical surface treatment and coating of metals and other materials
11 01 06*	acids not otherwise specified
11 01 09*	sludges and filter cakes containing hazardous substances
11 01 10	sludges and filter cakes other than those mentioned in 11 01 09
11 01 11*	aqueous rinsing liquids containing hazardous substances
11 01 12	aqueous rinsing liquids other than those mentioned in 11 01 11
11 01 98*	other wastes containing hazardous substances
11 01 99	wastes not otherwise specified
12	Shaping/Physical Treatment of Metals/Plastic
12 01	Wastes from shaping and physical and mechanical surface treatment of metals and plastics
12 01 04	non-ferrous metal dust and particles
12 01 17	Waste blasting material other than those mentioned in 12 01 16
12 01 99	Wastes not otherwise specified
15	Packaging, Absorbents, Wiping Cloths and Filters
15 02	Absorbants – filter materials – wiping cloths and protective clothing
15 02 02*	Absorbants, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by hazardous substances
15 02 03	Absorbants, filter materials, wiping cloths and protective clothing other than those mentioned in 15 02 02
16	Other wastes from Industrial Processes
16 01	end-of-life vehicles from different means of transport (including off-road machinery) and wastes from dismantling of end-of-life vehicles and vehicle maintenance (except 13, 14, 16 06 and 16 08)
16 01 18	non-ferrous metal
16 02	Electrical and electronic equipment
16 02 15*	hazardous components removed from discarded equipment
16 02 16	Components removed from discarded equipment other than those mentioned in 16 02 15
16 08	Spent catalysts
16 08 01	spent catalysts containing gold, silver, rhenium, rhodium, palladium, iridium or platinum (except 16 08 07)

Permitted waste types and quantities	
Maximum Quantities	The total quantity of waste accepted for activity shall be less than 250 tonnes a year.
Waste Code	Description
16 08 07*	spent catalysts contaminated with hazardous substances
17	Construction and Demolition Waste
17 04	Metals (including their alloys)
17 04 11	Cables other than those mentioned in 17 04 10
19	Materials from Waste and Water Treatment
19 09	municipal wastes including separately collected fractions
19 09 05	Saturated or spent ion exchange resins
20	Municipal Waste and Similar Materials from Commerce and Industry
20 01	
20 01 40	metals

Appendix VI

Fire Prevention Plan

FIRE PREVENTION PLAN

10 Merse Road, North Moons Moat, Redditch, B98 9HL
Kaug Refinery Services Limited

Version:	1.5	Date:	11/06/2024	
Doc. Ref:	2765-010-B	Author(s):	IA	Checked: KRS
Client No:	2765	Job No:	010	



Oaktree Environmental Ltd

Waste, Planning & Environmental Consultants



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REGISTERED IN THE UK | COMPANY NO. 4850754

Document History:

Version	Issue date	Author	Checked	Description
1.0	12/12/2022	IA	--	Document Issue
1.1	04/01/2023	IA	--	Client comments
1.2	17/01/2023	IA	--	Application copy
1.3	14/07/2023	IA	--	Minor amendments
1.4	22/01/2024	IA/DY	--	Application resubmission
1.5	11/06/2024	IA/DY	--	Amended in response to EA comments

THIS DOCUMENT IS DUE FOR REVIEW IN **JUNE 2026** OR AS A RESULT OF ANY INCIDENTS WHICH MAY LEAD TO THE REQUIREMENT FOR IMMEDIATE REVIEW, WHICHEVER IS THE SOONER

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Drawing No. 2765-010-04 – Sensitive Receptors Plan

Appendix II - Record Keeping Forms

KRS/RF/4 - Site Diary/Inspection Form

KRS/RF/5 - Preventative Maintenance Checklist

Site Information & Key Contacts List

Site Address:	10 Merse Road, North Moons Moat, Redditch, B98 9HL		
Site Operator:	Kaug Refinery Services Limited	National Grid Ref:	407336, 268807

CONTACT	DESCRIPTION	OFFICE HOURS	OUT OF HOURS
Adrian Coldicutt	TCM	TBC	TBC
<u>Alexandra Hospital</u> Woodrow Dr, Redditch B98 7UB	Local NHS Hospital (Main)	01527 503030	999
<u>Redditch Police Station</u> 105 Archer Rd, Redditch B98 8DJ	Local Police Non-Emergency	03003333000 or 101	999 or 112
<u>Hereford and Worcester Fire & Rescue Service</u> Redditch Fire station, 226 Birmingham Rd, Redditch B97 6EL	Fire and Rescue Service (in Emergency Dial 999)	01527 62223	999
<u>Environment Agency</u>	Environmental Regulator	03708 506506	0800 807060
<u>Redditch Borough Council</u> The Town Hall, Walter Stranz Square, Worcestershire, B98 8AH	County Council General Enquiries	01527 881770	999 or 112
<u>Severn Trent Water</u>	Mains water supplier	0800 783 4444	0800 783 4444
<u>Oaktree Environmental Ltd</u> Lime House, 2 Road Two, Winsford, Cheshire CW7 3QZ	Specialist Advisor (Waste and Planning Issues)	01606 558833	999 or 112 or 0800 807060

1 Introduction

1.1 Overview of site operations

1.1.1 This document considers the risks associated with fire on site at 10 Merse Road, North Moons Moat, Redditch, B98 9HL.

1.2 Fire prevention objectives

1.2.1 This Fire Prevention Plan (FPP) has been designed to meet the following objectives:

- To minimise the likelihood of a fire happening;
- To aim for a fire to be extinguished within 4 hours;
- To minimise the spread of a fire within the site and to surrounding neighbouring sites;
and,
- To minimise impact of fire on people, environment and businesses.

1.3 General

1.3.1 In addition to this document the site will be operated in accordance with an Environmental Management System (EMS).

1.3.2 The layout of the site is shown on Drawing No. 2765-010-03. This FPP document will be kept in the site office and all operational staff must be aware and understand the contents of the Fire Prevention Plan (FPP) and what they must do during a fire.

1.4 Staffing and management

1.4.1 The table below details the staff structure of the site when operating at full capacity. Only the site manager, machine/plant operators and general operatives will be permitted to tackle fires on-site.

Table 1.1 – Staffing Levels

Position	Employees	Responsibilities
Directors	2	Overseeing management of the site
Factory Manager	1	Management of the site and responsible for day-to-day operations
Deputy Factory Manager	1	Responsible for day-to-day operations

1.5 Plant and equipment

1.5.1 The table below details the plant/equipment on site including that equipment specifically required for the implementation of this FPP. Only trained operators will be permitted to drive/operate the plant/equipment listed below.

Table 1.2 – Plant & Equipment

Item	Number	Function
Boiler	2	Steam generation for processing
225ltr Glass lined steam jacketed vessel	4	Dissolution of precious metal away from precious metal bearing material
Acid scrubber	1	Fume abatement for glass lined steam jacketed vessels
Chiller	1	Providing cooled water for condensers
Acid solution tanks	1	Precipitation of precious metal from customer acidic solutions
Stainless steel steam jacketed kettle	3	Chemical precipitation of precious metals from alkaline solutions
Strip line	1	Surface stripping of precious metal in alkaline solution
Electric oven (Big & Small)	2	Drying of precious metal precipitates
Small scale thermal appliance for decontamination of metal	1	Removal of organic matter
Induction furnace	1	Melting of precious metal
Gas furnace	1	Melting of precious metal
Grinding & crushing mill	3	Grinding & crushing precious metal bearing material
Barrel Dce	1	Extraction for 3 x grinding & crushing mills
Sieve Dce	1	Extraction for manual sieving area
Laboratory extraction	1	Extraction for laboratory
AAS Machine	2	Precious metal analysis
Fork lift truck	1	Moving materials

Note: The plant/equipment on site may vary and additional equipment may be hired-in to cope with busy periods, larger jobs or jobs with specific requirements.

1.6 Hours of operation

1.6.1 The site will typically be operated in accordance with the following hours for the delivery and receipt of waste on site; including depositing, sorting, moving, storing and removing waste:

Monday to Friday	06:00 - 17:00
Saturday	No operations
Sundays, Bank/Public holidays	No operations

1.6.2 The only other activities on site which will be permitted outside of operational hours, will be maintenance works, emergency deliveries of waste/ plant machinery and general office use.

1.6.3 During the times when the site is closed and not operating, the site buildings will be locked and secured to prevent unauthorised vehicle and/or pedestrian access

1.7 Correspondence with Fire and Rescue Service

1.7.1 The FRS were contacted in the preparation of the FPP with a view to obtaining details regarding the nearest hydrants in the proximity of the site. The location of the nearest hydrant is show on Drawing No.2765-010-04.

1.7.2 Kaug Refinery Services Limited will seek a two-yearly response from the EA and FRS (or sooner should a fire incident occur) with regards to their FPP and associated operations on site. This regular correspondence will ensure all measures to prevent, mitigate and contain fires on site are up to date and deemed sufficient by the FRS.

1.8 Sensitive receptors

- 1.8.1 A Sensitive Receptors Plan has been provided in Appendix I and highlights all main receptors within 1,000m of the site.
- 1.8.2 All protected habitats, groundwater source protection zones, boreholes, wells, springs supplying water for human consumption are shown (if applicable) on this plan.
- 1.8.3 To minimise the impact on the local area and associated receptors from a fire on site, this document details mitigation measures which will decrease the likelihood of a fire occurring on site and limit the size and duration of a fire if it does occur (as per Section 1.1 above). These measures will ensure the potential impact on any of the surrounding land is as minimal as practicably possible.
- 1.8.4 The primary sensitive receptors for any fire event would be the site itself and any site users and the adjacent site and its users.

Table 1.3 – Common fire sources and mitigation

Receptor	Receptor Type	Source	Harm	Pathway	Probability of Exposure	Consequence	Magnitude of Risk	Risk Management
Numerous industrial and commercial uses surrounding the site.	Industrial / commercial premises	Fire causing the release of polluting materials to air (smoke, fumes and particulate matter)	Respiratory irritation, illness and nuisance to local population. Financial loss of businesses due to closure of adjacent roads/evacuation of premises.	Air transport of smoke.	High	Medium	Low	Procedures set out in this FPP. Toolbox talks and liaison meetings with receptors to review procedures in the event the site is subject of a fire.
Residential dwellings	Residential	As above	Respiratory irritation, illness and nuisance to local population.	Air transport of smoke.	Medium	Medium	Low	As above
Protected sites	Protected sites – European sites and SSSIs	As above	Harm to protected site through toxic contamination, nutrient enrichment, smothering, disturbance, predation etc.	Air transport of smoke.	Medium	Medium	Low	Procedures set out in this FPP
Nearby surface waters	Surface water	Direct run off of fire water across site or to surface waters. Fire causing the release of polluting materials to air (smoke, fumes and particulate matter).	Loss of amenity, deterioration of water quality, killing of flora / fauna and other local wildlife	Air transport of smoke. Direct run off of fire water across site to surface waters.	Low	Medium	Low	Procedures set out in this FPP. The site has a sealed drainage system and all firewater would be contained on site

2 Managing common causes of fire

2.1 Details

2.1.1 The following list outlines common causes of fire and outlines specific examples of these sources, the associated risks and any mitigation measures necessary to manage them:

Source	Risk	Magnitude of Risk / Likelihood	Brief outline of Mitigation (refer to Section 4 for storage/monitoring procedures)	Magnitude of risk / likelihood following mitigation
Arson or vandalism	Deliberate ignition of wastes by intruder(s) and/or vandalism of site infrastructure, plant and/or machinery which may give rise to malfunction or compromise the integrity of waste storage/containment measures	Medium	<ul style="list-style-type: none"> • Appropriate site security infrastructure. • Vehicle checks on arrival to the site. • Plant & equipment daily checks and preventative maintenance of plant / equipment by manufacturer. • Staff training / toolbox talks. 	Near-zero
Plant or equipment	Spillages of fuel, sparks from machinery or malfunction caused by ineffective maintenance	Medium	<ul style="list-style-type: none"> • Plant & equipment daily checks and preventative maintenance of plant / equipment by manufacturer. • Fuel stored in a bunded area. • Daily checks of site surfacing and spill kits. • Staff training / toolbox talks. 	Near zero
Electrical appliances and cabling	Faulty appliances or damaged/ exposed electrical cables may spark as a result of a power surge	Medium	<ul style="list-style-type: none"> • Fixed wiring testing is carried out 5 years and portable appliances are PAT tested 12 months in accordance with Legislation. • Daily checks for dust and fluff on wiring / electrical appliances. 	Low
Discarded smoking materials	Risk of ignition of stored wastes from smoking materials which have not been fully distinguished	Low	<ul style="list-style-type: none"> • No smoking or e-cigarettes allowed on site 	Near-zero
Sparks from loading buckets/shovels	Scraping of loading buckets/shovels causing sparks which may ignite stored wastes	Low	<ul style="list-style-type: none"> • Fire extinguishers are fitted in the cab of all loading plant. • Staff training / toolbox talks. • Plant & equipment daily checks and preventative maintenance of plant / equipment by manufacturer. 	Low
Hot works	e.g. welding, soldering, cutting, etc. which involve the use of high temperature equipment which may be a source of both primary and residual heat to stored wastes	Medium	<ul style="list-style-type: none"> • There will be a designated hot works area on site which is 6 metres away from combustible and flammable waste. 	Low
Industrial heating	Industrial heaters and/or pipework used to heat internal and external areas on site which may, in turn, supply heat to stored wastes increasing the risk of combustion	Low	<ul style="list-style-type: none"> • The site will have the following on site: <ul style="list-style-type: none"> ○ 3no. AmbiRad 22KW radiant tube gas heaters ○ 1no. Powrmatic 9KW gas heater • It is worth noting that the above heaters will be vented via flue(s) and will form part of the building fabrications. The heaters are used to heat the building for staff welfare purposes; they do not form part of the waste treatment activities. 	Low

Source	Risk	Magnitude of Risk / Likelihood	Brief outline of Mitigation (refer to Section 4 for storage/monitoring procedures)	Magnitude of risk / likelihood following mitigation
Hot exhausts	Potential source of both primary and residual heat to stored wastes	High	<ul style="list-style-type: none"> Fire extinguishers are fitted in the cab of all loading plant. Staff training / toolbox talks for continuous monitoring throughout the day to detect signs of a fire caused by dust settling on hot exhausts and engine parts. Plant & equipment daily checks and preventative maintenance of plant / equipment by manufacturer. Out-of-hours storage of plant & equipment away from combustible or flammable wastes. Daily checks for dust and fluff on plant/equipment before and use of equipment. 	Low
Build-up of loose combustible waste, dust and fluff	Light waste and ambient particulates with high combustibility settling and building up in key areas in and around plant/machinery and around exhausts	High	<ul style="list-style-type: none"> Fire extinguishers are fitted in the cab of all loading plant. Staff training / toolbox talks for continuous monitoring throughout the day to detect signs of a fire caused by dust settling on hot exhausts and engine parts. Plant & equipment daily checks and preventative maintenance of plant / equipment by manufacturer. Minimum daily checks for dust and fluff on plant/equipment before and use of equipment at the start/end of each working day. 	Low
Hot loads	Imported wastes which may contain materials which are above ambient temperature	High	<ul style="list-style-type: none"> All loads are inspected in accordance with strict waste acceptance procedures. Quarantine area and rejected waste containers on site for quick isolation of load. 	Low
Overhead power lines	Any overhead power lines on or around the site may ignite in the event of a fire and worsen the effects	Low	<ul style="list-style-type: none"> There are no overhead power lines which traverse the site. 	Near-zero
Ignition sources	Activities or appliances which use a source of both primary and residual heat to treat waste or manufacturer material or plant/equipment	Medium	<ul style="list-style-type: none"> There would be a designated hot works area on site which would be 6 metres away from combustible and flammable waste. Sources of ignition will be kept 6 metres away from combustible and flammable waste. 	Low
Batteries within waste deposits	Ignition of stored wastes via batteries within imported wastes	High	<ul style="list-style-type: none"> All loads are inspected in accordance with strict waste acceptance procedures. If batteries are found within any loads they will be rejected from the site or transferred to the quarantine area 	Medium
Other combustible non-waste materials on or near the site not mentioned above i.e. gas cylinders / LPG tanks	Any combustible non-waste materials on or near the site may ignite in the event of a fire and worsen the effects	High	<ul style="list-style-type: none"> All loads are inspected in accordance with strict waste acceptance procedures. Quarantine area and rejected waste containers on site for quick isolation of load. 	Low
Reaction between wastes	Combustible waste areas may ignite in the event of a fire and worsen the effects if wastes react	High	<ul style="list-style-type: none"> All loads are inspected in accordance with strict waste acceptance procedures. Quarantine area and rejected waste containers on site for quick isolation of load. 	Low
Leaks and spillages of oils and fuels	Fuels and combustible liquids leaking or trailing from site vehicles can combust or cause accidents leading to combustion	High	<ul style="list-style-type: none"> Spill kits available throughout the site. Suitable and sealed drainage system. Minimum daily checks for spillages around the site. Staff training / toolbox talks. 	Low

2.2 Fuel/Oil storage

2.2.1 The operator is not currently proposing to store any fuels on site.

2.3 Hot works procedure (if applicable)

2.3.1 Hot works carried out on site will be carried out in a designated hot works area, the following procedures apply:

- a) Check that hot work is required or could you use an alternative (drill and bolt etc).
- b) All hot works must be carried out away from other stored materials/wastes on site (i.e. 6 metres).
- c) Ensure the area is cleared of all flammables.
- d) Ensure you have TWO fire extinguishers to hand. The type would depend on your working environment but generally a CO₂ and a Powder extinguisher would be suitable.
- e) Ensure you have used screens to shield bystanders from sparks and welding flash.
- f) Ensure you have an observer to watch over you and check for sparks while you work
- g) When you are set up you must get the site supervisor or manager to check your preparation.
- h) If they are happy, they will sign your permit which should be displayed and you can proceed.
- i) During cutting/welding your observer should remain with you at all times and be constantly checking the area for sparks or signs of fire.
- j) When the work is complete again check for fire and if all looks OK, note the time the hot work finished on the permit.
- k) Check again for fire for at least 30 minutes and, if all is clear, the permit must be signed off. This would usually be by the person who authorised it.
- l) Hot work requires one permit per person for each day.

2.4 Smoking policy

2.4.1 There will be no smoking permitted within the waste storage building.

2.5 Mobile and fixed plant maintenance

2.5.1 All mobile and fixed plant on site including vehicles in the fleet will be subject to annual manufacturer maintenance to ensure proper working order in the form of service contracts.

2.5.2 Site management will undertake or delegate additional preventative maintenance checks on a more frequent basis i.e. daily, before, during and 1 hour at the end of each working day using a checklist similar to that in Appendix II to ensure the following:

- Machinery is mechanically sound for use and no presence of black fumes or trailing liquids visible prior to use or following shutoff of plant/equipment.
- Mobile plant is stored in the out-of-hours plant storage area following cessation of activities; and separation distances of 6m are observed between plant and any combustible or flammable material.
- In the building, all plant will be powered-down and completely shut off prior to cessation of operations on any given day.
- Plant which is not in use for any extended period is stored at least 6 metres from combustible waste.
- All plant and equipment vehicles are fitted with fire extinguishers in the cab. Rubber strips are not considered appropriate as they are usually removed via uneven and bumpy ground.

2.5.3 Dust from processing/treatment operations on site can settle throughout the working day onto processing plant, plant exhausts and engine parts so a fire-watch will be implemented after cessation of works and equipment powered down for 1 hour each day to remove any dust/fluff using brushes, hoses etc. Any build of dust/fluff will be removed from the equipment and deposited into a container to await removal from site and site management informed.

2.6 Site security

2.6.1 The site will have security perimeter fencing and entrance gate. The site will benefit from

an automated and monitored fire alarm with detectors, linked to site general alarm system; a monitoring centre will notify security and staff if a fire is detected; these security measures ensure that there is 24-hour on-and-off-site supervision.

2.6.2 The site security measures (fencing/gates) will be inspected on a daily basis and any defects which impair the effectiveness of the security will be repaired to the same or better standard within 7 working days. All repairs will be noted on the site diary within 24 hours of the event. The checklist in Appendix II provides further information. If unauthorised access becomes apparent as a problem at the site, the security measures will be reviewed, and improvements implemented.

2.7 Electrical faults or damaged/exposed electrical cables

2.7.1 All fixed wiring electrical cabling on site will be inspected daily by staff and serviced in accordance with Legislation (3/5 years) by fully qualified and certified electrical contractors to undertake both Planned Preventative Maintenance and Reactive Maintenance (under contract) of the following:

- a) Fire detection & alarm system;
- b) Emergency lighting;
- c) Machinery checks / services (as per manufacturers' instructions).

2.7.2 In terms of portable appliance testing (PAT), this will be serviced annually by qualified and certified electrical contractors.

2.7.3 Daily inspections of cabling, etc. will be undertaken and the daily Fire Checklist can be used as a reference. Any potential ignition sources from suspected electrical faults will be isolated and the appointed electrical contractors will be contacted immediately to rectify the situation. Where possible, staff will immediately remove any stored wastes from the vicinity of the fault area or cable traverse if safe to do so.

3 Waste acceptance procedures

3.1 General

3.1.1 Strict waste acceptance procedures are in place at the site as shown below and the following details will typically be recorded for every load accepted at the site (if applicable):

- a) The date and time of delivery.
- b) The name and address of the waste producer.
- c) The detailed and accurate description of the waste including type, quantity (in tonnes and/or cubic metres) and EWC codes.
- d) How the waste is contained e.g. loose, container type.
- e) The carrier's name and address.
- f) Driver's name, signature and vehicle registration No.
- g) Signature or initials of person(s) producing/ accepting/ inspecting/ carrying the waste.
- h) Additional handling details/notes made by the driver after inspection of the load.
- i) SIC code of the premises which produced the waste (where relevant).
- j) Waste hierarchy declaration.
- k) Information on previous treatment of the waste e.g. manual or mechanical (if applicable)

3.1.2 Wastes are predominantly delivered to the site using the operator's own vehicles; all waste material will be inspected upon collection to ensure that it conforms with the site acceptance criteria.

3.1.3 In the extremely unlikely event that material is delivered to the site by a third-party the load will be inspected upon arrival at the site to ensure it conforms with the acceptance criteria. If the non-conforming waste is discovered the waste will be rejected.

4 Managing waste

4.1 Stored combustible waste/materials

- 4.1.1 The main wastes accepted and stored on site which have been identified as having combustible potential are summarised in the table below which is also shown on Drawing No. 2765-010-03 in greater detail. The following table details the storage areas and duration for all combustible wastes stored on site. Wastes considered non-combustible have not been included in this table.

Table 4.1 – Combustible waste storage table

Plan Ref	Storage form/ containment	Height & width of firewall (m)	Approx. Max Length / Width (m)	Operational storage height (m)	Appox. Area (m²)	Conversion factor used	Approx. Volume (m³)	Max Duration of storage (worst case scenario)
Shredder (processing and storage area)	Enclosed storage arrangements in place	N/A	N/A	N/A	30m ²	N/A	N/A	<3 months

4.2 Waste storage

4.2.1 The building will provide full fire-fighting access from external areas of the site. The following table details the storage and monitoring procedures for all wastes/material stored at the site.

Table 4.2 – Waste storage and monitoring table

Storage Ref.	Storage/monitoring procedures to reduce the risk of fire
<ul style="list-style-type: none"> - Acid effluent, - Acid filters, - Acid area (dissolution of precious metals) 	<ul style="list-style-type: none"> • This area comprises the storage area for acid effluent and filters; the area also comprises the acid area for the dissolution of precious metals. • The area has enclosed storage arrangements in place. • The areas can be easily accessed for fire-fighting. • In addition to the security infrastructure detailed in Section 2.6, the waste will be visually monitored throughout the day by site operatives. • No further monitoring required.
<ul style="list-style-type: none"> - Shredder (processing and storage area) 	<ul style="list-style-type: none"> • This area comprises the shredder processing area and storage of shredded waste. • Stock rotation - The maximum duration of waste stored here will be 3 months, however this is a dynamic storage area as the process is ongoing and therefore the actual amount of time waste will be stored is likely to be less. • The area has enclosed storage arrangements in place. • The areas can be easily accessed for fire-fighting. • In addition to the security infrastructure detailed in Section 2.6, the waste will be visually monitored throughout the day by site operatives. • No further monitoring required.
<ul style="list-style-type: none"> - Barrel room 	<ul style="list-style-type: none"> • This area comprises the barrel storage room (area also includes the crushing and grinding of precious metals) • The area has enclosed storage arrangements in place. • The areas can be easily accessed for fire-fighting. • In addition to the security infrastructure detailed in Section 2.6, the waste will be visually monitored throughout the day by site operatives. • No further monitoring required.
<ul style="list-style-type: none"> - Furnace area 	<ul style="list-style-type: none"> • This area comprises the furnace area (which includes a small scale thermal appliance for metal decontamination; 1 x electric induction furnace for melting metals; 1 x gas furnace for melting metals; 2 x electric oven for drying of metal precipitates from chemical treatment). • The area has enclosed storage arrangements in place. • The areas can be easily accessed for fire-fighting.

Storage Ref.	Storage/monitoring procedures to reduce the risk of fire
	<ul style="list-style-type: none"> • In addition to the security infrastructure detailed in Section 2.6, the waste will be visually monitored throughout the day by site operatives. • No further monitoring required.
<ul style="list-style-type: none"> - Alkaline kettles - Alkaline filters - Alkaline stripping line - Alkaline tanks 	<ul style="list-style-type: none"> • This area comprises the storage area for alkaline filters, kettles and tanks; the area also comprises the alkaline stripping line. • The area has enclosed storage arrangements in place. • The areas can be easily accessed for fire-fighting. • In addition to the security infrastructure detailed in Section 2.6, the waste will be visually monitored throughout the day by site operatives. • No further monitoring required.
<ul style="list-style-type: none"> - Alkaline effluent storage 	<ul style="list-style-type: none"> • This area comprises the alkaline effluent storage area. • The area has enclosed storage arrangements in place. • The areas can be easily accessed for fire-fighting. • In addition to the security infrastructure detailed in Section 2.6, the waste will be visually monitored throughout the day by site operatives. • No further monitoring required.

4.3 Waste stored in containers

4.3.1 There are a number of areas which comprise the storage of waste in containers/boxes. The containers will be emptied/removed once full.

4.3.2 A clear area will be maintained and kept clear of obstruction in front of the containers in order to remove them in an emergency fire situation to the quarantine area should the container be the subject of a fire or any materials within a container were ignited.

4.3.3 Due to health and safety risk and potential risk of the fire spreading, the operator would not attempt to move a container full of waste which has fully ignited.

4.3.4 **Out of hours** - All waste stored in containers has been subject to rigorous processing/sorting and have a very low chance of self-combustion; the only risk of waste in containers igniting would be during operational hours i.e. staff negligence or arson when the site is open. Appropriate measures have been demonstrated throughout this FPP to ensure this risk of a container fire is minimised and extinguished efficiently.

4.4 Stock rotation and seasonal variations

4.4.1 In the unlikely event of destination site closures or seasonal demands for wastes leading to a longer storage duration, the operator has the ability to divert incoming waste to an alternative site. The operator can search for additional site's using EAs public register for alternative sites who could take this material, or they would contact the destination sites where waste from the site will be sent.

4.4.2 The list of outlets has not been provided due to confidentiality purposes however the contracts will range from daily – monthly depending on seasonal variations and demand for material.

4.5 External heating

It is considered that wastes which would be at risk of external heating are situated either within a building, container, shaded from buildings or are non-combustible.

5 Preventing fire spreading/self-combustion

5.1.1 The site will be manned by employees during normal operating hours.

5.2 Manage storage time

5.2.1 The site will reduce the risk of self-combustion by ensuring good stock rotation and minimal residence times for stored wastes. No combustible wastes will be stored on site for any longer than 3 months which is what the guidance permits.

5.2.2 Storage times for all stored combustible wastes on site are detailed in the Waste Storage Table in section 4.

5.2.3 **General** - All loads will be visually inspected before and after deposit to identify the potential for hot loads.

5.2.4 Whilst there are combustible wastes stored at the site, these will have been sorted and stored as described in subsequent sections of this document to await removal and have very little chance of combusting other than arson or staff negligence; both of which have been addressed in this FPP.

6 Prevent fire spreading

6.1 Waste storage general / fire breaks

- 6.1.1 Combustible waste will be stored as per Drawing No. 2765-010-03 and reference should be made to the Waste Storage Table to ensure the waste is stored within the guidelines of the table shown in 9.1 of the EA's FPP guidance.
- 6.1.2 The aim of the site is to process the incoming material and arrange for its export off site as soon as practicably possible, to minimise over-stocking which in-turn minimises the risk of overheating and spontaneous combustion.
- 6.1.3 Storage on flat ground: Site surfaces where wastes stored are and reduce the risk of falling materials accelerating the spread of fire.

7 Site inspection programme

7.1 Daily checks

- 7.1.1 Site management are responsible for carrying out daily site walks for checking drainage systems, security measures and waste storage areas. Site management can reference the fire checklist shown in Appendix II but may use internal check sheets. The site also carries out weekly inspections for firefighting equipment to ensure they are fit for purpose.
- 7.1.2 Carrying out the above checks daily will keep the levels of dust, fibre, paper and other loose combustible materials, which could aid in the acceleration of a fire, on site surfaces to a minimum and ensure all containment of wastes on site are functioning effectively in accordance with the storage limitations provided in the table on Drawing No. 2765-010-03.

7.2 Staff training

- 7.2.1 Operational staff will be subject to site inductions which includes basic fire emergency procedures by site management. If necessary, a third-party fire consultant will be contacted to carry out additional training.
- 7.2.2 A full test (drill) of the procedures in this document will be carried out every 12 months to test that the plan works. The first test will take place within one month of the agreement of this document with the EA. The outcome and any follow up training for staff will be documented in the site diary and relevant forms in the EMS. The fire checklist may also be used during the drill.

7.3 Toolbox talks

- 7.3.1 All operational staff will receive fire awareness training / toolbox talks by trained site management to detect early signs of fire and to minimise the chance of a fire breaking out; which will also include the procedures shown in this FPP.

8 Quarantine area

- 8.1.1 The operator only stores small quantities of combustible material onsite which will typically be dealt with in situ. The site will still benefit from a designated quarantine area which is accessible at all times and will allow for a 6-metre buffer from the site perimeter and other stored waste or materials on site.
- 8.1.2 The location has not been included on Drawing No. 010-2765-03 as the location may vary as operating conditions permit.
- 8.1.3 The waste would be moved using the onsite plant/equipment. In the event of a fire the area may be used either to isolate wastes which are smouldering to allow safe dissipation of heat without placing other areas on site at risk of ignition or to remove any wastes stored near any material affected by a fire to prevent fire spreading to adjacent storage areas. Waste will only be moved to the Quarantine Area if safe to do so.
- 8.1.4 As previously stated, it is anticipated that due to the small scale of the operations and low tonnage (<250 tpa), any fires would likely be dealt with in situ; the quarantine area is available as a secondary measure in the unlikely event that the fire can't be tackled in situ.

9 Fire detection procedure

9.1 Automated/out-of-hours detection

- 9.1.1 The site will benefit from an automated and monitored fire alarm with detectors, linked to site general alarm system; a monitoring centre will notify security and staff if a fire is detected. In addition to the above, the site will also carry out visual monitoring every 2-3 hours throughout the day.
- 9.1.2 In the event of a fire or signs of fire from the site out of hours, the site manager or TCM can call one other staff member to be at the site within 10 minutes to commence fire-fighting procedures. This ensures that at least 2 members of staff are available outside of office hours.
- 9.1.3 It is considered the FRS would be available within 10 minutes to assist the out-of-hours contact in suppressing and controlling the fire using their expertise and appliances.

9.2 Manual detection/on site detection

- 9.2.1 If a fire is detected or suspected by a member of staff during operational hours, the person will sound the fire alarm and report site/operations manager or TCM or can then then conduct the following procedure:
- a) Raise the fire alarm using radios to notify site management and other operational staff (if not already done by another staff member).
 - b) Initiate evacuation of staff and visitors on site to the meeting point and instruct delegated person(s) to conduct a roll-call to ensure all site users are accounted for.
 - c) Assess the intensity and scale of the fire and make a judgment as to whether the fire can be managed without the requirement for assistance from the emergency services i.e. using the hose or fire extinguishers.
 - d) If viable and safe, instruct necessary site staff to commence extinguishment.

10 Fire response procedures

10.1 Response procedure

10.1.1 Further to the detection measures in Section 8, the following procedures would apply in the event of a fire at the site:

- a) Call the Fire Response Service (FRS) immediately using 999.
- b) Call the EA's Emergency Contact Number.
- c) A suitably trained employee will initiate fire water containment measures to close the site's surface water drainage system (see Section 11).
- d) Prior to the FRS arriving, inform all neighbouring premises likely to be affected.
- e) If not previously informed, senior management of the company will be informed at this point of the details, nature and extent of the fire and whether assistance from staff from other depots is required.
- f) Ensure access routes are clear.
- g) If safe to do so, site management will inspect the location of the fire, to identify immediate risks to surrounding premises and the FRS.
- h) Ensure operators of appropriate machinery are standing by in a safe location to help create fire breaks, under the direction of the FRS when they arrive.
- i) Site management will identify themselves to the FRS as soon as they arrive on site and will provide them with a copy of this document and update them with relevant information that will assist them in dealing with a fire more effectively.
- j) Implement pollution control measures if safe to do so (see Section 12).

10.1.2 In the event of site management being absent from site, the operator will ensure the TCM or a suitably competent deputy is available during operating hours to take command of an incident should one occur.

10.2 Staff/Visitor Response Procedure

- 10.2.1 The following quick actions will be undertaken by site operatives where a fire is detected or suspected on site:
- a) Don't panic
 - b) Inform the site manager or technically competent manager immediately
 - c) Raise the alarm (if not done so already)
 - d) Do not try to tackle the fire yourself unless you are trained in doing so and you are sure of the nature of the fire
 - e) Leave the site using the nearest exit as quickly and as orderly as possible
 - f) Assemble at the specified fire assembly point
 - g) The site manager or delegated operative will be in charge of calling the emergency services on "999" and ensuring that all persons who were working in the building are assembled safely
 - h) Do not return to the site until you have been given the 'all clear' by the emergency services and/or site management / responsible person.

10.3 Evacuation of Staff (and Drill Procedure)

- 10.3.1 An evacuation plan has been formulated for the site and all operational staff will be made aware of the actions through site inductions, refresher training, toolbox talks etc.). The fast and effective evacuation of staff to the fire assembly point will increase safety on site and limit the impact of a fire on any persons on site.
- 10.3.2 Fire drills will take place every 12 months and 1 month after site operations commence to ensure evacuation times are acceptable and that site staff remain informed of evacuation procedures.
- 10.3.3 The drill will be a simulation of an emergency with the location of a mock fire notified to staff in order to test the response speed in deploying pollution control equipment i.e. including drain mats/plugs and ensure all firefighting equipment is sound. The fire check

form may also be completed and a detailed report of the outcome of the exercise will be prepared to assist with staff training.

10.4 Access for emergency services

10.4.1 The site has direct access for the emergency services. The width of the surrounding roads and gateway exceeds the minimum required by the FRS which is 3.7m. Site management will also ensure the 3.7m access routes are maintained throughout the working day and before cessation of works during site inspections.

10.5 Notifying nearby properties

10.5.1 The contact numbers of key sensitive receptors identified within 1km of the site who could be directly affected in the event of a fire along with the Receptor Plan will be stored within the site office.

10.5.2 As it isn't feasible for a contact number to be provided for every individual residential receptor and individual business within 1km, the most sensitive receptors and closest business receptors have been included within the table overleaf.

Table 10.1 – Receptor Contact Information

Contact	Description	Contact number
Redditch Borough Council	Contact for residential/small business receptors	01527 881770
Mikrofill	Adjacent commercial receptor	03452606020
Thermex Ltd	Adjacent commercial receptor	01527 62210

10.5.3 The above receptors will be contacted by a co-ordinated approach where staff from Kaug Refinery Services Limited will contact them by phone and/or email.

10.5.4 Once Emergency Services arrive on site i.e. FRS, Police, the lead authority (usually the Police) will co-ordinate a systematic approach to ensure all the relevant sensitive receptors within 1,000m are notified. This will involve via telephone calls, personal visits (knocking on doors).

In addition to this, the Emergency Services would also publicise the fire on their Social Media outlets and contact local news websites, radios who can also provide updates on the incident.

- 10.5.5 The police with the assistance of ECSS and any other attending authority will ensure all relevant properties are informed of the fire event and given clear instructions of the actions they need to take.

11 Supressing fire & water supply

11.1 General

11.1.1 Section 16 of the EA's FPP requires the site to have enough water available for firefighting to take place and to manage a worst-case scenario.

11.1.2 It is difficult to determine the largest storage area as the quantity of waste accepted at the site is <250tpa and will therefore result in only small quantities of stored material at the site which will typically vary throughout the year.

11.1.3 Details of fire hydrants have been discussed below as these may be used to fight any fire at the site (if required).

11.2 Adequate supply of water (on site)

11.2.1 As stated previously, there is a mains water supply, and the site will also have numerous other firefighting equipment i.e. extinguishers. If a large fire broke out, the operator would call the FRS to assist with tackling the fire.

11.3 Adequate supply of water (off site)

11.3.1 Due to the location of the site in an established industrial/commercial area, there are fire hydrants in close proximity to the site. As there is no readily available information in terms of off-site water supply, the following guidance on water supplies for industry extracted from The Local Government Association (LGA)/ Water UK National Guidance document has been referenced in order to determine an average flow:

- Up to one hectare minimum of 20 l/sec (1200 l/min)
- One to two hectares minimum of 35 l/sec (2100 l/min)
- Two to three hectares minimum of 50 l/sec (3000 l/min)
- Over three hectares minimum of 75 l/sec (4500 l/min)

11.3.2 Given that the site itself comprises an area of up to one hectare, this gives an approximate water supply of 20l/s (1200l/min) which will be more than sufficient in a worst-case scenario.

11.4 Internal

11.4.1 The building will be used for the processing and storage of wastes. The waste stored in these areas would be readily accessible by site staff and the FRS in the event of a fire.

11.4.2 There is access to fire extinguishers and hose reels to tackle a fire inside the waste buildings and any containers could be moved in the event of a fire to reduce the amount of dousing required.

11.5 On site techniques

11.5.1 As stated in the section above and below, the site benefits from fire-fighting equipment for smaller fires but large fires would require assistance from the FRS. If wastes have been isolated to the quarantine area, the operator can begin dousing any burned material.

11.6 Manoeuvrability on site

11.6.1 The operator will benefit from suitable plant which can move waste, containers around the site assisting the FRS having access to fires.

11.6.2 The plant can be used to:

- Remove or isolate any suspect material to the quarantine area; and,
- Continuous turning and monitoring until any heat is fully dissipated.

11.7 Alternative measures

11.7.1 The site will store small quantities of waste inside the waste transfer building (i.e. less than 250 tpa) and will have the following measures in place:

- The waste will be constantly monitored throughout the working day and outside of operational hours by CCTV.
- Monitored fire alarm.
- There will be visual monitoring of all combustible waste storage areas every 2-3 hours during the operational day by site operatives.
- The waste storage times are in line with what the guidance permits.
- The operator intends to keep stored wastes to an absolute minimum at all times.
- The site will have on-site firefighting equipment for the early suppression of any hotspots or fires which may be discovered day or night.
- The building will have direct access into the storage areas by mobile plant to remove burning material or material at risk of catching fire.

12 Managing fire water

12.1 General

- 12.1.1 The building is sealed to prevent water escaping into the external sewer system.
- 12.1.2 If there is any deviation from the current drainage arrangement, an amended FPP will be submitted for approval by the EA.

12.2 Fire water containment techniques

- 12.2.1 The FRS seek to undertake mitigating actions to prevent any firewater containment entering drains for 1 hour. This means that within this hour, staff could deploy the techniques detailed below and in Sections 12.3, 12.4 & 12.5 to ensure that sufficient containment is always available on site to ensure that no firewater escapes during a fire event:
- i) Remove any containers to an emergency container storage area
 - ii) Seal building entrances to stop fire water entering the external sewer system thus creating a lagoon within the building.
 - iii) Made contact with a tankering company to remove any excessive fire water.

12.3 Containment of fire water

- 12.3.1 The waste storage building comprises a concrete pad with sealed drainage; in the event of a fire the operator would place a fire boom over the building entrances which would seal the only conduit by which fire water could egress off site
- 12.3.2 Due to the small scale of the operations i.e., acceptance of <250tpa, there would be limited requirement for firewater containment; the building measures approximately 1,084m² and it is therefore anticipated that this would provide the required containment for firewater.

12.4 Fire water boom deployment procedure

- 12.4.1 Fire water booms will be available on site to place over the building entrance in the event of a fire. The fire water booms will be located on site and would be deployed in the event of a fire and positioned as per the plan to contain any fire water runoff. The booms have a 160mm diameter tube each side and using a standard water main i.e. the hose from the site could be filled and provide containment in <10 minutes based on the length of the boom (100m), the volume required and the 15 l/m from the standard hose.
- 12.4.2 A key member of senior staff will be responsible for arranging the deployment of the poly booms and will be trained in this procedure.
- 12.4.3 Upon confirmation that a significant volume of water is likely to be required for extinguishing a fire on site, the following deployment procedure for the poly booms will be observed:
- a) Take the boom roll;
 - b) Emplace the boom by rolling the necessary length;
 - c) Use supplied cable ties (also available in the site office) to seal the front end of the boom;
 - d) Using a sharp knife, cut the laid-out section from the remaining roll;
 - e) Using the Hose Reel, begin filling the first of the two chambers of the boom being sure to elevate the 'fill' end to prevent the water leaving the tube;
 - f) Once the first chamber is filled, repeat in second chamber ensuring the 'fill' end is kept elevated to prevent escape of water;
 - g) When both chambers are full the 'fill' end should be sealed using a cable tie thus completing deployment.
 - h) Typically, one side of the roll would be filled which has a 160mm diameter,
- 12.4.4 Once deployed, all booms should be regularly checked during a fire event to ensure that they are providing effective containment and that there are no breaches. Secondary/additional lengths of boom can be deployed in addition to the compulsory

locations using the same procedure (as above).

12.4.5 The fire water booms will be industry approved and consist of the same product as those issued to the FRS by the EA in their grab packs which all appliances now have. The firewater booms come in 10m rolls which is suitable for the site.

12.4.6 **Using the boom - the boom is used as follows:**

- Unroll the boom and seal one end with either an overhand knot or by using cable ties provided.
- Position boom and fill two large outer compartments with water from a hose reel.
- Seal open end with second cable tie.

12.4.7 An example of the boom is shown below referenced as (f) extracted from the EA grab back.



12.4.8 If there is any deviation from the above drainage arrangement, an amended FPP will be submitted for approval by the EA and FRS.

12.5 Removal of fire water

- 12.5.1 Upon successfully extinguishing a fire all standing fire water would be pumped using a hired-in vacuum tanker and deposited to a suitably permitted site for treatment.

- 12.5.2 The operator would also contact the water company to see if the fire water could be discharged into the foul system; this would obviously depend on the type of fire and the contamination of the fire water.

13 During and after an incident

13.1 Contingency Planning

- 13.1.1 In the event of a fire the site will cease bringing waste into the site.
- 13.1.2 No waste will be delivered to the site until the post-fire site recovery procedures outlined in below have been fully implemented and the site is authorised to re-open for waste acceptance.

13.2 Site decontamination

- 13.2.1 Surface water on site will be cleared using the following method:
- a) Using a bowser, all standing fire water should be sucked up and taken off site or stored in a tank/bowser prior to removal off site.
 - b) Using all available resources, manually clean out surface water gullies removing the debris to the pile of fire damaged waste for removal to landfill or permitted site.
 - c) Using a road sweeper, sweep the yard (damp as required using the bowser) until all ash and clinker has been removed.
 - d) All debris has now been isolated and all contaminated water holding areas have been cleaned and emptied.
 - e) Wash the yard down in entirety using clean water or allow a reasonably heavy rain shower to wash the yard down.
 - f) It is at this stage that site management should decide whether it is appropriate to remove the surface water protection measures, or repeat areas of the clean-up
- 13.2.2 If the clean-up operation has been deemed complete, the surface water protection measures can now be removed. This will be achieved using the following methods:
- a) Remove any temporary bungs/valves
 - b) Surface water discharge from the site is now possible the next time it rains to discharge to sewer. Ensure that surface water checks are made during the next rainfall event to

validate that clean-up has been undertaken satisfactorily. Record all findings and actions in the site diary.

- c) Account for all consumables that have been used in the fire and re-order / replace immediately.
- d) Restack, and re-locate all items used for the surface water protection during the fire to their storage locations ready for future deployment.
- e) Check monthly that items are still present and correct and still serviceable for use in an emergency.

13.2.3 The operator will liaise with the Environment Agency throughout the event ensuring they are satisfied with the clean-up programme and notify the operator when the site can begin accepting waste again onto site.

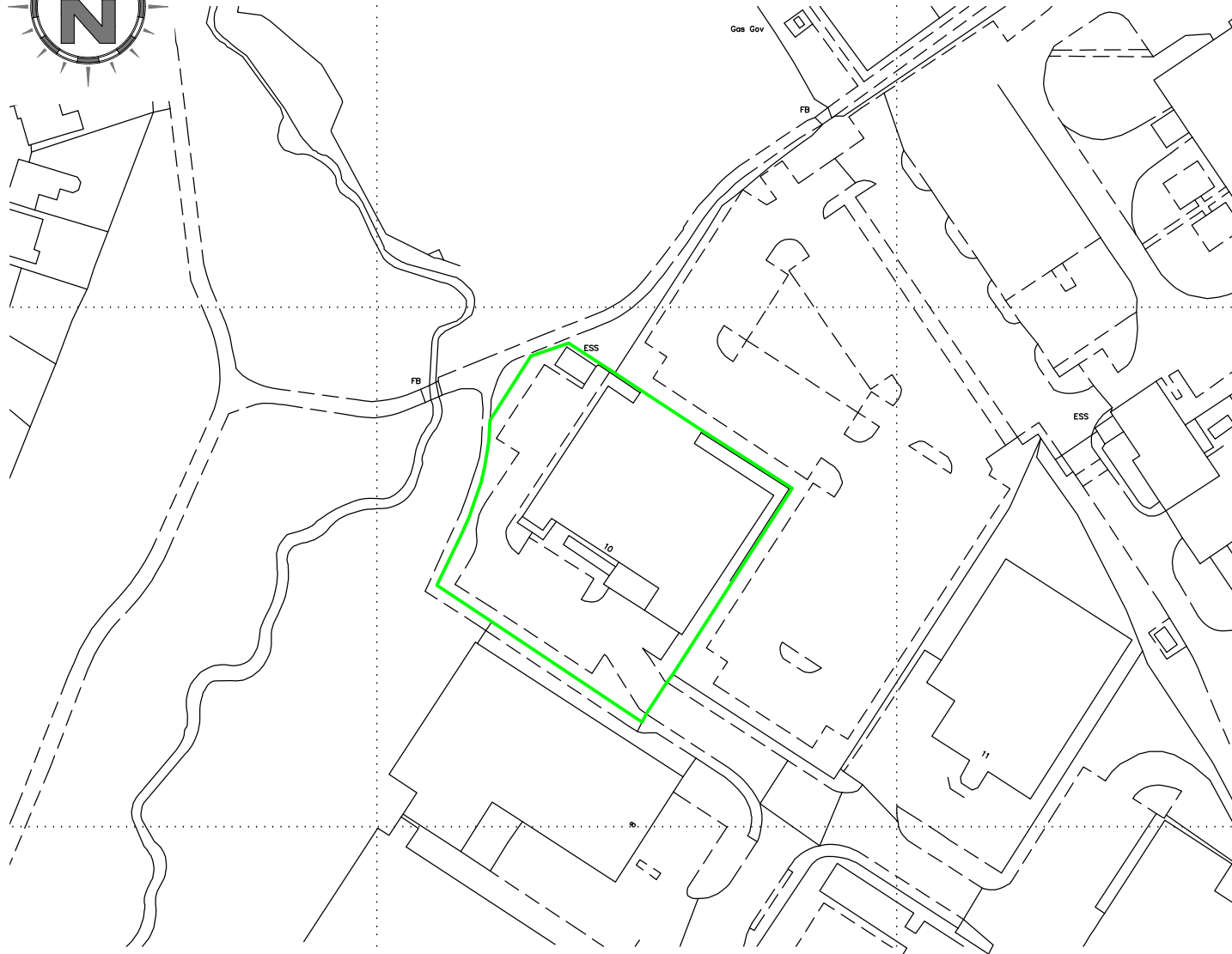
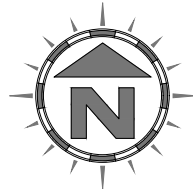
13.3 Post fire site recovery

13.3.1 If a recovery procedure is required, Kaug Refinery Services Limited would instigate the following;

- a) Remove damaged material to a permitted facility that is able to deal with it legally.
- b) Ask engineers to carry out repairs on any plant, vehicles and/or infrastructure.
- c) Assist the FRS with the fire investigation and where necessary engage the advice from a professional fire consultant.
- d) Review the FPP and EMS procedures and improve upon where found deficient.
- e) Review training requirements for staff.
- f) Assess whether further preventative measure could implemented.
- g) Ensure all fire equipment, where used, is replenished.
- h) Remove fire water to a permitted facility for disposal.

Appendix I

Drawings



NOTES

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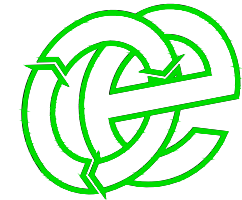
REVISION HISTORY

Rev:	Date:	Init:	Description:
-	05.12.22	JH	Initial drawing
A	05.01.23	IA	Address update
B	17.04.23	IA	Drawing title change

KEY:

Waste EP Permit boundary

Oaktree Environmental Ltd
Waste, Planning and Environmental Consultants



DRAWING TITLE
EP PERMIT BOUNDARY PLAN

CLIENT
Kaug Refinery Services Ltd

PROJECT/SITE
10 Merse Road, North Moons Moat, Redditch, B98 9HL

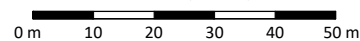
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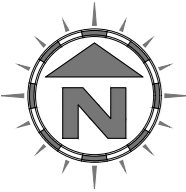
DRAWING NUMBER	REV	STATUS
2765-010-02	B	Issued

DRAWN BY	CHECKED	DATE
JH/IA	RS	17.04.23

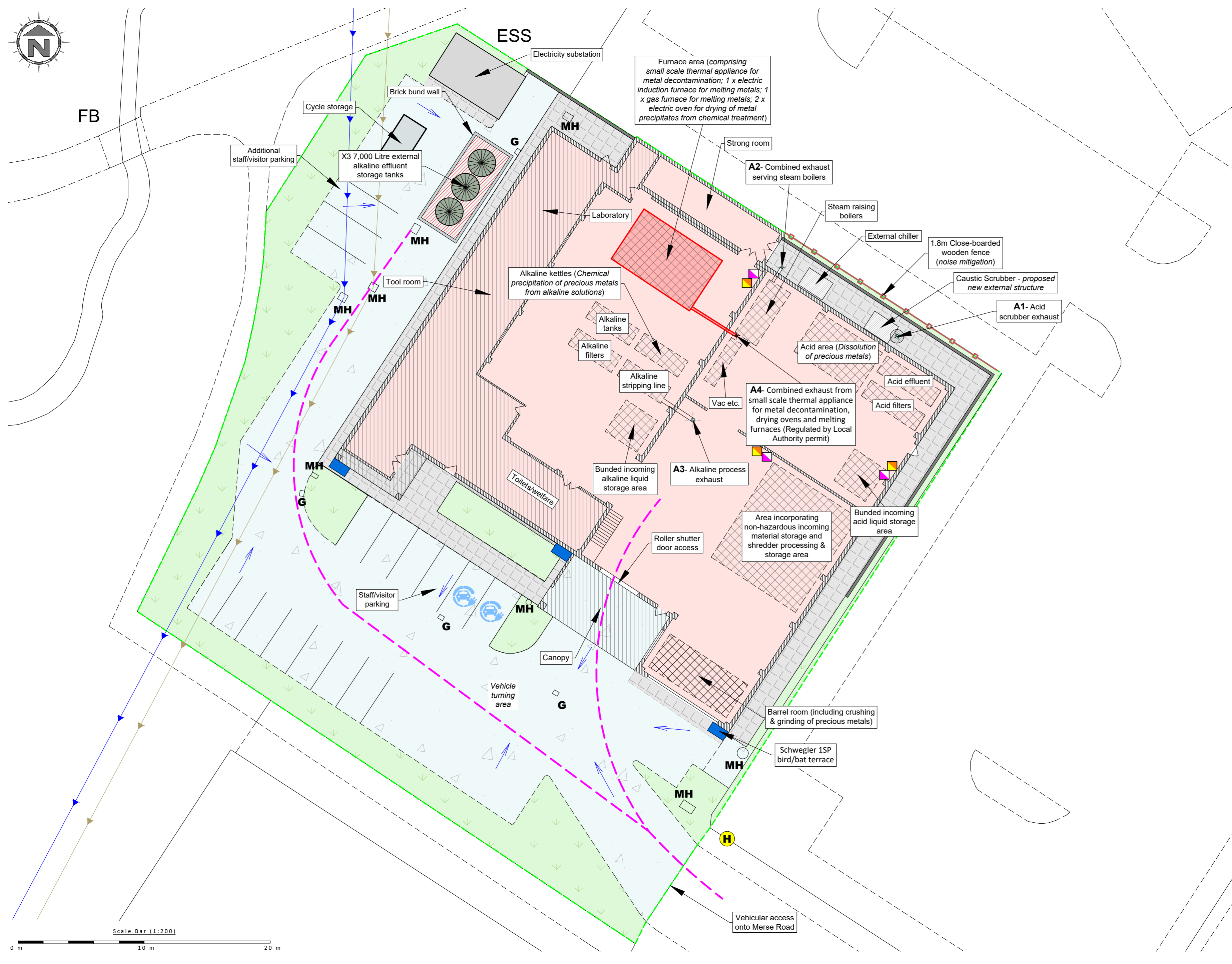
Lime House, Road Two, Winsford, Cheshire, CW7 3QZ
t: 01606 558833 | e: sales@oaktree-environmental.co.uk

Scale Bar (1:1,250)





FB

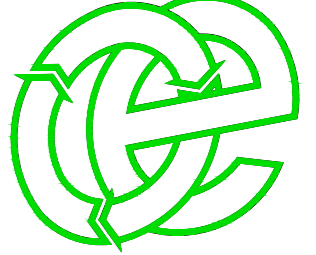


NOTES
 Site survey undertaken using Intel Falcon 8+ drone in September 2022. Ordnance Survey data reproduced with the permission of the controller of H.M.S.O. Crown copyright licence No. 100022432. This drawing is copyright and property of Oaktree Environmental Ltd.

Rev:	Date:	Init:	Description:
-	05.12.22	JH	Initial drawing
A	15.12.22	IA/JH	Drawing amendments
B	05.01.23	IA	Address update
C	22.03.23	IA	Layout changes
D	17.04.23	IA	Drawing amendments
E	04.05.23	IA	EA comments
F	28.07.23	IA	Drawing amendments
G	22.01.24	IA	Application resubmission

- KEY:**
- Waste EP Permit boundary (regulated by Environment Agency)
 - Part B Permit boundary (regulated by Local Authority)
 - Sealed buildings
 - Concreted areas
 - Spill kit
 - Firefighting equipment
 - Access routes for emergency vehicles
 - H Hydrant
 - MH** Manhole
 - G** Gully
 - Fall direction arrows
 - Paved areas
 - Un-surfaced areas

Oaktree Environmental Ltd
 Waste, Planning and Environmental Consultants



DRAWING TITLE
 SITE LAYOUT PLAN

CLIENT
 Kaug Refinery Services Ltd

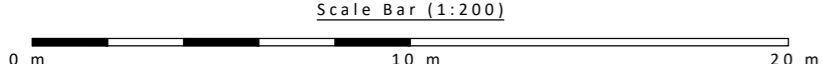
PROJECT/SITE
 10 Merse Road, North Moons Moat, Redditch, B98 9HL

SCALE @ A2 1:200 **CLIENT NO** 2765 **JOB NO** 010

DRAWING NUMBER 2765-010-03 **REV** G **STATUS** Issued

DRAWN BY JH/IA **CHECKED** RS/DY **DATE** 22.01.24

Lime House, Road Two, Winsford, Cheshire, CW7 3QZ
 t: 01606 558833 | e: sales@oaktree-environmental.co.uk



Appendix II

Record Keeping Forms

**KAUG REFINERY SERVICES LIMITED
 PREVENTATIVE MAINTENANCE CHECKLIST – KRS/RF/5**

CHECKED BY	POSITION
DATE	DATE OF LAST CHECKLIST

	EQUIPMENT ITEM					
OFFICIAL MAINTENANCE CHECK REQUIRED (Y/N)						
IF NO, DATE OF LAST CHECK						
IF YES, DATE OF NEXT CHECK						
IS ITEM IN CORRECT WORKING ORDER						
LEAKAGES OF OIL/DIESEL ON MOBILE PLANT / VEHICLES						
IF NO, WHAT REPAIRS ARE REQUIRED (USE SEPARATE SHEET IF REQUIRED)						
WERE REPAIRS DETAILED ON THE LAST CHECKLIST						
IF YES, HAVE THEY BEEN CARRIED OUT						
ADDITIONAL REPAIRS OR ACTIONS REQUIRED						

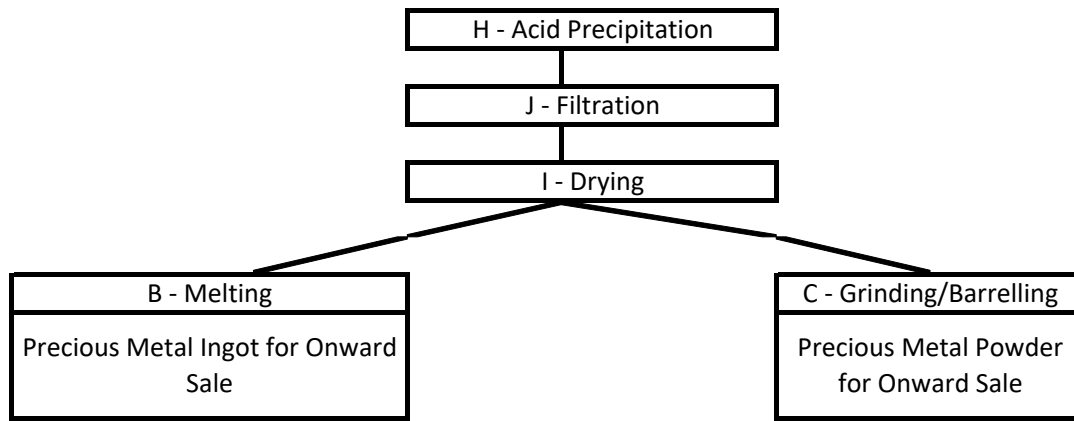
Appendix VII

Process Flow Diagram and Description

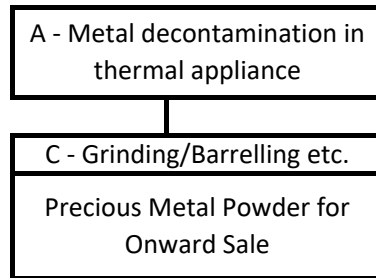
Process Ref.	Process	Objective	Input	Process & Equipment/Chemicals Used	Output	Likely Emissions
A	Thermal metal decontamination process	The removal of organic material to leave precious metal bearing ash for further processing	Individual batch processing of customers' precious metal bearing waste containing gold/silver/platinum/palladium/rhodium. Approx. 6.5 tonnes per annum throughput, generating approx. 4.0 tonnes of precious metal bearing ash for further processing	Small scale thermal decontamination unit (Addfield G20B unit)	Precious metal bearing ash	Please refer to document ref : 2765-009-C for details
B	Melting	Generation of homogeneous precious metal ingots suitable for assaying to determine precious metal content & for onward sale into the precious metal market	Metallic precious metal and precious metal powders containing gold/silver/platinum/palladium/rhodium received from customers and generated by in-house processing. Approx. 0.250 tonnes per annum)	Gas induction furnace (Bentone furnace, model no. STG146/2) and electric induction furnace (Radyne furnace, model no. 20TQ50)	Homogenous precious metal ingots	Please refer to document ref : 2765-009-C for details
C	Grinding/Barrelling/ Sieving/Blending	Creation of uniform, homogeneous powders suitable for assaying to determine precious metal content & for onward sale into the precious metal market. Also for the preparation of uniform powders for onward in-house processing via other processes	Precious metal powders containing gold/silver/platinum/palladium/rhodium received from customers or generated by in-house processing (from Processes A & I)	50kg & 100kg grinding & crushing mills and manual sieving	Homogenous precious metal powders	All dust captured by DCE system and returned to process loop for precious metal recovery
D	Printed Circuit Board Shredding	Shredding of gold plated, unpopulated boards and frames from UK circuit board manufacturers into approx. 4cm pieces for boxing & shipping to Belgium for precious metal recovery	Gold plated, unpopulated boards and frames from UK circuit board manufacturers. Approx. 100.0 tonnes per annum. Please note we do not incinerate printed circuit boards	Untha RS40-1000 37kW 4 shaft shredder	Shredded boards	All dust captured by DCE system and returned to process loop for precious metal recovery
E	Alkaline Strip Line	Individual batch processing of customers' material to remove surface plated gold from various substrates	Individual batch processing of customers' gold plated scrap on various, mainly metallic, substrates. Approx. 10 tonnes per annum	Immersion into 400 litre tank of warm strip solution (water, sodium cyanide, sodium hydroxide, sodium m-nitrobenzene & sodium carbonate) using semi-automated barrel line.	Gold bearing gold strip solution for further processing for recovery of gold via alkaline precipitation (Process F). Stripped substrate for onward sale or disposal	Steam
F	Alkaline Precipitation	Individual batch precipitation of gold/silver from customer's waste electroplating solutions or internal gold strip solutions (from Process E)	Customer's waste gold/silver electroplating solutions or internal gold strip solutions (from Process E). Approx. 36.0 tonnes per annum	Chemical precipitation of gold/silver precious metal powder in 1000, 450 or 80 litre steam jacketed vessels by the addition of dextrose/sodium dithionite/sodium hydroxide, subject to solution make-up.	Precious metal precipitate for further processing (Processes J & I)	Steam. Waste effluent stored onsite prior to regular removal via tanker to a registered disposal site (currently CSG)
G	Acid Dissolution	Individual batch processing of customers' material to separate gold/silver/platinum/palladium/rhodium from other substrates - base metal & inert material (plastic, glass, ceramic etc.)	Individual batches of customers' material containing gold/silver/platinum/palladium/rhodium on various substrates - base metal & inert material (plastic, glass, ceramic etc.). Approx. 1.120 tonnes per annum input, of which approx. 0.84 tonnes remains as undissolved residue	Dissolution using dilute nitric acid or dilute aqua regia (nitric & hydrochloric acid) in 225 litre glass lined, steam jacketed vessels with reflux condensers & caustic scrubber	Precious metal bearing solution for further processing for precious metal recovery (Process H) and residue for disposal or onward sale	Please refer to document ref : 2765-009-C for details
H	Acid Precipitation	Individual batch precipitation of gold/silver/platinum/palladium/rhodium from customer's waste electroplating solutions or internal acid solutions (from Process G)	Customer's waste gold/silver/platinum/palladium/rhodium acidic electroplating solutions or internal acid dissolution solutions (from Process G). Approx. 6.0 tonnes per annum	Chemical precipitation of gold/silver/platinum/palladium/rhodium precious metal powder in 225 litre glass lined, steam jacketed vessels with reflux condensers & caustic scrubber by the addition of the following: Silver = sodium chloride / gold = urea & ferrous sulphate / platinum, palladium & rhodium = zinc	Precious metal precipitate for further processing (Processes J & I)	No significant emissions anticipated. Effluents are all stored appropriately in enclosed containers/tanks/vessels

I	Drying	Drying of precious metal powders	Precious metal precipitates from alkaline precipitation (Process F) and acid precipitation (Process H) after filtration (Process J)	12kw & 1kw electric ovens	Dry precious metal powder for further processing via Process B or Process C	Not significant - air extracted via abatement plant serving thermal decontamination appliance
J	Filtration	Separation of liquid from precious metal precipitates	Precious metal precipitates from alkaline precipitation (Process F) and acid precipitation (Process H)	Ceramic vacuum filters	Damp precious metal powder for further processing (Process I)	None

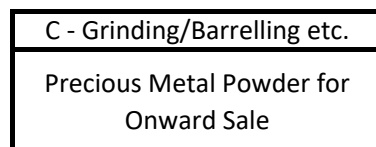
- 06 01 06* Acidic precious metal electroplating solutions
- 11 01 06* Acidic precious metal electroplating solutions
- 11 01 12 Aqueous platinum rinse solution



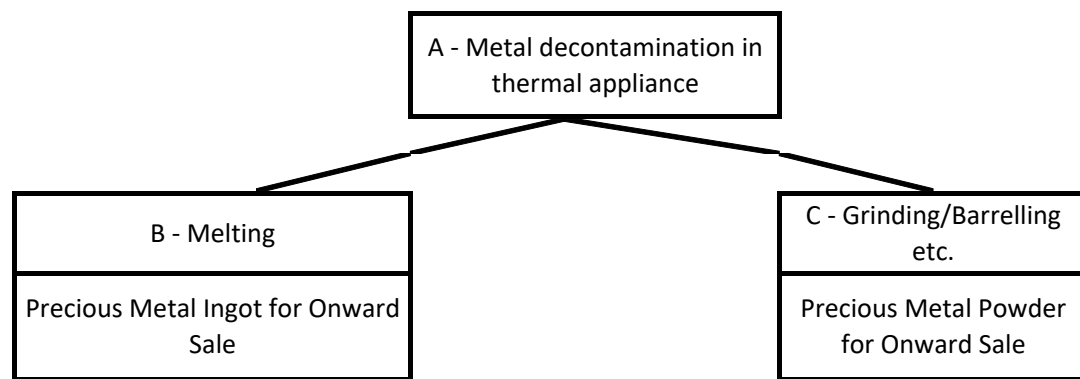
- 08 01 11* Precious metal
- 08 01 12 containing
- 08 01 13* pastes/paints
- 08 01 14
- 08 01 99 Rags & wipes contaminated with precious metal containing pastes/paints
- 08 02 01 Precious metal containing paint powder
- 08 03 12* Precious metal containing ink
- 08 03 13 Precious metal containing ink
- 10 12 99 Precious metal transfers, jewellers polishing wheels



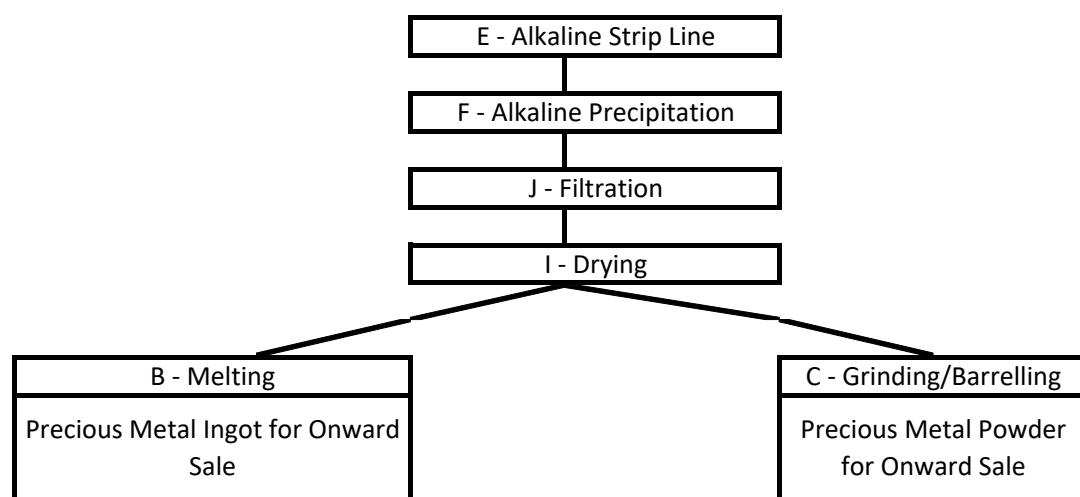
- 10 07 01 Precious metal containing
- 10 07 02 slags/crucibles
- 12 01 17 Grit blast containing platinum



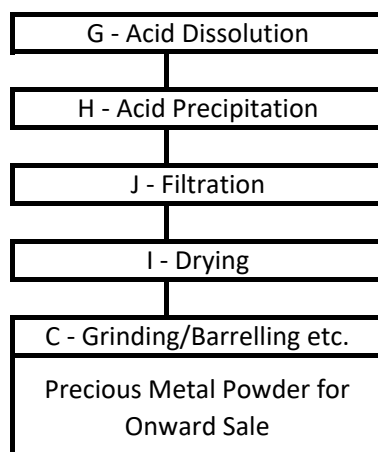
10 07 04 Jewellery sweeps, bench lemls & extraction bags
15 02 03 Rags/wipes/gloves/filter materials/protective clothing contaminated with precious metals



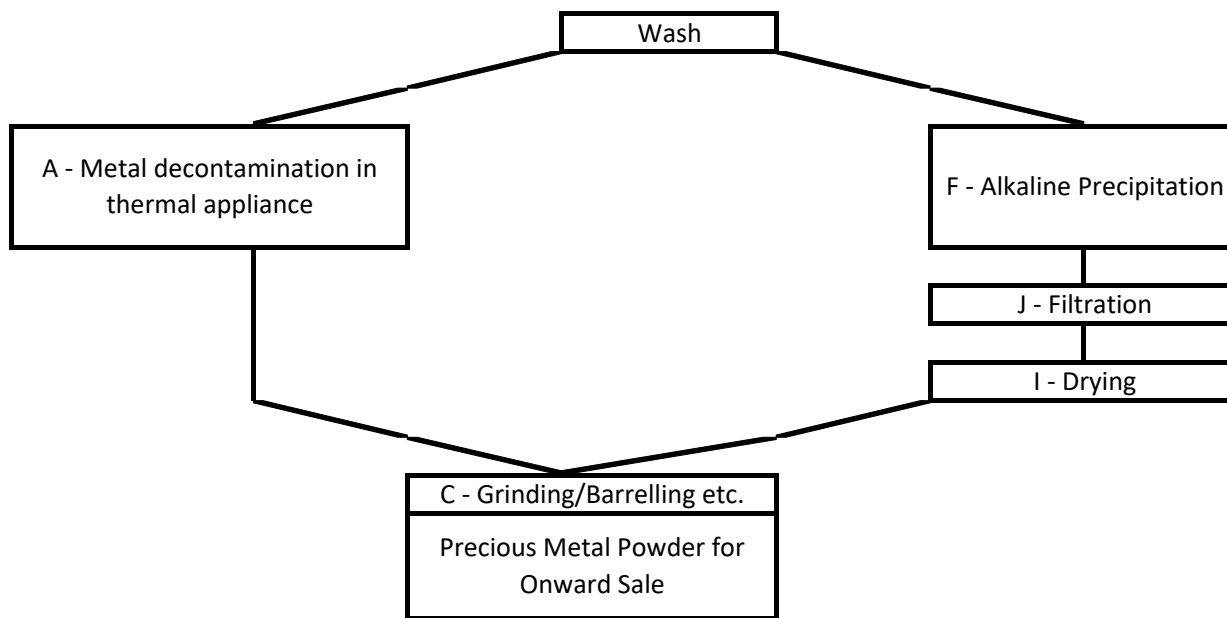
10 12 08 China with Precious Metal Decoration
20 01 40 Gold/silver plated scrap



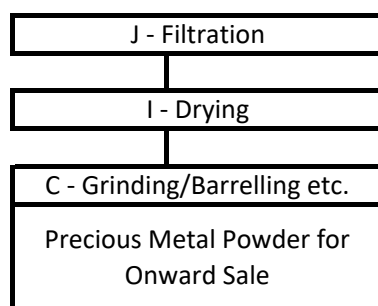
11 01 09* Sludges/tanks bottoms from acidic precious metal electroplating solutions
11 01 99 Platinum coated scrap plastic plating tanks, gold plated ceramic/tungsten scrap etc.
20 01 40 Precious metal plated scrap not suitable for surface stripping/jig scrapings



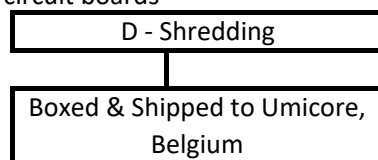
- 11 01 98* Filters from alkaline precious metal electroplating solutions
- 15 02 02* Filters from alkaline precious metal electroplating solutions



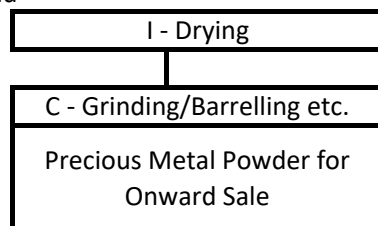
- 12 01 99 Sludge containing precious metal from jewellers handwash tanks
- 12 01 15 Jewellery deburring compound containing precious metal



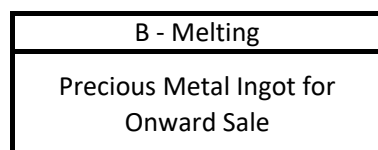
- 16 02 16 Unpopulated gold plated printed circuit boards



- 19 09 05 Ion exchange resin containing gold



- 20 01 40 Clean precious metal scrap



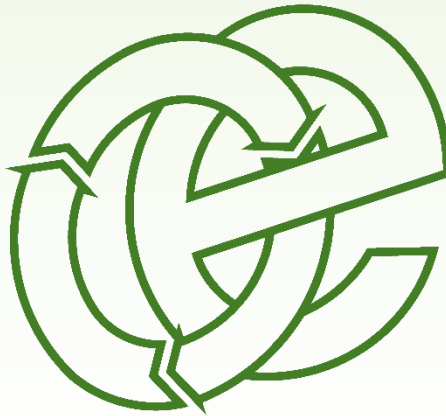
Appendix VIII

BAT Assessment

PRECIOUS METALS RECOVERY FACILITY, MERSE ROAD - BEST AVAILABLE TECHNIQUES ASSESSMENT

Kaug Refinery Services Limited

Version:	1.2	Date:	01/03/2024		
Doc. Ref:	2765-010-G	Author(s):	DY	Checked:	
Client No:	2765	Job No:	010		



Oaktree Environmental Ltd
Waste, Planning & Environmental Consultants



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REGISTERED IN THE UK | COMPANY NO. 4850754

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Document History:

Version	Issue date	Author	Checked	Description
1.0	06/06/2023	DY		Internal draft
1.1	28/07/2023	DY/IA		Draft for client comment
1.2	01/03/2024	DY		Application copy

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1 Introduction

1.1 This document includes an assessment of Best Available Techniques (BAT), which has been undertaken against the relevant BAT measures contained within the following documents:

- Commission Implementing Decision (EU) 2016/1032 of 13 June 2016 Establishing Best Available Techniques (BAT) Conclusions, Under Directive 2010/75/EU of the European Parliament and of the Council, for the Non-Ferrous Metals Industries¹.

1.2 This document has been prepared as part of the permit application for the proposed operation of an facility for the recovery of precious metals from waste. Throughout this document, reference has been made to other application documents, where relevant, which should be read in conjunction with this document.

1.3 It should be noted that in addition to the Part A1 installation activity being applied for, the site will also include Part B permitted activities which will be regulated by Worcestershire Regulatory Services, as highlighted on the Site Layout Plan. The consideration of BAT for the purpose of this document is therefore limited to the Part A1 activities and is not applicable to the Part B activities, including the small scale thermal appliance for metal decontamination and small scale melting furnaces.

¹ Commission Implementing Decision (EU) 2018/1032 of 13 June 2016 Establishing Best Available Techniques (BAT) Conclusions, Under Directive 2010/75/EU of the European Parliament and of the Council, for the Non-Ferrous Metals Industries.

2 BAT Assessment

2.1 Overview

2.1.1 The following sections provide assessment of BAT compliance for the proposed plant against the relevant BAT measures within the EU BAT Conclusions document¹.

2.2 BAT 1 – Environmental Management System

2.2.1 An EMS has been prepared for the operation, which has been submitted with this permit application, providing compliance with BAT 1.

2.3 BAT 2 – Energy Management

2.3.1 The process is extremely small scale and specialist in nature, with a maximum of 250 tonnes of waste to be accepted on site each year, a large proportion of which will be frames and unpopulated printed circuit board waste from the UK PCB manufacturing industry (approximately 100 tonnes) which will be simply shredded and sent for further recovery, plus associated base metal scrap (approximately 65 tonnes) which will be sorted, batched and sent on for further recovery. Much smaller quantities of wastes will be subject to chemical and thermal treatment for extraction of precious metals. It should be noted that efficiency of the process is correlated to the economics of the operation. It is not in the interests of the operator to be using any more energy than is absolutely required for successful operation of the process. This is especially critical given the small scale nature of the operations.

2.3.2 Given the very small scale of the facility, it is not considered that an ISO 50001 accredited Energy Management System is warranted. It must also be noted that the operator has not been required to have an accredited Energy Management System in place for their existing operation which is identical in scale and type, which has been regulated by the Environment Agency (EA) for several years.

- 2.3.3 Although the site will include two steam boilers (one as a backup), the use of regenerative or recuperative burners is not considered applicable. The boilers are operated infrequently on a batch basis to raise steam for the acid and alkaline metal precipitation processes, which will include a maximum of 35 to 40 tonnes per year of input material. The use of regenerative and recuperative burners would introduce a significant additional cost, which would not be proportionate to the scale of the process. The use of waste heat recovery systems would also not be considered warranted or indeed practical given the small scale batch nature of the operation.
- 2.3.4 Drying ovens are used to dry metal precipitates. This will be undertaken in electric ovens with a specific rating level. Although the drying ovens have the ability to vary the temperature, the site will dry the precious metal precipitates at 70°. The electric ovens are operated at low temperature.
- 2.3.5 High temperature equipment will be suitably insulated to minimise heat loss. Steam and hot water pipes are constructed with galvanised steel which has reduced heat loss compared to other materials. Again, it should be remembered that it is not in the interests of the operator for heat to be wasted as this would result in less efficient and more costly processes.
- 2.3.6 The extraction systems are designed to operate with an optimum flow rate based on the associated abatement plant.

2.4 BAT 3 and 4 – Process Control

- 2.4.1 The process will include a series of specialist chemical and physical processing operations to recover precious metals from wastes. The specific process used will depend on the type of wastes received and as demonstrated by the process flow diagrams submitted in support of the permit application, a combination of processes will sometimes be used.
- 2.4.2 All wastes brought onto site will be weighed, as will all products/wastes exported from site.
- 2.4.3 Processes will be operated on a batch basis rather than continuous and therefore feed rates of materials will be manually controlled in accordance with plant capacity. Given the batch

nature of the operations, equipment failures would become immediately apparent to the operator.

- 2.4.4 All plant and machinery will be operated in accordance with manufacturer specification and in accordance with relevant Health and Safety requirements.
- 2.4.5 The acid scrubber, including dosing of caustic soda will be in accordance with manufacturer specification and pH will be monitored during operation of the abatement plan to ensure efficient control of any residual acid gases arising from the process.
- 2.4.6 All abatement plant will be operated in accordance with manufacturer specification and planned preventive maintenance and servicing will be undertaken, as required. Dust filters will be replaced at a recommended interval.

2.5 BAT 5, 6 , 8 and 9 – Diffuse Emissions

- 2.5.1 Diffuse emissions are not anticipated to be a significant issue. All wastes and raw materials will be delivered to site in enclosed containers and vessels and all processes will either be enclosed or extracted in a controlled manor. Dust will not be a significant issue. Any dust would contain valuable precious metals and therefore great care will be taken to ensure diffuse emissions of dust are not generated.
- 2.5.2 All operations will be enclosed within a building and wastes and raw materials stored within enclosed vessels and containers. Products from the process will also be stored within sealed containers/vessels.
- 2.5.3 Chemical storage/processing tanks will be designed to be resistant to the materials contained within and all will be appropriately bunded to ensure sufficient secondary containment.
- 2.5.4 Acid and Alkaline chemicals will be stored in separate, designated areas within the building, as shown on the layout plan.

- 2.5.5 Wastes and chemicals will be stored in the area designated for processing of the materials concerned, ensuring that transportation distances are minimised.
- 2.5.6 Drop heights of materials will be minimised as far as is possible.
- 2.5.7 As demonstrated by the process flow diagrams submitted in support of the application, some elements of pre-treatment will be undertaken on some waste feeds to ensure efficient and optimum operation of the process.
- 2.5.8 Abatement plant will be used throughout the process to control potential emissions. An alkaline scrubbing unit using caustic soda will be used to control emissions from emission point A1. Exhaust air from thermal appliances, including the drying ovens, will directed to an abatement plant which will include baghouse filtration for dust control and sorbent injection, including activated carbon and sodium bicarbonate for control of organic compounds and acid gases, prior to release of exhaust air via emission point A4. A filtration system will be used to contain dust from the shredding operation.

2.6 **BAT 8 – Monitoring of Emissions to Air**

- 2.6.1 The table below outlines proposed emissions monitoring, in accordance with BAT.

Table 2.1 – Emission Limits and Monitoring Requirements – Emission Point A1

Pollutant	Emission Limits (mg.Nm ⁻³) Expressed at Reference Conditions of 273.15K, 101.3kPa, dry gas	Monitoring Frequency	Monitoring Method
Nitrogen Oxides (NO _x)	150	Annual extractive test	Manual extractive test – EN14792
Sulphur dioxide (SO ₂)	100	Annual extractive test	Manual extractive test – EN14791
Hydrogen Chloride (HCL)	10	Annual extractive test	Manual extractive test - EN 1911 or EN 16429
Chlorine	2	Annual extractive test	Manual extractive test – USEPA Method 26 A

2.7 BAT 18 – Noise

- 2.7.1 The Noise Impact Assessment submitted as part of this application has demonstrated that noise impacts will not be significant. A Noise Management Plan has also been prepared ensuring compliance with BAT 18.

2.8 BAT 19 – Odour

- 2.8.1 Odour is not expected to present an issue, given the small quantities of wastes to be handled, the types of wastes to be treated and enclosure of all operations within a building. However, the operator will maintain a complaints procedure as part of the EMS to ensure that should complaints of odour arise, these are fully investigated.

2.9 BAT 136, 137 and 138 – Diffuse Emissions from Precious Metals Production

- 2.9.1 Vessels and pipework within the acid and alkaline chemical processing area will be enclosed. An acid scrubber will be used to abate and control acid gases prior to release via elevated flue. Air from the alkaline metal extraction area will be released via elevated flue to dilute and disperse exhaust air. Preventative maintenance will be carried out on plant and equipment in accordance with manufacturer specification. Acid and alkaline effluents from the metal precipitation processes will be sealed and contained within bunded storage areas. Fume hoods will be used to extract exhaust air from drying ovens, which will be directed to abatement plant prior to release via elevated exhaust flue.

2.10 BAT 141 – NO_x Emissions from Hydrometallurgical Operations Including Digestion with Nitric Acid

- 2.10.1 A dedicated acid scrubber will be used to abate potential emissions from the acid processing area. This will include dosing with sodium hydroxide.

2.11 BAT 143 – SO₂ Emissions from Hydrometallurgical Operation

2.11.1 Wet scrubbing using sodium hydroxide will be used to control potential emissions of SO₂ from the acid processing area. Sorbent injection using sodium bicarbonate will be used to abate potential acid gas emissions from the drying operation.

2.12 BAT 144 – Hydrogen Chloride and Chlorine Emissions from Hydrometallurgical Operation

2.12.1 Wet scrubbing using sodium hydroxide will be used to control potential emissions of Hydrogen Chloride and Chlorine from the acid processing area. injection using sodium bicarbonate will be used to abate potential acid gas emissions from the drying operation.

2.13 BAT 147 – Soil and Groundwater Protection

2.13.1 Chemicals will be stored within appropriately bunded areas. Floors will be impermeable and acid resistant. All effluents will be exported from the site for disposal.

2.14 BAT 148 and 149 – Wastewater Generation and Waste

2.14.1 Wastes will be minimal from the process and will primarily include acid and alkaline effluents remaining after stripping and precipitation of precious metals. There will be no recycling of scrubbing liquids or hydrometallurgical reagents. It is in the interest of the operator to recover as much precious metal as is possible from solutions. The remaining concentrations of precious metals in solutions following extraction will be very low and the extra energy required for further processing would not therefore be warranted.

Appendix IX

Emissions Modelling Assessment

EMISSIONS MODELLING ASSESSMENT - PRECIOUS METALS RECOVERY FACILITY, MERSE ROAD, REDDITCH

Kaug Refinery Services Limited

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1 Introduction

1.1 Background and Context of Assessment

1.1.1 Kaug Refinery Services Limited are applying for planning permission and Environmental Permits for the operation of a facility for the recovery of precious metals from wastes at a site on Merse Road, Redditch. This assessment has been undertaken to predict the potential air quality impacts at sensitive receptor locations as a result of residual emissions associated with the proposed process.

1.2 Site Location

1.2.1 The site is located at 10 Merse Road, Redditch. The site location is industrial and therefore highly suited to this type of development. Reference should be made to the site location plan within Appendix I for details of the site location.

1.3 Proposed Activities and Environmental Context

1.3.1 Reference should be made to Appendix I for a site layout plan. Kaug Refinery Services Ltd are proposing to operate a facility for recovery of precious metals from wastes. The plant will be very small scale in nature, with a maximum throughput of 250 tonnes/annum. Various specialist thermal, acid and alkaline treatment processes will be undertaken to extract precious metals from the following types of typical wastes/materials:

- Printed circuit scrap and edge connectors;
- Connectors, switches and pins;
- Reel to reel;
- Webbing & stamping scrap;
- Gold rags, wipes, bottles etc;
- Screen printing waste;
- Lithographic waste;
- China;
- Gold colour;

- Gold plating solutions and dragouts;
- Gold stripping solutions;
- Silver solutions;
- Platinum, Palladium and Rhodium solutions;
- Ion exchange resins;
- Filters;
- Carbon packs;
- Anodes;
- Polishings and sweeps;
- Lemels and cuttings;
- Bombing (stripping) solutions;
- De-burring;
- Fan dust;
- Polishing grain;
- Casting scrap;
- Crucibles; and,
- Clean scrap.

1.3.2 There will be four principal point source emissions from the process as follows, as identified on the layout plan within Appendix I:

- Emission Point A1 – Flue serving acid scrubber (abatement of fumes from acid dissolution process);
- Emission Point A2 – Combined exhaust flue from steam boilers, used to generate steam for chemical treatment processes;
- Emission Point A3 - Flue serving alkaline based metal extraction process; and,
- Emission Point A4 – Combined flue serving thermal treatment processes, including small scale metal decontamination combustion appliance, small scale melting furnaces and drying ovens.

1.3.3 The operation of the process will have the potential to create airborne emissions and subsequent impacts upon the surrounding environment. Potential air quality impacts have

been quantified within this report through prediction of resulting ground level pollutant concentrations which have been compared to the relevant Air Quality Limit Values (AQLVs), Environmental Assessment Levels (EALs), critical levels and loads.

1.4 Environmental Regulation

- 1.4.1 The site will be regulated in accordance with two Environmental Permits (EPs). This will include an EA regulated EP for the chemical and physical waste processing operations and a Part B EP for the small scale thermal treatment appliances, regulated by Worcestershire Regulatory Services (WRS).

2 Air Quality Standards

2.1 Air Quality Limit Values and Objectives

2.1.1 The tables below contain the AQLVs and Air Quality Objectives which are relevant to this assessment. These have been obtained from the government permitting risk assessment website.

Table 2.1 - Air Quality Limit Values

Pollutant	Measured As	Purpose	AQLVs
Particulate matter less than 10µm in aerodynamic diameter (PM ₁₀)	24-hour mean	Protection of human health	50µg.m ⁻³ (not to be exceeded more than 35 times per calendar year)
	Annual mean	Protection of human health	40µg.m ⁻³
Particulate matter less than 2.5µm in aerodynamic diameter (PM _{2.5})	Annual mean	Protection of human health	20µg.m ⁻³
Nitrogen dioxide (NO ₂)	Annual mean	Protection of human health	40µg.m ⁻³
	Hourly Mean	Protection of human health	200µg.m ⁻³ (not to be exceeded more than 18 times per calendar year)
Sulphur dioxide (SO ₂)	1-hour mean	Protection of human health	350µg.m ⁻³ (not to be exceeded more than 24 times per calendar year)
	24-hour mean	Protection of human health	125µg.m ⁻³ (not to be exceeded more than 3 times per calendar year)
Benzene	Annual Mean	Protection of human health	5µg.m ⁻³
Carbon monoxide (CO)	Maximum daily running 8-hour mean	Protection of human health	10mg.m ⁻³

Table 2.2 - UK Air Quality Strategy Objectives

Pollutant	Measured As	Purpose	Ambient Air Directive Target Values and UK Air Quality Strategy Objectives
SO ₂	15-minute mean	Protection of human health	266µg.m ⁻³ (not to be exceeded more than 35 times per calendar year)

2.2 Environmental Assessment Levels

2.2.1 A list of short and long-term EALs relevant to this assessment are presented in the table below. These have been obtained from the permitting risk assessment guidance on the government website¹.

Table 2.3 - Environmental Assessment Levels

Substance	EALs		
	Annual Mean Limit ($\mu\text{g}\cdot\text{m}^{-3}$)	24-Hour Mean Limit ($\mu\text{g}\cdot\text{m}^{-3}$)	Hourly Mean Limit ($\mu\text{g}\cdot\text{m}^{-3}$)
CO	-	-	30,000
Benzene	-	30	-
Hydrogen Chloride (HCL)	-	-	750
Chlorine	-	-	290

2.3 Critical Levels for Protection of Vegetation and Ecosystems

2.3.1 The table below contains critical levels for the protection of vegetation at nature conservation sites, obtained from permitting risk assessment guidance on the government permitting risk assessment website.

Table 2.4 – Critical Levels

Pollutant	Critical Levels	
	Concentration ($\mu\text{g}\cdot\text{m}^{-3}$)	Measured As
Nitrogen oxide (NO_x , expressed as NO_2)	30	Annual mean
	75	Daily mean
SO_2	20 ($10\mu\text{g}\cdot\text{m}^{-3}$ where lichens or bryophytes are present)	Annual mean

¹ <https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit>

2.4 Critical Loads for Protection of Vegetation and Ecosystems

2.4.1 Critical loads are assigned for nitrogen and acid deposition at sensitive ecological sites, above which it is suggested harmful effects on vegetation may occur. The relevant guidance requires assessment of potential impacts at Special Protection Areas (SPA), Special Areas of Conservation (SAC) and Ramsar sites within 10km of a process and Sites of Special Scientific Interest and local nature sites (Local Wildlife Sites (LWS), ancient woodland areas and Local Nature Reserves (LNR)) within 2km of a process. The table below identifies relevant ecological sites which have required assessment. Reference has been made to the APIS website to determine site specific critical loads for SSSIs. No site specific information is available on critical loads for local nature sites. Therefore, the tables below contain worst case critical loads for local nature sites to ensure a precautionary assessment.

Table 2.5 – Worst Case Critical Load for Nitrogen Deposition

Site	Worst Case Critical Load for Nitrogen Deposition (Kg N.ha ⁻¹ .Year ⁻¹)
Ipsley Alders Marsh SSSI	10
All local nature sites within 2km	3

Table 2.6 – Worst Case Critical Loads for Acid Deposition

Site	Worst Case Critical Load for Acid Deposition (keq.ha ⁻¹ .Year ⁻¹)	
	MinCLMinN	MinCLMaxN
Ipsley Alders Marsh SSSI	0.856	4.856
All local nature sites within 2km	0.1	0.1

3 Baseline Position

3.1 Air Quality Across Redditch Borough

3.1.1 Redditch Borough Council (RBC) are required to undertake a review and assessment of air quality within their area of jurisdiction under Section 82 part IV of the Environment Act (1995). Local Authorities (LAs) are obligated to prepare an Annual Status Report (ASR) each year. For areas where AQLVs are not expected to be achieved, the LA will undertake further assessment. Subsequently, if AQLVs are not predicted to be met following detailed assessment, the LA must declare an Air Quality Management Area (AQMA).

3.1.2 The latest available air quality report for RBC is the 2022 ASR². Monitoring data demonstrated no exceedances of the annual mean AQLV for NO₂ during 2021 and no discernible upward or downward trends in concentrations over the 5 year period between 2017 and 2021.

3.1.3 Monitoring is not undertaken for any other pollutant by RBC at present.

3.1.4 There are no AQMAs declared within the RBC area at present.

3.2 Air Quality Monitoring Data

3.2.1 Continuous Monitoring

3.2.1.1 The Automatic Urban and Rural Network (AURN) is a network of air pollution monitoring stations across the UK, managed by Bureau Veritas on behalf of DEFRA. The main purpose of the network is to enable the government to assess air quality at different locations to aid with the implementation of suitable policy measures for protection of human health.

² 2022 ASR, RBC, 2022.

3.2.1.2 The closest AURN urban background monitoring stations to the proposed site are Birmingham Acocks Green, situated approximately 14km North-North-East of the site, Birmingham Ladywood, situated approximately 18km to the North of the site, Leamington Spa, situated approximately 25km to the East of the site and West Bromwich Kenrick Park, situated approximately 22 km the North-North-West of the site. The West Bromwich Kenrick Park monitoring site is located within a major urban area and in relatively close proximity to the M5 motorway, whilst the Birmingham Ladywood is also located within the heart of a major urban conurbation. As such, it was not considered that these sites would provide a suitably representative source of background data for use in this assessment. The Birmingham Acocks Green and Leamington Spa sites are located in suburban locations and it was therefore considered that they could potentially provide a suitable source of background data for use in this assessment. Data from five years of recent verified data for these sites is presented in the tables below.

3.2.1.3 Data for 2020 and 2021 has not been included since national lockdown restrictions for Covid were in place for periods during these years and therefore pollution data from these years is considered unlikely to be representative of the true baseline position. Data for 2022 has not yet been fully ratified yet. Data from years between 2015 and 2019 is contained in the table below for NO_x, NO₂, PM₁₀ and PM_{2.5}. Annual mean concentrations have been calculated from available AURN data.

Table 3.1 – Annual Mean NO_x Concentrations at Birmingham Acocks Green and Leamington Spa

Site	Site Type	Site NGR	Annual Mean NO _x Concentrations (µg.m ⁻³)				
			2015	2016	2017	2018	2019
Birmingham Acocks Green	Urban Background	411654, 282146	26.32	32.65	26.96	24.11	26.14
Leamington Spa	Urban Background	431943, 265733	26.49	33.12	32.3	24.5	25.14

Table 3.2 – Annual Mean NO₂ Concentrations at Birmingham Acocks Green and Leamington Spa

Site	Site Type	Site NGR	Annual Mean NO ₂ Concentrations (µg.m ⁻³)				
			2015	2016	2017	2018	2019
Birmingham Acocks Green	Urban Background	411654, 282146	18.77	21.31	19.44	17.7	18.14
Leamington Spa	Urban Background	431943, 265733	19.3	21.39	23.46	17.5	17.84

Table 3.3 – Annual Mean PM₁₀ Concentrations at Leamington Spa

Site	Site Type	Site NGR	Annual Mean PM ₁₀ Concentrations (µg.m ⁻³)				
			2015	2016	2017	2018	2019
Leamington Spa	Urban Background	431943, 265733	15.29	15.39	13.98	14.03	14.4

Table 3.4 – Annual Mean PM_{2.5} Concentrations at Birmingham Acocks Green and Leamington Spa

Site	Site Type	Site NGR	Reported Annual Mean PM _{2.5} Concentrations (µg.m ⁻³)				
			2015	2016	2017	2018	2019
Birmingham Acocks Green	Urban Background	411654, 282146	9	10.23	10.74	9.29	8.65
Leamington Spa	Urban Background	431943, 265733	12.26	10.49	10.67	9.8	9.83

3.2.1.4 RBC do not maintain any continuous monitoring stations within their area of jurisdiction for pollutants considered within this assessment.

3.2.2 Non-Automatic Hydrocarbon Network

3.2.2.1 The Non-Automatic Hydrocarbon Network measures ambient benzene concentrations at various sites around the United Kingdom. The closest monitoring location to the proposed site is Leamington Spa, which is an urban background monitoring location, situated approximately 25km to the East. Given the nature of this monitoring location, it was considered that it may potentially provide a suitable source of background benzene data for use within this assessment, in lieu of any monitoring data in the vicinity of the site.

3.2.2.2 Annual average benzene concentrations were calculated for the most recent five years of suitable data. Data for 2020 and 2021 has not been included since national lockdown restrictions were in place for periods during these years and therefore pollution data from these years is considered unlikely to be representative of the true baseline position. Data for 2022 has not yet been fully ratified yet. The data was calculated from data downloaded from the DEFRA website. It should be noted that monitoring periods are periodic (approximately two weekly collection) and in each case, include collection periods which span the tail end of one year and the first part of the following year. Therefore, it was not possible to calculate annual means as an absolute value for each calendar year. However, the annual mean concentrations are based on data collection rate considerably in excess of

75% for each year and is therefore considered to be valid for determining annual mean background pollution data for benzene.

Table 3.5 – Annual Mean Benzene Concentrations at Leamington Spa

Site	Site Type	Site NGR	Annual Mean Benzene Concentration ($\mu\text{g.m}^{-3}$)				
			2015	2016	2017	2018	2019
Leamington Spa	Urban Industrial, Part of Non-Automatic Hydrocarbon Network	431943, 265733	0.598	0.529	0.521	0.512	0.469

3.2.3 Acid Gas Monitoring

3.2.3.1 The UK Acid Gases and Aerosols Monitoring Network is maintained in the UK by DEFRA and has been in operation since 1999. The network includes several sites around the UK in rural monitoring locations and includes monitoring of HCL. There are no monitoring stations in close proximity to the proposed plant, the closest monitoring station being Rosemaund, which is a rural monitoring site located approximately 55km to the West-South-West of the plant. Furthermore, no HCL data is available since 2016 for any site within this monitoring network. The tables below confirm the maximum monitored annual mean HCL concentrations across all sites between 2011 and 2015, which has been calculated from available data on the DEFRA website. Similarly to the benzene data, some data collection periods span the tail end of one year and the first part of the following year. However, the annual mean concentrations are based on data collection rate considerably in excess of 75% for each year for the majority of the data presented and is therefore considered to be valid for use as annual mean background pollution data for HCL.

Table 3.6 – Maximum Monitored Annual Mean HCL Concentration Between 2011 and 2015

Site	Maximum Monitored Annual Mean HCL Concentration ($\mu\text{g.m}^{-3}$)				
	2011	2012	2013	2014	2015
All Sites within UK Acid Gases and Aerosols Monitoring Network	0.636	0.432	0.515	0.471	0.756

3.2.3.2 In lieu of any suitably representative recent data, the maximum monitored annual mean concentration across all UK sites between 2011 and 2015 has been used as a source of background data, which provides a conservative assessment.

3.3 Chlorine

3.3.1 No routine background ambient monitoring is currently undertaken for chlorine within the UK.

3.4 Background Pollutant Mapping

3.4.1 The DEFRA website contains background pollutant mapping data for NO_x, NO₂, PM_{2.5} and PM₁₀ on a 1km by 1km grid square basis across the UK. This data is routinely used for assessing background pollutant concentrations where no suitably representative air pollution monitoring data exists. NO_x, NO₂, PM₁₀ and PM_{2.5} data is available for each grid square for the years 2018 to 2030. Data for CO, benzene and SO₂ is only available up until 2001. Data for CO and benzene has been adjusted from 2001 background mapping to 2023 base year, in accordance with the relevant guidance. The annual mean SO₂ concentration has been assumed to be 75% of the mapped background concentration for 2001, in accordance with the relevant guidance. Table 3.7 contains mapped background pollutant concentrations for the grid square containing the site.

Table 3.7 - Background Pollutant Mapping Data for Grid Square 407500, 268500

Pollutant	2023 Annual Mean Pollutant Concentrations (µg.m ⁻³) within Grid Square Containing Site
NO _x	22.31
NO ₂	15.92
PM ₁₀	13.13
PM _{2.5}	8.50
Benzene	0.3

Pollutant	2023 Annual Mean Pollutant Concentrations ($\mu\text{g}\cdot\text{m}^{-3}$) within Grid Square Containing Site
CO	143.42
SO ₂	3.03

3.5 Summary of Background Data Used in Assessment

3.5.1 The table below summarises the background data used within this assessment. Short term background concentrations have been calculated using the following factors, based on government guidance and is an approach which has been accepted by the EA previously:

- 24-hour mean – factor of 0.59 applied to hourly mean background concentration;
- 8-hour mean - factor of 0.7 applied to hourly mean background concentration;
- 1-hour mean – assumed to be twice annual mean background concentration; and,
- 15-minute mean - factor of 1.34 applied to hourly mean background concentration

Table 3.8 - Summary of Background Data Used in Assessment

Pollutant	Annual Mean Background Concentration ($\mu\text{g}\cdot\text{m}^{-3}$)	24-Hour Mean Background Concentration ($\mu\text{g}\cdot\text{m}^{-3}$)	8-Hour Mean Background Concentration ($\mu\text{g}\cdot\text{m}^{-3}$)	1-Hour Mean Background Concentration ($\mu\text{g}\cdot\text{m}^{-3}$)	15-Minute Mean Background Concentration ($\mu\text{g}\cdot\text{m}^{-3}$)	Source of Background Data
NO _x	33.12	39.08	N/A	N/A	N/A	Highest monitored concentration from five years of available data at Leamington Spa and Birmingham Acocks Green AURN sites

Pollutant	Annual Mean Background Concentration ($\mu\text{g}\cdot\text{m}^{-3}$)	24-Hour Mean Background Concentration ($\mu\text{g}\cdot\text{m}^{-3}$)	8-Hour Mean Background Concentration ($\mu\text{g}\cdot\text{m}^{-3}$)	1-Hour Mean Background Concentration ($\mu\text{g}\cdot\text{m}^{-3}$)	15-Minute Mean Background Concentration ($\mu\text{g}\cdot\text{m}^{-3}$)	Source of Background Data
NO ₂	23.46	N/A	N/A	46.92	N/A	Highest monitored concentration from five years of available data at Leamington Spa and Birmingham Acocks Green AURN sites
PM ₁₀	15.39	18.16	N/A	N/A	N/A	Highest monitored concentration from five years of available data at Leamington Spa AURN site
PM _{2.5}	12.26	N/A	N/A	N/A	N/A	Highest monitored concentration from five years of available data at Leamington Spa and Birmingham Acocks Green AURN sites
SO ₂	3.03	3.58	N/A	6.06	8.12	DEFRA Mapped Background Concentration
CO	N/A	N/A	200.79	286.84	N/A	DEFRA Mapped Background Concentration
Benzene	0.6	0.71	N/A	N/A	N/A	Highest monitored concentration from five years of available data at Leamington Spa AURN site

Pollutant	Annual Mean Background Concentration ($\mu\text{g.m}^{-3}$)	24-Hour Mean Background Concentration ($\mu\text{g.m}^{-3}$)	8-Hour Mean Background Concentration ($\mu\text{g.m}^{-3}$)	1-Hour Mean Background Concentration ($\mu\text{g.m}^{-3}$)	15-Minute Mean Background Concentration ($\mu\text{g.m}^{-3}$)	Source of Background Data
HCL	N/A	N/A	N/A	1.512	N/A	Highest calculated concentration from five years of data at all sites within UK Acid Gas and Aerosol Monitoring Network

3.6 Discrete Sensitive Receptors

3.6.1 The table below outlines the nearest receptors to the proposed plant which are representative of relevant long term exposure locations. Reference should be made to Appendix II for a graphical representation of receptor locations. In order to provide a highly conservative assessment of worst case potential short term impacts, the maximum point of impact surrounding the plant has been used.

Table 3.9 – Sensitive Receptors

Receptor Identifier	Receptor Description	National Grid Reference (m)	
		X	Y
R1	Residential property on Fairford Close	407227.9	269099
R2	Residential property on Hillmorton Close	407250.5	268991.3
R3	Residential property on Hillmorton Close	407238.5	268953.1
R4	Residential property on Hillmorton Close	407241.8	268944.4
R5	Residential property on Hillmorton Close	407244.1	268934.4
R6	Residential property on Hillmorton Close	407241.9	268922.4
R7	Residential property on Hillmorton Close	407235.4	268912.5
R8	Residential property on Hillmorton Close	407231.2	268903.6

Receptor Identifier	Receptor Description	National Grid Reference (m)	
		X	Y
R9	Residential property on Hillmorton Close	407231.1	268891.6
R10	Residential property on Latchford Close	407225.1	268883.7
R11	Residential property on Latchford Close	407184.3	268838.3
R12	Residential property on Latchford Close	407155.6	268813.9
R13	Residential property on Latchford Close	407154.8	268802.2
R14	Residential property on Latchford Close	407141.7	268781.2
R15	Residential property on Latchford Close	407111.1	268751.9
R16	Residential property on Moorgate Close	407098.6	268723.2
R17	Residential property on Beoley Lane	407380	269468.8
R18	Holt End Farm	407414.7	269464.8
R19	Residential property on The Glebe	407533.1	269443.9
R20	Residential property on Holt Hill/Moss Lane	407750.9	269526.2
R21	Lower Greenhills Farm	408413.8	269048
R22	Carpenters Hill Wood AW/LWS	407927	270224.6
R23	Clifford's Wood LWS	408091	269765.2
R24	Pink Green Wood AW/LWS	408362.3	269725.7
R25	Grove Wood ARW	409252.5	268509.9
R26	Grove Wood AW	409049.8	268128.7
R27	Ipsley Alders Marsh SSSI	407839.98	267938.2
R28	Proctors Barn Meadow LNR	405959.38	267886.3
R29	Ravens Bank Drive Bride Track LWS	407514.9	268993.9
R30	Ravens Bank Drive Bride Track LWS	407535.2	268958.7
R31	Ravens Bank Drive Bride Track LWS	407587.9	268882.6
R32	Ravens Bank Drive Bride Track LWS	407623.6	268842.8
R33	Ravens Bank Drive Bride Track LWS	407695	268736.2
R34	Holt End Meadows LWS	407446.28	269530.6

Receptor Identifier	Receptor Description	National Grid Reference (m)	
		X	Y
R35	Ipsley Alders Marsh LWS	407863.9	268078.8
R36	Arrow Valley Park LWS	406502	267598.8
R37	River Arrow LWS	405732.7	267988.3
R38	River Arrow LWS	405697.5	268053.4
R39	River Arrow LWS	405464.1	268476.2
R40	River Arrow LWS	405424.6	268649
R41	Dagnell Brook LWS	405346	269144
R42	Dagnell Brook LWS	405454	269280

4 Modelling Methodology

4.1 Model Description

4.1.1 The potential air quality impacts associated with residual emissions arising from the process have been quantified using AERMOD, which is a steady state, next generation, dispersion model. AERMOD was developed jointly by the American Meteorological Society (AMS) and the United States (US) Environmental Protection Agency (EPA) Regulatory Model Improvement Committee. AERMOD is a development from the Industrial Source Complex (ISC) 3 dispersion model and incorporates improved dispersion algorithms and pre-processors to integrate the impact of meteorology and topography within the modelling output, and is approved for use in the UK. The version of AERMOD that has been used for this current assessment is Lakes Environmental ISC-AERMOD View Version 11.2.0. The model has been run using version 22112 of the AERMOD executable file. In order to improve model run times, Lakes Environmental have produced an equivalent source code to 22112, known as AERMOD parallel which enables the model to be run over multiple processors. The model was run using Lakes Environmental AERMOD MPI 22112.

4.2 Model Inputs

4.2.1 Emission Source Process Parameters

4.2.1.1 The process will include the following point source emissions to air, as denoted on the layout plan within Appendix I:

- Emission point A1 – Exhaust from scrubber which abates emissions from acid metal extraction process;
- Emission point A2 - Exhaust from steam boiler(s);
- Emission point A3 – Alkaline based metal extraction area exhaust; and,
- Emission point A4 – Combined exhaust from abatement plant serving thermal appliances, including small scale metal decontamination combustion appliance, melting furnaces and drying ovens.

4.2.1.2 Exhaust process parameters for the above emission sources are outlined in the tables below, based on information provided by the applicant.

Table 4.1 - Expected Emission Source Process Parameters – Emission Point A1 (Acid Scrubber Exhaust)

Process Parameter	Value
Stack NGR (m)	407371.73, 268868.35
Stack internal diameter (m)	0.3
Stack height (m)	10.44
Expected actual stack volumetric flowrate (Am ³ .s ⁻¹)	1.11
Expected stack efflux temperature (K)	288 (ambient release)

Table 4.2 - Expected Emission Source Process Parameters – Emission Point A2 (Steam Boilers)

Process Parameter	Value
Stack NGR (m)	407362.66, 268873.88
Stack internal diameter (m)	0.203
Stack height (m)	9.44
Expected actual stack volumetric flowrate (Am ³ .s ⁻¹)	0.15
Expected stack efflux temperature (K)	478

Table 4.3 - Expected Emission Source Process Parameters – Emission Point A3 (Alkaline Processing Area Exhaust)

Process Parameter	Value
Stack NGR (m)	407355.60, 268861.76
Stack internal diameter (m)	0.3
Stack height (m)	9.44
Expected actual stack volumetric flowrate (Am ³ .s ⁻¹)	1.11
Expected stack efflux temperature (K)	288 (ambient release)

Table 4.4 - Expected Emission Source Process Parameters – Emission Point A4 (Abatement Plant Serving Thermal Appliances)

Process Parameter	Value
Stack NGR (m)	407359.03, 268868.45
Stack internal diameter (m)	0.17
Stack height (m)	9.44
Expected actual stack volumetric flowrate (Am ³ .s ⁻¹)	0.208
Normalised flow rate expressed at 273.15K, 101.3kPa, dry basis, 11% oxygen (Nm ³ .s ⁻¹)	0.0857
Expected exhaust gas oxygen content (dry basis, vol/vol, %)	13.66
Expected exhaust gas moisture content (vol/vol, %)	6.92
Expected stack efflux temperature (K)	478
Expected stack absolute pressure (kPa)	101.3

4.2.2 Pollutant Emissions

4.2.2.1 Emissions from the drying ovens, melting furnaces and small scale metal decontamination appliance will be extracted via the abatement plant serving the metal decontamination appliance via emission point A4. The metal decontamination appliance will be subject to Emission Limit Values (ELVs) contained with Process Guidance (PG) Note 2/09(13)³, whilst it has been agreed with the regulator that the melting furnaces will be subject to ELVs contained within PG Note 2/03(13)⁴, both processes to be regulated by WRS in accordance with a Part B permit. Therefore, emission rates for these processes have been based on ELVs within the PG Notes to provide a conservative assessment. Emission limits for these processes are outlined within the table below. It should be noted that there are no emission limits within PG Note 2/09(13) for SO₂ and NO_x. Emission concentrations for these pollutants

³ PG 2/09(13) – Statutory Guidance for Metal Decontamination Processes and Installations, DEFRA, July 2013.

⁴ PG 2/03(13) – Statutory Guidance for Electrical Furnaces, DEFRA, July 2013.

have been based on information provided by the technology provider from a mass balance for the process and design emission values.

Table 4.5 – Emission Limits/Concentrations (Small Scale Metal Decontamination Appliance and Melting Furnaces)

Pollutant	ELV/Emission Concentration for Small Scale Metal Decontamination Appliance, Expressed at 273.15K, 101.3KPa, dry gas, 11% oxygen (mg.Nm ⁻³)	ELV for Melting Furnaces, Expressed at 273.1K, 101.3KPa, no correction for oxygen or water vapour (mg.Nm ⁻³)
Total particulate matter	20	20
SO ₂	No limit (43.28mg.Nm ⁻³ provided by technology provider as abated emission level)	-
NO _x	No limit (500mg.Nm ⁻³ assumed as conservative value based on technical information provided)	-
Chloride	10	-
Organic Compounds	20	-

- 4.2.2.2 There are no statutory emission limits for the steam boilers and alkaline process exhaust. It should be noted that these processes have been operated in accordance with an EP/licence for over 40 years at the operator’s existing site in Birmingham with no restrictions on emission or limits having been imposed by the EA.
- 4.2.2.3 For the steam boilers (emission point A2), emission rates were assigned based on the upper end of values stated within the boiler technical data sheet. There will be two steam boilers which will share an exhaust flue. It should be noted that only one will be operational at any one time with the second boiler provided as a backup.
- 4.2.2.4 The process is very small scale in nature and it is anticipated that the acid processing area will recover 142kg of precious metals each year. The acid and alkaline chemical based extraction processes do not involve the use of highly elevated temperatures, with solutions heated to allow the necessary process chemistry to occur for extraction of metals. Given these factors and the absence of any emissions controls that are applied by the regulator at the operator’s current site, it is not anticipated that emissions will be significant from the acid and alkaline chemical processing areas. However, the operator will be installing an acid

scrubber abatement unit within the acid processing area to abate any fumes that may arise from the process.

4.2.2.5 Despite the above, a precautionary assessment has been undertaken. In order to determine potential emissions, reference has been made to the European Commission (EC) Best Available Techniques (BAT) Reference Document for the Non-Ferrous Metals Industries (EC BREF)⁵, associated EC BAT conclusions document⁶ and EA Sector guidance for the non-ferrous metals sector⁷.

4.2.2.6 The alkaline chemical processing will predominantly include the stripping of precious metals in, and precipitation of precious metals from, cyanide based solutions. These are not anticipated to include high concentrations of cyanide. Hydrogen Cyanide (HCN) is identified as a potential emission from hydrometallurgical processes within the EC BREF. The EC BREF states the following:

“Gold is also removed from solid and liquid cyanide solutions such as plating baths. Solutions of sodium or potassium cyanide can be used to remove gold from surface-coated material such as electronic contacts or plated materials. Gold is recovered from the cyanide solutions by electrolysis. Cyanides react with acids to form hydrogen cyanide (HCN) and therefore careful segregation of these materials is practised”

4.2.2.7 Typical formation mechanisms for HCN would be through reaction of ammonia with methane, such as during fertiliser production, as a by-product in the manufacture of acrylonitrile or from combustion of nitrogen and carbon containing substances. HCN can also be formed by reaction of cyanide with other acid gases. No ammonia or methane will be used in the alkaline chemical processing area, nor will combustion processes be used

⁵ Best Available Techniques (BAT) Reference Document for the Non-Ferrous Metals Industries, European Commission, 2017
⁶ Commission Implementing Decision (EU) 2016/1032 of 13 June 2016 establishing best available techniques (BAT) conclusions under Directive 2010/75/EU of the European Parliament and of the Council, for the non-ferrous metals industries.
⁷ How to comply with your environmental permit Additional guidance for: Non - Ferrous Metals and the Production of Carbon and Graphite (EPR 2.03), EA, March 2009.

within this part of the site. Acid and alkaline chemical processing areas will also be kept completely separate on-site. As such, the potential for formation of HCN is anticipated to be insignificant. No other emissions are anticipated to be significant from emission point A3. Indeed, the applicant has been using the same processes at their existing site for over 40 years, regulated by the EA for approximately 27 years. There have been no requirements for emissions monitoring imposed in that time and no requirement for impact assessment. It is therefore logically concluded that the regulator is satisfied that emissions are not significant from the use of alkaline chemicals for precipitation of precious metals. Therefore no assessment of potential impacts for emissions from emission point A3 has been undertaken.

- 4.2.2.8 In terms of relevance to the acid based metal extraction process, the EC BREF outlines chlorine and VOCs to be potentially most significant from leaching and purification and distillation activities and to a lesser extent, NO_x, with SO₂ emissions outlined as least significant. Other emissions are not highlighted as highly significant. VOCs would not be expected to be significant.
- 4.2.2.9 HCL, chlorine, SO₂ and NO_x emissions may arise as a result of use of nitric acid, hydrochloric acid and sulphuric acid for precipitation of metals. The EC BREF provides emissions data for alkaline scrubbers which treat exhaust gases in operational plants recovering precious metals. Furthermore, the associated EC BAT Conclusions document for the non-ferrous metals sector contains a specific BAT based limit level for NO_x emissions from the use of nitric acid for hydrometallurgical operations including dissolving/leaching. This data is presented in Table 4.7. The data included in Table 4.6 is the range of maximum reported emission concentrations across operational plants presented within the EU BREF document. Plants which are stated to include pyrometallurgical processes have been excluded, since such processes will not be included as part of the acid precipitation process. In lieu of operational data from the proposed plant, the upper end of the values in the tables below have been used to provide a conservative assessment of potential emission concentrations arising from the acid scrubber unit.

Table 4.6 – Maximum Reported Emission Values Within EC BREF – Plants Recovering Precious Metals

Pollutant	Range of Maximum Monitored Emission Concentrations (mg.Nm ⁻³)
HCL	1.5 - 11.8
Chlorine	2.4 - 3
SO ₂	0.9 - 2

Table 4.7 – NO_x Emission Limit Within EC BAT Conclusions Document for Non-Ferrous Metals Sector

Pollutant	BAT Based Emission Limit Value for Hydrometallurgical Processes Involving Leaching with Nitric Acid (mg.Nm ⁻³) Expressed at 273.15K, 101.3kPa, dry gas)
NO _x (as NO ₂)	150

4.2.2.10 Emission rates assigned in the assessment are outlined within the tables below, based on the data discussed above.

Table 4.8 – Emission Rates – Emission Point A1 (Acid Scrubber)

Pollutant	Pollutant Emission Rate (g.s ⁻¹)
NO _x	0.158
HCL	0.0131
Chlorine	0.00333
SO ₂	0.00222

Table 4.9 – Emission Rates – Emission Point A2 (Steam Boilers)

Pollutant	Pollutant Emission Rate (g.s ⁻¹)
NO _x	0.00694
SO ₂	0.0000556
CO	0.000722

Table 4.10 – Emission Rates – Emission Point A4 (Thermal Appliances)

Pollutant	Pollutant Emission Rate (g.s ⁻¹)
Total particulate matter	0.00673
SO ₂	0.00371
NO _x	0.0428
Chloride	0.000857
Organic Compounds	0.00171

4.2.2.11 There are no ambient Air Quality Standards for total particulate matter. In order to provide a worst case assessment of particulate matter, it was assumed that total particulate matter comprises 100% PM₁₀ and PM_{2.5}, providing a highly conservative assessment.

- 4.2.2.12 In accordance with the relevant guidance, it was assumed that organic compounds from the metal decontamination appliance comprise 100% benzene.
- 4.2.2.13 Emissions of chlorides from emission point A4 were assumed to comprise 100% HCL, since chlorine compounds from combustion processes are likely to be mostly oxidised and emitted as HCL.
- 4.2.2.14 Nitric oxide (NO) and NO₂ are normally measured as oxides of NO_x, but when comparing against health based standards, NO_x is usually expressed as it's individual components. NO is oxidised to NO₂ in the presence of ozone. In order to provide a conservative estimate of resulting NO₂ concentrations, it has been assumed that 35% of modelled NO_x concentrations are present as NO₂ for short-term concentrations, whilst it has been assumed that 70% of modelled NO_x concentrations are present as NO₂ for long term average concentrations. This provides a worst case scenario, in accordance with the relevant guidance.

4.2.3 **Building Downwash**

- 4.2.3.1 The building on-site was digitised within the model from site layout and elevation information obtained from a drone survey. As the closest building to the emission points, this would be expected to have an influence on pollutant dispersion. Table 4.11 contains information on building heights assigned within the model. Reference should be made to Appendix I for a plan showing the building location and orientation. The integrated Building Profile Input Programme (BPIP) module within AERMOD was used to assess the potential impact of building downwash upon predicted dispersion characteristics. Building downwash occurs when turbulence, induced by nearby structures, causes pollutants emitted from an elevated source to be displaced and dispersed rapidly towards the ground, resulting in elevated ground level concentrations.

Table 4.11 - Building Inputs

Structure	Length and Width (m)	Max Height (m)
Building A	38.08 x 35.52	6.44

4.2.4 **Meteorological Data**

4.2.4.1 Meteorological data used in this assessment was from Pershore. Pershore meteorological station is located approximately 21km to the South-South-West of the proposed site and it is considered that it provides suitable data for use in this assessment. Previous guidance outlined met stations within 30km of a site to be potentially suitable to use in assessments.

4.2.4.2 Reference should be made to Appendix III for wind roses showing wind speed and direction frequency at Pershore between 2016 and 2020.

4.2.4.3 Five years of sequential meteorological data observed between 2016 and 2020 was used within the assessment. The AERMET processor within AERMOD was used to process the data to be site specific. US EPA guidance on processing met data for use within AERMOD states that land use up to 1km upwind from a site should be considered when determining surface roughness characteristics, whilst for Bowen ratio and albedo, land use types within a 10km by 10km area centred over the site should be considered⁸. AERMOD guidance states that albedo and Bowen ratio should be calculated as the arithmetic and geometric mean respectively of land use types over the 10km by 10km grid, not weighted by direction or distance. The Land Use Creator and AERSURFACE tool within AERMET was used to calculate the appropriate land-use characteristics, which are contained in the following table.

Table 4.12 - Parameters for Surface Roughness, Albedo and Bowen Ratio

Parameter	Directional Sector	Value
Surface Roughness	0-30°	0.164
	30-60°	0.151
	60-90°	0.21
	90-120	0.465
	120-150°	0.517
	150-180°	0.643

⁸

AERMOD Implementation Guide, USEPA, August 2015.

Parameter	Directional Sector	Value
	180-210°	0.7
	210-240°	0.869
	240-270°	0.972
	270-300°	0.89
	300-330°	0.357
	330-360°	0.276
Albedo	All	0.18
Bowen Ratio	All	0.68

4.2.5 Assessment Area

4.2.5.1 One high resolution uniform cartesian receptor grid was used to define the modelling domain, extended over a 3,000m by 3,000m area with a spacing of 15m in X and Y direction, centred over the emission source locations. In addition, a second uniform cartesian receptor grid was extended over a 20,000m by 20,000m area with a spacing of 200m in X and Y direction, centred over the emission source locations. This ensured the maximum point of impact could be captured to enable a conservative assessment of potential short term impacts. In addition, the discrete receptors identified previously were included within the model as cartesian receptors to assess short and long term impacts. Human receptor heights were set to 1.5m and ecological receptor heights set to 0.0m.

4.2.6 Terrain Data

4.2.6.1 Topographical features can have a significant impact on pollutant dispersion. Given that the gradient of the land between the site and receptors exceeds a gradient of 10% in places, terrain data was included in the model, in accordance with the relevant guidance⁹. The terrain data used was Ordnance Survey Terrain 5 data, which is 1:10,000 scale data, contoured at 5m vertical intervals. The digital terrain data was processed in AERMAP, the

⁹ LAQM.TG(16), DEFRA, 2016.

inbuilt terrain processor within AERMOD. This then applied elevation data to all sources, buildings and receptors within the modelling domain.

4.2.7 Model Scenarios

4.2.7.1 The site will only be open routinely for operations during the following hours:

- Monday to Friday 06:00 to 17:00
- Saturdays No operations
- Sundays and Bank Holidays No operations

4.2.7.2 The abatement plant serving the acid processing area (scrubber) and the alkaline process area extraction system will both be run for 24 hours per day, consistent with operations at the applicant's existing site. This is to ensure that any residual fumes are abated/dispersed whilst the system is cooling down. However, there will be no operation of waste processing plant, including chemical, physical and thermal processing, nor delivery or export of materials to and from site outside of the above hours. As such, potential for emissions will not be significant outside of the above hours.

4.2.7.3 Given the above, modelled annual mean pollutant concentrations have been factored by 0.3265, in accordance with the relevant guidance. This assumes that discharges from each emission point would occur continuously for 11 hours per day, Monday to Friday of each week, 52 weeks per year (32.65% of each year). This does not take account of closures on Bank Holidays and is therefore precautionary. Chemical and thermal treatment processes will not be operated continuously, being used on a batch basis as and when required and the operator has confirmed that the above assumption will likely overestimate operational up time of processing plant by some margin. As such, this provides a highly precautionary assessment.

4.2.7.4 Short term AQLVs for SO₂, NO₂ and PM₁₀ are based on a number of allowable exceedences of the relevant AQLV each calendar year. As such, it is appropriate to model equivalent percentiles for each pollutant/scenario when assessing potential short term impacts.

4.2.7.5 The scenarios modelling are outlined within the table below.

Table 4.13 - Model Scenarios

Pollutant	Modelled Scenarios
PM ₁₀	Annual mean, 90.4 th percentile of 24-hour mean concentrations
PM _{2.5}	Annual mean concentrations
NO _x	Annual mean, maximum 24-hour mean concentrations
NO ₂	Annual mean, 99.98 th percentile of 1-hour mean concentrations
SO ₂	Annual mean, 99.2 nd percentile of 24-hour mean concentrations, 99.7 th percentile of 1-hour mean concentrations, 99.9 th percentile of 15-minute mean concentrations
CO	Maximum 8-hour rolling mean concentration
Organic Compounds (as benzene)	Annual mean, maximum 24-hour mean concentration
Chlorine	Maximum 1-hour mean concentration
HCL	Maximum 1-hour mean concentration

4.3 Assessment of Potential Impacts

4.3.1 Methodology for Assessment of Potential Impacts at Human Receptors and SSSIs

4.3.1.1 In order to assess potential impacts at human receptors and SSSIs, reference has been made to the permitting air emissions risk assessment guidance on the government website.¹⁰

¹⁰

<https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit>.

4.3.1.2 The government guidance indicates that potential impacts from a process can be considered insignificant if the following screening criteria are met:

- The long term process contribution (PC) is <1% of the long term environmental standard; and/or,
- The short term PC is <10% of the short term environmental standard.

4.3.1.3 The guidance also indicates that more detailed assessment of emissions (modelling) for a process may be required if the following criteria are met:

- The long term PC + background concentration is >70% of the long term environmental standard; and/or
- The short term process contribution is >20% (Short term environmental standard minus twice annual mean background concentration).

4.3.1.4 If any of the criteria above are met for both short and long term modelled concentrations, it can be concluded that potential impacts will be acceptable and there is no requirement for further assessment, in accordance with the relevant guidance. If the above criteria are exceeded, the Predicted Environmental Concentration (PEC), inclusive of background concentrations, is then compared to the relevant environmental standard. If the modelling shows that the relevant standard will be met at receptor locations, confidence will be high that a breach of the standard will be unlikely, especially given the conservative assumptions which have been used throughout the assessment.

4.3.2 Methodology for Assessment of Potential Impacts at Local Nature Sites

4.3.2.1 In accordance with government permitting risk assessment guidance, potential impacts on local nature sites, such as Local Wildlife Sites and ancient woodland areas, can be screened out as insignificant if the PC is <100% of the critical level/load for relevant pollutants.

4.3.3 Assessment of Potential Impacts on Critical Loads for Acid Deposition at Ecological Receptors

4.3.3.1 It should be noted that a range of critical loads are assigned for each ecological receptor.

4.3.3.2 The APIS website provides specific guidance for assessing potential impacts on critical loads for acid deposition as follows, which has been used for assessing impacts on critical loads for acid deposition associated with the proposed development:

“The potential impacts of additional sulphur and/or nitrogen deposition from a source are partly determined by PEC, because only if PEC of nitrogen deposition is greater than CLminN will the additional nitrogen deposition from the source contribute to acidity. Consequently, if PEC is less than CLminN only the acidifying effects of sulphur from the process need to be considered.”

Where PEC N Deposition < CLminN

*PC as % CL function = (PC S deposition/CLmaxS)*100*

Where PEC is greater than CLminN (the majority of cases), the combined inputs of sulphur and nitrogen need to be considered. In such cases, the total acidity input should be calculated as a proportion of the CLmaxN.

Where PEC N Deposition > CLminN

*PC as %CL function = ((PC of S+N deposition)/CLmaxN)*100”*

4.3.3.3 Where the PC is <1% of the critical load for acid deposition at SSSIs, the impact can be concluded to be insignificant. Where the PC is <100% of the critical load at local nature sites, the impact can be concluded to be insignificant.

4.4 Model Verification and Uncertainty

4.4.1 There can be a significant degree in uncertainty in predications made by any atmospheric dispersion model, which needs to be considered when assessing results. Such uncertainty

can arise as a result of model limitations, uncertainty in input data, including emissions estimates, meteorological data used and background pollutant concentrations used in the assessment.

4.4.2 AERMOD is a commonly used model produced by the US EPA and is approved for use in the UK. The model is well validated and the US EPA present the results of the model validation exercises undertaken on their website. These verify the output of the model in comparison to observed data for a number of scenarios, to ensure predictions are as accurate as possible. The model input code is periodically updated by the US EPA to resolve bugs and errors and to improve the output to take account of latest knowledge. The latest AERMOD model executable file has been used to run the model for the purpose of this assessment.

4.4.3 In addition to the choice of model, the following methods used in the assessment ensure that confidence can be high that potential impacts have not been underestimated:

- Worst case modelled concentrations across 5 years of meteorological data used in assessment;
- Where possible, estimation of existing background pollutant concentrations have been conservative;
- Worst case assumption made that total particulate matter comprises PM₁₀ or PM_{2.5};
- Worst case assumptions made for NO_x to NO₂ conversion;
- Worst case assumption that organic compounds comprise 100% benzene;
- Worst case emission rates used throughout assessment; and,
- Worst case assumption that melting furnaces, small scale metal decontamination appliance and acid based metal extraction process would all operate simultaneously and be continuously operational for 11 hours each day.

5 Model Results

5.1 Predicted Pollutant Concentrations

- 5.1.1 The tables below contain the maximum modelled ground level pollutant concentrations within the modelling domain and at sensitive receptors, with comparison to the relevant AQLVs, EALs and critical levels for each pollutant and scenario. Maximum modelled concentrations from the five years of sequential data have been used to undertake assessment of potential impacts. Pollutant contour profiles for NO₂ are included within Appendix IV.
- 5.1.2 In accordance with previous guidance¹¹, annual mean AQLVs/EALs are considered relevant at receptors where cumulative occupancy exceeds 6 months of the year, eg residential properties. The annual mean AQLVs/EALs are not relevant at building facades of offices and other places of work where members of the public do not have regular access. In order to ensure a conservative, worst case assessment, the maximum point of impact within the modelling domain was used to assess potential worst case impacts on short term air quality standards.

¹¹

LAQM.TG(09), DEFRA, 2009.

Table 5.1 – Modelled Annual Mean NO₂ Concentrations at Receptor Locations

Receptor	Modelled PC to Annual Mean NO ₂ Concentrations (µg.m ⁻³)					Maximum PC to AQLV (%)	Maximum PEC (µg.m ⁻³)	Contribution of PEC to AQLV (%)
	2016	2017	2018	2019	2020			
R1	0.36546	0.31092	0.32665	0.35194	0.31720	0.91	23.83	59.56
R2	0.63590	0.55567	0.58070	0.62443	0.52403	1.59	24.10	60.24
R3	0.61593	0.58384	0.58695	0.66788	0.52801	1.67	24.13	60.32
R4	0.63376	0.61001	0.61830	0.71016	0.55403	1.78	24.17	60.43
R5	0.64324	0.63703	0.64643	0.75047	0.57897	1.88	24.21	60.53
R6	0.63818	0.66357	0.67138	0.79288	0.59935	1.98	24.25	60.63
R7	0.63008	0.67070	0.67767	0.80986	0.61403	2.02	24.27	60.67
R8	0.64555	0.68650	0.70214	0.83914	0.64413	2.10	24.30	60.75
R9	0.69495	0.71622	0.75103	0.89978	0.70863	2.25	24.36	60.90
R10	0.71650	0.71261	0.76936	0.90814	0.72859	2.27	24.37	60.92
R11	0.70365	0.64668	0.76718	0.85648	0.69714	2.14	24.32	60.79
R12	0.62018	0.55517	0.67448	0.73282	0.59893	1.83	24.19	60.48
R13	0.63483	0.54082	0.67405	0.72322	0.59125	1.81	24.18	60.46
R14	0.61500	0.48010	0.62259	0.65480	0.53635	1.64	24.11	60.29
R15	0.54034	0.38732	0.51764	0.54117	0.44608	1.35	24.00	60.00
R16	0.50857	0.33787	0.46037	0.47453	0.40813	1.27	23.97	59.92
R17	0.17304	0.17265	0.15655	0.17378	0.15969	0.43	23.63	59.08
R18	0.18903	0.18845	0.17064	0.18966	0.16991	0.47	23.65	59.12
R19	0.22204	0.22494	0.19555	0.23022	0.19955	0.58	23.69	59.23
R20	0.10877	0.13118	0.10932	0.11173	0.10499	0.33	23.59	58.98
R21	0.01963	0.02434	0.01672	0.02099	0.01850	0.06	23.48	58.71

Table 5.2 – Modelled 99.8th Percentile of 1-Hour Mean NO₂ Concentrations at Receptor Locations

Receptor	Modelled PC to 99.8 th Percentile of 1-Hour Mean NO ₂ Concentrations (µg.m ⁻³)					Maximum PC to AQLV (%)	Maximum PEC (µg.m ⁻³)	Contribution of PEC to AQLV (%)
	2016	2017	2018	2019	2020			
R1	29.55221	24.03047	25.56153	23.81002	26.31816	14.78	76.47	38.24
R2	36.63287	32.20771	34.18354	36.96677	37.38428	18.69	84.30	42.15
R3	36.00542	34.74205	31.46340	34.84589	35.88707	18.00	82.93	41.46
R4	36.18251	33.94964	32.78099	36.03938	35.49461	18.09	83.10	41.55
R5	36.18622	33.31164	36.34514	38.05996	38.00729	19.03	84.98	42.49
R6	37.31502	37.43363	38.93975	39.67577	40.00529	20.00	86.93	43.46
R7	40.78993	43.59997	39.10707	42.99746	42.21766	21.80	90.52	45.26
R8	42.47352	43.85128	40.08871	43.83654	41.99066	21.93	90.77	45.39
R9	42.75001	43.44585	40.54634	44.05096	42.55057	22.03	90.97	45.49
R10	44.45976	42.47053	40.35729	40.81223	42.61746	22.23	91.38	45.69
R11	38.03712	39.75583	38.98274	41.14923	37.25129	20.57	88.07	44.03
R12	30.34589	35.63415	35.34412	35.27771	35.66528	17.83	82.59	41.29
R13	32.73765	32.91674	36.19679	35.44623	36.21694	18.11	83.14	41.57
R14	32.61066	28.96349	33.30580	35.18583	32.77749	17.59	82.11	41.05
R15	31.15435	26.56822	29.28428	31.29751	28.76183	15.65	78.22	39.11
R16	26.42938	24.99252	28.52452	28.91564	25.03804	14.46	75.84	37.92
R17	14.09343	15.55458	14.64960	16.49244	15.20726	8.25	63.41	31.71
R18	15.19025	15.86737	13.44588	15.55927	14.54245	7.93	62.79	31.39
R19	15.85490	13.60745	15.03652	16.37387	15.94973	8.19	63.29	31.65
R20	6.83682	6.37822	6.55451	6.43920	6.51306	3.42	53.76	26.88
R21	2.23814	1.81984	1.43992	1.97432	1.74348	1.12	49.16	24.58
Maximum Point of Impact	135.95637	135.57563	137.49080	136.91726	138.00530	69.00	184.93	92.46

Table 5.3 – Modelled Annual Mean PM₁₀ Concentrations at Receptor Locations

Receptor	Modelled PC to Annual Mean PM ₁₀ Concentrations (µg.m ⁻³)					Maximum PC to AQLV (%)	Maximum PEC (µg.m ⁻³)	Contribution of PEC to AQLV (%)
	2016	2017	2018	2019	2020			
R1	0.01433	0.01214	0.01318	0.01389	0.01296	0.04	15.40	38.51
R2	0.02963	0.02567	0.02787	0.02893	0.02450	0.07	15.42	38.55
R3	0.02905	0.02735	0.02827	0.03126	0.02473	0.08	15.42	38.55
R4	0.03015	0.02884	0.03005	0.03374	0.02621	0.08	15.42	38.56
R5	0.03060	0.03024	0.03147	0.03600	0.02757	0.09	15.43	38.57
R6	0.03001	0.03139	0.03251	0.03812	0.02859	0.10	15.43	38.57
R7	0.02948	0.03182	0.03289	0.03926	0.02943	0.10	15.43	38.57
R8	0.03026	0.03273	0.03434	0.04094	0.03109	0.10	15.43	38.58
R9	0.03324	0.03456	0.03739	0.04459	0.03490	0.11	15.43	38.59
R10	0.03437	0.03411	0.03831	0.04487	0.03606	0.11	15.43	38.59
R11	0.03328	0.02982	0.03730	0.04076	0.03384	0.10	15.43	38.58
R12	0.02851	0.02476	0.03193	0.03394	0.02816	0.08	15.42	38.56
R13	0.02911	0.02387	0.03177	0.03330	0.02754	0.08	15.42	38.56
R14	0.02772	0.02053	0.02870	0.02941	0.02434	0.07	15.42	38.55
R15	0.02339	0.01574	0.02291	0.02320	0.01950	0.06	15.41	38.53
R16	0.02162	0.01329	0.01981	0.01980	0.01758	0.05	15.41	38.53
R17	0.00494	0.00529	0.00460	0.00498	0.00470	0.01	15.40	38.49
R18	0.00556	0.00588	0.00510	0.00556	0.00502	0.01	15.40	38.49
R19	0.00766	0.00811	0.00680	0.00801	0.00693	0.02	15.40	38.50
R20	0.00610	0.00654	0.00596	0.00610	0.00572	0.02	15.40	38.49
R21	0.00097	0.00117	0.00082	0.00102	0.00090	0.00	15.39	38.48

Table 5.4 – Modelled Annual Mean PM_{2.5} Concentrations at Receptor Locations

Receptor	Modelled PC to Annual Mean PM _{2.5} Concentrations (µg.m ⁻³)					Maximum PC to AQLV (%)	Maximum PEC (µg.m ⁻³)	Contribution of PEC to AQLV (%)
	2016	2017	2018	2019	2020			
R1	0.01433	0.01214	0.01318	0.01389	0.01296	0.07	12.27	61.37
R2	0.02963	0.02567	0.02787	0.02893	0.02450	0.15	12.29	61.45
R3	0.02905	0.02735	0.02827	0.03126	0.02473	0.16	12.29	61.46
R4	0.03015	0.02884	0.03005	0.03374	0.02621	0.17	12.29	61.47
R5	0.03060	0.03024	0.03147	0.03600	0.02757	0.18	12.30	61.48
R6	0.03001	0.03139	0.03251	0.03812	0.02859	0.19	12.30	61.49
R7	0.02948	0.03182	0.03289	0.03926	0.02943	0.20	12.30	61.50
R8	0.03026	0.03273	0.03434	0.04094	0.03109	0.20	12.30	61.50
R9	0.03324	0.03456	0.03739	0.04459	0.03490	0.22	12.30	61.52
R10	0.03437	0.03411	0.03831	0.04487	0.03606	0.22	12.30	61.52
R11	0.03328	0.02982	0.03730	0.04076	0.03384	0.20	12.30	61.50
R12	0.02851	0.02476	0.03193	0.03394	0.02816	0.17	12.29	61.47
R13	0.02911	0.02387	0.03177	0.03330	0.02754	0.17	12.29	61.47
R14	0.02772	0.02053	0.02870	0.02941	0.02434	0.15	12.29	61.45
R15	0.02339	0.01574	0.02291	0.02320	0.01950	0.12	12.28	61.42
R16	0.02162	0.01329	0.01981	0.01980	0.01758	0.11	12.28	61.41
R17	0.00494	0.00529	0.00460	0.00498	0.00470	0.03	12.27	61.33
R18	0.00556	0.00588	0.00510	0.00556	0.00502	0.03	12.27	61.33
R19	0.00766	0.00811	0.00680	0.00801	0.00693	0.04	12.27	61.34
R20	0.00610	0.00654	0.00596	0.00610	0.00572	0.03	12.27	61.33
R21	0.00097	0.00117	0.00082	0.00102	0.00090	0.01	12.26	61.31

Table 5.5 – Modelled 90.4th Percentile of 24-Hour Mean PM₁₀ Concentrations at Receptor Locations

Receptor	Modelled PC to 90.4 th Percentile of 24-Hour Mean PM ₁₀ Concentrations (µg.m ⁻³)					Maximum PC to AQLV (%)	Maximum PEC (µg.m ⁻³)	Contribution of PEC to AQLV (%)
	2016	2017	2018	2019	2020			
R1	0.1303	0.11535	0.13115	0.13008	0.12388	0.26	18.29	36.58
R2	0.27172	0.24558	0.27614	0.24892	0.21027	0.55	18.44	36.87
R3	0.23205	0.23811	0.27299	0.29528	0.21347	0.59	18.46	36.91
R4	0.24689	0.26717	0.27067	0.31231	0.23365	0.62	18.47	36.94
R5	0.25066	0.27481	0.28542	0.32405	0.2343	0.65	18.48	36.97
R6	0.25748	0.30897	0.31366	0.30847	0.24744	0.63	18.47	36.95
R7	0.25054	0.3184	0.28169	0.35134	0.27181	0.70	18.51	37.02
R8	0.29224	0.3194	0.29761	0.38549	0.29857	0.77	18.55	37.09
R9	0.28517	0.33156	0.33924	0.4172	0.33366	0.83	18.58	37.15
R10	0.33804	0.33021	0.32927	0.45277	0.35553	0.91	18.61	37.23
R11	0.36565	0.27796	0.36317	0.38656	0.28187	0.77	18.55	37.09
R12	0.28244	0.24035	0.30727	0.3196	0.24963	0.64	18.48	36.96
R13	0.28375	0.23412	0.29112	0.31184	0.26619	0.62	18.47	36.94
R14	0.29857	0.19773	0.2751	0.29025	0.24744	0.60	18.46	36.92
R15	0.26036	0.14589	0.22627	0.2252	0.19711	0.52	18.42	36.84
R16	0.22803	0.12397	0.18736	0.20634	0.1744	0.46	18.39	36.78
R17	0.042472	0.042741	0.03874	0.04455	0.042167	0.09	18.20	36.41
R18	0.04799	0.046133	0.039506	0.043955	0.041427	0.10	18.21	36.42
R19	0.060661	0.062224	0.052587	0.063382	0.05729	0.13	18.22	36.45
R20	0.045155	0.051504	0.04754	0.046131	0.039374	0.10	18.21	36.42
R21	0.007816	0.0099046	0.007036	0.008043	0.0081331	0.02	18.17	36.34
Maximum Point of Impact	5.48716	4.40435	5.60218	4.46301	4.91562	11.20	23.76	47.52

Table 5.6 – Modelled 99.2nd Percentile of 24-Hour Mean SO₂ Concentrations at Receptor Locations

Receptor	Modelled PC to 99.2 nd Percentile of 24-Hour Mean SO ₂ Concentrations (µg.m ⁻³)					Maximum PC to AQLV (%)	Maximum PEC (µg.m ⁻³)	Contribution of PEC to AQLV (%)
	2016	2017	2018	2019	2020			
R1	0.28688	0.27489	0.27232	0.28522	0.30741	0.25	3.89	3.11
R2	0.60452	0.46313	0.50179	0.55273	0.59235	0.48	4.18	3.35
R3	0.62541	0.48056	0.58592	0.67525	0.49322	0.54	4.26	3.40
R4	0.62202	0.50789	0.59188	0.66402	0.49879	0.53	4.24	3.40
R5	0.63247	0.51034	0.59879	0.60833	0.53995	0.51	4.21	3.37
R6	0.63937	0.50826	0.80277	0.72832	0.5213	0.64	4.38	3.51
R7	0.54758	0.56559	0.81424	0.76512	0.53951	0.65	4.39	3.52
R8	0.54769	0.67167	0.8071	0.75974	0.61132	0.65	4.39	3.51
R9	0.6103	0.71095	0.79394	0.82881	0.69828	0.66	4.41	3.53
R10	0.64399	0.65068	0.66642	0.80051	0.81684	0.65	4.40	3.52
R11	0.69157	0.79486	1.02464	0.94687	0.79366	0.82	4.60	3.68
R12	0.63758	0.65512	0.76205	0.84195	0.65482	0.67	4.42	3.54
R13	0.68496	0.5983	0.76372	0.68039	0.67392	0.61	4.34	3.47
R14	0.62388	0.58242	0.67806	0.5812	0.59884	0.54	4.26	3.41
R15	0.5267	0.50369	0.49046	0.48343	0.47099	0.42	4.11	3.29
R16	0.46114	0.42294	0.36022	0.39609	0.3642	0.37	4.04	3.23
R17	0.11133	0.11326	0.10157	0.11087	0.10664	0.09	3.69	2.95
R18	0.11821	0.13488	0.13031	0.098378	0.10355	0.11	3.71	2.97
R19	0.1356	0.13335	0.13909	0.13137	0.11064	0.11	3.72	2.98
R20	0.093709	0.08009	0.083698	0.085443	0.1197	0.10	3.70	2.96
R21	0.018999	0.023582	0.021	0.022145	0.016543	0.02	3.60	2.88
Maximum Point of Impact	6.87222	6.44064	6.85053	6.8153	6.95894	5.57	10.54	8.43

Table 5.7 – Modelled 99.7th Percentile of 1-Hour Mean SO₂ Concentrations at Receptor Locations

Receptor	Modelled PC to 99.7 th Percentile of 1-Hour Mean SO ₂ Concentrations (µg.m ⁻³)					Maximum PC to AQLV (%)	Maximum PEC (µg.m ⁻³)	Contribution of PEC to AQLV (%)
	2016	2017	2018	2019	2020			
R1	2.0611	1.69808	1.78439	1.75727	1.92877	0.59	8.12	2.32
R2	2.75134	2.45863	2.68291	2.77806	2.7768	0.79	8.84	2.53
R3	2.67356	2.65608	2.33618	2.77144	2.74513	0.79	8.83	2.52
R4	2.72679	2.62786	2.53638	2.82771	2.81353	0.81	8.89	2.54
R5	2.70228	2.60228	2.6224	2.92685	2.8504	0.84	8.99	2.57
R6	2.82416	2.96255	2.75033	3.12628	2.97568	0.89	9.19	2.62
R7	3.16791	3.4806	3.08546	3.36127	3.10668	0.99	9.54	2.73
R8	3.2761	3.542	3.21213	3.33901	3.39067	1.01	9.60	2.74
R9	3.42576	3.41193	3.26103	3.44761	3.34099	0.99	9.51	2.72
R10	3.37889	3.30223	3.11303	3.26692	3.33348	0.97	9.44	2.70
R11	2.80232	2.90845	2.92717	3.01182	2.89615	0.86	9.07	2.59
R12	2.46947	2.60371	2.7917	2.7002	2.70265	0.80	8.85	2.53
R13	2.49922	2.58456	2.79385	2.82117	2.60858	0.81	8.88	2.54
R14	2.47173	2.3859	2.59506	2.83538	2.46084	0.81	8.90	2.54
R15	2.29204	2.10815	2.30985	2.47705	2.18457	0.71	8.54	2.44
R16	2.13027	1.93611	2.13199	2.13435	2.03589	0.61	8.19	2.34
R17	0.80147	0.8646	0.80095	0.92546	0.91646	0.26	6.99	2.00
R18	0.91607	0.94332	0.83705	0.94053	0.8932	0.27	7.00	2.00
R19	0.93368	0.90652	0.92345	1.06647	0.9478	0.30	7.13	2.04
R20	0.60814	0.48733	0.57292	0.55773	0.57049	0.17	6.67	1.91
R21	0.13776	0.12981	0.096313	0.11224	0.10812	0.04	6.20	1.77
Maximum Point of Impact	12.31549	11.95087	12.17828	12.20111	12.12742	3.52	18.38	5.25

Table 5.8 – Modelled 99.9th Percentile of 15-Minute Mean SO₂ Concentrations at Receptor Locations

Receptor	Modelled PC to 99.9 th Percentile of 15-Minute Mean SO ₂ Concentrations (µg.m ⁻³)					Maximum PC to AQLV (%)	Maximum PEC (µg.m ⁻³)	Contribution of PEC to AQLV (%)
	2017	2018	2019	2020	2021			
R1	3.46379	3.27405	3.40619	3.13938	3.33791	1.30	11.58	4.35
R2	4.72589	4.67967	4.68838	4.76714	4.62627	1.79	12.89	4.84
R3	4.15341	4.55223	3.80017	4.26417	4.55703	1.71	12.68	4.77
R4	4.32643	4.38452	3.82396	4.32387	4.44999	1.67	12.57	4.73
R5	4.51892	4.55415	4.11698	4.59183	4.78245	1.80	12.90	4.85
R6	4.75590	5.12691	4.72617	4.69369	5.14393	1.93	13.26	4.99
R7	5.02745	5.45010	4.84331	5.28789	5.54626	2.09	13.67	5.14
R8	5.17249	5.75795	5.21240	5.64049	5.68602	2.16	13.88	5.22
R9	5.66577	5.76547	5.57930	5.50774	5.86458	2.20	13.98	5.26
R10	5.60392	5.38222	5.56167	5.55486	5.52666	2.11	13.72	5.16
R11	4.61909	4.81333	4.83657	4.88134	4.60424	1.84	13.00	4.89
R12	3.95419	4.25419	4.34010	4.20751	4.37408	1.64	12.49	4.70
R13	4.01972	4.07233	4.29230	4.28035	4.31480	1.62	12.43	4.67
R14	3.83913	3.73013	4.11857	4.18410	4.03258	1.57	12.30	4.63
R15	3.67400	3.39623	3.59732	3.71443	3.57139	1.40	11.83	4.45
R16	3.37121	3.15207	3.49000	3.45629	3.28429	1.31	11.61	4.36
R17	1.45066	1.45027	1.39951	1.60094	1.61623	0.61	9.74	3.66
R18	1.42647	1.47096	1.37063	1.45465	1.40656	0.55	9.59	3.61
R19	1.52807	1.49800	1.49665	1.57084	1.52961	0.59	9.69	3.64
R20	1.23543	1.09872	1.17754	1.17744	1.15830	0.46	9.36	3.52
R21	0.26586	0.23808	0.20053	0.22528	0.23987	0.10	8.39	3.15
Maximum Point of Impact	16.99376	17.14982	16.99995	16.88531	16.91881	6.45	25.27	9.50

Table 5.9 – Modelled Annual Mean Benzene Concentrations at Receptor Locations

Receptor	Modelled PC to Annual Mean Benzene Concentrations ($\mu\text{g}\cdot\text{m}^{-3}$)					Maximum PC to AQLV (%)	Maximum PEC ($\mu\text{g}\cdot\text{m}^{-3}$)	Contribution of PEC to AQLV (%)
	2016	2017	2018	2019	2020			
R1	0.00364	0.00308	0.00335	0.00353	0.00329	0.07	0.60	12.07
R2	0.00753	0.00652	0.00708	0.00735	0.00623	0.15	0.61	12.15
R3	0.00738	0.00695	0.00719	0.00794	0.00629	0.16	0.61	12.16
R4	0.00766	0.00733	0.00764	0.00857	0.00666	0.17	0.61	12.17
R5	0.00777	0.00768	0.00800	0.00915	0.00701	0.18	0.61	12.18
R6	0.00762	0.00798	0.00826	0.00969	0.00726	0.19	0.61	12.19
R7	0.00749	0.00808	0.00836	0.00997	0.00748	0.20	0.61	12.20
R8	0.00769	0.00832	0.00872	0.01040	0.00790	0.21	0.61	12.21
R9	0.00845	0.00878	0.00950	0.01133	0.00887	0.23	0.61	12.23
R10	0.00873	0.00867	0.00974	0.01140	0.00916	0.23	0.61	12.23
R11	0.00846	0.00757	0.00948	0.01036	0.00860	0.21	0.61	12.21
R12	0.00724	0.00629	0.00811	0.00862	0.00715	0.17	0.61	12.17
R13	0.00740	0.00606	0.00807	0.00846	0.00700	0.17	0.61	12.17
R14	0.00704	0.00522	0.00729	0.00747	0.00618	0.15	0.61	12.15
R15	0.00594	0.00400	0.00582	0.00590	0.00496	0.12	0.61	12.12
R16	0.00549	0.00338	0.00503	0.00503	0.00447	0.11	0.61	12.11
R17	0.00125	0.00134	0.00117	0.00127	0.00119	0.03	0.60	12.03
R18	0.00141	0.00150	0.00130	0.00141	0.00128	0.03	0.60	12.03
R19	0.00195	0.00206	0.00173	0.00203	0.00176	0.04	0.60	12.04
R20	0.00155	0.00166	0.00151	0.00155	0.00145	0.03	0.60	12.03
R21	0.00024	0.00030	0.00021	0.00026	0.00023	0.01	0.60	12.01

Table 5.10 – Maximum Modelled 24-Hour Mean Benzene Concentrations at Receptor Locations

Receptor	Maximum Modelled PC to 24-Hour Mean Benzene Concentrations ($\mu\text{g.m}^{-3}$)	Maximum PC to EAL (%)	Maximum PEC ($\mu\text{g.m}^{-3}$)	Contribution of PEC to EAL (%)
R1	0.14921	0.50	0.86	2.86
R2	0.2706	0.90	0.98	3.27
R3	0.2574	0.86	0.97	3.22
R4	0.28218	0.94	0.99	3.31
R5	0.31048	1.03	1.02	3.40
R6	0.32957	1.10	1.04	3.47
R7	0.30767	1.03	1.02	3.39
R8	0.28373	0.95	0.99	3.31
R9	0.28179	0.94	0.99	3.31
R10	0.28454	0.95	0.99	3.32
R11	0.42255	1.41	1.13	3.78
R12	0.37962	1.27	1.09	3.63
R13	0.3417	1.14	1.05	3.51
R14	0.28363	0.95	0.99	3.31
R15	0.20132	0.67	0.91	3.04
R16	0.18442	0.61	0.89	2.98
R17	0.05425	0.18	0.76	2.55
R18	0.05589	0.19	0.77	2.55
R19	0.06237	0.21	0.77	2.57
R20	0.10085	0.34	0.81	2.70
R21	0.00821	0.03	0.72	2.39
Maximum Point of Impact	2.69331	8.98	3.40	11.34

Table 5.11 – Maximum Rolling 8-Hour Mean CO Concentrations at Receptor Locations

Receptor	Maximum Modelled PC to 8-Hour Rolling Mean CO Concentrations ($\mu\text{g}\cdot\text{m}^{-3}$)	Maximum PC to AQLV (%)	Maximum PEC ($\mu\text{g}\cdot\text{m}^{-3}$)	Contribution of PEC to AQLV (%)
R1	0.19548	0.0020	200.99	2.01
R2	0.30707	0.0031	201.10	2.01
R3	0.2542	0.0025	201.04	2.01
R4	0.26285	0.0026	201.05	2.01
R5	0.26398	0.0026	201.05	2.01
R6	0.32627	0.0033	201.12	2.01
R7	0.30798	0.0031	201.10	2.01
R8	0.34969	0.0035	201.14	2.01
R9	0.37707	0.0038	201.17	2.01
R10	0.3585	0.0036	201.15	2.01
R11	0.32531	0.0033	201.12	2.01
R12	0.28104	0.0028	201.07	2.01
R13	0.25923	0.0026	201.05	2.01
R14	0.2606	0.0026	201.05	2.01
R15	0.20407	0.0020	200.99	2.01
R16	0.21791	0.0022	201.01	2.01
R17	0.053992	0.0005	200.84	2.01
R18	0.052485	0.0005	200.84	2.01
R19	0.069667	0.0007	200.86	2.01
R20	0.081593	0.0008	200.87	2.01
R21	0.0096951	0.0001	200.80	2.01
Maximum Point of Impact	1.6865	0.0169	202.48	2.02

Table 5.12 – Maximum Modelled 1-Hour Mean CO Concentrations at Receptor Locations

Receptor	Maximum Modelled PC to 1-Hour Mean CO Concentrations ($\mu\text{g}\cdot\text{m}^{-3}$)	Maximum PC to EAL (%)	Maximum PEC ($\mu\text{g}\cdot\text{m}^{-3}$)	Contribution of PEC to EAL (%)
R1	0.34571	0.0012	287.19	0.96
R2	0.50139	0.0017	287.34	0.96
R3	0.56246	0.0019	287.40	0.96
R4	0.57793	0.0019	287.42	0.96
R5	0.60693	0.0020	287.45	0.96
R6	0.62549	0.0021	287.47	0.96
R7	0.63045	0.0021	287.47	0.96
R8	0.64785	0.0022	287.49	0.96
R9	0.64391	0.0021	287.48	0.96
R10	0.6775	0.0023	287.52	0.96
R11	0.53829	0.0018	287.38	0.96
R12	0.4878	0.0016	287.33	0.96
R13	0.47154	0.0016	287.31	0.96
R14	0.45445	0.0015	287.29	0.96
R15	0.42716	0.0014	287.27	0.96
R16	0.40673	0.0014	287.25	0.96
R17	0.12082	0.0004	286.96	0.96
R18	0.12252	0.0004	286.96	0.96
R19	0.13052	0.0004	286.97	0.96
R20	0.13525	0.0005	286.98	0.96
R21	0.04509	0.0002	286.89	0.96
Maximum Point of Impact	2.12137	0.0071	288.96	0.96

Table 5.13 – Maximum Modelled 1-Hour Mean HCL Concentrations at Receptor Locations

Receptor	Maximum Modelled PC to 1-Hour Mean HCL Concentrations ($\mu\text{g}\cdot\text{m}^{-3}$)	Maximum PC to EAL (%)	Maximum PEC ($\mu\text{g}\cdot\text{m}^{-3}$)	Contribution of PEC to EAL (%)
R1	6.70166	0.89	8.21	1.10
R2	8.81678	1.18	10.33	1.38
R3	8.04051	1.07	9.55	1.27
R4	8.26707	1.10	9.78	1.30
R5	9.10499	1.21	10.62	1.42
R6	9.51744	1.27	11.03	1.47
R7	9.93281	1.32	11.44	1.53
R8	10.45696	1.39	11.97	1.60
R9	10.40569	1.39	11.92	1.59
R10	10.51787	1.40	12.03	1.60
R11	9.24655	1.23	10.76	1.43
R12	8.2186	1.10	9.73	1.30
R13	8.06541	1.08	9.58	1.28
R14	7.61543	1.02	9.13	1.22
R15	6.87264	0.92	8.38	1.12
R16	6.34972	0.85	7.86	1.05
R17	3.84496	0.51	5.36	0.71
R18	3.88775	0.52	5.40	0.72
R19	3.92781	0.52	5.44	0.73
R20	1.66168	0.22	3.17	0.42
R21	1.0788	0.14	2.59	0.35
Maximum Point of Impact	29.58972	3.95	31.10	4.15

Table 5.14 – Maximum Modelled 1-Hour Mean Chlorine Concentrations at Receptor Locations

Receptor	Maximum Modelled PC to 1-Hour Mean Chlorine Concentrations ($\mu\text{g.m}^{-3}$)	Maximum PC to EAL (%)
R1	1.60643	0.55
R2	2.10719	0.73
R3	1.92794	0.66
R4	1.95279	0.67
R5	2.20732	0.76
R6	2.29104	0.79
R7	2.36659	0.82
R8	2.48544	0.86
R9	2.47234	0.85
R10	2.49283	0.86
R11	2.21757	0.76
R12	1.96774	0.68
R13	1.93162	0.67
R14	1.8248	0.63
R15	1.65073	0.57
R16	1.52274	0.53
R17	0.94187	0.32
R18	0.95163	0.33
R19	0.96668	0.33
R20	0.40248	0.14
R21	0.26148	0.09
Maximum Point of Impact	7.3497	2.53

Table 5.15 – Modelled Annual Mean NO_x Concentrations at Receptor Locations

Receptor	Modelled PC to Annual Mean NO _x Concentrations (µg.m ⁻³)					Maximum PC to Critical Level (%)	Maximum PEC (µg.m ⁻³)	Contribution of PEC to Critical Level (%)
	2016	2017	2018	2019	2020			
R22	0.03763	0.04229	0.03309	0.03803	0.03405	0.14	33.16	110.54
R23	0.04038	0.05676	0.04309	0.04830	0.04521	0.19	33.18	110.59
R24	0.01763	0.02556	0.01892	0.02219	0.02046	0.09	33.15	110.49
R25	0.00525	0.00638	0.00423	0.00530	0.00474	0.02	33.13	110.42
R26	0.00730	0.00856	0.00537	0.00659	0.00640	0.03	33.13	110.43
R27	0.15814	0.12415	0.16917	0.16343	0.15066	0.56	33.29	110.96
R28	0.09056	0.05712	0.07177	0.08089	0.07059	0.30	33.21	110.70
R29	1.21469	1.53537	1.20399	1.35770	1.22887	5.12	34.66	115.52
R30	0.99574	1.28014	0.95138	1.15941	1.02830	4.27	34.40	114.67
R31	0.65672	0.77385	0.61692	0.69410	0.61875	2.58	33.89	112.98
R32	0.51208	0.57453	0.46616	0.52651	0.45789	1.92	33.69	112.32
R33	0.31438	0.34949	0.27059	0.30321	0.27922	1.16	33.47	111.56
R34	0.24672	0.24701	0.22242	0.24843	0.21972	0.83	33.37	111.23
R35	0.20140	0.15806	0.19162	0.20436	0.18909	0.68	33.32	111.08
R36	0.08571	0.05264	0.07988	0.06179	0.07634	0.29	33.21	110.69
R37	0.08184	0.05418	0.06846	0.07761	0.06470	0.27	33.20	110.67
R38	0.08010	0.05444	0.06983	0.07969	0.06452	0.27	33.20	110.67
R39	0.06103	0.05552	0.06347	0.07561	0.06586	0.25	33.20	110.65
R40	0.05734	0.05064	0.05778	0.06950	0.05817	0.23	33.19	110.63
R41	0.04230	0.03619	0.03931	0.04489	0.03961	0.15	33.16	110.55
R42	0.04363	0.04061	0.04107	0.04875	0.04063	0.16	33.17	110.56

Table 5.16 – Modelled Annual Mean SO₂ Concentrations at Receptor Locations

Receptor	Modelled PC to Annual Mean SO ₂ Concentrations (µg.m ⁻³)					Maximum PC to Critical Level (%)	Maximum PEC (µg.m ⁻³)	Contribution of PEC to Critical Level (%)
	2016	2017	2018	2019	2020			
R22	0.00105	0.00119	0.00093	0.00106	0.00097	0.012	3.03	30.31
R23	0.00108	0.00154	0.00117	0.00131	0.00123	0.015	3.03	30.32
R24	0.00050	0.00072	0.00053	0.00062	0.00058	0.007	3.03	30.31
R25	0.00015	0.00018	0.00012	0.00015	0.00013	0.002	3.03	30.30
R26	0.00020	0.00024	0.00015	0.00018	0.00018	0.002	3.03	30.30
R27	0.00318	0.00258	0.00359	0.00346	0.00317	0.036	3.03	30.34
R28	0.00192	0.00119	0.00154	0.00167	0.00151	0.019	3.03	30.32
R29	0.03410	0.04361	0.03378	0.03840	0.03455	0.436	3.07	30.74
R30	0.02779	0.03622	0.02673	0.03265	0.02894	0.362	3.07	30.66
R31	0.01811	0.02158	0.01716	0.01923	0.01717	0.216	3.05	30.52
R32	0.01369	0.01550	0.01258	0.01420	0.01231	0.155	3.05	30.45
R33	0.00764	0.00865	0.00664	0.00741	0.00678	0.087	3.04	30.39
R34	0.00573	0.00585	0.00518	0.00572	0.00506	0.059	3.04	30.36
R35	0.00415	0.00332	0.00405	0.00432	0.00401	0.043	3.03	30.34
R36	0.00174	0.00104	0.00169	0.00118	0.00155	0.017	3.03	30.32
R37	0.00178	0.00115	0.00149	0.00164	0.00140	0.018	3.03	30.32
R38	0.00174	0.00116	0.00152	0.00169	0.00139	0.017	3.03	30.32
R39	0.00129	0.00119	0.00139	0.00165	0.00145	0.016	3.03	30.32
R40	0.00119	0.00107	0.00126	0.00150	0.00127	0.015	3.03	30.31
R41	0.00081	0.00073	0.00082	0.00090	0.00079	0.009	3.03	30.31
R42	0.00082	0.00083	0.00085	0.00099	0.00079	0.010	3.03	30.31

Table 5.17 – Maximum Modelled 24-Hour Mean NO_x Concentrations at Receptor Locations

Receptor	Maximum Modelled PC to 24-Hour Mean NO _x Concentrations (µg.m ⁻³)	Maximum PC to Critical Level (%)	Maximum PEC (µg.m ⁻³)	Contribution of PEC to Critical Level (%)
R22	0.93919	1.25	40.02	53.36
R23	2.07353	2.76	41.15	54.87
R24	0.826	1.10	39.91	53.21
R25	0.24851	0.33	39.33	52.44
R26	0.50138	0.67	39.58	52.78
R27	7.69241	10.26	46.77	62.36
R28	4.51268	6.02	43.59	58.12
R29	32.42715	43.24	71.51	95.34
R30	31.69355	42.26	70.77	94.36
R31	18.14484	24.19	57.22	76.30
R32	17.53748	23.38	56.62	75.49
R33	11.68444	15.58	50.76	67.69
R34	8.53092	11.37	47.61	63.48
R35	8.29872	11.06	47.38	63.17
R36	2.99976	4.00	42.08	56.11
R37	2.89452	3.86	41.97	55.97
R38	3.06203	4.08	42.14	56.19
R39	3.54595	4.73	42.63	56.83
R40	2.70729	3.61	41.79	55.72
R41	1.60474	2.14	40.68	54.25
R42	2.34069	3.12	41.42	55.23

5.2 Assessment of Potential Impacts at Human Receptors

5.2.1 Nitrogen Dioxide

5.2.1.1 The modelled PEC for annual mean NO₂ concentrations is <70% of the AQLV at all relevant receptor locations. As such, impacts are concluded to be insignificant, in accordance with the relevant guidance. Furthermore, no exceedence of the annual mean AQLV is predicted at any relevant receptor location. Although the maximum modelled PC to 99.8th percentile of 1-hour mean concentrations is >10% of the AQLV at several receptor locations, the PEC is significantly below the AQLV at all discrete receptor locations (R1 to R21) surrounding the plant. Furthermore, no exceedence of the short term AQLV is predicted at the maximum point of impact, the PEC being 92.46% of the AQLV at maximum point of impact surrounding the plant. Therefore, potential impacts are not predicted to be significant. Confidence in this prediction is high given the highly conservative assumptions used in this assessment for NO_x emissions. The pollutant contour profiles within Appendix IV demonstrate that peak short term NO₂ concentrations occur in very close proximity to the plant and reduce rapidly with increasing distance from the plant.

5.2.2 Particulate Matter

5.2.2.1 The modelled PC to annual mean PM₁₀ and PM_{2.5} concentrations is <1% of the AQLVs at all relevant receptor locations. As such, impacts are predicted to be insignificant. Furthermore, no exceedence of the annual mean AQLV is predicted at any relevant receptor location. The modelled PC to 90.4th percentile of 24-hour mean PM₁₀ concentrations is <10% of the AQLV at all discrete receptor locations. Although this criteria is exceeded at the maximum point of impact, the PEC is significantly below the AQLV (47.52% of the AQLV). As such, no significant impacts are predicted. Confidence in this prediction is high given the highly conservative assumptions used in this assessment for particulate matter.

5.2.3 Sulphur Dioxide

5.2.3.1 The modelled PC to 99.2nd percentile of 24-hour mean concentrations, 99.7th percentile of 1-hour mean concentrations and 99.9th percentile of 15-minute mean concentrations is <10% of the AQLV at all locations surrounding the plant. As such, impacts on short term SO₂ AQLVs are predicted to be insignificant.

5.2.4 Benzene

5.2.4.1 The modelled PC is less than 1% of the annual mean AQLV for benzene at all relevant receptors surrounding the plant. Furthermore, the modelled PC is less than 10% of the short term EAL at all locations surrounding the plant. As such, potential impacts are not predicted to be significant. Furthermore, no exceedence of the AQLV/EAL is predicted at any relevant receptor location.

5.2.5 Carbon Monoxide

5.2.5.1 The maximum modelled PC to rolling 8-hour maximum mean and 1-hour mean CO concentration is <10% of the AQLV and EAL respectively at all locations surrounding the plant. As such, impacts are concluded to be insignificant. Furthermore, no exceedence of the AQLV/EAL is predicted at any relevant receptor location.

5.2.6 Hydrogen Chloride

5.2.6.1 The maximum modelled PC to 1-hour mean HCL concentration is <10% of the EAL at all locations surrounding the plant. As such, impacts are concluded to be insignificant. Furthermore, no exceedence of the EAL is predicted at any relevant receptor location.

5.2.7 Chlorine

5.2.7.1 The maximum modelled PC to 1-hour mean chlorine concentrations is <10% of the EAL at all locations surrounding the plant. As such, impacts are concluded to be insignificant.

5.3 Assessment of Potential Impacts at Sensitive Ecological Receptors

5.3.1 Critical Levels

5.3.1.1 The modelled PC is less than 100% of the critical level for annual mean and 24-hour mean NO_x concentrations and annual mean SO₂ concentrations at all local nature sites (receptors R22 to R26 and R28 to R42). As such, potential impacts on local nature sites are predicted to be insignificant, in accordance with the relevant guidance.

5.3.1.2 The modelled PC is less than 1% of the critical level for annual mean NO_x concentrations at receptor R27. Although the PC marginally exceeds 10% of the critical level at receptor R27 for 24-hour mean NO_x concentrations (10.26%), the PEC is significantly below the critical level (62.36%). Furthermore, this is based on the assumption that the plant would operate for 24-hours of each day. As such, no significant impacts are predicted. If the PC to 24-hour mean NO_x concentration is factored based on the precautionary assumption that all processing plant would operate simultaneously for 11 hours each day (45.83% of each day) the modelled PC is 3.53µg.m⁻³ at receptor R27, which equates to <10% of the critical level (4.7%).

5.3.1.3 The modelled PC to annual mean critical level for SO₂ is <1% at receptor R27.

5.3.1.4 Given the above, potential impacts at Ipsley Alders Marsh SSSI are predicted to be insignificant, in accordance with the relevant guidance.

5.3.2 Nitrogen Deposition

5.3.2.1 The maximum PC to nitrogen deposition has been calculated from the predicted annual mean NO_x concentration, in accordance with the relevant guidance. Nitrogen deposition arising as a result of resulting annual mean NO_x concentrations has been calculated using the following formula:

$$F = \left(\frac{V_d \times C \times 10000}{1000000000} \right) \times 0.3 \times 31536000$$

Where: F = deposition flux (Kg N.ha⁻¹.Year⁻¹)

V_d = nitrogen dry deposition velocity, assumed to be 0.003m.s⁻¹ to provide conservative assessment

C = predicted annual mean NO_x concentration (µg.m⁻³)

10000 = conversion from m² to hectares (ha)

1000000000 = conversion from µg to Kg

0.30 = Factor based on proportion of NO₂ that is nitrogen

31536000 = conversion from seconds to year

5.3.2.2 Calculated annual nitrogen deposition at relevant receptors is presented in the table below. As the PC is <100% of the worst case critical load at local nature sites (R22 to R26 and R28 to R42) and <1% of the critical load at Ipsley Alders Marsh SSSI (R27), impacts are predicted to be insignificant at all relevant ecological receptors and there is no requirement for further assessment in accordance with government permitting risk assessment guidance.

Table 5.18 - Calculated Annual Nitrogen Deposition at Ecological Receptors

Receptor	Maximum Modelled Annual Mean NO _x Concentration (µg.m ⁻³)	Calculated PC to Annual Nitrogen Deposition (Kg N.ha ⁻¹ .Year ⁻¹) Based on Modelled Annual Mean NO _x Concentration	Percentage Contribution to Worst Case Critical Load for Annual Nitrogen Deposition (%)
R22	0.04229	0.01200	0.40
R23	0.05676	0.01611	0.54
R24	0.02556	0.00725	0.24
R25	0.00638	0.00181	0.06
R26	0.00856	0.00243	0.08
R27	0.16917	0.04802	0.48
R28	0.09056	0.02570	0.86
R29	1.53537	0.43578	14.53
R30	1.28014	0.36333	12.11

Receptor	Maximum Modelled Annual Mean NO _x Concentration (µg.m ⁻³)	Calculated PC to Annual Nitrogen Deposition (Kg N.ha ⁻¹ .Year ⁻¹) Based on Modelled Annual Mean NO _x Concentration	Percentage Contribution to Worst Case Critical Load for Annual Nitrogen Deposition (%)
R31	0.77385	0.21964	7.32
R32	0.57453	0.16307	5.44
R33	0.34949	0.09919	3.31
R34	0.24843	0.07051	2.35
R35	0.20436	0.05800	1.93
R36	0.08571	0.02433	0.81
R37	0.08184	0.02323	0.77
R38	0.08010	0.02273	0.76
R39	0.07561	0.02146	0.72
R40	0.06950	0.01973	0.66
R41	0.04489	0.01274	0.42
R42	0.04875	0.01384	0.46

5.3.3 Acid Deposition

5.3.3.1 The potential PC to acid deposition across relevant ecological sites can be calculated by converting nitrogen and sulphur deposition predictions to kiloequivalents (keq.ha⁻¹.Year⁻¹) using the following assumptions, obtained from the APIS website:

- 1 keq N ha⁻¹.Year⁻¹ is equal to 14kg N ha⁻¹.Year⁻¹; and,
- 1keq S ha⁻¹.Year⁻¹ is equal to 16kg S ha⁻¹.Year⁻¹

5.3.3.2 Potential sulphur deposition across ecological sites was calculated in a similar fashion to nitrogen deposition, using the following equation and assumptions:

$$F = \frac{Vd \times C \times 10000}{1000000000} \times 0.50 \times 31536000$$

Where: F = deposition flux (Kg S.ha⁻¹.Year⁻¹)

V_d = sulphur dry deposition velocity, assumed to be 0.024m.s^{-1} to provide conservative assessment

C = predicted annual mean SO_2 concentration ($\mu\text{g.m}^{-3}$)

10000 = conversion from m^2 to hectares (ha)

1000000000 = conversion from μg to Kg

0.5 = Factor based on proportion of SO_2 that is sulphur

31536000 = conversion from seconds to year

5.3.3.3 Based upon the above, the following table summarises annual nitrogen and sulphur deposition, total PC to annual acid deposition at ecological receptors due to nitrogen and sulphur and percentage contribution to critical load function for nitrogen (CLmaxN). As is shown, the total PC to acid deposition is predicted to be less than 100% of the relevant critical load at all local nature sites (R22 to R26 and R28 to R42) and less than 1% of the relevant critical load at Ipsley Alders Marsh SSSI (R27). As such, potential impacts are predicted to be insignificant.

Table 5.19 - Calculated Acid Deposition at Ecological Receptors

Receptor	Calculated PC to Annual Acid Deposition from Nitrogen ($\text{keq.ha}^{-1} \cdot \text{Year}^{-1}$) Based on Maximum Modelled Annual Mean NO_x Concentration	Calculated PC to Annual Acid Deposition from Sulphur ($\text{keq.ha}^{-1} \cdot \text{Year}^{-1}$) Based on Maximum Modelled Annual Mean SO_2 Concentration	Total PC to Annual Acid Deposition Due to Nitrogen and Sulphur ($\text{keq.ha}^{-1} \cdot \text{Year}^{-1}$)	PC to CLMaxN (%)
R22	0.00086	0.00028	0.00114	1.14
R23	0.00115	0.00036	0.00152	1.52
R24	0.00052	0.00017	0.00069	0.69
R25	0.00013	0.00004	0.00017	0.17
R26	0.00017	0.00006	0.00023	0.23
R27	0.00343	0.00085	0.00428	0.09
R28	0.00184	0.00045	0.00229	2.29
R29	0.03113	0.01031	0.04144	41.44
R30	0.02595	0.00857	0.03452	34.52
R31	0.01569	0.00510	0.02079	20.79
R32	0.01165	0.00367	0.01531	15.31

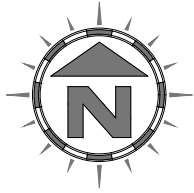
Receptor	Calculated PC to Annual Acid Deposition from Nitrogen (keq.ha ⁻¹ . Year ⁻¹) Based on Maximum Modelled Annual Mean NO _x Concentration	Calculated PC to Annual Acid Deposition from Sulphur (keq.ha ⁻¹ . Year ⁻¹) Based on Maximum Modelled Annual Mean SO ₂ Concentration	Total PC to Annual Acid Deposition Due to Nitrogen and Sulphur (keq.ha ⁻¹ . Year ⁻¹)	PC to CLMaxN (%)
R33	0.00709	0.00205	0.00913	9.13
R34	0.00504	0.00138	0.00642	6.42
R35	0.00414	0.00102	0.00516	5.16
R36	0.00174	0.00041	0.00215	2.15
R37	0.00166	0.00042	0.00208	2.08
R38	0.00162	0.00041	0.00203	2.03
R39	0.00153	0.00039	0.00192	1.92
R40	0.00141	0.00035	0.00176	1.76
R41	0.00091	0.00021	0.00112	1.12
R42	0.00099	0.00023	0.00122	1.22

6 Conclusions

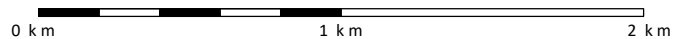
- 6.1 An assessment of potential air quality impacts has been undertaken for the proposed operation of a facility for the recovery of precious metals from wastes at 10 Merse Road, Redditch. Potential emissions from the processes have been modelled to predict resulting short and long term pollutant concentrations at relevant ecological and human receptor locations and comparison made with relevant AQLVs/EALs and critical levels and loads.
- 6.2 An assessment of potential impacts on AQLVs, EALs, critical levels and loads has been undertaken in accordance with government permitting risk assessment guidance.
- 6.3 The assessment has not predicted any significant impacts on health based short or long AQLVs and EALs at discrete human receptor locations and no exceedances of AQLVs or EALs have been predicted at any location surrounding the plant.
- 6.4 The assessment has not predicted any significant impacts on short and long term critical levels and loads at relevant ecological receptor locations.
- 6.5 A series of conservative assumptions have been used throughout this assessment and therefore confidence in the above conclusions is high.

Appendix I

Site Layout Plans



Scale Bar (1:25,000)



NOTES

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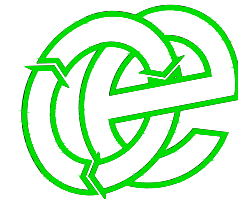
REVISION HISTORY

Rev:	Date:	Init:	Description:
-	20.05.22	RS	Initial drawing

KEY:

Planning boundary

Oaktree Environmental Ltd
Waste, Planning and Environmental Consultants



DRAWING TITLE
SITE LOCATION MAP

CLIENT
Kaug Refinery Services Ltd

PROJECT/SITE
10 Merse Road, Moons Moat North
Industrial Estate, Redditch B98 9HL

SCALE @ A4	CLIENT NO	JOB NO
1:1,250	2765	009

DRAWING NUMBER	REV	STATUS
2765-009-01	-	Issued

DRAWN BY	CHECKED	DATE
RS	RS	20.05.22

Lime House, Road Two, Winsford, Cheshire, CW7 3QZ
t: 01606 558833 | e: sales@oaktree-environmental.co.uk


NOTES

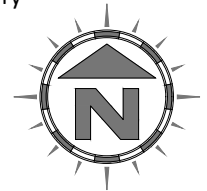
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REVISION HISTORY

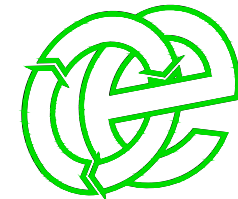
Rev:	Date:	Init:	Description:
-	20.05.22	RS	Initial drawing

KEY:

 Planning boundary



Oaktree Environmental Ltd
Waste, Planning and Environmental Consultants



DRAWING TITLE

SITE LOCATION PLAN

CLIENT

Kaug Refinery Services Ltd

PROJECT/SITE

10 Merse Road, Moons Moat North
Industrial Estate, Redditch B98 9HL

SCALE @ A4

1:1,250

CLIENT NO

2765

JOB NO

009

DRAWING NUMBER

2765-009-02

REV

-

STATUS

Issued

DRAWN BY

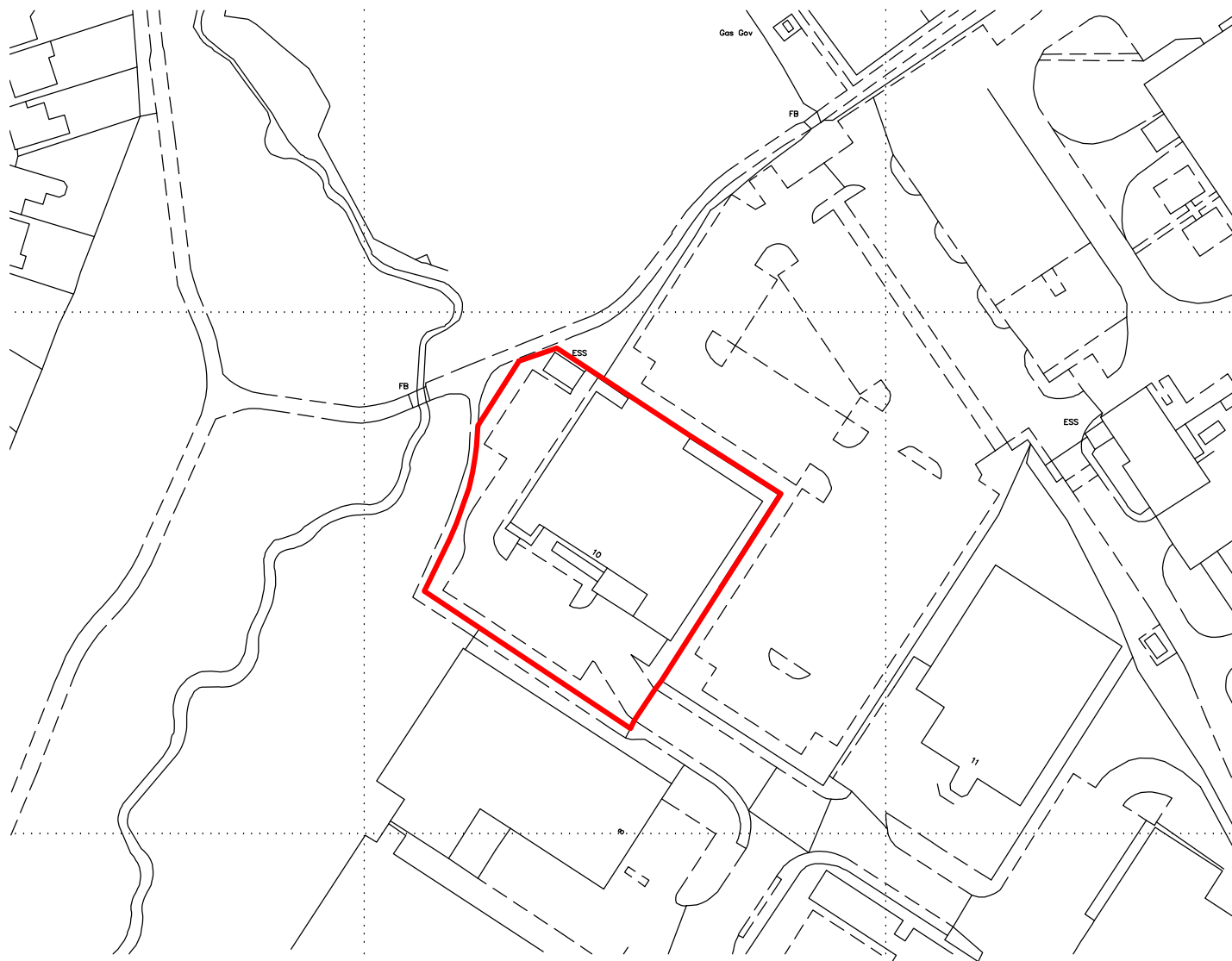
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CHECKED

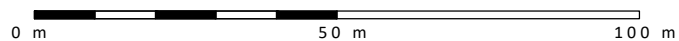
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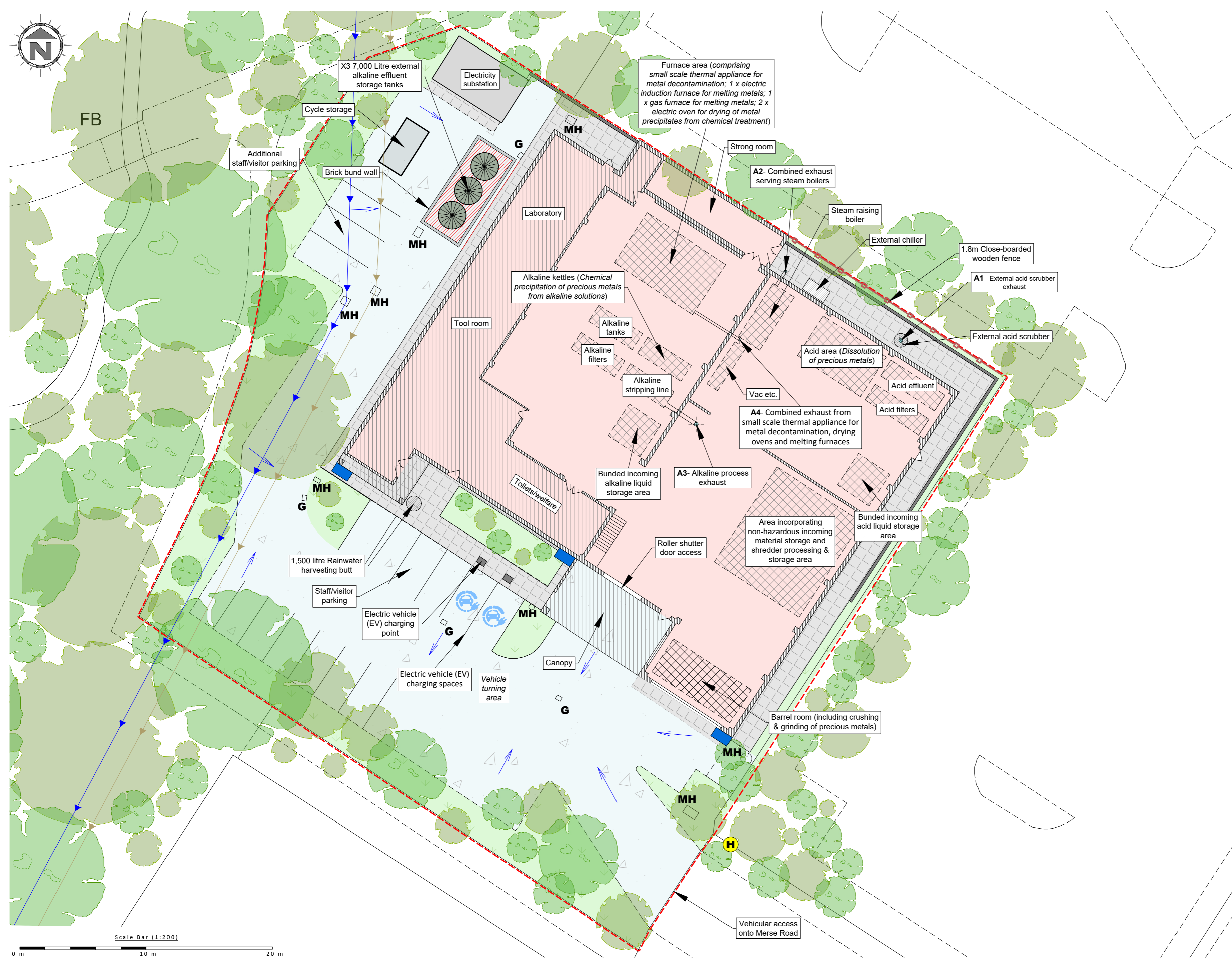
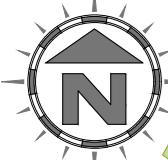
DATE

20.05.22



Scale Bar (1:1,250)



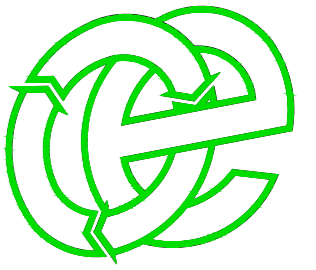


NOTES
 Site survey undertaken using Intel Falcon 8+ drone in September 2022. Ordnance Survey data reproduced with the permission of the controller of H.M.S.O. Crown copyright licence No. 100022432. This drawing is copyright and property of Oaktree Environmental Ltd.

Rev:	Date:	Init:	Description:
-	14.03.23	JH	Initial drawing
A	14.04.23	IA	Layout amendments
B	04.05.23	IA	Layout changes as required by EA
C	17.07.23	JH	Parking amended
D	17.08.23	JH	Fence added

- KEY:**
- Planning boundary
 - Sealed buildings
 - Concreted areas
 - H Hydrant
 - MH Manhole
 - G Gully
 - ↗ Fall direction arrows
 - Paved areas
 - Un-surfaced areas
 - Schwegler 1SP bird/bat terrace
 - Surface water drainage
 - Foul drainage

Oaktree Environmental Ltd
 Waste, Planning and Environmental Consultants



DRAWING TITLE
 PROPOSED LAYOUT PLAN

CLIENT
 Kaug Refinery Services Ltd

PROJECT/SITE
 10 Merse Road, North Moons Moat, Redditch, B98 9HL

SCALE @ A2 1:200	CLIENT NO 2765	JOB NO 009
----------------------------	--------------------------	----------------------

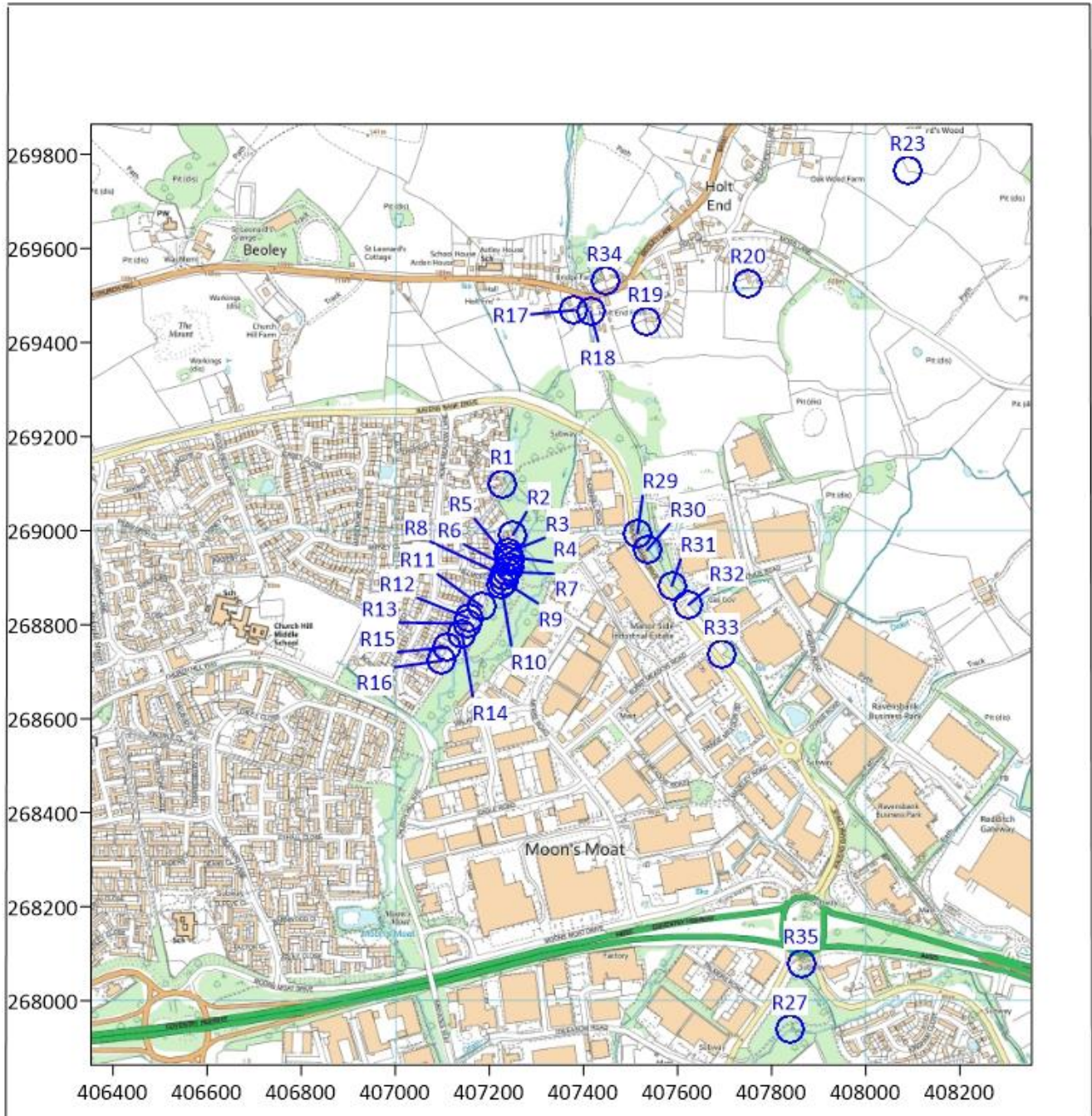
DRAWING NUMBER 2765-009-04	REV D	STATUS Issued
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DRAWN BY JH/IA	CHECKED RS/DY	DATE 17.08.23
--------------------------	-------------------------	-------------------------


Lime House, Road Two, Winsford, Cheshire, CW7 3QZ
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Appendix II

Sensitive Receptor Locations



Appendix II Figure 1 - Sensitive Receptors

 Receptor Location

R1 Receptor Identifier

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 Lime House
 2 Road Two
 Winsford
 Cheshire
 CW7 3QZ



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Appendix III

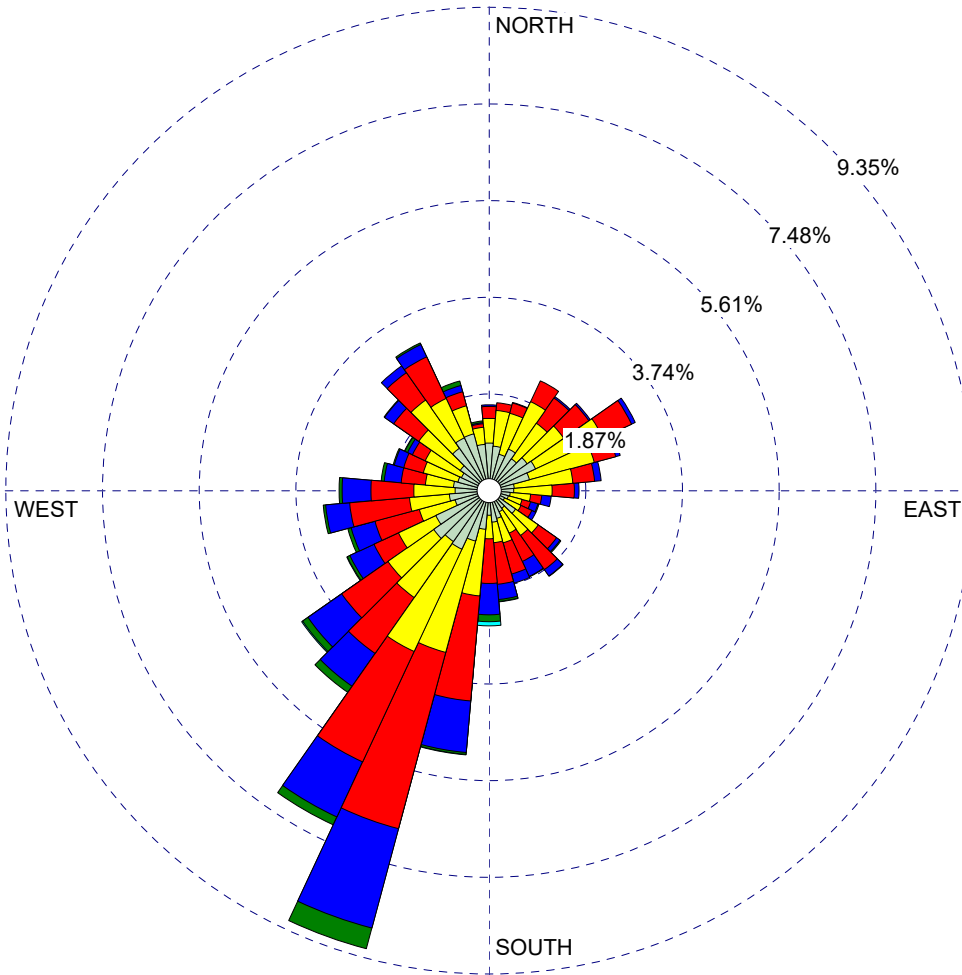
Pershore Wind Roses

WIND ROSE PLOT:

Wind Speed and Direction Frequency at Pershore - 2016

DISPLAY:

**Wind Speed
Direction (blowing from)**



WIND SPEED
(m/s)

- >= 11.10
- 8.80 - 11.10
- 5.70 - 8.80
- 3.60 - 5.70
- 2.10 - 3.60
- 0.50 - 2.10

Calms: 2.21%

COMMENTS:

DATA PERIOD:

**Start Date: 01/01/2016 - 00:00
End Date: 01/01/2017 - 23:59**

COMPANY NAME:

MODELER:

CALM WINDS:

2.21%

TOTAL COUNT:

8784 hrs.

AVG. WIND SPEED:

3.12 m/s

DATE:

20/05/2021

PROJECT NO.:

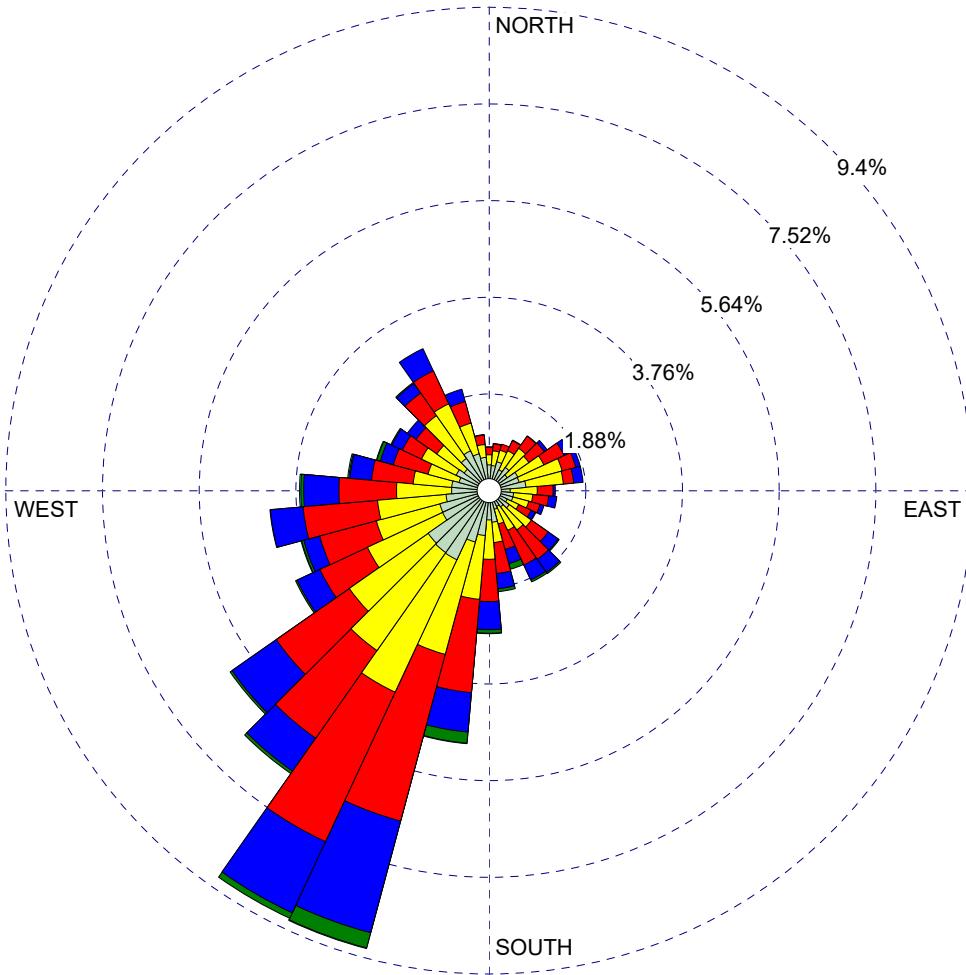
2385-004

WIND ROSE PLOT:

Wind Speed and Direction Frequency at Pershore - 2017

DISPLAY:

Wind Speed
Direction (blowing from)



WIND SPEED
(m/s)

- >= 11.10
- 8.80 - 11.10
- 5.70 - 8.80
- 3.60 - 5.70
- 2.10 - 3.60
- 0.50 - 2.10

Calms: 1.45%

COMMENTS:

DATA PERIOD:

Start Date: 01/01/2017 - 00:00
End Date: 01/01/2018 - 23:59

COMPANY NAME:

MODELER:

CALM WINDS:

1.45%

TOTAL COUNT:

8760 hrs.

AVG. WIND SPEED:

3.27 m/s

DATE:

20/05/2021

PROJECT NO.:

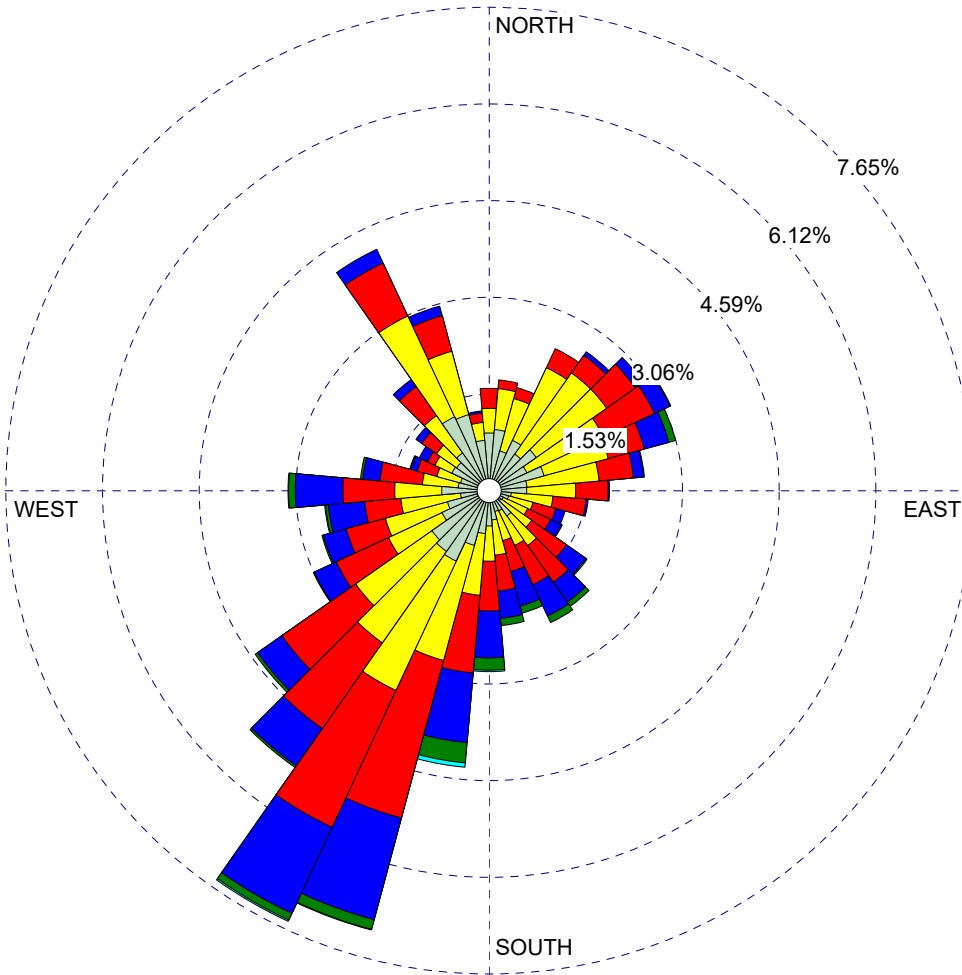
2385-004

WIND ROSE PLOT:

Wind Speed and Direction Frequency at Pershore - 2018

DISPLAY:

**Wind Speed
Direction (blowing from)**



WIND SPEED
(m/s)

- >= 11.10
- 8.80 - 11.10
- 5.70 - 8.80
- 3.60 - 5.70
- 2.10 - 3.60
- 0.50 - 2.10

Calms: 1.39%

COMMENTS:

DATA PERIOD:

**Start Date: 01/01/2018 - 00:00
End Date: 01/01/2019 - 23:59**

COMPANY NAME:

MODELER:

CALM WINDS:

1.39%

TOTAL COUNT:

8760 hrs.

AVG. WIND SPEED:

3.24 m/s

DATE:

20/05/2021

PROJECT NO.:

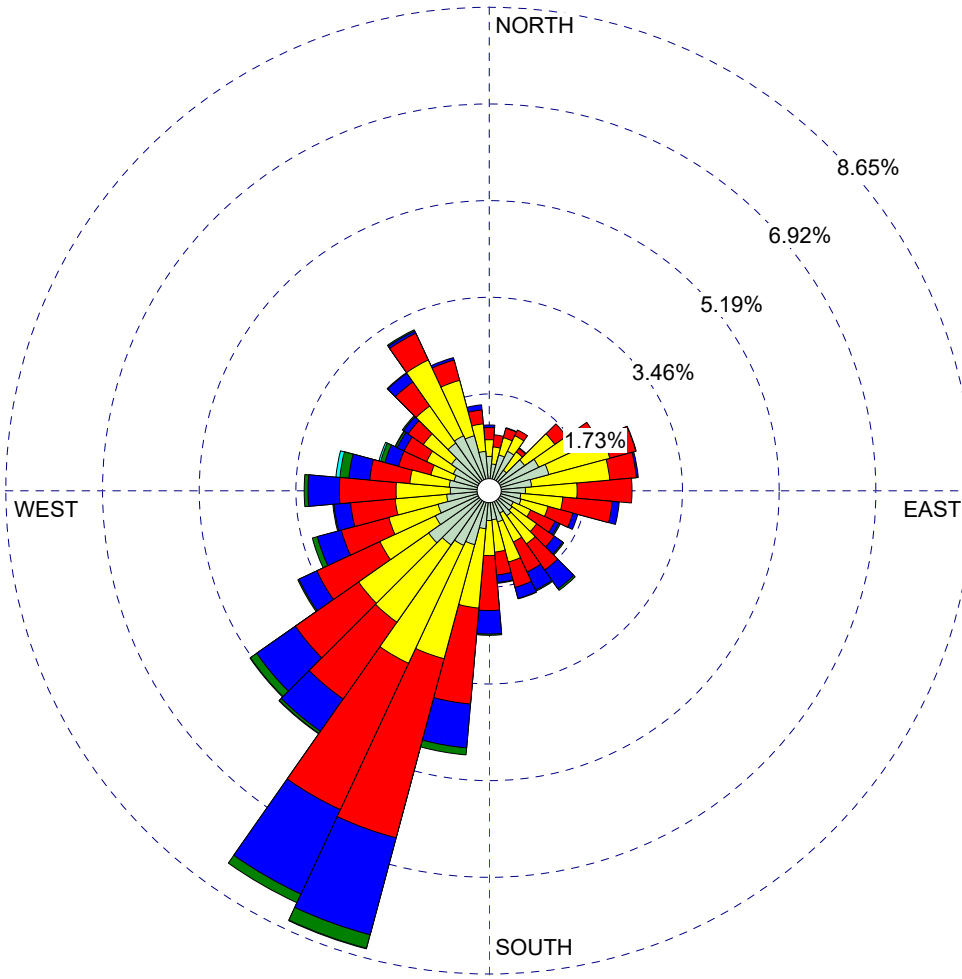
2385-004

WIND ROSE PLOT:

Wind Speed and Direction Frequency at Pershore - 2019

DISPLAY:

**Wind Speed
Direction (blowing from)**



**WIND SPEED
(m/s)**

- >= 11.10
- 8.80 - 11.10
- 5.70 - 8.80
- 3.60 - 5.70
- 2.10 - 3.60
- 0.50 - 2.10

Calms: 1.86%

COMMENTS:

DATA PERIOD:

**Start Date: 01/01/2019 - 00:00
End Date: 01/01/2020 - 23:59**

COMPANY NAME:

MODELER:

CALM WINDS:

1.86%

TOTAL COUNT:

8760 hrs.

AVG. WIND SPEED:

3.09 m/s

DATE:

20/05/2021

PROJECT NO.:

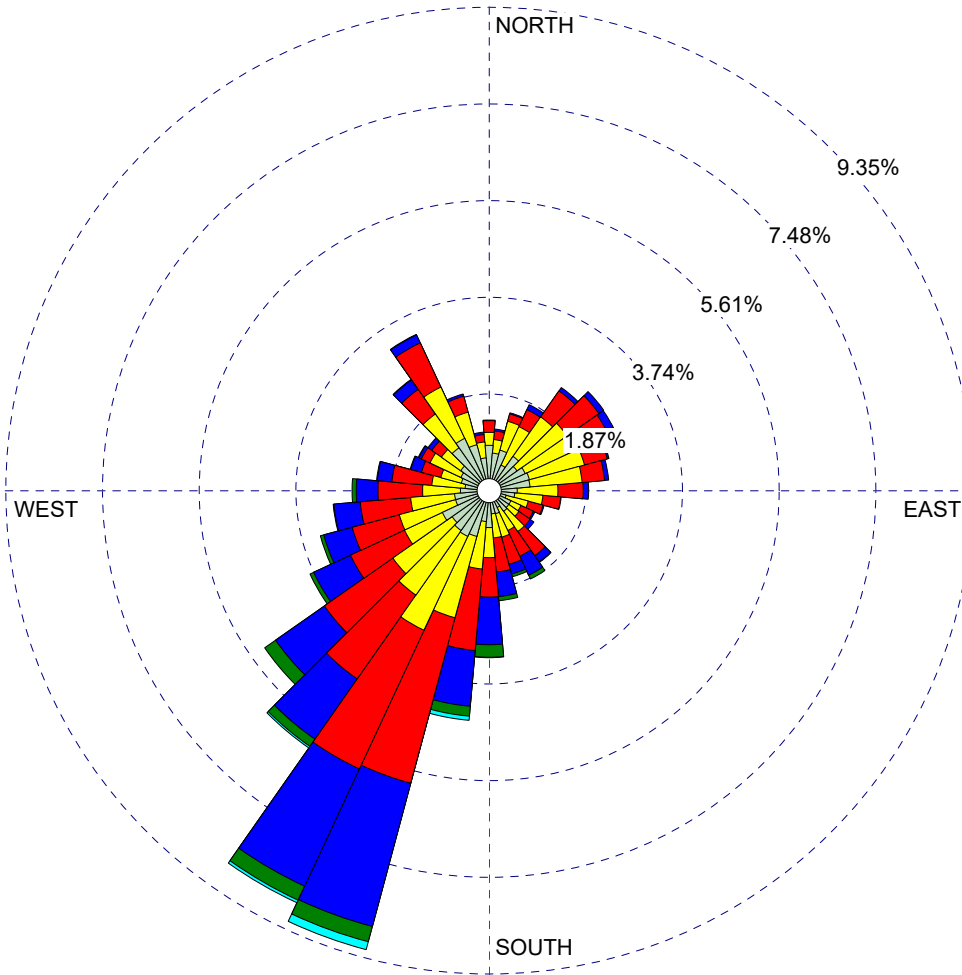
2385-004

WIND ROSE PLOT:

Wind Speed and Direction Frequency at Pershore - 2020

DISPLAY:

Wind Speed
Direction (blowing from)



WIND SPEED
(m/s)

- >= 11.10
- 8.80 - 11.10
- 5.70 - 8.80
- 3.60 - 5.70
- 2.10 - 3.60
- 0.50 - 2.10

Calms: 1.82%

COMMENTS:

DATA PERIOD:

Start Date: 01/01/2020 - 00:00
End Date: 01/01/2021 - 23:59

COMPANY NAME:

MODELER:

CALM WINDS:

1.82%

TOTAL COUNT:

8784 hrs.

AVG. WIND SPEED:

3.41 m/s

DATE:

20/05/2021

PROJECT NO.:

2385-004

Appendix IV

NO₂ Contour Profiles

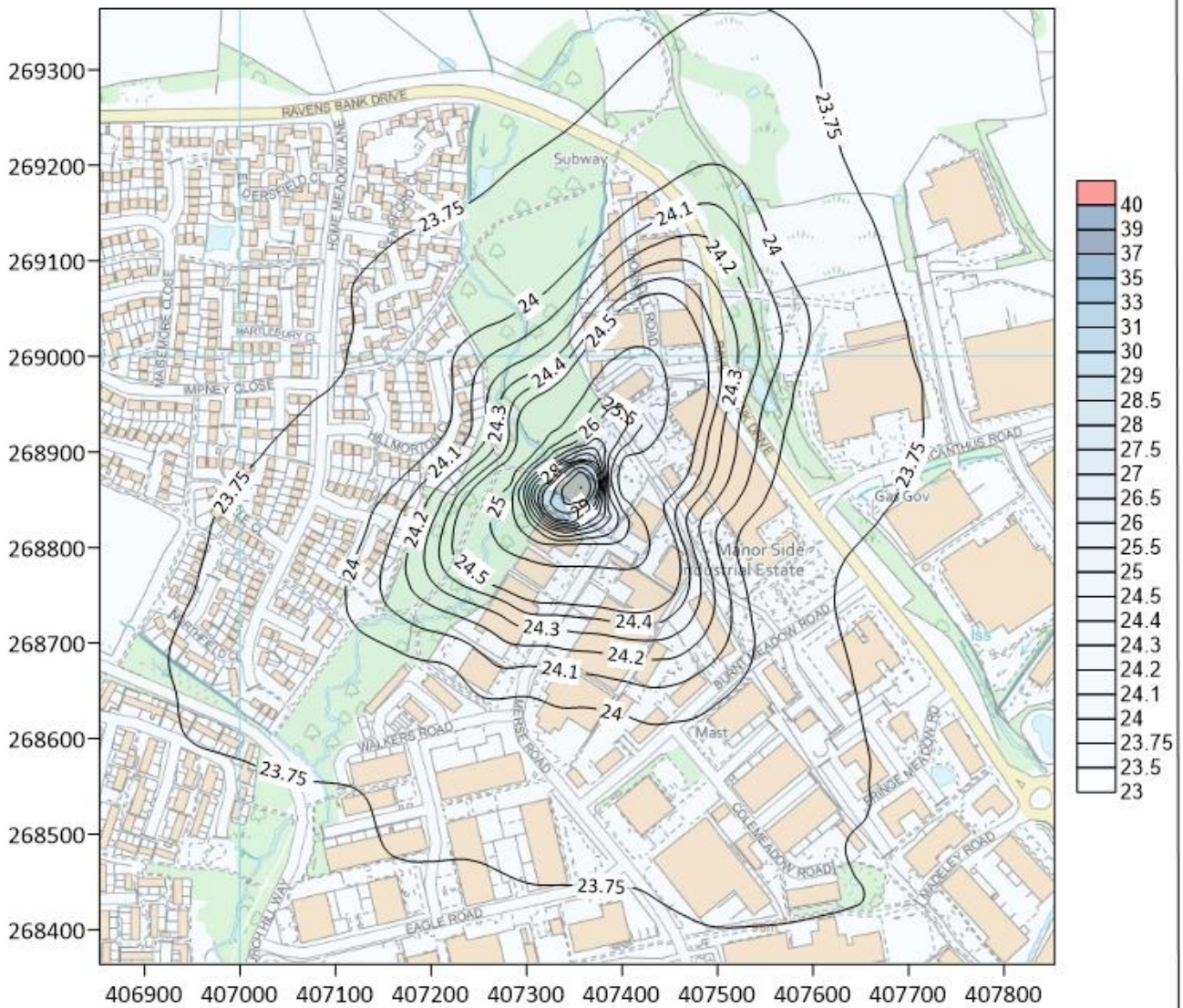


Figure IV Figure 1 - Predicted annual mean nitrogen dioxide concentrations ($\mu\text{g.m}^{-3}$) based upon 2016 meteorological data

Oaktree Environmental Ltd
 Lime House
 2 Road Two
 Winsford
 Cheshire
 CW7 3QZ



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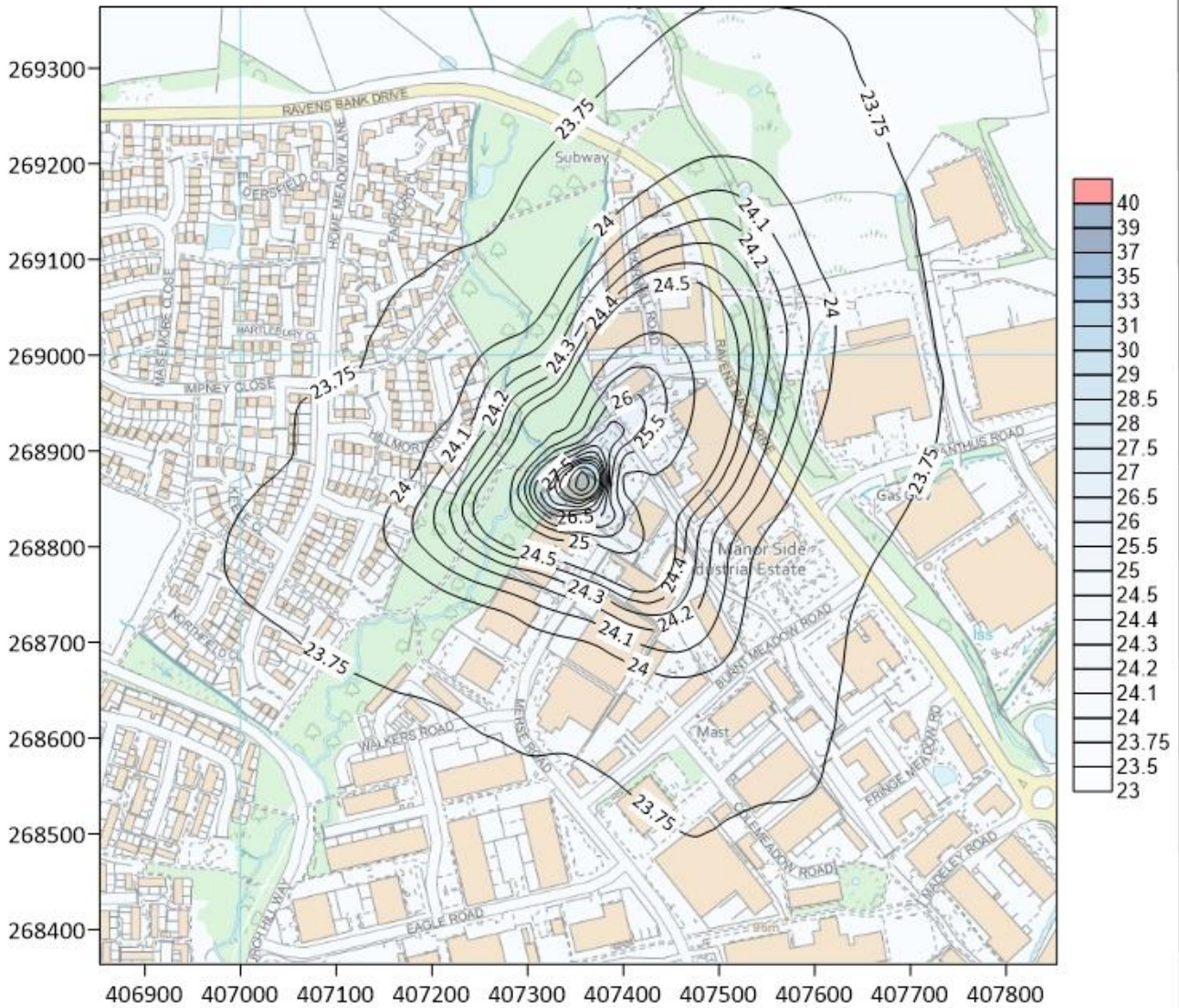


Figure IV Figure 2 - Predicted annual mean nitrogen dioxide concentrations ($\mu\text{g.m}^{-3}$) based upon 2017 meteorological data

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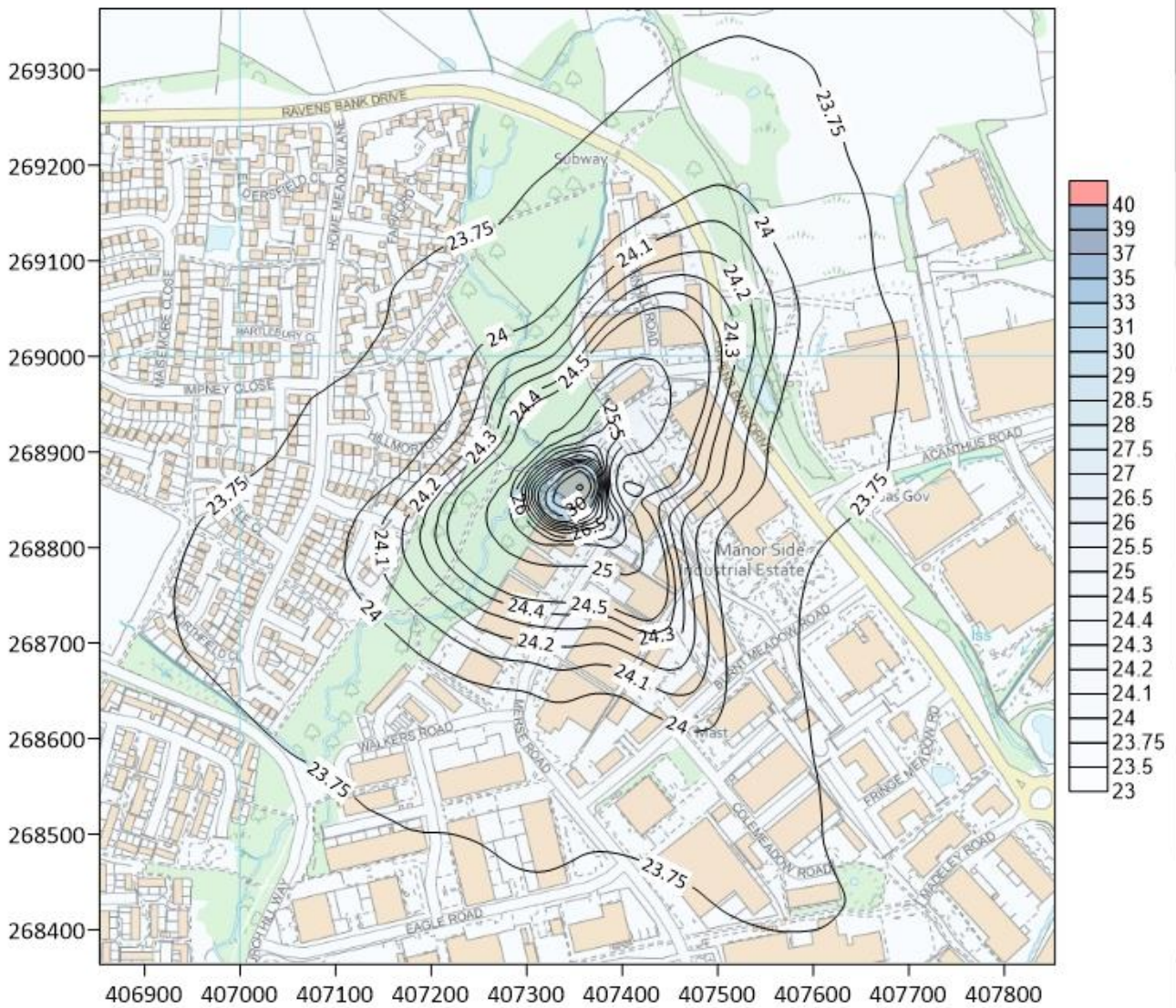


Figure IV Figure 3 - Predicted annual mean nitrogen dioxide concentrations ($\mu\text{g.m}^{-3}$) based upon 2018 meteorological data

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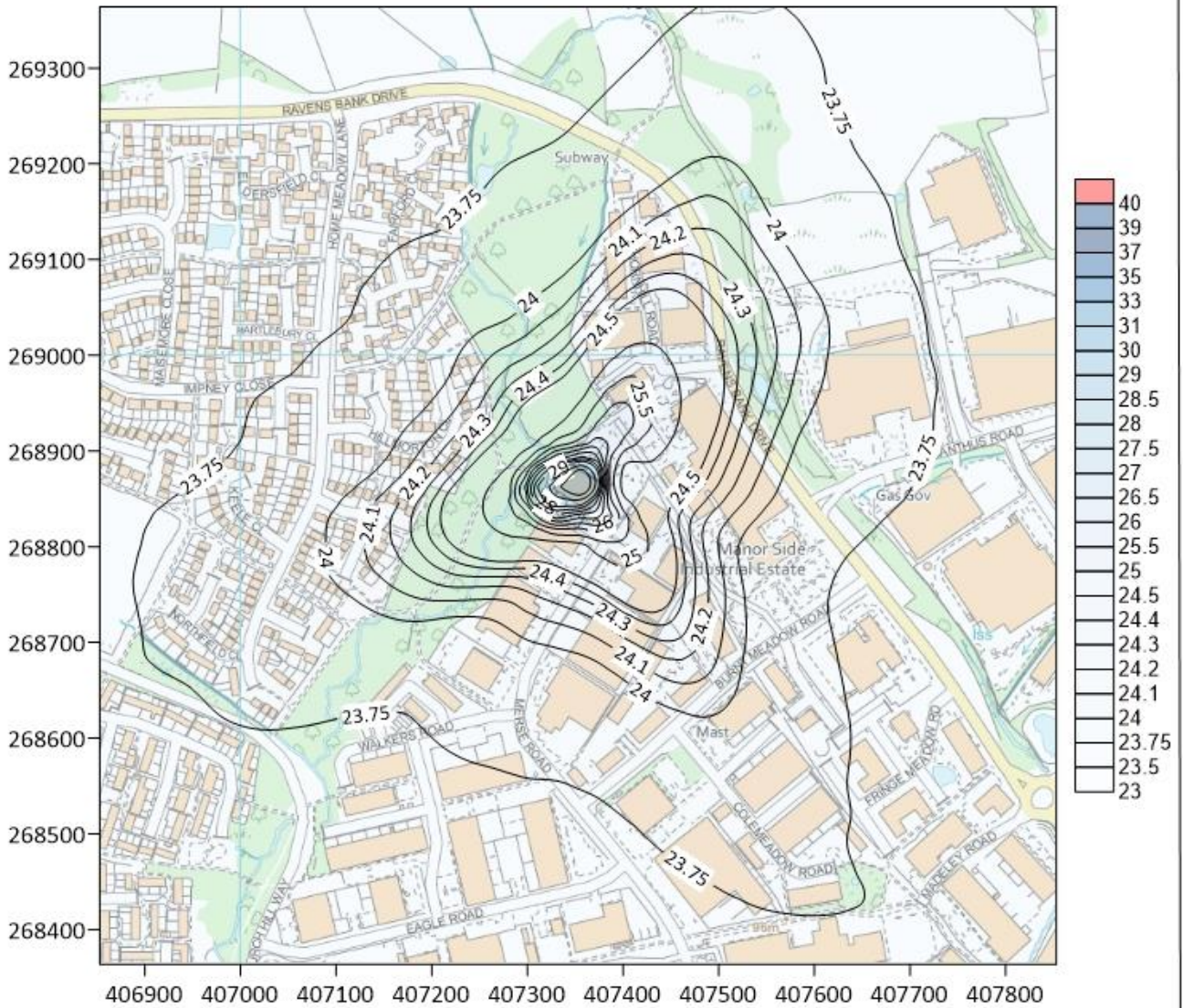


Figure IV Figure 4 - Predicted annual mean nitrogen dioxide concentrations ($\mu\text{g.m}^{-3}$) based upon 2019 meteorological data

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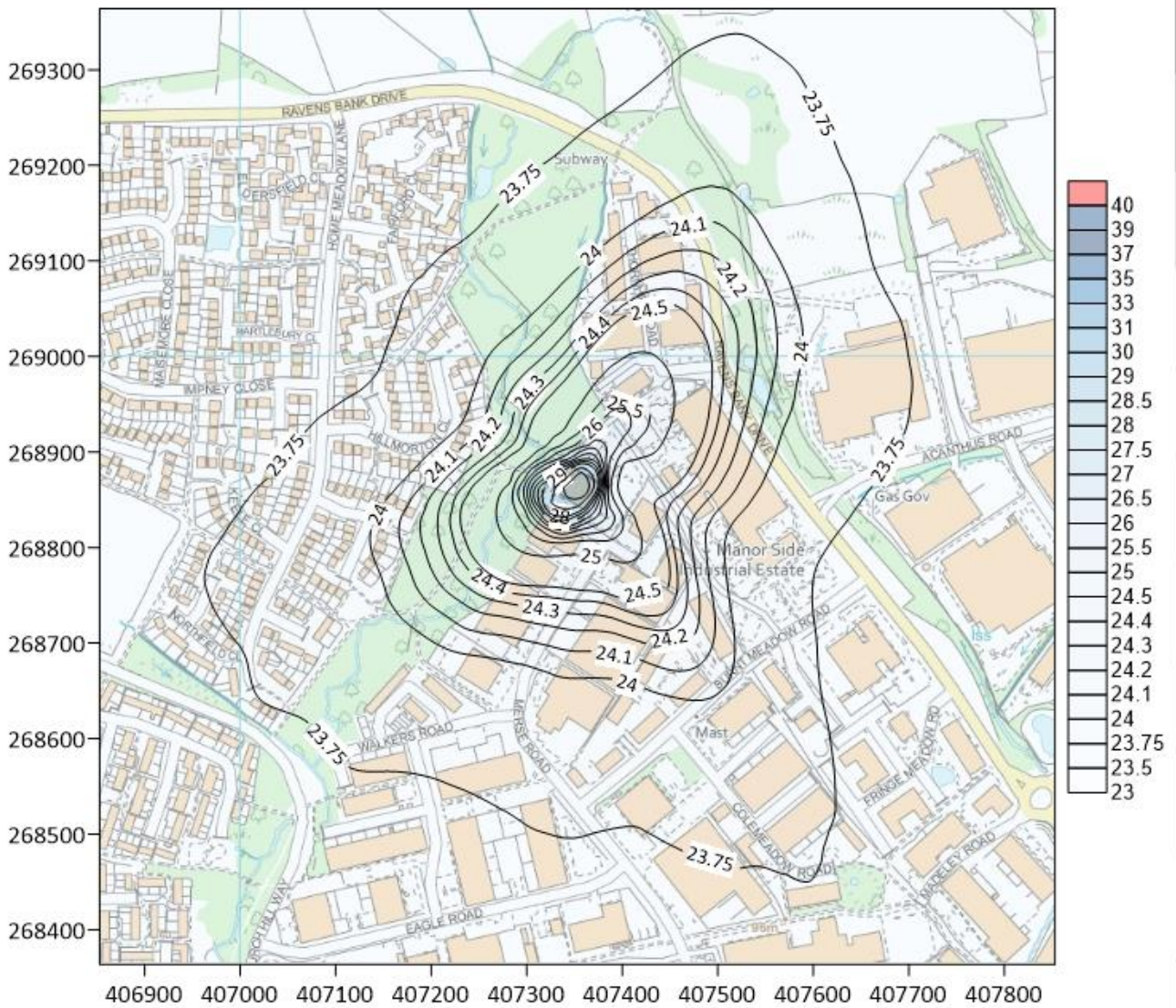


Figure IV Figure 5 - Predicted annual mean nitrogen dioxide concentrations ($\mu\text{g.m}^{-3}$) based upon 2020 meteorological data

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 Winsford
 Cheshire
 CW7 3QZ



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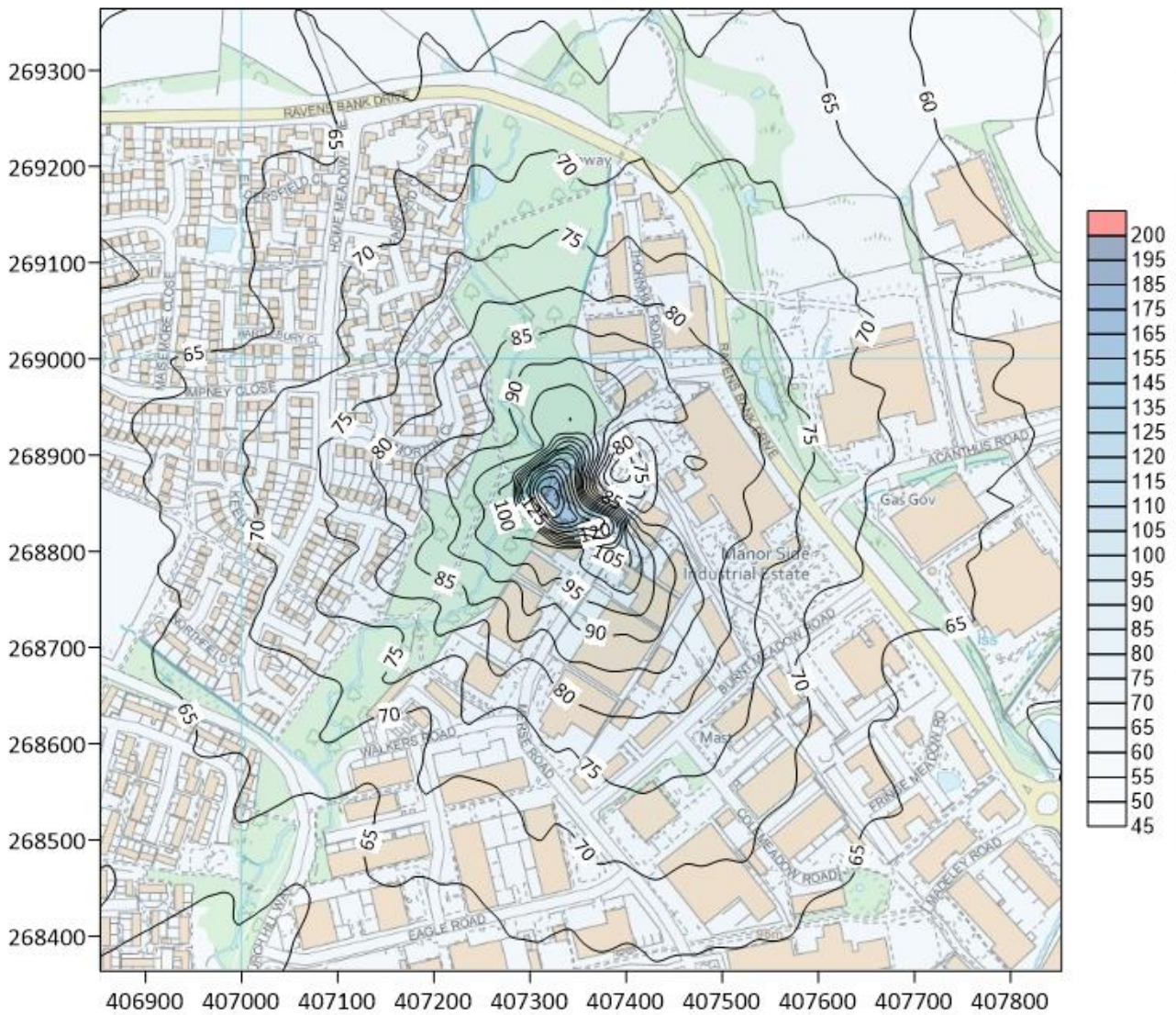


Figure IV Figure 6 - Predicted 99.8th percentile of 1-hour mean nitrogen dioxide concentrations ($\mu\text{g.m}^{-3}$) based upon 2016 meteorological data

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Cheshire
CW7 3QZ



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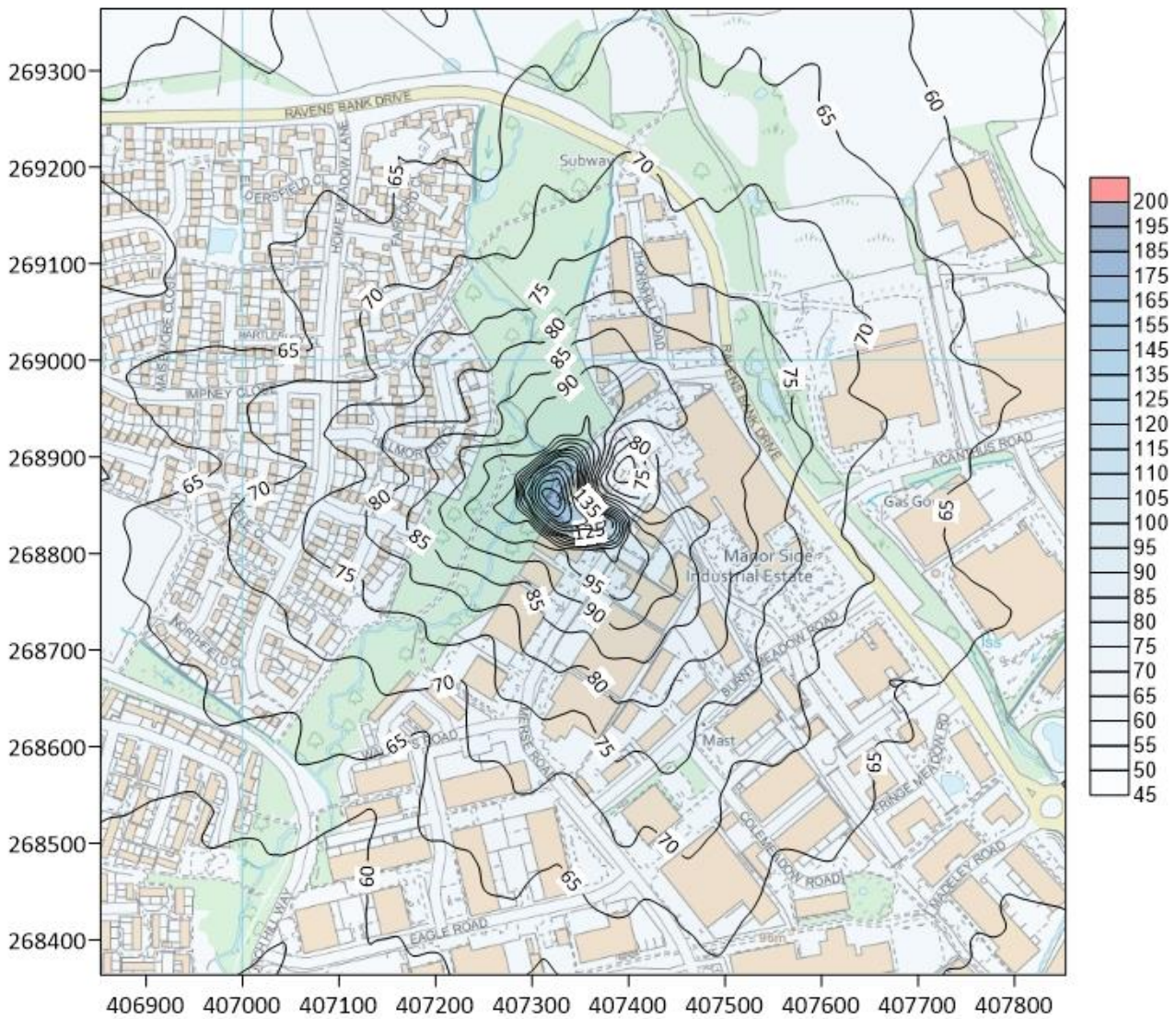


Figure IV Figure 7 - Predicted 99.8th percentile of 1-hour mean nitrogen dioxide concentrations ($\mu\text{g.m}^{-3}$) based upon 2017 meteorological data

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 2 Road Two
 Winsford
 Cheshire
 CW7 3QZ



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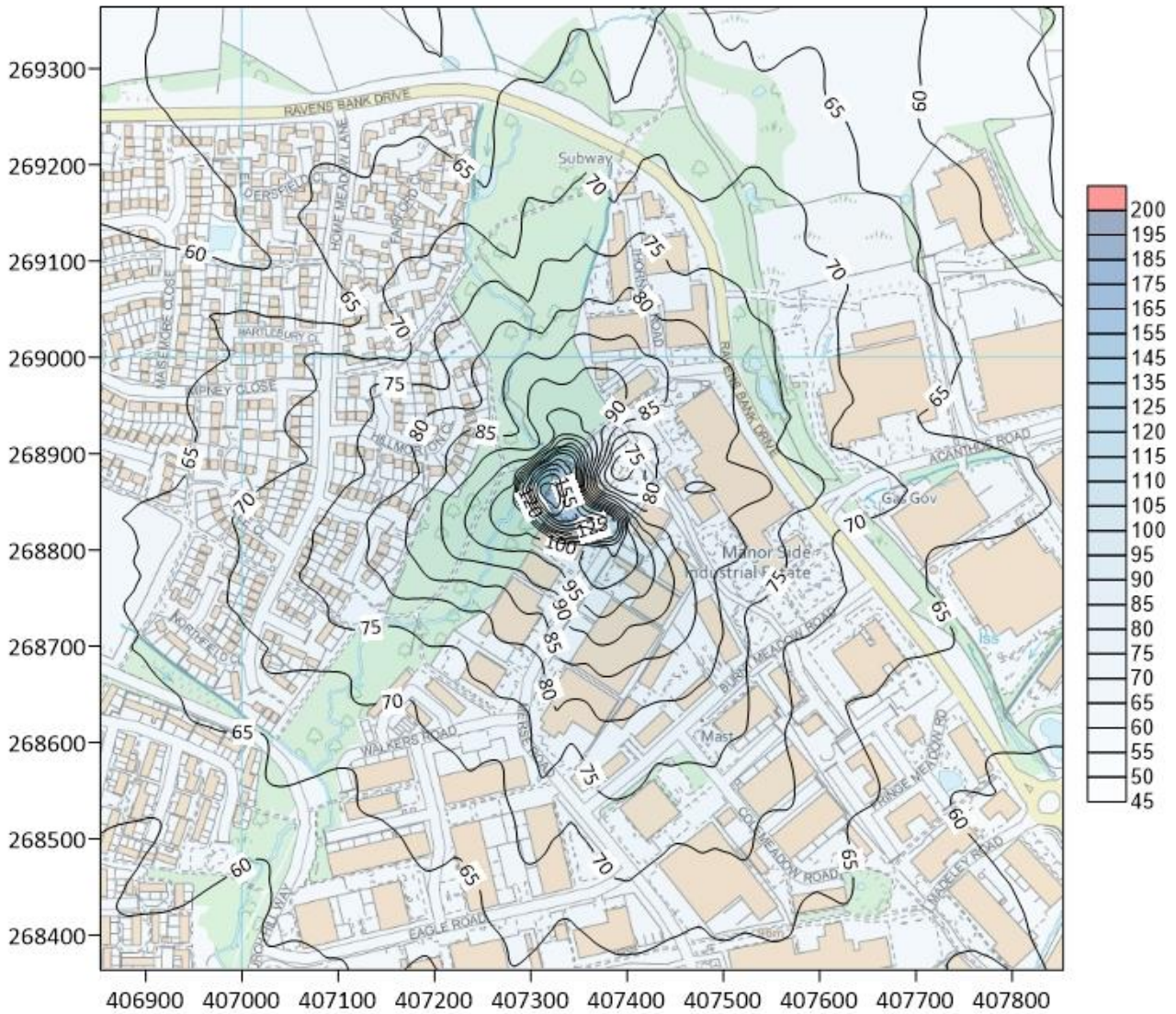


Figure IV Figure 8 - Predicted 99.8th percentile of 1-hour mean nitrogen dioxide concentrations ($\mu\text{g.m}^{-3}$) based upon 2018 meteorological data

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 Winsford
 Cheshire
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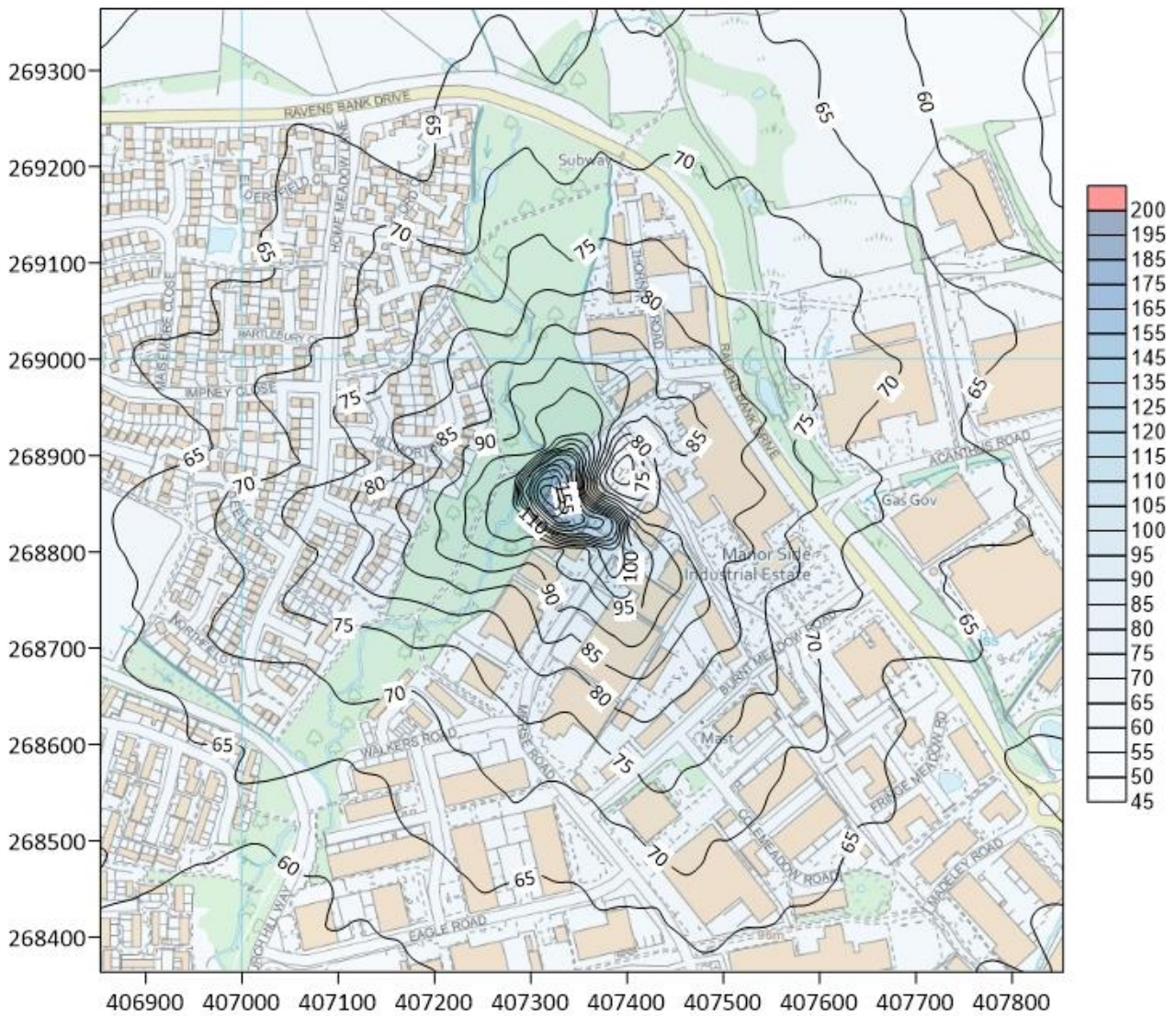


Figure IV Figure 9 - Predicted 99.8th percentile of 1-hour mean nitrogen dioxide concentrations ($\mu\text{g.m}^{-3}$) based upon 2019 meteorological data

Oaktree Environmental Ltd
 Lime House
 2 Road Two
 Winsford
 Cheshire
 CW7 3QZ



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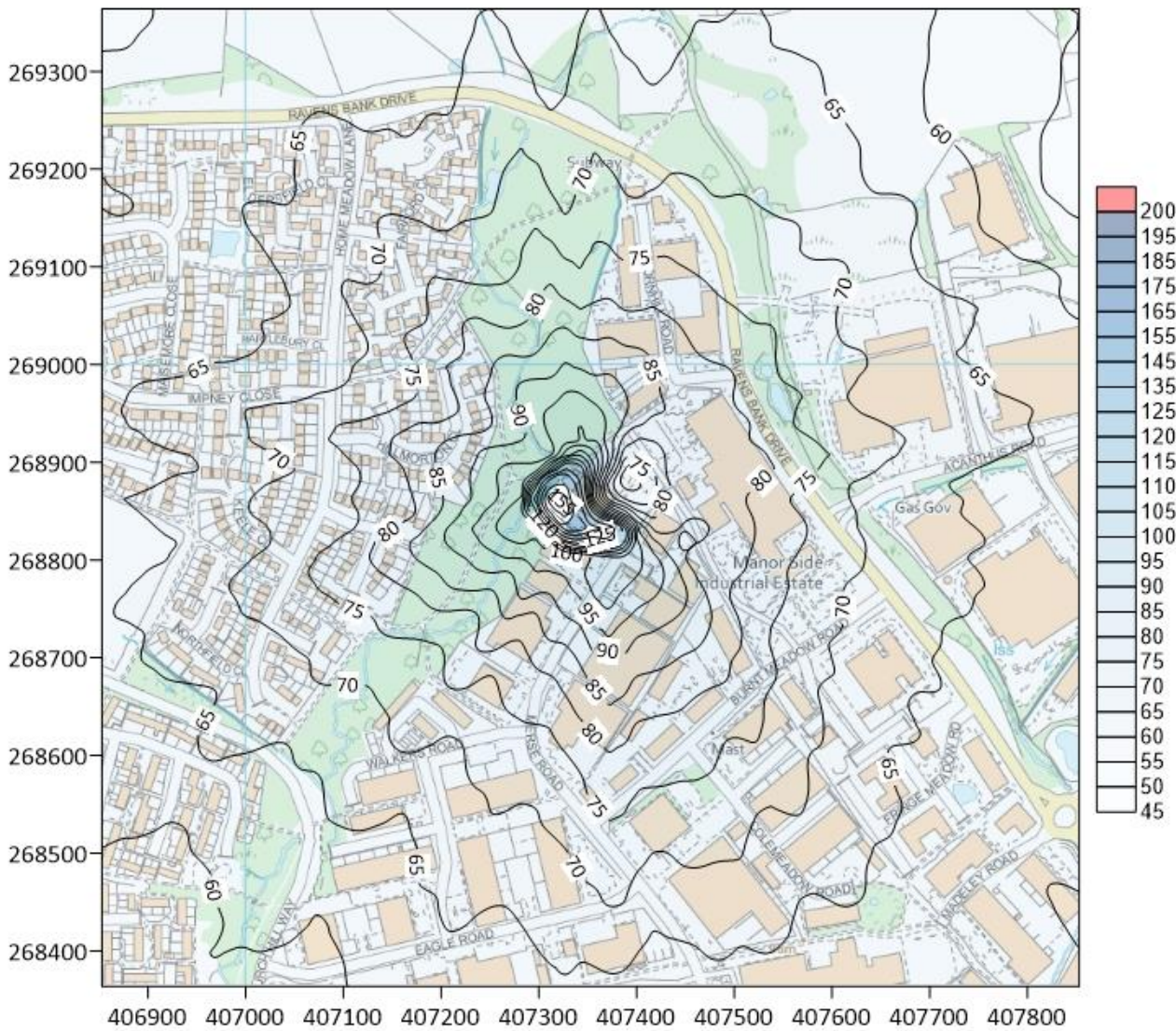


Figure IV Figure 10 - Predicted 99.8th percentile of 1-hour mean nitrogen dioxide concentrations ($\mu\text{g}\cdot\text{m}^{-3}$) based upon 2020 meteorological data

Oaktree Environmental Ltd
 Lime House
 2 Road Two
 Winsford
 Cheshire
 CW7 3QZ

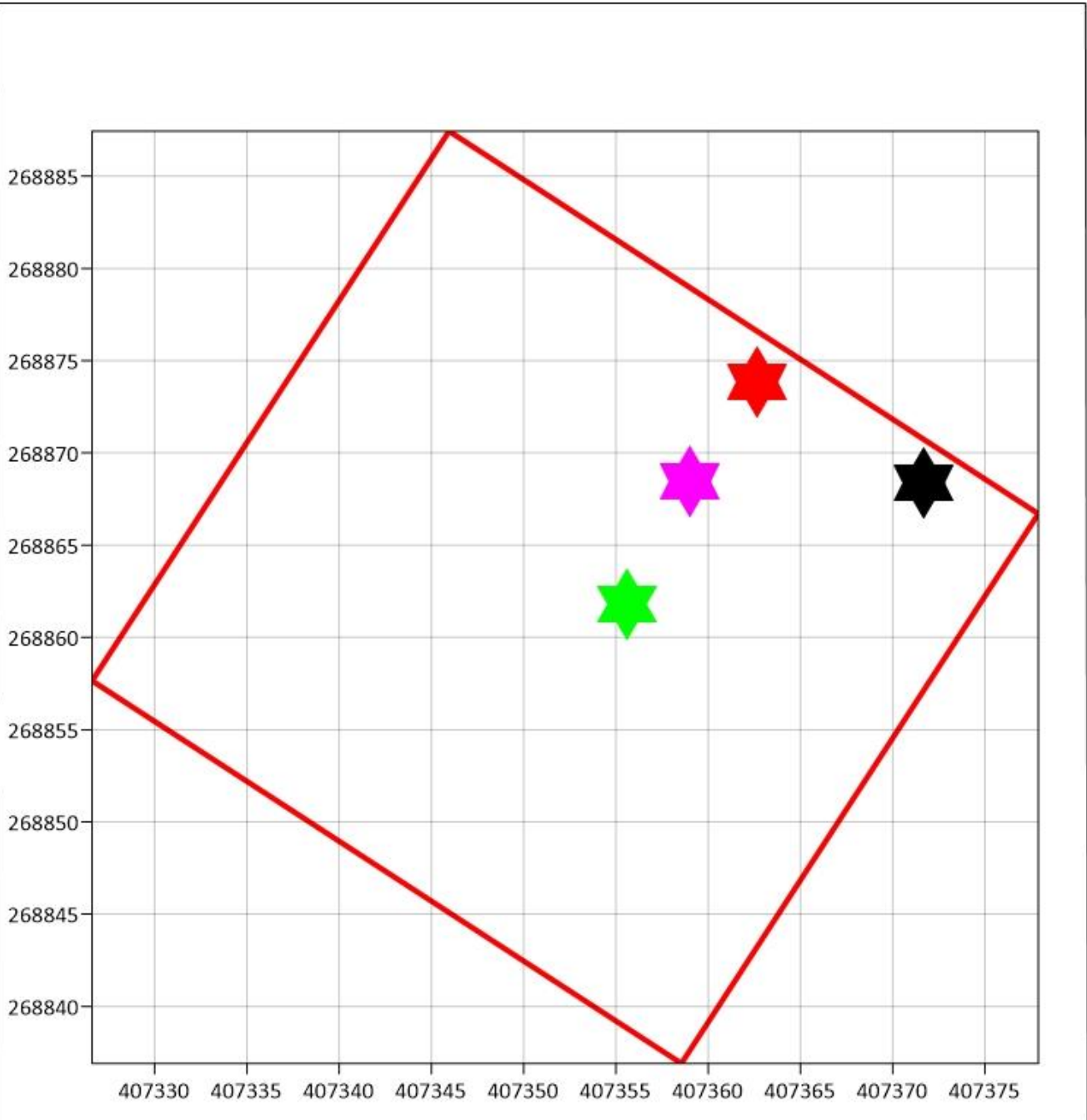


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Appendix V

Buildings and Emission Sources Digitised

Within Model



Appendix V Figure 1 - Buildings and Emission Points Digitised Within Model

-  Emission Point A1
-  Emission Point A2
-  Emission Point A3
-  Emission Point A4

Oaktree Environmental Ltd
Lime House
2 Road Two
Winsford
Cheshire
CW7 3QZ



Appendix X

Emissions Monitoring Reports

Stack Emissions Monitoring Report

commissioned by Kaug Refinery Services Ltd

Operator Name

Kaug Refinery Services Ltd | Deritend Site

Operator Address

Green St, Deritend
Birmingham
B12 0NB

Release Point

Drying Oven

Monitoring Organisation Name & Address

Atesta Ltd
Unit 2, Asher Court, Lyncastle Way
Appleton, Warrington
WA4 4ST

Monitoring Report Written By

Rob Haworth | Senior Team Leader
MCERTS Level 2 | MM 07 797 | TE1 TE2 TE3 TE4 | expires on 31/12/2023

Monitoring Report Approved By

Matt Pendlebury | Technical Support Manager
MCERTS Level 2 | MM 04 535 | TE1 TE2 TE3 TE4 | expires on 17/06/2024



Job Reference: JOB-759

Report Date | Version Number

27/07/2023 | Version 1

Dates of the Monitoring Campaign

17/07/2023

Atesta Ltd Primary Contact

Alastair Wolff | m: 07506 729 226
e: alastair.wolff@atesta.com



info@atesta.com

T: 0800 970 8945

atesta.com

Report Contents and Monitoring Objectives

Report Contents

TITLE PAGE

CONTENTS AND MONITORING OBJECTIVES

PART 1: EXECUTIVE SUMMARY

- Monitoring Results
- Monitoring and Analytical Methods (incorporating Method Deviations if applicable)
- Monitoring Location
- Duct and Sampling Platform Information
- Operating Information

PART 2: SUPPORTING INFORMATION

- Appendix 1 - Monitoring Personnel, Analysis Laboratories and Test Equipment Used
- Appendix 2 - Results and Calculations

Monitoring Objective

The monitoring objective was to conduct stack emissions monitoring to demonstrate compliance against a set of emission limit values (ELVs) as specified in the Site's Environmental Permit.

Special Requirements

There were no special requirements for this monitoring campaign.

Opinions and Interpretations

Any opinions or interpretations contained within this test report are outside the scope of Atesta's MCERTS / ISO 17025 accreditation.

Part 1: Executive Summary - Monitoring Results Summary

Monitoring Results - Summary

test parameter	EXPRESSED AS A CONCENTRATION				EXPRESSED AS A MASS EMISSION				reference conditions	accreditation status
	result	uncertainty (± 95% CI)	limit (ELV)	units	result	uncertainty (± 95% CI)	limit (ELV)	units		
Hydrogen Cyanide	< 0.066	0.013		mg/m ³	< 0.0085	0.0018		g/hr	STP, wet	Non accredited
Total VOCs (as Carbon)	14.7	0.76		mg/m ³	1.9	0.16		g/hr	STP, wet	MCERTS
Stack Gas Water Vapour	2.4	0.093		% v/v					actual	MCERTS
Stack Gas Temperature	69.0			°C					actual	MCERTS
Stack Gas Velocity	5.7	0.26		m/s					actual	MCERTS
Stack Gas Flow Rate (ACTUAL)	161	10.3		m ³ /hr					actual	MCERTS
Stack Gas Flow Rate (REF)	128	8.2		m ³ /hr					STP, wet	MCERTS

The stack gas water vapour, temperature, velocity and flow rates in the above table are calculated as an average of all of the results recorded during this monitoring campaign

Part 1: Executive Summary - Monitoring Results Further Details

Monitoring Results - Further Details

test parameter	run	EXPRESSED AS A CONCENTRATION				EXPRESSED AS A MASS EMISSION				sampling date times	run time (mins)	H ₂ O (% v/v)	reference conditions
		result	uncertainty (± 95% CI)	limit (ELV)	units	result	uncertainty (± 95% CI)	limit (ELV)	units				
Hydrogen Cyanide	R1	< 0.066	0.013		mg/m ³	< 0.0085	0.0018		g/hr	17/07/2023 10:23 - 11:03	40	2.4	STP, wet
Total VOCs (as Carbon)	R1	14.7	0.76		mg/m ³	1.9	0.16		g/hr	17/07/2023 10:33 - 11:03	30		STP, wet
Velocity & Flow Rate Traverse	R1	5.7	0.26		m/s	161	10.3		m ³ /hr	17/07/2023 11:05 - 11:07			actual

Part 1: Executive Summary - Monitoring and Analytical Methods

Monitoring and Analytical Methods

where analysis required	MONITORING					ANALYSIS					
test parameter	laboratory	accreditation number	technical procedure	reference method	monitoring status	laboratory	accreditation number	analytical procedure	analytical technique	analysis status	accreditation status
Hydrogen Cyanide	ATA	10706	TP-15	Based on US EPA OTM29	MCERTS	RPS	0605	W4	UV VIS Spec	Non accredited	Non accredited
Water Vapour	ATA	10706	TP-03	EN 14790	MCERTS	ATA	10706	TP-03	Gravimetric	MCERTS	MCERTS

where analysis not required	MONITORING					measurement technique & equipment		accreditation status
test parameter	laboratory	accreditation number	technical procedure	reference method	monitoring status			
Total VOCs (as Carbon)	ATA	10706	TP-21a	EN 12619	MCERTS	FID using ThermoFID		MCERTS
Velocity & Flow Rate Traverse	ATA	10706	TP-04a	EN 16911-1 TR 17078	MCERTS	Pitot Tube, Thermocouple & Thermomanometer		MCERTS

Summary of Monitoring Deviations (from Appendix 2)

test parameter	run	details of monitoring deviation
All	1	There were no deviations associated with the monitoring employed.

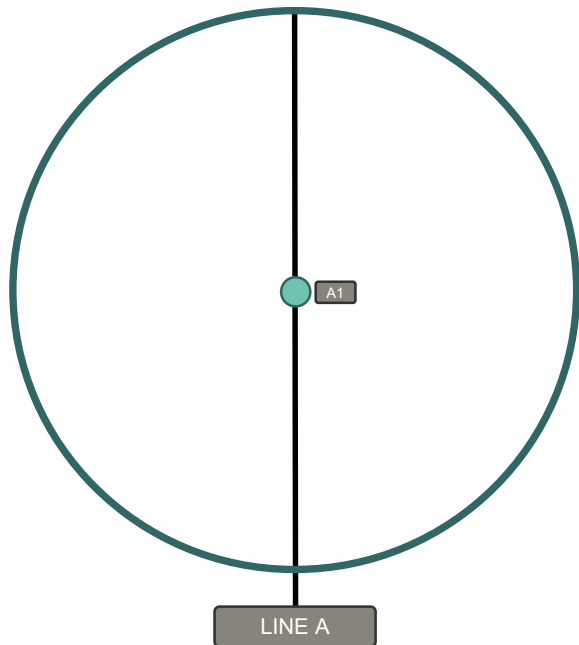
Part 1: Executive Summary - Monitoring Location

Monitoring Location Photos



Identification of Sampling Points on a Duct Diagram

refer to Appendix 2 - Raw Data to see how the points on this diagram relate to the points used for each test



Part 1: Executive Summary - Duct and Sampling Platform Information

Duct Characteristics | Sampling Ports

parameter	units	value
shape	-	Circular
dimensions	-	Diameter = 0.10 m
area	m ²	0.01
orientation	-	Vertical

parameter	value
primary sample port size	Hole
primary sample port depth cm	0
primary sample ports number of sampling lines available	1

summary of all sample ports available
Hole

Sampling Location General Information

general information	details
type location access	On the Ground Inside plant building On Ground Level

CEMS | Abatement Systems

parameter	details
abatement system/s	0
CEMS installed on the stack	0

Sampling Plane Validation Criteria Summary (EN 15259) from Stack Traverse/s

criteria in EN 15259	units	value	allowed	compliant
lowest differential pressure	Pa	24.0	> 5 Pa	Yes
lowest traverse velocity	m/s	5.7	-	-
highest traverse velocity	m/s	5.7	-	-
mean traverse velocity	m/s	5.7	-	-
ratio traverse velocities	: 1	1.00	< 3 : 1	Yes
angle of swirl compliance	°	< 15	< 15°	Yes
no local negative flow	-	Yes	-	Yes

Part 1: Executive Summary - Sampling Location and Operating Information

Process Details

process detail	details
plume appearance on day of monitoring	None visible
type of process	Drying Oven
batch or continuous process	Batch
fuel type	0
feedstock	Component Parts
typical load / throughput of plant	0
details of any unusual process occurrences	N/A

Part 2: Supporting Information - Appendix 1: Monitoring Personnel, Analysis Laboratories and Test Equipment Used

Monitoring Personnel

name	position	MCERTS level number expiry	MCERTS technical endorsements
Rob Haworth	Senior Team Leader	MCERTS Level 2 MM 07 797 31/12/2023	TE1 TE2 TE3 TE4
Ben Metcalfe	Technician	MCERTS Level 1 MM 21 1659 29/10/2026	-

Analysis Laboratories

laboratory	ISO 17025 accreditation number	laboratory short name	laboratory phone number
Atesta North West	10706	ATA	0800 970 8945
RPS Laboratories Salford	0605	RPS	0161 872 2443

Test Equipment Used

equipment type	A-EQ ID
Source sampling console	50
Low flow sampling MFCs	
ThermoFID / iFID mobile	53
Horiba PG-350E multigas analyser	
Gasmeter DX4000 FTIR	
Gasmeter PSS	
Protea AtmosFIR	
Protea PIB Pump	
Gasmeter syringe calibrator	
M&C PSS5-C conditioning unit	
Digital thermomanometer	115
Top pan balance kit	42

equipment type	A-EQ ID
Pitot	193
Calipers	35
Barometer	34
Timer	37
Tape measure	25
Heated head filter	63
Heated tee	
10m heated line	22
1.5m heated line	
Odour barrel	
Vacuum chamber	
Dilution probe	

equipment type	A-EQ ID
10m umbilical	
30m umbilical	88
Heated probe	147
Filter oven	
Ambient thermocouple	162
Stack thermocouple	241
Exit thermocouple	
Condenser thermocouple	
Tubes kit thermocouple	
2-way heater controller	
Air sampling pump	
5-figure analytical balance	1

Part 2: Supporting Information - Appendix 2: Hydrogen Cyanide | Run 1

Results

reference conditions are: STP, wet

parameter	units	result ± MU (95% CI)	units	result ± MU (95% CI)
Hydrogen Cyanide	mg/m ³	< 0.066 ± 0.013	g/hr	< 0.0085 ± 0.0018

Analytical Laboratory Information

parameter	details
name of analytical lab	RPS
lab analytical procedure	W4
lab analytical technique	UV VIS Spec Analysis Accreditation: Non accredited
date analysis completed	26/07/2023

General Information

parameter	details
sampling date	17/07/2023
sampling times testing team	10:23 - 11:03 40 minutes tested by: RH BM
standard technical procedure	Based on US EPA OTM29 TP-15
volume metering device	XD-502 Digital Source Sampling Console
probe material	Titanium
filter housing material	Titanium
impinger material capture media	Borosilicate Glass NaOH

parameter	details
filter size, material & location	47mm QF In Stack heated to 69°C
number sampling lines available	1
number sampling lines used	1
number sampling points ideal per line	1
number sampling points used per line	1
sampling point IDs	A1

Quality Assurance

² The concentration in the last absorber was less than 5 times the analytical LOD.

QA parameter	units	sample run			blank (taken on 17/07/2023)		
		value	allowable	result	value	allowable	result
maximum allowable blank	mg/m ³	-	-	-	0.062	N/A	N/A
leak test	%	0.80	2.00	Pass	0.80	2.00	Pass
absorption efficiency	%	100.0	N/A ²	Pass	-	-	-
silica trap <50% faded	-	Yes	-	Pass	-	-	-
are water droplets present	-	No	-	-	-	-	-
water vapour MU	%	3.8	20.0	Pass	-	-	-
pH maintained	-	13	≥12	Pass	-	-	-

Breakdown of Results

reference conditions are: STP, wet

parameter	sample volume [m ³]	LOD [mg]	impingers [front back] [mg/l]	impinger volume [front back] [ml]	mass total [mg]	LOD result [mg/m ³]	result [mg/m ³]	result reported [mg/m ³]	mass emission [g/hr]
sample run	0.4843	0.032	< 0.1 < 0.1	209 110	< 0.032	0.066	< 0.066	< 0.066	< 0.0085
blank	0.4843	0.03	< 0.1	298.0	< 0.03	0.062	< 0.062	< 0.062	

Part 2: Supporting Information - Appendix 2: Hydrogen Cyanide | Run 1

Raw Data | Calculations

data	units	value
P _{bar}	mmHg	761.3
P _g	Pa	0.0
ΔH _@	mmH ₂ O	44.3
P _m	mmHg	764.6
P _s	mmHg	761.3
V _m (metered)	m ³	0.5110
Y _d	-	0.9989
C _{stp}	-	0.3592

data	units	value
T _m	°C	23.0
ΔH _{av}	Pa	200.0
m _{wts}	g	9.6
M _w	g/mol	18.0
V _{mol}	m ³ /mol	0.0222
T _s	°C	69.0
R _{wv} (H ₂ O)	% v/v	2.4

data	units	value
%CO _{2d}	% v/v (est)	0.05
%O _{2d}	% v/v (est)	20.80
%O _{2w}	% v/v (est)	N/A
%N _{2d}	% v/v	79.15
%O _{2ref}	% v/v	N/A
O _{2facd}	-	N/A
O _{2facw}	-	N/A

data	units	value
M _d	g/mol	28.84
M _s	g/mol	28.58
A _s	m ²	0.01
θ (sample time)	mins	40

where (est) refers to an estimated value

metered volume calculations	units	value
allow favourable O ₂ correction	-	N/A
vol actual stack conditions, V _{ma} = (V _{mstw})(T _s + 273) / (P _s) / (C _{stp})	m ³	0.6057
vol dry, V _{mstd} = (V _m)(Y _d)(C _{stp}) / ((P _{bar} + (ΔH _{av} / 9.80665 / 13.6)) / (T _m + 273))	m ³	0.4725
vol wet, V _{mstw} = (V _{mstd})(100 / (100 - R _{wv}))	m ³	0.4843
vol dry O ₂ , V _{mstdO₂} = (V _{mstd}) / (O _{2facd})	m ³	N/A
vol wet O ₂ , V _{mstwO₂} = (V _{mstw}) / (O _{2facw})	m ³	N/A

velocity volume flow rate calculations	units	value
velocity of stack gas, v _s = average of all velocity measurements	m/s	5.7
stack gas flow actual stack conditions, Q _a = average of all flow rate measurements	m ³ /hr	160.5

Measurement Uncertainty (MU) Calculations

parameter	units	value	standard MU	MU as %age	required standard	value	sens coeff.	MU mg/m ³
DGM meter volume, V _m	m ³	0.5110	0.0026	0.50	≤2%	-	-	-
DGM temperature, T _m	K	296.0	2.0	0.68	≤1%	-	-	-
DGM pressure, P _m	kPa	101.9	0.50	0.49	≤1%	-	-	-
DGM humidity, H _m	% v/v	0	1.0	1.00	≤1%	-	-	-
DGM volume STP, V _{mstd}	m ³	-	-	-	-	0.4725	0.14	0.00093
leak, L	% ¹ mg/m ³ ²	0.94 ¹	-	0.94	≤2%	0.00036 ²	1.00	0.00036
laboratory result, L _r	% ¹ mg/m ³ ²	10 ¹	-	10.0	-	0.0066 ²	1.00	0.0066
<i>combined MU</i>								0.0067
<i>expanded MU 95% CI (k = 1.96) including method deviations MU</i>								0.013
<i>expanded MU 95% CI (k = 1.96) as percentage of measured value</i>								19.8%
<i>expanded MU 95% CI (k = 1.96) as percentage of measured value for mass emission</i>								20.8%

MU factor O ₂ correction
N/A

overall MU for O ₂ correction
N/A

method deviation factor
1.00

method and sampling deviations
Sampling was performed in full compliance with the Standard, technical procedure and regulatory requirements.

Part 2: Supporting Information - Appendix 2: Total VOCs (as Carbon) | Run 1

Results

reference conditions are: STP, wet

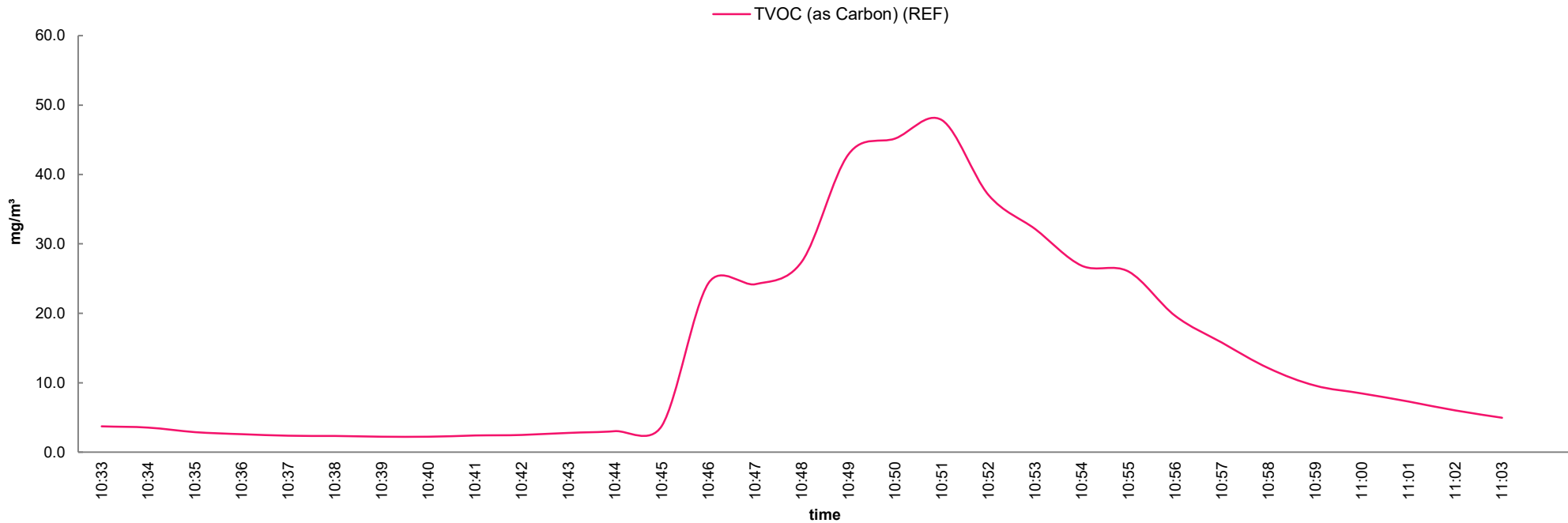
parameter	units	result ± MU (95% CI)	units	result ± MU (95% CI)
Total VOCs (as Carbon)	mg/m ³	14.7 ± 0.76	g/hr	1.9 ± 0.16

General Information

parameter	details
sampling start date & time	17/07/2023 10:33
sampling end date & time	17/07/2023 11:03
test time mins	30
testing team	RH BM
standard technical procedure	EN 12619 TP-21a
analyser type	ThermoFID
heated head & line temperature	180°C

parameter	details
probe material	Titanium
filter size, material & location	Filter Element PTFE Within Heated Head
number sampling lines available	1
number sampling lines used	1
number sampling points ideal per line	1
number sampling points used per line	1
sampling point IDs	A1

Plot of Emissions Over Time



Part 2: Supporting Information - Appendix 2: Total VOCs (as Carbon) | Run 1

Analyser Calibration Information with QA checks

where [A] = at analyser, [L] = down sampling line

CAL ID	pre-test calibration events							post-test calibration events			quality assurance						
	date & time	zero [A] [ppm]	span [A] [ppm]	zero [L] [ppm]	span [L] [ppm]	T ₉₀ [s]	leak [%]	date & time	zero [L] [ppm]	span [L] [ppm]	zero drift [%]	span drift [%]	allowable [%]	temp [°C]			
1	17/07/23 10:05	0.00	79.91	0.30	81.00	25	0.0	P	17/07/23 13:08	-0.06	80.70	-0.4	P	0.1	P	±5	19.5

Analyser Calibration Extended Information

CAL ID	performed by	drift corr. applied	log period [s]	CYL ID	CYL conc. [ppm]	CYL expiry	CYL MU [%]	zero gas type	span [CYL] gas type	span target [ppm]	range [ppm]	LOD [ppm]
1	RH	No	60	A-CYL-96	79.91	26/03/2028	1.0	Synthetic Air	5l 80ppm Propane in Air	79.91	AUTO	0.03

Part 2: Supporting Information - Appendix 2: Total VOCs (as Carbon) | Run 1

Measurement Uncertainty (MU) Calculations

general information	units	value
emission limit value (ELV) (REF)	mg/m ³	N/A
measured concentration (REF)	mg/m ³	14.7

MU budget			
parameter	units	min	max
ambient temp	°C	19.0	20.0
voltage	V	90.0	130.0

overall MU for O ₂ correction
N/A

MU factor O ₂ correction
N/A

performance characteristics	MU budget input parameters				MU budget		
	symbol	units	value	source	symbol	units	value
repeatability at zero	rz	% of value	0.2	MCERTS certificate MC050062	U _{rz}	mg/m ³	0.029
repeatability at span	rs	% of value	0.2	MCERTS certificate MC050062	U _{rs}	mg/m ³	0.029
lack of fit	lof	% of value	2	maximum allowable	U _{lof}	mg/m ³	0.17
maximum short term zero drift (ABS) [after drift correction]	dz	% of value	0.45	day of testing	U _{dz}	mg/m ³	0.038
maximum short term span drift (ABS) [after drift correction]	ds	% of value	0.075	day of testing	U _{ds}	mg/m ³	0.0064
influence of sample gas flow	f	% of value	-0.1	MCERTS certificate MC050062	U _f	mg/m ³	-0.0085
influence of sample gas pressure	p	% of value	0	MCERTS certificate MC050062	U _p	mg/m ³	0
influence of ambient temperature zero point (/ 35k)	tz	% of value	1.4	MCERTS certificate MC050062	U _{tz}	mg/m ³	0.0019
influence of ambient temperature span point (/ 35k)	ts	% of value	-0.57	MCERTS certificate MC050062	U _{ts}	mg/m ³	-0.0008
influence of supply voltage (/ 60V)	v	% of value	-1	MCERTS certificate MC050062	U _v	mg/m ³	-0.056
cross sensitivity at zero	iz	% of value	0	MCERTS certificate MC050062	U _{iz}	mg/m ³	0
cross sensitivity at span	is	% of value	3.9	MCERTS certificate MC050062	U _{is}	mg/m ³	0.33
maximum leak	L	% of value	0	day of testing	U _L	mg/m ³	0
uncertainty associated with calibration gas	adj	% of value	1	span gas calibration certificate	U _{adj}	mg/m ³	0.073
			<i>combined MU</i>			mg/m ³	0.39
			<i>expanded MU 95% CI (k = 1.96)</i>			mg/m ³	0.76
			<i>expanded MU 95% CI (k = 1.96) as percentage of measured value</i>			%	5.2
			<i>expanded MU 95% CI (k = 1.96) as percentage of measured value for mass emission</i>			%	8.2

method and sampling deviations
Sampling was performed in full compliance with the Standard, technical procedure and regulatory requirements.

Part 2: Supporting Information - Appendix 2: Velocity & Flow Rate Traverse | Run 1

Supporting Information

parameter	units	value
barometric pressure	kPa	101.5
average wet density	kg/m ³	1.021
average stack static pressure	Pa	45.0
pitot tube coefficient, C _p	-	0.832

General Information

parameter	details
traverse date	17/07/2023
traverse times performed by	11:05 - 11:07 performed by: RH BM
standard technical procedure	EN 16911-1 TR 17078 TP-04a
device used	S-type Pitot with KIMO MP 210 (500Pa module)

Limit of Detection (LOD) is 1 m/s for this device combination

Quality Assurance

parameter	details
result of pitot stagnation test	Pass
result of pitot leak check (pre)	Pass
result of pitot leak check (post)	Pass
water droplets present	No

NM = Not Measured

Line A

static pressure = 45 Pa

Pt	Depth m	ΔP Pa	Temp °C	Vel m/s	Swirl °
1	0.05	24.0	69.0	5.7	< 15

Part 2: Supporting Information - Appendix 2: Velocity & Flow Rate Traverse | Run 1

Measurement Uncertainty (MU) Calculations

parameter	units	value
standard uncertainty on the coefficient of the pitot tube	-	0.0015
standard uncertainty associated with the mean local dynamic pressures	Pa	1.1
standard uncertainty associated with the molar mass of the gas	-	0.000027
standard uncertainty associated with the temperature	K	1.7
standard uncertainty associated with the absolute pressure in the duct	Pa	176
standard uncertainty associated with the density of the gas effluent	kg/m ³	0.0056
standard uncertainty associated with the local velocities	m/s	0.13
standard uncertainty associated with the mean velocity	m/s	0.13

parameter	units	value
standard uncertainty associated with the mean velocity (95% CI)	m/s	0.26
standard uncertainty associated with the mean velocity (95% CI), relative	%	4.5
standard uncertainty associated with the volume flow rate @ actual (95% CI)	m ³ /hr	10.3
standard uncertainty associated with the volume flow rate @ actual (95% CI), relative	%	6.4
standard uncertainty associated with the volume flow rate @ ref 1 (95% CI)	m ³ /hr	8.2
standard uncertainty associated with the volume flow rate @ ref 1 (95% CI), relative	%	6.4

method and sampling deviations
Sampling was performed in full compliance with the Standard, technical procedure and regulatory requirements.

Stack Emissions Monitoring Report

commissioned by Kaug Refinery Services Ltd

Operator Name

Kaug Refinery Services Ltd | Deritend Site

Operator Address

Green St, Deritend
Birmingham
B12 0NB

Release Point

Kettle Line Extraction

Monitoring Organisation Name & Address

Atesta Ltd
Unit 2, Asher Court, Lyncastle Way
Appleton, Warrington
WA4 4ST

Monitoring Report Written By

Rob Haworth | Senior Team Leader
MCERTS Level 2 | MM 07 797 | TE1 TE2 TE3 TE4 | expires on 31/12/2023

Monitoring Report Approved By

Matt Pendlebury | Technical Support Manager
MCERTS Level 2 | MM 04 535 | TE1 TE2 TE3 TE4 | expires on 17/06/2024



Job Reference: JOB-759

Report Date | Version Number

27/07/2023 | Version 1

Dates of the Monitoring Campaign

17/07/2023

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Report Contents and Monitoring Objectives

Report Contents

TITLE PAGE

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Monitoring and Analytical Methods (incorporating Method Deviations if applicable)

Monitoring Location

Duct and Sampling Platform Information

Operating Information

PART 2: SUPPORTING INFORMATION

Appendix 1 - Monitoring Personnel, Analysis Laboratories and Test Equipment Used

Appendix 2 - Results and Calculations

Monitoring Objective

The monitoring objective was to conduct stack emissions monitoring to demonstrate compliance against a set of emission limit values (ELVs) as specified in the Site's Environmental Permit.

Special Requirements

There were no special requirements for this monitoring campaign.

Opinions and Interpretations

Any opinions or interpretations contained within this test report are outside the scope of Atesta's MCERTS / ISO 17025 accreditation.

Part 1: Executive Summary - Monitoring Results Summary

Monitoring Results - Summary

test parameter	EXPRESSED AS A CONCENTRATION				EXPRESSED AS A MASS EMISSION				reference conditions	accreditation status
	result	uncertainty (± 95% CI)	limit (ELV)	units	result	uncertainty (± 95% CI)	limit (ELV)	units		
Hydrogen Cyanide	< 0.061	0.012		mg/m ³	< 0.19	0.040		g/hr	STP, wet	Non accredited
Total VOCs (as Carbon)	0.11	0.0058		mg/m ³	0.36	0.025		g/hr	STP, wet	MCERTS
Stack Gas Water Vapour	2.8	0.087		% v/v					actual	MCERTS
Stack Gas Temperature	23.0			°C					actual	MCERTS
Stack Gas Velocity	9.0	0.11		m/s					actual	MCERTS
Stack Gas Flow Rate (ACTUAL)	3466	162		m ³ /hr					actual	MCERTS
Stack Gas Flow Rate (REF)	3199	150		m ³ /hr					STP, wet	MCERTS

The stack gas water vapour, temperature, velocity and flow rates in the above table are calculated as an average of all of the results recorded during this monitoring campaign

Part 1: Executive Summary - Monitoring Results Further Details

Monitoring Results - Further Details

test parameter	run	EXPRESSED AS A CONCENTRATION				EXPRESSED AS A MASS EMISSION				sampling date times	run time (mins)	H ₂ O (% v/v)	reference conditions
		result	uncertainty (± 95% CI)	limit (ELV)	units	result	uncertainty (± 95% CI)	limit (ELV)	units				
Hydrogen Cyanide	R1	< 0.061	0.012		mg/m ³	< 0.19	0.040		g/hr	17/07/2023 12:23 - 13:03	40	2.8	STP, wet
Total VOCs (as Carbon)	R1	0.11	0.0058		mg/m ³	0.36	0.025		g/hr	17/07/2023 12:33 - 13:03	30		STP, wet
Velocity & Flow Rate Traverse	R1	9.0	0.11		m/s	3466	162		m ³ /hr	17/07/2023 12:15 - 12:20			actual

Part 1: Executive Summary - Monitoring and Analytical Methods

Monitoring and Analytical Methods

where analysis required	MONITORING					ANALYSIS					
test parameter	laboratory	accreditation number	technical procedure	reference method	monitoring status	laboratory	accreditation number	analytical procedure	analytical technique	analysis status	accreditation status
Hydrogen Cyanide	ATA	10706	TP-15	Based on US EPA OTM29	MCERTS	RPS	0605	W4	UV VIS Spec	Non accredited	Non accredited
Water Vapour	ATA	10706	TP-03	EN 14790	MCERTS	ATA	10706	TP-03	Gravimetric	MCERTS	MCERTS

where analysis not required	MONITORING					measurement technique & equipment		accreditation status
test parameter	laboratory	accreditation number	technical procedure	reference method	monitoring status			
Total VOCs (as Carbon)	ATA	10706	TP-21a	EN 12619	MCERTS	FID using ThermoFID		MCERTS
Velocity & Flow Rate Traverse	ATA	10706	TP-04a	EN 16911-1 TR 17078	MCERTS	Pitot Tube, Thermocouple & Thermomanometer		MCERTS ^o

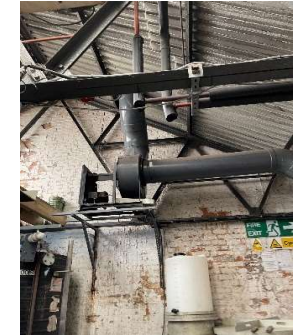
^o = monitoring deviations apply to this test parameter, refer to the 'Summary of Monitoring Deviations' in the table below

Summary of Monitoring Deviations (from Appendix 2)

test parameter	run	details of monitoring deviation
Velocity & Flow Rate Traverse	1	Only one sampling line was available. The number of sampling points used on this available line was increased to meet the minimum required by the Standard.

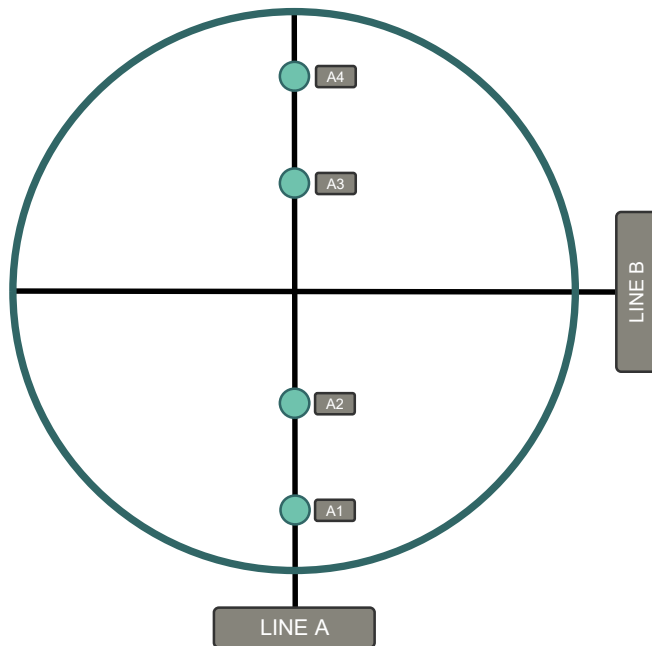
Part 1: Executive Summary - Monitoring Location

Monitoring Location Photos



Identification of Sampling Points on a Duct Diagram

refer to Appendix 2 - Raw Data to see how the points on this diagram relate to the points used for each test



Part 1: Executive Summary - Duct and Sampling Platform Information

Duct Characteristics | Sampling Ports

parameter	units	value
shape	-	Circular
dimensions	-	Diameter = 0.37 m
area	m ²	0.11
orientation	-	Horizontal

parameter	value
primary sample port size	Hole
primary sample port depth cm	0
primary sample ports number of sampling lines available	1

summary of all sample ports available
Hole

Sampling Location General Information

general information	details
type location access	Mobile Tower Inside plant building Ladder

CEMS | Abatement Systems

parameter	details
abatement system/s	N/A
CEMS installed on the stack	N/A

Sampling Plane Validation Criteria Summary (EN 15259) from Stack Traverse/s

criteria in EN 15259	units	value	allowed	compliant
lowest differential pressure	Pa	67.0	> 5 Pa	Yes
lowest traverse velocity	m/s	8.8	-	-
highest traverse velocity	m/s	9.0	-	-
mean traverse velocity	m/s	9.0	-	-
ratio traverse velocities	: 1	1.02	< 3 : 1	Yes
angle of swirl compliance	°	< 15	< 15°	Yes
no local negative flow	-	Yes	-	Yes

Part 1: Executive Summary - Sampling Location and Operating Information

Process Details

process detail	details
plume appearance on day of monitoring	None visible
type of process	Chemical Batch Extraction
batch or continuous process	Batch
fuel type	N/A
feedstock	Chemical Stripping
typical load / throughput of plant	Normal operation
details of any unusual process occurrences	None

Part 2: Supporting Information - Appendix 1: Monitoring Personnel, Analysis Laboratories and Test Equipment Used

Monitoring Personnel

name	position	MCERTS level number expiry	MCERTS technical endorsements
Rob Haworth	Senior Team Leader	MCERTS Level 2 MM 07 797 31/12/2023	TE1 TE2 TE3 TE4
Ben Metcalfe	Technician	MCERTS Level 1 MM 21 1659 29/10/2026	-

Analysis Laboratories

laboratory	ISO 17025 accreditation number	laboratory short name	laboratory phone number
Atesta North West	10706	ATA	0800 970 8945
RPS Laboratories Salford	0605	RPS	0161 872 2443

Test Equipment Used

equipment type	A-EQ ID
Source sampling console	50
Low flow sampling MFCs	
ThermoFID / iFID mobile	53
Horiba PG-350E multigas analyser	
Gasmet DX4000 FTIR	
Gasmet PSS	
Protea AtmosFIR	
Protea PIB Pump	
Gasmet syringe calibrator	
M&C PSS5-C conditioning unit	
Digital thermomanometer	115
Top pan balance kit	42

equipment type	A-EQ ID
Pitot	193
Calipers	35
Barometer	34
Timer	37
Tape measure	25
Heated head filter	63
Heated tee	
10m heated line	22
1.5m heated line	
Odour barrel	
Vacuum chamber	
Dilution probe	

equipment type	A-EQ ID
10m umbilical	
30m umbilical	88
Heated probe	147
Filter oven	
Ambient thermocouple	162
Stack thermocouple	241
Exit thermocouple	
Condenser thermocouple	
Tubes kit thermocouple	
2-way heater controller	
Air sampling pump	
5-figure analytical balance	1

Part 2: Supporting Information - Appendix 2: Hydrogen Cyanide | Run 1

Results

reference conditions are: STP, wet

parameter	units	result ± MU (95% CI)	units	result ± MU (95% CI)
Hydrogen Cyanide	mg/m ³	< 0.061 ± 0.012	g/hr	< 0.19 ± 0.04

Analytical Laboratory Information

parameter	details
name of analytical lab	RPS
lab analytical procedure	W4
lab analytical technique	UV VIS Spec Analysis Accreditation: Non accredited
date analysis completed	26/07/2023

General Information

parameter	details
sampling date	17/07/2023
sampling times testing team	12:23 - 13:03 40 minutes tested by: RH BM
standard technical procedure	Based on US EPA OTM29 TP-15
volume metering device	XD-502 Digital Source Sampling Console
probe material	Titanium
filter housing material	Titanium
impinger material capture media	Borosilicate Glass NaOH

parameter	details
filter size, material & location	47mm QF In Stack heated to 23°C
number sampling lines available	1
number sampling lines used	1
number sampling points ideal per line	1
number sampling points used per line	1
sampling point IDs	A1

Quality Assurance

² The concentration in the last absorber was less than 5 times the analytical LOD.

QA parameter	units	sample run			blank (taken on 17/07/2023)		
		value	allowable	result	value	allowable	result
maximum allowable blank	mg/m ³	-	-	-	0.056	N/A	N/A
leak test	%	0.80	2.00	Pass	0.80	2.00	Pass
absorption efficiency	%	100.0	N/A ²	Pass	-	-	-
silica trap <50% faded	-	Yes	-	Pass	-	-	-
are water droplets present	-	Yes	-	-	-	-	-
water vapour MU	%	3.1	20.0	Pass	-	-	-
pH maintained	-	13	≥12	Pass	-	-	-

Breakdown of Results

reference conditions are: STP, wet

parameter	sample volume [m ³]	LOD [mg]	impingers [front back] [mg/l]	impinger volume [front back] [ml]	mass total [mg]	LOD result [mg/m ³]	result [mg/m ³]	result reported [mg/m ³]	mass emission [g/hr]
sample run	0.5289	0.032	< 0.1 < 0.1	202 120	< 0.032	0.061	< 0.061	< 0.061	< 0.19
blank	0.5289	0.03	< 0.1	298.0	< 0.03	0.056	< 0.056	< 0.056	

Part 2: Supporting Information - Appendix 2: Hydrogen Cyanide | Run 1

Raw Data | Calculations

data	units	value
P _{bar}	mmHg	761.3
P _g	Pa	-206.0
ΔH _@	mmH ₂ O	44.3
P _m	mmHg	764.6
P _s	mmHg	759.8
V _m (metered)	m ³	0.5570
Y _d	-	0.9989
C _{stp}	-	0.3592

data	units	value
T _m	°C	23.5
ΔH _{av}	Pa	200.0
m _{wts}	g	22.0
M _w	g/mol	18.0
V _{mol}	m ³ /mol	0.0222
T _s	°C	23.0
R _{wv} (H ₂ O)	% v/v	2.8

data	units	value
%CO _{2d}	% v/v (est)	0.05
%O _{2d}	% v/v (est)	20.80
%O _{2w}	% v/v (est)	N/A
%N _{2d}	% v/v	79.15
%O _{2ref}	% v/v	N/A
O _{2facd}	-	N/A
O _{2facw}	-	N/A

data	units	value
M _d	g/mol	28.84
M _s	g/mol	28.54
A _s	m ²	0.11
θ (sample time)	mins	40

where (est) refers to an estimated value

metered volume calculations	units	value
allow favourable O ₂ correction	-	N/A
vol actual stack conditions, V _{ma} = (V _{mstw})(T _s + 273) / (P _s) / (C _{stp})	m ³	0.5737
vol dry, V _{mstd} = (V _m)(Y _d)(C _{stp}) / ((P _{bar} + (ΔH _{av} / 9.80665 / 13.6)) / (T _m + 273))	m ³	0.5142
vol wet, V _{mstw} = (V _{mstd}) / (100 - R _{wv})	m ³	0.5289
vol dry O ₂ , V _{mstdO₂} = (V _{mstd}) / (O _{2facd})	m ³	N/A
vol wet O ₂ , V _{mstwO₂} = (V _{mstw}) / (O _{2facw})	m ³	N/A

velocity volume flow rate calculations	units	value
velocity of stack gas, v _s = average of all velocity measurements	m/s	9.0
stack gas flow actual stack conditions, Q _a = average of all flow rate measurements	m ³ /hr	3466.1

Measurement Uncertainty (MU) Calculations

parameter	units	value	standard MU	MU as %age	required standard	value	sens coeff.	MU mg/m ³
DGM meter volume, V _m	m ³	0.5570	0.0028	0.50	≤2%	-	-	-
DGM temperature, T _m	K	296.5	2.0	0.67	≤1%	-	-	-
DGM pressure, P _m	kPa	101.9	0.50	0.49	≤1%	-	-	-
DGM humidity, H _m	% v/v	0	1.0	1.00	≤1%	-	-	-
DGM volume STP, V _{mstd}	m ³	-	-	-	-	0.5142	0.12	0.00086
leak, L	% ¹ mg/m ³ ²	0.86 ¹	-	0.86	≤2%	0.0003 ²	1.00	0.0003
laboratory result, L _r	% ¹ mg/m ³ ²	10 ¹	-	10.0	-	0.0061 ²	1.00	0.0061
<i>combined MU</i>								0.0062
<i>expanded MU 95% CI (k = 1.96) including method deviations MU</i>								0.012
<i>expanded MU 95% CI (k = 1.96) as percentage of measured value</i>								19.8%
<i>expanded MU 95% CI (k = 1.96) as percentage of measured value for mass emission</i>								20.4%

MU factor O ₂ correction
N/A

overall MU for O ₂ correction
N/A

method deviation factor
1.00

method and sampling deviations
Sampling was performed in full compliance with the Standard, technical procedure and regulatory requirements.

Part 2: Supporting Information - Appendix 2: Total VOCs (as Carbon) | Run 1

Results

reference conditions are: STP, wet

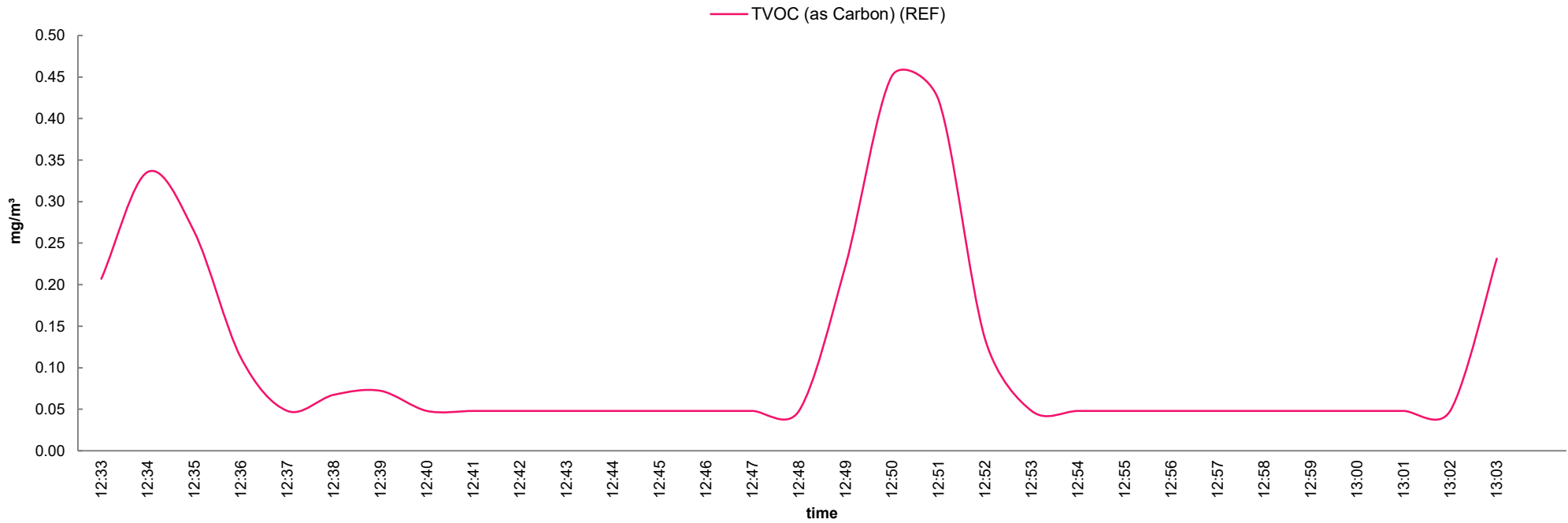
parameter	units	result ± MU (95% CI)	units	result ± MU (95% CI)
Total VOCs (as Carbon)	mg/m ³	0.11 ± 0.0058	g/hr	0.36 ± 0.025

General Information

parameter	details
sampling start date & time	17/07/2023 12:33
sampling end date & time	17/07/2023 13:03
test time mins	30
testing team	RH BM
standard technical procedure	EN 12619 TP-21a
analyser type	ThermoFID
heated head & line temperature	180°C

parameter	details
probe material	Titanium
filter size, material & location	Filter Element PTFE Within Heated Head
number sampling lines available	1
number sampling lines used	1
number sampling points ideal per line	1
number sampling points used per line	1
sampling point IDs	A1

Plot of Emissions Over Time



Part 2: Supporting Information - Appendix 2: Total VOCs (as Carbon) | Run 1

Analyser Calibration Information with QA checks

where [A] = at analyser, [L] = down sampling line

CAL ID	pre-test calibration events							post-test calibration events			quality assurance						
	date & time	zero [A] [ppm]	span [A] [ppm]	zero [L] [ppm]	span [L] [ppm]	T ₉₀ [s]	leak [%]	date & time	zero [L] [ppm]	span [L] [ppm]	zero drift [%]	span drift [%]	allowable [%]	temp [°C]			
1	17/07/23 10:05	0.00	79.91	0.30	81.00	25	0.0	P	17/07/23 13:08	-0.06	80.70	-0.4	P	0.1	P	±5	19.5

Analyser Calibration Extended Information

CAL ID	performed by	drift corr. applied	log period [s]	CYL ID	CYL conc. [ppm]	CYL expiry	CYL MU [%]	zero gas type	span [CYL] gas type	span target [ppm]	range [ppm]	LOD [ppm]
1	RH	No	60	A-CYL-96	79.91	26/03/2028	1.0	Synthetic Air	5l 80ppm Propane in Air	79.91	AUTO	0.03

Part 2: Supporting Information - Appendix 2: Total VOCs (as Carbon) | Run 1

Measurement Uncertainty (MU) Calculations

general information	units	value
emission limit value (ELV) (REF)	mg/m ³	N/A
measured concentration (REF)	mg/m ³	0.11

MU budget			
parameter	units	min	max
ambient temp	°C	19.0	20.0
voltage	V	90.0	130.0

overall MU for O ₂ correction
N/A

MU factor O ₂ correction
N/A

performance characteristics	MU budget input parameters				MU budget		
	symbol	units	value	source	symbol	units	value
repeatability at zero	rz	% of value	0.2	MCERTS certificate MC050062	U _{rz}	mg/m ³	0.00022
repeatability at span	rs	% of value	0.2	MCERTS certificate MC050062	U _{rs}	mg/m ³	0.00022
lack of fit	lof	% of value	2	maximum allowable	U _{lof}	mg/m ³	0.0013
maximum short term zero drift (ABS) [after drift correction]	dz	% of value	0.45	day of testing	U _{dz}	mg/m ³	0.00029
maximum short term span drift (ABS) [after drift correction]	ds	% of value	0.075	day of testing	U _{ds}	mg/m ³	0.000049
influence of sample gas flow	f	% of value	-0.1	MCERTS certificate MC050062	U _f	mg/m ³	-0.000065
influence of sample gas pressure	p	% of value	0	MCERTS certificate MC050062	U _p	mg/m ³	0
influence of ambient temperature zero point (/ 35k)	tz	% of value	1.4	MCERTS certificate MC050062	U _{tz}	mg/m ³	0.000015
influence of ambient temperature span point (/ 35k)	ts	% of value	-0.57	MCERTS certificate MC050062	U _{ts}	mg/m ³	-0.0000061
influence of supply voltage (/ 60V)	v	% of value	-1	MCERTS certificate MC050062	U _v	mg/m ³	-0.00043
cross sensitivity at zero	iz	% of value	0	MCERTS certificate MC050062	U _{iz}	mg/m ³	0
cross sensitivity at span	is	% of value	3.9	MCERTS certificate MC050062	U _{is}	mg/m ³	0.0025
maximum leak	L	% of value	0	day of testing	U _L	mg/m ³	0
uncertainty associated with calibration gas	adj	% of value	1	span gas calibration certificate	U _{adj}	mg/m ³	0.00056
			<i>combined MU</i>			mg/m ³	0.003
			<i>expanded MU 95% CI (k = 1.96)</i>			mg/m ³	0.0058
			<i>expanded MU 95% CI (k = 1.96) as percentage of measured value</i>			%	5.2
			<i>expanded MU 95% CI (k = 1.96) as percentage of measured value for mass emission</i>			%	7

method and sampling deviations
Sampling was performed in full compliance with the Standard, technical procedure and regulatory requirements.

Part 2: Supporting Information - Appendix 2: Velocity & Flow Rate Traverse | Run 1

Supporting Information

parameter	units	value
barometric pressure	kPa	101.5
average wet density	kg/m ³	1.175
average stack static pressure	Pa	-202.0
pitot tube coefficient, C _p	-	0.832

General Information

parameter	details
traverse date	17/07/2023
traverse times performed by	12:15 - 12:20 performed by: RH BM
standard technical procedure	EN 16911-1 TR 17078 TP-04a
device used	S-type Pitot with KIMO MP 210 (500Pa module)

Limit of Detection (LOD) is 1 m/s for this device combination

Quality Assurance

parameter	details
result of pitot stagnation test	Pass
result of pitot leak check (pre)	Pass
result of pitot leak check (post)	Pass
water droplets present	No

NM = Not Measured

Line A

static pressure = -202 Pa

Pt	Depth m	ΔP Pa	Temp °C	Vel m/s	Swirl °
1	0.05	67.0	23.0	8.8	< 15
2	0.09	68.8	23.0	9.0	< 15
3	0.28	70.0	23.0	9.0	< 15
4	0.32	69.1	23.0	9.0	< 15

Part 2: Supporting Information - Appendix 2: Velocity & Flow Rate Traverse | Run 1

Measurement Uncertainty (MU) Calculations

parameter	units	value
standard uncertainty on the coefficient of the pitot tube	-	0.0015
standard uncertainty associated with the mean local dynamic pressures	Pa	1.5
standard uncertainty associated with the molar mass of the gas	-	0.000027
standard uncertainty associated with the temperature	K	1.5
standard uncertainty associated with the absolute pressure in the duct	Pa	176
standard uncertainty associated with the density of the gas effluent	kg/m ³	0.0064
standard uncertainty associated with the local velocities	m/s	0.1
standard uncertainty associated with the mean velocity	m/s	0.055

parameter	units	value
standard uncertainty associated with the mean velocity (95% CI)	m/s	0.11
standard uncertainty associated with the mean velocity (95% CI), relative	%	1.2
standard uncertainty associated with the volume flow rate @ actual (95% CI)	m ³ /hr	162
standard uncertainty associated with the volume flow rate @ actual (95% CI), relative	%	4.7
standard uncertainty associated with the volume flow rate @ ref 1 (95% CI)	m ³ /hr	150
standard uncertainty associated with the volume flow rate @ ref 1 (95% CI), relative	%	4.7

method and sampling deviations
Only one sampling line was available. The number of sampling points used on this available line was increased to meet the minimum required by the Standard.

Stack Emissions Monitoring Report

commissioned by Kaug Refinery Services Ltd

Operator Name

Kaug Refinery Services Ltd | Deritend Site

Operator Address

Green St, Deritend
Birmingham
B12 0NB

Release Point

Stripping Line Extraction

Monitoring Organisation Name & Address

Atesta Ltd
Unit 2, Asher Court, Lyncastle Way
Appleton, Warrington
WA4 4ST

Monitoring Report Written By

Rob Haworth | Senior Team Leader
MCERTS Level 2 | MM 07 797 | TE1 TE2 TE3 TE4 | expires on 31/12/2023

Monitoring Report Approved By

Matt Pendlebury | Technical Support Manager
MCERTS Level 2 | MM 04 535 | TE1 TE2 TE3 TE4 | expires on 17/06/2024



Job Reference: JOB-759

Report Date | Version Number

27/07/2023 | Version 1

Dates of the Monitoring Campaign

17/07/2023

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Report Contents and Monitoring Objectives

Report Contents

TITLE PAGE

CONTENTS AND MONITORING OBJECTIVES

PART 1: EXECUTIVE SUMMARY

Monitoring Results

Monitoring and Analytical Methods (incorporating Method Deviations if applicable)

Monitoring Location

Duct and Sampling Platform Information

Operating Information

PART 2: SUPPORTING INFORMATION

Appendix 1 - Monitoring Personnel, Analysis Laboratories and Test Equipment Used

Appendix 2 - Results and Calculations

Monitoring Objective

The monitoring objective was to conduct stack emissions monitoring to demonstrate compliance against a set of emission limit values (ELVs) as specified in the Site's Environmental Permit.

Special Requirements

There were no special requirements for this monitoring campaign.

Opinions and Interpretations

Any opinions or interpretations contained within this test report are outside the scope of Atesta's MCERTS / ISO 17025 accreditation.

Part 1: Executive Summary - Monitoring Results Summary

Monitoring Results - Summary

test parameter	EXPRESSED AS A CONCENTRATION				EXPRESSED AS A MASS EMISSION				reference conditions	accreditation status
	result	uncertainty (± 95% CI)	limit (ELV)	units	result	uncertainty (± 95% CI)	limit (ELV)	units		
Hydrogen Cyanide	< 0.065	0.013		mg/m ³	< 0.15	0.031		g/hr	STP, wet	Non accredited
Total VOCs (as Carbon)	2.8	0.15		mg/m ³	6.6	0.48		g/hr	STP, wet	MCERTS
Stack Gas Water Vapour	2.4	0.088		% v/v					actual	MCERTS
Stack Gas Temperature	21.0			°C					actual	MCERTS
Stack Gas Velocity	8.3	0.20		m/s					actual	MCERTS
Stack Gas Flow Rate (ACTUAL)	2545	130		m ³ /hr					actual	MCERTS
Stack Gas Flow Rate (REF)	2364	121		m ³ /hr					STP, wet	MCERTS

The stack gas water vapour, temperature, velocity and flow rates in the above table are calculated as an average of all of the results recorded during this monitoring campaign

Part 1: Executive Summary - Monitoring Results Further Details

Monitoring Results - Further Details

test parameter	run	EXPRESSED AS A CONCENTRATION				EXPRESSED AS A MASS EMISSION				sampling date times	run time (mins)	H ₂ O (% v/v)	reference conditions
		result	uncertainty (± 95% CI)	limit (ELV)	units	result	uncertainty (± 95% CI)	limit (ELV)	units				
Hydrogen Cyanide	R1	< 0.065	0.013		mg/m ³	< 0.15	0.031		g/hr	17/07/2023 11:28 - 12:08	40	2.4	STP, wet
Total VOCs (as Carbon)	R1	2.8	0.15		mg/m ³	6.6	0.48		g/hr	17/07/2023 11:38 - 12:08	30		STP, wet
Velocity & Flow Rate Traverse	R1	8.3	0.20		m/s	2545	130		m ³ /hr	17/07/2023 11:20 - 11:25			actual

Part 1: Executive Summary - Monitoring and Analytical Methods

Monitoring and Analytical Methods

where analysis required	MONITORING					ANALYSIS					
test parameter	laboratory	accreditation number	technical procedure	reference method	monitoring status	laboratory	accreditation number	analytical procedure	analytical technique	analysis status	accreditation status
Hydrogen Cyanide	ATA	10706	TP-15	Based on US EPA OTM29	MCERTS	RPS	0605	W4	UV VIS Spec	Non accredited	Non accredited
Water Vapour	ATA	10706	TP-03	EN 14790	MCERTS	ATA	10706	TP-03	Gravimetric	MCERTS	MCERTS

where analysis not required	MONITORING					measurement technique & equipment		accreditation status
test parameter	laboratory	accreditation number	technical procedure	reference method	monitoring status			
Total VOCs (as Carbon)	ATA	10706	TP-21a	EN 12619	MCERTS	FID using ThermoFID		MCERTS
Velocity & Flow Rate Traverse	ATA	10706	TP-04a	EN 16911-1 TR 17078	MCERTS	Pitot Tube, Thermocouple & Thermomanometer		MCERTS

Summary of Monitoring Deviations (from Appendix 2)

test parameter	run	details of monitoring deviation
All	1	There were no deviations associated with the monitoring employed.

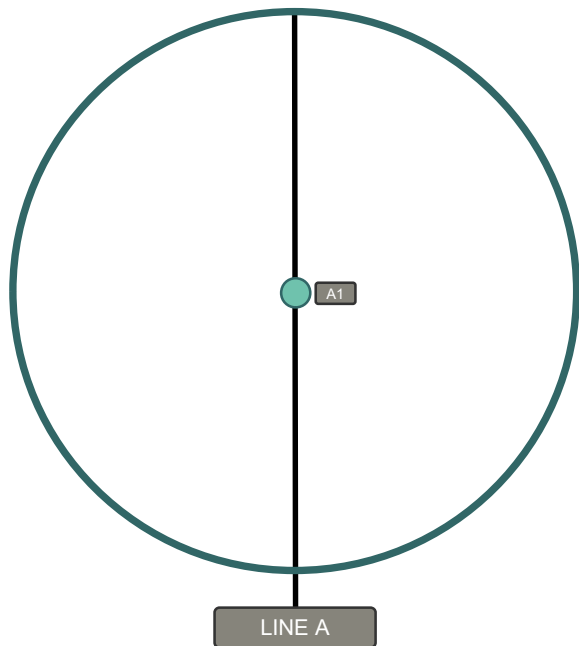
Part 1: Executive Summary - Monitoring Location

Monitoring Location Photos



Identification of Sampling Points on a Duct Diagram

refer to Appendix 2 - Raw Data to see how the points on this diagram relate to the points used for each test



Part 1: Executive Summary - Duct and Sampling Platform Information

Duct Characteristics | Sampling Ports

parameter	units	value
shape	-	Circular
dimensions	-	Diameter = 0.33 m
area	m ²	0.09
orientation	-	Vertical

parameter	value
primary sample port size	Hole
primary sample port depth cm	0
primary sample ports number of sampling lines available	1

summary of all sample ports available
Hole

Sampling Location General Information

general information	details
type location access	On the Ground Inside plant building On Ground Level

CEMS | Abatement Systems

parameter	details
abatement system/s	N/A
CEMS installed on the stack	N/A

Sampling Plane Validation Criteria Summary (EN 15259) from Stack Traverse/s

criteria in EN 15259	units	value	allowed	compliant
lowest differential pressure	Pa	59.0	> 5 Pa	Yes
lowest traverse velocity	m/s	8.3	-	-
highest traverse velocity	m/s	8.3	-	-
mean traverse velocity	m/s	8.3	-	-
ratio traverse velocities	: 1	1.00	< 3 : 1	Yes
angle of swirl compliance	°	< 15	< 15°	Yes
no local negative flow	-	Yes	-	Yes

Part 1: Executive Summary - Sampling Location and Operating Information

Process Details

process detail	details
plume appearance on day of monitoring	None visible
type of process	Chemical Batch Extraction
batch or continuous process	Batch
fuel type	N/A
feedstock	Chemical Stripping
typical load / throughput of plant	Normal operation
details of any unusual process occurrences	None

Part 2: Supporting Information - Appendix 1: Monitoring Personnel, Analysis Laboratories and Test Equipment Used

Monitoring Personnel

name	position	MCERTS level number expiry	MCERTS technical endorsements
Rob Haworth	Senior Team Leader	MCERTS Level 2 MM 07 797 31/12/2023	TE1 TE2 TE3 TE4
Ben Metcalfe	Technician	MCERTS Level 1 MM 21 1659 29/10/2026	-

Analysis Laboratories

laboratory	ISO 17025 accreditation number	laboratory short name	laboratory phone number
Atesta North West	10706	ATA	0800 970 8945
RPS Laboratories Salford	0605	RPS	0161 872 2443

Test Equipment Used

equipment type	A-EQ ID
Source sampling console	50
Low flow sampling MFCs	
ThermoFID / iFID mobile	53
Horiba PG-350E multigas analyser	
Gasmet DX4000 FTIR	
Gasmet PSS	
Protea AtmosFIR	
Protea PIB Pump	
Gasmet syringe calibrator	
M&C PSS5-C conditioning unit	
Digital thermomanometer	115
Top pan balance kit	42

equipment type	A-EQ ID
Pitot	193
Calipers	35
Barometer	34
Timer	37
Tape measure	25
Heated head filter	63
Heated tee	
10m heated line	22
1.5m heated line	
Odour barrel	
Vacuum chamber	
Dilution probe	

equipment type	A-EQ ID
10m umbilical	
30m umbilical	88
Heated probe	147
Filter oven	
Ambient thermocouple	162
Stack thermocouple	241
Exit thermocouple	
Condenser thermocouple	
Tubes kit thermocouple	
2-way heater controller	
Air sampling pump	
5-figure analytical balance	1

Part 2: Supporting Information - Appendix 2: Hydrogen Cyanide | Run 1

Results

reference conditions are: STP, wet

parameter	units	result ± MU (95% CI)	units	result ± MU (95% CI)
Hydrogen Cyanide	mg/m ³	< 0.065 ± 0.013	g/hr	< 0.15 ± 0.031

Analytical Laboratory Information

parameter	details
name of analytical lab	RPS
lab analytical procedure	W4
lab analytical technique	UV VIS Spec Analysis Accreditation: Non accredited
date analysis completed	26/07/2023

General Information

parameter	details
sampling date	17/07/2023
sampling times testing team	11:28 - 12:08 40 minutes tested by: RH BM
standard technical procedure	Based on US EPA OTM29 TP-15
volume metering device	XD-502 Digital Source Sampling Console
probe material	Titanium
filter housing material	Titanium
impinger material capture media	Borosilicate Glass NaOH

parameter	details
filter size, material & location	47mm QF In Stack heated to 21°C
number sampling lines available	1
number sampling lines used	1
number sampling points ideal per line	1
number sampling points used per line	1
sampling point IDs	A1

Quality Assurance

² The concentration in the last absorber was less than 5 times the analytical LOD.

QA parameter	units	sample run			blank (taken on 17/07/2023)		
		value	allowable	result	value	allowable	result
maximum allowable blank	mg/m ³	-	-	-	0.056	N/A	N/A
leak test	%	0.80	2.00	Pass	0.80	2.00	Pass
absorption efficiency	%	100.0	N/A ²	Pass	-	-	-
silica trap <50% faded	-	Yes	-	Pass	-	-	-
are water droplets present	-	No	-	-	-	-	-
water vapour MU	%	3.7	20.0	Pass	-	-	-
pH maintained	-	13	≥12	Pass	-	-	-

Breakdown of Results

reference conditions are: STP, wet

parameter	sample volume [m ³]	LOD [mg]	impingers [front back] [mg/l]	impinger volume [front back] [ml]	mass total [mg]	LOD result [mg/m ³]	result [mg/m ³]	result reported [mg/m ³]	mass emission [g/hr]
sample run	0.5331	0.035	< 0.1 < 0.1	235 110	< 0.035	0.065	< 0.065	< 0.065	< 0.15
blank	0.5331	0.03	< 0.1	298.0	< 0.03	0.056	< 0.056	< 0.056	

Part 2: Supporting Information - Appendix 2: Hydrogen Cyanide | Run 1

Raw Data | Calculations

data	units	value
P _{bar}	mmHg	761.3
P _g	Pa	-230.0
ΔH _@	mmH ₂ O	44.3
P _m	mmHg	764.6
P _s	mmHg	759.6
V _m (metered)	m ³	0.5589
Y _d	-	0.9989
C _{stp}	-	0.3592

data	units	value
T _m	°C	21.0
ΔH _{av}	Pa	200.0
m _{wts}	g	10.4
M _w	g/mol	18.0
V _{mol}	m ³ /mol	0.0222
T _s	°C	21.0
R _{wv} (H ₂ O)	% v/v	2.4

data	units	value
%CO _{2d}	% v/v (est)	0.05
%O _{2d}	% v/v (est)	20.80
%O _{2w}	% v/v (est)	N/A
%N _{2d}	% v/v	79.15
%O _{2ref}	% v/v	N/A
O _{2facd}	-	N/A
O _{2facw}	-	N/A

data	units	value
M _d	g/mol	28.84
M _s	g/mol	28.58
A _s	m ²	0.09
θ (sample time)	mins	40

where (est) refers to an estimated value

metered volume calculations	units	value
allow favourable O ₂ correction	-	N/A
vol actual stack conditions, V _{ma} = (V _{mstw})(T _s + 273) / (P _s) / (C _{stp})	m ³	0.5744
vol dry, V _{mstd} = (V _m)(Y _d)(C _{stp}) / ((P _{bar} + (ΔH _{av} / 9.80665 / 13.6)) / (T _m + 273))	m ³	0.5203
vol wet, V _{mstw} = (V _{mstd}) / (100 - R _{wv})	m ³	0.5331
vol dry O ₂ , V _{mstdO₂} = (V _{mstd}) / (O _{2facd})	m ³	N/A
vol wet O ₂ , V _{mstwO₂} = (V _{mstw}) / (O _{2facw})	m ³	N/A

velocity volume flow rate calculations	units	value
velocity of stack gas, v _s = average of all velocity measurements	m/s	8.3
stack gas flow actual stack conditions, Q _a = average of all flow rate measurements	m ³ /hr	2544.6

Measurement Uncertainty (MU) Calculations

parameter	units	value	standard MU	MU as %age	required standard	value	sens coeff.	MU mg/m ³
DGM meter volume, V _m	m ³	0.5589	0.0028	0.50	≤2%	-	-	-
DGM temperature, T _m	K	294.0	2.0	0.68	≤1%	-	-	-
DGM pressure, P _m	kPa	101.9	0.50	0.49	≤1%	-	-	-
DGM humidity, H _m	% v/v	0	1.0	1.00	≤1%	-	-	-
DGM volume STP, V _{mstd}	m ³	-	-	-	-	0.5203	0.12	0.00091
leak, L	% ¹ mg/m ³ ²	0.86 ¹	-	0.86	≤2%	0.00032 ²	1.00	0.00032
laboratory result, L _r	% ¹ mg/m ³ ²	10 ¹	-	10.0	-	0.0065 ²	1.00	0.0065
<i>combined MU</i>								0.0065
<i>expanded MU 95% CI (k = 1.96) including method deviations MU</i>								0.013
<i>expanded MU 95% CI (k = 1.96) as percentage of measured value</i>								19.8%
<i>expanded MU 95% CI (k = 1.96) as percentage of measured value for mass emission</i>								20.5%

MU factor O ₂ correction
N/A

overall MU for O ₂ correction
N/A

method deviation factor
1.00

method and sampling deviations
Sampling was performed in full compliance with the Standard, technical procedure and regulatory requirements.

Part 2: Supporting Information - Appendix 2: Total VOCs (as Carbon) | Run 1

Results

reference conditions are: STP, wet

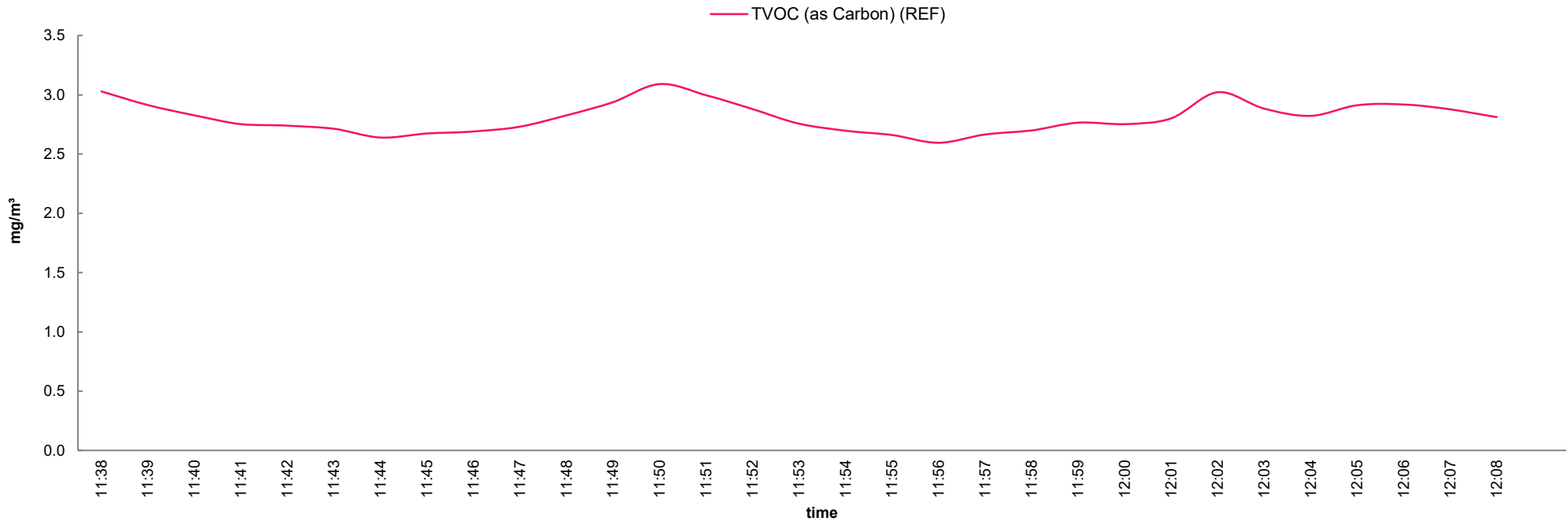
parameter	units	result ± MU (95% CI)	units	result ± MU (95% CI)
Total VOCs (as Carbon)	mg/m ³	2.8 ± 0.15	g/hr	6.6 ± 0.48

General Information

parameter	details
sampling start date & time	17/07/2023 11:38
sampling end date & time	17/07/2023 12:08
test time mins	30
testing team	RH BM
standard technical procedure	EN 12619 TP-21a
analyser type	ThermoFID
heated head & line temperature	180°C

parameter	details
probe material	Titanium
filter size, material & location	Filter Element PTFE Within Heated Head
number sampling lines available	1
number sampling lines used	1
number sampling points ideal per line	1
number sampling points used per line	1
sampling point IDs	A1

Plot of Emissions Over Time



Part 2: Supporting Information - Appendix 2: Total VOCs (as Carbon) | Run 1

Analyser Calibration Information with QA checks

where [A] = at analyser, [L] = down sampling line

CAL ID	pre-test calibration events							post-test calibration events			quality assurance						
	date & time	zero [A] [ppm]	span [A] [ppm]	zero [L] [ppm]	span [L] [ppm]	T ₉₀ [s]	leak [%]	date & time	zero [L] [ppm]	span [L] [ppm]	zero drift [%]	span drift [%]	allowable [%]	temp [°C]			
1	17/07/23 10:05	0.00	79.91	0.30	81.00	25	0.0	P	17/07/23 13:08	-0.06	80.70	-0.4	P	0.1	P	±5	19.5

Analyser Calibration Extended Information

CAL ID	performed by	drift corr. applied	log period [s]	CYL ID	CYL conc. [ppm]	CYL expiry	CYL MU [%]	zero gas type	span [CYL] gas type	span target [ppm]	range [ppm]	LOD [ppm]
1	RH	No	60	A-CYL-96	79.91	26/03/2028	1.0	Synthetic Air	5l 80ppm Propane in Air	79.91	AUTO	0.03

Part 2: Supporting Information - Appendix 2: Total VOCs (as Carbon) | Run 1

Measurement Uncertainty (MU) Calculations

general information	units	value
emission limit value (ELV) (REF)	mg/m ³	N/A
measured concentration (REF)	mg/m ³	2.8

MU budget			
parameter	units	min	max
ambient temp	°C	19.0	20.0
voltage	V	90.0	130.0

overall MU for O ₂ correction
N/A

MU factor O ₂ correction
N/A

performance characteristics	MU budget input parameters				MU budget		
	symbol	units	value	source	symbol	units	value
repeatability at zero	rz	% of value	0.2	MCERTS certificate MC050062	U _{rz}	mg/m ³	0.0056
repeatability at span	rs	% of value	0.2	MCERTS certificate MC050062	U _{rs}	mg/m ³	0.0056
lack of fit	lof	% of value	2	maximum allowable	U _{lof}	mg/m ³	0.032
maximum short term zero drift (ABS) [after drift correction]	dz	% of value	0.45	day of testing	U _{dz}	mg/m ³	0.0072
maximum short term span drift (ABS) [after drift correction]	ds	% of value	0.075	day of testing	U _{ds}	mg/m ³	0.0012
influence of sample gas flow	f	% of value	-0.1	MCERTS certificate MC050062	U _f	mg/m ³	-0.0016
influence of sample gas pressure	p	% of value	0	MCERTS certificate MC050062	U _p	mg/m ³	0
influence of ambient temperature zero point (/ 35k)	tz	% of value	1.4	MCERTS certificate MC050062	U _{tz}	mg/m ³	0.00037
influence of ambient temperature span point (/ 35k)	ts	% of value	-0.57	MCERTS certificate MC050062	U _{ts}	mg/m ³	-0.00015
influence of supply voltage (/ 60V)	v	% of value	-1	MCERTS certificate MC050062	U _v	mg/m ³	-0.011
cross sensitivity at zero	iz	% of value	0	MCERTS certificate MC050062	U _{iz}	mg/m ³	0
cross sensitivity at span	is	% of value	3.9	MCERTS certificate MC050062	U _{is}	mg/m ³	0.063
maximum leak	L	% of value	0	day of testing	U _L	mg/m ³	0
uncertainty associated with calibration gas	adj	% of value	1	span gas calibration certificate	U _{adj}	mg/m ³	0.014
<i>combined MU</i>						mg/m ³	0.074
<i>expanded MU 95% CI (k = 1.96)</i>						mg/m ³	0.15
<i>expanded MU 95% CI (k = 1.96) as percentage of measured value</i>						%	5.2
<i>expanded MU 95% CI (k = 1.96) as percentage of measured value for mass emission</i>						%	7.3

method and sampling deviations
Sampling was performed in full compliance with the Standard, technical procedure and regulatory requirements.

Part 2: Supporting Information - Appendix 2: Velocity & Flow Rate Traverse | Run 1

Supporting Information

parameter	units	value
barometric pressure	kPa	101.5
average wet density	kg/m ³	1.184
average stack static pressure	Pa	-230.0
pitot tube coefficient, C _p	-	0.832

General Information

parameter	details
traverse date	17/07/2023
traverse times performed by	11:20 - 11:25 performed by: RH BM
standard technical procedure	EN 16911-1 TR 17078 TP-04a
device used	S-type Pitot with KIMO MP 210 (500Pa module)

Limit of Detection (LOD) is 1 m/s for this device combination

Quality Assurance

parameter	details
result of pitot stagnation test	Pass
result of pitot leak check (pre)	Pass
result of pitot leak check (post)	Pass
water droplets present	No

NM = Not Measured

Line A

static pressure = -230 Pa

Pt	Depth m	ΔP Pa	Temp °C	Vel m/s	Swirl °
1	0.17	59.0	21.0	8.3	< 15

Part 2: Supporting Information - Appendix 2: Velocity & Flow Rate Traverse | Run 1

Measurement Uncertainty (MU) Calculations

parameter	units	value
standard uncertainty on the coefficient of the pitot tube	-	0.0015
standard uncertainty associated with the mean local dynamic pressures	Pa	1.4
standard uncertainty associated with the molar mass of the gas	-	0.000027
standard uncertainty associated with the temperature	K	1.5
standard uncertainty associated with the absolute pressure in the duct	Pa	176
standard uncertainty associated with the density of the gas effluent	kg/m ³	0.0065
standard uncertainty associated with the local velocities	m/s	0.1
standard uncertainty associated with the mean velocity	m/s	0.1

parameter	units	value
standard uncertainty associated with the mean velocity (95% CI)	m/s	0.2
standard uncertainty associated with the mean velocity (95% CI), relative	%	2.4
standard uncertainty associated with the volume flow rate @ actual (95% CI)	m ³ /hr	130
standard uncertainty associated with the volume flow rate @ actual (95% CI), relative	%	5.1
standard uncertainty associated with the volume flow rate @ ref 1 (95% CI)	m ³ /hr	121
standard uncertainty associated with the volume flow rate @ ref 1 (95% CI), relative	%	5.1

method and sampling deviations

Sampling was performed in full compliance with the Standard, technical procedure and regulatory requirements.