Knauf Insulation

Application to vary Environmental Permit EPR/BQ4335IC

Application Technical Report

WSP UK Limited – January 2024

Report for

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Document revisions

No.	Details	Date
P01	First draft	April 2023
P02	Issue for application	April 2023
P03	Updated to include additional information	January 2024

Non-technical summary

Knauf Insulation Limited (KI) proposes to increase manufacturing capacity to produce glass wool insulation at the site at Ravenhead Insulation Works, Stafford Road, St Helens, WA10 3LZ. This will require changes to be made to existing plant and infrastructure and installation of new equipment.

The site currently operates three production lines at the site, though throughput on only the following lines will be increased:

- The Low Density (LD) Line.
- The High Density (HD) Line.

Although the glass mineral wool products can be manufactured on separate lines, these are both fed by molten glass produced in a single Glass Melting Furnace which, because of the extreme heat it is exposed to, is periodically rebuilt during planned shut-downs. During the next planned shut-down in 2024, the furnace will be rebuilt to accommodate a larger furnace melting area and modified to include more electrical boost heating. The changes to the furnace will increase the amount of molten glass produced, improve energy efficiency and reduce emissions of nitrogen oxides (NO_x). The furnace will be heated with Low NO_X burners together with specially designed electric heaters. Waste gas arising from the burners and the molten glass will be released to air via a tall chimney. Before being emitted, the gas will be treated by technologies specially designed for this purpose that are proven to be effective in removing pollutants before the treated gases are released into the air.

The HD Line is currently constrained by glass availability but has sufficient spare capacity to produce the required throughput without any changes being required to the manufacturing processes.

The LD Line does not currently have sufficient spare capacity. On this basis, a number of modifications will be required. New plant will be installed on this line to:

- Mix the fibres produced from the molten glass with binders.
- Form the fibres and binders into glasswool mat.
- Cure the glasswool mat.
- Cool the mat to produce the finished product.

In addition, a new water tank and pipework will be installed, and new equipment will be installed to package the finished product.

The cullet cooling towers will be replaced with a larger capacity system to cope with the increased volume of molten glass within the expanded furnace. Similarly, a larger capacity set of cooling towers will be installed to cool the additional fiberizers for the LD line. The air compressors and their associated cooling towers will be replaced with a more efficient unit to ensure compressed air supply. These cooling systems will be replaced with more energy efficient units with improved environmental performance and capacity to meet the increased production.

As a result of the increase in production there will be:

- A proportional increase in raw materials needed for the manufacturing process and for packaging the finished product. There will be no changes to the product formulations therefore there will be no changes to the raw materials used in the production process. The amount of raw materials stored at the facility will not increase, though there will be more

frequent deliveries to the site. It is not considered that noise or dust associated with vehicle movements or unloading these materials will be unacceptable.

- A proportional increase in the requirement for water. It should be noted that because more efficient equipment will be installed (such as dewatering screws that remove water from the product during the manufacturing process), the amount of water required to produce a unit of product will reduce by 5% compared to current figures.

  It should also be noted that a large component of water used in the production process is released via the chimneys. Any water from processes retained in liquid form is recirculated in closed loop systems. On this basis, the increase in production will not generate additional effluent.

- An increase in the requirement for gas and electricity. However, as the Melting Furnace will be rebuilt and energy efficient burners, compressors and cooling towers will be operated, the amount of energy used to produce a unit of finished product will be reduced significantly.

- A need for additional land to store finished product as required. Knauf Insulation has recently acquired an area of land to the north of the site. As this area will also need to be regulated by the Permit, information is provided in the Site Condition Report provided at Appendix B to describe:

  - Land and groundwater quality of this area.
  - Site surfacing and drainage arrangements.
  - The potential pollution impacts of storing the finished product.

  This area may also be used on occasions to store cullet (recycled glass fed into the Melting Furnace to produce glass) and will be accessed by heavy goods that will be required to park temporarily within this area. . Pollution risks for these activities are also assessed in the document at Appendix B.

  Storm water that runs off from the hard standing will be released to two surface water drainage systems:

  - The surface water drainage system that runs through the site and releases to the Ravenhead Dam on the site. Knauf Insulation currently monitors the component of oil contained in run off released from other areas of the site that flow to the Dam. On this basis, it is recommended the Environment Agency includes a condition in the Variation Notice should it grant this application.
  - Surface water drainage system operated by United Utilities.

- Changes to emissions released to air from the tall chimneys that release waste gas from:

  - The Melting Furnace. The waste gas comprises mainly combustion gases and components of the raw materials fed into the furnace as they melt in the high heat.
  - The HD production line and the LD production lines. The waste gas mainly comprises evaporated water from the process and residues of raw materials and surplus binder contained in the fibre as it is cooled and cured.

Before being released to air, waste gases from the Melting Furnace, the HD Line and the LD Line will be treated to remove pollutants using technologies that are specifically designed and proven to be effective.

It is anticipated the modifications will not give rise to increased noise emissions as, although additional equipment will be installed to achieve increased manufacturing capacity, the plant has

been installed to achieve stringent noise levels. Where appropriate, items of plant and equipment associated with noise emissions (e.g. cooling towers) have been specified to support upgrading to further reduce noise emissions in the event further mitigation of noise is required.

Some plant is required to be replaced e.g compressors and cooling towers as they have come to the end of operational lifetimes. These aged items are associated with increased noise emissions as:

- These units were not specified to achieve the stringent noise levels of modern equipment.
- The duty of the units means they will be subject to extensive wear and tear of non-replaceable components.

The Noise Assessment predicts there will be no appreciable increase in noise as a result of the proposed modifications when the replacement units are introduced into service.

A technical assessment of the effects of release of the waste gases outlined above on air quality has been undertaken and is presented at Appendix C. The assessment confirms that release of the treated gases from the stacks will not give rise to unacceptable impacts on air quality or adverse effects on human beings or ecological receptors.

In order for the Environment Agency to vary the Variation Notice to accommodate these changes, Knauf Insulation is required to demonstrate that the design, operation and management of activities associated with the modifications described are consistent with Best Available Techniques published by the Environment Agency and the European Commission. An extensive comparison of the measures implemented with the relevant Best Available Techniques is provided at Appendix D. The assessment confirms the proposals are consistent with these Techniques.

This application to vary the Environmental Permit also requests the Environment Agency make a number of changes to the current Permit, though these are relatively administrative in nature. These include:

- Redefining the definition included in the Permit for a specific operating scenario which the Environment Agency currently considers to be an abnormal operation, though does not give rise to adverse environmental impacts.
- Removing references to a number of air vents on the wash water building from the Permit as this building has been demolished.
- Specifying emission point W1 (run off from the recently acquired area of land released to the Ravenhead Dam as described in the initial Permit application) and including requirements for monitoring.

Contents

1. Introduction

1.1 Background and context to the application

Knauf Insulation Limited (KI) is making this application to the Environment Agency (EA), to vary the Environmental Permit for the installation located at Ravenhead Insulation Works, Stafford Road, St Helens, WA10 3LZ. This obligation is conferred by the Environmental Permitting (England and Wales) Regulations 2016 (EPR) and the conditions included in Permit no. EPR/BQ4335IC, on the basis the Operator is proposing to rebuild the Glass Melting Furnace, expand the downstream production line and to add additional land to the permitted installation boundary.

The Environmental Permit regulates activities undertaken at the installation associated with manufacture of glass wool insulation materials for use in domestic and commercial applications. These activities require a Glass Melting Furnace (Melting Furnace) and as with all refractory lined furnaces, these require periodic rebuild in addition to maintaining and replacing items of plant and equipment in accordance with the preventative maintenance regime.

The facility is scheduled to be shut-down in 2024 to enable:

- Scheduled rebuilding of the Melting Furnace.
- Preventative maintenance and the scheduled replacement of items of plant and equipment e.g., cooling towers, compressors and dewatering screws with more efficient units.

As part of this package of measures, KI will take the opportunity to modify the manufacturing process to increase the capacity of the Melting Furnace, to meet increased demand for products and to remove various bottlenecks that constrain production. This will require operation of additional items of plant for processes and activities downstream of the Melting Furnace, to enable the increased volume of product to be treated with binders, formed, cured, cooled, bagged and stored at the site.

Several ancillary systems will be replaced with more efficient units that provide a greater capacity and more reliable operation. Rather than installing additional plant to meet the increased cooling requirement, KI is taking this opportunity to entirely replace the existing cooling towers (providing cooling to the cullet cooling, fiberizers, and air compressors), and the compressors associated with production of compressed air. These units are specified to optimize energy efficiency and reduce noise emissions.

It should be noted the arrangements for oxygen supply will be replaced in due course. This will be operated following a subsequent application to vary the Environmental Permit and / or review of the Noise Impact Assessment by the Environment Agency, as appropriate.

KI has confirmed that the current arrangements for abatement of emissions to air, supply of on-site utilities, wastewater treatment and storage of raw materials and wastes will not require modification.

KI has recently acquired a plot of land previously used for manufacturing activities at a neighboring facility. KI will use this land to store finished goods when there is insufficient capacity available within the current installation boundary and where required, washed cullet. The finished product will be transferred from this area onto heavy goods vehicles for transfer from the site.. These activities comprise associated activities for the purposes of the Environmental Permitting Regulations, therefore this land is required to be incorporated within the Installation Boundary.

In addition, there have been some changes to the site layout since the latest Variation Notice was issued. This includes the demolition of the wash-water building that accommodated sixteen roof vents regulated as Emission Points A101-A116 by the Environmental Permit, details of which have previously been provided to the local Environment Agency Inspector, though are included in this technical report for completeness.

The activities associated with these modifications will be regulated by the Environmental Permit for the installation, which includes the obligation to demonstrate Best Available Techniques (BAT) for the design, operation and management of the regulated activities. KI is therefore required to submit an application to vary the Environmental Permit to notify the Environment Agency of the changes outlined above and demonstrate compliance with BAT to enable conditions to be modified to provide an appropriate level of regulatory control to prevent and where this is not possible to minimise impacts to the environment.

Changes to Permit conditions

The most recent variation of the Permit was initiated by the Environment Agency (in 2015) as part of the Regulation 60 process to assess compliance with the BAT Conclusions as presented in the Manufacture of Glass BAT Reference Document (Glass BREF) [1].

Based on our review and assuming the Environment Agency is minded to approve this application, the following changes to version 007 of Environmental Permit for the installation are anticipated:

- Replacement of the Site Plan provided at Schedule 7. The updated Site Plan is provided at Appendix E of this Technical Report.
- Inclusion of release point W1 in Schedule 3, Table S3.2 for release of uncontaminated clean surface water from the extended area of the Installation boundary to the Ravenhead Dam. This emission point was described in the initial Permit application submitted in 2002 though the flow was not included in the Environmental Permit for reasons that are not confirmed. Flow from this area will continue to be transferred to the Dam via existing drainage infrastructure to the Dam which is also sited within the installation boundary. Although this flow does not constitute trade effluent, consistent with permitting of other surface water flows within the installation, it is anticipated the Variation Notice will include an emission limit value of 5mg/l for oil and require monthly monitoring of this parameter in accordance with the Alcontrol Method TM172 to monitor the potential for hydrocarbon run-off.
- KI also requests the definition of Abnormal Operations specified in Schedule 6 of the Permit is updated. The Permit currently defines Abnormal Operations to include.

  '*abnormal operations for the wet electrostatic precipitator is on a wet electrostatic precipitator means a greater than 30% reduction in abatement capacity of the wet electrostatic precipitator*'.

  This definition means KI is required to notify the Environment Agency of events that would ordinarily not be regarded as abnormal.

  KI therefore proposes the definition included at Schedule 6 is updated to include wording similar to: 'on a wet Electrostatic *Precipitator means non-operation of the wet Electrostatic Precipitator.*

  This definition aligns with the approach undertaken for the dry Electrostatic Precipitator, reflecting a review of analytical data that confirms emissions continue to be effectively abated while the facility operates in single sided mode as shown in Element Stack Testing Reports for the LD and HD WESPs [2] [3] undertaken in response to Improvement Condition 20 on the V007 permit. Operations undertaken

within this definition of an abnormal event do not give rise to exceedances of emission limit values in the Environmental Permit or adverse environmental impacts.

- Removal of emission points A100-A116 from the Environmental Permit. These emission points comprised roof vents on the wash water building, which is now demolished.
- The requirement to verify the assumptions and findings of the Noise Assessment when representative data is available and to agree any further noise mitigation measures with the Environment Agency to ensure noise emissions are not likely to cause pollution, consistent with Condition 3.4.1 of the current Consolidated Variation Notice.

As noted in 'Regulatory Context' below, this document should be read in conjunction with the EA application forms EPR A, C2, C3 and F1.

1.2 The Site and Operator

This document supports the application to vary the bespoke permit (EPR/BQ4335IC/V007) for the Installation located at National Grid Reference: SJ 501 945, sited at Ravenhead Insulation Works, Stafford Road, St Helens, Merseyside, WA10 3LZ.

The location of the installation is shown in Figure 1.1. This variation application proposes to add additional land to the permitted installation which is shown in Figure 1.2 with the existing site shown with a red boundary and the additional land shown in green. The new site plan is included at Appendix E.

Figure 1.1 Installation location

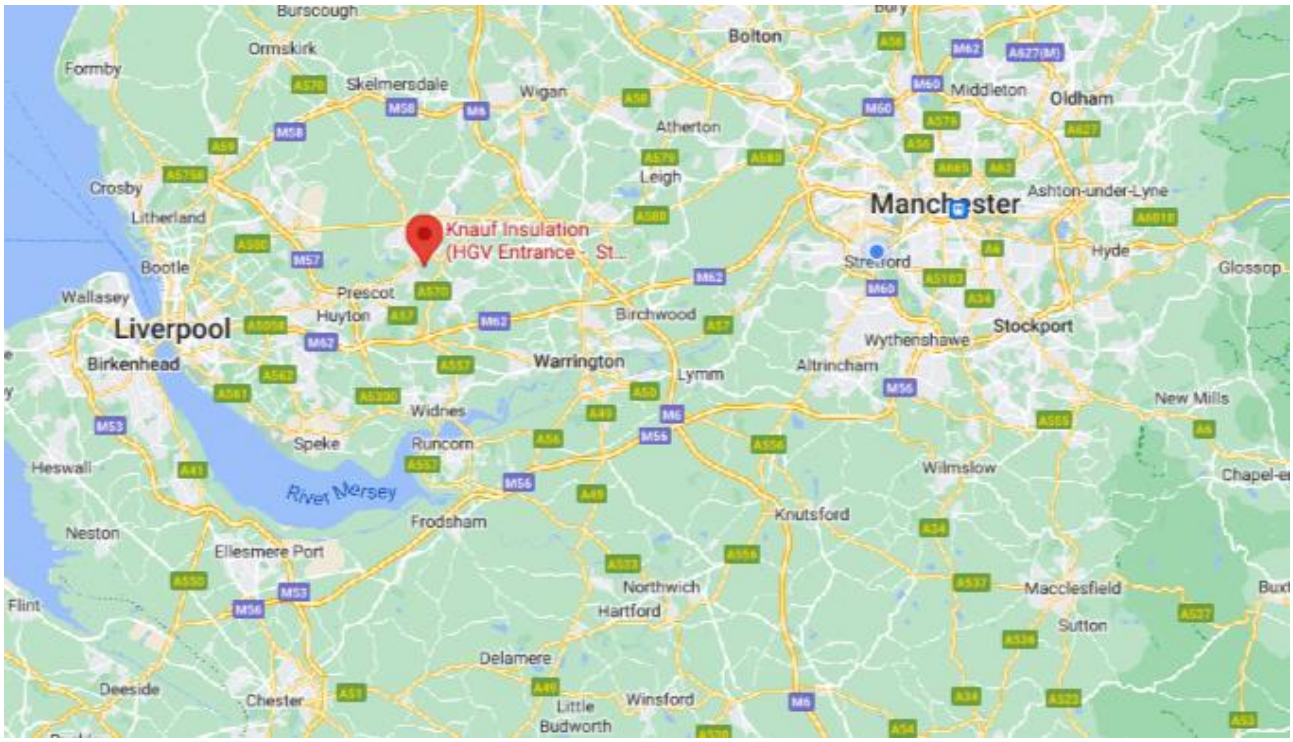


Figure 1.2 Installation boundary

1.3 Description of the modifications

The operator proposes to make a number of changes associated with the refurbishment of plant and operational arrangements that will also support increased manufacturing capacity. These are summarised at Table 1.1. More extensive information detailing the nature and extent of these modifications is provided at Section 3. An extensive comparison of these arrangements with Best Available Techniques is provided at Appendix D.

Table 1.1 Summary of proposed changes

Change	Description of proposed changes	Potential environmental effects	Type of change
Additional land for storage	Inclusion of additional land within the installation boundary.	Release of run-off	Substantial Technical
Glass Melting Furnace rebuild	Rebuilding of the glass melting furnace including replacement of the melter and oxy-gas burner system to facilitate greater throughput	Energy use (gas and electricity) Emissions to air Water use Noise Increased raw materials (cullet, batch raw materials and oxygen)	Normal
Changes to downstream processes	Low Density production line will be expanded to increase the production throughput and allow production of products with higher thermal performance.	Energy use (gas and electricity) Emissions to air Water use for binder and steam from the wet electrostatic precipitator	Normal

Change	Description of proposed changes	Potential environmental effects	Type of change
		Increased raw materials (air, binder, packaging) Noise	
Ancillary system upgrades	Replace slab baggers with alternative packaging machines and installing an additional fourth multi-pack machine. Installation of additional transformer within the transformer room to support electrical assist heating. Two additional batch chargers from the backwall to charger larger volume of raw material to furnace. Replacement of the cullet and fiberiser (furnace) cooling towers. Replacement of the air compressors and associated cooling towers.	Noise Energy use (electricity and liquefied petroleum gas) Reduced water requirement. Reduced waste generation Dust	Minor
Removal of emission points	The wash water building was demolished in 2015. Therefore this building and the associated roof vent emission points (A100-A116) are to be removed from the Environmental Permit.	Not applicable	Minor
Redefine abnormal operating conditions	No change to plant or operational measures	Not applicable	Minor Operational

1.4 Matters agreed with the Environment Agency

Knauf have confirmed with the Environment Agency (EA) that the application fee due for this application is to be £12,307 as per their guidance document for a substantial variation to permits of this type, though this will be increased to accommodate review of the Noise Management Plan and may require further revision as the application is determined. Notwithstanding further information that may be required to be provided, it was agreed this application should also accommodate the following:

- Confirm the permitting status of releases of surface water run-off from the area of the site associated with the extension of the installation boundary to Ravenhead Dam and confirm whether an H1 Environmental Risk Assessment of emissions to water is required. Confirmation that releases to Ravenhead Dam will comprise clean, uncontaminated run off only and will not comprise trade effluent is provided at Section 9.2. On this basis, an H1 environmental risk assessment is not presented.
- A summary of the Environmental Management System for the installation. This is provided at Section 4.

- An Air Quality Assessment that includes consideration of Local Wildlife Sites within the appropriate screening distance. This is provided at Appendix C.
- An Environmental Risk Assessment that specifically considers dust. This is provided at Appendix F.
- A Noise Assessment to evaluate effects of noise associated with the modifications outlined in this application. This assessment is presented at Appendix G.
- The updated Noise Management Plan to accommodate the modifications. This is presented at Appendix H.

1.5 Acronyms and Definitions

The following acronyms and terms are defined for use in this application.

Table 1.2 Acronyms and definitions

Abbreviation	Description
AQMA	Air Quality Management Area
BAT	Best Available Techniques
BGS	British Geological Survey
Dry EP	Dry Electrostatic Precipitator (installed on A1)
EA	Environment Agency
EPR	Environmental Permitting Regulations
FG	Finished Goods
FLT	Forklift truck
GWh	Gigawatt hour
HD	High Density (Product/Production Line)
HGV	Heavy Goods Vehicle
KI	Knauf Insulation
LD	Low Density (Product/Production Line)
LNR	Local Nature Reserve
LPG	Liquefied petroleum gas
LWS	Local Wildlife Site
SCR	Site Condition Report
SPZ	Source Protection Zone
WESP	Wet Electrostatic Precipitator (installed on A2 and A4)

2. Site location and sensitivity

The site location and sensitivity are consistent with the positions outlined to the Environment Agency is earlier submissions relating to the Environmental Permit including the response to the Regulation 60 questionnaire issued to the Environment Agency to review compliance with BAT Conclusions for Glass Manufacture.

The exception to this is the additional area of land located within the northern area of the installation, to be incorporated into the Installation Boundary (see Figure 1.2). This area is described extensively in the Site Condition Report (SCR) provided at Appendix B.

2.1 Overview

As shown in Figure 1.2, the location of the installation continues to be located within a largely suburban setting, with residential receptors on the installation boundary to the North-East, North, North-West, South-West and South of the installation. Although beyond the initial two rows of housing to the south is undeveloped until Elm Road/Heathfield Avenue at between 400 and 600 m from the installation boundary.

The area to the west of the facility has the Alexandra Lake followed by office blocks with residential populations beyond that at approximately 250m from the installation boundary.

The area to the east is predominantly industrial.

2.2 Ecology

The locations of sites that form part of the National Site Network (formerly Internationally Important Designated Sites such as Special Protection Areas, Special Areas of Conservation and Ramsar sites) within 10km, and nationally and locally important designated sites within 2km have been reviewed.

There are no National Site Network sites identified though there are two Local Nature Reserves (LNRs) within 2km.

Thatto Heath Meadows LNR and Local Wildlife Site lies 0.8km to the South-East and was designated in 2002. Mill Brow LNR lies 1.6 km to the North-West and was designated in 2016 (since the previous variation was determined). There are 16 other Local Wildlife Sites located within 2.5km of the installations.

The relevant ecological receptors are described in full detail in Appendix C (Air Quality Impact Assessment).

2.3 Hydrogeological setting

The hydrogeological setting of the Installation remains unchanged from information previously submitted to the Environment Agency. This section summarises the hydrogeological setting of the additional area of the site to be accommodated within the Installation Boundary.

The additional land is underlain by superficial and bedrock aquifers as follows:

- The till deposits are classed as a secondary (undifferentiated) aquifer.
- The Pennine Lower Coal Measures are classed as a Secondary A aquifer.

The Environment Agency Groundwater Vulnerability Map as presented on the MAGIC interactive map shows the groundwater vulnerability classification is medium to low.

The additional land is not located in a groundwater source protection zone (SPZ).

2.4 Geology and hydrogeology

The hydrogeological setting of the Installation remains unchanged from information previously submitted to the Environment Agency. The geology and hydrogeology of the Installation is described in detail in Appendix B. This section summarises the geology and hydrogeology of the additional area of the site to be accommodated within the Installation Boundary.

The 1:50,000 scale British Geological Survey (BGS) geology mapping supplied with the Envirocheck report (appended to the SCR [Appendix B] shows the eastern half of the additional land directly underlain by made ground, and the west of the additional land directly underlain by superficial Diamicton Deposits (Till – sandy, gravelly and/or cobbly clay) over bedrock comprising sandstones and mudstones of the Pennine Lower Coal Measures. BGS 1:50,000 scale mapping viewed on the GeoIndex shows five coal seams running through the additional land on a southwest to northeast axis, one roughly centrally and four in the southeast of the additional land.

Ground conditions on the additional land may be similar to those encountered on the existing permitted installation, particularly in the east of the additional land.

2.5 Residential receptors

The locations of residential receptors remains unchanged from information previously submitted to the Environment Agency and are described in full detail in Appendix C (Air Quality Impact Assessment).

There are residential receptors within 0.5 km on the North, West and South sides of the facility, and a subset of these receptors has been selected for the Air Quality Impact Assessment. The receptors for the Air Quality Impact Assessment were selected in line with the Air Quality Standards Regulations 2010.

The effects of noise on residential receptors is also considered in the Noise Impact Assessment at Appendix G.

2.6 Air quality and noise

Sensitive air quality receptors are described in full detail in Appendix C (Air Quality Impact Assessment).

In summary, the installation is not located within an Air Quality Management Area. There are two Air Quality Management Areas (AQMAs) designated for control of nitrogen dioxide emissions within 1.5 km of the site covering Borough Road to the North and Reflection Court to the North-East. There are two further AQMAs within 5km but further than 1.5km.

The Air Quality Impact Assessment also considers impacts on Residential Receptors described in Section 2.5 and Ecological Receptors described in Section 2.2. The Assessment is presented at Appendix C.

The installation is not located within an area managed by a Noise Action Plan. The Noise Impact Assessment considers impacts on noise sensitive receptors associated with site operations following deployment of the changes. The Noise Assessment is presented at Appendix G.

3. Proposed modifications

3.1 Overview

This section outlines the modifications required to support the increase in manufacturing capacity. It should be read alongside the BAT Assessment Report provided at Appendix D.

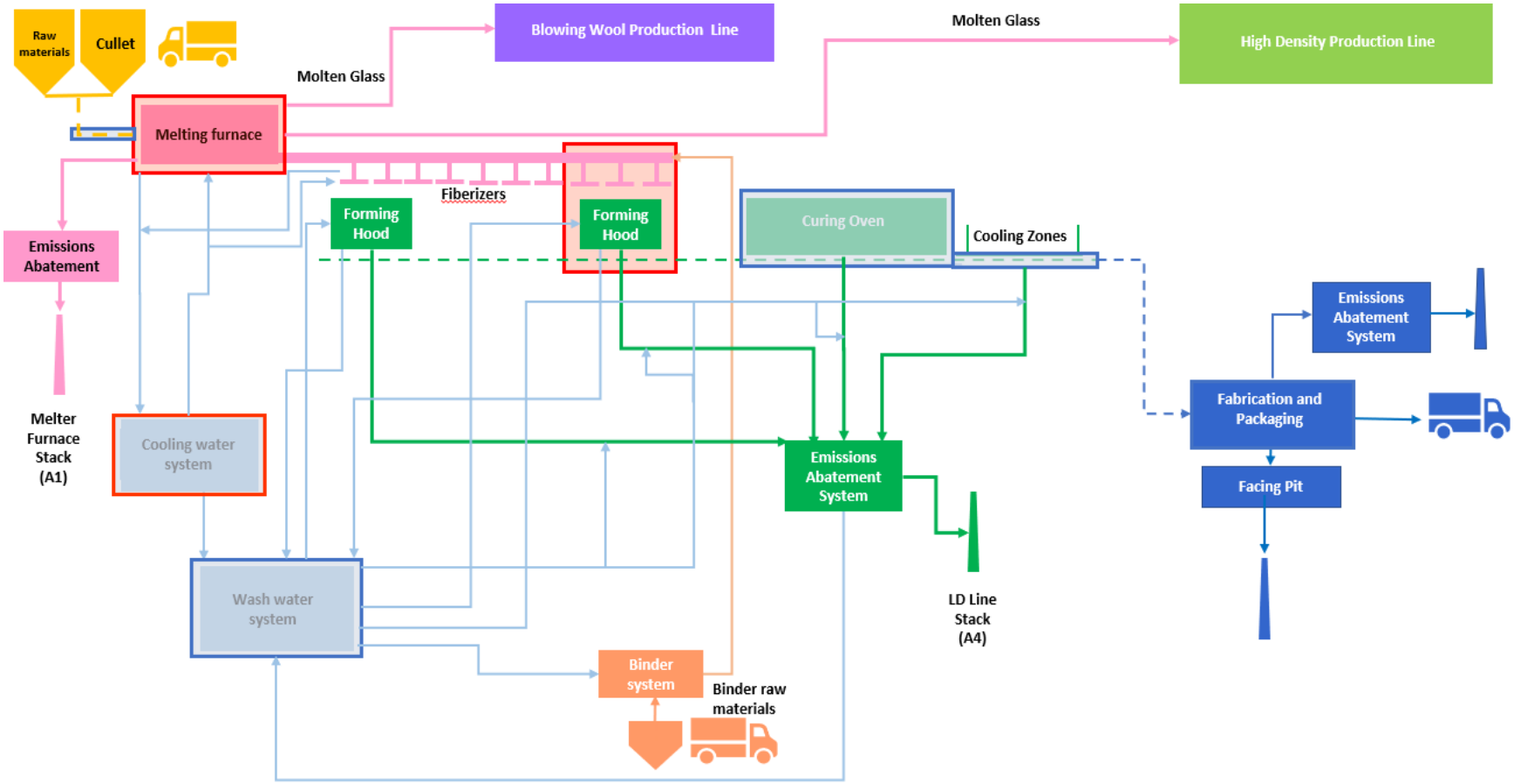
For context, **Error! Reference source not found.** is a schematic representation of the assets and processes installed at the facility and identifies those that will be subject to modification. Figure 3.1 is colour coded to reflect the following:

Colour	System
Nature of modifications	
	Boxes with red borders indicate significant new or replaced equipment.
	Boxes with blue borders indicate sections with minor modifications or upgrades
Manufacturing processes and systems	
	Batch plant
	Melting furnace and molten glass
	LD Production Line
	Blowing Wool Production line
	HD Production Line
	Fabrication and Packaging
	Binder system
	Cooling and Wash Water systems

Dashed lines represent conveyors and solid lines represent pipework and ductwork.

The HD line and blowing wool line are not shown in detail, as there are no changes to any portion of the line from the information previously provided to the Environment Agency. The LD line is shown in detail to highlight the modifications to specific elements. The locations of the items of equipment to be replaced and upgraded are identified at Appendix I.

Figure 3.1 Knauf St Helens – Process Schematic



3.2 Proposed changes

3.2.1 Operations associated with storage of finished goods associated within additional area of land

The additional area of land to be incorporated into the installation boundary will be used to provide spare capacity for finished goods storage pending removal from the installation by heavy goods vehicles that will park temporarily within this area. This area may also be used for temporary storage of clean/washed cullet.

Given the nature and extent of activities undertaken within this area, these are not anticipated to give rise to any deterioration of ground conditions or release of contaminated flows to Ravenhead Dam. This is on the basis that:

- Finished goods will be deposited and removed from the installation by liquefied petroleum gas (LPG) or electric powered forklift trucks.
- Finished goods will be stored in robust weatherproof packaging specified to withstand movement and handling.
- The area will be accessed temporarily by heavy goods vehicles.
- All activities will be undertaken within areas founded on competent hardstanding installed with engineered drainage systems.

Uncontaminated run-off will drain to:

- The currently installed site drainage system.
- The public surface water drainage system operated by United Utilities.

Extensive information relating to this area of the site, pollution control measures and the site drainage system is provided in the Site Condition Report (Appendix B).

The increased requirement for raw materials will be met by more frequent deliveries. The inventory of raw materials and current infrastructure and plant used for storage and transfer of raw materials will remain unchanged.

3.2.2 Modifications to the Melting Furnace

The Melting Furnace will continue to operate at a temperature ranging from 1200-1500°C using oxygen, natural gas and electricity.

The current Melting Furnace installed at the installation will be substantially rebuilt as part of the maintenance programme. It will be designed and operated consistent with information previously provided to the Environment Agency with limited modifications relating to the Melting Furnace design and specification of the oxy-gas burners / melter and electric assist heating as outlined below.

The size of the Melting Furnace will be increased from 55m^2 to 72 m^2, with the same techniques applied for heating the unit but with increased capacity (oxy-gas burners with electrical boost). This increase in melting capacity will support a greater throughput of Low Density (LD) and High Density (HD) products.

Two additional batch chargers using electrically powered screw conveyors will charge raw materials from the existing batch plant into the enlarged furnace. These conveyors will enter via the back wall where existing conveyors charged from the sidewall.

This will provide feed of 330 tonnes of glass per day, compared to 251 tonnes of glass currently. This will support the following design capacity:

- Maximum glass flow to the Low Density (LD) line to be increased to 8500 kg/hour.
- Maximum glass flow to the High Density (HD) line to be increased 3667 kg/hour.
- Maximum glass flow to the blowing wool line remains at 1583 kg/hour.
- Total glass throughput of 119,350 tonnes per annum to be achieved by the rebuilt furnace.

Gas-oxy burner design and electric assist heating

Currently, the heat requirement of the Melting Furnace is met by oxy-gas burners and electric boost heaters. As electric melting furnaces are not considered viable for large scale melting, the oxy-gas burners will use low nitrogen oxides (NO_x) type burners (as per currently installed model). Based upon the experience of KI from several glass plants it operates in Europe that are regulated by the Industrial Emissions Directive, Eclipse Primefire 400 burners will be installed, having been confirmed in technical appraisals as the most suitable burners for this application and compliant with Best Available Techniques on the basis of:

- Optimum control over NO_x generation, through the use of partial gas cracking to increase flame luminosity and heat transfer and reduce flame temperature.
- Utilising flat flame geometry to promote heat transfer without increasing flame temperature (and therefore thermal NO_x).

To minimise the potential for sulphur oxides (SO_x) emissions:

- The batch formulation will not change.
- Natural gas and oxygen will be used to meet the energy requirement.
- Emissions from the Melting Furnace will be abated by the dry EP.

Further information on the Techniques applied to reduce NO_x and SO_x emissions in line with BATC 57 and BATC 59 is provided in Appendix D.

To support even heat distribution, the number of electric heaters operated within the Melting Furnace will be increased from 16 to 24. The amount of electrical assist heating will increase from 47 MWh/day (2021) to ~55 MWh/day. This will provide greater control over carbon monoxide (CO) and NO_x emissions from the furnace.

Whilst this will increase the electricity requirement of the installation, as outlined in Section 7 (Energy efficiency and climate change), the more efficient use of energy will enable a reduction in the specific energy benchmark.

Hot gases will continue to exit the Melting Furnace and treated by quenching with fresh air then abated in the Dry Electrostatic Precipitator (Dry EP) before release from the inner annulus of the Furnace Stack (emission point A1). The Dry EP installed is oversized to allow future expansion and the increased flow from the furnace is within the stated design capacity of the unit.

The molten glass will continue to flow through the canals to the three manufacturing lines currently operated at the installation; HD Line, the LD Line and the Blowing Wool Line, collectively known as the downstream processes.

3.2.3 Design and operational changes to downstream processes

As outlined above, the molten glass will continue to be transferred to the three production lines operated at the installation:

- LD Production Line – the increase in production capacity requires modification, as outlined below.
- HD Production Line – there will be no changes made to this line, though throughput will increase.
- Blowing Wool Production Line – there will be no changes made to this line.

Only the LD Line will require modification to facilitate the increased throughput, comprising:

- Operation of three additional Fiberizers.
- Operation of a second forming zone.
- Operation of an additional Curing Oven zone.
- Operation of an additional cooling zone.
- Replacement of the existing slab bagging plant and operation of a fourth multi-pack machine.

The LD Production line is fitted with primary wet scrubbing techniques with secondary abatement provided by the currently installed WESP. The WESP is currently over-sized to allow for future expansion, such that the additional flows will be within the stated design capacity of the WESP.

Fiberizers and Forming Zone

Consistent with the design and operating arrangements for the Fiberizers currently installed and operated at the installation:

- Molten glass from the Melting Furnace will be distributed via heated canals to the fiberizing units. The ten Fiberizers will be split between two forming hoods, with five located directly above each hood.
- In addition to the seven currently installed Fiberizers, three new units will receive molten glass from the furnace. The new Fiberizers are of a proprietary design, to enable molten glass to flow through a series of rotating fibre spinners to produce the fine glass fibres.
- Consistent with the design of the currently installed fiberizers, each of the new units will be fitted with a water overspray system to cool the fibre and minimise subsequent volatilisation of binder components. The formed fibre will be sprayed with binder within the Forming Hood. A new Forming Hood will be installed in order that each unit serves five fiberizers. Consistent with current practice, binder will be applied to ensure the product has the necessary dimensional stability, strength and required fire performance. There will be no change to the formulation of the binder, described in earlier submissions to the Environment Agency.
- Consistent with the current design, the fibres will be directed to the Forming Hood by suctions fans that will create downwards air velocity directing the fibres onto the conveyor where it forms the glasswool mat. This area is referred to as the Forming Zone.
- Air drawn by the Forming Fans will be abated by:
    - Initial treatment by suction boxes (with water sprays), wet venturi scrubbers and drop out boxes (with water jets) upstream of the fans.

- Secondary treatment is provided by cyclones.
- Final treatment by wet electrostatic precipitator prior to release via the LD Line stack (emission point A4).

Curing Oven

The installed Curing Oven is consistent with the design and specification of the unit currently operated at the installation as described in information previously provided to the Environment Agency. However, this will be modified to remove the plate separating the oven zones above the product conveyor to improve energy performance. The new zone will expand the Curing Oven from 7 to 8 zones and will operate as follows:

- The glasswool mat will be transferred by conveyor to the Curing Oven to enable the binder to be thermally set to the fibre.
- The Curing Oven top zone separation will be removed in order to improve the energy performance of the Curing Ovens by reducing the extraction volume and therefore heat loss from the oven.
- The energy requirement of the Curing Oven will continue to be met by low NO_x natural gas burners (one burner per zone).
- In normal operation, exhaust gases from the Curing Oven will be removed from both ends of the oven under extraction.
- In line with the current approach, the Curing Oven will not be fitted with separate purge stacks, and the exhaust gases from burner purge prior to start up will be released via the LD Line stack.
- Air extracted from the Curing Oven will be abated by:
  - Initial treatment by wet scrubbing with water impact jets before being merged with the cooling zone air flows.
  - Secondary treatment by WESP prior to release via the LD Line stack (A4).

Cooling zones

The two existing Cooling Zones are consistent with the design and specification of the units currently operated at the site as described in information previously provided to the Environment Agency, subject to replacement of the cooling zone fan motors. The fan motors will be increased from 70 to 110 kW to allow increased throughput of the Cooling Zones without requiring additional equipment. The Cooling Zones will operate as follows:

- Following curing, the product will be transferred by conveyors over cooling zones, where ambient air is drawn through the mat to cool it.
- Air extracted from the Cooling Zones will be abated by:
  - Initial treatment by wet scrubbing with wet venturi scrubbers before being merged with the Curing Oven air flows.
  - Secondary treatment by WESP prior to release via the LD Line stack (A4).

Ancillary systems

The closed circuit Cullet Quench Cooling System and the evaporative cooling circuit for the Furnace will be upgraded and replaced as part of the modifications.

Additional cooling capacity is required for cooling the three additional fiberizers on the LD line. KI have elected to replace the whole system in the same location with new more efficient cooling towers. These units are to be installed to the north of the main building (FR15) and immediately north of the cullet quench cooling system and to the west of the existing compressor house where the current fiberiser cooling towers are. The towers selected for cooling of the fiberizers are 2 x Polacel CMC9 units, which each have a rated cooling capacity of 989 kW based upon a cooling water flow of 89.5 m³/h. The system has a maximum evaporative water loss of 1.54 m³/h, with drift eliminators to minimise the water losses. The fan is powered by a 7.5 kW motor on a variable speed drive. A counter flow cooling system has been selected for maximum efficiency.

Additional cooling capacity is also required for cooling the cullet in the event that molten glass cannot be processed through the production lines or on a furnace shutdown. KI have selected Truwater ECX 1212F3-2GM as the best available cooling tower for the cullet quench cooling. It is located immediately to the south of the fiberiser cooling towers, located to the north of building FR15, and to the west of the existing compressor house. Similar to the fiberiser cooling system, an induced counterflow evaporative cooling system has been selected to maximise the cooling efficiency. A single cooling tower with two cells has been provided, the cooling water flow rate is 125m³/h per cell, and the total rated capacity is ~7270 kW. The fan in each cell is powered by an 18.5 kW motor with a speed reducer control system. The design includes an allowance of make-up water of 12 m³/h split between blowdown and evaporative losses.

For the cooling water systems (cullet quench and fiberiser), counter flow induced draft systems have been selected to maximise energy efficiency, as counter flow units have improved heat transfer capability compared to cross flow units of similar size. Equally, induced draft systems allow smaller fan motors to be utilised compared to a forced draft system. Each unit incorporates and number of drift eliminators to minimise the water emissions, it is noted that this complies with the requirement of HSG274 in relation to control of Legionnaires Disease.

The current air compressors require replacement and Atlas Copco have been selected as the appropriate supplier on the basis of technical performance and energy efficiency. Four new air compressors with associated driers will be located opposite the BOC oxygen plant in the location which previously housed the old compressors cooling towers. The air compressors and driers will be located within Quadcore GRP houses to minimise noise emissions. Each compressor will deliver up to 8186 m³/h at an operating pressure of 8 bar(g) utilising a three stage compression process to minimise energy requirements. The compressor motors have a rated capacity of 710 kW provided by a dedicated 6.6 kV power supply. The supplied driers have extremely low pressure drop, combined with an efficient heat exchanger and a condensate drain which prevents air loss minimises losses and therefore increases the energy efficiency of the compressed air system.

The air compressors will be serviced by three new cooling towers which will be located behind the new compressor houses. These cooling towers operate on a closed circuit cooling systems, where an induced draft counter flow evaporative cooling process is used to cool water which falls into the redistribution basin at the base of the unit, the cooled water will then remove heat from the primary coolant loop which uses a closed circuit ethylene glycol fluid, which interfaces with the Atlas Copco compressors. Three cooling towers have been provided, the cooling water flow rate is 208m³/h per cell, and the total rated capacity is ~2017 kW per tower. The fan in each tower is powered by a 30 kW motor with a variable speed control system. The design accounts for evaporative water losses of up to 2.4 m³/h.

Fabrication and packaging

There are no changes proposed to the fabrication section of the LD production line.

In the packaging section which services the LD Line, and the HD Line, the existing slab baggers will be replaced with an alternative packaging machine. The installation of a fourth multi-pack machine will be connected to the existing Local Exhaust Ventilation (LEV) system to remove dust from the finished product handling process.

Consistent with current operations, the dust will be removed from the LEV air stream by a bag filter system sited with in the production building. The clean exhaust air is to be released within the building.

In-process monitoring

The modifications will not give rise to any changes to in-process monitoring as described in earlier Permit applications.

4. Environmental management

4.1 Applicant organisation

The operator maintains an integrated management system that incorporates the environmental management system (EMS) accredited for environmental management to ISO14001:2015 (Certificate No: 44 104 190742-021) and energy management to ISO50001:2011 (Certificate No.: 44 764 190742-021). The management systems are certified as compliant with these standards by our auditors, TÜV NORD CERT GmbH and are consistent with the requirements for effective environmental management systems outlined in the BAT Conclusions for manufacture of glass and guidance published on the .gov.uk website. This position was accepted by the Environment Agency as part of the BAT compliance assessment following introduction of the BAT Conclusions for the glass sector.

It is noted the management system is also certified against ISO9001:2015 and ISO45001:2018 covering quality and occupational health & safety.

The EMS confirms the commitment of senior management to complying with legal and regulatory commitments and minimising environmental impacts, It provides a systematic approach to managing these obligations and ensuring environmental data and information can be created, retrieved, updated and managed. The EMS is developed to support compliance with the Environmental Permit and has also been developed to address the broader requirements for an effective management system published at https://www.gov.uk/guidance/develop-a-management-system-environmental-permits.

The EMS therefore incorporates the following arrangements:

- Consolidated plans that identify:
  - Buildings, raw materials and waste storage locations.
  - Pollution prevention arrangements for use in accidents and other arrangements relevant to managing accident and emergency scenarios.
  - Inspection and environmental monitoring locations, together with regulated emission points.
  - Surface water bodies.
  - Site drainage systems.
  - Utilities and services.
  - Locations of sensitive receptors.

  The Plans have been developed with reference to the Site Condition Report, the site Environmental Risk Assessment and are periodically updated to reflect changes to these documents.

- As the EMS is aligned to the activities undertaken at the site, it accommodates arrangements for identifying, reducing and managing environmental risks and compliance obligations associated with normal, abnormal, accident and emergency scenarios including fire and climate change. These are supported by management and contingency plans to control these scenarios, including where appropriate, the safe and controlled shut down of assets where required. These requirements are

subject to periodic review and are summarised in the Environmental Risk Assessment presented at Appendix F.

- The EMS also integrates arrangements for inspection and maintenance of assets, plant and infrastructure (including emissions monitoring arrangements) within a site Inspection and Preventative Maintenance Schedule to support continuity of operations, reliability of equipment and to minimise environmental effects associated with wear and tear (e.g. increased noise emissions). The management arrangements also include arrangements for dealing with abnormal events, incidents, accident and emergency events.

The modifications outlined in this application will not give rise to changes in the management structure or the framework of the EMS, Though the following documents that inform the EMS have been updated to reflect these changes and are presented alongside this application:

- The Site Plan(s).
- The Environmental Risk Assessment .
- The Site Condition Report (an appendix to the Site Condition Report for the existing the installation boundary. Review of the risks to soil and groundwater in the current SCR confirmed this document did not require updating given the nature of the modifications).
- The Noise Management Plan.
- The Air Impact Assessment.

Following implementation of the changes, the following management tools, Registers and interfacing arrangements will also be updated:

- The Environmental Aspects and Impacts Register.
- The Accident Management Plan (based on information included in the updated Environmental Risk Assessment).
- The Site Inspection regime.
- Site operational plans to accommodate arrangements for plant start up, shutdown and abnormal arrangements.
- The Inspection and Preventative Maintenance Schedule.
- Training and awareness requirements.

Other arrangements may also require updating to reflect conditions in the Variation Notice.

5. Raw materials

The furnace rebuild will not give rise to the introduction of new raw materials or changes to the product formulations as described in earlier submissions to the Environment Agency. The products used to manufacture the glass wool will remain unchanged and the same biocide will be used to treat water used for the cooling system. All raw materials will be stored in areas founded on competent hardstanding and will be installed with appropriate pollution prevention and control measures as outlined in the Environmental Risk Assessment presented at Appendix F. Whilst the modifications will give rise to an increase in the raw materials requirement proportionate to increased throughput, this will be managed by increased frequency of deliveries, rather than increasing the inventory of raw materials stored. The current storage arrangements are consistent with the BAT requirements (as outlined in the Environmental Risk Assessment presented at Appendix F and as accepted by the Environment Agency as part of the review of compliance with the BAT Conclusions for Glass Manufacture) and are subject to periodic preventative inspection and maintenance regimes. Therefore, arrangements for storage and handling of raw materials are not considered further.

The modifications have afforded the following opportunities to optimise raw material usage:

- Robust packaging control to optimise and reduce the usage of packaging materials for Finished Goods, leading to a reduction of carbon emissions related to packaging.

5.1 Water requirement

The following modifications will have a water requirement:

Domestic water supply

- Additional requirement for water overspray on the fibres from the new Fiberizers.

Cooling-water systems

- Additional cooling water flows for the fiberizers, and furnace, which will increase evaporative losses via the cooling towers.

Wash water system

- Increased throughput to abate emissions from the LD Line Forming Processes.
- Increased throughput to the Binder System for use on either the LD Line or HD Line.
- No change to requirement to abate emissions from the new Curing Oven zone on the LD Line.
- Minor increased water requirement to abate emissions from the LD Line Cooling Zones.
- No anticipated change to water requirement to abate emissions in the WESP for the LD Line. All incoming streams are saturated due to wet primary scrubbing.

The process accommodates two quasi-closed loop water systems to provide cooling and wash water. These will require more frequent topping up due to the increased evaporative losses released via the cooling towers for cooling water, LD and HD Line stacks for wash water.

It is anticipated the total water usage will increase from 551 m³/day to 685m³/day, which is an increase of 24.3%. This will facilitate an increase from 251 tonnes/day to 330 tonnes/day of

production, an increase of 31.5%. This represents a **reduction in water usage per tonne of product** of approximately 5%.

Additionally, given the commitment of KI to review opportunities to improve water efficiency, consistent with the requirement of Condition 1.3.1 of the Environmental Permit, the dewatering screws currently installed will be replaced with more efficient units. This will reduce the volume of water in solid waste streams to minimise the mass of waste produced and to optimise opportunities for recovery of water for reuse at the installation.

6. Waste handling and storage

The modifications will not give rise to the introduction of new waste streams or new waste management storage and handling arrangements described in information previously provided to the Environment Agency and as outlined at Schedule 2 of the Environmental Permit.

It is anticipated there will be a proportional increase in waste packaging and cullet generated, though opportunities to reduce waste arisings will be reviewed on an ongoing basis.

7. Energy efficiency and climate change

7.1 Energy requirement and energy efficiency

7.1.1 Energy management

The operator maintains an environmental management system accredited for energy management to ISO50001:2011 (Certificate No.: 44 764 190742-021). The management system is certified as compliant with these standards by TÜV NORD CERT GmbH.

7.1.2 Energy consumption

KI is required to submit annual energy usage to the Environment Agency. The data for the year 2021 and partial year 2022 is given below.

Table 7.1 Energy consumption

Time Period	Annual Energy Usage (Gas) (GWh)	Electrical Power Usage (GWh)
2021	153.3	69.6
2022 (KI to confirm period)	148.1	71.7
Anticipated Future Year	189.4	79.3

It is anticipated the modifications will give rise to:

- Increased gas requirement of approximately 24-28%
- Increased electricity requirement of approximately 11-14%.

This increased energy consumption will support an increase in production from 251 tonnes per day to 330 tonnes per day, equivalent to an 31% increase**. This represents a decrease in the unit of specific energy requirement.**

The modifications have afforded the following opportunities to optimise energy efficiency:

- Replacement of existing air compressors with more energy efficient model to supply plant air for various processes in the production.
- Modification of the Curing Oven to improve thermal performance through modification of the existing Curing Oven zones (see Section 3.2.3).
- Replacement of existing cooling towers with more energy and water efficient units.

7.2 Climate change

The Project has been executed in accordance with Knauf's sustainability strategy and environmental management system to account for and mitigate the foreseeable effects of climate change

8. Environmental Risk Assessment including Accidents

8.1 Environmental Risk Assessment and Accidents Risk Assessment

The operator maintains a safety management system accredited for occupational health and safety to ISO45001:2018 (Certificate No.: 44 764 190742-021). The management system is certified as compliant with these standards by TÜV NORD CERT GmbH.

Given the limited changes to the activities and operations undertaken at the Installation associated with the modifications, the maturity of the management systems outlined, the high standards of environmental controls and effectiveness of pollution prevention measures, the environmental risk profile associated with normal, abnormal and accidental scenarios for the installation is unchanged.

This has been confirmed in the Environmental Risk Assessment undertaken in accordance with the methodology outlined at https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit to accommodate the changes outlined in this application.

The environmental risk assessment confirms the most significant environmental risk is associated with noise given the proximity of the site to residential receptors, though it should be noted, the assigned risk rating is medium. Noise will be managed in accordance with the Noise Management Plan (presented at Appendix H). This has also been updated to accommodate the modifications.

The most significant risk associated with abnormal operating conditions arises from failure of the furnace abatement plant that may give rise to elevated releases of dust. The assigned risk rating is also assessed to be medium.

Environmental risks associated with accident scenarios such as fire and vandalism are assigned risk ratings classified as low or very low.

9. Emissions to air, land and water

9.1 Point source emissions to air

There will be no new point sources for emissions to air. The modifications will give rise to the introduction of new flows from process equipment and increased flows from existing process equipment that will discharge via the existing Furnace Stack (emission point A1) and LD Line stack (emission point A4). The changes to downstream processes will not require modification of the local exhaust ventilation system:

- Increased flow from the Melting Furnace to the Furnace Stack arising from the increased furnace capacity. Emissions from the Furnace Stack will be abated by the existing Dry EP. The increased flows are within the design capacity.
- The following modifications will give rise to the introduction of the following new or modified releases that will discharge via the LD Line stack (emission point A4).
    - Operation of the 3 new Fiberizers.
    - Increased use of binder product and throughput through the forming area
    - Operation of the expanded Curing Oven
    - Increased throughput through the cooling section.

  Emissions from the LD Line stack will be abated by the existing WESP. This is within the design capacity of the existing system.
- Increased throughput on the HD Line will give rise to increased loads that will discharge to the HD Line Stack (emission point A3), but this is within the installed capacity of the existing system.

  Emissions from the HD Line Stack will be abated by the existing WESP.

The impacts of the changes to these emissions to air are summarised in Section 10.1, with the full Air Quality Impact Assessment given in Appendix C.

The replacement cooling towers will have evaporative losses of water released to air, but these systems are not regulated as emission points in the Consolidated Variation Notice and therefore it is anticipated that they do not need to be included in the current variation

The modifications do not require changes to the monitoring arrangements specified for point source emissions to air as described at Schedule 3, Table 3.1.

9.2 Point source emissions to surface water and sewer

The modifications will not give rise to any new regulated releases of trade effluent to surface water.

Clean, uncontaminated run off associated with the additional area of adjacent land to be included in the installation boundary will continue to be released to:

- The installation surface water drainage system that releases to the Ravenhead Dam located within the installation Boundary. This emission point is referred to as W1.

This emission point was outlined in the initial Permit application submitted in 2002 though the flow was not included in the Permit for reasons that are not confirmed. Flow from this area will continue to be transferred to the Dam which is also sited within the installation boundary.

It is acknowledged releases of surface water run-off from other areas of the installation are regulated by the Permit (emission points W2, W4 and W5) and an emission limit value of 5mg/l for oil is specified together with monthly monitoring of this parameter in accordance with the Alcontrol Method TM172 for hydrocarbon run-off.

It is anticipated releases from emissions point W1 will not be regulated by the Variation Notice, given the very limited range of activities to be undertaken and the significantly reduced environmental risks and nature of the vehicles that will access this area, compared to the catchments of the site associated with emission point W2, W4 and W5. On this basis, releases via emission point W1 is considered to constitute uncontaminated clean water run-off rather than trade effluent. On this basis and for the reasons specified at Section 9.3 and do not comprise trade effluent, an H1 Environmental Impact Assessment has not been prepared.

- The public surface water drainage system operated by United Utilities. This is a new flow, though as clean surface water will be released only, this may not be required to be regulated by the Environmental Permit. The modifications give rise to increased flows associated with the following water streams:
- Return flow of cooling water from the Melting Furnace and Fiberizers to the cooling water system will increase.

  The cooling water system is a closed loop system, the only losses of water from the system are evaporative via the cooling towers or periodic purge to prevent scaling or legionella.
- Return of wash water from the LD Line abatement systems (wet scrubbers, impact jets, drop out boxes and WESP) to the wash water system will increase.

These flows will be contained within the quasi-closed loop system, the only losses of water from the system are evaporative via the LD Line Stack and the HD Line Stack. Consistent with the established cascade water system, effluent (i.e. blow down water) generated by the cooling towers will be transferred to a sump for water collection, which will be pumped to the wash water system and used to the process water requirement. Effluent from the wash water plant is generally recycled through the wash water system until it is subject to evaporative loss via the WESPs or transfer to the binder system for making binder as outlined at Figure 3.1.

The modifications will therefore not give rise to the release of process water to surface water or sewer. Consistent with the current arrangements, the system will not be routinely bled, due to the regular make-up water added.

The modifications will not impact the physical or chemical properties of wastewater generated or require changes to current arrangements for management of wastewater.

9.3 Emissions to soil and groundwater

There will be no emissions to soil and groundwater. The Operator does not propose to collect baseline environmental data for the area associated with the extension to the installation boundary on the basis:

- Finished product enclosed in robust weatherproof uPVC packaging will be stored on competent hardstanding when there is insufficient storage capacity available within the installation boundary.
- Washed (clean) cullet may also be required to be stored within this area from time to time.
- Forklift trucks accessing this area will be electric or powered by liquefied petroleum gas.
- Heavy goods vehicles will access this area temporarily.
- The activities will be undertaken within areas founded on competent hardstanding with engineered drainage systems.

9.4 Point source emissions to land

There will be no emissions to land.

9.5 Fugitive emissions to air

Emissions of dust and particulates associated with manufacturing activities are effectively controlled and abated as outlined at Section 9.1 and the Environmental Risk Assessment, to prevent risks to occupational health. This also affords high standards of protection for the environment.

More frequent deliveries of bulk materials will give rise to a nominal increase in releases of dust to air during deliveries. This are insignificant in nature and it is considered these will not give rise to noticeable effects on site or beyond the installation boundary.

There is also the potential for a nominal increase in fugitive emissions associated with the handling of increased volumes of raw materials including cullet and finished product. With the exception of storage of finished product, these activities will be undertaken within buildings/covered structures. Finished Goods will be stored in weatherproof packaging within the adjacent new area of the installation.

The increased throughput will also give rise to a change in fugitive emissions associated with the cooling towers. It should be noted that the enhanced specification of the proposed cooling towers that will replace the current system means that it is not anticipated to be proportionate to the increase in duty, given the improved performance specification of the units.

It considered any fugitive emissions associated with these activities will be negligible.

9.6 Fugitive emissions to soil, surface water and sewer

There will be no fugitive emissions to soil, surface water and sewer.

9.7 Odour

There will be no change in the potential for odour emissions associated with the modifications. The operations undertaken at the installation are not associated with odour emissions and there is no regulatory requirement for activities to be undertaken in accordance with an Odour Management Plan.

9.8 Noise and vibration

Noise ratings have been included within the specification for procurement of all new equipment and it is noted that the majority of the changes represent upgrades or expansion of existing equipment and will be located within new or existing buildings. On this basis, the potential for noise emissions from the process line is anticipated to decrease as a result of the modifications.

The replacement of the compressors and cooling towers with new units are anticipated to give rise to reduced noise emissions though it is acknowledged that due to space constraints and the requirement to commission these units whilst operating existing plant, the compressors will be located more proximate to residential receptors, with the cooling towers located in the same location as current systems.

There will be an increase in frequency of vehicle movements and unloading of cullet associated with delivering bulk consignments of raw materials. These activities will be undertaken during daytime hours and in accordance with the Noise Management Plan. On this basis, the modifications will not give rise to levels or frequencies that will give rise to nuisance or cause pollution outside of the site as stated at Condition 3.4.1 of the Environmental Permit.

A Noise Impact Assessment is provided at Appendix G and the Noise Management Plan, updated to reflect the proposed modifications is presented at Appendix H.

10. Environmental assessment

10.1 Emissions to air

A comprehensive Air Quality Impact Assessment has been undertaken and is provided at Appendix C. The assessment quantifies the impacts of the increased flows and pollutant loads of emissions transferred to the Furnace Stack (emission point A1) and the LD Line (emission point A4) associated with the modifications outlined in this application. Based on information included in the Knauf Insulation Engineering Process Description Handbook, pollutants for which emission limit values are specified in the Environmental Permit and information included in annual reports summarising monitoring data for stacks A1 and A4, the assessment considered the following pollutants:

- Oxides of nitrogen (NO_X as NO_2),
- Particulate matter (PM_{10} and $PM_{2.5}$).
- Carbon monoxide (CO).
- Sulphur dioxide (SO_2).
- Hydrogen chloride (HCl).
- Hydrogen fluoride (HF).
- Metals (As, Co, Ni, Cd, Se, Cr(III/VI), Sb, Pb, Cu, Mn, V, Sn and their compounds).
- Volatile organic compounds (VOCs) as benzene.
- Ammonia (NH_3).

This assessment has used detailed dispersion modelling to undertake an impact assessment of emissions to air to determine the variance between the current and anticipated inventory for releases to air associated with releases to air via the Melting Furnace Stack and the LD Line stack.

The impact assessment demonstrates that exceedances of any Air Quality Standards, Air Quality Objectives and Environmental Assessment Levels are unlikely at the local receptors identified to protect human health. With regards to ecological receptors, the assessment demonstrated that there are no exceedance of the ambient pollution concentration and deposition levels. Therefore, the impact of emissions on human and ecological receptors is insignificant.

10.2 Emissions to water

For the reasons described in Section 9.2, the modifications will not give rise to release of process effluents or contaminated releases to water, therefore emissions to water are not considered further.

10.3 Noise

The Noise Impact Assessment undertaken in line with BS 4142 is presents at Appendix F. The assessment presents a 3-dimensional noise model for the site that assesses baseline noise levels and the proposed modifications to assess effects on noise sensitive receptors. The baseline noise levels have been extrapolated from third party reports and recent noise surveys undertaken in the vicinity of the site and receptor locations. The assessment concludes there will be no appreciable

increase in noise and that noise emissions will be likely to have a low impact on noise sensitive receptors.

10.4 Dust

The Environmental Risk Assessment presented at Appendix F confirms dust emissions will continue to be managed effectively consistent with the requirements of the Consolidated Variation notice and will not give rise to adverse effects.

10.5 The Conservation of Habitats and Species Regulations 2010 (as amended)

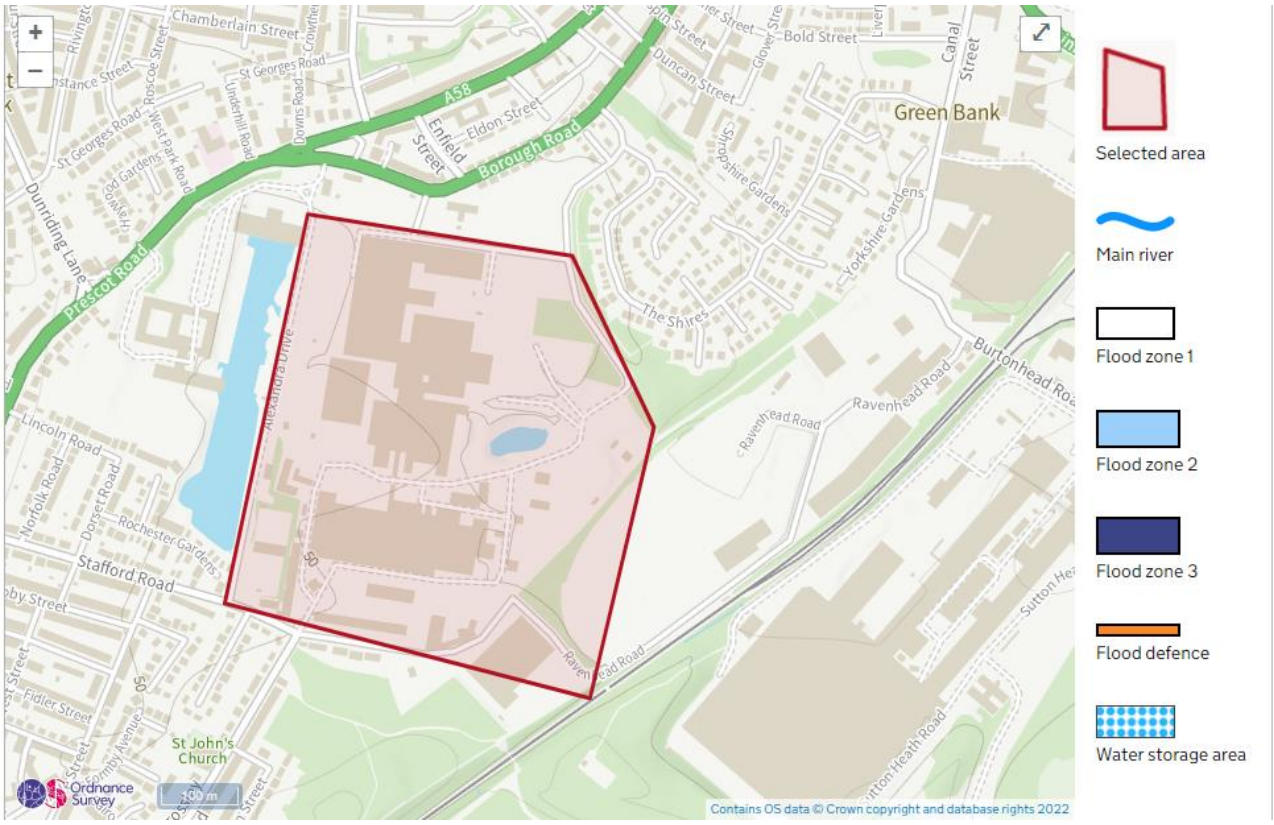
Based on the limited nature and extent of the proposed modifications and the arrangements, taking into account the arrangements for control and abatement of emissions (including noise) as described above, it is concluded there will be no significant effects on the conservation interest of protected ecological receptors with 2km and 10km of the installation.

10.6 Flood risk and flood defences

The existing installation and the land to be added to the permitted installation all lie within Flood Zone 1 as shown by the Environment Agency Flood Risk Map for Planning, an extract of which can be seen in Figure 10.1.

As the area added to the installation boundary is within the same Flood Zone as the existing installation and Flood Zone 1 is the lowest risk zone given on the Flood Risk Map, no additional precautions are considered to be required.

Figure 10.1 EA Flood Risk Map



10.7 Climate Change

The limited nature of the modifications and operational arrangements are not vulnerable to effects of climate change.

Appendix A
Management System Certificates

Appendix B
Site Condition Report

Appendix C
Air Quality Impact Assessment Report

Appendix D
BAT Assessment Report

Appendix E
Site Plan

Appendix F
Environmental Risk Assessment

Appendix G
Noise Impact Assessment

Appendix H
Noise Management Plan

Appendix I
Locations of proposed modifications

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