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Environmental Risk Assessment

for Etex Building Performance Ltd

07 February 2023

Document Control

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1 Introduction

1.1 Overview

This Environmental Risk Assessment (ERA) has been prepared on behalf of Etex Building Performance Ltd (hereby referred to as the 'Operator') in support of a substantial permit variation application for the existing Installation Site located off Redland Avenue near Easton-In-Gordano in North Somerset.

The Operator wishes to expand their existing Facility and add a new plasterboard production line to their existing permitted activities. The new production line will be autonomous with the existing production process however will have a symbiotic relationship with the existing warehouses in order to maintain efficiency across the site and in the distribution and transport of finished product off site.

The proposed new production line seeks to increase and double the capacity of the existing Facility site and will require new gas-fired burners to be installed to produce the energy required to manufacture the plasterboard.

The new production line will be located in a warehouse adjacent to the existing warehouse.

The principal risks from the newly proposed activities will be emissions to atmosphere from the new combustion plant; particulate matter from the gypsum process; and the potential for impact of noise from the new line.

1.2 Scope and Objectives of The Assessment

This ERA has been prepared in answer to Question 6 within Part C2 and Question 2 of Part C3 of the Environment Agency's Application Forms.

The objectives of this ERA are to:

- Identify potential sources of risk and hazards that the new regulated activities may present to the environment;
- Identify nearby (Human Health and Ecological) sensitive receptors;
- Screen out those risks that are insignificant and don't require further detailed assessment;
- Where appropriate identify potentially significant risks and undertake detailed assessment;
- Where appropriate choose the right control measures; and
- Report the findings of the assessment.

This report contains justification for all risk assessments completed and those screened out from requiring further consideration and provides an overall assessment of the acceptability of the proposed new plasterboard production line and associated equipment.

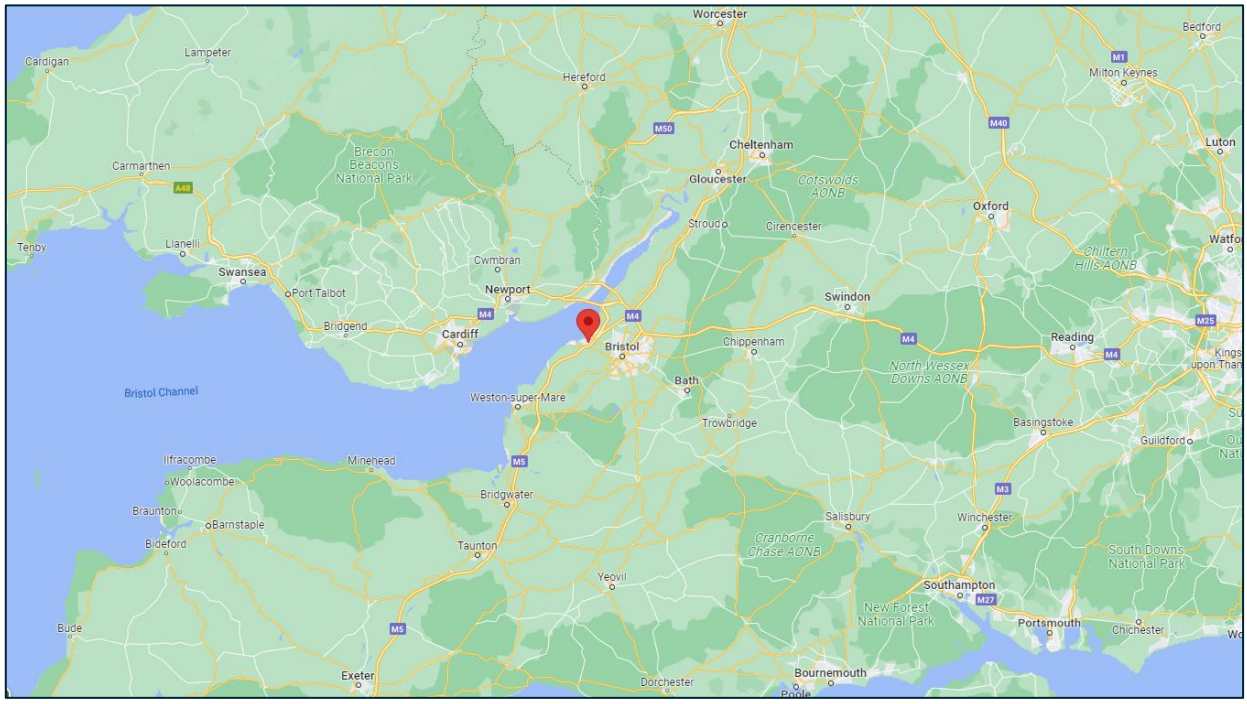
The risk assessment does not assess existing permitted activities as these will remain unchanged and have already undergone technical assessment and are authorised under current permit conditions.

1.3 Site Location and Environmental Setting

The Site is located on Redland Avenue within the Royal Portbury Docks area of Bristol (approximately 7.5 km to the northwest of Bristol city centre). The site is surrounded by industrial land and disused land. The river Avon flows approximately 600 m to the east and north of the site, with the Severn Estuary (which is a

designated Special Protection Area (SPA), Special Area of Conservation (SAC) Ramsar Site and Site of Special Scientific Interest (SSSI)), approximately 800 m to the north. The Avon Gorge Woodlands SAC is also just over 4km from the existing Facility. The existing Facility is centred at Grid Reference ST 50750 76980.

Figure 1-1 Site Location



Source: Google Maps ©2022

1.4 Relevant Legislation and Guidance

Guidance for undertaking an ERA for an Installation was originally published on 1 February 2016 and has subsequently been updated (1 April 2022). The Guidance can be accessed via the following link: Environment Agency Risk Assessment Guidance.

The risk assessments prepared in support of this variation application have followed the guidance referenced above.

1.5 Proposed New Regulated Activities

The new activities to be added to the permit will be identical to those currently permitted and are as follows:

- Section 1.1 A1 (a)(i) Burning any fuel in an appliance with a rated thermal input of >50MW (aggregation of all units);
- Section 3.5 B (a) Unless falling within Part A(1) or Part A(2) of any Section of this Schedule, the crushing, grinding or size reduction, other than the cutting of stone, or the grading, screening, or heating of any designated mineral or mineral product except where the operation of the activity is unlikely to result in the release into the air of particulate matter (plaster process).

A full description of the plasterboard production process is described within the Operational Techniques, BAT Assessment and Monitoring Plan submitted in support of the variation application.

In summary, the process consists of the following principal stages:

- Delivery, offloading and storage of raw materials;
- Transfer and initial crushing of gypsum;
- Calcining and milling of gypsum;
- Forming of wet plasterboard;
- Drying of plasterboard;
- Cutting of plasterboard;
- Dispatch to customers;
- Waste management and recovery;
- Truck Wash Bay; and
- Utilities and ancillary operations.

1.6 Associated Hazards and Risks

This report follows the Environment Agency's Guidance and begins by identifying potential hazards and risks to the environment from the proposed new regulated activities. Hazards and risks to be considered within this assessment are presented within Table 1-1 below.

Table 1-1 Identified Hazards

No.	Hazard / Risk	Description
1.	Amenity Impacts	Potential Dust, Litter, Mud, Pest/Vermin from normal operations and during routine maintenance
2.	Noise	Potential new noise sources from mechanical equipment associated with the new production line
3.	Odour	Potential new odour sources include fuel source (natural gas), exhaust emissions, chemical & raw material stores, waste handling & storage
4.	Point Source Emissions to Air	Potential harmful emissions from exhaust stack(s)
5.	Point Source Emissions to Surface Waters	Potentially harmful substances released to surface waters
6.	Point Source Emissions to Sewer	Potentially harmful substances released to sewer
7.	Fugitive Emissions	Potential uncontrolled releases to the environment from the raw material handling; gypsum, natural gas pipes; combustion units; or chemicals stored on site
8.	Wastes Generated on Site	Under normal operations predicted wastes will include packaging waste, waste oil from combustion units; oil rags &

		cloths from operation & maintenance works; and empty chemical drums; spill kits; additives
9.	Abnormal Operations or Accidents	Potential hazards include fire, vandalism/arson, plant or equipment failure, spillages due to loss of containment, flooding

1.7 Nearby Sensitive Receptors

1.7.1 Ecological Sensitive Receptors

Searches were carried out using data sources including the government website 'www.magic.defra.gov.uk' to establish all ecological sensitive receptors within close proximity to the existing site.

The site does not lie within a designated Area of Outstanding Natural Beauty (AONB) or within a Local Authority designated Air Quality Management Area (AQMA).

The site is however situated within relevant Environment Agency screening distances to several designated sites. Details of each sensitive ecological receptor is listed below and within Table 1-2.

- The Severn Estuary Special Area of Conservation (SAC), Special Protection Area (SPA), RAMSAR and Special Scientific Interest (SSSI) situated to the North and North-West of the existing site (with the closest point approximately 340m from the nearest stack);
- The Avon Gorge Woodlands SAC and SSSI situated to the South-East of the existing site (with the closest point approximately 4,000m from the nearest stack);
- Hails Wood Ancient Woodland (AW) situated to the South-South-East of the existing site (with the closest point approximately 1,650m from the nearest stack);
- Longlands Wood AW situated to the South-South-West of the existing site (with the closest point approximately 1,600m from the nearest stack); and
- St George's Flower Bank Local Nature Reserve (LNR) situated to the South of the existing site (with the closest point approximately 1,500m from the nearest stack).

There are no other RAMSAR, SAC or SPA designated habitat areas within the Environment Agency's 10km screening distance. There are also no National Nature Reserves (NNR) or other SSSI's, LNRs or AWs within the Environment Agency's 2km screening distance.

Table 1-2 Ecological Sensitive Receptors

Receptor	Receptor Type	Distance	Direction
The Severn Estuary	(SAC) (SPA) (RAMSAR) (SSSI)	340 m	N & NW
St George's Flower Bank	(LNR)	1,500m	S
Longlands Wood	(AW)	1,600m	SSW
Hails Wood	(AW)	1,650m	SSE
The Avon Gorge Woodlands	(SAC) and (SSSI)	4,000m	SE

1.7.2 Human Health Sensitive Receptors

There are also several human sensitive receptors within close proximity to the existing site and proposed expansion area. The nearest human sensitive receptors are listed within Table 1-3 below.

Table 1-3 Human Sensitive Receptors

Receptor	Receptor Type	Distance	Direction
Marsh Lane	Commercial/Residential Nearest non-roadside human receptor	250m	S
Marsh Lane	Residential Nearest roadside human receptor	900m	S
Beechwood Road	Residential	1,000m	SE
Gloucester Road	Residential	1,100m	NNE
The Breaches	Residential	1,100m	SE
Avon Road	Residential	1,200m	ESE
West Town Road	Residential	1,250m	W
Portway	Residential	1,300m	W
Sheepway	Residential	1,300m	SW
St Mary's School	Commercial / School	1,450m	SSW
Portview Road	Residential	1,500m	NE
B4054	Residential	1,600m	NE
Station Road	Residential	1,600m	SW
Wharf Lane	Residential	1,850m	W
Wren Garden	Residential	2,300m	NW
Oakhill Lane	Residential	5,000m	NE

Locations of all ecological and human sensitive receptors are illustrated within Figure 1-1 below. The location of the site is illustrated in green, whilst Ecological Sensitive Receptors are labelled as 'ESR' whilst Human Sensitive Receptors are labelled as 'HR'.

Figure 1-2 Location of All Nearby Sensitive Receptors

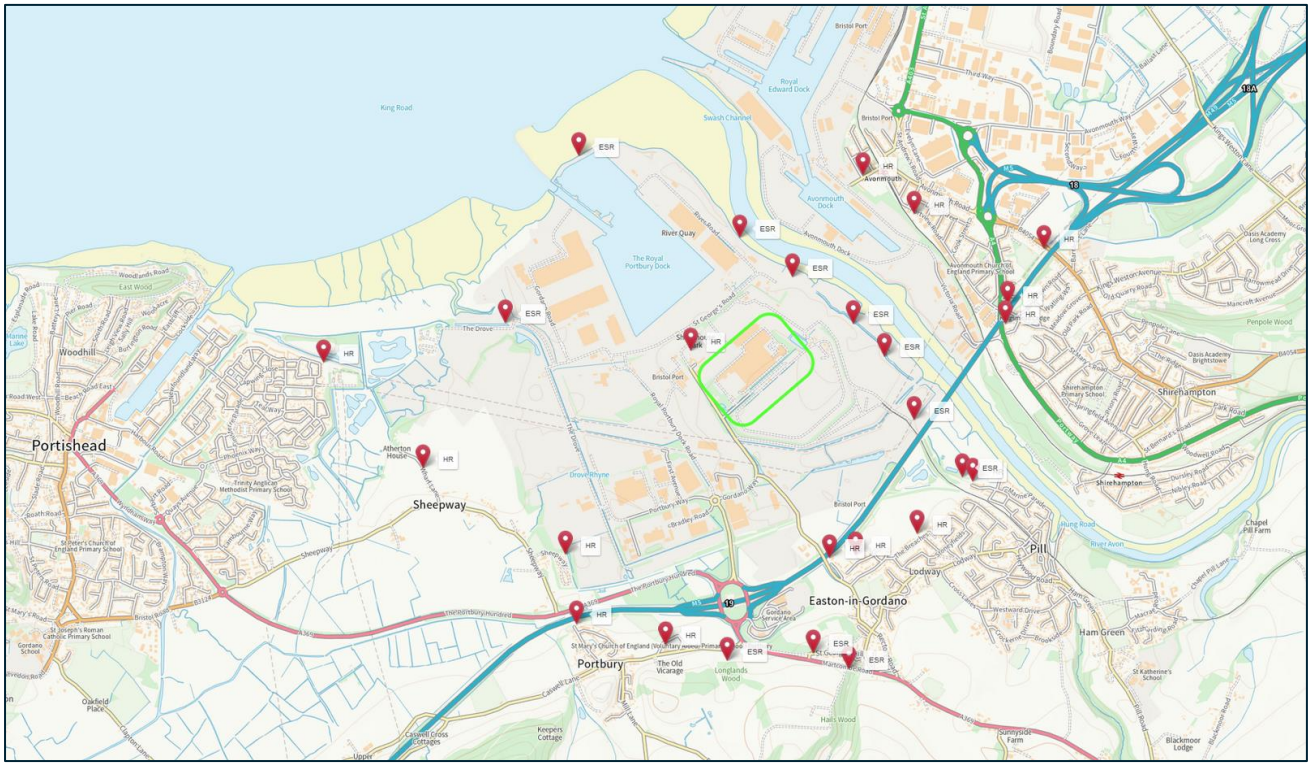


Image source: Grid Reference Finder © 2022

1.8 New Point Source Emissions

1.8.1 New Point Source Emissions to Atmosphere

The current permit has a number of existing point source emissions to air listed within Schedule 3, which have associated emission limits and monitoring requirements.

The new plasterboard production line will introduce several new point source emissions to atmosphere. These new emission points will not replace the existing emissions, which are to remain unchanged.

The principal risks from emissions produced from the newly proposed manufacturing facility will be Nitrogen Dioxide (NO_2), Particulate Matter (PM_{10} and $PM_{2.5}$) for human health, and Nitrogen Oxides (NOx)and nutrient and acid nitrogen deposition for ecological receptors.

Table 1-4 New Point Source Emissions to Atmosphere

Emission Point Reference and Location	Source of Emission	Emissions
A31	Exhaust Stack - Dryer Prezone	H_2O
A32 & A52	Heat Exchangers	NOx, CO, H_2O
A33	Dedusting System - Stucco Silo	PM_{10}
A34	Dedusting System - Stucco Circuit	PM_{10}

A35-A36, A38-A47	Dedusting (combined stack)	PM_{10}
A37	Dedusting Dust Collector - Bulk Bag Unloading	PM_{10}
A48	Dedusting Dust Collector - Mixer	PM_{10}
A49	Main Exhaust Air Stack (Calcination Area)	NOx, CO, PM_{10}
A50	Dedusting System Dividing Saw (Calcination Area)	PM_{10}
A51	Emergency Stack (Calcination Area)	NOx, CO, PM_{10}

1.8.2 New Point Source Emissions to Surface Waters

The permit also has a single point emission to water (point source discharge to surface waters) from the existing installation. The expansion of the permitted site boundary and new production line and warehouse will introduce a new discharge point where uncontaminated surface water from Site run-off from new plasterboard production line warehouse and surrounding area will leave the site boundary and connect to existing surface water drains, which will ultimately discharge to the river Avon. All process effluents will be re-used within the process itself and there will be no discharge of process effluents to surface water or to sewer, with the exception of run-off from the truck wash bay, details of which are described below.

Table 1-5 New Point Source Emissions to Surface Waters

Emission Point Reference and Location	Source of Emission	Emissions
W2	Site run-off from new plasterboard production line warehouse and surrounding area	Clean, uncontaminated surface water run-off only

1.8.3 New Point Source Emissions to Sewer

The expansion of operations will introduce a new point source discharge to sewer from a newly proposed truck wash bay, which is to be located along the South-West corner of the new production line warehouse, adjacent to the main access road. All effluent from the truck wash will pass through an oil interceptor, prior to connecting to the sites foul drainage system and subsequent discharging off site to the mains sewerage network system. Foul drainage from the site is sent to Portbury Wharf Sewage Treatment Works (STWs). This is a medium-sized treatment works which services a population of approximately 32,000 and can accept flow rates of up to 550l/s of sewage for treatment, prior to discharge into the Severn Estuary.

The principal emissions from the truck wash bay will be sulphates, suspended solids and hydrocarbons. The discharge point is referenced as F2 on the site layout and emissions plan.

Table 1-6 New Point Source Emissions to Sewer

Emission Point Reference and Location	Source of Emission	Emissions

F2	Effluent run-off from Truck Wash Bay	Sulphates, suspended solids, Hydrocarbons

2 Environmental Risk Assessments

2.1 Scope of Assessments Completed

A number of assessments have been considered to determine the environmental risks posed by the new production line and to identify whether the level of risk is considered acceptable with appropriate mitigation or if further measures are required.

During pre-application discussions held with the Environment Agency, it was established early on in the project, that the following bespoke quantitative modelling assessments would be required:

- Air Quality. An Air Quality Assessment (AQA) would be required to establish if the impact of emissions to air from the new production line would be significant, and if the emissions risk exceedances of either human-health or ecological-health related air quality standards (AQSs).
- Noise. A Noise Impact Assessment (NIA) would be required to establish if noise emissions from the new production line would likely have a negative impact on nearby human receptors.

These qualitative assessments have been completed and copies provided as Appendices to this report.

An H1 assessment is also required to assess trade effluent emissions to sewer from the proposed new truck wash bay.

2.2 Amenity Impacts

Potential source of amenity impacts from the proposed new activities include litter, mud and debris and pests or vermin.

The proposed new warehouse will contain offices and associated welfare facilities as well as the new plasterboard production line process, thus containing any litter or wastes generated on site inside the building.

The warehouse will be accessible via impermeably surfaced roadways, which will reduce the risk of mud from vehicles traversing across the site. A copy of the proposed Site Drainage Plan is provided within the Drawings submitted in support of this application.

An assessment of each hazard identified above has been evaluated, and the potential risk and associated prevention measures to be implemented described within the Risk Assessment and Management Control Matrix submitted within Appendix A1 to this report.

In consideration of the above, the potential for the proposed activities to generate amenity impacts during normal operations or during routine maintenance is considered to be negligible.

2.3 Noise

A Noise Impact Assessment (NIA) was completed by Acoustical Control Engineering Consultants Ltd (ACEC) in July 2020 to assess the potential impact of noise and vibration from the proposed new plasterboard production line process on nearby noise sensitive receptors.

The assessment has been prepared considering a number of relevant guidance documents, including BS4142: 2014 standards. A copy of the acoustic assessment is provided within Appendix A2 of this report.

As the above assessment was completed during the first national lockdown of the Covid-19 Pandemic, environmental sound levels were considered atypical as a result of significantly reduced traffic flows at the time. It was decided that a second Noise Impact Assessment would be required to ensure background data recorded was representative.

This additional NIA was undertaken at the end of 2022 / early 2023 by Noise Consultants Ltd which included additional background noise monitoring. The assessment concluded that the newly proposed activities would not result in an unacceptable noise impact at nearest noise sensitive receptors.

A copy of this additional NIA is also provided within Appendix A2 of this report.

2.4 Odour

Under normal operations, there will be very minimal potential sources of odour from the proposed new production line and associated activities. Potential odour sources identified within Table 1-1 above include fuel source (natural gas), exhaust stack emissions, chemical & raw material stores, and waste handling & storage.

Natural gas will arrive on site via underground pipework with no requirement for additional storage on site. All above ground pipework infrastructure will be constructed of stainless steel and will undergo pressure testing during dry commissioning to ensure they are fit for purpose. Routine maintenance checks will be undertaken to ensure the plant is operating within normal parameters and to visually inspect for any damage or leaks within the pipework.

Odours from exhaust gases is considered insignificant as the combustion process will destroy 99% of any potentially odorous components within the natural gas fuel, such as mercaptans.

Some chemicals will be required to be stored on site. Chemicals will be stored within appropriate storage containers with integral secondary containment providing more than 110% of the volume stored. Staff will follow COSHH risk assessments & wear appropriate PPE when handling substances during transfer and replacement of old drums with new. Containers will be regularly inspected to ensure they remain fit for purpose and containment remains intact with no potential for odour release.

All storage infrastructure involving the storage of potentially polluting substances will be stored in an enclosed areas or in bunded areas that meet the requirements of CIRIA C736 *Containment systems for the prevention of pollution*.

Full details of all raw materials to be stored at the site are detailed within the Operational Techniques, BAT Assessment and Monitoring Plan Report submitted in support of this application.

2.5 Emissions to Atmosphere

A detailed Air Quality Modelling Assessment has been undertaken to fully assess emissions to atmosphere from all emission stacks associated with the proposed new plasterboard production line.

The principal risks from emissions produced from the newly proposed manufacturing facility will be Nitrogen Dioxide (NO_2), Particulate Matter (PM_{10} and $PM_{2.5}$) for human health, and Nitrogen Oxides (NOx)and nutrient and acid nitrogen deposition for ecological receptors.

Modelling was carried out in line with EA guidance and impacts were predicted using the ADMS-5.2 dispersion model developed by Cambridge Environmental Research Consultants (CERC). A copy of the full Air Quality Assessment is provided in Appendix A3.

The Air Quality Assessment concluded that:

- there is no risk that any of the Air Quality Standards (AQS) for the protection of human health will be exceeded as a result of the additional production line at the facility, at any relevant receptor. On this basis, the impacts are judged to be not significant;

- The impacts at designated ecological sites are either insignificant or will not cause an exceedance of any AQS, with the exception of one location within the Severn Estuary SAC where the AQS for annual mean NOx is exceeded with or without the Process Contribution (PC) from the installation. The NOx impacts were subject to a shadow HRA Appropriate Assessment at planning stage and agreed with Natural England to be not significant.

The assessment overall concluded that the air quality impacts from the proposed new manufacturing facility will be not significant.

2.6 Emissions to Sewer

An H1 Assessment was carried out to assess emissions from a newly proposed truck wash bay and the resulting environmental impact on the Severn Estuary. Effluent from the truck wash bay will drain via an oil interceptor into the site's domestic foul sewage network, prior to discharging into the mains sewerage network. Sewage from the site is treated downstream at Portbury Wharf Sewage Treatment Works, which discharges final effluent into the Severn Estuary.

The Operator collected representative samples in December 2022 from their existing truck wash bay to establish determinands and concentrations likely to be present within the propose new truck wash bay. The analysis results are provided within Appendix A4 to this report. The primary determinands are also listed below:

- Sulphates;
- Suspended Solids; and
- Total Pet. Hydrocarbons.

As the final discharge point is downstream of Portbury Wharf STWs, and into the Severn Estuary, there is no Environmental Quality Standard (EQS) for Sulphates into discharges to Estuaries or Coastal Waters. As a result, the only determinand which required assessment was Total Hydrocarbons. Following a conservative approach, 100% Benzene was assessed in the H1 assessment. The site volume flow rate used in the assessment includes volumes from amenity areas rather than just effluent discharge from the truck wash. This again follows a worst case and conservative approach. The actual discharges and effluent concentrations from the truck wash bay are likely to be significantly lower.

The results of the H1 Assessment concluded that the Process Contribution (PC) for Benzene is below the 4% threshold and is therefore screened out as not requiring any further assessment, as the impact is deemed to be insufficient.

A copy of the H1 assessment and associated data is provided within Appendix A4 to this report.

2.7 Emissions to Land

There will be no emissions to land from the new plasterboard production line process or associated ancillary infrastructure.

2.8 Emissions to Surface Waters

There will be no process discharges to surface waters from the new plasterboard production line process.

There will be an additional discharge point to surface water constituting of uncontaminated surface water run-off from buildings and hardstanding areas.

The location of this discharge point is illustrated on the updated Site Boundary and Layout Plan and identified as emission point W2.

As the production line process will predominately take place within a warehouse building, the potential sources of risks and hazards to surface water run-off under normal operations is considered to be very low. Under abnormal operations, risks include oils or chemicals due to accidental release from spillages during transferring of substances to and from site, loss of containment or spillages could also occur from overfilling of vessels.

Spill kits will be available with materials suitable for absorbing and containing minor spills and site staff will be trained in their use and in the spill clean-up procedures. Deliveries of chemicals will be supervised by the Operator's personnel.

Hazards from potential Accidents are considered in more detail within Section 2.11 below.

Based on the above proposed control measures and the output of the risk assessment in Appendix A1 of this report, the potential risk to the environment from point source emissions to surface waters is considered to be low.

2.9 Fugitive Emissions

There is potential for uncontrolled releases of fugitive emissions to the environment from a number of sources, including the handling of raw materials; the transfer and storage of gypsum; natural gas pipes; chemicals stored on site; and vehicle movements across the site.

An assessment of each hazard identified above has been evaluated, and the potential risk and associated prevention measures to be implemented described within the Risk Assessment and Management Control Matrix submitted within Appendix A1 to this report.

Based on the proposed control measures and the output of the risk assessment in Appendix A1 of this report, the potential risks to the environment from fugitive emissions is considered to be low.

2.10 Wastes Generated on Site

Waste plasterboard generated from the production process will be recycled and fed back into the process. Other wastes generated from the production line will be minimised where possible through efficient management and control procedures.

Any hazardous wastes removed from the Bristol facility will be removed by an appropriately permitted waste contractor and will be recovered at a suitably authorised and permitted facility. As a waste producer, the Operator will receive consignee returns every quarter from their consignee dealing with their hazardous wastes.

Records of all wastes removed from site will be recorded, held securely, and made available for inspection by the Environment Agency upon request. Should any new waste streams be generated during either normal or abnormal operations, the Operator will apply the principles of the Waste Hierarchy prior to removal off site.

2.11 Abnormal Operations or Accidents

There is potential for hazards and risk of exposure from abnormal, emergency scenarios or accidents from the newly proposed new production line process. An assessment of each hazard identified below has been evaluated, and the potential risk and associated prevention measures to be implemented described within the Risk Assessment and Management Control Matrix submitted within Appendix A1 to this report.

The Operator's existing Accident Management Plan (AMP) is implemented on site via a series of Emergency Procedures which form part of the manufacturing facility's Environmental management System (EMS). In

combination with conforming to ISO14001 standards and as set out under EPR, these Emergency Procedures address significant environmental aspects for the installation including the following emergency scenarios:

- Spillages Procedure;
- Siren Emergency Procedure;
- Emergency Rescue Procedure;
- Flood Event Procedure;
- Fire Evacuation Procedure;
- Fire Response Team Procedure;
- Emergency Preparedness Process Flow Chart.

These existing procedures will be adopted at the new production line process. As the new activities are identical to those currently permitted at the existing manufacturing warehouse, it is not anticipated that the procedures will require any fundamental changes. A copy of the current Emergency Preparedness Process Flow Chart is provided as an Appendices to the Operational Techniques, BAT Assessment and Monitoring Plan Report submitted in support of this application.

3 Conclusions

3.1 Conclusions of Risk Assessments

This Environmental Risk Assessment has been prepared on behalf of Etex Building Performance Ltd in support of a substantial permit variation application for their existing Installation Site in Easton-In-Gordano, Bristol. This report contains justification for all risk assessments completed and those screened out from requiring further consideration and has provided an overall assessment of the acceptability of the proposed new plasterboard production line process.

This risk assessment does not assess existing permitted activities that will remain unchanged, as these have already undergone assessment and are authorised under current permit conditions.

The assessment has followed the Environment Agency's guidance and best practice on 'Risk Assessments for your Environmental Permit'.

A number of environmental risk assessments have been carried out to determine whether the proposed new plasterboard production line can be operated without causing pollution to the environment. Bespoke quantitative modelling assessments were undertaken for:

- Air Quality. An Air Quality Assessment (AQA) would be required to establish if the impact of emissions to air from the new production line would be significant, and if the emissions risk exceedances of either human-health or ecological-health related air quality standards (AQSs).
- Noise. A Noise Impact Assessment (NIA) would be required to establish if noise emissions from the new production line would likely have a negative impact on nearby human receptors.

An H1 Assessment was also carried out to assess environmental impacts on the Severn Estuary from effluent discharged to sewer from the Truck Wash Bay. The H1 Assessment screened out the need for further modelling and concluded that the potential impacts are deemed to be insignificant.

Taking into consideration all potential hazards and risks, as well as the intended design and operational management and mitigation practices to be implemented by the Operator, all assessments have considered the possible impacts on nearby sensitive receptors and have concluded that potential impacts from the proposed new plasterboard production line will not be significant.

As presented within this report, the Operator will implement appropriate control measures and management systems to ensure that the proposed new plasterboard production line does not have any significant impacts or represent an unacceptable risk to the local environment.

4 Appendices

A1 Risk Assessment and Risk Management Techniques

Appendix A1: Risk Assessment and Risk Management Techniques

Hazard	Receptor	Pathway	Risk Management Techniques	Probability of Exposure	Consequence	Overall Risk
Amenity Impacts						
Litter, Debris, Mud	Local Workforce; Nearby Human Receptors	Transportation through the air or tracked via vehicle wheels leaving site	There will be minimal vehicle movements to and from site as natural gas fuel will be delivered to site via pipework, whilst gypsum transported by ship will be delivered to site via conveyor belt directly into the new storage building from the port. Vehicle access to the site will be via roadways serviced with impermeable surfacing therefore removing any risk of mud or debris in the outside yard and carpark areas. There will be regular cleaning of the site access roadways by street sweeper. The site will also have a dedicated wheel wash to be installed to remove dusty materials, mud and debris from wheels and undercarriages of HGV vehicles prior to leaving site. Any litter waste generated by staff will be stored in secure bins and regularly removed off site by a waste contractor.	Negligible	Low	Negligible
Pest, Vermin		Travel across land or air	The proposed new production line warehouse will include offices and welfare facilities. Any putrescible / degradable wastes generated will be stored in secure bins and regularly removed off site by a waste contractor.	Negligible	Low	Negligible
Noise						
Noise Pollution	Local Workforce; Nearby Human Receptors	Noise through the air	The majority of all equipment and machinery associated with the new production line will be housed within the new warehouse building. The Operator will implement an effective planned preventative maintenance regime to ensure equipment remains fit for purpose, equipment operates within optimum conditions, and minimises generation of noise and/or vibration. Operational procedures will be in place to investigate and respond to any complaints received regarding noise. Records will be maintained on site.	Low	Moderate	Low
Odour						

Hazard	Receptor	Pathway	Risk Management Techniques	Probability of Exposure	Consequence	Overall Risk
Gas Leak	Local Workforce at Site; Nearby Human Receptors	Transportation through the air	All pipework associated with the transportation of natural gas to site will be constructed of stainless steel and will undergo CQA integrity tests prior to the site being commissioned. The Operator will undertake routine maintenance checks across to site to identify any gas leaks. In the event a leak is detected the Operators Emergency Procedures will be followed.	Low	Low	Low
Abnormal exhaust gases			The Operator will implement a Planned Preventative Maintenance programme that will include regular checks on the gas-fired burners to ensure they are operating within optimum conditions. The Operator's SCADA system will continuously monitor plant performance. In the event any abnormal conditions are detected, or critical alarms raised, staff will be alerted immediately. Emergency alerts will be linked to the existing Site's Emergency System to ensure a coordinated response is implemented and all parties concerned are suitably notified of any emergency. The new production line will operate and be monitored by staff continuously 24 hours a day.	Low	Low	Low
Loss of containment of stored chemicals, wastes generated on site and/or raw materials			Chemical Storage and Raw Material Storage Areas will be serviced with an impermeable concrete base providing a physical barrier between the material and the land below. Gypsum will be stored within a dedicated building. Gypsum will be delivered directly to the storage building via covered conveyor belt. Any hazardous materials such as lubricating oils etc. will be stored within double skinned tanks which will have 110% capacity secondary containment. Chemicals will be stored within a secured containers which will also have appropriately sized secondary containment. All wastes generated on site will be stored within suitable containers and removed from site by an appropriately permitted waste contractor on a frequent basis.	Low	Low	Low
Accidents						

Hazard	Receptor	Pathway	Risk Management Techniques	Probability of Exposure	Consequence	Overall Risk
Fugitive emissions	Local Workforce at Site; Nearby Human Receptors	Transportation through the air	There is potential for unintentional, uncontrolled fugitive releases into the environment. Pipework associated with the plant will undergo CQA integrity tests prior to the plant being commissioned. The Operator will undertake routine visual checks across to site to identify any fugitive releases. The production line process will be housed within a building and serviced with an impermeable concrete base providing a physical barrier between the plant and the land below. Outside vehicle access areas will also be serviced with impermeable surfacing. There will be regular cleaning of the site access roadways by street sweeper. The site will also have a dedicated wheel wash to be installed to remove dusty materials, mud and debris from wheels and undercarriages of HGV vehicles prior to leaving site.	Low	Low	Low
Accidental release of potential polluting substances due to mechanical failure	Local Workforce at Site; Nearby Human Receptors	Transportation through the air; Percolation through soils, direct run-off from site across the ground and entering existing drainage system.	The Operator will implement a Planned Preventative Maintenance programme that will include regular checks on all process and abatement equipment to ensure they are operating within optimum conditions. The Operator's SCADA system will continuously monitor plant performance. In the event of mechanical failure, staff will be alerted immediately, and actions will be taken to either isolate and shut down the failed equipment or undertake immediate remedial measures to return the equipment back to optimum operating conditions.	Moderate	Moderate	low
Abnormal release of gases from exhaust stacks	Local Workforce at Site; Nearby Human Receptors	Transportation through the air	The Operator will implement a Planned Preventative Maintenance programme that will include regular checks on all process and abatement equipment to ensure they are operating within optimum conditions. The Operator's SCADA system will continuously monitor plant performance. In the event any abnormal conditions are detected, or critical alarms raised, staff will be alerted immediately. Emergency alerts will be linked to the existing Site's Emergency System to ensure a coordinated response is implemented and all parties concerned are suitably notified of any emergency.	Low	Moderate	low

Hazard	Receptor	Pathway	Risk Management Techniques	Probability of Exposure	Consequence	Overall Risk
			The new production line will operate and be monitored by staff continuously 24 hours a day. Emissions from the stacks will undergo monitoring, as detailed within the Operational Techniques, BAT Assessment & Monitoring Plan.			
Contaminated effluent discharged off site	Operators Drainage System; Sewerage System and Downstream Sewage Treatment Works; Surface Water Drains and River Avon	Transportation across land and into drainage channels	The production line process will be housed within a building and serviced with an impermeable concrete base providing a physical barrier between the plant and the land below. Outside vehicle access areas will also be serviced with impermeable surfacing. In the event that any contaminated run-off was to enter a surface water drain, these drains can be physically isolated to contain the spillage on site prior to clean up and remediation. Chemicals will be stored within suitable containers and will be serviced with secondary containment where appropriate. Spill kits will be available on site and staff will receive internal training on their use. Any spill kit equipment used will be replenished as soon as practically possible.	Low	Low	Low
Loss of containment of wastes stored on site	Local Workforce at Site; Nearby Human Receptors	Transportation across land, percolation through soils, and into drainage channels via direct run-off from site	Waste plasterboard generated from the production process will be recycled and fed back into the process. Other wastes generated from the production line will be minimised where possible through efficient management and control procedures. Any wastes generated will be stored in suitable containers with hazardous wastes serviced with appropriate secondary containment. Wastes will be removed from site for onwards recycling or disposal at regular intervals.	Low	Low	Low
Accidental release of potential polluting substances due to vehicle collision	Nearby natural habitats; Local Workforce at Site; Nearby Human Receptors	Percolation through soils, direct run-off from site across the ground and entering existing drainage system.	There will be minimal vehicle movements to and from site as natural gas fuel will be delivered to site via pipework, whilst gypsum transported by ship will be delivered to site via conveyor belt directly into the new storage building from the port. The only access onto site by road is via the main gatehouse. Vehicles will be directed upon entrance, and speed limits will be enforced across the site.	Low	Low	Low

Hazard	Receptor	Pathway	Risk Management Techniques	Probability of Exposure	Consequence	Overall Risk
Accidental release of potential polluting substances through flooding	Nearby natural habitats; Local Workforce at Site; Nearby Human Receptors	Percolation through soils, direct run-off from site across the ground and entering existing drainage system.	The Site is designated as a Flood Zone 1 with low probability of flooding. Flooding will likely only occur in flash flood events of if local drains become blocked. Drains will be regularly inspected to ensure they are kept free of debris. Any potentially polluting substances will be stored in secure containers with secondary containment provided where appropriate, thus reducing the risk of release in the event of localised flood.	Negligible	Low	Negligible
Accidental release of potential polluting substances due to adverse weather conditions	Nearby natural habitats; Local Workforce at Site; Nearby Human Receptors	Percolation through soils, direct run-off from site across the ground and entering existing drainage system.	Weather conditions will be monitored frequently. Drains will be regularly inspected to ensure they are kept free of debris. Any potentially polluting substances will be stored in secure containers with secondary containment provided where appropriate.	Low	Low	Low
Arson and / or vandalism and / or theft causing the release of polluting materials to air (smoke or fumes), water or land.	Nearby natural habitats; Local Workforce at Site; Nearby Human Receptors	Transportation through the air; Percolation through soils, direct run-off from site across the ground and entering existing drainage system.	The Bristol Facility has existing security measures in place which effectively prohibit unauthorised access. Access to the new warehouse will only be via the Site's main Gatehouse entrance for both pedestrians or vehicles. The Bristol Facility has security fencing around the perimeter of the site to prevent unauthorised access. The site is staffed 24 hours a day.	Low	Moderate	low
Accidental fire/explosion causing the release of polluting materials to air (smoke or fumes), water or land from on-site machinery	Nearby natural habitats; Local Workforce at Site; Nearby Human Receptors	Transportation through the air; Percolation through soils, direct run-off from site across the ground and entering existing drainage system.	The existing Bristol Facility follows strict security measures to prevent unauthorised access. The new production line warehouse will have a No Smoking Policy which is to be strictly enforced by Site Rules and by signage around site, with smoking only permitted within designated smoking areas. All plant and equipment and electrical installations will be maintained and kept in good working condition and subject to routine inspection and maintenance. Good housekeeping measures will be in place including the cleaning of small leaks of oils or other flammable liquids immediately. The Production line will also be fitted with emergency 'E. Stop' to allow for manual shutdown if required.	Moderate	Moderate	low

Hazard	Receptor	Pathway	Risk Management Techniques	Probability of Exposure	Consequence	Overall Risk
			The Operator's existing Environmental Management System includes procedures and actions required in the event of fire or spillage to control and minimise their spread. Localised firefighting equipment will be maintained in accordance with fire regulations and the Operators Fire Evacuation Procedure followed in the event of a major incident.			
Accidental release of potential polluting substances due to power outage	Nearby natural habitats; Local Workforce at Site; Nearby Human Receptors	Transportation through the air; Percolation through soils, direct run-off from site across the ground and entering existing drainage system.	The Operator's SCADA system will continuously monitor plant performance. In the event a power outage is detected a critical alarm will be raised and staff will be alerted immediately. Emergency alerts will be linked to the existing Site's Emergency SCADA System to ensure a coordinated response is implemented and all parties concerned are suitably notified of any emergency.	Moderate	Moderate	low

A2 Noise Impact Assessment

Noise Assessment for Environmental Permit:
Etex Bristol Substantial Permit Variation

March 2023

Experts in noise and vibration assessment and management

Document Control

Client	Etex Building Performance Limited
Principal Contact	Richard José – BU Environmental Advisor (Building Performance)
Site Address	Royal Portbury Docks, Redland Avenue, Easton-in-Gordano Bristol, BS20 0FB
Existing Permit No.	EPR/XP3036SZ

Job Number	12012C-20

Report Prepared By:	David Sproston BSc MIOA MCIEH (Principal Consultant)

Document Status and Review Schedule

Report No.	Date	Status	Reviewed by
12012C-20-R01-03	7 March 2023	Final	George Gibbs BEng MSc CEng CEnv MIOA MIEnvSc (Associate Director)

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Synopsis

This report describes the noise assessment to support the substantial permit variation for the Etex Bristol site in North Somerset, situated within the port of Bristol and falls within the administrative district of North Somerset Council (NSC).

The assessment has been carried out by Noise Consultants Ltd (NCL) on behalf of Etex Building Performance (Etex), in line with current Guidance published by the Environment Agency, and in accordance with the methodology set out in BS 4142:2014.

With the exception of Sheephouse Park (a caravan park 175m to the north-west of the Site boundary), the nearest noise sensitive receptors (NSRs) to the Site are typically dwellings >800m from the Site.

A baseline noise survey found the underlying noise climate comprised of steady noise from the nearby Port, or road traffic. During this time, the existing Etex plant was fully operational, but importantly, was observed as being inaudible, and therefore the measured baseline noise levels are considered representative of those which would prevail in the absence of the Etex site. This is also a positive indication that current operational noise from the site does not result in an unacceptable noise impact, and that industrial noise from other land uses is a constituent part of the existing noise climate at some receptors.

The new plant will house comparable activities and processes as existing. A noise survey has been undertaken to establish plant source noise levels within the existing plant, and the results used in a computer noise modelling exercise to calculate future operational sound levels at the nearest dwellings resulting from significant sources of internal and external sound at the site. It was not feasible to measure, or obtain, source noise levels for all sources and source noise data from established sources, NCL's in-house data library, or noise surveys carried out by others at the Site in connection with the planning application have been used. It has been necessary to calculate the sound insulation performance of various building elements of the new plant, which has included a conservative approach and corrections for uncertainty.

Modelling results demonstrate that operational sound levels will be well below the existing typical background and residual sound levels at all assessment locations around the Site. Furthermore, as the predicted operational sound levels are well below the underlying noise climate at the nearest noise sensitive receptors, it is likely that noise from the Site will be inaudible.

Consequently, the operation of all plant at the Site should not result in an unacceptable noise impact at any nearby noise sensitive receptors, and no specific noise mitigation measures are considered necessary.

1 Introduction

1.1 This report describes a noise assessment prepared by Noise Consultants Ltd (NCL) on behalf of Etex Building Performance (Etex), to support the substantial permit variation for the Etex Bristol site in North Somerset, situated within the port of Bristol that falls within the administrative district of North Somerset Council (NSC).

Site Description, Environs, and Existing and Consented Development

1.2 Etex is located on land off Redland Avenue, Easton-in-Gordano Bristol. The Site location is shown in **Figure 1**.

1.3 Etex has extant planning consent[1] for a new plasterboard production line and warehouse facility (the 'Development') alongside their existing Bristol plasterboard plant (collectively, the 'Site'). Operations at the existing plant are permitted by the Environment Agency (ref. EPR/XP3036SZ).

1.4 The Development (new plant) includes the construction of 3 no. new buildings in the southernmost area of the Site, consisting of a Gypsum store, Calcination Workshop and a main building housing a 50 million square metre per year capacity board line (plasterboard production line, compressor room, warehouse storage, office space and other ancillary uses). The Development will allow the combined Bristol Site to double its present output capacity and be an autonomous facility but will have a symbiotic relationship between the existing and new warehouses in order to maintain the efficiency of the distribution transport load out. The various areas of the existing and consented buildings are shown in **Figure 2.**

1.5 Gypsum, a soft mineral composed of calcium sulphate dehydrate, is the primary raw material used in the production of plasterboard. Gypsum is imported twice-annually by oceangoing vessels to Royal Portbury Dock to the north of Site, and subsequently transported to the existing Gypsum store via an existing conveyor system during both the day and night, until unloading is complete. This process will continue, with the new plant requiring an increase in imported gypsum, although the approved Development allows the existing conveyor serving the existing Gypsum Store to be decommissioned and will be switched to a part-repurposed and part-new conveyors (see **Figure 2).**

1.6 The Site will operate continuously throughout the day and night. Consequently, noise from fixed plant and equipment will be steady and continuous. Several Distribution Tractors will move empty trailers into the main building (Storage and Distribution, **Figure 2)** and loaded trailers to a trailer park to await export from the Site. Visiting HGV's import/export non-gypsum materials and finished goods throughout the daytime. HGV trips to/from the site do not currently occur at night. It is anticipated that visiting HGVs will park an empty trailer in on one of the three new trailer parks (Trailer Parks 2-4, **Figure 2)** and depart after with a loaded trailer from one of the trailer parks.

[1] North Somerset Council, Planning Application ref: 20/P/2122/FUL, Approved 9th April 2021

1.7 The nearest and most exposed noise-sensitive receptors (NSRs) are Sheephouse Park (residential park home) approximately 175m north-west, Court House Farm on Marsh Lane approximately 750m to the south, and dwellings and a hotel to the east the River Avon approximately 900m to the east, of the Site boundary. NCL are not aware of any recent noise complaints associated with the operation of the existing plant and operations.

Previous Noise Assessments

1.8 A noise impact assessment[2] was undertaken in connection with the planning application for the Development and included;

- Source noise measurements to quantify levels associated with the main sources of noise at the existing plant;
- Use of the measured noise levels to calculate operational noise level at NSRs to the east that were considered to be the most exposed to operational noise from the Site;
- Assessment of the calculated operational sound from the site at NSRs to the east.

1.9 The noise assessment was undertaken by Acoustical Control Consultants Ltd (ACC) during the first national lockdown of the Covid-19 pandemic when environmental sound levels were atypical as a result of significant reductions in traffic flows on the local and strategic road network. Consequently, residual and background sound levels were also atypical and not representative, and an assessment in accordance with the methodology set out in BS 4142:2014[3] was not carried out. Nevertheless, the outcome of the assessment found that sound from the existing and now consented Development was low at NSRs to the east, typically <35 dB $L_{Aeq,T}$. It is noted that;

- Noise from HGV movements was not included;
- Noise from the future conveyor system was found to be low, and not a significant contributor to overall sound from the Development; and
- The sitting Environmental Health Officer at NSC was satisfied with the assessment methodology and findings.

Assessment Summary

1.10 This noise assessment has been requested in connection with the permit variation for the consented Development as it will;

- introduce new noise sources to the Site;
- require alteration of some existing equipment associated with the existing site, and;
- generate some additional HGV movements around the site.

[2] Acoustical Control Consultants Limited (ACC), *'Acoustic Assessment of Proposed Extension, ETEX Manufacturing Facility'*, Report Ref: B5268 2020-07-07 R (7th July 2020).
[3] British Standards Institute, BS 4142: 2014 *'Methods for rating and assessing industrial and commercial sound'* (2014)

1.11 This noise assessment has been prepared with regard to The Environment Agency's *'Guidance – Noise and vibration management: environmental permits'* (the 'Guidance'), replaces Environment Agency *'Horizontal Guidance for Noise'* (H3) Parts 1 and 2; and SEPA's *'Guidance on the control of noise at PPC installations'*) which requires sound from the Site to be assessed in accordance with the methodology set out in BS 4142:2014[3].

Report Structure

1.12 This report is structured to align with that recommended in the Guidance. The assessment locations, survey equipment and meteorology, assessment methodology, noise data and predictions, assessment, noise control, discussion on uncertainty and conclusions are provided in the report body. Report appendices contain relevant equipment certificates, the results and analysis of noise survey data, and other supporting material referred to in the report body.

Competency

1.13 The surveys, calculations, noise modelling and assessment have been undertaken by the report author, David Sproston (Principal Consultant, NCL) who holds a BSc in Audio Technology from the University of Salford, is a corporate member of the Institute of Acoustics (MIOA), member of the Chartered Institute of Environmental Health (MCIEH), and has over 16yrs' of continuous experience in the measurement, prediction and assessment of environmental noise in a wide range of sectors and is therefore deemed competent to undertake this assessment.

Figure 1: Site Location and Layout

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Figure 2: Existing and Proposed Building Uses

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Figure 3: Conveyor Utilisation

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2 Assessment and Baseline Survey Locations

Noise Sensitive Receptors - Assessment Locations

2.1 This report includes an assessment of operational sound at existing NSRs to the Site, which have been identified as residential dwellings which are regarded as having a high sensitivity. There are a significant number of NSRs within the wider vicinity of the Site that could be affected by operational sound. However, it is not reasonably practicable to undertake a noise assessment at each of these NSRs individually. Therefore, a selection of NSRs have been chosen for this assessment;

- that are in closest proximity to the site;
- where exposure to existing environmental sound levels (not attributable to the Development) is low; and/or,
- where acoustic screening by intervening buildings is minimal.

2.2 The assessment locations are shown in **Figure 4,** numbered (NSR Ref) to align with those in the ACC noise assessment for consistency. Pertinent details for each assessment location are summarised in **Table 1**. Heights for each NSR have been set to be representative of windows of likely habitable rooms on the highest floor of the receptor building.

2.3 R11 (Sheephouse Park), is at ground floor, and therefore predicted site noise levels at this location are representative of those in external amenity spaces. Predicted operational noise levels at the remaining assessment locations are at upper floors, and consequently, are likely to be lower in private external amenity spaces (i.e. rear gardens) due to acoustic screening provided by intervening buildings, and self-screening by dwellings at receptors R12 and R14.

Baseline Survey Locations and Conditions

2.4 Existing baseline sound levels have been measured in the day and night on a weekday, at locations representative of each NSR identified in **Table 1**. It was not possible to measure baseline sound levels directly outside each NSRs due to access and safety concerns. Therefore, surrogate noise measurement locations (NMLs) have been used where the residual (L_{Aeq}) and background (L_{A90}) sound levels were considered reasonably representative of its associated NSR. The existing Etex plant was operational at the time of the baseline survey, but was inaudible at each NML/NSR. Ongoing construction activities at the new plant site were also inaudible. Therefore, the baseline noise data obtained is therefore considered representative of the underlying noise climate, and therefore considered appropriate for use in this assessment.

2.5 The baseline NMLs are identified in **Figure 4** with pertinent details summarised in **Table 2**, and discussed below.

- **R9** - It was not possible to gain access within the curtilage of this property. Consequently, baseline noise levels were measured at a surrogate location (**NML9**), approximately 6m from

Marsh Lane. Noise levels were measured over a 16hr period including the day and night on a part-attended basis.

- **R11** - Baseline levels were logged towards the centre of Sheephouse Park (**NML11**) on a part attended basis, over a 16hr period including the day and night.
- **R12** - Baseline levels were only able to be measured on an attended basis (**NML12**), during a representative period of one day and night.
- **R14** - Baseline levels were only able to be measured on an attended basis (**NML14**), during representative period of one day and night.

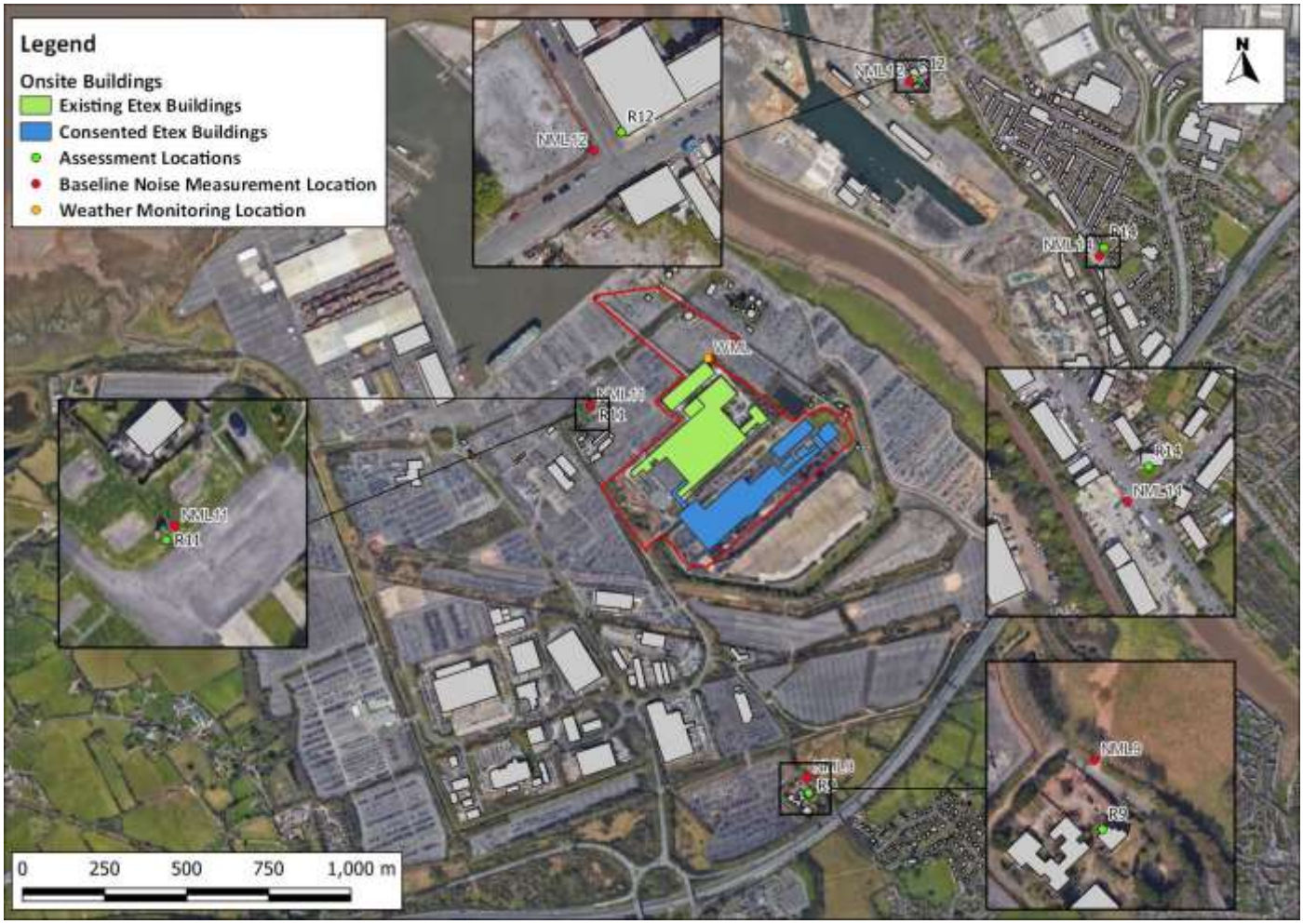
Table 1: Details of Assessment Locations (NSRs)

Assessment Location (NSR Ref)	Description / Address	Type	Grid Reference (O.S. X,Y)	Assessment Height (m above local ground)	Intervening Ground Type	Representative Baseline Measurement Location
R9	Court House Farm, Marsh Lane, Bristol BS20 0ND	3 Storey, Residential	351113, 175956	6.5m	Hard (predominantly tarmac)	**NML9**
R11	Sheephouse Park, Marsh Lane, Bristol, BS20 0NL	Single Storey, Residential	350448, 177135	1.5m		**NML11**
R12	The Royal Hotel, 28 Gloucester Rd, Avonmouth, Bristol BS11 9AD	3 Storey, Hotel	351431, 178132	9.5m	Hard (predominantly tarmac, and water)	**NML12**
R14	3 Pages Mead, Avonmouth, Bristol BS11 9LA	2 Storey, Residential	352013, 177618	4.0m		**NML14**

Table 2: Summary Baseline Sound Measurement Locations (NMLs)

Measurement Location (NML Ref)	Description / Address	Measurement Conditions	Grid Reference (O.S. X,Y)	Underlying Noise Climate (ranked)
NML9	6m from, Marsh Lane, Bristol BS20 0ND	1.4m above local ground, free-field	351108, 176004	Road traffic (M5) Road Traffic (Marsh Lane)
NML11	Toward Centre of Sheephouse Park, Marsh Lane, Bristol, BS20 0NL		350448, 177135	Steady plant/engine noise from Royal Portbury Dock
NML12	Corner of Gloucester Rd, Avonmouth, Bristol BS11 9AD		351420, 178125	Road traffic (Gloucester Road) Steady plant/engine noise from Royal Portbury Dock
NML14	On footpath of Portview Road, Avonmouth, Bristol BS11 9LA		351998, 177594	Road traffic (Portview Road) Distant road traffic (M5 and surrounding roads)

Figure 4: Assessment, Background Sound and Meteorological Survey Locations



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3 Survey Instrumentation, Meteorology and Conditions

Survey Instrumentation

3.1 Details of the survey instrumentation deployed during the baseline and source noise surveys are summarised in **Table 3**.

3.2 All noise measurements were undertaken using instrumentation confirming to conform to BS EN 61672-1:2013[4], Class 1, each calibrated within the preceding 2 years. The calibration level (94dB @ 1kHz) of each SLM was checked before and after the survey using an acoustic field calibrator conforming to BS EN 60942:2003[5], Class 1, calibrated with the preceding 12 months. No drift in the calibration levels noted. Calibration certificates of the sound level meters used are provided in Appendix **A1**.

3.3 A suitable windshield was fitted to the measurement microphones to minimise the effects of any wind induced turbulent sound for the duration of the measurements.

Baseline Noise Survey

3.4 Baseline noise measurements were conducted, where possible, in accordance with BS 7445-1:2003[6] and BS 4142:2014, between 16:55hrs on Wednesday 7 December 2022 until Thursday 8 December 2022

3.5 Baseline noise levels were;

- Measured out at a height of 1.4m-1.5m above ground, as required by BS 4142:2014;
- Carried out under free-field conditions (i.e. the sound level meter (SLM) was positioned at least 3.5m from all surrounding reflective surfaces other than the ground); and
- Measured in consecutive 5-minute periods, with the L_{AFmax}, L_{Aeq}, and L_{A90} descriptors.

Source Noise Survey

3.6 In addition to the baseline survey, source noise measurements within the noisiest areas within the existing Etex building were undertaken under various conditions, representative of the reverberant internal noise level at that location. The noise climate in these areas was dominated by fixed plant and equipment, was typically steady, permitting measurements of short duration to be undertaken to quantify internal noise levels for this assessment.

Survey Data Processing

3.7 Processing and analysis of the measured noise data has been undertaken using Microsoft Excel.

[4] British Standards Institute. BS EN 61672-1:2013 'Electroacoustics. Sound level meters – Specifications' (2013)
[5] British Standards Institute. BS EN 60942:2003 'Electroacoustics. Sound calibrators' (2003)
[6] British Standards institute. BS 7445-1:2003 'Description and measurement of environmental noise. Guide to quantities and procedures' (2003)

Meteorological Conditions

3.8 A weather station was deployed during the noise surveys at the northern extent of the Site (Location WML, **Figure 4**) to monitor the prevailing weather conditions in the vicinity of the site throughout the noise surveys undertaken by NCL. Temperature and wind speed during the survey are summarised in **Appendix A2** and shows that the prevailing weather conditions were cold (0.5 - 3.5 °C) and calm with maximum wind speeds not exceeding 1m/s. No rain was observed during the measurement period whilst on site, cloud cover was minimal (<3 Okta).

3.9 The prevailing weather conditions were therefore considered acceptable for the purposes of the assessment.

Local Conditions

3.10 There were no known atypical traffic conditions, such as speed restrictions of traffic control (e.g. temporary traffic lights), and all road traffic at the measurement locations was free flowing.

3.11 The prevailing local conditions were therefore considered acceptable for the purposes of the assessment.

Table 3: Survey Instrumentation

Purpose	Make / Model	Serial No.	Date of Last Calibration	Measurement Locations
Baseline Noise Measurements	Rion NL-52	1009670	10 March 2021	NML11
	Rion NL-52	1176453	26 July 2022	NML9
	Rion NL-52	00687043	7 March 2022	NML12 NML14
Source Noise Measurements	Rion NL-52			Various (onsite)
Acoustic Field Calibrator	Rion NC-75	34212937	7 March 2022	n/a
Weather Monitoring	Davis Vantage Vue	TBC	n/a	WML

4 Assessment Methodology

Assessment Approach

4.1 The calculation of operational sound from the site has been undertaken by a noise modelling exercise, as this readily permits source noise levels, sound insulation, screening and the effects of dispersion to be input, the results analysed and evaluated, and any necessary mitigation to be evaluated and optimised.

4.2 As the site would operate continuously over a 24-hour period the assessment includes all significant sources that would be in operation at any one time. The assessment considers the sources summarised in **Table 4** that have been determined to result in potentially significant noise at the assessment locations.

Table 4: Summary of Potentially Significant Noise Sources

Potentially Significant Noise Sources	Summary Description
Fixed plant and equipment within the building	All potentially significant items of fixed plant and equipment will be located internally and be in continuous operation. Therefore, plant noise will be the same during both the day and night.
HGVs	HGV flows to/from the site will vary throughout the day and night. Miscellaneous makes/models expected
Distribution tractors	Terberg DT 183s will move un/loaded trailers to/from the main building/trailer parks throughout the day and night.

4.3 As required by the Guidance, the calculated operational sound levels have then been assessed in accordance with BS 4142:2014[3] at the assessment locations, with a 'typical' background sound level (dB L_{A90}) established from analysis of the baseline noise survey data. The assessment has been undertaken for a 1hr period in the daytime (07:00-23:00hrs) and 15 minutes at night (23:00-07:00hrs).

4.4 To inform the assessment and provide reliable source data for use in the noise modelling;

- a source noise survey has been undertaken of existing source and activities that will be located in the new plant has been undertaken at the existing plant; and
- architects' drawings have been reviewed and the sound insulation of the buildings calculated.

4.5 The predicted free-field specific sound level ($L_{Aeq,T}$) at the assessment locations take account of the temporal changes in activities and HGVs movements on the site to undertake the assessment in the day and night.

4.6 To supplement this report, operational noise from existing and future conveyors has been considered, although it is acknowledged that this occurs for a very limited period and is not representative of the standard operation of the Site.

4.7 Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. A character correction for tonality, impulsivity, and/or intermittency can be added. Where the specific sound has characteristics that do not fall into the tonal, impulsive or intermittent categories but are otherwise readily distinguishable against the residual acoustic environment, a penalty of +3 dB can be applied in isolation.

4.8 Any corrections for the character of noise have been added to determine the rated sound level ($L_{Ar,Tr}$) from the site which has then been compared to a typical background sound level ($L_{A90,T)}$ measured at the NML associated with the assessment location to determine an initial estimate of the impact of the operation on external receptors with regards to the adverse impacts set out in BS 4142:2014 that states:

- *"Typically, the higher the rating level is above the background sound level the greater the magnitude of impact;*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context; and*
- *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."*

4.9 The initial estimate of the impact is then modified due to the context in which the sound occurs and avoids rigid adherence to noise limits at the exclusion of any other relevant considerations, which is vital in providing a reasoned assessment.

5 Noise Monitoring Data and Predictions

Baseline Noise Monitoring Results and Analysis

5.1 The results of the baseline noise survey undertaken between the 7 and 8 of December 2022 are provided in **Appendix A2**

5.2 Due to the large amount of data, the full baseline sound survey data is presented as a time/level history in **Appendix A2** and summarised in **Table 5** (rounded to the nearest integer value). Noise levels at NML9 and NML11 exhibit the diurnal characteristics expected of locations exposed to transportation noise with daytime only operational hours. Survey results obtained at NML9 are noticeably higher than all other measurement locations due to its proximity to the M5.

5.3 The main source of noise at each location are described in **Table 2.** Noise from the Etex site was not audible at any time and therefore the measured sound levels are therefore representative of the underlying noise climate.

5.4 BS 4142 does not define how a 'typical' background sound level (BSL) is to be established, and therefore analysis of the measured background (L_{A90}) sound levels has been undertaken. The Mean (Average), Mode and Median for the day and night-time periods are shown in **Table 5**. The adopted typical background is based on the lowest of the statistical metrics to provide a balanced and robust assessment.

Table 5: Analysis of Measured Sound Levels and Adopted Background Sound Levels

Measurement Location	Associated Assessment Location	Period	Measured $L_{Aeq,\ T}$ (dB)	analysis of $L_{A90,T}$ (dB)			Adopted Background Sound Level $L_{A90,T}$ (dB)
				Mean	Mode	Median	
NML9	R9	Daytime (07:00-23:00)	70	66	70	67	66
		Night-time (23:00-07:00)	65	58	55	56	55
NML11	R11	Daytime (07:00-23:00)	52	52	52	52	52
		Night-time (23:00-07:00)	50	50	51	50	50
NML12	R12	Daytime (07:00-23:00)	54	49	46	48	46
		Night-time (23:00-07:00)	47	45	44	45	44
NML14	R14	Daytime (07:00-23:00)	63	53	50	53	50
		Night-time (23:00-07:00)	49	43	43	43	43

Noise Modelling

5.5 A sound propagation model has been developed using Predictor-LimA® computational sound modelling software, configured to calculate sound levels in accordance with ISO 9613-2:1996[7].

5.6 Geospatial data for model was informed by publicly available mapping data[8], the layout plans and drawings provided by the Client.

Calculation Parameters

5.7 The following parameters were used in the noise modelling;

- Order of reflections = 1
- Ground absorption, G = 0.0 (representative of hard ground between the Site and assessment locations, as noted in **Table 1**.
- Adverse weather conditions = no
- Building heights = based on a combination of site observations, development designs, and LIDAR DTM/DSM data[7].

5.8 External walls and roofs have been modelled as vertical and horizontal (respectively) noise emitting planes. Operational sound levels have been calculated as free-field noise levels at each assessment location (for ease of comparison to the measured background sound levels), at the heights specified in **Table 1**.

Source Data – Conveyor Systems

5.9 It was not possible to measure noise from the existing or repurposed conveyor system, nor does the ACC report provide sufficient details to establish a reliable location(s) or its noise emission value(s). However, the operation of the existing conveyor system is permitted and regulated by extant planning permissions, and is not believed to have resulted in noise complaints from nearby receptors. Previous planning permissions required noise from the existing conveyor to be ≤ 65dB $L_{Aeq,1m}$.

5.10 Similarly, new tube conveyors are to be installed between the new extension and existing DSG store. However, as the procurement of this conveyor is still ongoing, there is insufficient technical detail available to determine its likely noise emission level(s). Nevertheless, this plant is nestled between new buildings, removing the line of sight to nearby NSR, at which resulting specific sound levels attributable to this plant is likely to be low and inaudible.

5.11 NCL have recently undertaken source measurements of a similar conveyor system, which found that at a distance of 1m, the specific noise level was 65 dB $L_{Aeq,T}$ and aligns well with a previous noise

[7] International Standard Organisation. ISO 9613 2:1996 '*Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation*' (1996).
[8] DEFRA National LIDAR Programme - data.gov.uk

emission limit for the existing conveyor. Therefore, to guide this assessment, the noise emission of all conveyors (except the new tube conveyors) has been taken as 65 dB $L_{Aeq,T}$ at 1m, modelled as a line source.

5.12 Gypsum unloading at the Dock will continue to be carried over throughout the day and night. It is anticipated that 16 vessels per year will be unloaded.

Source Data – HGVs

5.13 Hourly traffic data contained within the Transport Assessment[9] submitted with the planning application for the new plant shows up to a total 16 HGV movements to/from the site in worst-case 1hr daytime period, (07:00-08:00hrs, **Appendix A3**), which have been used in the noise modelling exercise.

5.14 The Site is a 'shunt-only' operation at night (23:00-07:00) and the only mobile plant source within the Site boundary are Distribution Tractors. Nevertheless, in order to undertake a robust and future proof assessment night-time HGV movements have been included in the assessment. Transport assessment methodologies do not ordinarily consider the vehicle movements at night as they primarily focus on impacts during daytime peak traffic hours. Therefore, the worst-case daytime HGV movements have been included, pro-rata, into the noise model for the night-time.

5.15 It is assumed that the drop and collection of trailers by visiting HGVs would be spread equally between across Trailer Parks 2-4 (**Figure 2**).

5.16 Due to safety reasons, it was not possible to measure source noise levels from visiting HGVs at the Site. Therefore, octave-band (L_{AFmax}) source noise levels for HGVs have been obtained from BS 5228[10]. A summary of the noise data used in connection with HGV movements is summarised in **Table 7**. The HGV routes are show in **Figure 5**.

Source Data – Distribution Tractors

5.17 A number of distribution tractors (shunters) will operate around the site in the day and night to obviate the need for visiting HGVs to enter into the main building to collect loaded and awaiting trailers, and to effectively manage distribution activities.

5.18 Expectedly, neither the Transport Assessment[9] nor other available documents provide sufficient details of the likely distribution tractor movements within the Site which are likely to vary over time. Therefore, it has been assumed that the shunter movements will be distributed evenly to/from the main building to each of the trailer parks.

5.19 NCL have not been able to obtain source noise data for the distribution tractor units to be used. Therefore, a relatively high, broadband sound power level has been assumed for the shunters based

[9] Markides Associates, *'Transport Assessment, Etex Site, Marsh Lane, Bristol'*, Report Ref: 9357-01 TA01 Rev D (17 July 2020), Table 5.6.
[10] British Standards Institute, BS 5228-1:2009:+A1 (2014) 'Code of practice for noise and vibration control on construction and open sites. Noise', (2014)

on past experience. A summary of the noise data adopted for the shunters is summarised in **Table 7**. The shunter and HGV routes are show in **Figure 5**.

Figure 5: HGV and Distribution Tractor Routes

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Source Data – Internal Plant, Equipment and Activities

5.20 Internal noise resulting from the operation of a large number of numerous individual items of plant, equipment and activities can be calculated. However, this relies on a robust understanding of the noise emission, operating parameters and conditions, and location of each, as well as their interdependences and of the acoustics of each internal space being considered. Consequently, such an approach is exceedingly complex, time consuming and subject to significant degrees of uncertainty.

5.21 Therefore, given that the manufacturing processes in the areas of the existing plant will be duplicated in comparable areas of the new plant, reverberant internal ambient noise levels (IANLs) have first been measured in each of the noisiest areas of the existing plant, and then an appropriate IANL adopted (in terms of octave band levels and the L_{Aeq} descriptor) from those measurements for the same area in the new plant, and noise break-out calculated by the noise model.

5.22 Due to site Health and Safety, it was not possible to enter the main storage and distribution area within the existing building. Therefore, the broadband IANL measured by ACC has been adopted for this space.

5.23 A summary of the IANLs adopted for each area of the new plant site is summarised in

5.25 Table 6.

Sound Insulation Data – Building Envelope

5.26 To predict noise break-out from buildings, it is necessary to associate an appropriate sound reduction (sometimes referred to as the transmission loss) for the various elements of the building envelope, including the walls, roof, glazing, roller/sectional overhead shutter doors etc. It is often not possible to obtain sound reduction performance values for each element of the building envelope. Where data is available, its often provided as a single figure value (in terms of the R_w descriptor, a sound insulation performance measured under laboratory conditions), and without any octave-bands performance.

5.27 As reliable sound insulation performance was unable to be obtained for each of the elements in the building envelope, architectural drawings have been used to calculate the likely octave-band sound insulation performance for each element type. This has been done using Insul®, software capable of predicting the sound insulation of walls, floors, roofs, ceilings and windows and bespoke elements for use in noise transfer calculations, acoustical design or specification.

5.28 NCL understand that some external walls and roof will be constructed from profiled steel cladding (Euroclad 32/1000 profiled cladding sheet with reverse facing troughs) incorporating an internal steel liner forming a 120mm cavity, filled with 120mm Knauf Factoryclad 40 Quilt Insulation. At the time of this assessment, external walls incorporating this construction details were not confirmed. Therefore, for simplicity, and to further facilitate a robust assessment, one layer of profiled steel cladding has been assumed for all the external walls.

5.29 The roof and walls of the Calcination Workshop will be entirely profiled steel cladding (Euroclad 32/1000 profiled cladding sheet with reverse facing troughs). However, the majority of walls and roof of other buildings comprises a combination of profiled steel cladding, glazing, and roller/sectional overhead shutter doors in some walls. Therefore, for simplicity;

- the composite sound reduction of the Gypsum Store roof has been calculated based on the respective areas of steel cladding and windows;
- the composite sound reduction of the roof of the main building has been calculated based on the respective areas of cladding and roof lights (Zenon Pro 30 Outer Sheet);
- The sound insulation performance of roller/sectional overhead shutter doors and glazing in external wall exceeds that of the steel cladding, and has not been included for simplistic and robust approach as including the higher sound insulation performance of these elements has negligible effect on the overall noise immission at the assessment locations;
- The IANL for the storage/distribution area in the ACC report is provided in broadband terms only, and therefore, the calculated broadband reduction (R_w) provided by the roof/walls has been used when calculating noise break-out for this area.

5.30 To be within the confidence limits (95%) of Insul (in each octave-band) to reduce uncertainty, all adopted sound insulation values includes a correction of -3 dB, applied to the Insul calculated octave band values. Similarly, a -3 dB connection has been applied to the broadband (R_w) performance where the IANL is input as a broadband level.

5.31 Intermittent access is required to the Gypsum Store and Distribution Warehouse by mobile plant and equipment. Accordingly, the noise model also assumed that two shutter doors on the south-west elevation of the Distribution Warehouse and the main access door on the north-east elevation of the Gypsum Store will be fully open 100 % of the time, in both the day and night. In any event, the Environmental Permit requires all roller shutter doors to remain closed as far as reasonably practicable, and therefore this assumption adds further robustness to the assessment.

5.32 A summary of the adopted sound reduction of the various areas of the new plant site is summarised in

5.34 Table 8. Typically, the internal noise level in noisy production areas is 83-86 dB $L_{Aeq,T}$ and is due to the operation of a wide range of plant and equipment.

Excluded Buildings/Areas

5.35 Some spaces within the new plant will not contain significant source of noise, and have been excluded from the noise model, and include;

- Maintenance
- Raw Materials
- Paper Storage

Table 6: Noise Modelling Inputs - Internal Sound Levels

Area	Octave Centre Reverberant Sound Pressure Level (dB)								Broadband L_{Aeq} (dB)
	63	125	250	500	1K	2K	4K	8K	
Gypsum Store[11]	80	79	76	72	68	65	62	53	75
Calcination Workshop[11]	86	87	84	84	80	77	72	64	86
Start of Boardline[11]	86	85	83	82	78	74	72	67	84
Ovens[11]	78	80	80	79	74	71	70	77	82
End of Boardline[11]	85	85	84	85	81	76	74	75	86
Cutters / Packing[11]	81	85	81	78	77	76	74	67	83
Compressor Room[11]	73	85	83	83	77	71	63	54	83
Storage, Warehousing & Picking Area	-								79

Table 7: Noise Modelling Inputs – External Sources

Source	Make / Model / Source	Source Type	Height (relative to ground)	Speed / Capacity	L_{WA}	% On Time
HGV Movements[12]	BS 5228, Table C11, item 9: Road Lorry 313kw, 32t	Moving Point Source	1.0m	16km/h (10mph)	110[13]	-
Distribution tractor	Terberg DT 135	Moving Point Source	1.0m	16km/h (10mph)	104[14]	-
Brake Hiss[15]	At each side of gatehouse, and end of each Internal HGV and Distribution Tractor Route	Point Source	1.0m	-	110	2%
Tonal Reverse Alarm[15]	End of Each Internal HGV and Distribution Tractor Route	Point Source	1.0m	-	101	5%
Idling HGV[12]	One, each side of gatehouse	Point Source	1.0m	-	93	50%
Conveyor System	Conveyor carrying gypsum	Line Source	Elevated, Varies.	-	73	100%

[11] Based on the logarithmic average of noise levels measured in these areas of the existing plant
[12] Daytime only
[13] Modelling drive-by maximum sound pressure level in L_{max} (octave bands)
[14] Modelling as an assumed broadband sound power level, @1kHz
[15] Daytime only for HGV's

Table 8: Noise Modelling Inputs – Adopted Building Envelope SRI

Type	Construction	Building / Façade Element	Octave-band Sound Reduction (dB, Hz)								Broadband Sound Reduction (dB R_w)
			63	125	250	500	1k	2k	4k	8k	
Wall	Euroclad 32/1000 profiled sheet (100%)	All Main Building	6	9	12	14	13	16	18	18	15
		All Calcination									
		Gypsum Storage (NW and SE walls)									
	Euroclad 32/1000 profiled sheet (88%) + ArcoPlus® glazing (12%)	Gypsum Storage (NE and SW walls)	6	8	12	14	14	16	19	15	15
	2 x Louvres 3m x 2m (w x h)	Compressor Room (NW and NE walls)	1	1	2	4	4	6	6	4	3
	Open Access Door, 4m x 5m (w x h)	Gypsum Storage (NE and wall x 1)	0	0	0	0	0	0	0	0	0
		Distribution Access Door (SW wall)									
Roof	Euroclad 32/1000 profiled sheet (95%) + Zenon Pro 30 Outer Sheet Rooflights (5%)	All Main Building	6	9	12	14	13	16	19	15	15
	Euroclad 32/1000 profiled sheet (100%)	Calcination Workshop	6	9	12	14	13	16	18	18	15
	Euroclad 32/1000 profiled sheet (31%) + Zenon Pro 30 Outer Sheet Rooflights (69%)	Gypsum Storage	6	8	12	15	15	17	20	15	16

Results and Assessment – Main Operations

5.36 The predicted noise levels are summarised in **Table 9**.

Table 9: Assessment of Specific Sound Levels – Main Operations

Description	Assessment Location (NSR Ref)			
	R9	R11	R12	R14
Daytime (07:00-23:00hrs, inc. HGV Movements)				
Predicted Specific Sound Level dB $L_{Aeq,T}$	39	39	29	32
Character corrections, dB	0	0	0	0
BS 4142:2104 Sound Rating Level, rounded to nearest dB, dB $L_{Ar,Tr}$	39	39	29	32
Background Sound Level (BSL), dB L_{A90}	66	52	46	50
Sound Rating Level – BSL (dB)	-27	-13	-17	-18
Existing Residual Sound Level (RSL dB $L_{Aeq,T}$)	70	52	54	63
Sound Rating Level – RSL (dB)	-31	-13	-25	-31
Assessment Outcome	'Low Impact'			
Night-time (23:00-07:00hrs, inc. HGV Movements)				
Predicted Specific Sound Level dB $L_{Aeq,T}$	39	39	29	32
Character corrections, dB	0	0	0	0
BS 4142:2104 Sound Rating Level, rounded to nearest dB, dB $L_{Ar,Tr}$	39	39	29	32
Background Sound Level (BSL), dB L_{A90}	55	50	44	43
Sound Rating Level – BSL (dB)	-16	-11	-15	-11
Existing Residual Sound Level (RSL dB $L_{Aeq,T}$)	65	50	47	49
Sound Rating Level – RSL (dB)	-26	-11	-18	-17
Assessment Outcome	'Low Impact'			

5.37 The predicted Specific sound levels (dB $L_{Aeq,T}$) for the main operation of the new plant are at least 11 dB below the background (dB $L_{A90,T}$) and residual (dB $L_{Aeq,T}$) sound levels and are therefore unlikely to be audible or discernible against the underlying noise climate. Accordingly, no acoustic feature corrections have been applied. With reference to BS 4142 (2014) and prior to consideration of context, this indicates the operation of the new plant will have a 'low impact'.

5.38 At R9, the predicted specific sound levels are at least 16 dB(A) and 26 dB(A) below the background and residual sound levels (respectively) which are dominated by road traffic. At R11, the closest existing receptor(s) to the Site, the predicted specific sound levels are at least 11 dB(A) below the background and residual sound levels which are dominated by industrial noise from the Port and

wider area. This is a positive indication that noise from the new plant will be inaudible at both receptors.

5.39 Therefore, given that the rating levels for the new plant are well below the background sound levels, that operational sound from the new plant is unlikely to be audible, it is concluded that the operation of both the new and existing plant (which is inaudible), would not result in unacceptable noise impact at the nearest noise-sensitive receptors to the site.

Results and Assessment – With Conveyor System Operating

5.40 The results of the noise modelling indicate that at the receptor closest to the existing conveyor system (Receptor R11, Sheephouse Park), conveyor noise is 35 dB $L_{Aeq,T}$ which is low in absolute terms. When the new and repurposed conveyors are operational, the source of conveyor noise will move appreciably further way from this receptor, and conveyor noise will decrease by 1dB (to 34 dB $L_{Aeq,T}$).

5.41 The noise model indicates that with the new and repurposed conveyors operating, the cumulative sound from the conveyor and new plant would increase to 40dB $L_{Aeq,T}$ for the day and night. This small increase would not change the outcome of the assessment, and therefore cumulative noise (that includes the operation of the new plant, repurposed and new conveyor systems) would not increase significantly, and the assessment outcome ('Low Impact') would not change.

Uncertainty

5.42 Factors of uncertainty are summarised in **Table 10**. It is concluded that the magnitude of uncertainty is low and when considered would not change the outcome of the assessment.

Table 10: Considerations and Impact of Uncertainty

Source of Uncertainty	Uncertainty Relief	Impact on Assessment
Weather Conditions	The survey was carried out in acceptable weather conditions	Negligible
Survey equipment	Fully and field-calibrated equipment was used	Negligible
Source Directivity	Noise from the Etex site was not audible at the baseline noise measurement locations	Negligible
Baseline Noise Measurements	All baseline noise measurements were carried out at the same position are repeatable, and were undertaken under free-field conditions.	Negligible
Source Noise Measurements	Plant source noise measurements carried out at representative locations with the existing Etex plant. Noise levels were steady, and are comparable to those previously measured by ACC. The highest measured noise level in each area have been used in the calculations	Negligible
Broadband Source Noise Data	A high source noise level for the Distribution tractor has been adopted.	The contribution of noise from the tractors is likely to be higher than in practice, but the overall predicted specific sound levels will be significantly lower, and therefore has a negligible impact on the assessment
Sound Reduction of Building Elements	A -3 dB correction has been applied to the predicted values to ensure they are with the 95% confidence limits of Insul	A small uncertainty remains as the values are not based on test data obtained under laboratory conditions, but would not affect outcome of the assessment, and is therefore negligible
Operator Error	The consultant undertaking the survey, calculations an assessment is considered competent.	Negligible
Accuracy of Prediction Method	ISO 9613 is considered accurate to within ± 3dB.	This uncertainty would not change the outcome of the assessment, and is therefore negligible

6 Conclusions

6.1 This report describes a noise assessment prepared by Noise Consultants Ltd (NCL) on behalf of Etex Building Performance (Etex), to support the substantial permit variation for the Etex Bristol site in North Somerset, situated within the port of Bristol that falls within the administrative district of North Somerset Council (NSC).

6.2 Noise surveys have been undertaken to quantify existing background sound levels at the nearest identified noise sensitive receptors under acceptable conditions, and the results analysed to establish a 'typical' background sound level for use in the assessment.

6.3 A source noise survey has been undertaken at Etex's existing plant to quantify internal noise levels that are likely to be present in the noisiest areas of the Site, and, along with construction details provided by the client, noise break-out has been calculated at the nearest noise sensitive receptors. Source emission levels for some plant has been adopted from other sources as it was not possible to measure noise from some items/activities.

6.4 The calculation of operational sound from the site has been undertaken by a noise modelling exercise, and the results assessed in accordance with BS 4142:2014. The assessment found noise from the site to be well below the 'typical' background sound levels at all times, and therefore will not result in unacceptable noise impact at the nearest noise sensitive receptors. Consequently, no specific noise mitigation measures are considered necessary at this stage.

7 Glossary

dB	Decibel. The logarithmically scaled measurement unit of sound.
A-weighting	Frequency weighting applied to measured sound in order to account for the relative loudness perceived by the human ear.
$L_{Aeq,T}$	A-weighted equivalent continuous sound level over a given time period. It is the sound level of a steady sound that has the same energy as a fluctuating sound over the same time period.
$L_{A10,T}$	The A-weighted sound level exceeded for 10% of the measurement period. It is widely used as a descriptor of road traffic noise.
$L_{A90,T}$	The A-weighted sound level exceeded for 90% of the measurement period. Often referred to as the background sound level.
L_{Amax}	The A-weighted maximum recorded noise level during a measurement period.
Ambient sound level, $L_a = L_{Aeq,T}$	The A-weighted equivalent continuous sound level of the totally encompassing sound for a given situation and time interval, T.
Residual sound level	The A-weighted equivalent continuous ambient sound level remaining when the specific sound level has decreased to a degree in which it does not contribute to the ambient sound level.
Specific sound level, $L_s = L_{Aeq,Tr}$	The A-weighted equivalent continuous sound pressure level produced by the specific sound source at the reference location over a reference time interval, T
Rating level, $L_{Ar,Tr}$	The specific sound level plus any adjustment for the characteristic features of the sound.

A1 Noise Survey Instrumentation Calibration Certificates

MEASUREMENT SYSTEMS

CERTIFICATE OF CALIBRATION

0653

Date of Issue: 10 March 2021

Certificate Number: UCRT21/1332

Calibrated at & Certificate issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Page 1 of 2 Pages

Approved Signatory

K. Mistry

Customer: Noise Consultants Limited
6 Bankside
Crosfield Street
Warrington
WA1 1UD

Order No. 151

Description: Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Identification:

Manufacturer	*Instrument*	*Type*	*Serial No. / Version*
Rion	Sound Level Meter	NL-52	01009670
Rion	Firmware		2.0
Rion	Pre Amplifier	NH-25	09975
Rion	Microphone	UC-59	18145
Rion	Calibrator	NC-75	34212937
	Calibrator adaptor type if applicable		NC-75-022

Performance Class: 1

Test Procedure: TP 2.SLM 61672-3 TPS-49

Procedures from IEC 61672-3:2006 were used to perform the periodic tests.

Type Approved to IEC 61672-1:2002 YES Approval Number 21.21 / 13.02

If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003

Date Received 10 March 2021 ANV Job No. UKAS21/03181

Date Calibrated 10 March 2021

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	Initial Calibration		

MEASUREMENT SYSTEMS

CERTIFICATE OF CALIBRATION

0653

Date of Issue: 26 July 2021

Certificate Number: UCRT21/1917

Calibrated at & Certificate issued by:
ANV Measurement Systems
Beaufort Court
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Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Approved Signatory

K. Mistry

Customer	Noise Consultants Limited 6 Bankside Crosfield Street Warrington WA1 1UD
Order No.	174
Description	Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Identification

Manufacturer	*Instrument*	*Type*	*Serial No. / Version*
Rion	Sound Level Meter	NL-52	01176453
Rion	Firmware		2.0
Rion	Pre Amplifier	NH-25	76472
Rion	Microphone	UC-59	12404
Rion	Calibrator	NC-75	34291339
	Calibrator adaptor type if applicable		NC-75-022

Performance Class	1
Test Procedure	TP 10. SLM 61672-3:2013 *Procedures from IEC 61672-3:2013 were used to perform the periodic tests.*
Type Approved to IEC 61672-1:2013	Yes *If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2013*
Date Received	23 July 2021 ANV Job No. UKAS21/07486
Date Calibrated	26 July 2021

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 specifications of IEC 61672-1:2013.

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	03 August 2020	UCRT20/1737	0653

ANV MEASUREMENT SYSTEMS

CERTIFICATE OF CALIBRATION

0653

Date of Issue: 07 March 2022

Certificate Number: UCRT22/1318

Calibrated at & Certificate issued by:
ANV Measurement Systems
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Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Approved Signatory

K. Mistry

Customer	Noise Consultants Ltd 6 Bankside Crosfield Street Warrington WA1 1UP
Order No.	205
Description	Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Identification

Manufacturer	*Instrument*	*Type*	*Serial No. / Version*
Rion	Sound Level Meter	NL-52	00687043
Rion	Firmware		2.0
Rion	Pre Amplifier	NH-25	87198
Rion	Microphone	UC-59	13561
Rion	Calibrator	NC-75	34212937
	Calibrator adaptor type if applicable		NC-75-022

Performance Class	1
Test Procedure	TP 10. SLM 61672-3:2013
	Procedures from IEC 61672-3:2013 were used to perform the periodic tests.
Type Approved to IEC 61672-1:2013	Yes
	If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2013
Date Received	04 March 2022 ANV Job No. UKAS22/03157
Date Calibrated	07 March 2022

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 specifications of IEC 61672-1:2013.

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	24 February 2020	UCRT20/1224	0653

CERTIFICATE OF CALIBRATION

0653

Date of Issue: 07 March 2022

Certificate Number: UCRT22/1315

Calibrated at & Certificate issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
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Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Page 1 of 2 Pages

Approved Signatory

K. Mistry

Customer	Noise Consultants Ltd 6 Bankside Crosfield Street Warrington WA1 1UP
Order No.	205
Test Procedure	Procedure TP 14 Calibration of Sound Calibrators (30942:2017)
Description	Acoustic Calibrator

Identification	*Manufacturer*	*Instrument*	*Model*	*Serial No.*
	Rion	Calibrator	NC-75	34212937
Public evidence of Type Approval		Yes	Approved by PTB	

The calibrator has been tested as specified in Annex B of IEC 60942:2017. As public evidence was available, from a testing organisation responsible for approving the results of pattern evaluation tests, to demonstrate that the model of sound calibrator fully conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2017, the sound calibrator tested is considered to conform to all the class 1 requirements of IEC 60942:2017.

ANV Job No.	UKAS22/03157
Date Received	04 March 2022
Date Calibrated	07 March 2022
Previous Certificate	*Dated* 10 March 2021 *Certificate No.* UCRT21/1329 *Laboratory* 0653

Figure A2.5: Analysis of Measured Background Sound, dB $L_{A90,5min}$, NML9

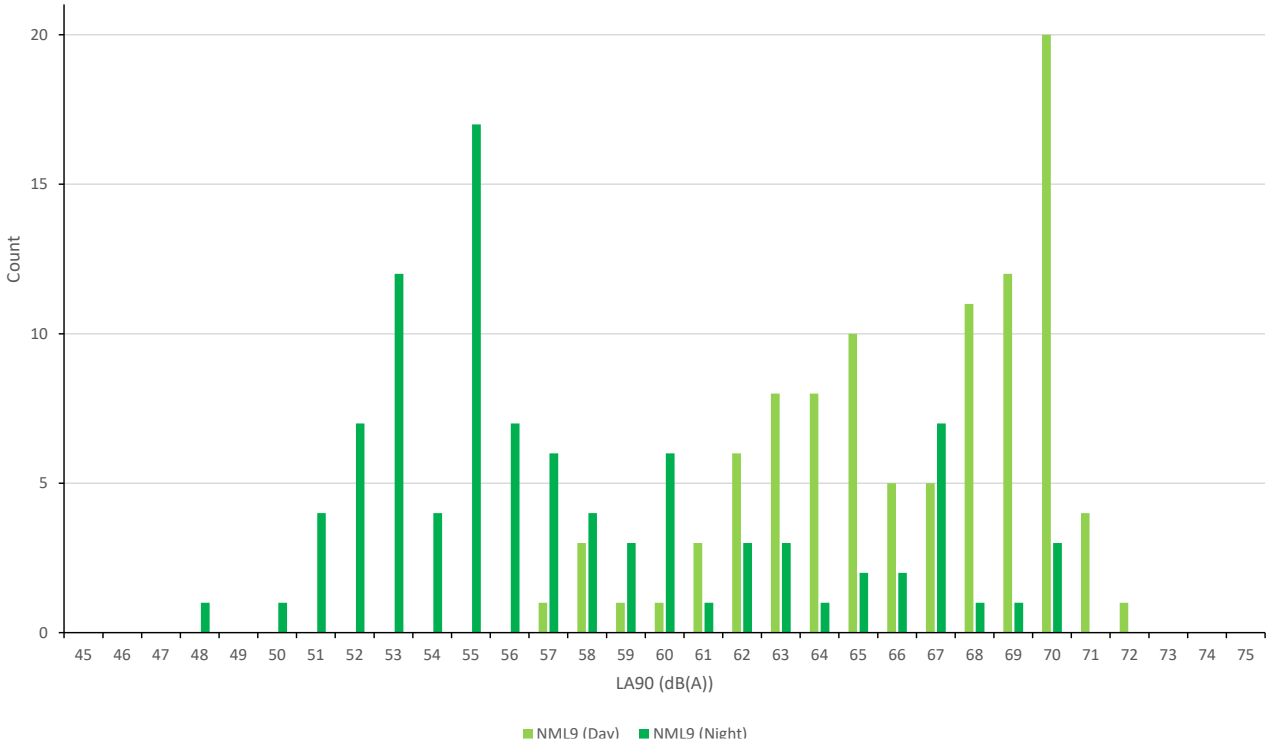
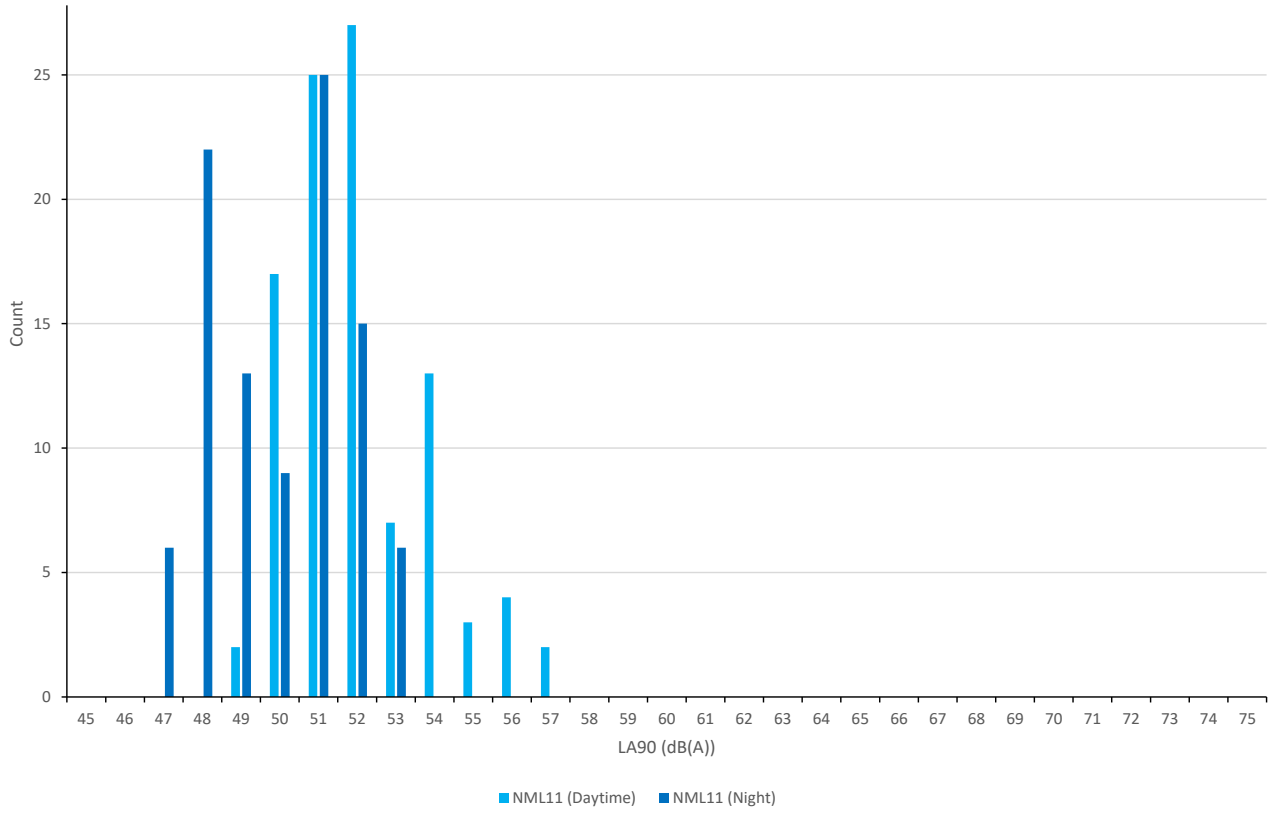


Figure A2.6: Analysis of Measured Background Sound, dB $L_{A90,5min}$, NML11



A2 Survey Data

Figure A3.1: Measured Weather Data

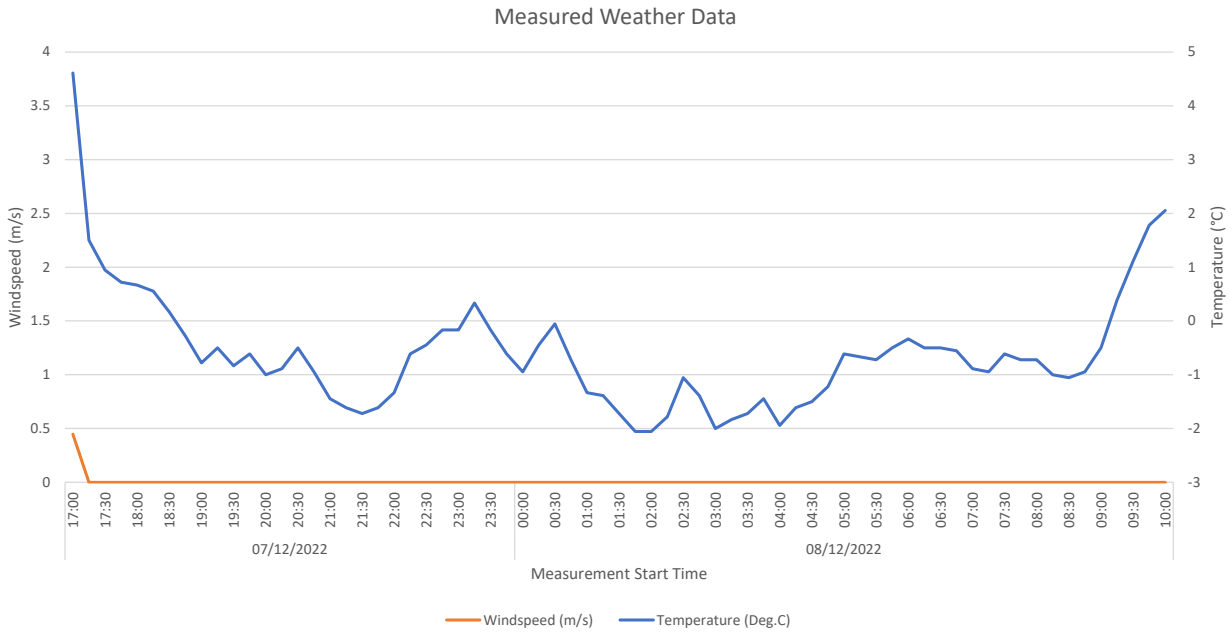


Figure A2.7: Measured Noise Data, NML9

Figure A2.8: Statistical Analysis of Measure L_{A90} Noise Data, NML9

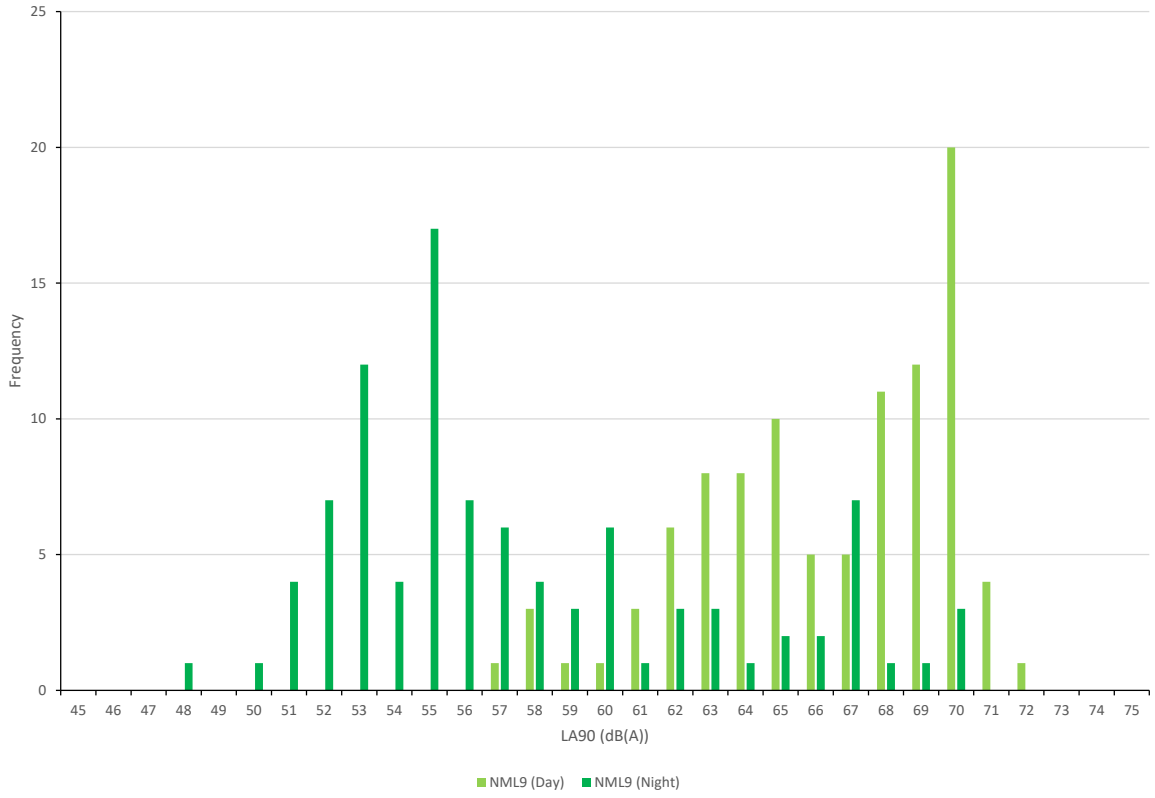


Figure A2.9: Measured Noise Data NML11

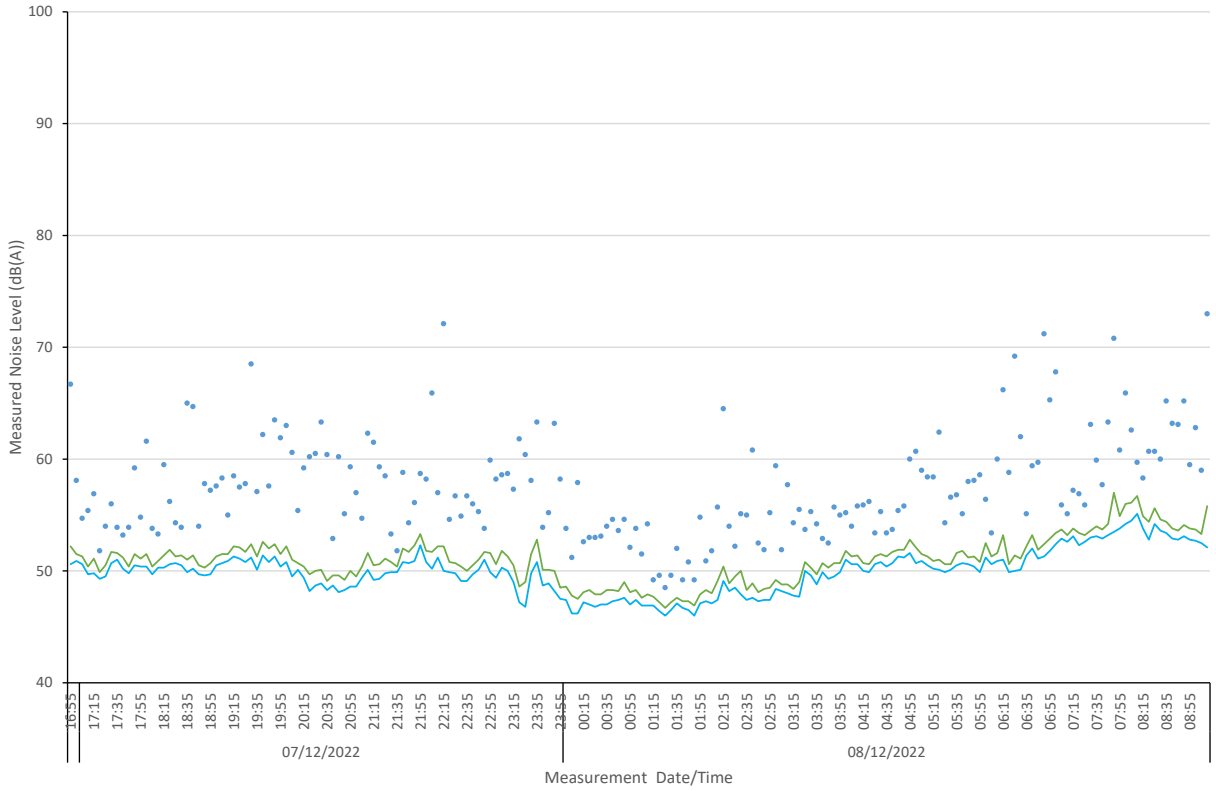


Figure A2.10: Statistical Analysis of Measure L_{A90} Noise Data, NML11

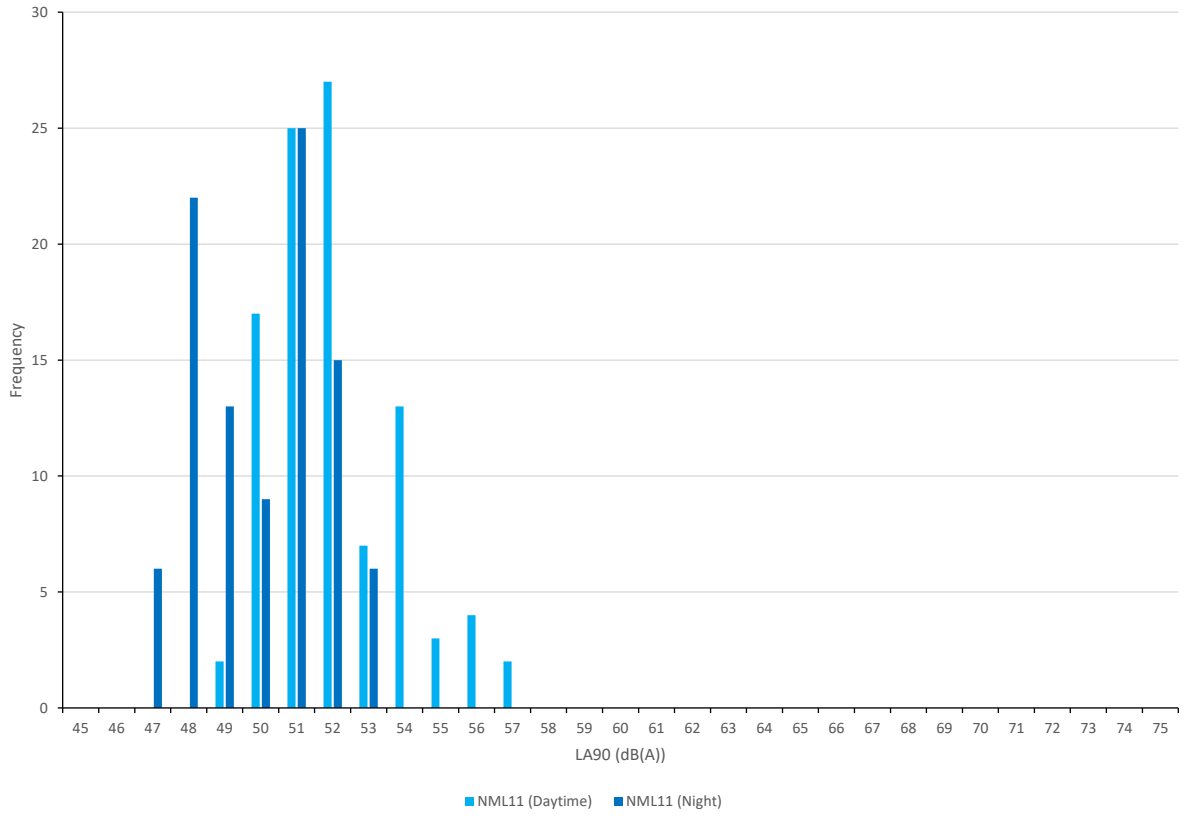


Table A 2.1: Measured Noise Data, NML12

Period	Start time (hh:mm)	Duration (hh:mm)	L_{AFmax}	L_{Aeq}	L_{A90}	Comment / Observations
Daytime	17:35	00:05	71.2	55.7	51.8	Steady plant at docks. Occasional posing road traffic. No discernible noise from Etex
	17:40	00:05	66.6	54.0	50.7	
	17:45	00:05	68.5	55.3	52.0	
	17:50	00:05	77.1	57.4	52.8	
	18:28	00:05	73.3	55.2	50.1	
	18:33	00:05	70.7	54.7	51.1	
	18:38	00:05	72.1	55	49	
	18:43	00:05	57.4	49.3	46.9	
	18:48	00:05	62.3	50.2	46.4	
	18:53	00:05	64.3	49.8	45.9	
	18:58	00:05	67.5	50.7	45.7	
	19:03	00:05	61.1	51.3	48.1	
	19:08	00:05	68.2	52.2	48.2	Steady plant at docks. Occasional posing road traffic. No discernible noise from Etex
Night-time	02:00	00:05	60.9	46.2	44	
	02:05	00:05	61.5	46.3	44.3	
	02:10	00:05	52.4	46.6	45.2	
	02:47	00:05	73.6	49.4	45.8	
	02:52	00:05	53.8	46.8	45.3	
	02:57	00:05	62.9	47.2	45.7	

Table A 2.2: Measured Noise Data, NML14

Period	Start time (hh:mm)	Duration (hh:mm)	L_{AFmax}	L_{Aeq}	L_{A90}	Comment / Observations
Daytime	18:01	00:05	84.9	64.4	55.8	Occasional road traffic. Distant motorway traffic. No discernible noise from Etex
	18:06	00:05	78.1	62.6	55.0	
	18:11	00:05	81.8	63.5	56.0	
	18:16	00:05	76.6	63.8	57.0	Occasional road traffic. Distant motorway traffic. Slow moving train @ 18:18. No discernible noise from Etex
	19:21	00:05	74.0	59.9	50.4	Occasional road traffic. Distant motorway traffic. No discernible noise from Etex
	19:26	00:05	74.4	59.7	49.6	
	19:31	00:05	81.8	62.2	49.3	
	19:36	00:05	80.2	61.4	49.5	
Night-time	02:19	00:05	58.1	45.4	42.7	

Period	Start time (hh:mm)	Duration (hh:mm)	L_{AFmax}	L_{Aeq}	L_{A90}	Comment / Observations
	02:24	00:05	50.3	45.3	42.4	Steady plant at docks. Occasional posing road traffic. No discernible noise from Etex
	02:29	00:05	60.4	46.4	43.2	
	02:34	00:05	70.7	49.6	39.9	
	02:39	00:05	63.7	46.7	41.3	
	03:05	00:05	58.8	46.3	44.0	
	03:10	00:05	77.0	54.5	44.6	
	03:15	00:05	54.5	46.3	44.6	

Table A 2.3: Measured Noise Data, Internal Noise

Plant Item – Measurement Ref	Measurement Location	Start time (hh:mm)	Duration (hh:mm:ss)	L_{AFmax}	L_{Aeq}	Comment / Observations
Calciner Workshop						
187 - 38	By Mill	11:44	00:00:59.7	88.6	85.4	Mainly Motor And Mill Working
182 - 39	By ID Fan for Calciner 102	11:50	00:03:30.4	95.2	86.0	Motor For ID Fan At Calciner 102
186 - 40	Rear of ID Fan for Calciner 102	11:54	00:01:16.2	83.8	81.0	Mainly ID Fans
181 and 182 (no access) - 41	Below Calciner Conveyor	11:56	00:01:45.5	84.5	79.7	General Plant In Building
180 (no access) - 42	Below Calciner Conveyor	11:59	00:00:53.2	89.8	80.6	General Plant In Building
111 - 43	ID Fan and Mill	12:01	00:01:05.3	87.4	86.1	Mill And ID Fan Adjacent
403 - 44	Centre of Mills and Kettles	11:44	00:02:03.4	91.3	90.0	Noise From ID Fans and Kettle Plant
Compressor House						
207 - 58	Sweep of Compressor House	14:09	00:00:56.7	84.3	82.6	Steady noise from 2 compressors
Cutter and Packing Area						
215 - 30	Side of Boardline 1 Quarantine Area	10:22	00:02:07.7	86.6	81.8	Steady Plant And Conveyor
223 - 31	Side of Boardline 1 Quarantine Area	10:31	00:02:00.5	87.8	82.9	Conveyor At End Of Oven
214 - 32	Side of Cutter Table	10:35	00:03:07.2	91.0	84.0	Conveyor To Cutter (Mainly Conveyor And Cutting Blades)

209 - 33	On Bridge Over Cutter Table	10:39	00:01:37.8	87.5	84.1	On Bridge Above Conveyor Feeding Cutter
212 - 34	Pallet Wrapping	10:48	00:00:35.1	85.5	80.4	General Internal Plant and Noise from Wrapper
End of Boardline 1						
220 - 24	On bridge over Conveyor	09:43	00:03:00.5	90.3	86.3	Boards Fed Underneath Measurements Position
222 & 210 - 25	Between Conveyors	09:52	00:02:00.5	87.6	85.2	Steady noise, Mainly from Conveyor and Ovens
219 - 26	By Conveyor	09:57	00:02:02.0	86.4	84.9	In Front Of Oven Entrance (Start Of Ovens)
217 - 48	Close to Ovens	13:13	00:00:51.2	90.1	89.1	Ovens
218 - 49	Between Conveyors and Electric Cabinets	13:15	00:03:11.8	88.3	85.0	Conveyor And General Fixed Plant
401 - 50	By ID Fan Close to External Wall	13:20	00:01:00.5	86.7	85.1	ID Fan Motor And Conveyor
Gypsum Store						
193 - 35	By External Wall	11:14	00:03:26.5	83.5	72.1	Front end loader working and conveyor system operating
101 - 36	By External Wall	11:18	00:02:19.8	82.9	77.0	Sample measurement of Loader working close by
194 - 37	By External Wall	11:27	00:01:09.0	76.8	72.3	Front end loader working and conveyor system operating
Ovens						
226 - 27	By Large ID Fan on External Wall	10:08	00:01:45.7	80.4	78.3	Ovens
216 - 28	By Ovens	10:12	00:02:02.7	84.6	82.4	By Oven 17 And Conveyor
227 - 29	By Ovens	10:19	00:02:16.4	86.1	83.9	End Of Ovens
Start of Boardline 1						
202 - 51	Mixer Outlet Area	13:36	00:01:15.3	95.4	87.8	Vibrating Conveyor at Start of Boardline 1
200 - 52	Rotary Machine	13:40	00:00:51.1	87.3	83.2	Motor And Steady Plant
199 - 53	Lower Assembly Area	13:42	00:00:35.5	85.4	80.9	Steady Plant Noise
203 - 54	Above Mixer	13:45	00:01:00.5	83.9	79.3	Steady Plant Noise
206 - 55	Silo Above Mixer	13:52	00:00:49.9	88.7	79.4	Steady Plant Noise
204 - 56	Funnel Feeder	13:56	00:01:13.4	98.6	83.5	Steady Plant Noise

A3 Site Generated Operational Road Traffic

Table A 3.1: Site Generated HGV Flows

Period	Time (hh:mm)	In	Out	Total
Daytime	07:00-08:00	+8	+8	+16
	08:00-09:00	+7	+7	+15
	10:00-07:00	+3	+5	+9

ACOUSTICAL CONTROL Engineers & Consultants

GUARANTEED SOLUTIONS TO YOUR NOISE & VIBRATION PROBLEMS

Acoustic Assessment of Proposed Extension

ETEX Manufacturing Facility

Royal Portbury Docks, Bristol, BS20 0FB

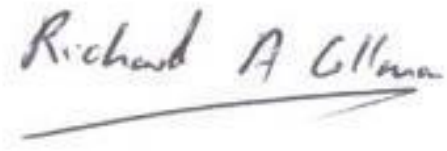
Report Reference: B5268 2020-07-07 R

Report Prepared by:

Kristoffer Tsinontas BSc (Hons), AMIOA

Acoustic Consultant

Report Reviewed by:



Richard A Collman BSc (Jt. Hons), CEng, MIOA, Tech IOSH

Director

Version Number	Notes	Issued By	Issue Date
B5268.0		KT	07 July 2020

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Contents

1.0 Introduction

1.1 Etex Engineering Ltd proposes to increase the capacity of their existing facility at Portbury Docks, Bristol by constructing a new additional plasterboard manufacturing line in a new building.

1.2 Maber Associates has instructed Acoustical Control Consultants Limited (ACC) on behalf of Etex Engineering Ltd to undertake an acoustic assessment in support of the planning application for the proposed development.

1.3 The aim of this assessment is to establish the likely acoustic impact of the development on the existing noise sensitive receptors in the vicinity of the site.

1.4 The assessment will consider noise emanating from sources and activities within the new building, taking the building construction into consideration; the use of forklift trucks outdoors; and the use, repurposing and extension of the existing material conveyor system from the nearby dock, which will result in a net decrease of the total length of conveyor in use.

1.5 The existing factory is currently operational 24 hours a day, with the new plasterboard line also anticipated to operate 24 hours a day.

1.6 Acoustical Control Consultants is an independent acoustic consultancy company. All our acoustic consultants are qualified and experienced practitioners and are either Associate or Corporate members of the Institute of Acoustics. Acoustical Control Engineers is our associated specialist noise and vibration control engineering company.

2.0 Scope of Works

2.1 To undertake preparatory work for an acoustic site survey.

2.2 To visit the existing premises, take sound level measurements and gather other appropriate data.

2.3 To analyse the data provided and that obtained during the acoustic site survey in order to assess the likely acoustic impact of the proposed development on relevant noise sensitive receptors (dwellings).

2.4 To report on the findings of the analysis.

3.0 Synopsis

3.1 ACC were instructed to conduct an acoustic survey and subsequent assessment in support of proposals to extend the operations at the Etex plasterboard manufacturing factory in Bristol.

3.2 The proposals consist of erecting a new building near the existing building which will contain a manufacturing line and associated processes, additional forklift truck usage, and the repurpose and extension of a conveyor system from the dock area in the vicinity of the site.

3.3 ACC attended the existing facility to measure and quantify sound producing activities to inform the assessment of the new facility and associated processes.

3.4 The assessment methodology contains many worst-case assumptions to ensure sufficient 'headroom' in the calculations and modelling to account for uncertainty. This includes potentially overstating source sound levels calculated from measured activities at the existing site, understating the building envelope sound reduction performance, and understating the varying forms of attenuation between the site and the noise sensitive receptors. Should the resulting sound level from these calculations be suitable to protect amenity of noise sensitive dwellings, then any difference in real world sound levels is likely to be of greater benefit.

3.5 The sound levels from activities at the site were assessed based on the average sound level emitted from the source at the time it was measured. In instances where certain sound sources emitted a shorter during 'high' sound level, such as the cutting of plasterboard, or instances where the movement of plasterboard between different conveyors within the building produced higher sound levels, these have been separately identified as 'high' sound levels, analysed and assessed accordingly.

3.6 At the most sensitive receptors, the sound level due to activities within the existing building were calculated at 23dBA on average and 29dBA if all 'high' level sound events occur simultaneously. The worst case analysis indicates that sound from the proposed building and associated site operations would increase the average sound level by 1dBA and the high sound level by 2dBA. This would increase an insignificant sound level by an unnoticeable amount.

3.7 When the repurposed and extended conveyor is operating, it would have a similar sound level at the most sensitive receptor to the current conveyor layout (existing dock conveyor and the coal conveyor).

3.8 The sound levels calculated from the factory extension and conveyor repurposing are within suitable sound levels to protect the residents' amenity. Additionally, the sound from the site would tend to be masked by residual sound from the M5 motorway and other industry closer to the receptors.

3.9 The compliance measurement locations referred to in the planning application utilise a methodology which is prone to uncertainty and may unduly restrict the operational sound from the site. Consistent with previous Government guidance in the no longer extant PPG 24: Planning & Noise, it is recommended that a more robust methodology is used, calculating sound levels measured closer to the sources on site, and modelling the resulting sound level at the most sensitive receptors to demonstrate compliance with suitable criteria.

4.0 Site, Location, and Acoustic Environment

4.1 The existing factory is located in Portbury Docks in Bristol and occupies an approximate footprint of 67,000 m^2. Access to the existing and proposed sites is from Redland Avenue, via Marsh Lane, where turning left from Redland Avenue takes you to the existing site and turning right gives access to the new site.

4.2 The main building contains office space, production lines, warehousing, storage for raw materials and completed product. The west of the site provides car parking for staff and visitors, and loading docks for goods out. Certain materials are delivered to the goods in facility, to the east of the site. Two 'Boardlines' (plasterboard manufacturing lines) are located internally, to the north and south of the building. These Boardlines convert the raw materials comprising primarily gypsum slurry from the mixer and reels of paper/ card to finished pallets of plasterboard. The first part of this process takes place along the length of the building, before the partially made boards are turned over, and head in the opposite direction, going through an oven, before being cut to size, stacked, wrapped, stored, and then loaded for delivery.

4.3 Much of the raw material is transported to the site from the nearby dock approximately 1.2 km to the north west. A conveyor transports the material around 800 m from the dock to the storehouse to the north of the site.

4.4 The new building will cover approximately 59,000 m^2 of space to the south east of the existing site, on the right of Redland Avenue when approaching the site from Marsh Lane. An additional Boardline will be located in the new building with associated equipment and processes.

4.5 As part of the development, the existing conveyor from the dock will be decommissioned, and an old coal conveyor will be repurposed, with additional conveyors connecting this conveyor to material storage at the existing site, and to the newly constructed storage facility for the new building.

4.6 The area in the vicinity of the site comprises primarily industrial/ commercial use near the port, with a large proportion of the area used for storing motor vehicles. The site is approximately 10 km north west of Bristol, approximately 1 km south east of the Bristol Chanel, and 1 km north west of the M5 motorway which runs in a south west to north east direction.

4.7 The closest noise sensitive receptors (dwellings) are located approximately 300m north west of the site on a private road at the end of Marsh Lane. Relative to these dwellings, the new building will be on the opposite side of the existing building which is acoustically similar to the new building. Therefore, the new building will be acoustically screened from and make no significant difference to the sound level at these dwellings.

4.8 Other dwellings are located around 1.2 km to the south east on Beechwood Road, and a similar distance to the north east on Portview Road. Despite the significantly greater separation distances than the dwellings at the end of Marsh Lane, it is these other dwellings which are potentially more sensitive to sound from the proposed new building, due to the lack of acoustic screening provided by the existing building.

4.9 The new building will provide acoustic screening between the existing building and the dwellings to the south east on Beechwood Road. This means that there will be relatively little difference to the sound level at these dwellings with, it is anticipated, the slightly reduced separation distance being more than offset by the new building emitting slightly lower sound levels than the existing one. Therefore, it is likely that the proposed development may marginally reduce the already low sound levels at these dwellings, albeit by an Audiologically insignificant margin.

4.10 Dwellings to the north east on Portview Road will have a direct sound transmission path and will therefore be exposed to sound emanating from both the existing and new buildings. This location is therefore considered to be the most noise sensitive receptor.

5.0 Relevant Guidance & Criteria

5.1 A number of relevant guidance documents may be applicable to this assessment. The key points of each document are summarised below:

BS4142:2014 Methods for rating and assessing industrial and commercial sound

5.2 BS4142:2014 provides a method specifically intended for the assessment of sound of an industrial and/or commercial nature, at existing noise sensitive receptors.

5.3 One of the significant differences between BS4142:2014 and previous editions of the Standard is the explicit requirement to consider context as part of the assessment. It is no longer adequate to simply compare the Rating Level and the Background Sound Level without due regard to the context of the acoustic environment and the sound source. The context can significantly affect the outcome of the Initial Estimate of Impact, which is based solely on the difference between the Rating and Background Sound Levels.

5.4 The Background Sound Level (L_{A90}) specifically excludes acoustic events occurring for less than 90% of the time, such as passing vehicles or activity occurring for much but not all of the time. This means that the difference between Rating and Background Sound Levels can be identical for two locations with very different acoustic characteristics and corresponding sensitivities to noise.

5.5 In addition to comparing the level and character of the specific and residual sound, the context also includes careful consideration of other factors such as the character of the locale e.g. quiet rural or predominantly industrial; noise sensitive receptors e.g. outdoor amenity space or indoors; and duration and time of specific sound e.g. 24/7 operation or one event per week.

BS8233:2014 Guidance on sound insulation and noise reduction for buildings

5.6 BS8233:2014 provides guidance for the control of noise in and around buildings. It provides recommendations for suitable noise criteria for different purposes, such as resting in a living room during the day or sleeping in a bedroom during the night.

5.7 For dwellings the main indoor considerations are to protect sleep in bedrooms and to protect resting, listening and communicating in other rooms. For noise without a specific character it is desirable that the overall average levels during the 8 hour night or 16 hour day time periods do not exceed 30 dBA or 35 dBA respectively.

5.8 For amenity space, such as gardens and patios, it is desirable that the average level does not exceed 50 dBA, with an upper guideline value of 55 dBA which would be acceptable in noisier environments. For dwellings with conventional windows, an internal target of 35 dBA during the day equates to around 50 dBA (possibly slightly lower) outside noise sensitive rooms with openable windows.

World Health Organisation (WHO): Guidelines for Community Noise & Night Noise Guidelines for Europe

5.9 The WHO states that a steady level of 30 dBA within bedrooms is suitable to protect vulnerable people from sleep disturbance. Research also indicates that event maximum noise levels ($L_{Amax,f}$) exceeding an internal sound level of 45 dB more than about ten times during the night would be required to wake a sleeping person.

5.10 To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55dBL_{Aeq} on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50 dB L_{Aeq}. Where it is practicable and feasible, the lower outdoor level should be considered the maximum desirable sound level for new development.

Noise at Work

5.11 The Control of Noise at Work Regulations 2005 place various duties on employers. These include:

5.11.1 Where personnel may be exposed to noise at or above an exposure action value to '*make a suitable and sufficient assessment of the risk from that noise to the health and safety of those employees*'.

5.11.2 Where appropriate to either eliminate at source or, where this is not reasonably practicable, reduce to as low a level as is reasonably practicable, the risk to employees from their exposure to noise.

5.12 Although the purpose of this report is not to provide a noise at work assessment, the requirements of the Control of Noise at Work Regulations will be considered where this may affect the level of noise emitted from the new building.

Extant Planning Condition

5.13 An extant planning condition from application no. 04/P/0151/F identifies four ground level compliance locations around the site with noise limits expressed as L10, 1 hour values, and another at 1m from the housing of the dock conveyor. The Environmental Noise Monitoring document provided by Etex also contains a fifth optional ground level compliance measurement position chosen for its proximity to the dwellings to the north of the site on the private road at the end of Marsh Lane.

5.14 While the limits at the four measurement positions were likely chosen to protect amenity of receptors around the existing site at the time, the new building will be located to the south of all of the measurement positions, closer to the noise sensitive receptors to the south.

5.15 This means that the measurement positions to the south east of the existing building will then be between the two buildings and no longer serve any purpose.

Discussion

5.16 The proposed development will render the original compliance measurement locations, largely irrelevant due to them being surrounded by the enlarged site. As the no longer extant PPG 24 Planning & Noise made clear, the purpose of noise limits for development planning purposes is to protect noise sensitive receptors, and limits at other possibly arbitrary locations are likely to result in criteria that are either overly onerous or fail to properly protect the noise sensitive receptors due to differing relative distances and sound propagation paths between sources, measurement locations and receptors.

5.17 Therefore, the approach used in this report is to assess the change in sound level at the receptors emitted by the site, due to the additional building, and to consider the likely absolute sound levels that the proposed development will produce at the noise sensitive receptors assuming worst case parameters where applicable, such as the anticipated performance of the building envelope. This combined approach will ensure that the amenity of residents will be properly protected.

6.0 Survey

6.1 A visit to the site was conducted by Richard A Collman BSc (Jt. Hons), CEng, MIOA, Tech IOSH and Kristoffer Tsinontas BSc (Hons), AMIOA on Monday, 18 May 2020 between 10:30 to 16:30 hours.

6.2 Sound level measurements were taken of sources and activities within and outside the existing facility using a hand held sound level meter. Additional measurements were also taken at the five 'compliance positions' referenced in the planning condition, and at a ground level location near the dock conveyor to calculate the sound level at distance. As appropriate, sound level measurements were taken at a height of 1.2m to 1.5m above the ground and at least 3.5m away from reflective surfaces apart from the ground.

6.3 While the planning condition requires all windows and doors from the site to be closed when assessing the sound levels at the positions, the measurements during the survey were taken under normal operating conditions, which are non-compliant with this criterion, with some windows and doors on site open. This will have increased the sound levels emitted from the buildings and therefore represents 'worst case' conditions.

6.4 Ordinarily, residual sound level measurements taken near the closest noise sensitive receptors would have formed part of the assessment, however, the survey took place during the lockdown period for the Covid-19 outbreak. Residual activity, including traffic on the nearby M5 motorway, during this time was not representative of typical activity, and so residual sound level measurements were not taken.

6.5 Subjective observations were recorded at the entrance of the private road which leads to the caravan park to the north of the site. Despite the artificially low residual sound level, which provided less acoustic masking than would ordinarily be the case, sound from Etex was not readily identifiable. As sound from the site was not identifiable at this position, observations were not taken at the other receptors significantly further away to the south east and north east.

6.6 Figure 6.1 shows the relative positions of the existing and proposed site buildings (yellow pins), areas that are sensitive to noise (green pins) and the compliance measurement locations (numbered markers).

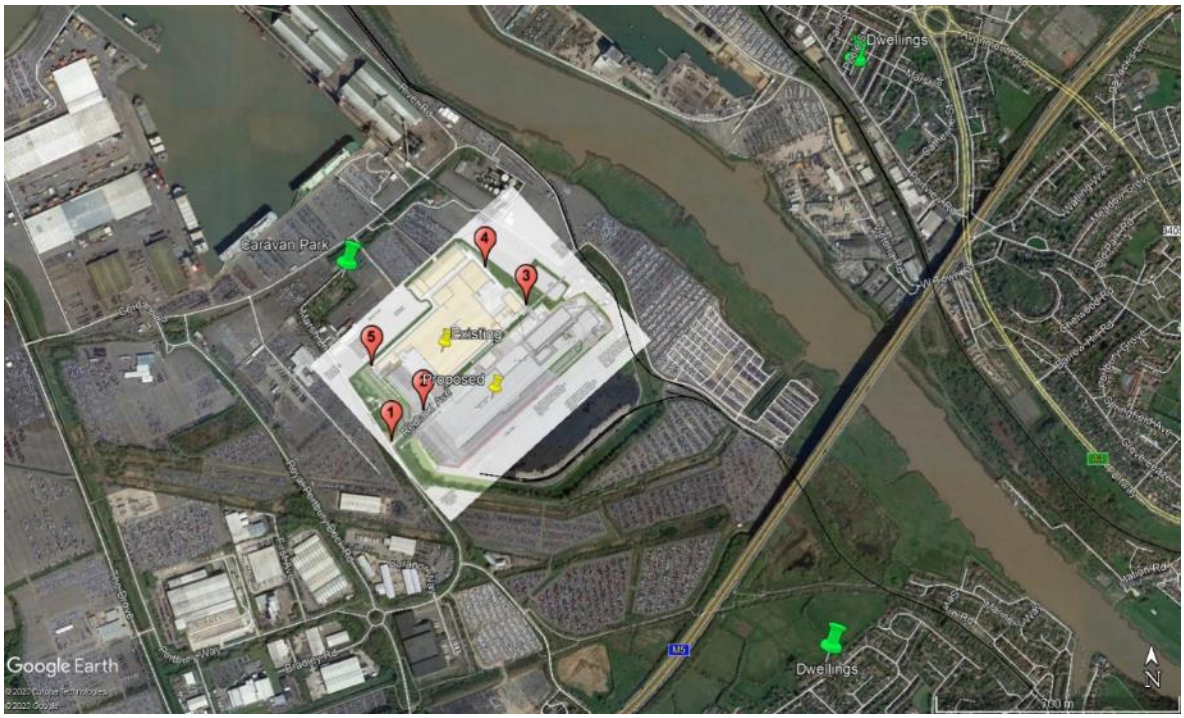


Figure 6.1 New Site, Receptors, and Measurement Location

Instrumentation

Cirrus Optimus Sound Level Analyser Type CR 171, Serial No. G068268
Cirrus Calibrator Type CR 515, Serial No. 57135
Cirrus Windshield

Rion 1/3 Octave Band Analyser Type NA-28, Serial No. 01070575
Rion Sound Calibrator Type NC-74, Serial No. 35173526
Rion Windshield

Tripod
Skywatch Meteos Anemometer

6.7 Weather conditions were logged throughout the survey. At the external measurement locations there was a slight breeze from the west, dry ground surfaces, and temperature of approximately 15°C. It is considered that the local weather conditions were appropriate for measurements to be taken.

6.8 Measurements were taken of a variety of sources and activities within the factory. The measurement method differs depending on the subject of the measurement. The main two methods of measurement involve measuring a specific source/ operation at a distance (for items producing sound to be captured at a fixed distance), or measuring the sound level over a particular area to ascertain a spatial average of multiple sources and operations in an area (for multiple items within an area which contribute to a reverberant sound field).

6.9 The main areas measured include Calcining, gypsum storage, dock conveyor, mixer, ovens, cutter/packaging, and miscellaneous/ general equipment including blowers and compressors.

6.10 Measurements taken during the factory survey are shown in Graphs 1 to 6 of Appendix 1. Measurements taken at the Compliance Locations are displayed in Graph 7. The various measurements are referenced and summarised in Appendix 2. Photographs of the measurements taken can be found in Appendix 4 along with measurement references.

6.11 Graph 1 shows the sound levels measured in the vicinity of the mills and kettles (which will not be duplicated in the new building) and the Calciner, which will be duplicated in the new building, although the new equipment will be similar rather than identical.

6.12 The first two series of measurements indicate that the sound level in the vicinity of the mills and kettles is around 86dBA. It is understood that there will not be similar equipment in the new building. The remainder of the measurements shown on Graph 1 were taken in the vicinity of the Calciner, where the average level typically varied around 82 – 83 dBA except close to the body at low level, where it was around 85 dBA. At high level occasional impulsive events produced maximum levels of up to around 95 dBA. Two measurements were taken at 1 & 2.5 metres from a high level conveyor, producing very similar results, although the measured sound level was slightly lower when closer to the conveyor which is consistent with the subjective observation that sound from the conveyor was insignificant in comparison to the residual sound from other parts of the Calciner system.

6.13 Graph 2 shows measurements taken of several sources and noise producing activities in the vicinity of the Compressor/ Blower Room and Gypsum Store. A spatial average measurement was taken within the Blower Room of 100 dBA. Air is drawn into the room via louvred apertures from the wider factory; the sound level measured in the factory 1 m from one of the louvres was 93 dBA. Given the relatively high sound levels from this plant, it will be attenuated in the new building, primarily be means of acoustically enclosing it to control noise emitted both within and external to the building.

6.14 A spatial average measurement was also taken around the Pneumatic Transfer giving an average sound level of 86 dBA and air discharges producing levels of up to 105 dBA. Sound from this equipment is partially attenuated to other areas by means of acoustic screening/ barriers. It is anticipated that sound from the similar plant in the new building will also be attenuated to control the level to which personnel would otherwise be exposed.

6.15 Sound measured at 10m from external equipment on the northern façade was around 72dBA.

6.16 Inside the gypsum storage building, a conveyor was in use near the centre of the building, which was measured at 75dBA at a distance of approximately 10m. where there was influence from other plant in the area, which when measured at approximately 10m was producing 76dBA. HGVs were operational in the waste reclaim area of the building, producing sound levels of 83dBA at the measurement position between 10 and 20m from the vehicles.

6.17 Graph 3 shows the measurements taken in and around the dock conveyor system. The dock conveyor transports materials from the dock to the gypsum building. A tower just north of the gypsum building houses a motor which runs the conveyor. The first measurement on the graph shows the sound level taken going up the stairs of the tower, starting at 75dBA, increasing to 95dBA when passing the motor, and then falling to 86dBA further up the tower, when next to the conveyor while the conveyor was running. The next measurement was taken while walking north and then returning, inside the tunnel, next to the conveyor. The sound level from the motor reduced with distance, so that the overall sound level dropped from 86dBA to 82dBA, and then rose back up to 85dBA when walking back towards the motor.

6.18 A measurement of 60dBA was taken at ground level around 40m west of the conveyor line. This measurement was influenced by sound from residual elements such as the conveyor motor, particularly as the tower door was open while the measurement took place, and the occasional movement of nearby foliage.

6.19 Graph 4 shows measurements taken around the mixer area where the average sound levels range from 81dBA to 84dBA. The first measurement was taken at the lower assembly area where various items of plant produced levels between 80dBA to 90dBA with occasional impulsive sounds producing up to 95dBA. A rotary machine was measured at around 3m which produced sound levels of 85dBA dropping to 80dBA when the machine stopped turning. The slurry outlet was producing sound levels of around 84dbA, while machinery above the slurry outlet ranged from 78dBA to 87dBA.

6.20 The funnel feeding into these machines was producing multiple impulsive events ranging from 76dBA to 92dBA as product moved within. Various conveyors were present in the upper levels of this area producing sound levels of around 82dBA with occasional impulsive events of up to 94dBA. The machinery around the silos in this area generated sound levels of around 85dBA.

6.21 Graph 5 shows the sound levels at the compressor plant room which contained a number of items of plant for the building was measured at 82dBA spatially averaged around the room. Another compressor enclosed within the building was measured at 89dBA. Graph 5 also displays sound levels from around the sawing area where boards leaving the oven are cut to size and packed. A measurement was taken on the bridge before the sawing area. As the two boards were stacked immediately below this location, this produced maximum levels of around 95dBA, with the more distant sawing producing levels of around 87dBA at the measurement position.

6.22 Another measurement was taken around 5m from the saws, which produced a level of 90dBA when the sawing. The conveyors in this area generated sound levels of around 80dBA. Measurements were also taken around 5m from the wrapping system where the stacking and movements of product along the conveyor produced sound levels of 80dBA to 90dBA, with the overall level around this area ranging from 75dBA to 80dBA when the conveyors were not generating significant sound. The conveyor between the oven and cutter was producing sound levels around 83dbA

6.23 Graph 6 shows measurements taken around the oven system along the length of the factory, starting at the output end of the oven, where an average level of 77dBA was measured. A three minute measurement was taken along the length of the oven system, from the saw end, with sound levels of around 75dBA, rising to around 80dBA where there was visible wear and tear where sound was escaping. The sound level dipped again to 75dBA and began to rise towards the start of the oven.

6.24 The conveyors feeding the ovens produced sound of around 88dBA. The next measurement was taken alongside the entrance to the oven where sound levels between 80dBA and 90dBA were recorded. Measurements around this area were influenced by a high pitch sound of up to 105dBA as boards moved from the faster long conveyor to the slower oven conveyors. Sound around the oven entrance was 87dBA. The sorting mechanisms and conveyors before the oven produced levels of between 80dBA and 90dBA.

6.25 A five minute measurement was taken on the other side of the ovens near the 'wetside' to 'dryside' conveyor. The sound from this measurement was influenced primarily by the oven system, not the conveyor, along with the occasional high pitched sound previously described. The sound level dropped from around 80dBA to 75dBA along the length of the oven, increasing again towards the cutter end of the oven. The conveyor moving from the oven declining towards the cutter producing sound levels of 81dBA.

6.26 Forklifts move the finished wrapped product from the production line to be stored in the warehouse, and from the storage locations to the be loaded on to trailers to be delivered. A measurement of 78dBA was taken at 3m from the forklift. Loading and unloading was relatively quiet compared to the overall sound level from the factory and was not measurable.

7.0 Analysis

Existing Operations – Sound Power Level Emitted Within the Existing Building

7.1 Measurements taken during the survey, their corresponding average (LAeq) values, and associated notes are summarised in Appendix 2. Sound levels were measured at locations to be representative of the area that they occur and can be converted to sound power levels for further analysis, as shown in Calculation Sheet 1 of Appendix 3. For identification purposes photographs of the items measured are shown in Appendix 4.

7.2 The following method is used to analyse a 'worst case' scenario for the operational sound produced by the factory. Measurements have been taken of the various sources and noise producing activities within the building. It has been assumed that these measurements are representative of the 'free field' sound level emitted by the source or activity being measured. In reality, the sound level measurements will also include sound from other sources/ activities and reverberant sound reflected from other surfaces within the building. Therefore, the measured sound levels will tend to over-state the sound levels actually emitted by the various sources and noise producing activities.

7.3 For most sources it is appropriate simply to measure the 'average' sound level. However, some sources produce relatively high sound levels for only some of the time. It is therefore also appropriate to measure these 'higher sound levels to ensure that the shorter duration maximum sound levels are also suitable at the nearest dwellings.

7.4 These sound pressure level measurements are then converted to sound power levels, by correcting for the surface area over which the sound level measurement is representative for the source or noise producing activity.

7.5 The total sound power level emitted within the building is then calculated by logarithmically adding the various sound power levels together. This is appropriate for the average sound levels, but for the short duration 'higher' sound levels, the calculated overall sound power level will only be produced if all sources are simultaneously producing the higher sound level.

7.6 The overall sound power levels can then be corrected to allow for the sound propagation path from the site to the nearest dwellings to calculate the corresponding sound pressure levels at the dwellings as if the source sounds were occurring outdoors. A conservative reduction can then be applied for the building envelope, and for reduction measures taken closer to the source for noise at work purposes (e.g. enclosed plant rooms) to give a resulting sound pressure level at the dwellings.

7.7 Lines 1 and 2 show measurements taken at a conveyor in the mill area at distances of approximately 1 m and 2.5 m. The level measured closer to the conveyor was lower than the further measurement which indicates that sound from the conveyor was not significant. Line 3 shows the difference between these two sound levels. Conversely, Line 4 shows the expected sound level decrease due to the increase in distance from a 'line source' for these two measurements. Because the actual difference is negligible, it means that the sound levels measured were mainly due to sources other than the conveyor and therefore that sound from the conveyor was significantly less than the measured levels even 1 metre from the conveyor. This shows the effect described in section 7.2 of this report where the sound level measured is assumed to be that solely emitted by the source, where in reality there may be influence from other sources. This occurs at the majority of the measurement locations and results in an overstated sound level from the source.

7.8 Lines 5 and 6 shows the analysis for converting the sound pressure level measurements taken of the mill to a sound power level. Line 5 shows the approximate area over which this sound level is produced, together with the corresponding average and 'higher' measured levels as appropriate.

7.9 Line 6 shows the sound level calculated by adding 10 x Log_{10} (Area) to the average and high sound levels, giving a resulting sound power level of 107dBA in this case.

7.10 Lines 7 through 22 use the same methodology to determine an average/high sound power level for the calciner (107/ 118dBA) , the ovens (104dBA) , the oven feeding system (98/ 125dBA), the conveyor system before sawing (100/ 110 dBA), the sawing itself (104/ 109 dBA), the mixer system (105/ 109 dBA), gypsum storage location (105/ 113 dBA), and pneumatic transfer (99/ 118dBA).

7.11 Lines 23 and 24 analyse the sound level produced by the forklift operating indoors. Four forklifts moving at all times is considered the 'average level' of 98dBA, and eight forklifts in motion at all times is considered the 'high level' of 101dBA.

7.12 Line 25 shows that by logarithmically adding all of these sources the average sound power level emitted by all sources and noise producing activities within the building is around 114 dBA, and that if it is assumed all relevant sources simultaneously produce the higher sound levels the resulting total sound power level is 127 dBA.

7.13 Line 26 deducts sound from the Mills & Kettles from this to give the corresponding overall sound power level expected to be emitted by all plant in the new building with average and maximum levels of 113 & 127 dBA respectively.

Existing Operations – Sound Pressure Level at Dwellings

7.14 Calculation Sheet 2 shows the resulting sound pressure level at the closest dwellings. Line 1 shows the resulting total of the existing building from Calculation Sheet 1. Line 2 shows the total from the proposed building. Line 3 shows the sound power level of forklift activity occurring outside of the building. The average level of 95 dBA comprises two forklifts running at all times, and the high level of 98 dBA is four forklifts running at once.

7.15 Line 4 shows a distance of 1.2km from dwellings to the north east on Portview Road. Line 5 shows the resulting distance attenuation of 70dBA between the site and these dwellings.

7.16 Line 6 shows a conservative reduction of 5dBA to account for all screening, ground and atmospheric attenuation between the site and dwellings. In reality, localised screening provided by industrial buildings on the opposite side of Portview Road will provide a somewhat greater reduction than 5dBA.

7.17 Line 7 shows the resulting sound level at the dwellings as if the activities within the site were located outdoors. The average level is 39dBA and the high level is 52dBA.

7.18 Line 8 shows the conservatively estimated effect of building envelope and the local noise control measures considered for noise at work. The reduction for the average level is 20dBA. The reduction for high levels is 5dB higher at 25dBA as most of the high sound level events produced by various activities within the building are composed of higher frequency sounds which would be better attenuated by the building itself. This is not applied to the forklift activities in Line 3 as these occur outdoors.

7.19 Line 9 shows the estimated average sound level at the dwellings of 23dBA and 29dBA for average/ maximum sound levels associated with the existing building. The high level figure is based on the unlikely assumption that all high sound level producing sources occur simultaneously.

Existing Operations – Compliance Measurement Locations

7.20 An extant planning condition highlights four compliance locations around the site with noise limits expressed as L10, 1 hour values. These locations are the access road to the south west of the site, the south of the site, east of the site and north east of the site. A fifth compliance position to the north of the site is provided by the Etex Environmental Noise Monitoring document to assumedly provide a location to assess sound from site at the caravan park receptor to the north. There is also a compliance sound level to be taken at 1m from the housing of the dock conveyor

7.21 Graph 7 of Appendix 2 shows indicative measurements taken at compliance measurement positions 1 through 5. It should be noted that the measurements taken are not the required length to assess whether the existing site is complying with the condition, but are gathered for informative purposes. The LAeq,T is displayed in red, with the L10,T shown in black, and the relevant limits from the condition are shown as a green dotted line for each measurement.

7.22 The first measurement shows Position 1, near the pond on the corner of Marsh Lane and Redland Avenue, which is used to access the existing site, and will be used to access the proposed site. This location is around 250m south of the closest noise generating element of the factory. The compliance sound level for this area is 75dBA. The underlying sound level measured at Position 1 is around 50dBA. Road traffic passing this location produces peaks of up to 75dBA on top of this, increasing the LAeq,T to 60dBA and the L10,T to 64dBA. Local road traffic can pass this measurement location when traversing Marsh Lane.

7.23 Position 2 is located to the south of the site, next to the ring road around the site, 170m from the loudest sound generating activities of the site. The compliance sound level here is the lowest around the site at 58dBA. The LAeq,T was 59dBA and L10,T was slightly above this at 60dBA. It is likely that the lower compliance sound level for this location was chosen due to the intervening structures between the measurement position, and the sound generating element of the factory; however, at the measurement position sound from HGVs in the car park, and traffic passing closer to the measurement position increased the sound level to 75dBA on occasion and contributed significantly to the L10,T level.

7.24 Due to the nature of the L10 parameter, vehicular traffic traversing the site, or working in the vicinity of measurement positions in the case of Positions 2 to 5, and as part of general traffic flow on Marsh Lane in the case of Position 1, will tend to artificially increase the L10 parameter at their respective location. These measurement cannot be extrapolated to the sound level at the closest receptors as some may be near field measurements, and in general the sound measured could be attenuated in ways that are uncertain due to localised screening, and varying distance, atmospheric and ground attenuation between the activities occurring and the receptors.

7.25 Position 3 to the east of the site has a compliance sound level of 62dBA. It is around 15m from a façade of the building, but around 150m from the loudest sound generating elements of the site. This location was heavily screened from sound generating elements of the factory. The LAeq,T was around 51dBA and L10,T was around 52dBA, with traffic in this area being less frequent compared to other compliance monitoring positions.

7.26 The compliance level for position 4 to the north east of the site was 62dBA. The position is around 150m from the loudest sound generating elements of the site and is screened from these by intervening rooms within the building. The underlying sound level in the area was around 50dBA, and passing vehicles generating sound levels of 80dBA increased the LAeq,T to 65dBA and the L10,T to 66dBA. As there was activity happening near to the measurement position, the total measurement time here was comparatively short, and the measurement conditions would not have been representative/suitable due to the proximity of activity occurring nearby.

7.27 Measurement position 5 is to the north of the site. An optional compliance level of 70dBA is in place here. The sound level from the activities within the site were the most apparent here, with the high-pitched sound from the conveyors readily identifiable, occurring some 50m away within the building. The underlying sound level ranges from 50dBA to 60dBA due to activity from within the building, with levels increasing to 70dBA when vehicles passed the measurement position.

7.28 It is likely that the sound limits in place at these positions around the site have been used to extrapolate the sound level present at receptors further away. However, the placement of these locations, and the methodology used to assess the resulting level at nearby receptors is prone to uncertainty.

7.29 Compliance positions 3 and 4 to the east and north east corners of the site respectively, are the closest compliance measurement positions to the most sensitive dwellings on Portview Road. The compliance limit for both of these positions is 62dBA expressed as an LA10 over one hour. These positions are approximately 150m from the sound generating elements of the factory and the dwellings are approximately 1.2km from north eastern facade of the existing and proposed buildings. Extrapolating the distance attenuation from 100m to 1.2km gives a reduction of approximately 18dBA, taking the resulting sound level expected at the dwellings to around 44dBA, although as previously noted it is not appropriate to simply apply a distance correction in this manner.

7.30 Applying the same conservative 5dBA reduction for all screening, ground and atmospheric attenuation between the site and dwellings, this would give a resulting sound level of approximately 39dB $L_{A10,1h}$. Adequate information cannot be inferred from this as the LA10 at the nearby receptors would very likely be influenced by other local sources.

7.31 As the closest receptors near the site are 300m to the north, and the second closest are 1.2km away, placing compliance positions near to the site, where localised screening is in place and there are significant variations in distance to various sources distributed across a large site, does not represent the sound propagation path to the receptors, as the sound from these various sources would travel over other nearby buildings towards receptors.

7.32 The use of the L10 parameter to assess the sound level from the factory may also be unsuitable as there are both standard vehicles and HGVs operating around the site, including close to the measurement positions. These may affect the L10 parameter resulting in artificially inflated results. It is also the case that vehicles, including HGVs, would be generating higher noise levels on the M5 motorway which is 800m and 600m closer to the dwellings to the south east and north east respectively when compared to the site's distance to these receptors. The motorway is also a line source (instead of moving point sources on site) due to the number and distribution of sound sources, resulting in only 3dB distance attenuation per doubling of distance rather than 6 dB for point sources on site.

7.33 Planning Policy Guidance 24: Planning and Noise identified that the aim of the assessment is to protect the noise sensitive receptors. This should be achieved by ensuring that appropriate sound levels are achieved at the receptors. As it is not possible at the receptor locations to accurately measure the sound levels emitted by the site, it is more appropriate to gather measurements at various sources around the site and then determine by calculation, the resulting sound level at the most sensitive receptors, calibrating and adjusting this sound level at distance if needed. This is further recommended as the proposed building renders some of the compliance positions obsolete as these would now be between the buildings, or unequally influenced by elements of the site.

7.34 The compliance limit at the conveyor, identified as C1 in the planning condition, is set at 65dBA when measured at 1m from the conveyor housing. As the conveyor operates at height, the Environmental Noise Monitoring document provided by Etex recommends measuring the sound level at a different location for safety concerns, to calculate the sound level at 1m.

7.35 Measurement 198 shown in Graph 3 of Appendix 1 shows the ambient sound level measured at a distance of 40m from the conveyor housing which was 60dBA. This measurement was influenced by sound from residual elements such as the conveyor motor as the tower door was open while the measurement took place. Moving foliage in gusts of wind also contributed to the measured sound level. In the interest of modelling a worst case scenario, the measurement at 60dBA has been taken as the specific sound level from the conveyor at a distance of 40m although this is overstated due to the influence of the conveyor motor. Due to the length of the conveyor housing, the conveyor would be acting as somewhere between a line and point source at the measurement location. Applying a distance propagation correction from 40m to 1m, and a façade correction of 3dBA for the reflective surface of the factory building, the resulting sound level at 1m would be around 73 to 79dBA.

7.36 However, measurement 197 shown on Graph 3 shows the reverberant sound level taken next to the conveyor within the housing of around 82dBA where there was negligible influence from the conveyor motor in the tower. From experience, it is expected that the conveyor housing would give a level difference of around 20dBA from the internal sound level, indicating approximate compliance with the criterion. The significant difference between this and the level calculated from the 40m measurement indicates the significant uncertainty and safety margin in some of these measurements and analyses.

7.37 While the sound level taken at 1m from the housing can be calculated at a distance, the sound level at any point in the conveyor may vary so it would be prudent to take measurements at varying distances from the conveyor to confirm or calibrate the measurement taken at 1m.

7.38 The most sensitive receptors for the repurposed conveyor system are around 1km to the north east on Portview Road, which are also the most sensitive receptors for the proposed building, so it is important to view the sound emitted from the conveyor in the context of the extension proposals as a whole.

Noise at Work

7.39 In order to comply with the Noise at Work Regulations, the more significant sources of sound within the new building will be attenuated. This will further reduce the sound level breaking out of the building and similarly at the dwellings.

Proposed Factory Operations

7.40 The new building will be located to the south east of the existing site. This site will expand the capacity of the existing operations, and many sound producing activities in place at the existing factory will also be present in the new building.

7.41 The existing site contains equipment and methods of production that are over 20 years old, and it is likely that the new facility will use equipment and methods that are quieter than those currently being utilised. However, in the interest of assessing a worst-case scenario, the overall sound power level calculation for the existing building has been used to assess the new building. It has also been assumed that the building construction may be similar to the existing building, and that the sound reduction from the building façade will be minimal. The effect of localised screening has also not been considered.

7.42 Line 26 of Calculation Sheet 1 shows the total sound power level from all sources that will be present in the new building, totalling 113dBA for the average level and 127dBA for the high level.

7.43 Line 10 of Calculation Sheet 2 adds the calculated level from the existing and proposed buildings, altered by the reductions in Lines 4 to 8, assuming that with both facilities are working at full capacity, and that there will be no reduction in overall sound level from the extension's new processes when compared to the existing operations. The average sound level at the dwellings to the north east will increase by 1dBA, with a worst case high sound level increasing by 2dBA. For comparative purposes, a change of around 3dBA is generally regarded as 'just noticeable'.

Conveyor

7.44 As part of the works, the existing 400m long dock conveyor will be decommissioned and repurposed, re-introducing a sound source in to the area that was there previously.

7.45 An additional 200m of conveyor will be constructed to connect the repurposed conveyor to the existing gypsum storage, and another 100m to connect the conveyor system to the new gypsum storage building bringing to the total length of conveyor in use from 1.1km down to 1km.

7.46 The existing conveyor system is 200m away from the dwellings at the end of Marsh Lane to the north of the site at its closest point. The new conveyor extension will be an additional 100m away at its closest point which provides an additional 1 to 2dB distance attenuation. Any expansion of the conveyor to the new gypsum storage building will be screened from these receptors by the existing factory building.

7.47 The existing dock conveyor is 1.3 km from the dwellings to the northeast whereas the repurposed conveyor will be 1 km away, resulting in a 1dB reduction in distance attenuation which is acoustically negligible.

7.48 It is important to consider the impact of the conveyor in conjunction with the proposed and existing buildings. The conveyor runs almost parallel to the receptors on Portview Road, so while dwellings further to the north on Portview Road may be exposed to sound from the conveyor on its own, other dwellings at a similar distance are exposed to the sound from the conveyor as well as the existing and proposed buildings. If dwellings exposed to sound from the buildings and the conveyor is suitable, then other areas along the conveyor route will be suitable as well.

7.49 At the distances between the conveyor and the receptor, the total length of the conveyor is the primary contributing factor to the overall sound compared with the distribution of the conveyor within the area. This means that even though there are parts of the conveyor line where two conveyors are running side by side (as is the case with both conveyor extensions to the gypsum buildings), the distance from the source and receptor means that the conveyor act as a point source.

7.50 Applying the sound reduction from the conveyor housing to the sound level measurement taken next to the conveyor within the housing would demonstrate approximate compliance with the 65dBA at 1m sound level. We can use the compliance limit to give an indication of the worst-case sound level at the closest receptors.

7.51 It is possible to convert the sound level at 1m to a sound power level by applying a correction for the area of the total conveyor length. This results in a sound power level of around 108dBA. The most sensitive receptors on Portview Road are those that are the closest to the factory buildings, which are 1km from the conveyor at its closest point. Due to the distance between the source and the receptors, this would act as a point source.

7.52 Since the conveyor operates at height, it would appropriate to treat it as a point source with spherical sound propagation. Excluding additional attenuation e.g. due to atmospheric or ground effects, the correction from sound power level to sound pressure level at 1km is 71dBA. This reduction may be slightly understated as the conveyor is 1.2km away from the most sensitive receptor at its furthest point.

7.53 Applying a conservative reduction of 7dBA for screening between the conveyor and receptors, the resulting calculated sound level from the repurposed and extended conveyors is approximately 30dBA.

7.54 It is also possible to assess the impact of sound from the conveyor by considering the change between the existing arrangement, comprising of the dock conveyor to the existing gypsum building and the coal conveyor, with the new arrangement where the existing 400m dock conveyor is decommissioned and 300m of new conveyor is built to connect the coal conveyor to the two gypsum buildings.

7.55 In this case, approximately 75% of the conveyor length is being moved around 200m (20%) closer to the dwellings to the north east. Extending the coal conveyor to the gypsum buildings is introducing less overall conveyor length (slight decrease in sound level) at a closer distance (slight increase in sound level) to the receptors. These two actions result in an acoustically negligible difference as they somewhat cancel each other out.

7.56 Line 11 of Calculation Sheet 2 shows the sound level analysed from the repurposed conveyor of 30dBA.

7.57 Line 12 shows the conservative worst case cumulative level from the existing site, proposed site, and the repurposed/extended conveyor system. The sound level from the site ranges from an average level of 31dBA to a high level of 34dBA.

8.0 Assessment

8.1 At the closest noise sensitive receptor, both factories, and the conveyor system would produce a specific level of between approximately 31dBA and 34dBA. Impulsive and tonal sound characteristics would likely be present within the buildings, however BS4142:2014 states that "*where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level*". Sound from the site will be masked by the residual sound level from the M5 motorway, and by other industrial sources closer to the dwellings so therefore a rating penalty would not be applicable. All specific levels reported are therefore equivalent to their rating levels.

8.2 Adding the sound levels from the proposed building to the existing building results in an increase of 1dBA at the most sensitive dwellings, which is unlikely to be noticeable.

8.3 Considering a worst case scenario for the conveyor operation, the sound level generated by this would be up to approximately 30dBA at the dwellings. This would only be operational when material arrives from the port, and would not be operational 24 hours a day, but may run during any time during the day or night.

8.4 The average sound levels from the existing building, proposed building, and the new conveyor total up to an average of 31dBA at the most sensitive receptors during the day, which would be within suitable criteria to protect indoor resting amenity and the use of gardens during the daytime hours, therefore the proposals are suitable to protect the amenity of nearby residents during the day time period.

8.5 Relevant guidance states that indoor sound levels of up to 30dBA are suitable to protect the amenity of residents during the night. Windows slightly open for ventilation purposes reduce the sound level from outdoors by around 10 - 15dBA. When considering the effect of the sound levels produced by the site, even with the conveyor running during the night time period, the sound level produced would be up to 34dBA outdoors equating to around 19 - 24dBA indoors, which is well below the suitable criterion for protecting night time amenity, therefore the proposals are suitable to protect the amenity of residents during the night.

8.6 Additionally, due to the receptors close proximity to the M5 motorway, it is very likely that the sound levels generated from the proposed site would be masked by road traffic noise from the M5, as well as other residual activity in the area such as other industry.

9.0 Conclusions

9.1 ACC have been instructed on behalf of Etex Engineering Ltd to undertake an acoustic assessment to support a planning application for their new building.

9.2 The predicted operational noise from the new building operations has been modelled and assessed against relevant authoritative guidance to protect the amenity of nearby residents.

9.3 The existing building was producing sound levels of between 23 and 29dBA at the most sensitive dwellings. Adding the predicted sound levels of the proposed extension increases this to between 24 and 31dBA.

9.4 The sound level from the repurposed conveyor system is around 30dBA at the dwellings when the conveyor is operating.

9.5 Combining the sound level from the existing and proposed buildings, and the conveyor system, the sound level at the dwellings is between 31 and 34dBA.

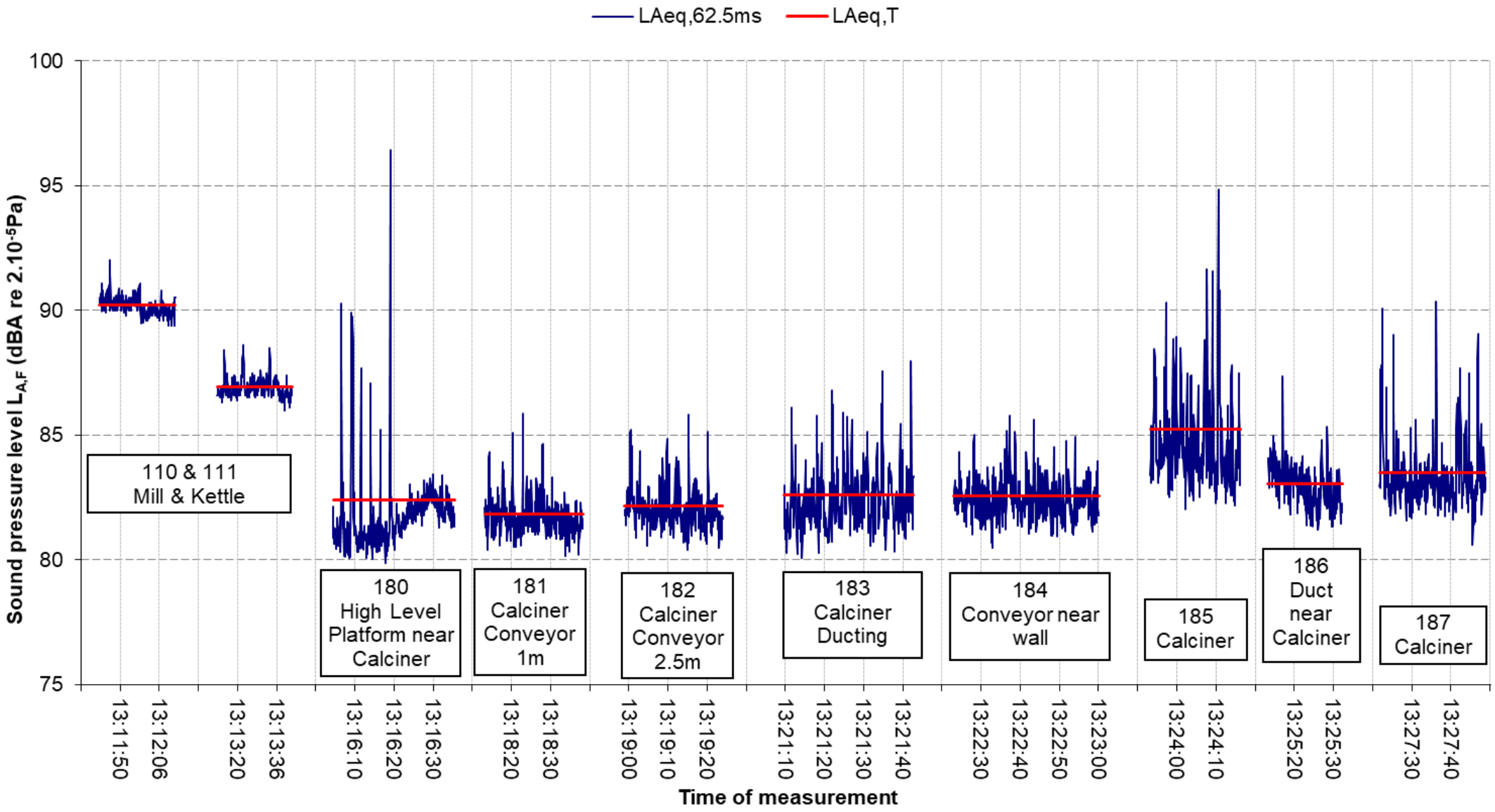
9.6 The predicted insertion loss of the existing and proposed buildings is highly conservative, so the resulting sound levels at the dwellings are likely to be lower than those assessed.

9.7 The proposed development has been found to produce sound levels that are within relevant criteria and therefore the amenity of nearby residents will be properly protected.

Appendix 1 Measurement Graphs

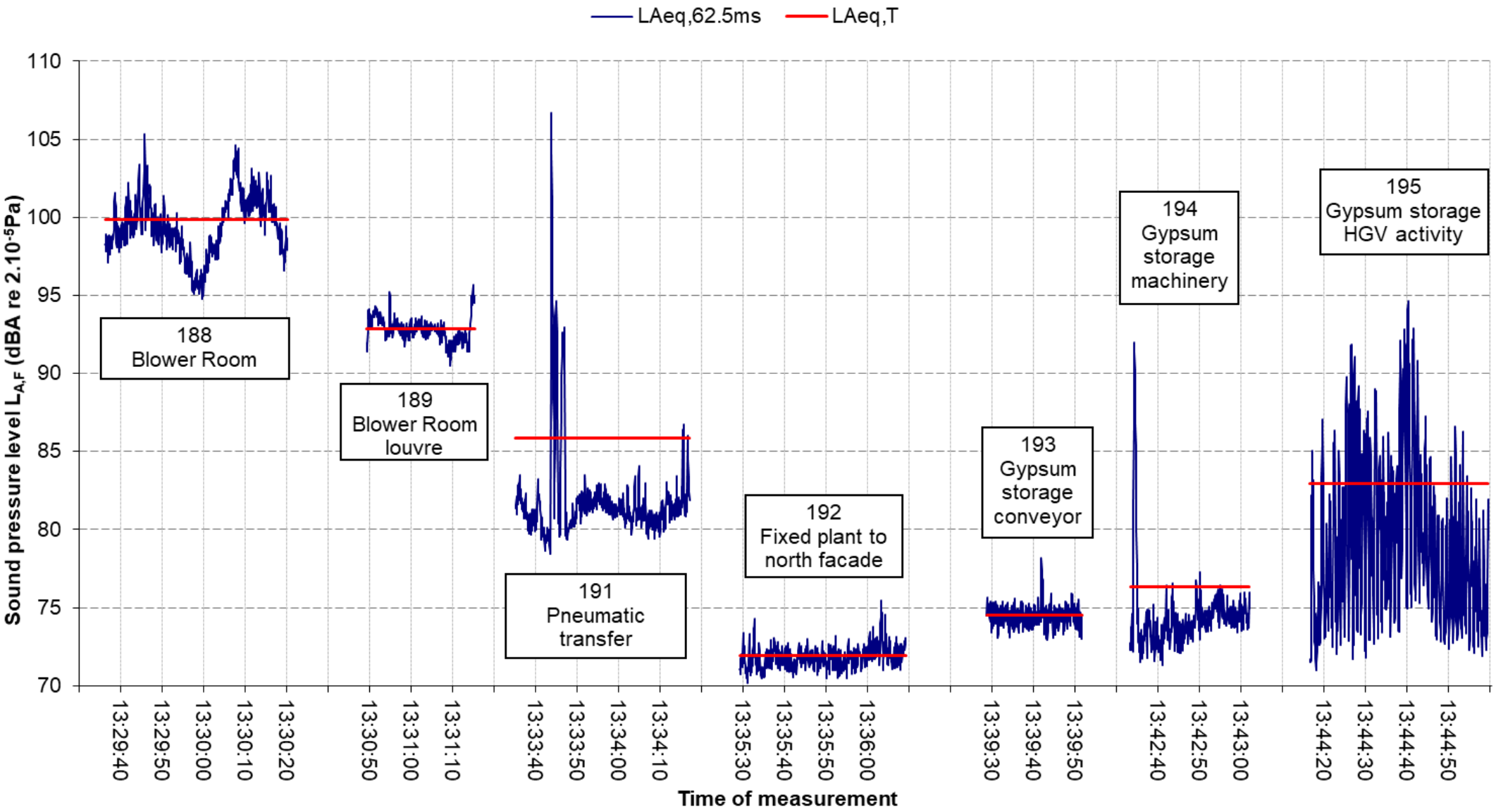
ACOUSTICAL CONTROL Engineers & Consultants

Graph 1 - Sound Level measurements in the Calciner area
Measured 18th May 2020



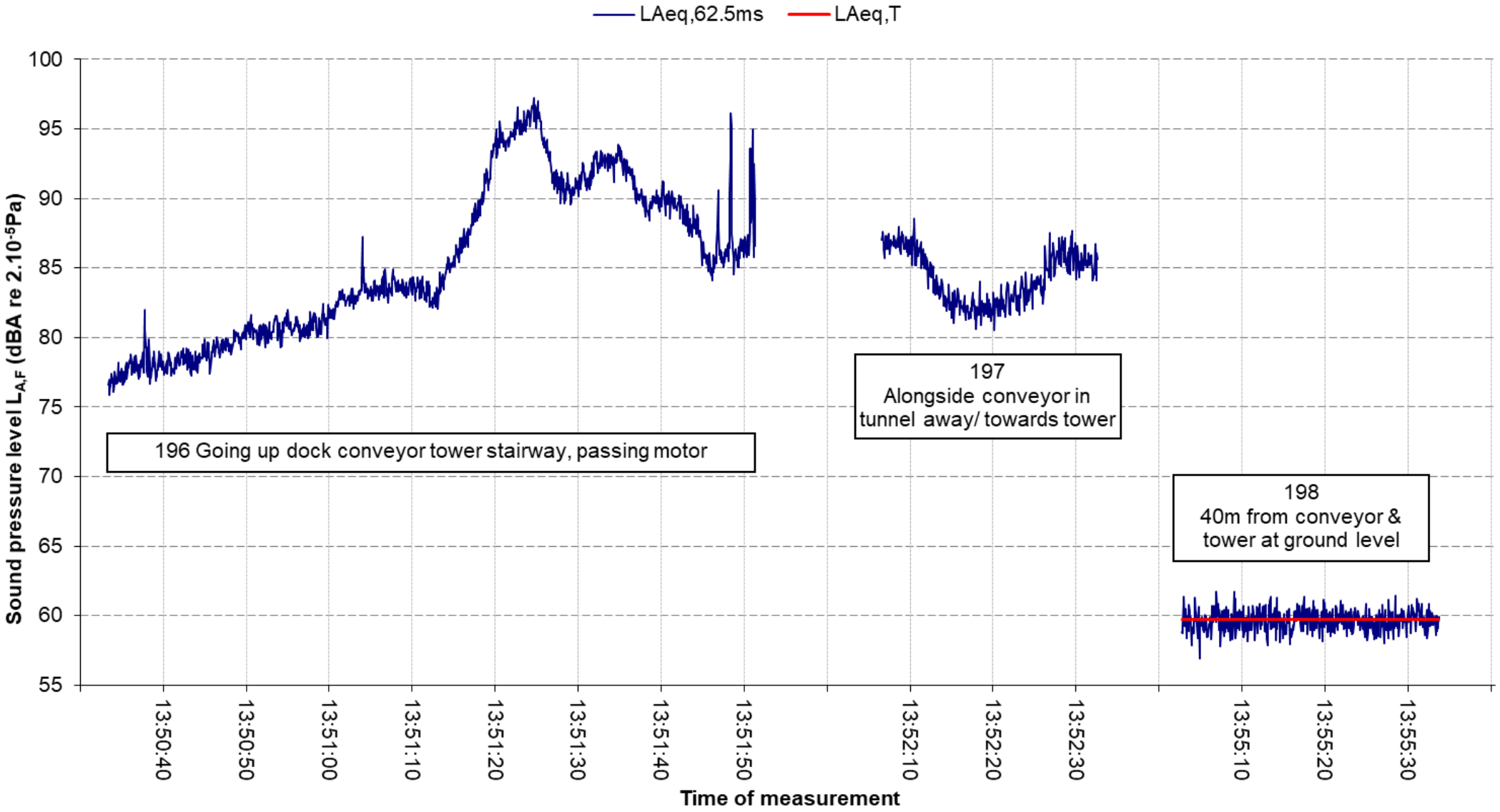
ACOUSTICAL CONTROL Engineers & Consultants

Graph 2 - Sound Level measurements around factory and storage building
Measured 18th May 2020



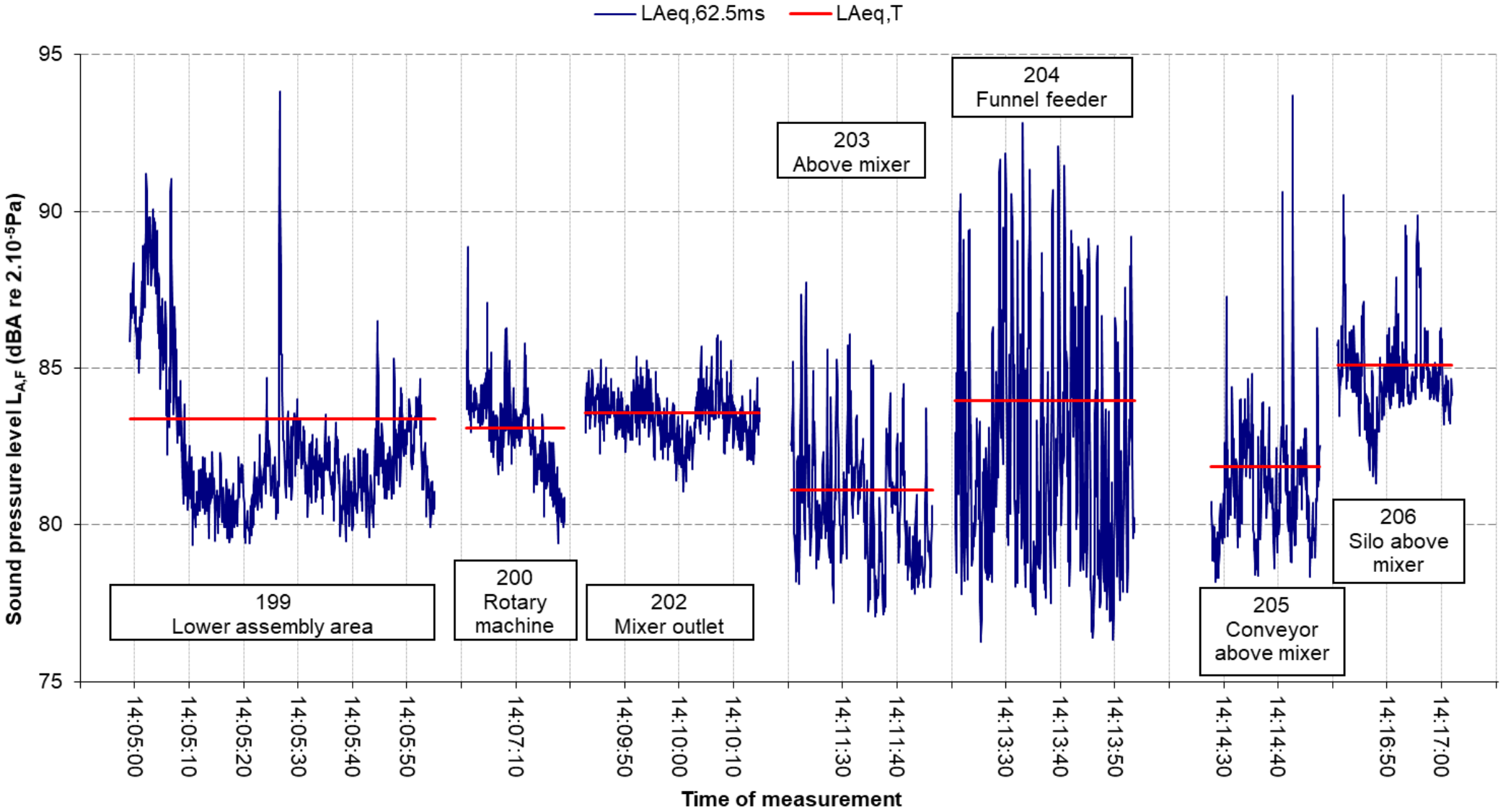
ACOUSTICAL CONTROL Engineers & Consultants

Graph 3 - Sound Level Measurements taken in and around dock conveyor
Measured 18th May 2020



ACOUSTICAL CONTROL Engineers & Consultants

Graph 4 - Sound Level measurements in the mixing area
Measured 18th May 2020



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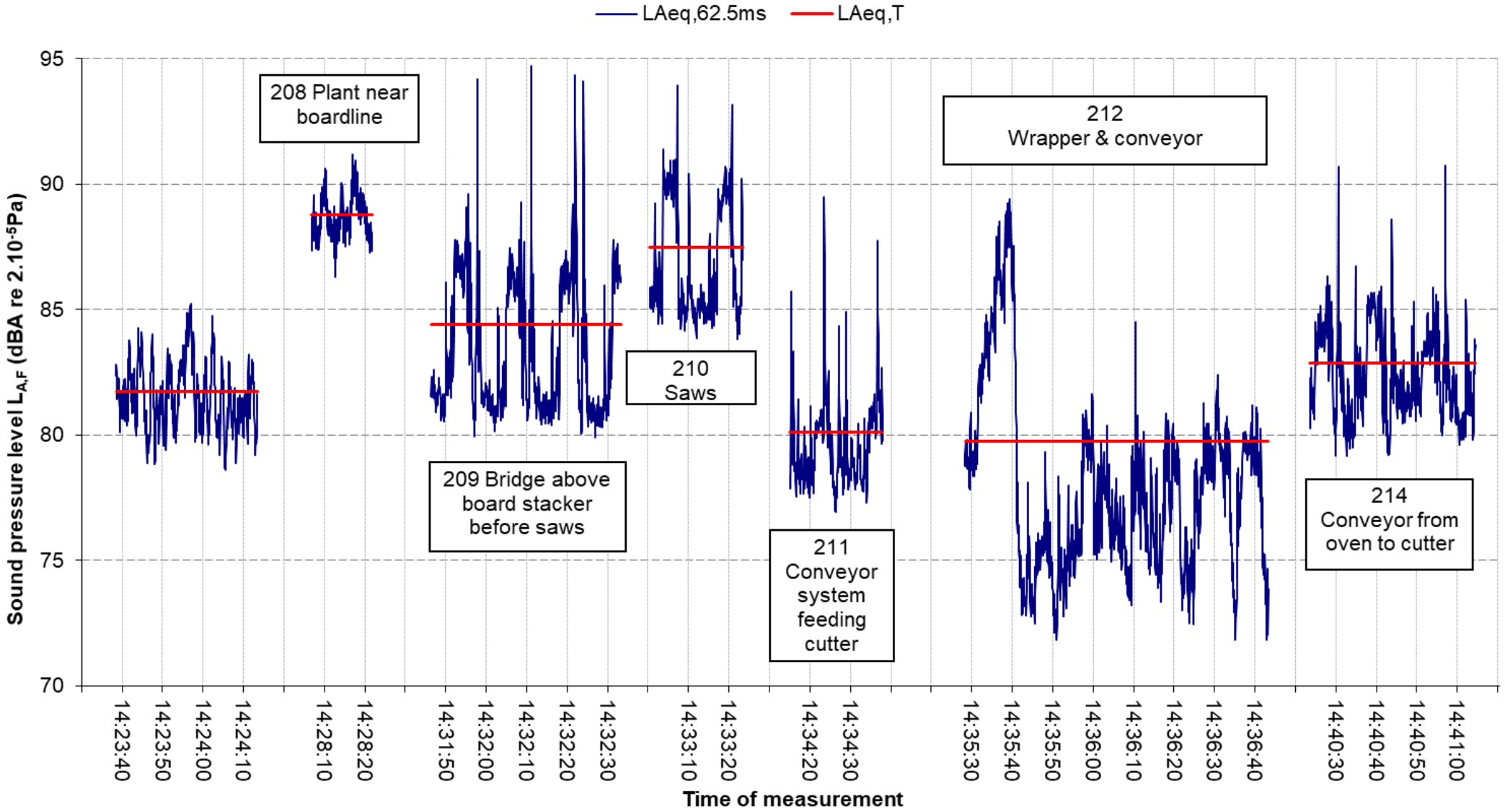
Graph 5 - Sound Level measurements taken in compressor room and near board saws
Measured 18th May 2020



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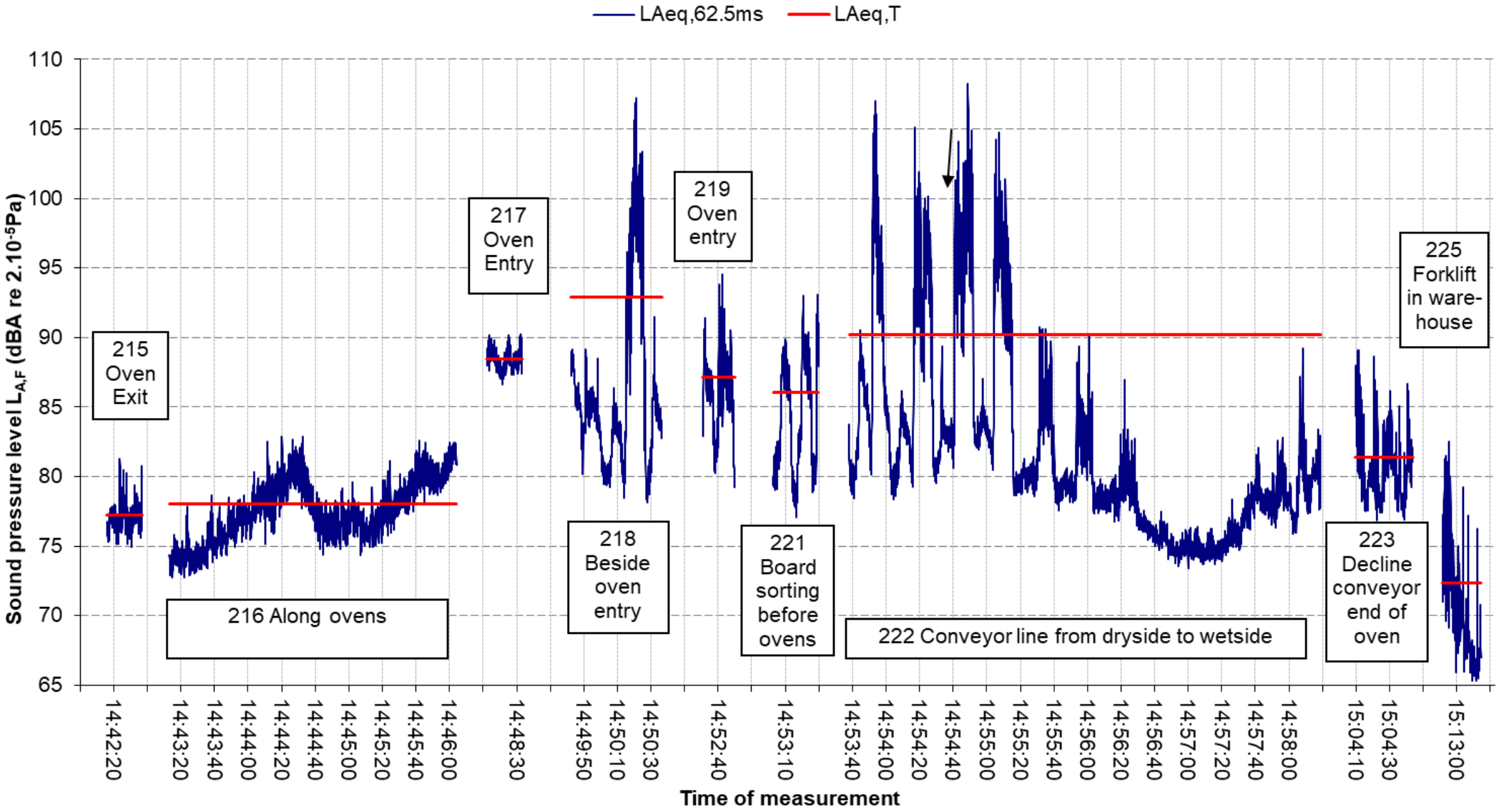
Graph 6 - Sound Level measurements taken near oven system & warehouse measurement
Measured 18th May 2020



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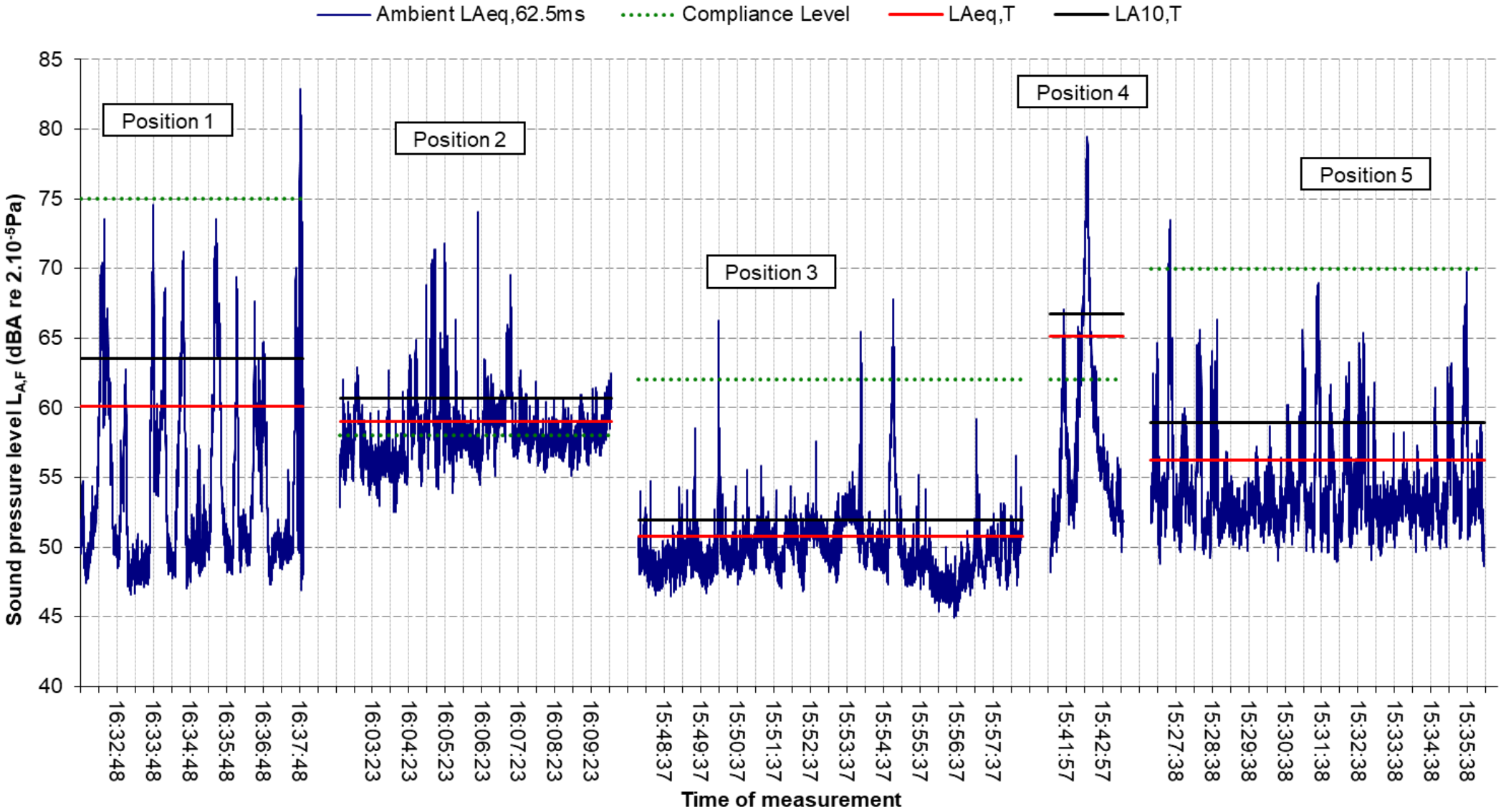
Graph 7 - Existing ambient sound level at the five compliance positions
Measured 18th May 2020



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Appendix 2 Summary of Measurements

No.	Subject	Area	LAeq,T	Notes	Area (m^2)	H	W	D
180	Above Calciner	Calciner	82	Average over area	180	30	20	40
181	Calciner Conveyor	Calciner	82	1m from conveyor	180	30	20	40
182	Calciner Conveyor	Calciner	82	2.5m from conveyor	180	30	20	40
183	Calciner Pipework	Calciner	83	Down one level from above	180	30	20	40
184	Conveyor near wall	Calciner	83	Other sources dominant	180	30	20	40
185	Calciner	Calciner	85	3m from Calciner	180	30	20	40
186	Additional machinery 1	Calciner	83	Ground floor	180	30	20	40
187	Additional machinery 2	Calciner	83	Average over area	180	30	20	40
111	Mill	General	87	At 5m	92	17	17	12
188	Blower Room	General	100	Average over room	42	9	9	3
189	Blower Room louvre	General	93	1m from louvre. Influence from other areas	6		1	2
191	Pneumatic transfer	General	86	LAmax 105dB	20	2	2	6
192	Fixed plant to north façade	General	72	Measured at 10m, discharging north				
193	Conveyor centre of gypsum storage	Gypsum Storage	75	Influenced by other plant				
194	Conveyor/Machine side of storage	Gypsum Storage	76	Dominant source. 10m from area emanating sound	100	30	10	10
195	HGV activity within storage warehouse	Gypsum Storage	83		118	35	20	4
196	Dock conveyor tower	Dock Conveyor	89	Starts at 75dBA, increasing to 95dBA passing motor. 85dB next to conveyor, with influence from motor				
197	Walking along dock conveyor away from motor	Dock Conveyor	85	87 initially, drops to 82 sustained				
198	Dock Conveyor, ground level	Dock Conveyor	60	~40m from position to conveyor, influence from motor, and foliage				
199	Lower assembly area	Mixer	83	Average over area	134	35	20	12
200	Rotary machine	Mixer	83	3m from machine, influence from elsewhere	134	35	20	12
202	Mixer outlet area	Mixer	84	3m from puree outlet	134	35	20	12
203	Above mixer	Mixer	81	Average over area	134	35	20	12
204	Funnel feeder	Mixer	84	3m from feeder	134	35	20	12
205	Conveyor system above mixer	Mixer	82	Average over area	134	35	20	12
206	Silo above mixer	Mixer	85	Average over area	134	35	20	12
207	Additional compressor room	General	82	Average over area	52	12	12	2
208	Compressor near borderline	General	89	Measured inside enclosure				
209	Bridge above cutter	Cutter/Packing	84	Product fed underneath measurement position	36	7	10	1
210	Cutter	Cutter/Packing	87	Cutter at 5m	52	10	15	1
211	Conveyor system feeding cutter	Cutter/Packing	80	Impulsive elements as plasterboard moves through system	32	5	10	1
212	Product wrapper	Cutter/Packing	80	Mainly movement along conveyors, actual wrapper insignificant	50	5	20	
214	Conveyor from oven to cutter	Cutter/Packing	83	3m from conveyors	42	5	15	1
215	End of Ovens	Ovens	77	Near end of oven conveyor	76.4	4.2	30	4
216	Ovens	Ovens	78	Average measurement. Gaps in part of enclosure produce short increases in sound level	436.4	4.2	210	4
217	Conveyors near start of ovens	Ovens	88		116.4	4.2	50	4
218	Alongside oven entrance	Ovens	93	High pitched sound as boards move along conveyors. Increased to 105dB				
219	In front of entrance to ovens	Ovens	87					
221	End of 'wetside'. Boards moving from long conveyor to oven system	Ovens	86		44	10	10	2
222	Wetside to Dryside conveyor/Oven system	Ovens	90	Conveyor insignificant. Measurements shows decrease in level from ovens to cutter (~85 to 75), high pitch sound produces 105 dB increases	436.4	4.2	210	4
223	Conveyor at end of oven	Ovens	81		42	5	15	1
225	Forklift	General	72	78dBA passing at 3m. Loading/unloading negligible	84	15	25	2

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Appendix 3 Calculation Tables

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Calculation Sheet 1 - Overall Sound Power Level (Lw) within Building

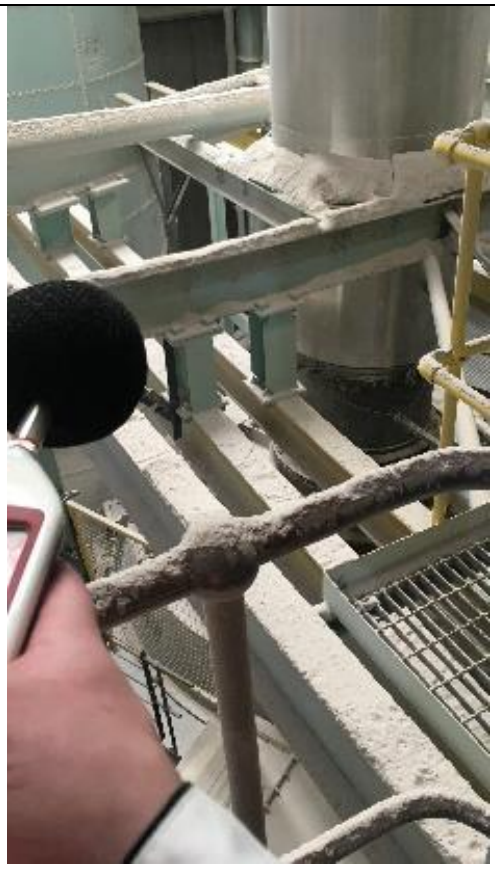
Line	Details	m/ sqm	dBA		Notes
			Av	Max	
1	High Level Conveyor above Calciner (approx. dist & L_{Aeq})	1.0 m	81.8		MS1 Line (artificial precision of 1 decimal
2	High Level Conveyor above Calciner (approx. dist & L_{Aeq})	2.5 m	82.2		MS1 Line (artificial precision of 1 decimal
3	Difference with distance (positive if source is significant)		-0.3		Lines 1 - 2
4	Expected 'Line Source' distance attenuation		-4.0		10 Log (distance$_1$ / distance$_2$)
5	Vicinity of Mills (approx. enveloping area & L_{Aeq})	92 sqm	87	87	
6	Approximate Mills Lw		107	107	Line 5 + 10 Log (Line 5 area). High as excludes reverberant effect
7	Vicinity of Calciner (approx. enveloping area & L_{Aeq})	180 sqm	84	95	Conservative (high) estimated average level
8	Approximate Calciner Lw		107	118	Line 7 + 10 Log (Line 7 area). High as excludes reverberant effect
9	Vicinity of Oven (approx. enveloping area & L_{Aeq})	430 sqm	78	78	
10	Approximate Oven Lw		104	104	Line 9 + 10 Log (Line 9 area). High as excludes reverberant effect
11	Vicinity of Oven Feed (approx. enveloping area & L_{Aeq})	90 sqm	78	105	Average & High levels (when board transferred to Oven rollers)
12	Approximate Oven Feed Lw		98	125	Line 11 + 10 Log (Line 11 area). High as excludes reverberant effect
13	Vicinity of Board Stacking before Saws (approx. enveloping area & L_{Aeq})	40 sqm	84	94	Average & High levels (when two boards stacked)
14	Approximate Board Stacking Lw		100	110	Line 13 + 10 Log (Line 13 area). High as excludes reverberant effect
15	Vicinity of Board Sawing (approx. enveloping area & L_{Aeq})	50 sqm	87	92	Average & High levels (when boards sawn)
16	Approximate Board Sawing Lw		104	109	Line 15 + 10 Log (Line 15 area). High as excludes reverberant effect
17	Vicinity of Mixer (approx. enveloping area & L_{Aeq})	134 sqm	84	88	Average & High levels (impulsive events above mixer)
18	Approximate Mixer Lw		105	109	Line 17 + 10 Log (Line 17 area). High as excludes reverberant effect
19	Vicinity of Gypsum Storage (approx. enveloping area & L_{Aeq})	100 sqm	85	93	Average & High levels (when HGV are moving product)
20	Approximate Gypsum Storage Lw		105	113	Line 19 + 10 Log (Line 19 area). High as excludes reverberant effect
21	Pneumatic Transfer (approx. enveloping area & L_{Aeq})	20 sqm	86	105	Average & High levels (air discharge)
22	Pneumatic Transfer Lw		99	118	Line 21 + 10 Log (Line 21 area). High as excludes reverberant effect
23	Vicinity of indoor Forklift Activity (approx. enveloping area & L_{Aeq})	85 sqm	79	82	Average (4 forklift in use at all times) & High levels (8 forklifts in use at all times)
24	Approximate indoor Forklift Activity Lw		98	101	Line 23 + 10 Log (Line 23 area). High as excludes reverberant effect
25	**Approx. Combined Source Lw within Building**		**114**	**127**	**'High' level assumes all 'High' events occur simultaneously**
26	**Approx. Combined Source Lw within New Building**		**113**	**127**	**Exc. Sources that will not be replicated e.g. Mills & Kettles**

Calculation Sheet 2 - Unattenuated Sound Pressure Level at Dwellings & Target Building Insertion Loss

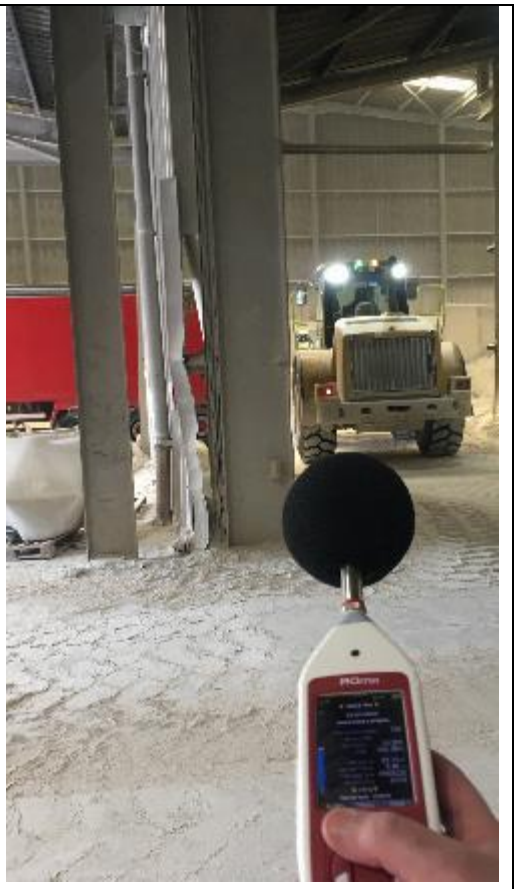
Line	Details		dBA		Notes
1	Approx. Combined Source Lw within Building		114	127	CS1 Line 25
2	Approx. Combined Source Lw within New Building		113	127	CS1 Line 26
3	Vicinity of Outoor Forklift Activity (approx. enveloping area & L_{Aeq})	85	76	79	Average (2 forklift in use at all times) & High levels (4 forklists in use at all times)
	Approximate outdoor Forklift Activity Lw		95	98	Line 3 + 10 Log (Line 3 area). High as excludes reverberant effect
4	Approx. Distance from Building to nearest dwellings (m)	1,200			
5	Approx. Distance attenuation		-70	-70	Hemispherical 'point source' geometrical propagation
6	Conservative propagation path attenuation		-5	-5	Screening, ground/ atmospheric attenuation
7	Unenclosed sound pressure level (Lp) at nearest dwellings		39	52	
8	Estimated minimum likely Building etc. insertion loss		-20	-25	Building envelope, local noise control measures e.g. for Noise at Work
					'High' levels better attenuated as more high frequency dominant
					Not applied to Line 2
9	Estimated Lp at nearest dwellings due to sound within existing building		23	29	
10	Estimated Lp at nearest dwellings due to sound within existing and proposed buildings		24	31	Does not consider reduction in level from proposed building screening existing build and vice versa.
11	Estimated Lp at nearest dwellings due to the repurposed conveyor system		30	30	
12	Estimated Lp at nearest dwellings due to sound from the conveyor, and sound from within the existing and proposed buildings		31	34	

Appendix 4 Photos

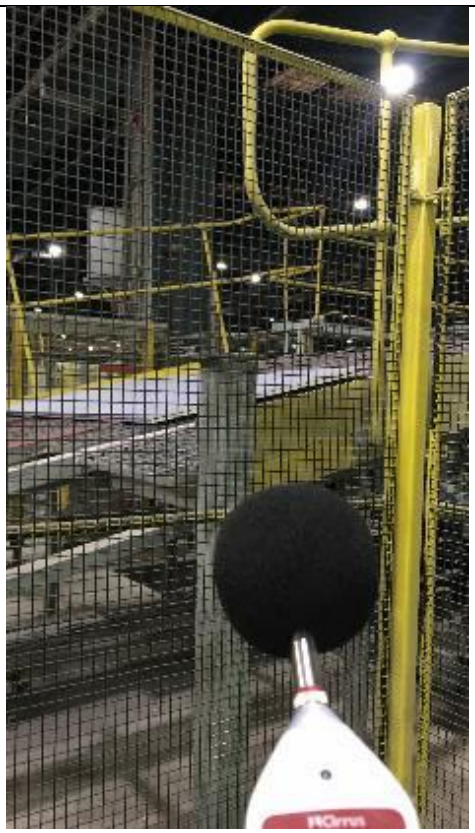
Ref	Photo	Ref	Photo
180	 Above Calciner	Rion 111	 Mill 2
181	 Calciner Conveyor	182	 Calciner Conveyor

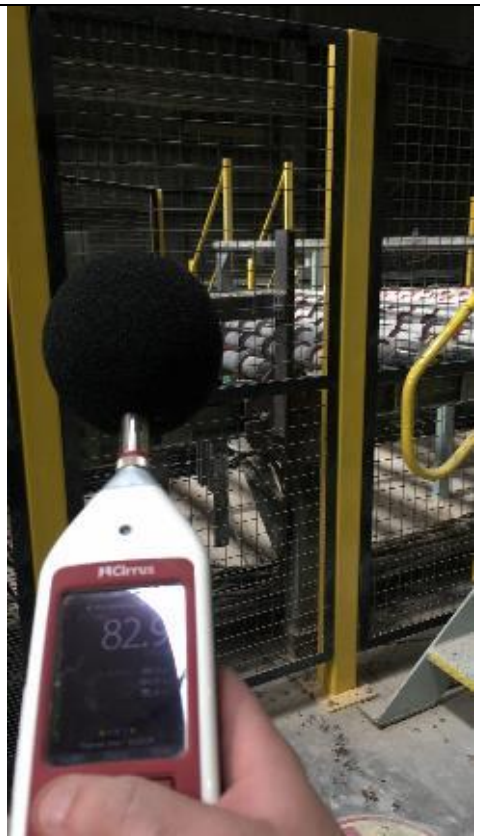
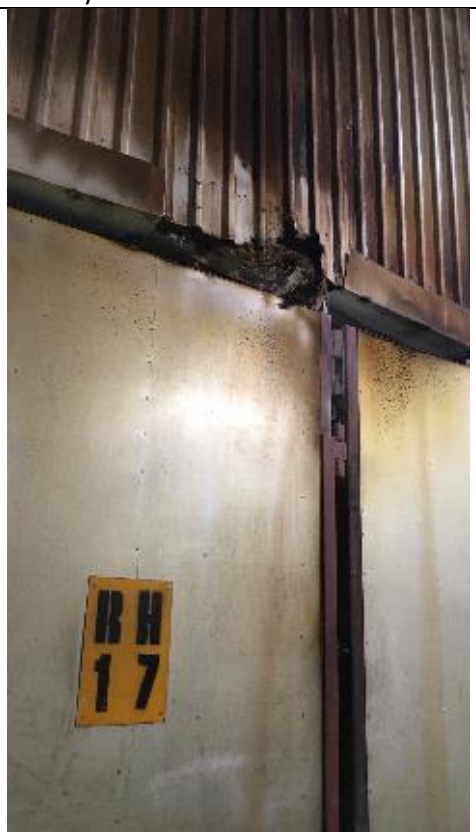
183	 Calciner Pipework	184	 Conveyor near wall

185	 Calciner	186	 Additional machinery 1
187	 Additional machinery 2	193	 Conveyor centre of gypsum storage

194	 Conveyor centre of gypsum storage	195	 HGV activity within storage warehouse
199	 Lower assembly area	200	 Rotary machine

202	 Mixer outlet area	203	 Above mixer
204	 Funnel feeder	205	 Conveyor system above mixer

206	 Silo above mixer	207	 Additional compressor room
209	 Bridge above cutter	211	 Conveyor system feeding cutter

214	 Conveyor from oven to cutter	215	 End of Ovens
216	 Ovens	217	 Conveyors near start of ovens

218	 Alongside oven entrance	222	 Wetside to Dryside conveyor/Oven system
223	 Conveyor at end of oven		

Appendix 5 Calibration Certificates

ACOUSTICAL CONTROL Engineers & Consultants

MEASUREMENT SYSTEMS

CERTIFICATE OF CALIBRATION

Date of Issue: 13 July 2018

Certificate Number: TCRT18/1605

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Approved Signatory

K. Mistry

Customer	Acoustical Control Engineers Broadway Bourne CB23 2TA

Order No.	ACE01			
Description	Sound Level Meter / Pre-amp / Microphone / Associated Calibrator			
Identification	*Manufacturer*	*Instrument*	*Type*	*Serial No. / Version*
	Rion	Sound Level Meter	NA-28	01070575
	Rion	Firmware		2
	Rion	Pre Amplifier	NH-23	70592
	Rion	Microphone	UC-59	00390
	Rion	Calibrator	NC-74	34246504
		Calibrator adaptor type if applicable		NC-74-002
Performance Class	1			
Test Procedure	TP 2.SLM 61672-3 TPS-49			
	Procedures from IEC 61672-3:2006 were used to perform the periodic tests.			
Type Approved to IEC 61672-1:2002	Yes	Approval Number	21.21/07.01	
	If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003			
Date Received	13 July 2018	ANV Job No.	TRAC18/07359	
Date Calibrated	13 July 2018			

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	26 July 2016	1607396	AV Calibration

CERTIFICATE OF CALIBRATION

Date of Issue: 04 July 2019

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Certificate Number: TCRT19/1533

Approved Signatory

K. Mistry

Customer	Acoustical Control Engineers Ltd Broadway Bourn Cambridge CB23 2TA			
Order No.	M250			
Test Procedure	Procedure TP 1 Calibration of Sound Calibrators			
Description	Acoustic Calibrator			
Identification	*Manufacturer* Rion	*Instrument* Calibrator	*Model* NC-74	*Serial No.* 35173527

The calibrator has been tested as specified in Annex B of IEC 60942:2003. As public evidence was available from a testing organisation (PTB) responsible for approving the results of pattern evaluation tests, to demonstrate that the model of sound calibrator fully conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2003, the sound calibrator tested is considered to conform to all the class 1 requirements of IEC 60942:2003.

ANV Job No.	TRAC19/07286	
Date Received	04 July 2019	
Date Calibrated	04 July 2019	
Previous Certificate	*Dated*	04 May 2018
	Certificate No.	TCRT18/1391
	Laboratory	ANV Measurement Systems

ACOUSTICAL CONTROL Engineers & Consultants

Certificate of Calibration

Cirrus Research plc
dedicated to noise measurement

Equipment Details

Instrument Manufacturer	Cirrus Research Plc
Instrument Type	CR:171B
Description	Sound Level Meter
Serial Number	G068268

Calibration Procedure

The instrument detailed above has been calibrated to the publish test and calibration data as detailed in the instrument hand book, using the techniques recommended in the latest revisions of the International Standards IEC 61672-1:2013, IEC 61672-1:2002, IEC 60651:1979, IEC 60804:2001, IEC 61260:1995, IEC 60942:2003, IEC 60942:1997, IEC 61252:1993, ANSI S1.4-1983, ANSI S1.11-1986 and ANSI S1.43-1997 where applicable.
Sound Level Meters: All Calibration procedures were carried out by substituting the microphone capsule with a suitable electrical signal, apart from the final acoustic calibration.

Calibration Traceability

The equipment detailed above was calibrated against the calibration laboratory standards held by Cirrus Research plc. These are traceable to International Standards {A.0.6}. The standards are:

Microphone Type	GRAS 40AP	Serial Number	173198	Calibration Ref.	0170
Calibrator Type	B&K 4231	Serial Number	2564324	Calibration Ref.	A1914
Calibrator Type	B&K 4231	Serial Number	2564325	Calibration Ref.	A1915
Calibrator Type	B&K 4231	Serial Number	2594796	Calibration Ref.	A1916

Calibrated by T. A. Goodall.

Calibration Date 26 June 2019

Calibration Certificate Number 272006

This Calibration Certificate is valid for 12 months from the date above.

Cirrus Research plc, Acoustic House, Bridlington Road, Hunmanby, North Yorkshire, YO14 0PH
Telephone: +44 (0) 1723 891655 Fax: +44 (0) 1723 891742
Email: sales@cirrusresearch.co.uk

ACOUSTICAL CONTROL Engineers & Consultants

Certificate of Calibration

Certificate Number: **130210**
Date of Issue: **26 June 2019**

Instrument

Manufacturer: **Cirrus Research plc** Serial Number: **70553**
Model Number: **CR:515**

Calibration Procedure

The sound calibrator detailed above has been calibrated to the published data as described in the operating manual and in the half-inch configuration. The procedures and techniques used are as described in IEC 60942:2003 Annex B – Periodic Tests and three determinations of the sound pressure level, frequency and total distortion were made.

The sound pressure level was measured using a WS2F condenser microphone type MK:224 manufactured by Cirrus Research plc.

The results have been corrected to the reference pressure of 101.33 kPa using the manufacturer s data.

Date of Calibration: **26 June 2019**

Calibration Results

Measurement	Level (dB)	Frequency (Hz)	Distortion (% THD + Noise)
1	93.98	1000.3	0.28
2	93.98	1000.3	0.31
3	93.99	1000.3	0.31
Average	**93.98**	**1000.3**	**0.30**
Uncertainty	± 0.11	± 0.14	± 0.10

The reported uncertainties of measurement are expanded by a coverage factor of k=2, providing a 95% confidence level.

Cirrus Research plc, Acoustic House, Bridlington Road
Hunmanby, North Yorkshire, YO14 0PH, United Kingdom
Telephone: 0845 230 2434 **Int**: +44 1723 891655
Email: sales@cirrusresearch.co.uk
Web: www.cirrusresearch.co.uk
UK Registration No. 987160

A3 Air Quality Assessment

Air Quality Assessment for Environmental Permit: Etex Bristol Substantial Permit Variation

August 2022

Experts in air quality management & assessment

Document Control

Client	Etex Group	**Principal Contact**	Steve Hemmings

Job Number	J10_12012B_10

Report Prepared By:	Martin Peirce

Document Status and Review Schedule

Report No.	Date	Status	Reviewed by
J10_12012B_10/1/F1	18 August 2022	Final	Laurence Caird (Technical Director)

Air Quality Consultants Ltd
23 Coldharbour Road, Bristol BS6 7JT Tel: 0117 974 1086
24 Greville Street, Farringdon, London, EC1N 8SS Tel: 020 3873 4780
aqc@aqconsultants.co.uk

Registered Office: 23 Coldharbour Road, Bristol BS6 7JT
Companies House Registration No: 2814570

Contents

Tables

Figures

1 Introduction

1.1 This report describes the air quality assessment to support the substantial permit variation for the Etex Bristol site in North Somerset. The assessment has been carried out by Air Quality Consultants Ltd on behalf of Etex Building Performance (Etex).

1.2 Etex is constructing a new plasterboard production line and warehouse facility alongside their existing Bristol plasterboard plant. The new plant will be an autonomous facility but will have a symbiotic relationship between the existing and new warehouses in order to maintain the efficiency of the distribution transport load out. There will also be further interconnection with the existing plant, to allow direct supply of some elements of raw material supplied by processing workshops within the existing plant, and to allow sitewide vehicle movement and safe pedestrian access between both sites. The new plant will house a 50 million square metre per year capacity board line which will allow the combined Bristol site to double its present output capacity. The new plant is being built on a leased area of land currently owned by The Bristol Port Company and previously used as a coal stockyard.

1.3 The proposed development will increase the capacity of the facility and require new gas-fired burners to be installed to produce the energy required to manufacture the plasterboards. In addition, the process involved in the fabrication of the plasterboards leads to emissions of fine dust. There will be some additional road traffic due to the proposed development, both light and heavy vehicles.

1.4 The assessment focuses on nitrogen dioxide, PM_{10} and $PM_{2.5}$ for human health, and on nitrogen oxides (NOx) and nutrient and acid nitrogen deposition for ecological impacts. Emissions of other pollutants such as carbon monoxide are considered to be small compared to the environmental standards and not warranting assessment.

1.5 Emissions from the existing facility have been modelled for completeness, acknowledging that there will be some double-counting to the extent they are included in the background concentrations.

1.6 Table 1 gives the site location. Table 2 summarises the modelled scenarios and sensitivity tests that have been carried out.

1.7 The model input files have been packaged as a zip file and sent alongside this report.

Table 1: Site Location

Parameter	Entry
Site Name	Etex
Site Address	Royal Portbury Docks, Bristol
Grid Reference (approximate centre of new development site) (O.S. X,Y)	350950, 176900

Table 2: Summary of Model Scenarios and Sensitivity Tests

Parameter	Entry
Year for Baseline Conditions	2023, the anticipated year of opening of the expanded facility (see Section 5)
Operating Hours	Assumed to operate continuously (8,760 hours per year)
Meteorological Conditions	Five years of meteorological data used. Each modelled separately. Receptor-specific maxima out of the five years are reported (see Section 6)
Building Wake Effects	Model run with and without nearby buildings. Receptor-specific maxima from the two tests are reported (see Section 6)
Terrain Effects	Model run with and without terrain. Receptor-specific maxima from the two tests are reported (see Section 6)
Surface Roughness	Model run with spatially-variable surface roughness length and fixed 0.5 m surface roughness length. Receptor-specific maxima from the two tests are reported (see Section 6)

2 Site Description

Nearby Sensitive Features

2.1 The facility is in the Royal Portbury Dock area of Bristol, south of the River Avon and close to the Severn Estuary. The land on which the new development will be built was previously used as a coal stockyard. The area around the facility is industrial and port usage, with residential areas at a greater distance. The M5 motorway runs approximately 750 m from the site. Figure 1 shows the site location and highlights the designated habitats within 2 km and 10 km distance lines from the site. Figure 2 presents the same information but focusing on the area within 2 km of the site only. Table 3 summarises the proximity of nearby sensitive features.

2.2 The following Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar sites are within 10 km of the proposed development:

- The Severn Estuary SAC, SPA, Ramsar site and Site of Special Scientific Interest (SSSI). These designations largely overlap so are not clearly distinguished in the figures. At its closest point, the designated area of the Severn Estuary is 320 m from the nearest stack; and
- The Avon Gorge Woodlands SAC and SSSI is located approximately 4,000 m from the proposed development's stacks at its closest point.

2.3 The following ancient woodland (AW) and local nature reserves (LNR) are within 2 km of the proposed development:

- Hails Wood AW, 1,650 m from the nearest stack;
- Longlands Wood AW, 1,600 m from the nearest stack; and
- St George's Flower Bank LNR, 1,500 m from the nearest stack.

2.4 There are no national nature reserves or other SSSIs within 2 km of the proposed installation.

2.5 Local authority Air Quality Management Areas (AQMAs) are also shown in these figures. The nearest AQMA, called Bristol AQMA, is about 7,400 m from the facility at its closest point. The former Cribbs Causeway AQMA adjacent to the M5 Junction 17 roundabout was formally revoked in July 2020 as nitrogen dioxide concentrations within the AQMA have consistently been below the annual mean objective since 2010 (South Gloucestershire Council, 2021).

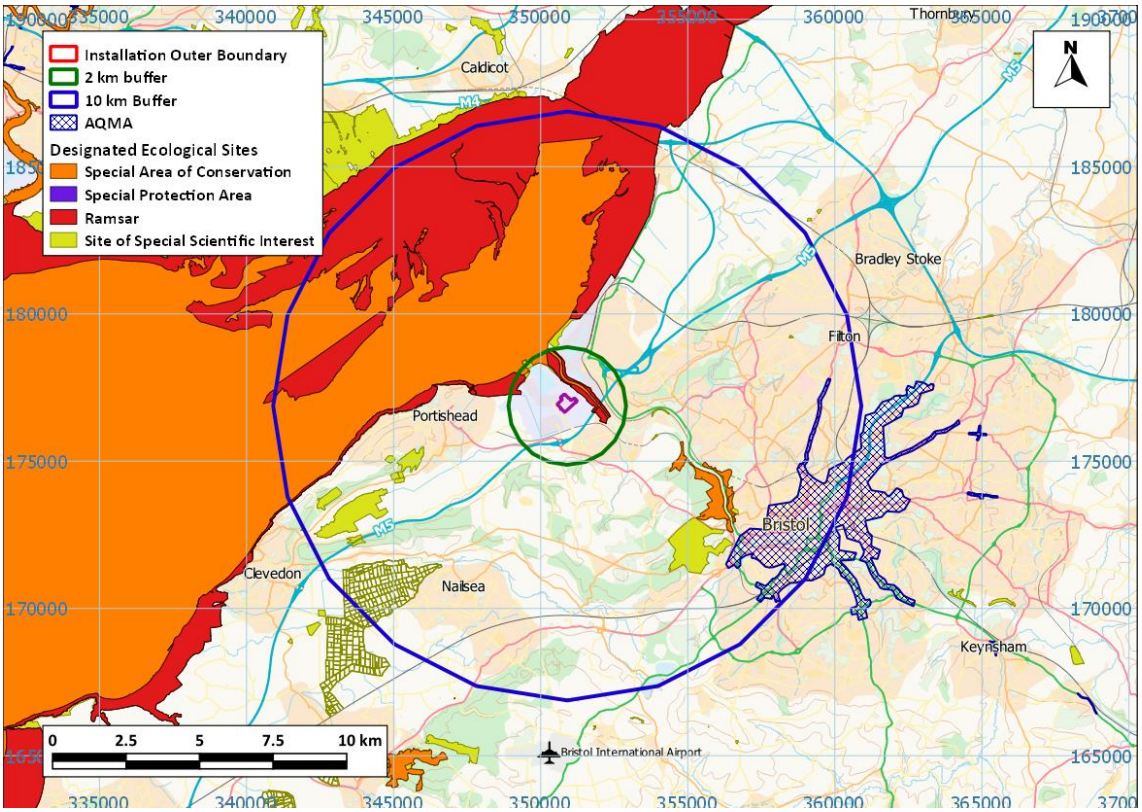


Figure 1: Site Location, AQMAs, SACs, SPAs, Ramsar Sites and SSSIs Within 10 km

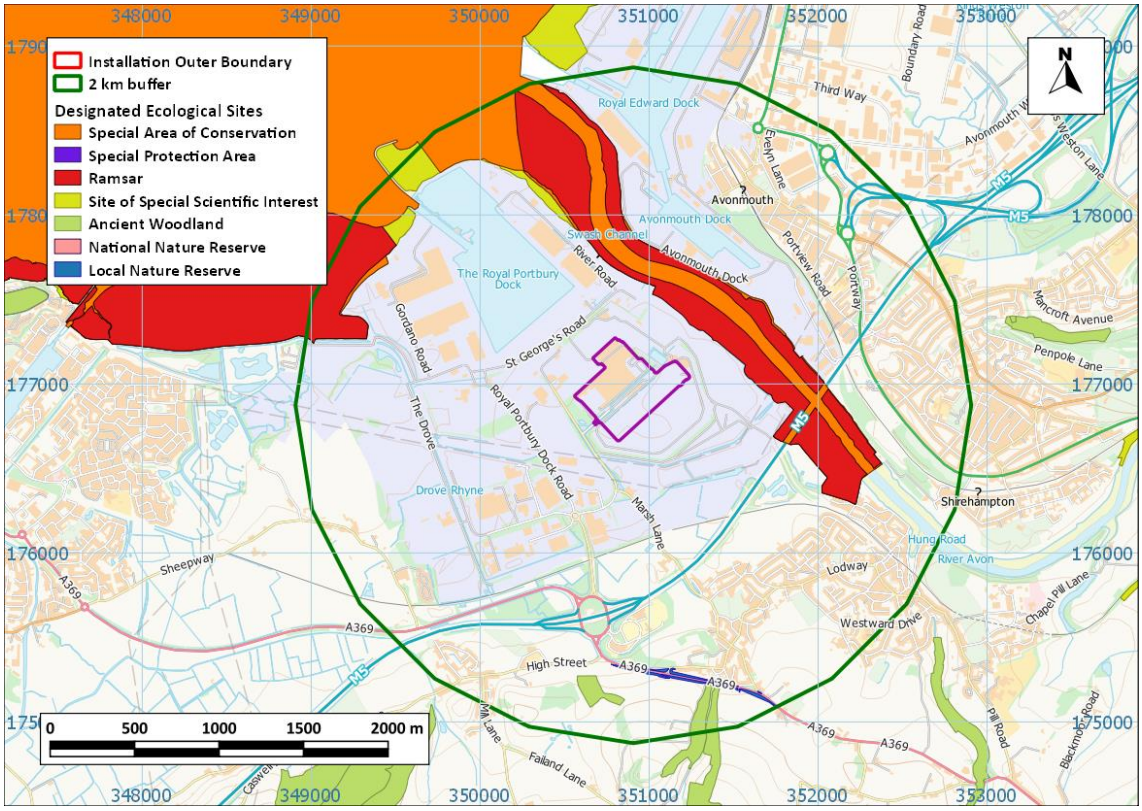


Figure 2: Site Location, AQMAs, SACs, SPAs, Ramsar Sites, SSSIs, AW and LNRs Within 2 km

Table 3: Summary of Nearby Sensitive Features

Feature	Description	Distance from Nearest Stack
Nearest roadside human receptor	Residential properties, Marsh Lane	900 m
Nearest non-roadside human receptor	Caravan Park, Marsh Lane	250 m
Nearest SAC, SPA, Ramsar site or SSSI	Severn Estuary SAC, SPA, Ramsar site and SSSI	340 m
Receptors within the downwash cavity length from the nearest edge/side of the building?	There are no receptors downwind of the building within the region of potential downwash effects	n/a
Sensitive receptor setting	Mixed	n/a
Sensitive receptors near an A road or motorway network?	Yes	900 m
Sensitive receptors within an AQMA declared for NO_2?	Yes	7,400 m

Topography and Terrain

2.6 Figure 3 shows the terrain across the modelled study area using Ordnance Survey (OS) Terrain 50 data. The area immediately surrounding the site is broadly flat, such that the base of the stacks from which the plant exhausts is approximately at the same elevation as the base of the on-site buildings and nearest human health receptors.

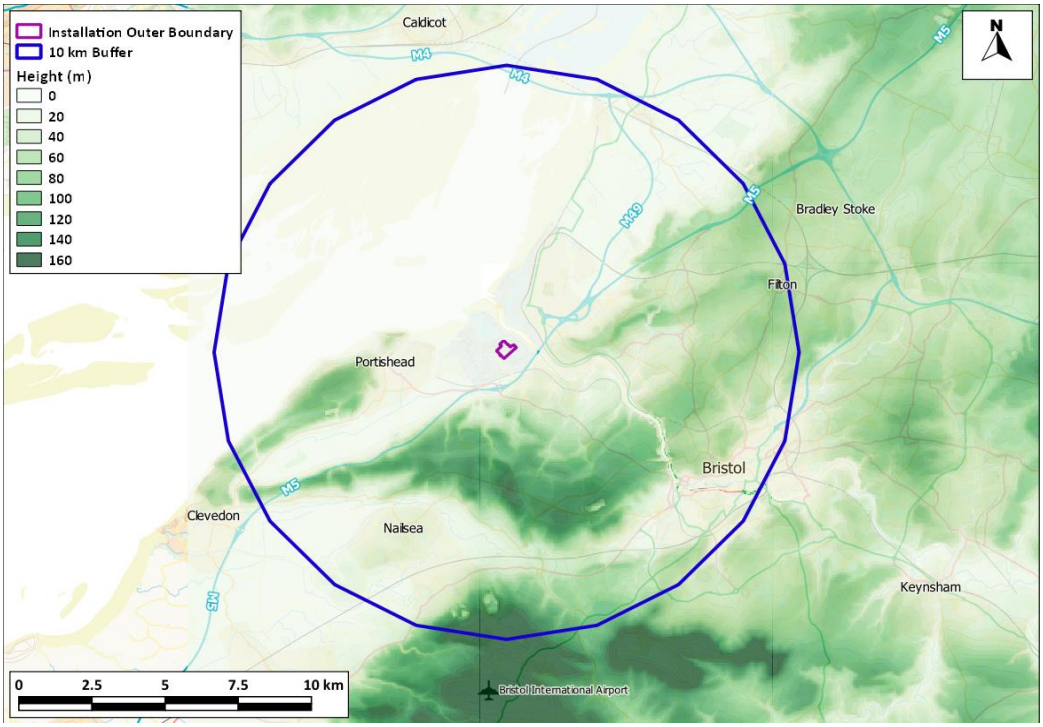


Figure 3: Terrain across Modelled Area

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3 Description of Process

Overview of Plant Requiring Permit

3.1 The proposed development will include several natural gas-fired air heater burners, venting through three main stacks: two stacks for the two-stage heat exchanger at the dryer outlet and one for the calciner.

3.2 The gypsum dryer is a combi-dryer. The first half is divided into 22 cross ventilated zones with fan-driven air circulation within each zone; 19 of them have a gas burner of 1.4 MW each to warm the air in circulation. The second half is a longitudinal fan-driven air circulation zone, which has a gas burner of 5.3 MW to warm the air in circulation within this zone. The total thermal output power which will allow evaporating the water contained in the manufactured product (plaster boards) is therefore approximately 32 MW.

3.3 The wet air is vented through a stack, after passing through a two-stage heat exchanger which warms fresh air entering the dryer and used for burner combustion. These burners are a low-NOx design. Use of selective catalytic reduction (SCR) abatement equipment is considered unsuitable, as SCR works most efficiently at temperatures above 350 °C but the process air always remains below 300 °C.

3.4 The calciner workshop is used to calcine natural gypsum with warm air. The air is warmed by a gas burner with a thermal output of 19 MW, then passed through the calciner where the gypsum is calcined (calciner inlet air temperature 600 °C , calciner outlet air temperature 165 °C). The air in the closed circuit is moved by a fan with a maximum throughput of 200,000 m^3/h. After the calcination process, part of this air is vented (72,000 m^3/h) through a stack, after passing through a heat exchanger which warms fresh air entering the calciner and used for burner combustion (35,000 m^3/h). These burners are a low-NOx design to avoid the need for end-of-pipe abatement.

3.5 In addition, the proposed development will also include several space extract stacks which will provide point sources of dust emissions. These are fitted with dust filters. All these sources will emit up to 10 mg/m^3 of fine dust, which for the purpose of this assessment has been assumed to correspond to PM_{10} (particulate matter with an aerodynamic diameter less than 10 µm). To provide a worst-case assessment of $PM_{2.5}$ (particulate matter with an aerodynamic diameter less than 2.5 µm), the total fine dust emissions have also been assumed to correspond to $PM_{2.5}$. All building extracts through dust filters will operate 100% of the time, as for the combustion sources.

3.6 The assumed specifications for these point sources (thereafter collectively referred to as 'plant') are set out in Section 6.

3.7 Figure 4 shows the site plan and layout. Details of buildings and stack locations, as modelled, are shown in Figure 6.

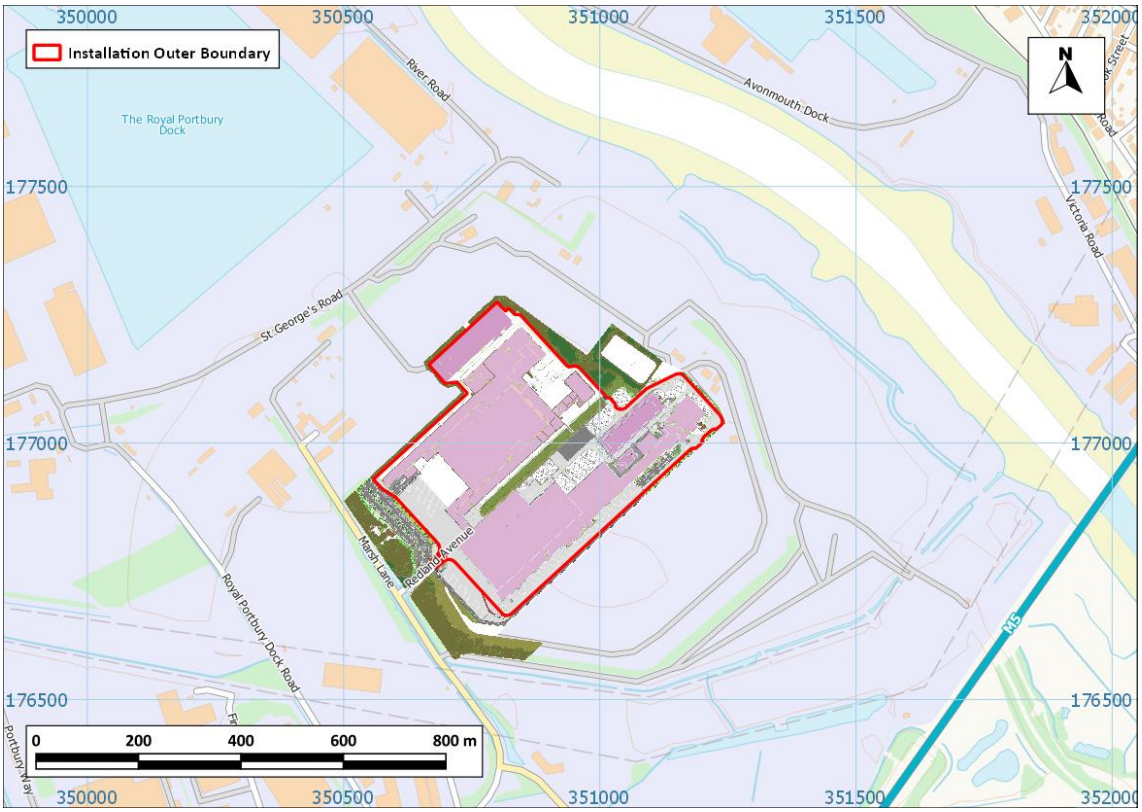

Figure 4: Site Layout (Existing and Proposed)

For clarity, the installation boundary shown is the outermost boundary only; some parts inside the boundary are excluded from the proposed installation.

4 Environmental Standards

4.1 The relevant Air Quality Standards (AQS) for human health impacts are set out in Table 4 (EA, 2022).

Table 4: AQS for Human Health

Pollutant	Averaging Period	AQS (µg/m^3)	Acceptable Exceedance Criteria
NO_2	Annual Mean	40	Zero exceedances
	1-hour	200	Not to be exceeded more than 18 times a year
Fine Particles (PM_{10})	24-hour Mean	50	Not to be exceeded more than 35 times a year
	Annual Mean	40 [a]	Zero exceedances
Fine Particles ($PM_{2.5}$)	Annual Mean	25	Zero exceedances

[a] A proxy value of 32 µg/m^3 as an annual mean is used in this assessment to assess the likelihood of the 24-hour mean PM_{10} objective being exceeded. Measurements have shown that, above this concentration, exceedances of the 24-hour mean PM_{10} objective are possible (Defra, 2018b).

4.2 The AQS for NO_2 are defined as UK objectives within the Air Quality (England) Regulations (2000) and the Air Quality (England) (Amendment) Regulations (2002). The same numerical values are also set as European Limit values (The European Parliament and the Council of the European Union, 2008).

4.3 The objectives apply at locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective. Defra explains where these objectives will apply in its Local Air Quality Management Technical Guidance (Defra, 2018). The annual mean objectives are considered to apply at the façades of residential properties, schools, hospitals etc.; they do not apply at hotels. The 1-hour mean objective for nitrogen dioxide applies wherever members of the public might regularly spend 1-hour or more, including outdoor eating locations and pavements of busy shopping streets. In the UK, only monitoring and modelling carried out by UK Central Government meets the specification required to assess compliance with the limit values and specific monitor and receptor siting requirements apply. Neither the objectives nor limit values apply in places of work where members of the public have no free access and where relevant provisions concerning health and safety at work apply (AQC, 2016).

4.4 Table 5 sets out the relevant critical levels and critical loads for the designated ecological sites in the study area, as taken from the Air Pollution Information System (APIS) website (APIS, 2021).

Table 5: AQS for Designated Ecological Sites

Site	Maximum 24-hour Mean NOx (µg/m^3)	Annual Mean				
		NOx (µg/m^3)	Nutrient Nitrogen Deposition (kgN/ha/yr)	Acid Deposition (keq/ha/yr)		
				MaxCLminN	MaxCLmaxN	MaxCLmaxS
Severn Estuary (SAC, SPA, SSSI)	200	30	20	Not sensitive	Not sensitive	Not sensitive
Avon Gorge Woodlands (SAC, SSSI)	200	30	15	0.142	1.219	1.077
Hails Wood (AW)	200	30	10	0.142	2.743	2.601
Longlands Wood (AW)	200	30	15	0.142	2.737	2.595
St George's Flower Bank (LNR)	200	30	15	0.856	4.856	4

4.5 The environment standard for daily mean NOx is 200 µg/m^3 for detailed assessments where the ozone concentration is below the AOT40 critical level of 6,000 h µg/m^3 and the sulphur dioxide concentration is below the lower critical level of 10 µg/m^3, or 75 µg/m^3 otherwise. Monitoring data from Defra's Automatic Urban and Rural Monitoring Network (AURN) from stations within 50 km of the Etex site has been reviewed to determine if ozone or sulphur dioxide are above their critical levels. Four stations measure ozone (Bristol St Paul's, Cardiff Centre, Charlton Mackrell and Cwmbran Crownbridge) and one station measures sulphur dioxide (Cardiff Centre). Data for 2019 (i.e. pre-pandemic) has been used.

4.6 Monitored annual mean concentrations of sulphur dioxide for 2019 are 1.37 µg/m^3 at Cardiff Centre, less than 15% of the critical level. According to APIS (APIS, 2021), the maximum sulphur dioxide concentration anywhere across the Severn Estuary protected area is 2.61 µg m^{-3} or 26% of the critical level.

4.7 Monitored AOT40 concentrations for 2019 vary widely in the range 691 h µg/m^3 (at Cardiff Centre) to 3198 h µg/m^3 (at Cwmbran), giving a maximum of 53% of the standard.

4.8 It is concluded that both ozone and sulphur dioxide concentrations are below their critical levels. The appropriate critical level for daily mean NOx concentrations is therefore 200 µg/m^3.

5 Baseline Conditions

Human Health

5.1 Figure 5 sets out the background annual mean NO_2 concentrations in the study area taken from Defra's published maps for 2023 (Defra, 2021a).

5.2 Annual mean NO_2 concentrations in the study area as measured by Bristol City Council are given in Table 6. These include both roadside and background sites, with the measurements at the roadside sites higher than those at background sites. Monitored concentrations at Receptor 16 are considerably higher than PCM concentrations, and may be influenced by a local industrial source. The other monitoring locations are located close to either the A4 or M5 roads and are likely to be influenced by local traffic conditions, or are a considerable distance from the site and likely to be influenced by other urban sources.

5.3 The monitoring closest to the site is undertaken using diffusion tubes. There are seven continuous monitors in Bristol, but the nearest is over 8.5 km from the site (501, Colston Avenue), and these are therefore considered unrepresentative of concentrations in the study area as they will be strongly influenced by other urban sources.

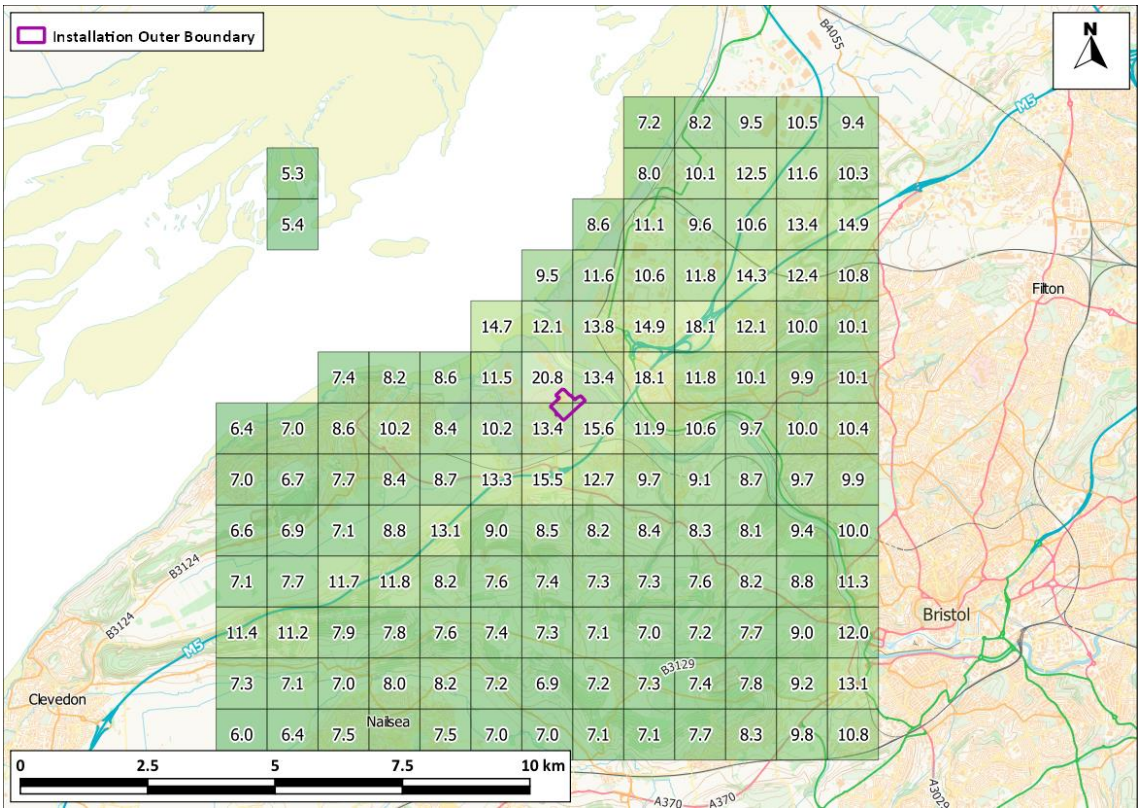

Figure 5: Defra's Predicted NO_2 Background Concentrations in the Area Surrounding the Site, 2023 (µg/m^3)

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Table 6: Summary of NO_2 Monitoring (2016-2020) [a]

Site No.	Site Type	Location	2016	2017	2018	2019	2020
Diffusion Tubes - Annual Mean (µg/m³)							
16	Roadside	Third Way	35.7	35.2	32.6	28.6	23.2
489	Roadside	Avonmouth Road No 12	38.6	37.7	35.5	28.6	22.8
490	Roadside	Avon School Barrack's Lane	32.4	31	26.8	22.4	18.6
491	Roadside	Avonmouth Road No 76	36.5	34.4	33.5	27.3	22
503	Urban Background	Sea Mills Pharmacy	–	–	19.1	–	–
504	Urban Background	Avonmouth Primary	–	–	26.7	–	–
Objective			**40**				

[a] Data downloaded from the Bristol City Council Annual Status Report (BCC, 2019) (BCC, 2021).

Summary of Baseline Concentrations

5.4 In the absence of representative monitoring data, baseline annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations used in this assessment have been taken from the Defra maps (Defra, 2021a). The contribution from road traffic on the M5 motorway has been modelled explicitly (as described in detail in Appendix A3).

Designated Ecological Sites

5.5 The estimated annual mean background NOx concentrations at the designated ecological sites have been derived using Defra's background maps (Defra, 2021a). The baseline nutrient nitrogen and acid deposition fluxes have been defined using APIS (APIS, 2021) and are 1 km x 1 km grid square averages based on the three year mean between 2018 and 2020. The derived values are presented in Table 7. (Details of the receptors are given in paragraph 6.12.)

5.6 The annual mean NOx concentrations are well below the critical level of 30 µg/m³ at all receptors. Baseline nutrient nitrogen deposition fluxes are just below the site-specific critical load (see Table 5) at the Severn Estuary (E1–E9), but substantially above the respective critical loads at the Avon Gorge Woodlands SAC (E10) and at the local nature sites (E11–E13), as is the case for very many designated ecological sites across the UK.

Table 7: Background NOx Concentrations and Deposition Fluxes at Designated Ecological Sites

Receptor ID	Description	NOx (µg/m³)	Nutrient Nitrogen Deposition (kgN/ha/yr)	Acid Deposition (keq/ha/yr)	
				N Component	S Component
E1	Severn Estuary	8.97	18.9	1.4	0.2

Receptor ID	Description	NOx (µg/m^3)	Nutrient Nitrogen Deposition (kgN/ha/yr)	Acid Deposition (keq/ha/yr)	
				N Component	S Component
E2	Severn Estuary	15.41	17.6	1.3	0.1
E3	Severn Estuary	20.47	17.6 [a]	1.3 [a]	0.1 [a]
E4	Severn Estuary	31.14	18.1 [a]	1.3 [a]	0.2 [a]
E5	Severn Estuary	18.29	17.6 [a]	1.3 [a]	0.2 [a]
E6	Severn Estuary	18.29	17.6 [a]	1.3 [a]	0.2 [a]
E7	Severn Estuary	18.29	17.6 [a]	1.3 [a]	0.2 [a]
E8	Severn Estuary	21.25	17.6	1.3	0.2
E9	Severn Estuary	15.75	18.2 [a]	1.3 [a]	0.2 [a]
E10	Avon Gorge Woodlands	10.46	34	2.4	0.2
E11	Hails Wood AW	16.85	29.68	2.12	0.17
E12	Longlands Wood AW	20.98	29.68	2.12	0.17
E13	St George's Flower Bank LNR	16.85	16.66	1.19	0.14

[a] Deposition data not available in APIS for these locations. Data for an adjacent grid square has been used instead.

6 Modelling Methodology

6.1 Modelling has been carried out in line with EA documents: *"Air emissions risk assessment for your environmental permit"* (EA, 2022) and *"Environmental permitting: air dispersion modelling reports"* (EA, 2019).

Dispersion Model

6.2 Impacts from plant have been predicted using the ADMS-5.2 dispersion model developed by Cambridge Environmental Research Consultants (CERC). ADMS-5.2 is a new generation model that incorporates a state-of-the-art understanding of the dispersion processes within the atmospheric boundary layer. ADMS is widely used for assessments of this type and has been extensively validated[1]. It is considered suitable for the current assessment.

6.3 Emissions from road traffic on the M5 (used to determine baseline concentrations at receptors close to the M5) have been modelled using the ADMS-Roads dispersion model dev eloped by CERC. This is a close relative of ADMS 5.2 with optimisations for modelling road traffic (see Appendix A3 for roads modelling methodology).

Emission Parameters: New Sources

6.4 Operational parameters have been determined from data provided by Etex. These have been used as the basis for the exhaust and pollutant emission calculations, alongside the emission limit values. The stack diameter and stack height has been provided by Etex. Emission points A35, A36 and A38–A47 have a common stack and have been combined. Emission points A32 and A52, representing the two heat exchangers, are immediately adjacent and have been treated as a single stack within the model. Emission point A51 (Emergency Stack) is not used in normal operation and have not been modelled. Stack locations, along with the existing stacks and the buildings as modelled, are shown in Figure 6.

Table 8: Stack Parameters for New Emissions Sources

Ref.	Source Description	Release Height (m)	Stack Diameter (m)	Coordinates
A32,A52	Heat Exchanger	18	1.4	350972, 176834
A33	Dedusting System - Stucco Silo	27	0.4	351158, 177034
A34	Dedusting System - Stucco Circuit	14.5	0.2	351135, 177031
A35-A36, A38-A47	Dedusting (combined)	13	0.5	351160, 177029

[1] https://www.cerc.co.uk/environmental-software/model-validation.html

Ref.	Source Description	Release Height (m)	Stack Diameter (m)	Coordinates
A37	Dedusting Dust Collector - Bulk Bag Unloading	13	0.1	351144, 177040
A48	Dedusting Dust Collector - Mixer	8	0.2	351152, 177015
A49	Main Exhaust Air Stack	36	2.8	351048, 176967
A50	Dedusting System Dividing Saw	34	0.6	351035, 176947

Table 9: Emission Parameters for New Emissions Sources

Ref.	Volume Flux (Am^3/s)	Temperature (°C)	Efflux Velocity (m/s)
A32,A52	171,000	75	30.9
A33	4,000	Ambient	8.8
A34	4,000	Ambient	35.4
A35-A36, A38-A47	7,300	Ambient	11.1
A37	300	Ambient	7.4
A48	1,200	Ambient	10.6
A49	216,900	72	9.8
A50	13,000	ambient	14.7

Table 10: Emission Rates for New Emissions Sources

Ref.	NOx Concentration (mg/Am^3)	PM10 Concentration (mg/Am^3)	NOx Emission Rate (g/s)	PM_{10} Emission Rate (g/s)
A32,A52	< 50	–	2.38	0
A33	–	< 10	0	0.011
A34	–	< 10	0	0.011
A35-A36, A38-A47	–	< 10	0	0.020
A37	–	< 10	0	0.001
A48	–	< 10	0	0.003
A49	100	< 10	6.03	0.603
A50	–	< 10	0	0.036

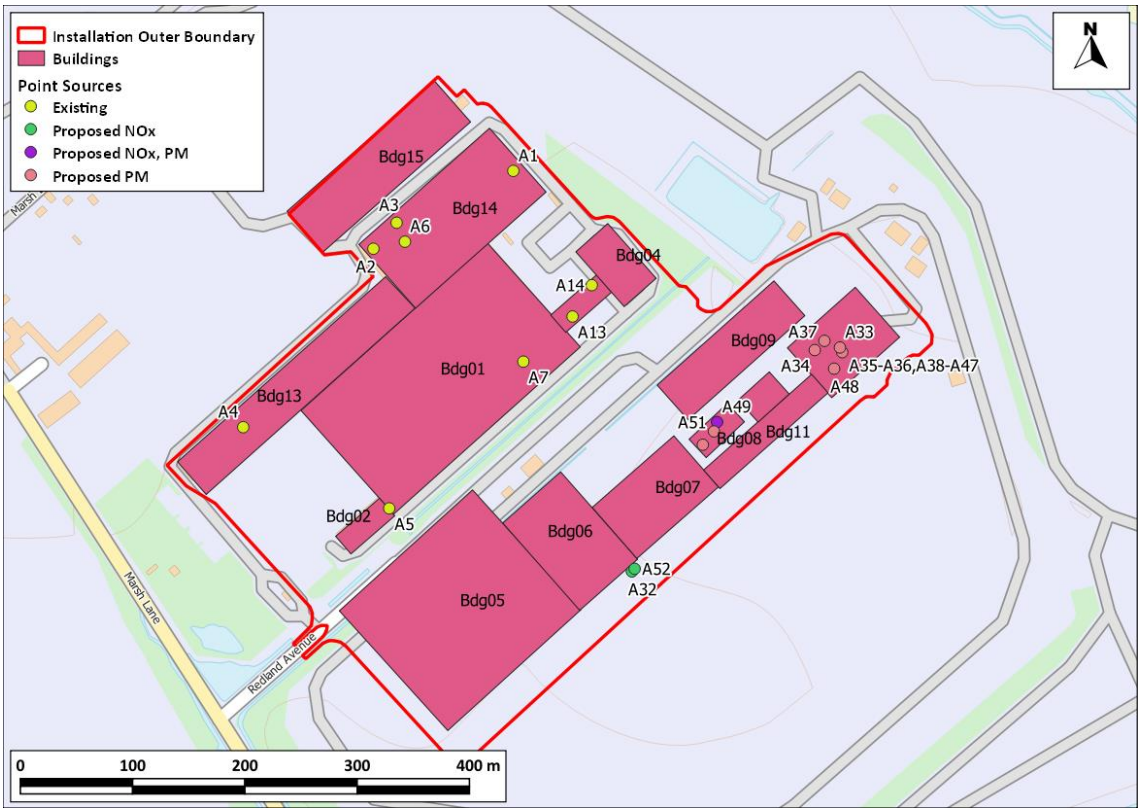

Figure 6: Emission Points and Buildings Included in the Model

Emission Parameters: Existing Installation

6.5 Emission parameters for the existing Etex installation are taken from reports supporting the applications for the permit and permit variations (AECOM, 2017). Stack coordinates are taken from georeferenced aerial imagery. Parameters are given in Table 11 and Table 12.

6.6 Emission point A14 is no longer in use, but has been included in the model for completeness and consistency with the air quality assessment undertaken to support the planning application.

Table 11: Stack Parameters for Existing Emissions Sources

Ref.	Source Description	Release Height (m)	Stack Diameter (m)	Coordinates
A1	Cove Line Dryer	21.3	0.5	350867, 177191
A2	Flash Calciner Gas Burner	34.5	1.1	350742, 177122
A3	Mill 1 and 2	35.4	1.1	350763, 177145
A4	Line 1 Dryer	23.6	1.6	350626, 176963

Ref.	Source Description	Release Height (m)	Stack Diameter (m)	Coordinates
A5	Line 2 Dryer	23.5	1.4	350756, 176891
A6	Gas Burner on Kettles	37.6	1.4	350770, 177128
A7	Board Line 2	23.5	0.6	350875, 177021
A13	Main Stack - New Calciner Burner (formerly A8)	23.0	1.7	350919, 177061
A14	Reclaim Burner (formerly A9)	21.0	0.5	350936, 177089

Table 12: Emission Parameters for Existing Emissions Sources

Ref.	Volume Flux (Nm^3/s)	Temperature (°C)	Efflux Velocity (m/s)
A1	1.2	159	11.3
A2	9.5	149	15.2
A3	12.9	60	15.7
A4	20.3	121	14.3
A5	13.9	79	11.3
A6	30.8	170	13.5
A7	2.8	15	10.2
A13	13.9	98	9.5
A14	2	86	17.7

Table 13: Emission Rates for Existing Emissions Sources

Ref.	NOx Emission Concentration (mg/Nm^3)	PM Emission Concentration (mg/Nm^3)	NOx Emission Rate (g/s)	PM Emission Rate (g/s)
A1	16.1	8.5	0.019	0.01
A2	28.9	50	0.28	0.48
A3	6.5	50	0.084	0.64
A4	20.5	5.9	0.42	0.12
A5	13.9	20.7	0.19	0.29
A6	9.2	8.5	0.3	0.3
A7	0	14.3	0	0.04
A13	12.6	15.2	0.2	0.2
A14	9.9	0.4	0.02	0.0008

Model Parameters: M5 Motorway

6.7 Concentrations have been predicted using the ADMS-Roads dispersion model, with vehicle emissions derived using Defra's Emission Factor Toolkit (EFT) (v11.0) (Defra, 2020b). Details of the model inputs, assumptions and the verification are provided in Appendix A3. Where assumptions have been made, a realistic worst-case approach has been adopted.

6.8 Markides Associates, who undertook the Transport Assessment for the proposed development, provided the increases in traffic associated with the proposed development. Baseline flows were derived from the interactive web-based map provided by DfT (2020). Further details of the traffic data used in this assessment are provided in Appendix A3.

Receptors and Study Area

6.9 Human health impacts have been predicted over a 10 km x 10 km model domain, with the new installation at the centre. Concentrations have been predicted over this area using nested Cartesian grids (see Figure 7). These grids have a spacing of 25 m x 25 m within 400 m of the facility, 50 m x 50 m within 1,000 m of the facility, 250 m x 250 m within 2,000 m of the facility and 500 m x 500 m within 5,000 m of the facility. This grid is considered to provide a sufficiently high resolution to enable the identification of worst-case impacts throughout the study area. The receptor grid has been modelled at a height of 1.5 m above ground level.

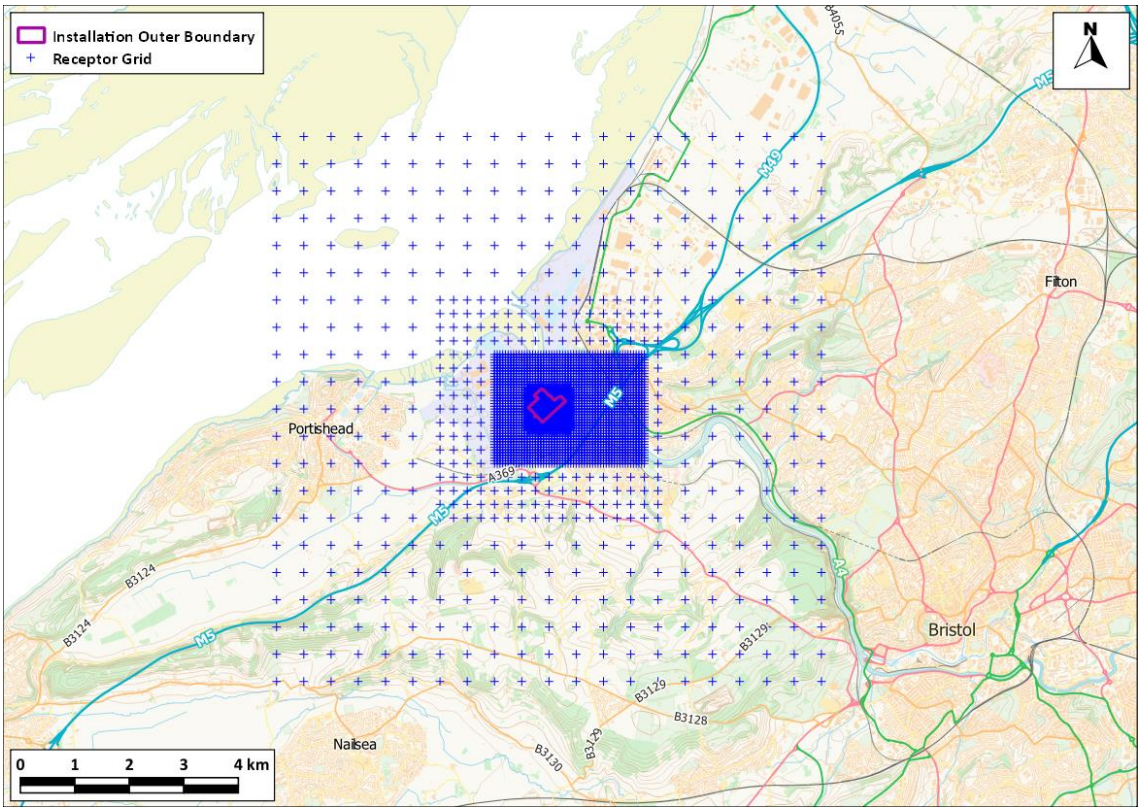

Figure 7: Modelled Receptors (Nested Grid)

6.10 Specific receptors have also been selected to determine impacts at locations where the AQS apply. The specific receptors identified are detailed in Table 14 and shown in Figure 8.

Table 14: Specific Human Health Receptor Coordinates

Receptor ID	Description	X Coordinate	Y Coordinate
R1	West Town Road	352276	177258
R2	Portway	352287	177371
R3	B4054	352502	177700
R4	B4054	352593	177674
R5	Oakhill Lane	355272	179805
R6	B4054	352570	177644
R7	Station Road	349749	175491
R8	Marsh Lane	351240	175877
R9	Marsh Lane	351126	175945
R11	Caravan park off Marsh Lane	350421	177095
R12	Gloucester Road	351434	178128
R13	Portview Road	351738	177901
R14	Portview Road	351994	177637
R15	Portway	352474	176858
R16	Avon Road	352083	176331
R17	The Breaches	351753	176023
R18	Beechwood Road	351393	175897
R19	St Marys School	350274	175367
R20	Sheepway	349681	175898
R21	Wharf Lane	348841	176406
R22	Wren Garden	348257	177026

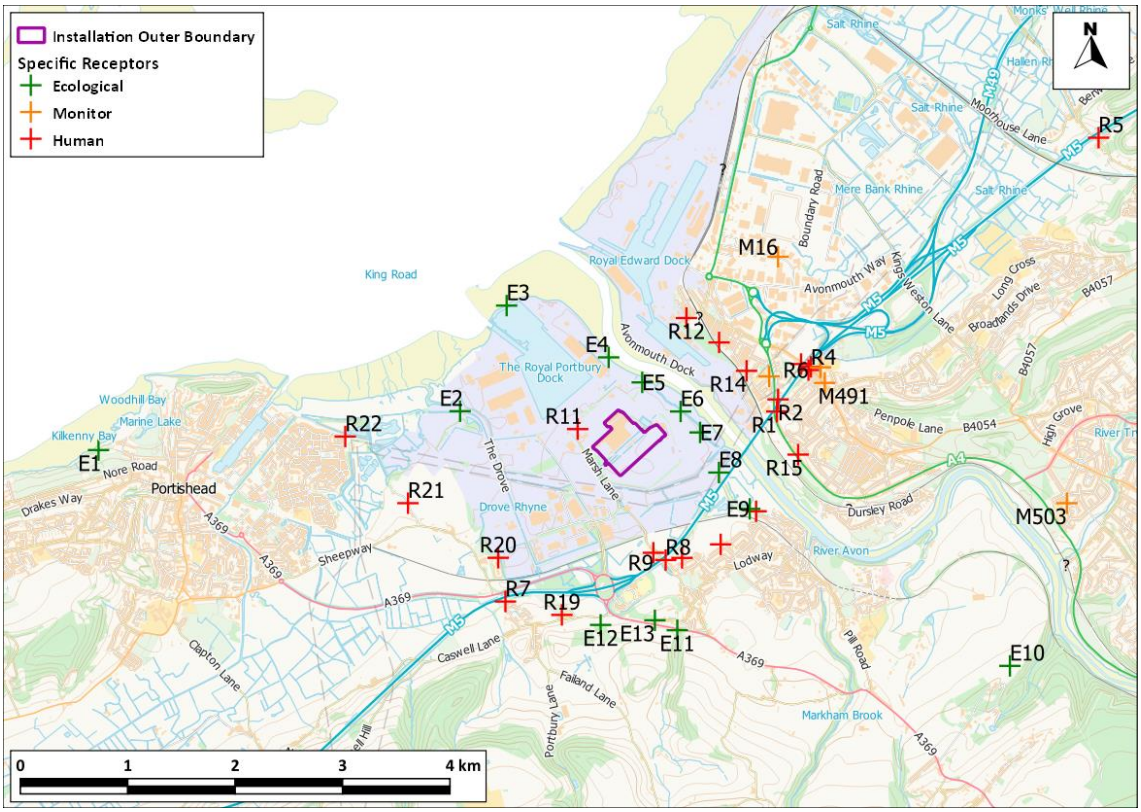

Figure 8: Modelled Receptors (Discrete)

6.11 Receptor ID R10 is not used in this assessment. This ID was used in the air quality assessment for the planning application to represent the Cribbs Causeway AQMA, which has since been revoked and so is not assessed here.

6.12 In addition, specific receptors have been modelled at the boundaries of the designated ecological sites closest to the facility. Receptors have been modelled at 1.5 m above ground level to be consistent with Defra's national modelling of ecosystem impacts. The grid references for these specific locations are presented in Table 15, and their locations are shown in Figure 8.

Table 15: Specific Ecological Receptor Coordinates

Receptor ID	Description	X Coordinate	Y Coordinate
E1	Severn Estuary	345959	176900
E2	Severn Estuary	349326	177262
E3	Severn Estuary	349760	178244
E4	Severn Estuary	350710	177762
E5	Severn Estuary	351022	177529
E6	Severn Estuary	351380	177259

E7	Severn Estuary	351561	177064
E8	Severn Estuary	351736	176691
E9	Severn Estuary	352023	176353
E10	Avon Gorge Woodlands	354446	174893
E11	Hails Wood AW	351349	175224
E12	Longlands Wood AW	350635	175274
E13	St George's Flower Bank LNR	351140	175317

Meteorological Data

6.13 In order to allow for uncertainties in local and future-year conditions, the dispersion model has been run five times, with each run using a different full year of hour-by-hour meteorological data from the nearest appropriate meteorological site. For each individual receptor point on the nested Cartesian grids, the maximum predicted concentration across any of the five meteorological datasets has then been determined. It is these maxima which are presented.

6.14 Hourly sequential meteorological data from Bristol Lulsgate have been used for the years 2017–2021 inclusive. The Bristol Lulsgate meteorological monitoring station is located approximately 12 km to the south of the site. It is deemed to be the nearest monitoring station representative of meteorological conditions at the site. It is operated by the UK Meteorological Office. Raw data were provided by the Met Office, and processed by AQC for use in ADMS.

6.15 The meteorological parameters entered into the model are shown in Table 16. Wind roses for each year are presented in Appendix A1.

Table 16: Meteorological Parameters Entered into the ADMS Model

Parameter	Modelled Receptors (including Cartesian Grids)	Meteorological Site
Surface Roughness	Variable Surface Roughness File	0.3 m
Minimum MO length	30 m	30 m
Surface Albedo	0.23[a]	0.23[a]
Priestly-Taylor Parameter	1[a]	1[a]

[a] Model default value

Variable Surface Roughness File

6.16 The study area encompasses a range of land types. A variable surface roughness file has been used to represent the spatial variation of the surface roughness over each land type as shown in Figure 9. The following parameters have been used regarding surface roughness and land type:

- forest – 1 m;

- built-up area – 0.5 m;
- grassland – 0.2 m; and
- water – 0.0001 m.

6.17 In addition, a model sensitivity test has been run using a fixed study area surface roughness length of 0.5 m (typical of suburban/low lying urban environments). The worst-case results from either sensitivity test have been used to inform the modelling.

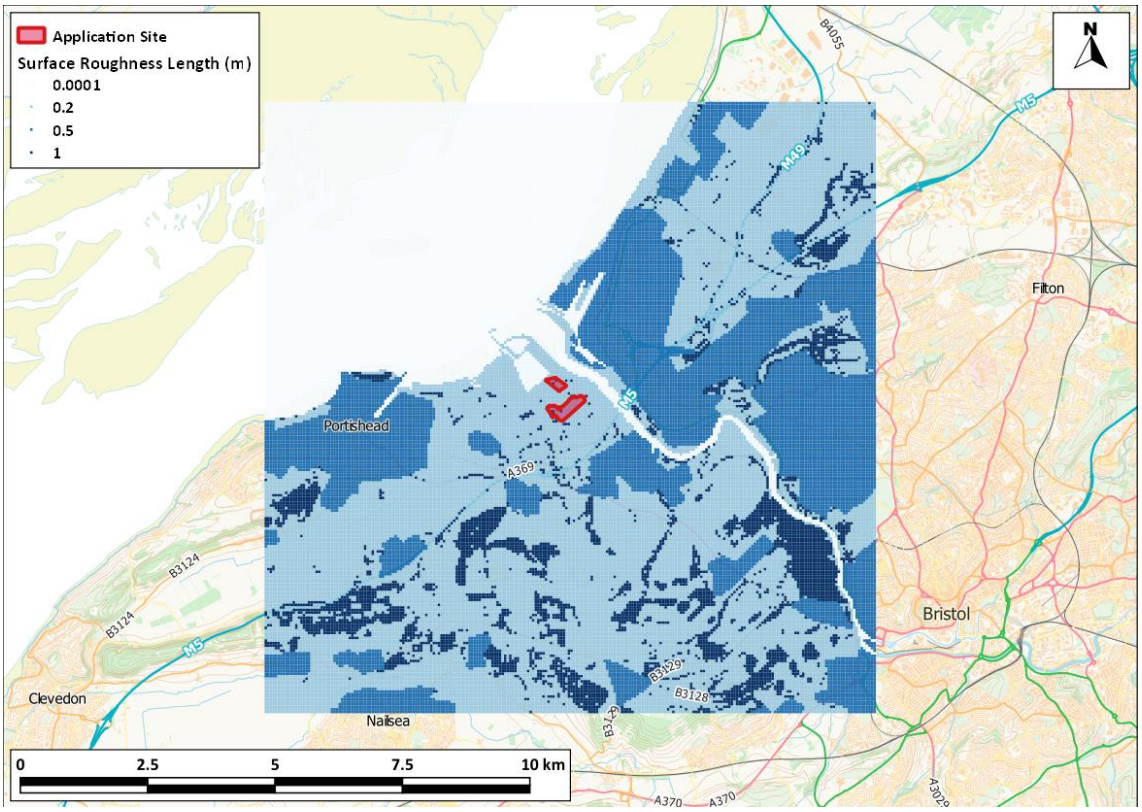

Figure 9: Surface Roughness across Modelled Area

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Buildings

6.18 Where buildings are a significant height relative to the stack height, building downwash effects may occur. The downwash effects should be accounted for within modelling where the stack is less than 2.5 times the height of the buildings within a distance which is five times the minimum of the stack height and the maximum projected width of the building.

6.19 The model has been run once with the adjacent buildings included, and once without, for each meteorological year. The maximum predicted concentrations from either buildings scenario, and any meteorological year, have then been determined and presented. Buildings as modelled are shown in Figure 6, and the dimensions of all buildings are given in Table 17.

Table 17: Modelled Building Dimensions

Building	Height (m)	Length (m)	Width (m)	Rotation (º)
Bdg01	9.5	124	223	318
Bdg02	9	21	52	319
Bdg03	20	20	54	319
Bdg04	17	65	38	319
Bdg05	12	144	160	318
Bdg06	12	104	69	319
Bdg07	12	60	97	319
Bdg08	33.1	22	47	317
Bdg09	20.2	41	139	318
Bdg10	12	59	81	318
Bdg11	12	22	129	319
Bdg12	36.9	27	37	318
Bdg13	9.5	35	246	318
Bdg14	9.5	77	156	318
Bdg15	9.5	49	177	319

Terrain Effects

6.20 The model has been run with or without local terrain effects as a sensitivity test. Testing shows modelling with terrain provides worst-case results and therefore local terrain has been included within the model based on OS Terrain 50 data, as shown in Figure 3.

NO_X to NO_2 conversion

6.21 NOx emissions will be in the form of nitric oxide (NO) and primary NO_2. The primary NO_2 from natural gas-fuelled burners is likely to be in the region of 5–12% of the total NOx. Over time, the NO emissions will react with available ozone (O_3) to form NO_2. In close proximity to the source, the ratio will be similar to the primary NO_2 proportion; with increasing distance from the source the ratio will increase, depending on the availability of O_3.

6.22 The EA (2022) recommends that, as a conservative approach:

- 70% of the NOx emitted converts to NO_2 for the annual mean average concentrations; and
- 35% of the 1-hour mean NOx emitted converts to NO_2 for the 1-hour mean average concentrations.

6.23 It is likely that the primary NO_2:NOx ratio will be 10% or less; therefore, the 70% (long-term) and 35% (short-term) conversion ratios used represent a conservative approach.

6.24 The contribution of roads to NO_2 concentrations has been calculated using Defra's tool for this purpose.

Model Post-Processing

Deposition

6.25 Deposition of NO_2 has not been included within the dispersion model because NO_2 has been calculated from NOx outside of the model. Instead, deposition has been calculated from the predicted ambient concentrations using the deposition velocity set out in Table 18. This means that depletion effects are ignored, resulting in a worst-case assessment. Deposition velocities refer to a height above ground, typically 1 or 2 m, although in practice the precise height makes little difference and here they have been applied to concentrations predicted at a height of 1.5 m above ground, which is the average height of the monitors which underpin the Concentration Based Estimated Deposition (CBED) model which generates predictions used by UK Government. The velocities are applied simply by multiplying a concentration (µg/m^3) by the velocity (m/s) to predict a deposition flux (µg/m^2/s). Subsequent calculations required to present the data as kg/ha/yr of nitrogen as keq/ha/yr for acidity follow basic chemical and mathematical rules[2].

Table 18: Deposition Velocities Used in This Assessment

Pollutant	Deposition Velocity (m/s)	Reference
Nitrogen Dioxide	0.0015 m/s (Grassland)	AQTAG06 (2011)
	0.003 m/s (Forest)	AQTAG06 (2011)

6.26 Wet deposition of emissions from the facility has been discounted. Wet deposition of the emitted pollutants this close to the emission source will be restricted to wash-out, or below cloud scavenging. For this to occur, rain droplets must come into contact with the gas molecules before they hit the ground. Falling raindrops displace the air around them, effectively pushing gasses away. The low solubility of NO_2 means that any scavenging of this gas will be a negligible factor.

[2] i.e. 1 kg N/ha/yr = 0.071 keq/ha/yr

Uncertainty

6.27 The point source dispersion model used in the assessment is dependent upon emission rates, flow rates, exhaust temperatures and other parameters for each source, all of which are both variable and uncertain. There are then additional uncertainties, as models are required to simplify real-world conditions into a series of algorithms. These uncertainties cannot be easily quantified and it is not possible to verify the point-source model outputs. Where these parameters have been estimated the approach has been to use reasonable worst-case assumptions.

6.28 On balance, when taking into account the assumed number of operating hours; the approach taken to meteorological conditions and the sensitivity testing for building downwash, terrain effects and surface roughness, the assessment can be expected to over-predict the impacts of the facility. The approach has been designed to provide a robust and conservative assessment.

7 Assessment Approach

7.1 EA guidance (EA, 2022) states that, following detailed modelling, Process Contributions (PCs) are insignificant where they are less than:

- 10% of a short-term environmental standard; or
- 1% of a long-term environmental standard.

7.2 This is the case regardless of the total concentration or deposition flux (i.e. the PC + the local baseline, or the Predicted Environmental Concentration 'PEC').

7.3 For local nature conservation sites and ancient woodlands, the EA (2022) states that PCs are insignificant where they are less than 100% of either a long-term or short-term standard.

7.4 Where these criteria are not met following detailed modelling, the EA does not provide any specific assessment criteria but instead requires a judgement of significance based on the site-specific circumstances, taking into account the PCs and PECs. EA guidance (EA, 2022) does, however, provide a further screening criterion for long-term PECs, suggesting that where the long-term PEC is less than 70% of the long-term environmental standard then no further assessment is required.

7.5 For human health receptors, the approach has been to provide contour plots which highlight the area within which PCs cannot be considered insignificant using the criteria outlined in Paragraph 7.1. Consideration is also given to the maximum PCs at locations with relevant exposure to the AQS, and to the PECs. A judgement of significance has then reached based on the potential for the facility to cause an exceedance of the AQS.

7.6 For the designated ecological sites, the assessment has focused on the maximum PCs within the designated sites.

8 Results

8.1 Results in this section are given to several of significant figures. This does not necessarily reflect the accuracy of the results.

Road traffic

8.2 Annual mean NO_2 concentrations increase by less than 0.05 µg/m^3 at all modelled receptors as a result of the increase in traffic due to the proposed development. Annual mean PM_{10} and $PM_{2.5}$ concentrations increase by less than 0.01 µg/m^3 and 0.005 µg/m^3 respectively. These increases are extremely small and have therefore not been assessed further.

Human Health Receptors

Nitrogen dioxide

8.3 Figure 10 presents the area where the annual mean NO_2 Process Contribution (PC) is greater than 0.4 µg/m^3 (1% of the AQS). This covers an area which extends up to approximately 3.5 km from the exhaust flues.

8.4 Figure 11 presents the area where the PC to the 99.79th percentile of 1-hour mean NO_2 concentrations is greater than 20 µg/m^3 (10% of the AQS). This covers an area which extends up to approximately 2 km from the exhaust flues.

8.5 Figure 10 and Figure 11 also show the locations where the maximum PCs are predicted:

- anywhere on the nested Cartesian grids;
- at any location with relevant exposure to each AQS[3]; and
- at any busy roadside location with relevant exposure to each AQS. This is important because baseline concentrations are higher at the roadside, meaning that a smaller PC may give rise to an exceedance of the AQS.

8.6 The predicted PCs and PECs at these worst-case locations are set out in Table 19.

8.7 Predicted PCs and PECs at the specific receptors identified in Figure 8 and Table 14 are set out in Table 20.

[3] See Paragraph 4.3.

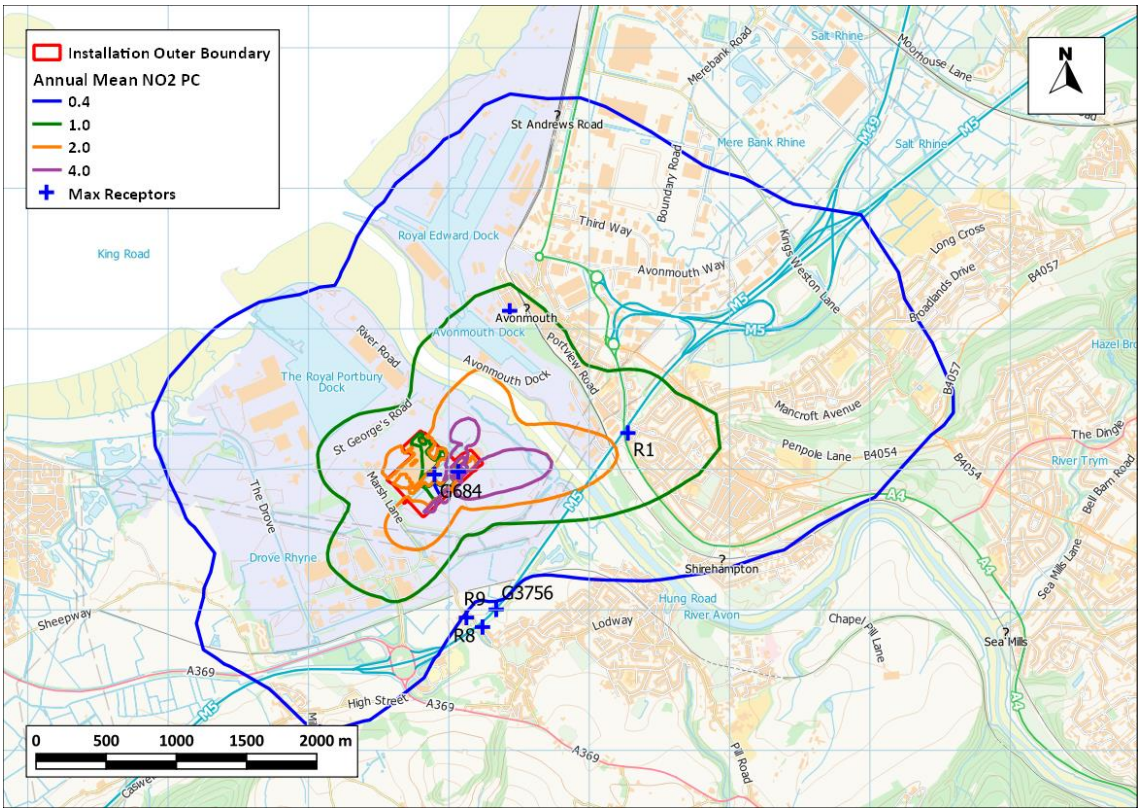

Figure 10: Contour Plot of Annual Mean NO_2 PC and Locations of Maxima

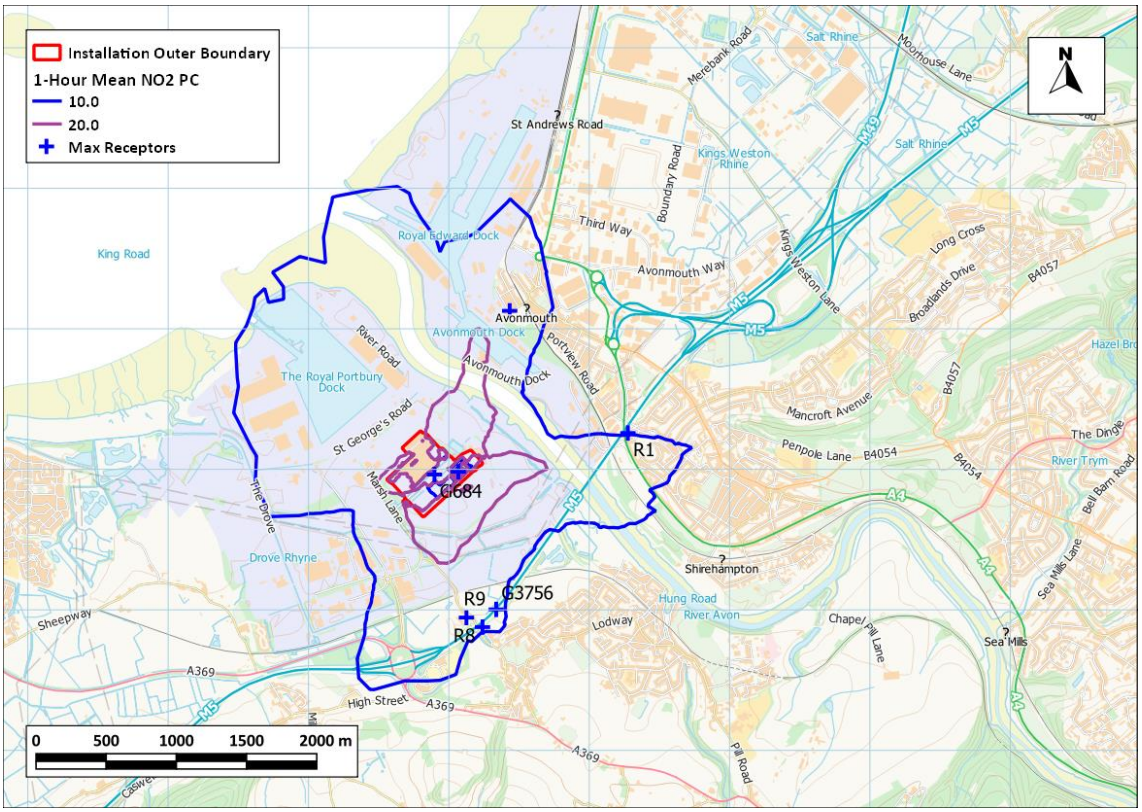

Figure 11: Contour Plot of the 99.79th Percentile of 1-hour Mean NO_2 PC and Locations of Maxima

Table 19: Maximum NO_2 PCs and PECs Relevant for Human Health

	Receptor ID	Coordinates	PC (µg/m³)	PC (% of AQS) [a]	PEC (µg/m³) [b]	PEC (% of AQS)
Annual Mean NO_2 AQS (40 µg/m³)						
Max PC on Grid [c]	G1382	351068, 176983	21.8	55%	38.8	97%
Max PC at Relevant³ Receptor	R1	352276, 177258	1.7	4%	22.3	56%
Max PC at Relevant³ Roadside Receptor	R1	352276, 177258	1.7	4%	22.3	56%
Max PEC on Grid [c]	G3756	351338, 176003	0.5	1%	70.3	176%
Max PEC at Relevant³ Receptor	R8	351240, 175877	0.4	1%	36.8	92%
Max PEC at Relevant³ Roadside Receptor	R8	351240, 175877	0.4	1%	36.8	92%
1-hour Mean NO_2 AQS (200 µg/m³) [d]						
Max PC on Grid [c]	G684	350898, 176963	64.6	32%	95.6	48%
Max PC at Relevant³ Receptor	R12	351434, 178128	15.1	8%	44.9	22%
Max PC at Relevant³ Roadside Receptor	R9	351126, 175945	11.5	6%	55.4	28%
Max PEC on Grid [c]	G3756	351338, 176003	11.3	6%	152.0	76%
Max PEC at Relevant³ Receptor	R8	351240, 175877	10.3	5%	84.0	42%
Max PEC at Relevant³ Roadside Receptor	R8	351240, 175877	10.3	5%	84.0	42%

[a] Based on unrounded numbers.

[b] After adding the relevant baseline concentrations (paragraph 5.4).

[c] This row has been greyed out as the AQS do not apply at this location.

[d] 99.79th percentile of 1-hour means. PCs for the 100th percentile of 1-hour mean concentrations are provided in Appendix A2.

Table 20: NO_2 PCs and PECs at Specific Receptors

Receptor ID	Annual Mean NO_2 AQS (40 µg/m³)				1-hour Mean NO_2 AQS (200 µg/m³) [a]			
	PC		PEC [b]		PC		PEC [b]	
	µg/m³	% AQS [c]	µg/m³	% AQS [c]	µg/m³	% AQS [c]	µg/m³	% AQS [c]
R1	1.7	4%	22.3	56%	9.5	5%	51.4	26%
R2	1.4	4%	22.7	57%	6.4	3%	49.7	25%
R3	1.0	2%	30.3	76%	6.1	3%	65.5	33%
R4	1.0	2%	34.7	87%	5.9	3%	74.0	37%
R5	0.2	1%	13.0	32%	2.9	1%	28.9	14%

Receptor ID	Annual Mean NO_2 AQS (40 µg/m³)				1-hour Mean NO_2 AQS (200 µg/m³) [a]			
	PC		PEC [b]		PC		PEC [b]	
	µg/m³	% AQS [c]	µg/m³	% AQS [c]	µg/m³	% AQS [c]	µg/m³	% AQS [c]
R6	1.0	3%	33.0	83%	6.1	3%	70.9	35%
R7	0.4	1%	24.9	62%	5.1	3%	54.9	27%
R8	0.4	1%	36.8	92%	10.3	5%	84.0	42%
R9	0.4	1%	21.9	55%	11.5	6%	55.4	28%
R11	1.6	4%	23.0	57%	14.2	7%	58.7	29%
R12	1.2	3%	15.6	39%	15.1	8%	44.9	22%
R13	1.1	3%	15.4	39%	6.9	3%	36.5	18%
R14	1.1	3%	16.0	40%	6.5	3%	37.1	19%
R15	1.1	3%	14.4	36%	9.7	5%	37.1	19%
R16	0.5	1%	14.3	36%	8.0	4%	36.3	18%
R17	0.3	1%	18.1	45%	7.6	4%	44.0	22%
R18	0.3	1%	19.3	48%	10.1	5%	48.9	24%
R19	0.5	1%	17.8	45%	8.6	4%	44.1	22%
R20	0.5	1%	14.9	37%	5.7	3%	35.4	18%
R21	0.3	1%	8.9	22%	5.6	3%	23.7	12%
R22	0.3	1%	9.0	22%	5.1	3%	23.4	12%

[a] 99.79th percentile of 1-hour means

[b] After adding the relevant baseline concentrations (paragraph 5.4).

[c] Based on unrounded numbers.

PM_{10}

8.8 Figure 12 presents the area where the annual mean PM_{10} PC is greater than 0.4 µg/m³ (1% of the AQS). This covers an area which extends up to approximately 800 m from the exhaust flues.

8.9 Figure 13 presents the area where the PC to the 90.4th percentile of 24-hour mean PM_{10} concentrations is greater than 5 µg/m³ (10% of the AQS). This area is confined to the immediate vicinity of the exhaust flues.

8.10 Figure 12 and Figure 13 also show the locations where the maximum PCs are predicted:

- anywhere on the nested Cartesian grids;
- at any location with relevant exposure to each AQS[4]; and

[4] See Paragraph 4.3.

- at any busy roadside location with relevant exposure to each AQS. This is important because baseline concentrations are higher at the roadside, meaning that a smaller PC may give rise to an exceedance of the AQS.

8.11 The predicted PCs and PECs at these worst-case locations are set out in Table 21.

8.12 Predicted PCs and PECs at the specific receptors identified in Figure 8 and Table 14 are set out in Table 22.

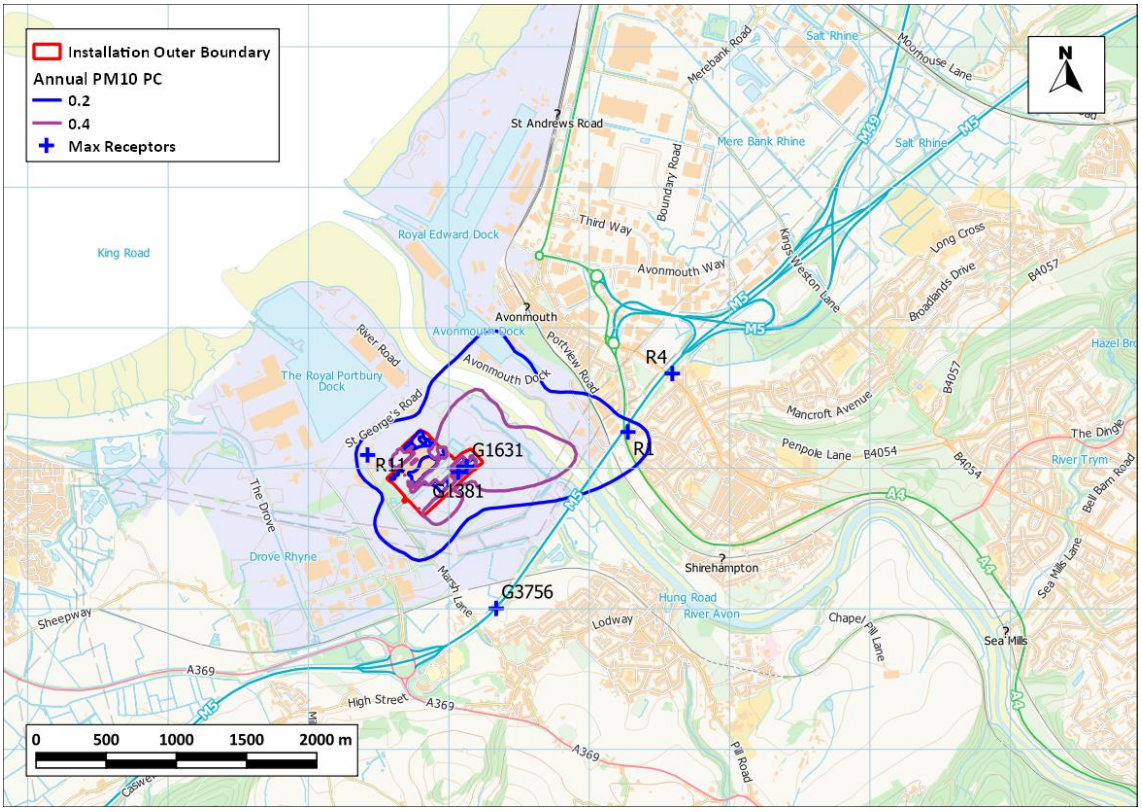

Figure 12: Contour Plot of Annual Mean PM_{10} PC and Locations of Maxima

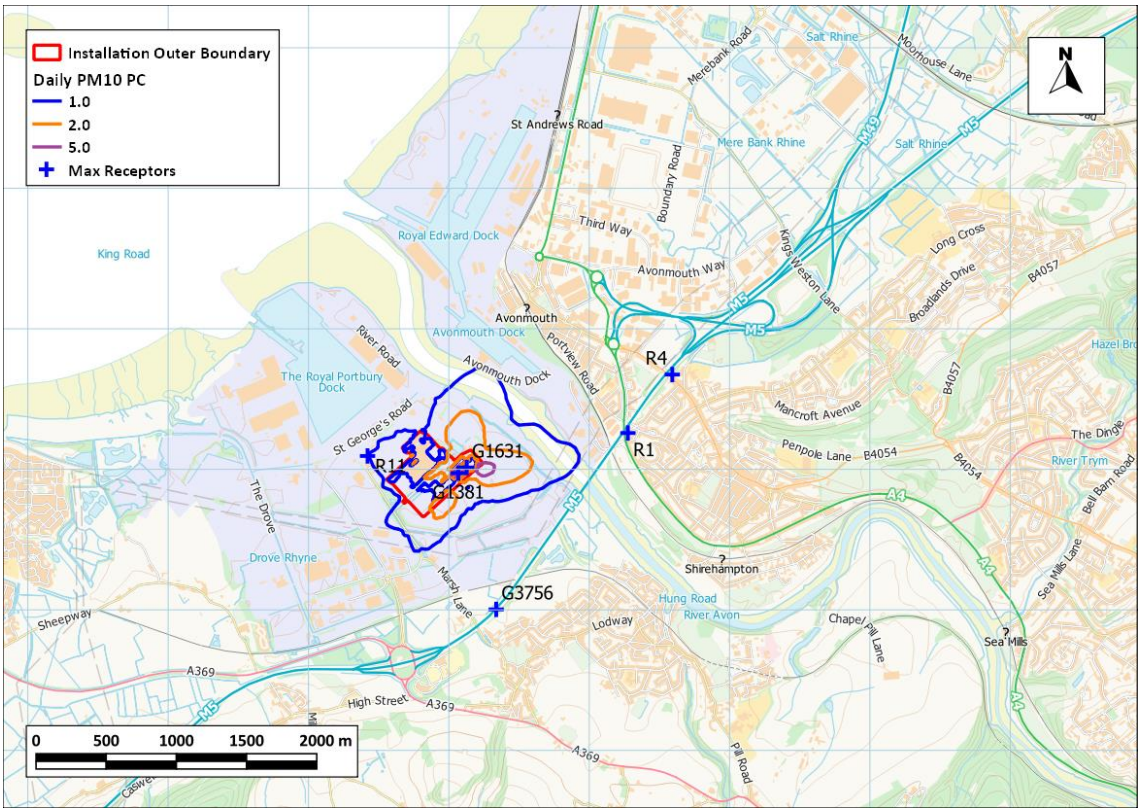

Figure 13: Contour Plot of the 90.4th Percentile of 24-hour Mean PM_{10} PC and Locations of Maxima

Table 21: Maximum PM_{10} PCs and PECs Relevant for Human Health

	Receptor ID	Coordinates	PC (µg/m³)	PC (% of AQS) [a]	PEC (µg/m³) [b]	PEC (% of AQS)
Annual Mean PM_{10} AQS (40 µg/m³)						
Max PC on Grid [c]	G1381	351068, 176973	4.3	11%	20.3	51%
Max PC at Relevant[3] Receptor	R11	350421, 177095	0.2	1%	13.2	33%
Max PC at Relevant[3] Roadside Receptor	R1	352276, 177258	0.2	1%	15.9	40%
Max PEC on Grid [c]	G1381	351068, 176973	4.3	11%	20.3	51%
Max PEC at Relevant[3] Receptor	R4	352593, 177674	0.1	0%	16.6	42%
Max PEC at Relevant[3] Roadside Receptor	R4	352593, 177674	0.1	0%	16.6	42%
24-hour Mean PM_{10} AQS (50 µg/m³) [d]						
Max PC on Grid [c]	G1631	351128, 177013	6.9	3%	35.3	18%
Max PC at Relevant[3] Receptor	R11	350421, 177095	1.0	1%	28.0	14%
Max PC at Relevant[3] Roadside Receptor	R1	352276, 177258	0.6	0%	32.1	16%
Max PEC on Grid [c]	G3756	351338, 176003	0.2	0%	38.8	19%
Max PEC at Relevant[3] Receptor	R4	352593, 177674	0.3	0%	33.5	17%
Max PEC at Relevant[3] Roadside Receptor	R4	352593, 177674	0.3	0%	33.5	17%

[a] Based on unrounded numbers.

[b] After adding the relevant baseline concentrations (paragraph 5.4).

[c] This row has been greyed out as the AQS do not apply at this location.

[d] 99.79th percentile of 1-hour means. PCs for the 100th percentile of 1-hour mean concentrations are provided in Appendix A2.

Table 22: PM_{10} PCs and PECs at Specific Receptors

Receptor ID	Annual Mean PM_{10} AQS (40 µg/m³)				24-hour Mean PM_{10} AQS (50 µg/m³) [a]			
	PC		PEC [b]		PC		PEC [b]	
	µg/m³	% AQS [c]	µg/m³	% AQS [c]	µg/m³	% AQS [c]	µg/m³	% AQS [c]
R1	0.2	1%	15.9	40%	0.6	1%	32.1	64%
R2	0.2	0%	15.9	40%	0.5	1%	32.2	64%
R3	0.1	0%	16.3	41%	0.4	1%	32.8	66%
R4	0.1	0%	16.6	42%	0.3	1%	33.5	67%
R5	0.0	0%	14.1	35%	0.1	0%	28.3	57%

Receptor ID	Annual Mean PM_{10} AQS (40 µg/m³)				24-hour Mean PM_{10} AQS (50 µg/m³) [a]			
	PC		PEC [b]		PC		PEC [b]	
	µg/m³	% AQS [c]	µg/m³	% AQS [c]	µg/m³	% AQS [c]	µg/m³	% AQS [c]
R6	0.1	0%	16.5	41%	0.3	1%	33.2	66%
R7	0.0	0%	14.4	36%	0.2	0%	29.4	59%
R8	0.1	0%	15.1	38%	0.2	0%	30.3	61%
R9	0.1	0%	14.0	35%	0.2	0%	28.3	57%
R11	0.2	1%	13.2	33%	1.0	2%	28.0	56%
R12	0.2	0%	14.2	35%	0.6	1%	29.0	58%
R13	0.2	0%	13.2	33%	0.5	1%	26.8	54%
R14	0.2	0%	13.3	33%	0.4	1%	27.0	54%
R15	0.1	0%	13.8	35%	0.4	1%	28.0	56%
R16	0.1	0%	13.6	34%	0.2	0%	27.7	55%
R17	0.0	0%	15.1	38%	0.1	0%	30.5	61%
R18	0.0	0%	13.8	35%	0.1	0%	27.9	56%
R19	0.1	0%	14.2	35%	0.2	0%	28.7	57%
R20	0.1	0%	13.8	35%	0.3	1%	28.2	56%
R21	0.0	0%	11.7	29%	0.2	0%	23.8	48%
R22	0.0	0%	11.0	28%	0.1	0%	22.4	45%

[a] 99.79th percentile of 1-hour means

[b] After adding the relevant baseline concentrations (paragraph 5.4).

[c] Based on unrounded numbers.

$PM_{2.5}$

8.13 Figure 14 presents the area where the annual mean $PM_{2.5}$ Process Contribution (PC) is greater than 0.25 µg/m³ (1% of the AQS). This covers an area which extends up to approximately 1,200 m from the exhaust flues.

8.14 Figure 14 also shows the locations where the maximum PCs are predicted:

- anywhere on the nested Cartesian grids;
- at any location with relevant exposure to each AQS[5]; and
- at any busy roadside location with relevant exposure to each AQS. This is important because baseline concentrations are higher at the roadside, meaning that a smaller PC may give rise to an exceedance of the AQS.

8.15 The predicted PCs and PECs at these worst-case locations are set out in Table 23.

[5] See Paragraph 4.3.

8.16 Predicted PCs and PECs at the specific receptors identified in Figure 8 and Table 14 are set out in Table 24.

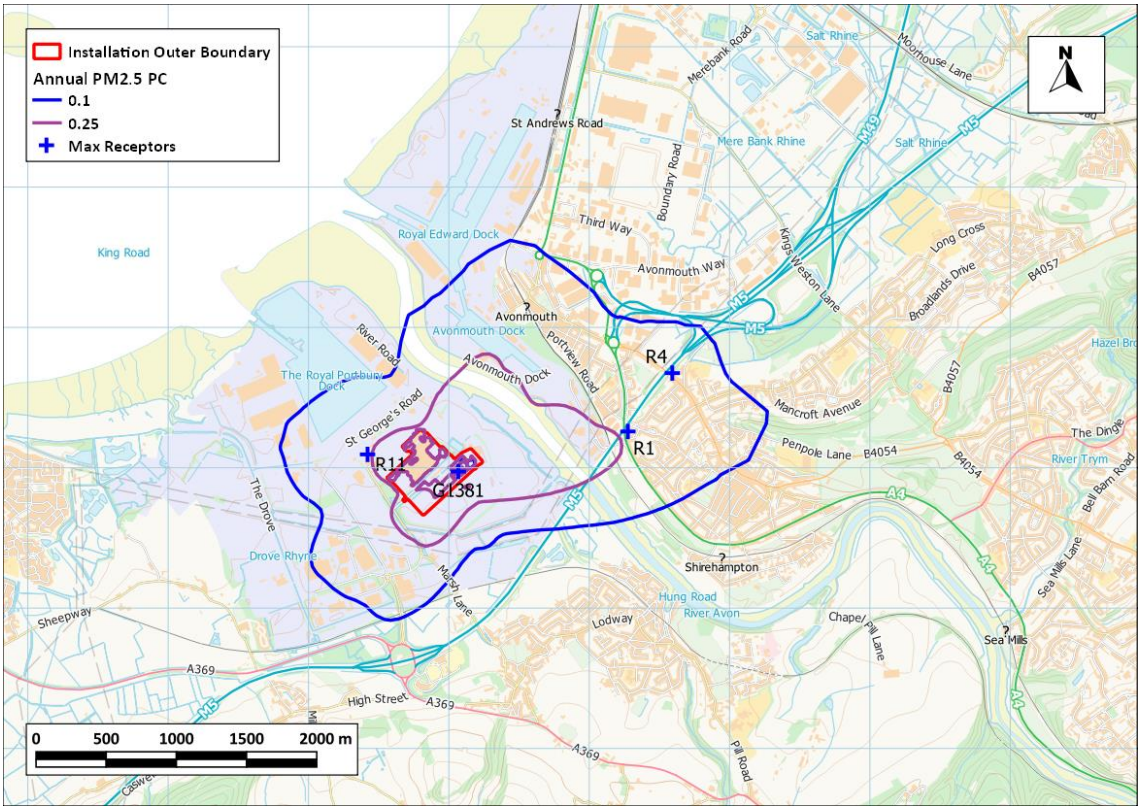

Figure 14: Contour Plot of Annual Mean $PM_{2.5}$ PC and Locations of Maxima

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Table 23: Maximum $PM_{2.5}$ PCs and PECs Relevant for Human Health

	Receptor ID	Coordinates	PC ($\mu g/m^3$)	PC (% of AQS) [a]	PEC ($\mu g/m^3$) [b]	PEC (% of AQS)
Annual Mean $PM_{2.5}$ AQS (25 $\mu g/m^3$)						
Max PC on Grid [c]	G1381	351068, 176973	4.3	17%	14.4	57%
Max PC at Relevant[3] Receptor	R11	350421, 177095	0.2	1%	8.6	35%
Max PC at Relevant[3] Roadside Receptor	R1	352276, 177258	0.2	1%	10.3	41%
Max PEC on Grid [c]	G1381	351068, 176973	4.3	17%	14.4	57%
Max PEC at Relevant[3] Receptor	R4	352593, 177674	0.1	1%	10.6	43%
Max PEC at Relevant[3] Roadside Receptor	R4	352593, 177674	0.1	1%	10.6	43%

[a] Based on unrounded numbers.

[b] After adding the relevant baseline concentrations (paragraph 5.4).

[c] This row has been greyed out as the AQS do not apply at this location.

[d] 99.79th percentile of 1-hour means. PCs for the 100th percentile of 1-hour mean concentrations are provided in Appendix A2.

Table 24: $PM_{2.5}$ PCs and PECs at Specific Receptors

Receptor ID	Annual Mean $PM_{2.5}$ AQS (25 $\mu g/m^3$)			
	PC		PEC [a]	
	$\mu g/m^3$	% AQS [b]	$\mu g/m^3$	% AQS [b]
R1	0.2	1%	10.3	41%
R2	0.2	1%	10.3	41%
R3	0.1	1%	10.4	42%
R4	0.1	1%	10.6	43%
R5	0.0	0%	8.9	36%
R6	0.1	1%	10.6	42%
R7	0.0	0%	9.1	36%
R8	0.0	0%	9.6	38%
R9	0.1	0%	9.0	36%
R11	0.2	1%	8.6	35%
R12	0.2	1%	8.9	36%
R13	0.2	1%	8.5	34%
R14	0.2	1%	8.6	35%
R15	0.1	1%	9.0	36%
R16	0.1	0%	8.8	35%

Receptor ID	Annual Mean $PM_{2.5}$ AQS (25 µg/m^3)			
	PC		PEC [a]	
	µg/m^3	% AQS [b]	µg/m^3	% AQS [b]
R17	0.0	0%	9.2	37%
R18	0.0	0%	8.8	35%
R19	0.1	0%	8.9	36%
R20	0.1	0%	8.7	35%
R21	0.0	0%	7.6	30%
R22	0.0	0%	7.3	29%

[a] After adding the relevant baseline concentrations (paragraph 5.4).

[b] % rounded to nearest whole number and based on unrounded PCs.

Designated Ecological Sites

8.17 Figure 15 and Figure 16 present contours of annual mean NOx and daily mean NOx concentrations respectively. Contours of nitrogen deposition and acid deposition are not presented, since these depend on the type of vegetation present.

8.18 Table 25, Table 26, Table 27 and Table 28 present the maximum PCs and PECs at any of the designated ecological sites for annual mean NOx, daily mean NOx, annual mean nitrogen deposition and annual mean acid deposition respectively.

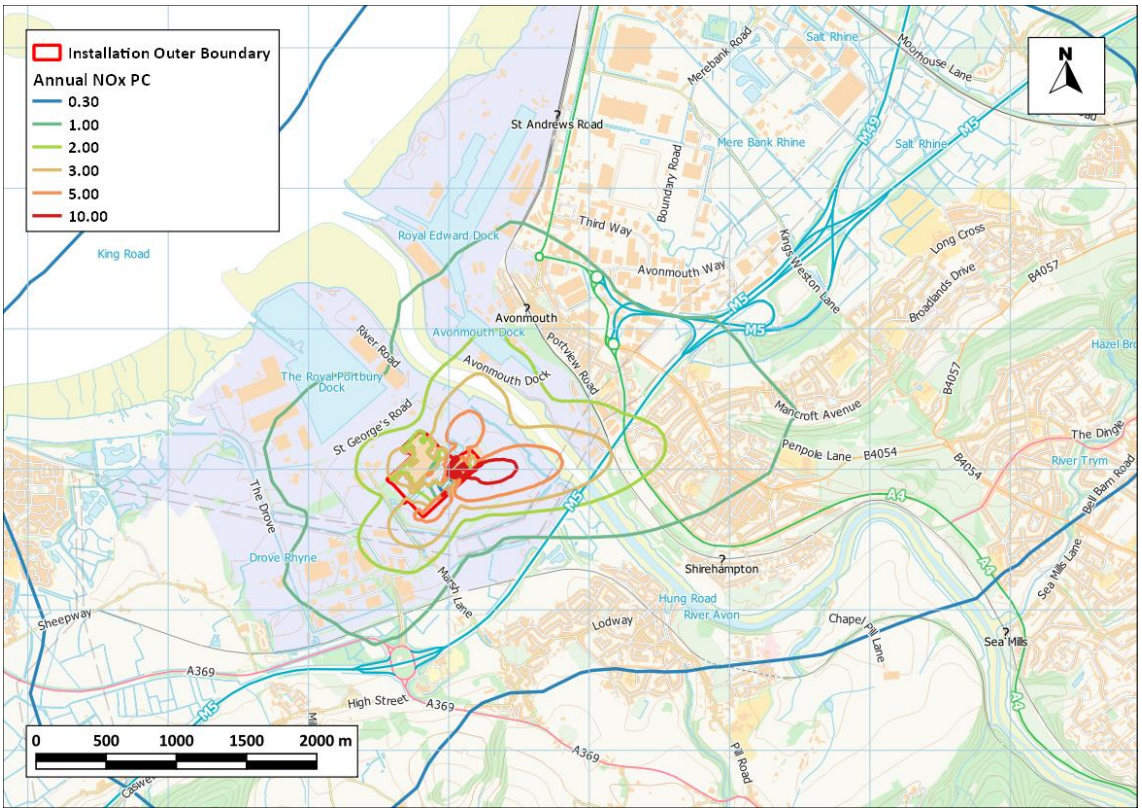

Figure 15: Contour Plot of Annual Mean NOx PC and Locations of Maxima

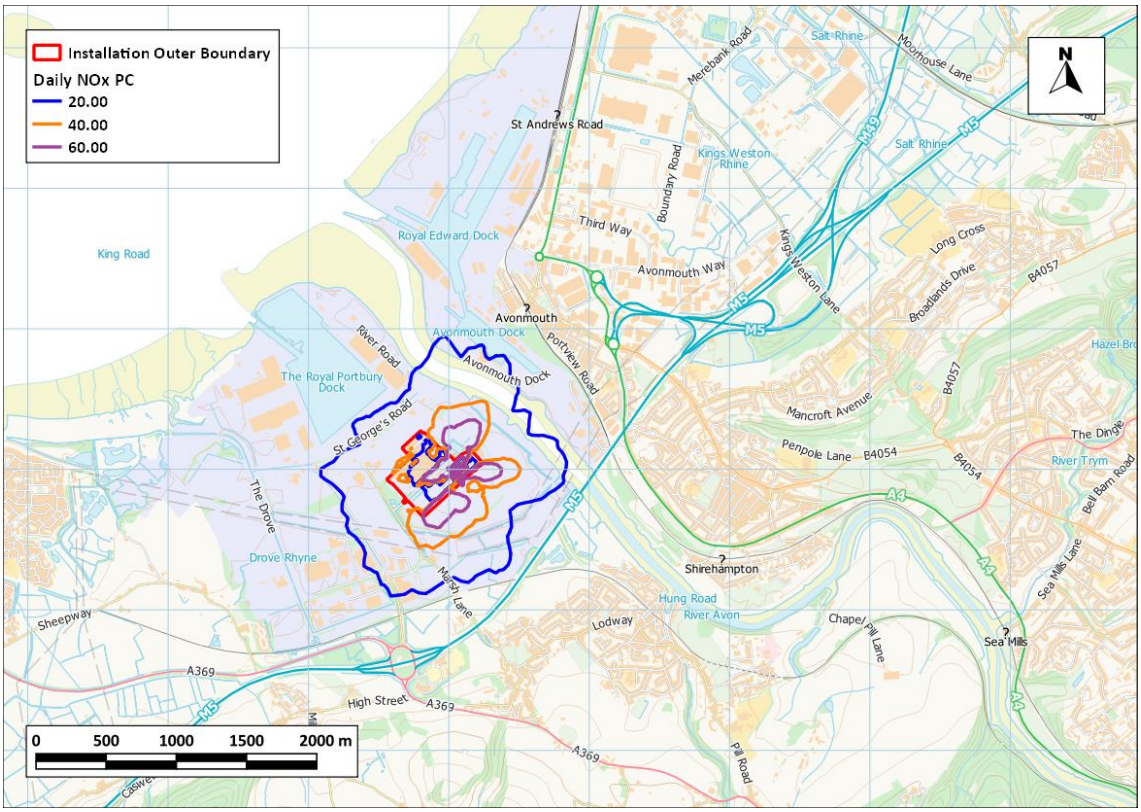

Figure 16: Contour Plot of Daily Mean NOx PC and Locations of Maxima

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Table 25: Annual Mean NOx PCs and PECs at Specific Receptors

Receptor ID	Description	Annual Mean NOx AQS (30 µg/m^3)			
		PC		PEC [a]	
		µg/m^3	% AQS [b]	µg/m^3	% AQS [b]
E1	Severn Estuary	0.2	1%	9.2	31%
E2	Severn Estuary	0.8	3%	16.6	55%
E3	Severn Estuary	0.6	2%	21.4	71%
E4	Severn Estuary	1.3	4%	33.4	111%
E5	Severn Estuary	3.1	10%	22.8	76%
E6	Severn Estuary	3.4	11%	24.1	80%
E7	Severn Estuary	7.8	26%	28.8	96%
E8	Severn Estuary	1.8	6%	27.2	91%
E9	Severn Estuary	0.7	2%	20.4	68%
E10	Avon Gorge Woodlands	0.2	1%	10.9	36%
E11	Hails Wood AW	0.3	1%	18.0	60%
E12	Longlands Wood AW	0.5	2%	23.3	78%

Receptor ID	Description	Annual Mean NOx AQS (30 µg/m³)			
		PC		PEC [a]	
		µg/m³	% AQS [b]	µg/m³	% AQS [b]
E13	St George's Flower Bank LNR	0.3	1%	18.4	61%

[a] After adding the relevant baseline concentrations (paragraph 5.4).

[b] % rounded to nearest whole number and based on unrounded PCs.

Table 26: Daily Mean NOx PCs and PECs at Specific Receptors

Receptor ID	Description	24-hour Mean NOx AQS (200 µg/m³)			
		PC		PEC [a]	
		µg/m³	% AQS [b]	µg/m³	% AQS [b]
E1	Severn Estuary	8.3	4%	28.0	14%
E2	Severn Estuary	25.3	13%	60.5	30%
E3	Severn Estuary	27.3	14%	73.7	37%
E4	Severn Estuary	45.1	23%	113.9	57%
E5	Severn Estuary	60.3	30%	104.8	52%
E6	Severn Estuary	42.6	21%	87.4	44%
E7	Severn Estuary	63.0	32%	108.1	54%
E8	Severn Estuary	33.2	17%	86.8	43%
E9	Severn Estuary	23.1	12%	65.0	32%
E10	Avon Gorge Woodlands	9.3	5%	32.2	16%
E11	Hails Wood AW	19.6	10%	57.4	29%
E12	Longlands Wood AW	24.3	12%	72.1	36%
E13	St George's Flower Bank LNR	21.6	11%	60.2	30%

[a] After adding the relevant baseline concentrations (paragraph 5.4).

[b] % rounded to nearest whole number and based on unrounded PCs.

Table 27: Nitrogen Deposition PCs and PECs at Specific Receptors

Receptor ID	Description	Minimum critical load (kgN/ha/y)	Annual Mean Nitrogen Deposition Rate			
			PC		PEC [a]	
			µg/m³	% AQS [b]	µg/m³	% AQS [b]
E1	Severn Estuary	20	0.02	0%	18.92	95%
E2	Severn Estuary	20	0.08	0%	17.68	88%
E3	Severn Estuary	20	0.06	0%	17.66	88%
E4	Severn Estuary	20	0.13	1%	18.23	91%
E5	Severn Estuary	20	0.31	2%	17.91	90%
E6	Severn Estuary	20	0.34	2%	17.94	90%

Receptor ID	Description	Minimum critical load (kgN/ha/y)	Annual Mean Nitrogen Deposition Rate			
			PC		PEC [a]	
			µg/m³	% AQS [b]	µg/m³	% AQS [b]
E7	Severn Estuary	20	0.79	4%	18.39	92%
E8	Severn Estuary	20	0.18	1%	17.78	89%
E9	Severn Estuary	20	0.07	0%	18.27	91%
E10	Avon Gorge Woodlands	15	0.03	0%	34.03	227%
E11	Hails Wood AW	10	0.05	1%	29.73	297%
E12	Longlands Wood AW	10	0.10	1%	29.78	298%
E13	St George's Flower Bank LNR	5	0.03	1%	16.69	334%

[a] After adding the relevant baseline concentrations (paragraph 5.4).

[b] % rounded to nearest whole number and based on unrounded PCs.

Table 28: Acid Deposition PCs and PECs at Specific Receptors

Receptor ID	Description	Annual Mean Acid Deposition Rate			
		PC		PEC [b]	
		keq/ha/y	% AQS [c]	keq/ha/y	% AQS [c]
E1	Severn Estuary [a]	0.001	N/A	1.60	N/A
E2	Severn Estuary [a]	0.005	N/A	1.41	N/A
E3	Severn Estuary [a]	0.004	N/A	1.40	N/A
E4	Severn Estuary [a]	0.009	N/A	1.51	N/A
E5	Severn Estuary [a]	0.022	N/A	1.52	N/A
E6	Severn Estuary [a]	0.025	N/A	1.52	N/A
E7	Severn Estuary [a]	0.056	N/A	1.56	N/A
E8	Severn Estuary [a]	0.013	N/A	1.51	N/A
E9	Severn Estuary [a]	0.005	N/A	1.51	N/A
E10	Avon Gorge Woodlands	0.002	0%	2.60	214%
E11	Hails Wood AW	0.004	0%	2.29	84%
E12	Longlands Wood AW	0.007	0%	2.30	84%
E13	St George's Flower Bank LNR	0.002	0%	1.33	27%

[a] Not sensitive to acidity.

[b] After adding the relevant baseline concentrations (paragraph 5.4).

[c] Percent of critical load function. Based on unrounded numbers.

9 Discussion

Human Health Receptors

Annual Mean NO_2

9.1 Figure 10 shows that the PC exceeds 1% of the long-term NO_2 AQS across a broad area of Avonmouth and west Bristol. Table 19 shows that the PEC is exceeded at some modelled grid receptors, but this is because the grid covers the carriageway of the M5 motorway which is not a location of relevant exposure, and the high concentrations are due to the existing road traffic. Table 19 and Table 20 show that the PEC is below the AQS at all modelled receptors with relevant exposure, although it is close to the AQS at some locations close to the M5 motorway, e.g. receptor R8 where Marsh Lane passes under the motorway; this is predominantly due to the existing road traffic, and the extra contribution from the Proposed Development (including additional road traffic) is less than 1% of the AQS at this location. The greatest PC at a receptor with relevant exposure is 1.7 µg/m^3 or 4% of the AQS at receptor R1, where the PEC is 22 µg/m^3 or 56% of the AQS. Considering that the assessment makes a number of conservative and worst-case assumptions, it is unlikely that the proposed development would result in an exceedance of the AQS at any relevant location.

1-hour Mean NO_2

9.2 Figure 11 shows that the PC exceeds 10% of the short-term NO_2 AQS across an area around the Proposed Development, but this area is confined to the industrial site with limited public access. Table 19 shows that the PEC will remain well below the AQS, even where there is no relevant exposure and including within the carriageway of the M5 motorway. There is thus no risk that the AQS will be exceeded as a result of the facility.

Annual Mean PM_{10}

9.3 Figure 12 shows that the PC exceeds 1% of the long-term PM_{10} AQS close to the facility, but this is confined to an area of the industrial estate around the facility. Table 21 shows that the PEC remains well below the AQS at all modelled locations, including within the carriageway of the motorway. There is therefore no risk that the AQS will be exceeded as a result of the facility.

24-hour Mean PM_{10}

9.4 Figure 13 shows that the PC exceeds 10% of the short-term PM_{10} AQS in a small area very close to the Proposed Development. The PEC will remain well below the AQS, even where there is no relevant exposure. There is thus no risk that the AQS will be exceeded as a result of the facility.

Annual Mean $PM_{2.5}$

9.5 Figure 14 shows that the PC exceeds 1% of the long-term $PM_{2.5}$ AQS across an area of the industrial estate around the facility. Table 23 shows that the PEC remains well below the AQS at all modelled locations, including within the carriageway of the motorway. There is therefore no risk that the AQS will be exceeded as a result of the facility.

Designated Ecological Sites

Annual Mean NOx

9.6 Figure 15 shows that the PC exceeds 1% of the long-term NOx AQS across a large area. Table 25 shows that the greatest PC at any relevant ecological receptor is 7.8 µg/m^3 or 26% of the AQS at receptor E7, representing the River Avon east of the facility (within the Severn Estuary designated area); the PEC here is 29 µg/m^3 or 96% of the AQS and this is therefore considered to be not significant.

9.7 The highest PEC is 33.4 µg m^{-3} or 111% of the AQS at receptor E4, representing the Severn Estuary nearer to the mouth of the River Avon, where the PC is 1.3 µg/m^3 or 4% of the AQS. The PEC exceeds the critical level at this location, even without the PC. This issue was identified during the planning application for the new installation and was subject to protracted dialogue with both local and national officers within Natural England. A shadow Habitats Regulations Appropriate Assessment was undertaken by ecological consultants on behalf of Etex, which concluded that the contribution of NOx from the Etex facility on the Severn Estuary SAC would be not significant. Comments from Natural England's air quality lead Lydia Knight corroborated these conclusions:

"there is a compelling argument that the expansion is unlikely to be of high risk due to the specifics of the situation. We do generally advise that tidal saltmarsh is not highly sensitive to air pollution due to the regular influx of nutrients from the water. This is considered on a case by case site specific basis however currently this is not addressed within the appropriate assessment as reason for no adverse effect. The area team have agreed that if this evidence was to be included within the air pollution section on page 21 of the appropriate assessment then we can agree no adverse effect to the designated sites affected and advise no objection to the application to North Somerset Local Authority."

9.8 It is therefore considered that the impacts of NOx PCs to the Severn Estuary SAC (including at Receptor E4) are not significant.

24-hour Mean NOx

9.9 Figure 16 shows that the PC exceeds 10% of the short-term AQS across a 1.3 km length of the River Avon (within the Severn Estuary designated area). However, Table 26 shows that the PEC is at most 57% of the AQS at any receptor, and there is therefore no risk of the AQS being exceeded. At all

other ecological receptors, the PC is less than 10% of the AQS and EA guidance is that these PCs are insignificant.

Nitrogen deposition

9.10 Table 27 shows that the maximum PCs exceed 1% of the long-term AQS at some receptors along the River Avon (within the Severn Estuary designated area), but the PEC at these receptors remains below the AQS. The maximum PEC at a Severn Estuary receptor is 18.9 kg N/ha/y or 95% of the AQS of 20 kg N/ha/y for this habitat at receptor E1, where the PC is 0.02 kg N/ha/y or 0.1% of the AQS. Considering that the assessment makes a number of conservative and worst-case assumptions, it is unlikely that the proposed development would result in an exceedance of the AQS at any receptor on the Severn Estuary.

9.11 At the Avon Gorge Woodlands SAC (receptor E10), the PEC is at exceedance due to the existing background deposition. However, the PC from the proposed facility is less than 1% of the long-term AQS. The EA guidance is thus that the impact is insignificant regardless of the PEC.

9.12 The other receptors representing ecological sites are local designations (ancient woodland and LNR). Although the PECs at these receptors is at exceedance due to the existing background deposition, the PC at these receptors is at most 1% (rounded) of the long-term AQS. Since this is less than 100% of the long-term AQS, the EA guidance is that these PCs are insignificant regardless of the PEC.

Acid deposition

9.13 The Severn Estuary is not sensitive to acidity, according to APIS. At the remaining receptors, Table 28 shows that the PC is less than 1% of the long-term AQS (i.e. the site-specific critical load function). The EA guidance is thus that these PCs are insignificant regardless of the PEC.

10 Conclusions

10.1 There is no risk that any of the AQS for the protection of human health will be exceeded as a result of the facility at any relevant receptor. On this basis, the impacts are judged to be not significant.

10.2 The impacts at designated ecological sites are either insignificant or will not cause an exceedance of any AQS, with the exception of one location within the Severn Estuary SAC where the AQS for annual mean NOx is exceeded with or without the PC from the installation. The NOx impacts were subject to a shadow HRA Appropriate Assessment at planning stage and agreed with Natural England to be not significant.

10.3 The assessment includes a number of conservative assumptions. It also takes account of the maximum predicted impacts across several sensitivity tests. In particular:

- the assessment of short-term impacts assumes constant operation of the plant;
- the results presented are the maxima from modelling with five separate years of meteorological data;
- the results presented are the maxima from modelling both with and without including surrounding buildings within the dispersion model;
- the results presented are the maxima from modelling both with and without including terrain effects within the dispersion model;
- the results presented are the maxima from modelling both with and without including spatially-varying surface roughness lengths within the dispersion model;
- depletion has not been included in the model. This will cause a tendency for impacts to be over-predicted; and
- a conservative approach has been taken to calculating NO_2 concentrations from modelled NOx concentrations.

10.4 It is thus concluded that the air quality impacts of the proposed facility will be not significant.

Table 29: EA Checklist for Dispersion Modelling Report for Installations

Item	Included	Comment
Location map	✓	See Figure 1 and Figure 2
Site plan	✓	See Figure 4
List of emissions modelled	✓	See Paragraph 1.4
Details of modelled scenarios	✓	See Table 2 and Section 6
Details of relevant ambient concentrations used	✓	See Section 5
Model description and justification	✓	See Paragraph 6.2
Special model treatments used	✓	See Section 6
Table of emission parameters used	✓	See Table 8–Table 13
Details of modelled domain receptors	✓	See Figure 7, Figure 8 and Paragraph 6.9
Details of meteorological data used (including origin) and justification	✓	See Paragraphs 6.13 to 6.15
Details of terrain treatment	✓	See Paragraph 6.20
Details of building treatment	✓	See Paragraphs 6.18 and 6.19
Sensitivity analysis	✓	See Table 2 and Section 6
Assessment of impacts	✓	See Sections 9 and 10
Model input files	✓	Sent electronically

11 References

AECOM. (2017). *Environmental permit support: Revised H1 impact assessment following burner replacement.*

APIS. (2021). *APIS.* Retrieved from Air Pollution Information System Database: http://www.apis.ac.uk/

APIS. (2021). *APIS.* Retrieved from Air Pollution Information System Database: http://www.apis.ac.uk/

AQC. (2016). *Relationship between the UK Air Quality Objectives and Occupational Air Quality Standards.* Retrieved from http://www.aqconsultants.co.uk/AQC/media/Reports/Relationship-between-the-UK-Air-Quality-Objectives-and-Occupational-Air-Quality-Standards.pdf

AQC. (2020a). Calculator for Road Emissions of Ammonia V1A. https://www.aqconsultants.co.uk/resources.

AQTAG. (2011). *AQTAG06 - Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air.*

BCC. (2019). *2019 Air Quality Annual Status Report (ASR).*

BCC. (2021). *2021 Air Quality Annual Status Report (ASR).*

Bristol City Council. (2019). *Air Quality Annual Status Report.*

Defra. (2018). *Review & Assessment: Technical Guidance LAQM.TG16 February 2018 Version.* Defra. Retrieved from https://laqm.defra.gov.uk/documents/LAQM-TG16-February-18-v1.pdf

Defra. (2018b). *Review & Assessment: Technical Guidance LAQM.TG16 February 2018 Version.* Defra. Retrieved from https://laqm.defra.gov.uk/documents/LAQM-TG16-February-18-v1.pdf

Defra. (2020b). *Local Air Quality Management (LAQM) Support Website.* Retrieved from http://laqm.defra.gov.uk/

Defra. (2021a). *Background Mapping data for local authorities.* Retrieved from https://uk-air.defra.gov.uk/data/laqm-background-home

DfT. (2017). *TEMPro (Version 7.2) Software.* Retrieved from https://www.gov.uk/government/collections/tempro

DfT. (2019). *DfT Road traffic statistics (TRA03).* Retrieved from https://www.gov.uk/government/statistical-data-sets/road-traffic-statistics-tra

DfT. (2020). *Road traffic statistics.* Retrieved from http://www.dft.gov.uk/matrix/

EA. (2019). *Environmental permitting: air dispersion modelling reports.* Retrieved from https://www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports?utm_source=4101c1a1-65a0-4299-99f3-

d50dc8cd5823&utm_medium=email&utm_campaign=govuk-notifications&utm_content=immediate

EA. (2022). *Air emissions risk assessment for your environmental permit*, Updated 5 July 2022. Retrieved from https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

North Somerset Council. (2019). *Air Quality Annual Status Report.*

South Gloucestershire Council. (2019). *Air Quality Annual Status Report.*

South Gloucestershire Council. (2021). *2020 Air Quality Annual Status Report (ASR).*

The Air Quality (England) (Amendment) Regulations 2002, Statutory Instrument 3043. (2002). HMSO. Retrieved from https://www.legislation.gov.uk/uksi/2002/3043/contents/made

The Air Quality (England) Regulations 2000 Statutory Instrument 928. (2000). HMSO. Retrieved from http://www.legislation.gov.uk/uksi/2000/928/contents/made

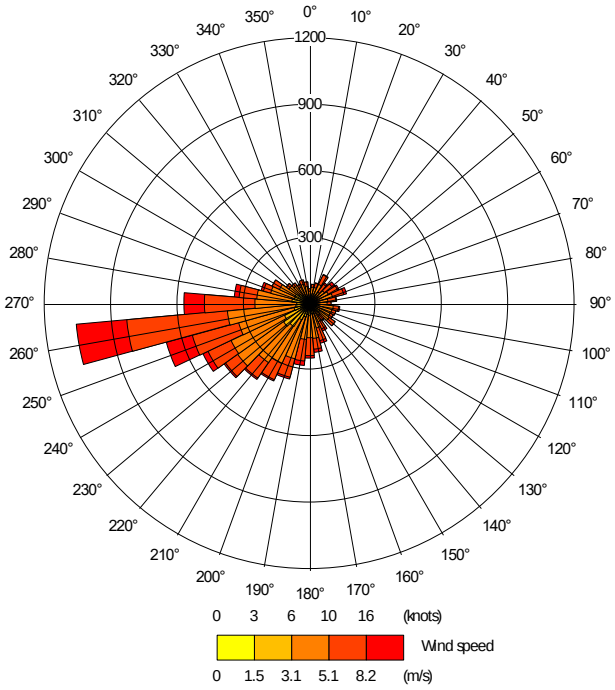
The Environmental Permitting (England and Wales) (Amendment) Regulations 2018 Statutory Instrument 2018 No.110. (2018). Retrieved from http://www.legislation.gov.uk/uksi/2018/110/contents/made

The European Parliament and the Council of the European Union. (2008). *Directive 2008/50/EC of the European Parliament and of the Council.* Retrieved from http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32008L0050

12 Appendices

A1 Wind Roses for Bristol Lulsgate

2017



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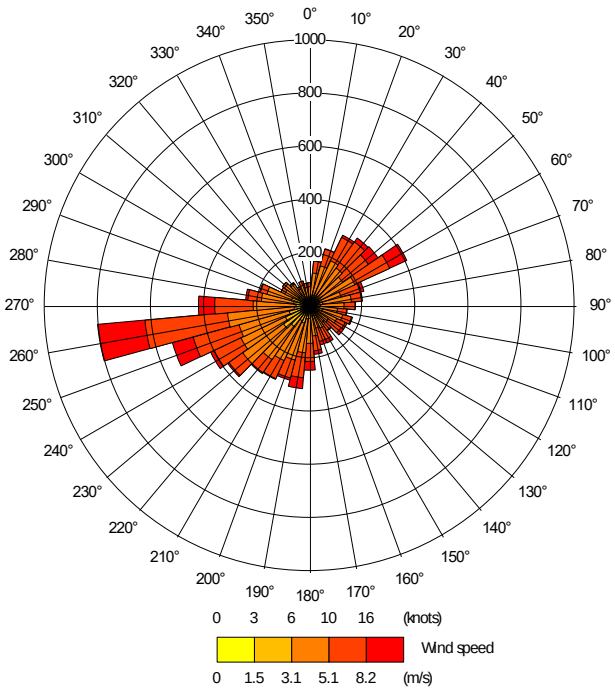
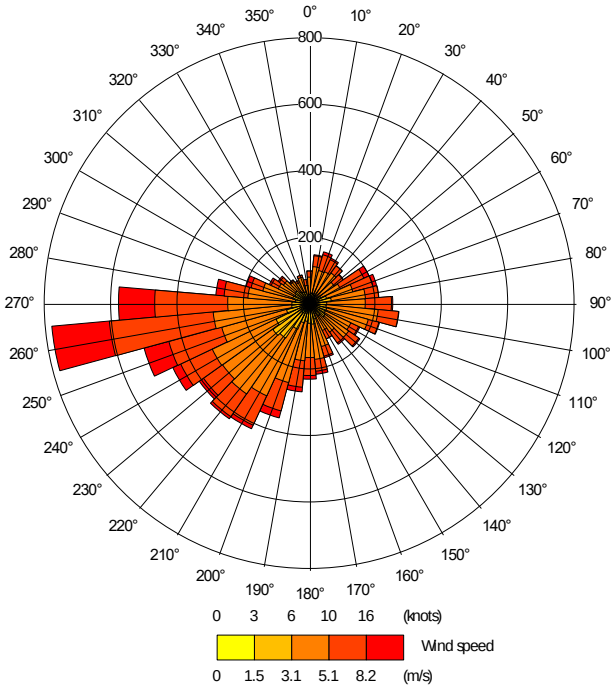


2019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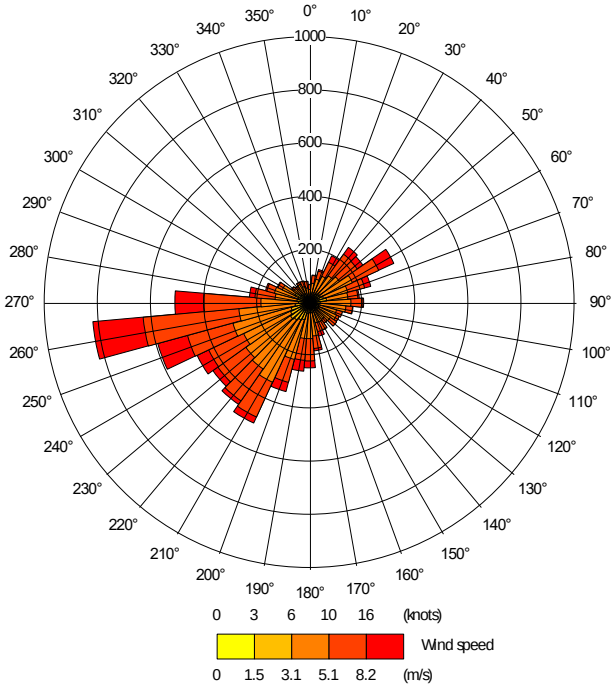
2020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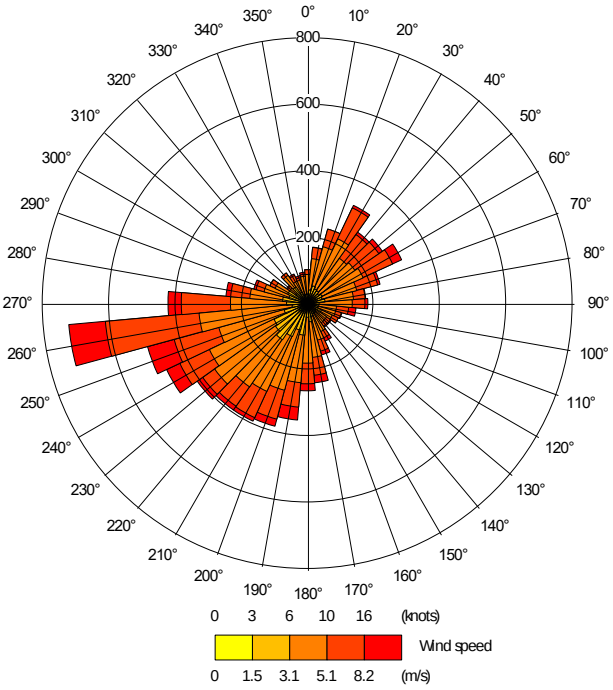
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Wind speed
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A2 100th Percentile of 1-hour Mean PCs

A3.1 Table A2.1 presents the maximum 100th percentile of 1-hour Mean NO_2 PCs and PECs at different receptors, while Figure A2.1 presents a contour plot of these PCs. The AQS for 1-hour mean NO_2 concentrations allows 18 exceedances of 200 µg/m^3 in each calendar year. The 100th percentile of 1-hour means (i.e. the maximum in any hour of the year) is thus not comparable with the AQS. Results are provided here for information only.

Table A2.1: Maximum 100th Percentile of 1-hour Mean NO_2 PCs and PECs

	Receptor ID	Coordinates	PC (µg/m^3)	PC (% of AQS)	PEC (µg/m^3)	PEC (% of AQS)
Max PC on Grid	G2530	351068, 176983	73.9	N/A	116.6	N/A
Max PC at Relevant[a] Receptor	R12	352276, 177258	25.6	N/A	54.1	N/A
Max PC at Relevant[a] Roadside Receptor	R9	352276, 177258	23.9	N/A	69.1	N/A
Max PEC on Grid	G3756	351338, 176003	20.3	N/A	172.1	N/A
Max PEC at Relevant[a] Receptor	R8	351240, 175877	21.3	N/A	100.0	N/A
Max PEC at Relevant[a] Roadside Receptor	R8	351240, 175877	21.3	N/A	100.0	N/A

[a] See Paragraph 4.3.

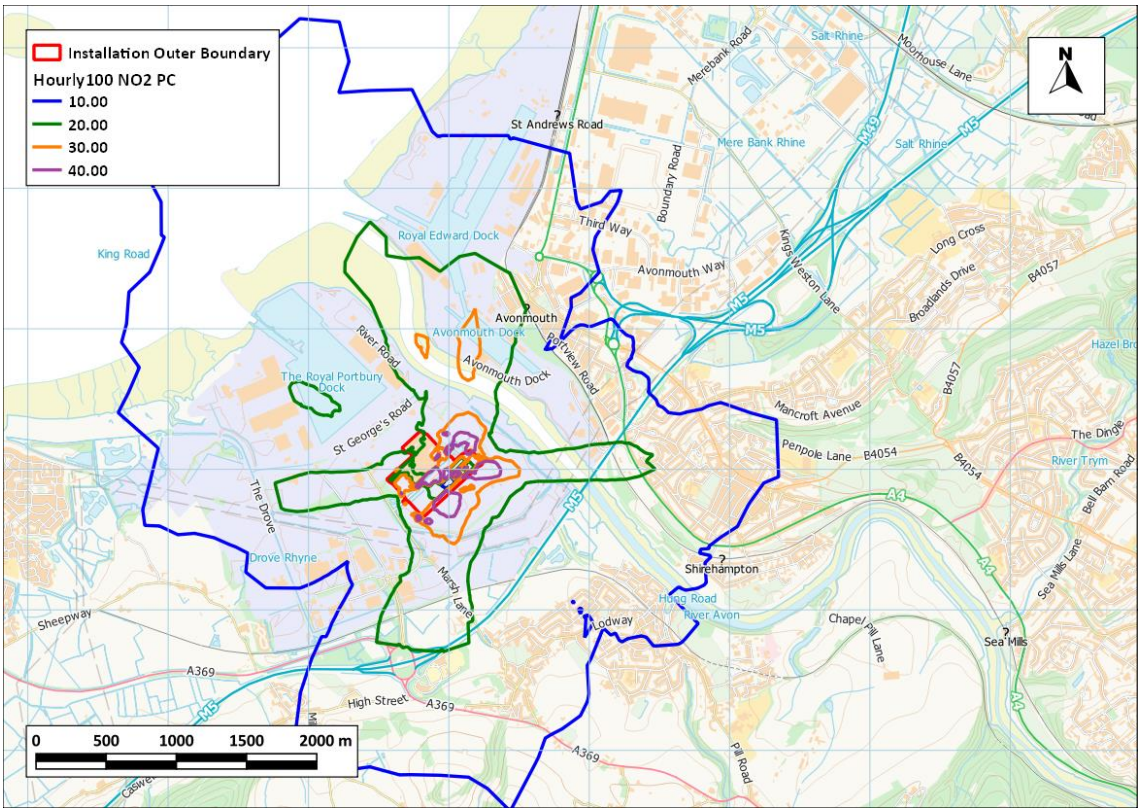

Figure A2.1: Contour Plot of the 100th Percentile of 1-hour Mean NO_2 PCs

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A3 Roads Modelling Methodology

Model Inputs

A3.1 Predictions have been carried out using the ADMS-Roads dispersion model (v5). The model requires the user to provide various input data, including emissions from each section of road and the road characteristics (including road width and height where applicable). Vehicle emissions have been calculated based on vehicle flow, composition and speed data using the EFT (Version 11.0) published by Defra (2020b).

A3.2 Hourly sequential meteorological data from Bristol for 2018 have been used in the model. The Bristol meteorological monitoring station is located at Bristol Airport, approximately 11.5 km to the south of the proposed development site. It is deemed to be the nearest monitoring station representative of meteorological conditions in the vicinity of the proposed development site; both the development site and the Bristol meteorological monitoring station are located in the southwest of England, close to the Severn Estuary where they will be influenced by the effects of coastal meteorology over urban topography.

A3.3 Development generated AADT flows and vehicle fleet composition data have been provided by Markides Associates, who have undertaken the transport assessment work for the proposed development. Baseline AADT flows, and the proportions of HDVs, for the M5 adjacent to the proposed development site have been determined from the interactive web-based map provided by DfT (2020). The 2018 AADT flows have been factored forwards to the assessment year of 2023 using growth factors derived using the TEMPro System v7.2 (DfT, 2017). Traffic speeds have been estimated based on professional judgement, taking account of the road layout, speed limits and the proximity to a junction. The traffic data used in this assessment are summarised in Table A3.1. Diurnal and monthly flow profiles for the traffic have been derived from the national profiles published by DfT (2019).

A3.4 No adjustments have been made for effects of the Covid-19 pandemic on road traffic. This is expected to be conservative.

Table A3.1: Summary of Traffic Data used in the Assessment (AADT Flows)

Road Link	2018		2023 (Without Scheme)		2023 (With Scheme)	
	AADT	%HDV	AADT	%HDV	AADT	%HDV
M5 between Junctions 18 and 19	131,812	8.2	143,187	8.2	143,555	8.3
M5 between Junctions 18 and 18A	98,461	6.1	106,958	6.1	107,262	6.2
M5 between Junctions 17 and 18	123,874	9.7	134,564	9.7	134,868	9.8
B4054	11,268	0.9	12,240	0.9	12,263	0.9
B4055	5,405	1.1	5,871	1.1	5,871	1.1
M5 South of Junction 19	103,275	9.9	112,188	9.9	112,282	9.9

A3.5 Figure A3.1 shows the road network included within the model, along with the speed at which each link was modelled, and defines the study area.

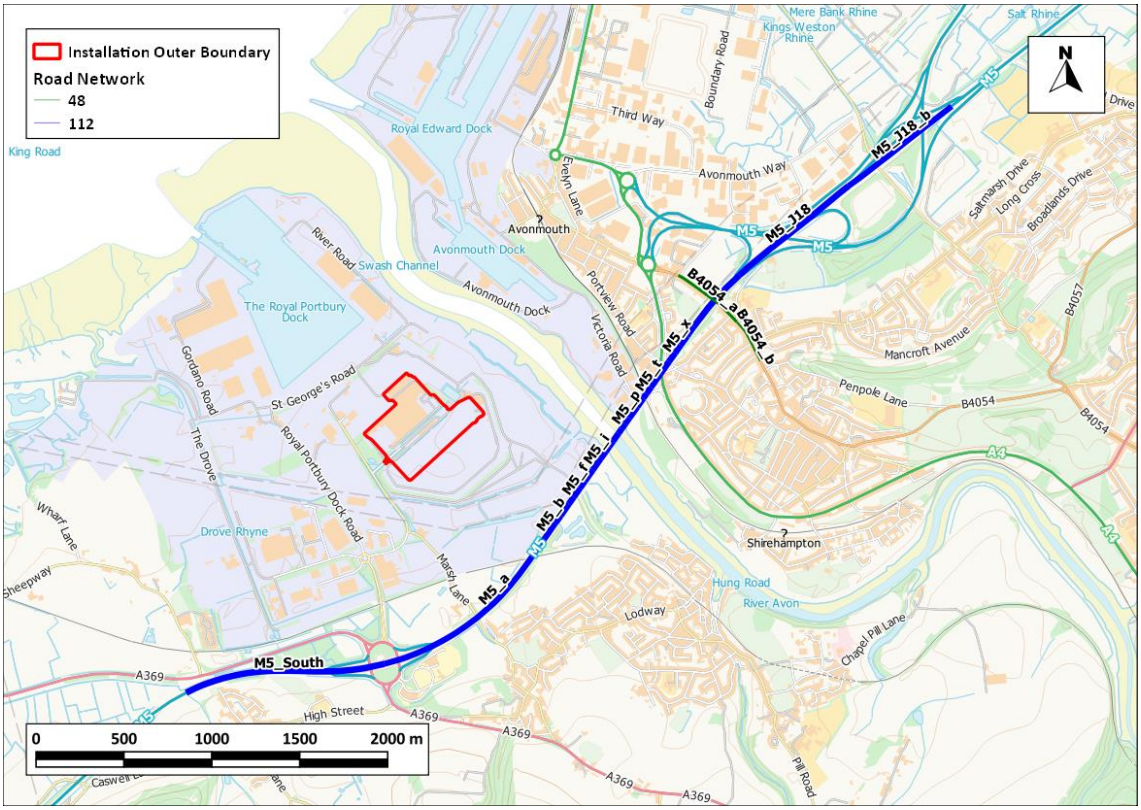


Figure A3.1: Modelled Road Network & Speed

Model Verification

A3.6 In order to ensure that ADMS-Roads accurately predicts local concentrations of NOx, it is necessary to verify the model against local measurements. It is not practical, nor usual, to verify the ADMS-5 model, and, because ADMS-5 does not rely on estimated road-vehicle emission factors, the adjustment used for ADMS-Roads cannot be applied to ADMS-5. Predictions made using ADMS-5 have thus not been verified.

Background Concentrations

A3.7 The 2018 background NO_2 concentrations for the monitoring sites have been derived from the national maps, and are presented in Table A3.2.

Table A3.2: Annual Mean Background Concentrations used in the Verification for 2018

Diffusion Tube	NO_2 (µg/m^3)
489	23.63
491	23.63
Objective	**40**

Traffic Data

A3.8 2018 AADT flows, and the proportions of HDVs, for the roads adjacent to the monitoring sites, have been determined from the interactive web-based map provided by the DfT (2020). The 2009 AADT flows for the B4054 have been factored forwards to 2018 for model verification purposes using growth factors derived using the TEMPro System v7.0 (DfT, 2017) (a growth factor of 1.1097 for the years 2011 to 2018 has been applied, in the absence of a 2009-2018 factor). Traffic data used in the model verification are summarised in Table A3.3.

Table A3.3: 2018 AADT Traffic Data used in the Model Verification

Road Link	AADT	%HDV
M5 between Junctions 18 and 19	131,812	8.2
M5 between Junctions 17 and 18	123,874	9.7
B4054	11,268	0.9
B4055	5,405	1.1

Nitrogen Dioxide

A3.9 Most nitrogen dioxide (NO_2) is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions of nitrogen oxides (NOx = NO + NO_2). The model has been run to predict the annual mean NOx concentrations during 2018 at the 489 and 490 diffusion tube monitoring sites. Concentrations have

been modelled at the height of the monitors as displayed in the relevant annual status reports (BCC, 2021).

A3.10 The model output of road-NOx (i.e. the component of total NOx coming from road traffic) has been compared with the 'measured' road-NOx. Measured road-NOx has been calculated from the measured NO_2 concentrations and the predicted background NO_2 concentration using the NOx from NO_2 calculator (Version 8.1) available on the Defra LAQM Support website (Defra, 2020b).

A3.11 The unadjusted model has under predicted the road-NOx contribution; this is a common experience with this and most other road traffic emissions dispersion models. An adjustment factor has been determined as the slope of the best-fit line between the 'measured' road contribution and the model derived road contribution, forced through zero. The calculated adjustment factor of 2.1 has been applied to the modelled road-NOx concentration for each receptor to provide adjusted modelled road-NOx concentrations.

A3.12 The total nitrogen dioxide concentrations have then been determined by combining the adjusted modelled road-NOx concentrations with the predicted background NO_2 concentration within the NOx to NO_2 calculator.

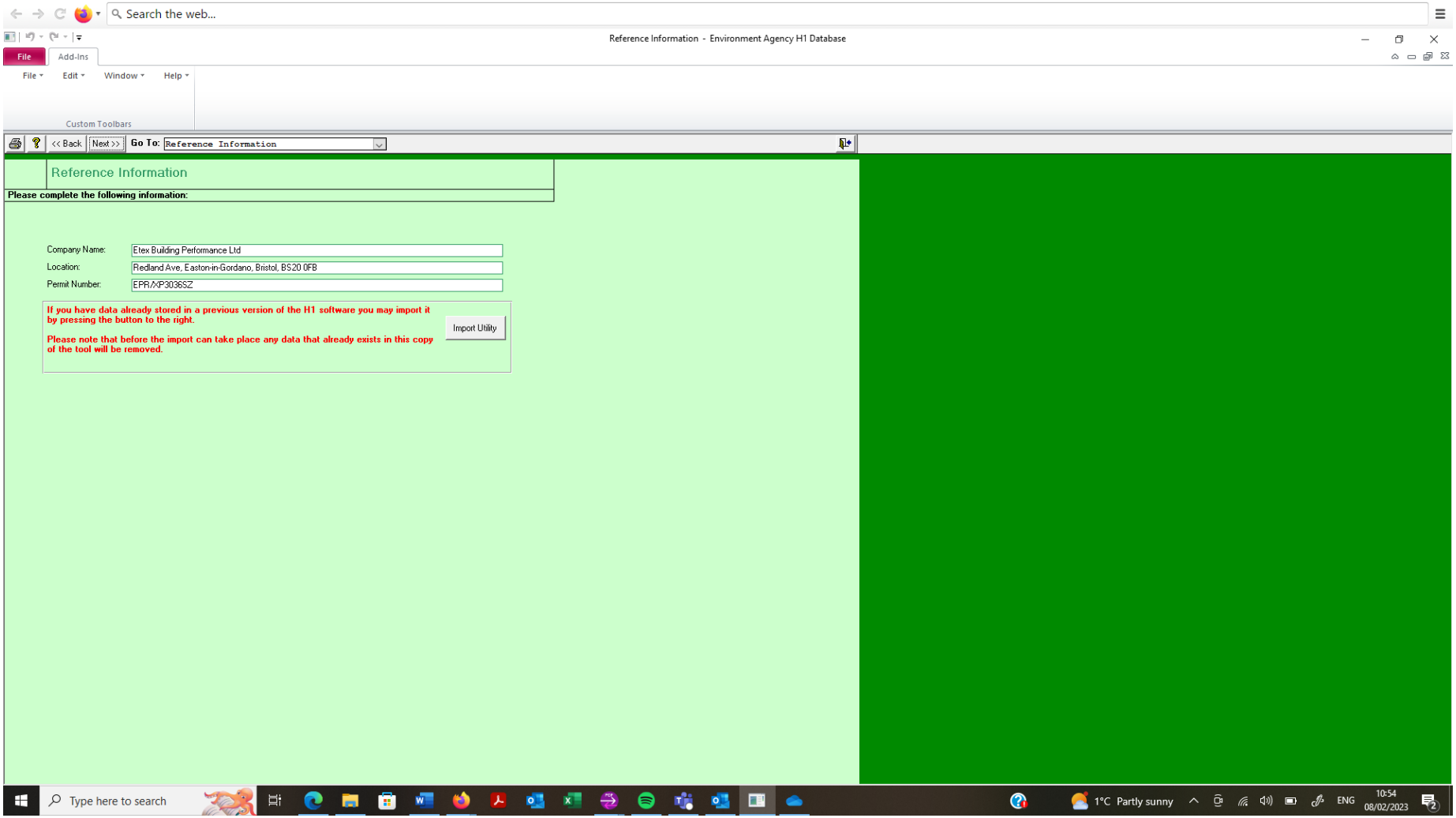
PM_{10} and $PM_{2.5}$

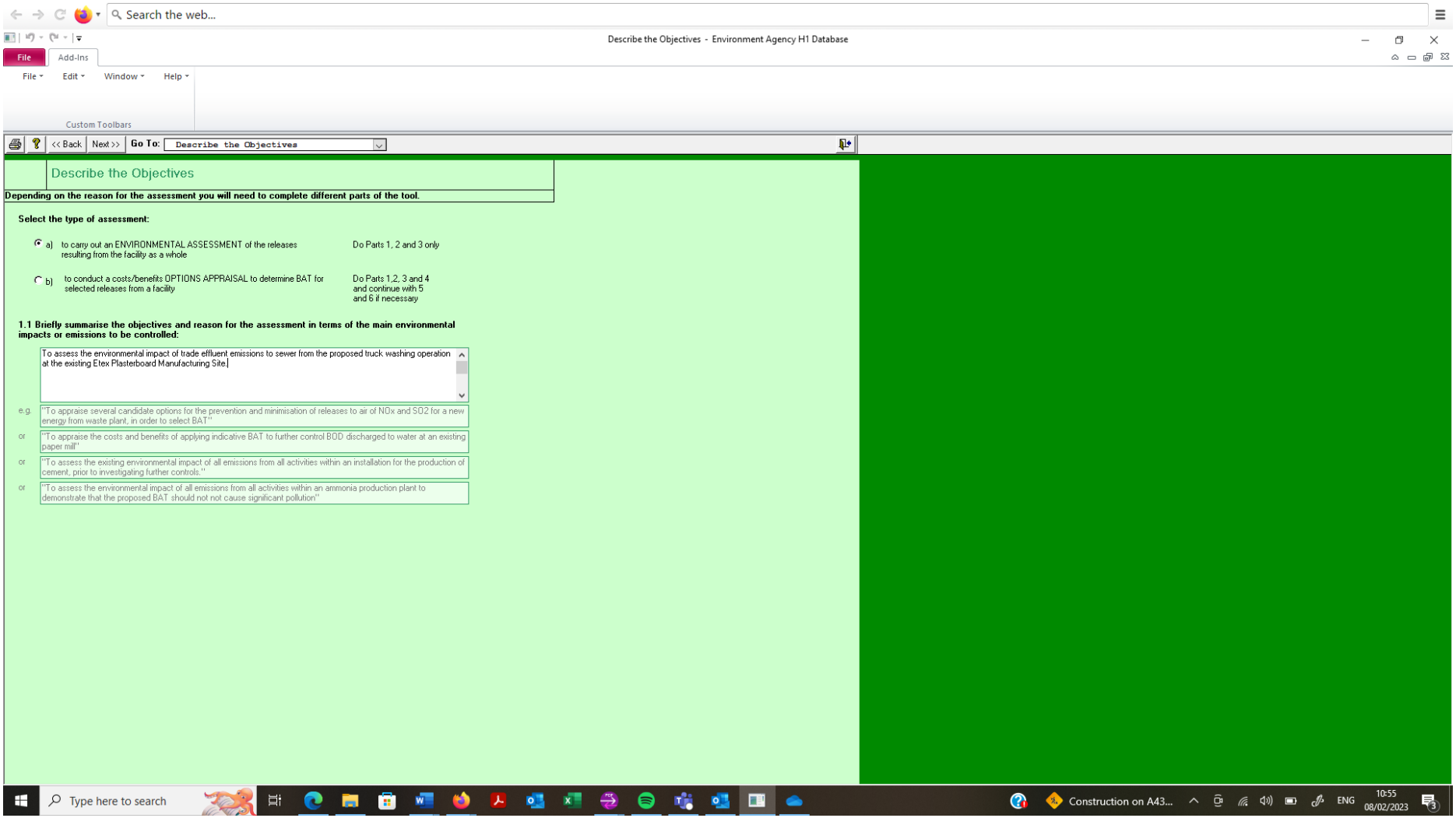
A3.13 There are no nearby PM_{10} or $PM_{2.5}$ monitors. It has therefore not been possible to verify the model for PM_{10} or $PM_{2.5}$. The model outputs of road-PM_{10} and road-$PM_{2.5}$ have therefore been adjusted by applying the adjustment factor calculated for road NOx.

Model Post-processing

A3.14 The model predicts road-NOx concentrations at each receptor location. These concentrations have been adjusted using the adjustment factor set out above, which, along with the background NO_2, has been processed through the NOx to NO_2 calculator available on the Defra LAQM Support website (Defra, 2020b). The traffic mix within the calculator has been set to "All UK traffic", which is considered suitable for the study area. The calculator predicts the component of NO_2 based on the adjusted road-NOx and the background NO_2.

A4 H1 Assessment Emissions to Sewer


Search the web...
Reference Information - Environment Agency H1 Database
File
Add-Ins
File
Edit
Window
Help
Custom Toolbars
<< Back
Next >>
Go To: Reference Information
Reference Information
Please complete the following information:
Company Name: Etex Building Performance Ltd
Location: Redland Ave, Easton-in-Gordano, Bristol, BS20 0FB
Permit Number: EPR/XP3036SZ
If you have data already stored in a previous version of the H1 software you may import it by pressing the button to the right.
Please note that before the import can take place any data that already exists in this copy of the tool will be removed.
Import Utility
Type here to search
1°C Partly sunny
ENG
10:54
08/02/2023


Search the web...
Describe the Objectives - Environment Agency H1 Database
File
Add-Ins
File
Edit
Window
Help
Custom Toolbars
<< Back
Next >>
Go To:
Describe the Objectives
Describe the Objectives
Depending on the reason for the assessment you will need to complete different parts of the tool.
Select the type of assessment:
a) to carry out an ENVIRONMENTAL ASSESSMENT of the releases resulting from the facility as a whole
Do Parts 1, 2 and 3 only
b) to conduct a costs/benefits OPTIONS APPRAISAL to determine BAT for selected releases from a facility
Do Parts 1,2, 3 and 4 and continue with 5 and 6 if necessary
1.1 Briefly summarise the objectives and reason for the assessment in terms of the main environmental impacts or emissions to be controlled:
To assess the environmental impact of trade effluent emissions to sewer from the proposed truck washing operation at the existing Etex Plasterboard Manufacturing Site.
e.g.
"To appraise several candidate options for the prevention and minimisation of releases to air of NOx and SO2 for a new energy from waste plant, in order to select BAT"
or
"To appraise the costs and benefits of applying indicative BAT to further control BOD discharged to water at an existing paper mill"
or
"To assess the existing environmental impact of all emissions from all activities within an installation for the production of cement, prior to investigating further controls."
or
"To assess the environmental impact of all emissions from all activities within an ammonia production plant to demonstrate that the proposed BAT should not not cause significant pollution"
Type here to search
Construction on A43...
ENG
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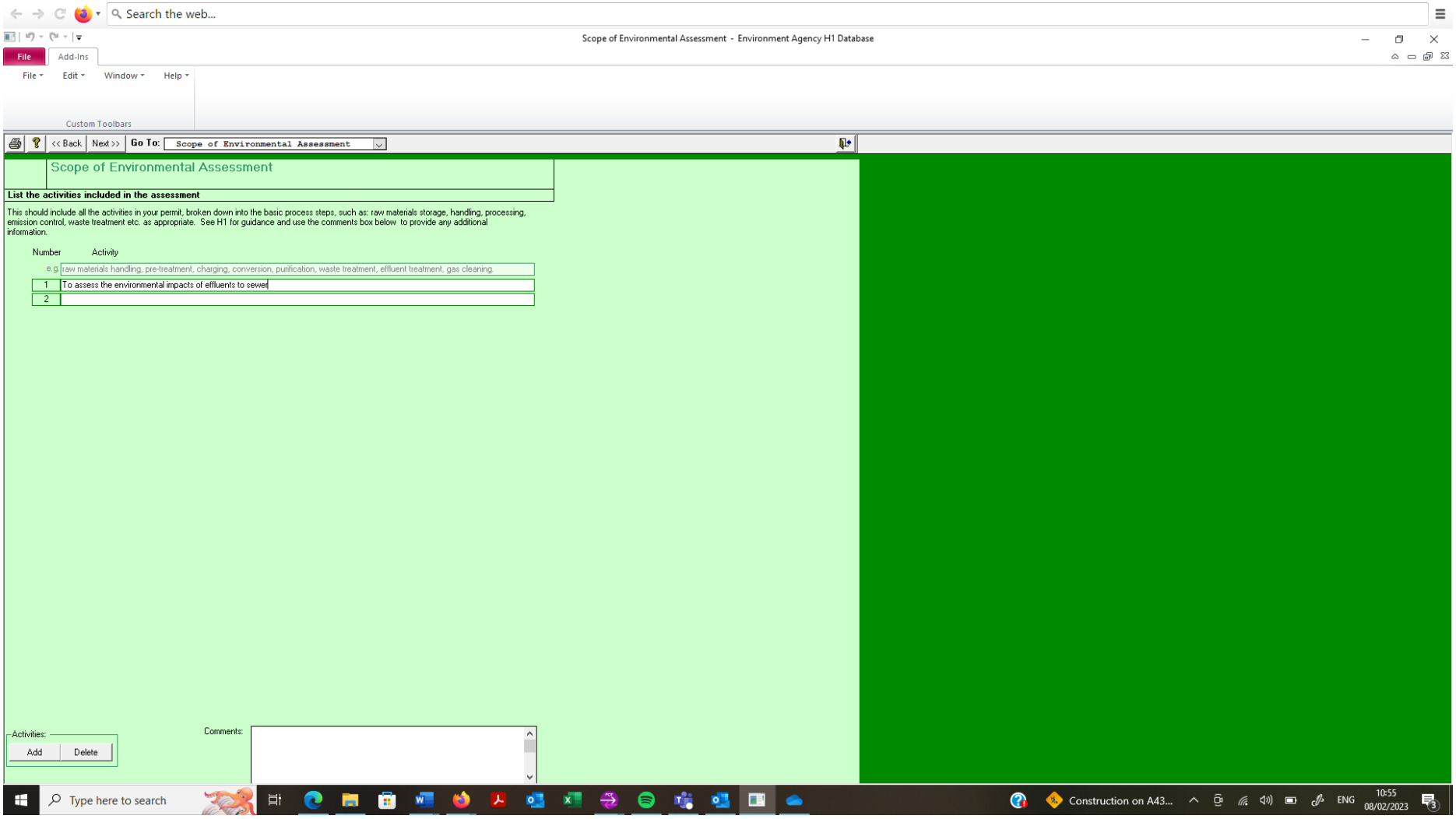
08/02/2023


Search the web...
Scope of Environmental Assessment - Environment Agency H1 Database
File
Add-Ins
File
Edit
Window
Help
Custom Toolbars
<< Back
Next >>
Go To:
Scope of Environmental Assessment
Scope of Environmental Assessment
List the activities included in the assessment
This should include all the activities in your permit, broken down into the basic process steps, such as: raw materials storage, handling, processing, emission control, waste treatment etc. as appropriate. See H1 for guidance and use the comments box below to provide any additional information.
Number
Activity
e.g. raw materials handling, pre-treatment, charging, conversion, purification, waste treatment, effluent treatment, gas cleaning.
1
To assess the environmental impacts of effluents to sewer
2
Activities:
Add
Delete
Comments:
Type here to search
Construction on A43...
ENG
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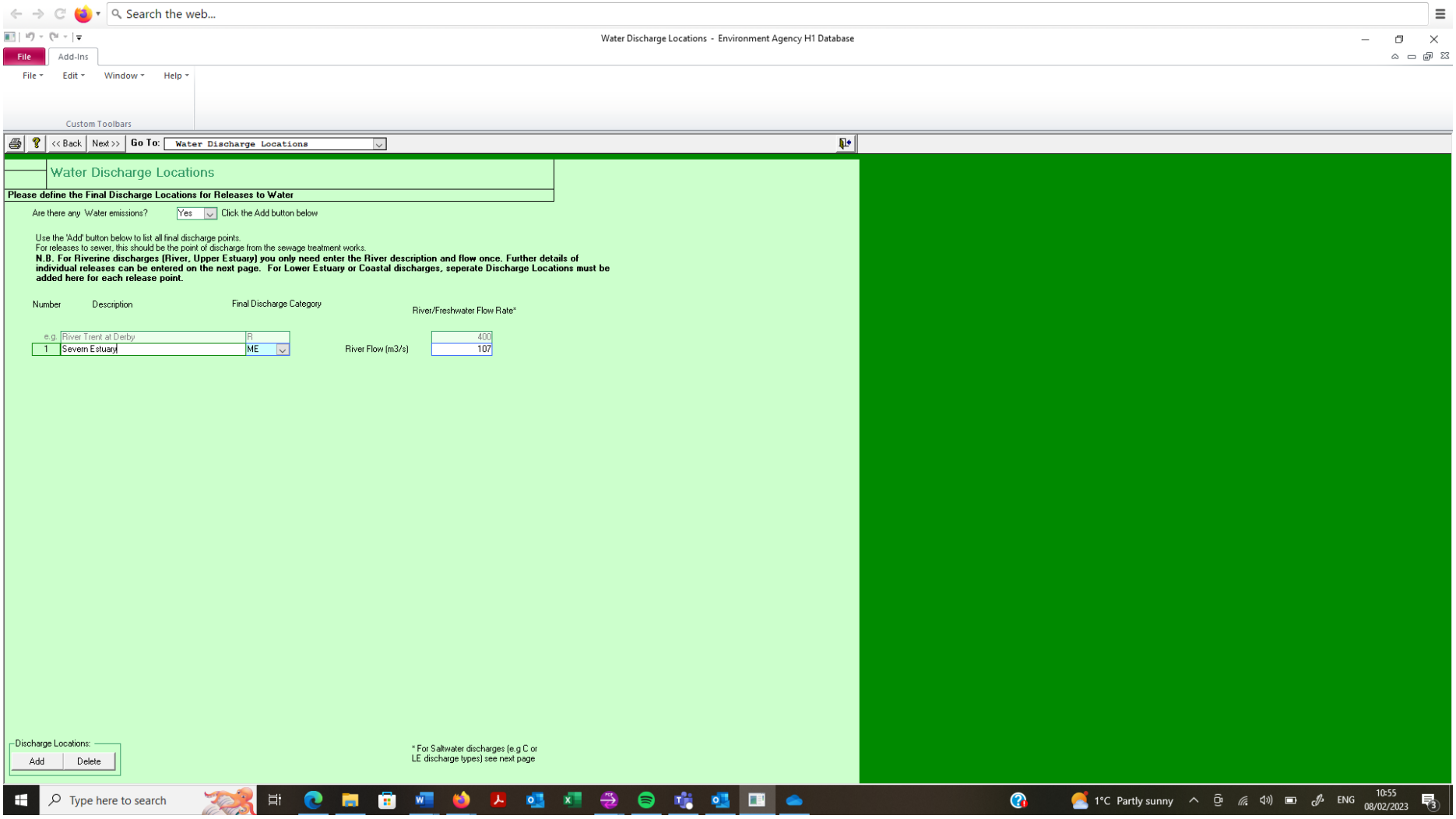
08/02/2023


Search the web...
Water Discharge Locations - Environment Agency H1 Database
File
Add-Ins
File
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Window
Help
Custom Toolbars
<< Back
Next >>
Go To:
Water Discharge Locations
Water Discharge Locations
Please define the Final Discharge Locations for Releases to Water
Are there any Water emissions?
Yes
Click the Add button below
Use the 'Add' button below to list all final discharge points.
For releases to sewer, this should be the point of discharge from the sewage treatment works.
N.B. For Riverine discharges (River, Upper Estuary) you only need enter the River description and flow once. Further details of individual releases can be entered on the next page. For Lower Estuary or Coastal discharges, seperate Discharge Locations must be added here for each release point.
Number
Description
Final Discharge Category
River/Freshwater Flow Rate*
e.g.
River Trent at Derby
R
400
1
Severn Estuary
ME
River Flow (m3/s)
107
Discharge Locations:
Add
Delete
* For Saltwater discharges (e.g C or LE discharge types) see next page
Type here to search
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ENG
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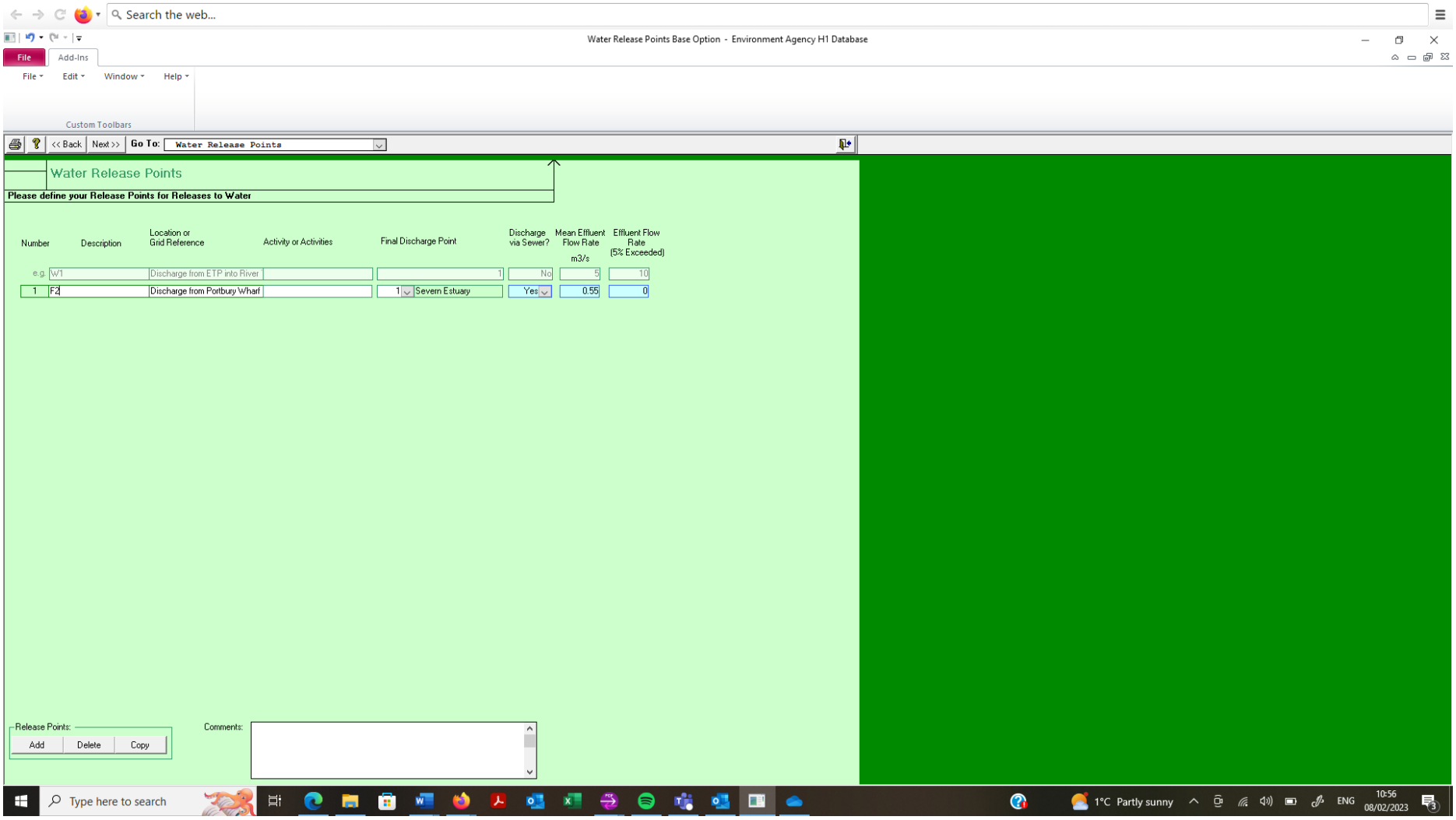
08/02/2023


Search the web...
Water Release Points Base Option - Environment Agency H1 Database
File
Add-Ins
File
Edit
Window
Help
Custom Toolbars
<< Back
Next >>
Go To:
Water Release Points
Water Release Points
Please define your Release Points for Releases to Water
Number
Description
Location or Grid Reference
Activity or Activities
Final Discharge Point
Discharge via Sewer?
Mean Effluent Flow Rate m3/s
Effluent Flow Rate (5% Exceeded)
e.g.
W1
Discharge from ETP into River
1
No
5
10
1
F2
Discharge from Portbury Wharf
1
Severn Estuary
Yes
0.55
0
Release Points:
Add
Delete
Copy
Comments:
Type here to search
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ENG
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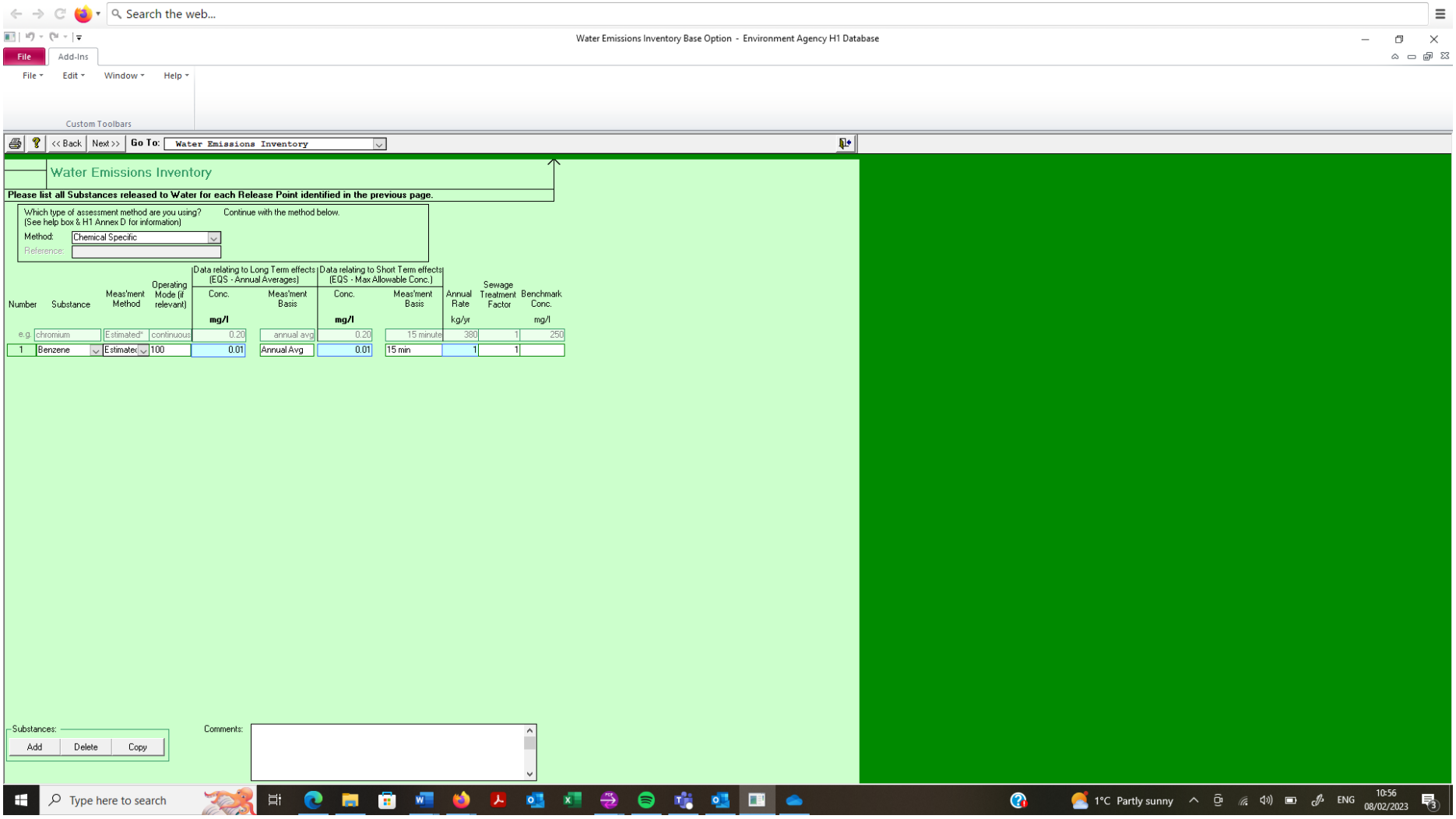
08/02/2023


Search the web...
Water Emissions Inventory Base Option - Environment Agency H1 Database
File
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File
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Window
Help
Custom Toolbars
<< Back
Next >>
Go To:
Water Emissions Inventory
Water Emissions Inventory
Please list all Substances released to Water for each Release Point identified in the previous page.
Which type of assessment method are you using? (See help box & H1 Annex D for information)
Continue with the method below.
Method:
Chemical Specific
Reference:
Data relating to Long Term effects (EQS - Annual Averages)
Data relating to Short Term effects (EQS - Max Allowable Conc.)
Number
Substance
Meas'ment Method
Operating Mode (if relevant)
Conc.
Meas'ment Basis
Conc.
Meas'ment Basis
Annual Rate
Sewage Treatment Factor
Benchmark Conc.
mg/l
mg/l
kg/yr
mg/l
e.g. chromium Estimated* continuous 0.20 annual avg 0.20 15 minute 380 1 250
1 Benzene Estimated 100 0.01 Annual Avg 0.01 15 min 1 1
Substances:
Add
Delete
Copy
Comments:
Type here to search
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ENG
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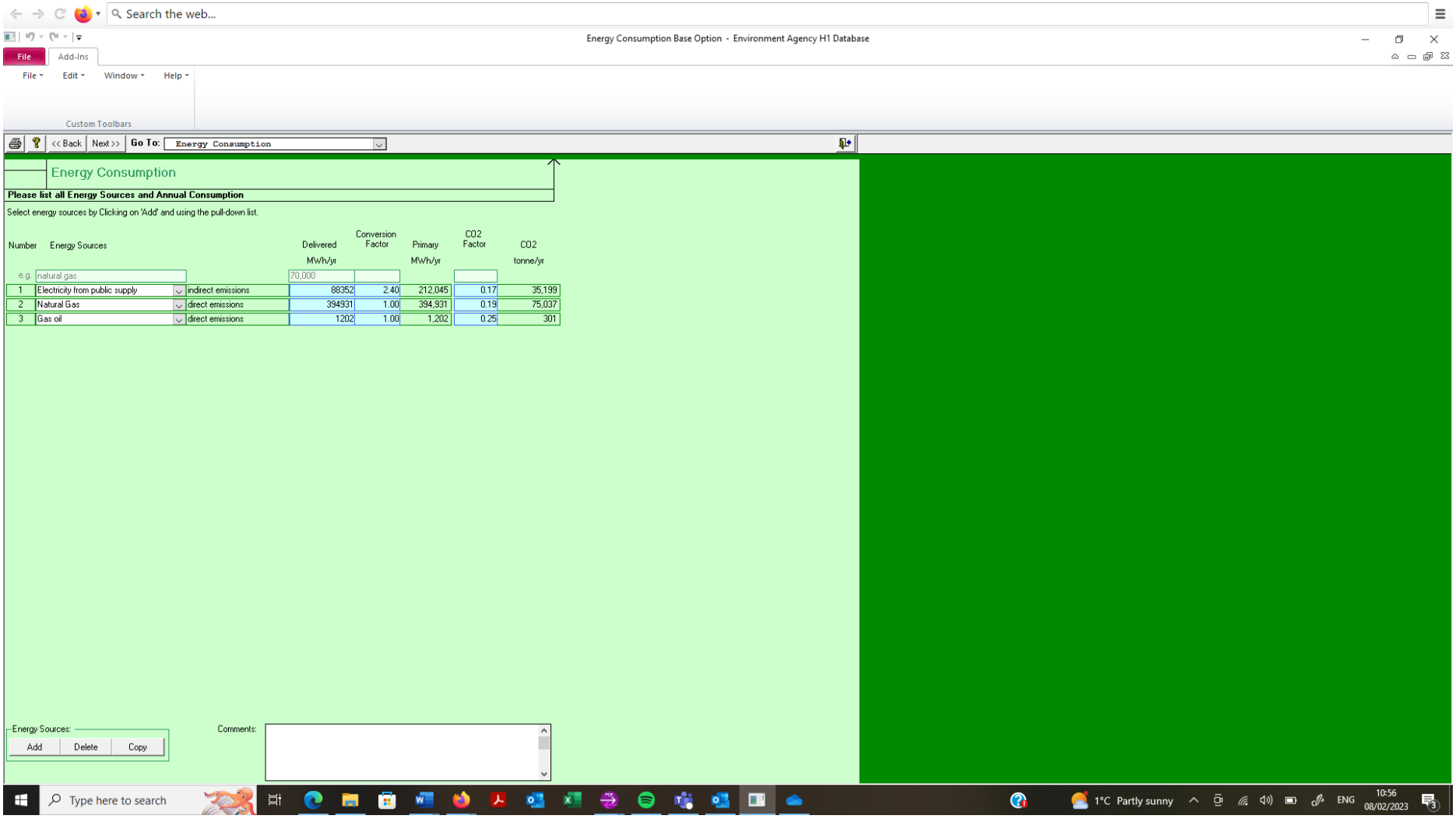
08/02/2023


Search the web...
Energy Consumption Base Option - Environment Agency H1 Database
File
Add-Ins
File
Edit
Window
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Custom Toolbars
<< Back
Next >>
Go To:
Energy Consumption
Energy Consumption
Please list all Energy Sources and Annual Consumption
Select energy sources by Clicking on 'Add' and using the pull-down list.
Number
Energy Sources
Delivered MWh/yr
Conversion Factor
Primary MWh/yr
CO2 Factor
CO2 tonne/yr
e.g. natural gas 70,000
1 Electricity from public supply indirect emissions 88352 2.40 212,045 0.17 35,199
2 Natural Gas direct emissions 394931 1.00 394,931 0.19 75,037
3 Gas oil direct emissions 1202 1.00 1,202 0.25 301
Energy Sources:
Add
Delete
Copy
Comments:
Type here to search
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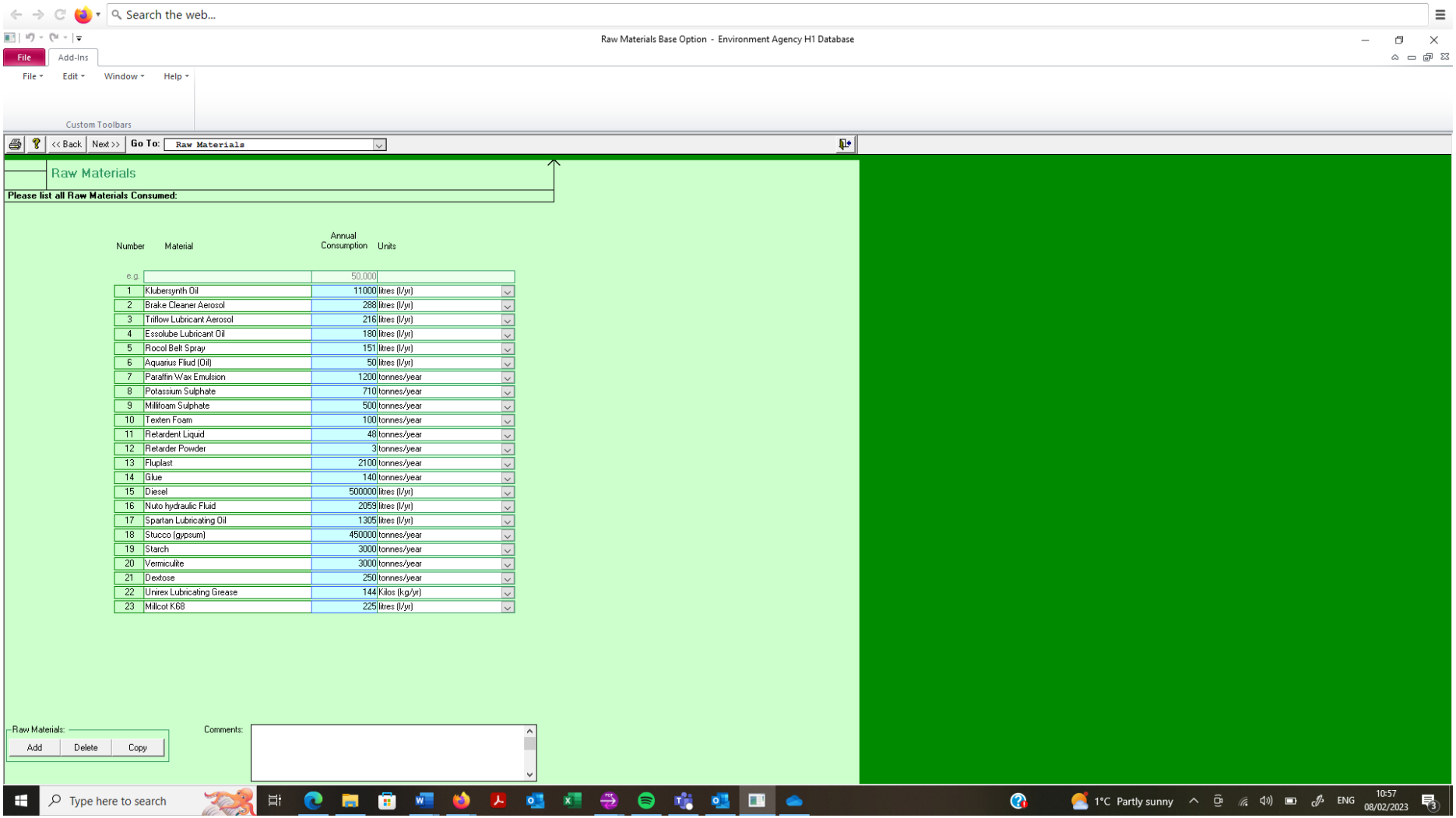
08/02/2023


Search the web...
Raw Materials Base Option - Environment Agency H1 Database
File
Add-Ins
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Help
Custom Toolbars
<< Back
Next >>
Go To:
Raw Materials
Raw Materials
Please list all Raw Materials Consumed:
Number
Material
Annual Consumption
Units
e.g.
50,000
1 Klubersynth Oil 11000 litres (l/yr)
2 Brake Cleaner Aerosol 288 litres (l/yr)
3 Triflow Lubricant Aerosol 216 litres (l/yr)
4 Essolube Lubricant Oil 180 litres (l/yr)
5 Rocol Belt Spray 151 litres (l/yr)
6 Aquarius Fluid (Oil) 50 litres (l/yr)
7 Paraffin Wax Emulsion 1200 tonnes/year
8 Potassium Sulphate 710 tonnes/year
9 Millifoam Sulphate 500 tonnes/year
10 Texten Foam 100 tonnes/year
11 Retardent Liquid 48 tonnes/year
12 Retarder Powder 3 tonnes/year
13 Fluplast 2100 tonnes/year
14 Glue 140 tonnes/year
15 Diesel 500000 litres (l/yr)
16 Nuto hydraulic Fluid 2059 litres (l/yr)
17 Spartan Lubricating Oil 1305 litres (l/yr)
18 Stucco (gypsum) 450000 tonnes/year
19 Starch 3000 tonnes/year
20 Vermiculite 3000 tonnes/year
21 Dextose 250 tonnes/year
22 Unirex Lubricating Grease 144 Kilos (kg/yr)
23 Millcot K68 225 litres (l/yr)
Raw Materials:
Add
Delete
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Comments:
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ENG
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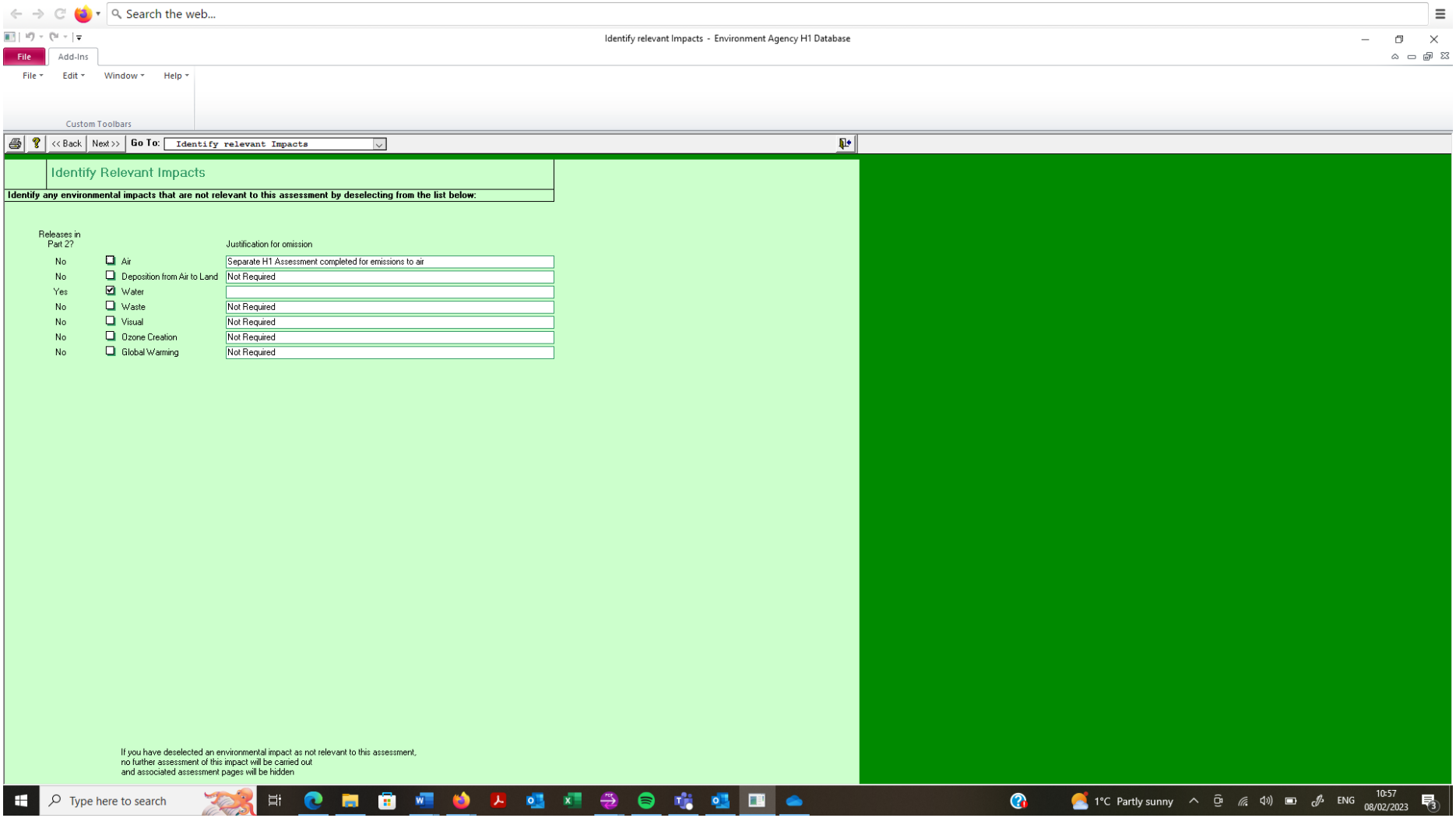
08/02/2023


Search the web...
Identify relevant Impacts - Environment Agency H1 Database
File
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File
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Custom Toolbars
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Next >>
Go To:
Identify relevant Impacts
Identify Relevant Impacts
Identify any environmental impacts that are not relevant to this assessment by deselecting from the list below:
Releases in Part 2?
Justification for omission
No
Air
Separate H1 Assessment completed for emissions to air
No
Deposition from Air to Land
Not Required
Yes
Water
No
Waste
Not Required
No
Visual
Not Required
No
Ozone Creation
Not Required
No
Global Warming
Not Required
If you have deselected an environmental impact as not relevant to this assessment,
no further assessment of this impact will be carried out
and associated assessment pages will be hidden
Type here to search
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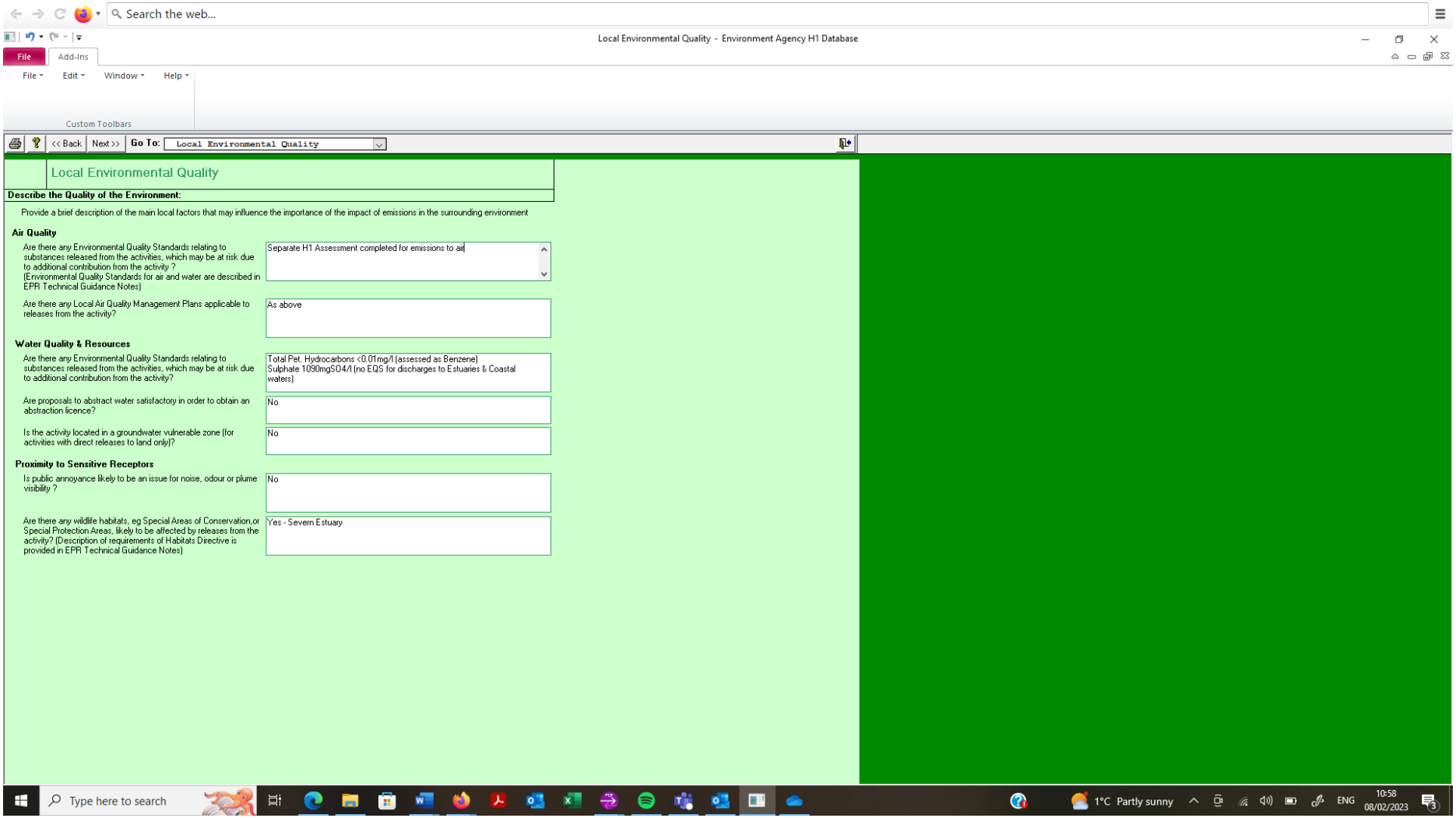
08/02/2023


Search the web...
Local Environmental Quality - Environment Agency H1 Database
File
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File
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Window
Help
Custom Toolbars
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Go To:
Local Environmental Quality
Local Environmental Quality
Describe the Quality of the Environment:
Provide a brief description of the main local factors that may influence the importance of the impact of emissions in the surrounding environment
Air Quality
Are there any Environmental Quality Standards relating to substances released from the activities, which may be at risk due to additional contribution from the activity ? (Environmental Quality Standards for air and water are described in EPR Technical Guidance Notes)
Separate H1 Assessment completed for emissions to air
Are there any Local Air Quality Management Plans applicable to releases from the activity?
As above
Water Quality & Resources
Are there any Environmental Quality Standards relating to substances released from the activities, which may be at risk due to additional contribution from the activity?
Total Pet. Hydrocarbons <0.01mg/l (assessed as Benzene)
Sulphate 1090mgSO4/l (no EQS for discharges to Estuaries & Coastal waters)
Are proposals to abstract water satisfactory in order to obtain an abstraction licence?
No
Is the activity located in a groundwater vulnerable zone (for activities with direct releases to land only)?
No
Proximity to Sensitive Receptors
Is public annoyance likely to be an issue for noise, odour or plume visibility ?
No
Are there any wildlife habitats, eg Special Areas of Conservation,or Special Protection Areas, likely to be affected by releases from the activity? (Description of requirements of Habitats Directive is provided in EPR Technical Guidance Notes)
Yes - Severn Estuary
Type here to search
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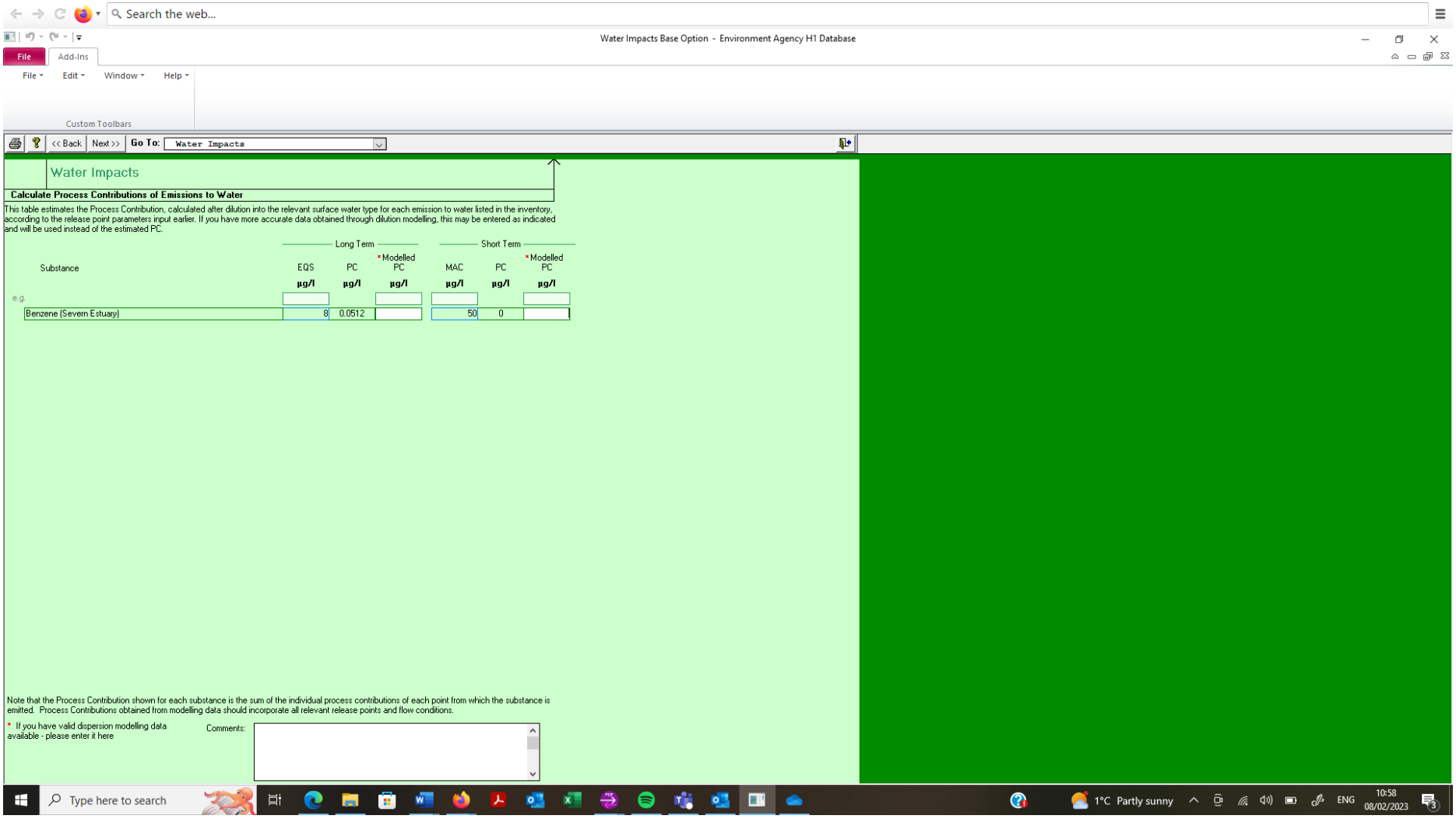
08/02/2023


Search the web...
Water Impacts Base Option - Environment Agency H1 Database
File
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File
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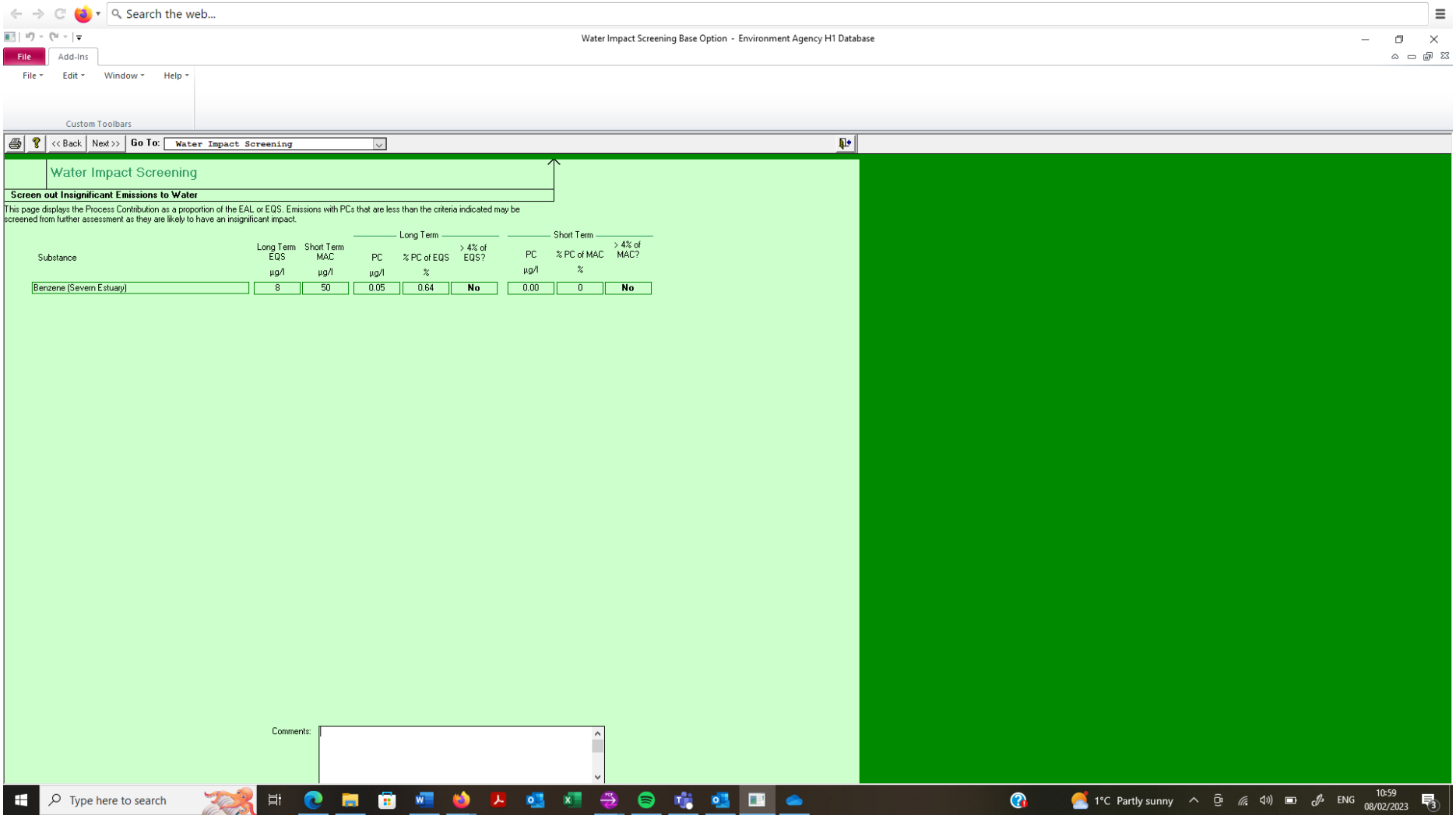
<< Back
Next >>
Go To:
Water Impacts
Water Impacts
Calculate Process Contributions of Emissions to Water
This table estimates the Process Contribution, calculated after dilution into the relevant surface water type for each emission to water listed in the inventory, according to the release point parameters input earlier. If you have more accurate data obtained through dilution modelling, this may be entered as indicated and will be used instead of the estimated PC.
Long Term
Short Term
Substance
EQS
PC
*Modelled PC
MAC
PC
*Modelled PC
µg/l
µg/l
µg/l
µg/l
µg/l
µg/l
e.g.
Benzene (Severn Estuary)
8
0.0512
50
0
Note that the Process Contribution shown for each substance is the sum of the individual process contributions of each point from which the substance is emitted. Process Contributions obtained from modelling data should incorporate all relevant release points and flow conditions.
* If you have valid dispersion modelling data available - please enter it here
Comments:
Type here to search
1°C Partly sunny
ENG
10:58
08/02/2023


Search the web...
Water Impact Screening Base Option - Environment Agency H1 Database
File
Add-Ins
File
Edit
Window
Help
Custom Toolbars
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Next >>
Go To:
Water Impact Screening
Water Impact Screening
Screen out Insignificant Emissions to Water
This page displays the Process Contribution as a proportion of the EAL or EQS. Emissions with PCs that are less than the criteria indicated may be screened from further assessment as they are likely to have an insignificant impact.
Long Term
Short Term
Substance
Long Term EQS
Short Term MAC
PC
% PC of EQS
> 4% of EQS?
PC
% PC of MAC
> 4% of MAC?
µg/l
µg/l
µg/l
%
µg/l
%
Benzene (Severn Estuary)
8
50
0.05
0.64
No
0.00
0
No
Comments:
Type here to search
1°C Partly sunny
ENG
10:59
08/02/2023

Search the web...

Water Long Term Substance Graph Base Option - Environment Agency H1 Database

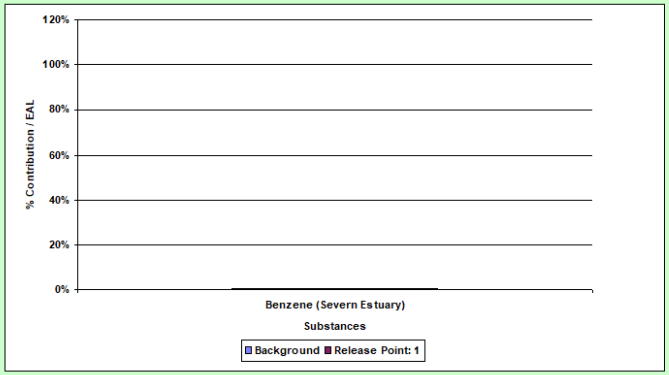
File Add-Ins

File Edit Window Help

Custom Toolbars

<< Back Next >> Go To: Water Long Term Substance Graph

Water Long Term Effects - Comparison by Substance



Type here to search

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ENG 10:59 08/02/2023

Search the web...

Water Short Term Substance Graph Base Option - Environment Agency H1 Database

File Add-Ins

File Edit Window Help

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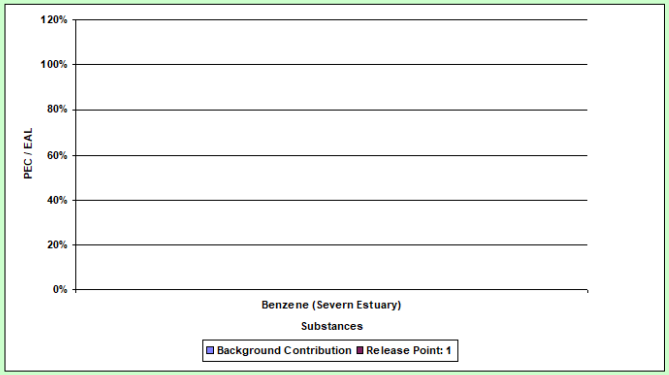
<< Back Next >> Go To: Water Short Term Substance Graph

Short Term Water - Substance Comparison



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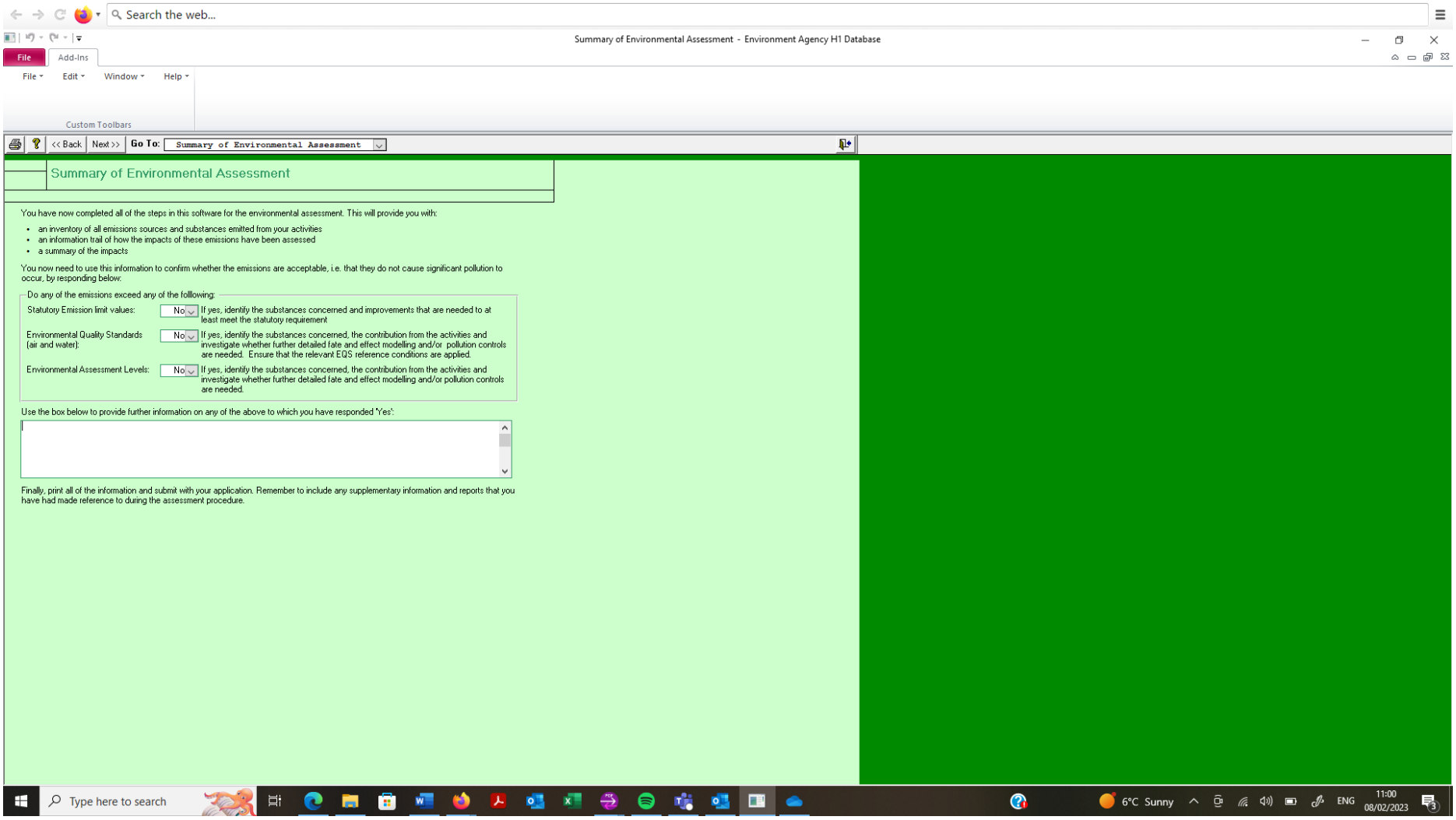
Search the web...
Summary of Environmental Assessment - Environment Agency H1 Database
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Go To:
Summary of Environmental Assessment
Summary of Environmental Assessment
You have now completed all of the steps in this software for the environmental assessment. This will provide you with:
an inventory of all emissions sources and substances emitted from your activities
an information trail of how the impacts of these emissions have been assessed
a summary of the impacts
You now need to use this information to confirm whether the emissions are acceptable, i.e. that they do not cause significant pollution to occur, by responding below:
Do any of the emissions exceed any of the folllowing:
Statutory Emission limit values:
No
If yes, identify the substances concerned and improvements that are needed to at least meet the statutory requirement
Environmental Quality Standards (air and water):
No
If yes, identify the substances concerned, the contribution from the activities and investigate whether further detailed fate and effect modelling and/or pollution controls are needed. Ensure that the relevant EQS reference conditions are applied.
Environmental Assessment Levels:
No
If yes, identify the substances concerned, the contribution from the activities and investigate whether further detailed fate and effect modelling and/or pollution controls are needed.
Use the box below to provide further information on any of the above to which you have responded 'Yes':
Finally, print all of the information and submit with your application. Remember to include any supplementary information and reports that you have had made reference to during the assessment procedure.
Type here to search
6°C Sunny
ENG
11:00
08/02/2023