# Application for an environmental permit:
# Part C2 – General: Varying a bespoke permit

| | |
|---|---|
| **Fill in this part of the form, together with part A, the relevant parts of C3 to C7 and part F1 or F2.**<br><br>Please check that this is the latest version of the form available from our website.<br><br>**Note: If you are applying to convert your existing permit to a standard permit or add a standard facility you need to fill out form C1.**<br><br>**If you want to make an administrative change, you should complete form C0.5.**<br><br>You only need to give us details in this application for the parts of the permit that will be affected (for example, if you are adding a new facility or changing existing ones). | You do not need to resend any information from your original permit application.<br><br>Please read through this form and the guidance notes that came with it. All relevant guidance documents can be found on our website.<br><br>Contents<br> |

## 1 About the permit

### 1a Discussions before your application

If you have had discussions with us before your application, give us the case reference number or details on a separate sheet.

| | |
|---|---|
| Case or document reference | |

### 1b Permit number

| | |
|---|---|
| Permit number this application relates to? | BX7282IS |

### 1c Site details

What is the name, address and postcode of the site?

| | |
|---|---|
| Site name | The Brewery |
| Address | Wilcrick |
| | Magor |
| | Caldicot |
| | Monmouthshire |
| Postcode | NP26 3RA |

## 2 About your proposed changes

### 2a Type of variation

What type of variation are you applying for? (Please tick)

| | |
|---|---|
| Standalone water discharge activity or point source groundwater activity | ☐ |
| Minor technical | ☐ |

Normal variation ☒

Substantial ☐

**2b Provide a non-technical summary of your application**

Please give us brief details of all the proposed changes to current activities, and any new activities you want to add to your permit.

You can use the box below, in Table 1 below. Or, you can use a separate sheet and send it to us with your application form. Tell us below the reference you have given this document.

| Document reference | BX7282IS_AB InBev Variation |
|---|---|

| **Table 1 – Details of the proposed changes** |
|---|
| |

**2c Consolidating existing permits into the modern style**

Consolidating you permit can mean:

- combining the original permit and all subsequent changes into a single document (modern permit), or

- combining two or more environmental permits for the same operator and site into a single permit.

Note: In both cases we may require additional information from you about, for example your management system. Therefore we would always advise you to talk to us before you submit any application to modernise or consolidate permits.

**2c1** Do you want to have a modern style (consolidated) permit?

No ☐ *Go to section 2d*

Yes ☒ *Please note: An additional charge may apply for modernising your permit(s).*

**2c2** Identify all the permits you want to consolidate by listing the permit numbers/ versions in Table 2 below.

| **Table 2 – Permit numbers** |
|---|
| BX7282/A001, BX7282/V002, BX7282/V003, BX7282/V004, BX7282/V005, BX7282/V006 |

**2d Low impact installations (installations only)**

Are any of the regulated facilities low impact installations?

No ☒ *Go to section 2e*

Yes ☐

Please give us a description of your proposed activity telling us how you meet the conditions for a low impact installation and send it to us with your application form.

Document reference

Tick the box to confirm you have filled in the low impact installation checklist in Appendix 1 for each regulated facility. ☐

**2e Treating batteries**

Are you planning to treat batteries? (See the guidance notes on part C2.)

No ☒

Yes ☐ Tell us how you will do this, send us a copy of your explanation and tell us the reference you have given this explanation.

Document reference

**2f Medium Combustion Plant**

Are you applying to *add* additional new Medium Combustion Plant(s) to your existing permit

No ☒

Yes ☐ Please complete Table 3 below

| **Table 3 – Adding Additional Medium Combustion Plant** | | |
|---|---|---|
| | **Number Currently permitted for** | **Number you wish to add** |
| **Medium Combustion Plant** | **0** | **0** |

Please complete Appendix 8 of Form C3 for each new Medium Combustion Plant you wish to add.

**2g Combined Medium Combustion Plant and Specified Generators**

**2g1** Are you applying to add a Specified Generator to your existing permit?

No ☒ *Go to section 3*

Yes ☐ *Go to section 2g2* and complete Appendix 9 of Form C3 for each generator that comprises the Specified Generator.

**2g2** Is the Specified Generator also a new Medium Combustion Plant?

No ☐

Yes ☐ Please complete Appendix 8 and Appendix 9 of Form C3 for each new Medium Combustion Plant you wish to add that is also a Specified Generator.

## 3 Your ability as an operator

**If you are only applying to change or add a water discharge activity, you only have to fill in question 3d.**

**If you are applying to add waste installations or waste operations to a permit that has not previously had them, you need to fill in all of section 3.**

If you are applying to consolidate two or more permits or have an updated permit you must fill in question 3d.

**3a Relevant offences – installations, waste operations, medium combustion plant and specified generators** (See guidance notes on part C2)

Have you, or any other relevant person, been convicted of any relevant offence?

No ☒ *Go to section 3b*

Yes ☐ Please give details below

| | |
|---|---|
| Title | |
| First name | |
| Last name | |
| Date of birth (DD/MM/YYYY) | |
| Position held at the time of the offence | |
| Name of the court where the case was dealt with | |
| Date of conviction (DD/MM/YYYY) | |
| Offence and penalty set | |
| Date any appeal against the conviction will be heard (DD/MM/YYYY) | |

If necessary, use a separate sheet to give us details of other relevant offences, and tell us below the reference number you have given the extra sheet.

| | |
|---|---|
| Document reference | |

**3b Technical ability - relevant waste operations only** (see the guidance notes on part C2)

**3b1** Which approved scheme are you using to show you have the suitable technical skills and knowledge to manage your facility?

CIWM / WAMITAB ☐

ESA / EU ☐

**3b2** Do you already hold the relevant, formal qualifications to manage your facility?

Yes ☐ Tick to confirm you've included all original *and* continuing competence evidence. ☐

No ☐ Tick to confirm you've included evidence you've registered with a Scheme. ☐

**3c Finances (installations, waste operations, mining waste operations, medium combustion plant and specified generators)**

**Do you or any relevant person have current or past bankruptcy or insolvency proceedings against you?**

No ☒ *Go to section 3d.*

Yes ☐ Please give details of the required set-up (including infrastructure), maintenance and clean up costs for the proposed facility, against which a credit check may be assessed.

Please note: We may want to contact a credit reference agency for a report about your business's finances.

**Landfill, Category A mining waste facilities and mining waste facilities for hazardous waste only**

How do you plan to make financial provision (to operate a landfill or a mining waste facility you need to show us that you are financially capable of meeting the obligations of closure and aftercare)?

Bonds ☐

Escrow account ☐

Trust fund ☐

Lump sum ☐

Other ☐

Provide a plan of your estimated expenditure on each phase of the landfill or mining waste facility.

Document reference

**3d Management systems (all)**

You can find guidance on management systems in both 'How to Comply' and 'Horizontal Guidance Note 6 – Environmental Management Systems'. We have also developed environmental management toolkits for some business sectors which you can use to produce your own management system. You can get these by calling 0300 065 3000 or by downloading them from our guidance webpages.

**3d1 Does your management system meet the conditions set out in our guidance?**

Yes ☒

No ☐

**3d2 What management system will you provide for your regulated facility?**

EC Eco-Management and Audit Scheme (EMAS) ☐

ISO 14001 ☐

BS 8555 (Phases 1–5) ☐

Green Dragon ☐

Own management system ☒

**3d3 Make sure you include a summary of your management system which sets out any changes or additional measures you will put in place to the address risks from the proposed changes. Tick the box to confirm you've done this and tell us the reference below.** ☒

Document reference BX7282IS_AB InBev Variation

***Water discharge activities:*** *Go to section 5.*

## 4 Consultation (fill in 4a to 4c for installations and waste operations and 4d for installations only)

**Could the waste operation or installation involve releasing any substance into any of the following?**

**4a A sewer managed by a sewerage undertaker**

No ☒

Yes ☐ Please name the sewerage undertaker

**4b A harbour managed by a harbour authority**

No ☒

Yes ☐ Please name the harbour authority

**4c Direct into relevant territorial waters or coastal waters within the sea fisheries district of a local fisheries**

No ☒

Yes ☐ Please name the fisheries committee

**4d Is the installation on a site for which:**

**4d1 a nuclear site licence is needed under section 1 of the Nuclear Installations Act 1965?**

No ☒

Yes ☐

**4d2 a policy document for preventing major accidents is needed under regulation 5 of the Control of Major Accident Hazards**

No ☒

Yes ☐

## 5 Supporting information

**5a Provide a plan or plans for the site (see guidance notes on part C2 for what needs to be marked on the plan)**

Document reference: BX7282IS_AB InBev Variation

**5b Do any of the variations you plan to make need extra land to be included in the permit?**

No ☐

Yes ☒ Please provide a site report for the extra land.

Document reference: BX7282IS_AB InBev Variation

**5c Adding an installation**

If you are applying to add an installation, tick the box to confirm that you have sent in a baseline report and provide a reference. ☐

Document reference:

## 6 Environmental risk assessment - if you need one (see the guidance notes on part C2)

Provide an assessment of the risks each of your proposed activities cause to the environment. The risk assessment must use H1 or an equal method.

Document reference: 1700003382_Environmental Risk Assessment_01

## Appendix 1 – Low impact installation checklist (see guidance notes on part C2)

| **Installation reference** | | | | | |
|---|---|---|---|---|---|
| **Condition** | **Response** | | | | **Do you meet this?** |
| A – Management techniques | Provide references to show how your application meets A. | | | | Yes ☐ No ☐ |
| | References | | | | |
| B – Aqueous waste | Effluent created | | m3/day | | Yes ☐ No ☐ |
| C – Abatement systems | Provide references to show how your application meets C. | | | | Yes ☐ No ☐ |
| | References | | | | |
| D - Groundwater | Do you plan to release any hazardous substances or non-hazardous pollutants into the ground? | | Yes ☐ No ☐ | | Yes ☐ No ☐ |
| E – Producing waste | Hazardous waste | | Tonnes per year | | Yes ☐ No ☐ |
| | Non-hazardous waste | | Tonnes per year | | |
| F – Using energy | Peak energy consumption | | MW | | Yes ☐ No ☐ |
| G – Preventing accidents | Do you have appropriate measures to prevent spills and major releases of liquids? (See 'How to comply'.) | | Yes ☐ No ☐ | | Yes ☐ No ☐ |
| | Provide references to show how your application meets G. | | | | |
| | Reference | | | | |
| H - Noise | Provide references to show how your application meets H. | | | | Yes ☐ No ☐ |
| | Reference | | | | |
| I - Emissions of polluting substances | Provide references to show how your application meets I. | | | | Yes ☐ No ☐ |
| | Reference | | | | |
| J – Odours | Provide references to show how your application meets J. | | | | Yes ☐ No ☐ |
| | Reference | | | | |
| K – History of keeping to the regulations | Say here whether you have been involved in any enforcement action as described in Compliance History Appendix 1 explanatory notes. | | Yes ☐ No ☐ | | |

Intended for
**AB InBev UK Limited**

Date
**September 2019**

Project Number
**1700003382_ERA**

# AB INBEV UK LIMITED ENVIRONMENTAL RISK ASSESSMENT

RAMBOLL

# AB INBEV UK LIMITED
# ENVIRONMENTAL RISK ASSESSMENT

| | |
|---|---|
| Project No. | **1700002282** |
| Issue No. | **01** |
| Date | **30/09/2019** |
| Made by | **Lucy Cleverley/ Karen Hardy** |
| Checked by | **Lucy Cleverley** |
| Approved by | **Greg Roberts** |

Made by:

Checked/Approved by:



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| Revision | Date | Made by | Checked by | Approved by | Description |
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| 1 | 30/09/2019 | LC/ KH | LC | GR | First issue to client |

Ramboll
8 Village Way
Tongwynlais
Cardiff
CF15 7NE
United Kingdom
T +44 2920 543 550
www.ramboll.co.uk

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# APPENDICES

# INTRODUCTION

Ramboll Environment and Health UK Limited (Ramboll) was commissioned by AB InBev UK Limited ('AB InBev' or the 'Client') to prepare a Site Condition Report (SCR) for its manufacturing facility located at The Brewery, Wilcrick, Magor, Caldicot, Monmouthshire, NP26 3RA (the 'Facility' or the 'site'). The SCR shall support AB InBev's application for a variation to their existing Environmental Permit (EP) (BX7282IS).

The SCR (and application for a variation to the EP) requires an Environmental Risk Assessment (ERA) to be carried out based on Natural Resources Wales' EPR H1 Guidance. The objective of the ERA is to identify the substances used and produced that could pollute the soil or groundwater if there was an accident, or if measures to protect land fail.

In accordance with the aforementioned guidance, this ERA is structured as follows:

1. Identification and consideration of risks for the Facility and sources of the risks.
2. Identification of receptors (people, animals, property and anything else that could be affected by the hazard) at risk from the Facility.
3. Identification of possible pathways from the sources of the risks to receptors.
4. Assessment of the risks relevant to the specific activities carried out at the site and consideration of which risks can be screened out as negligible.
5. Description of measures to control identified risks.

# 1. IDENTIFICATION OF ENVIRONMENTAL RISKS

## 1.1 Source-Pathway-Receptor Concept

In order for pollution to have an impact on the environment, a pollution linkage must be present which relies on the Source-Pathway-Receptor concept, where all three factors must be present and linked for a potential risk to exist.

A "pollution linkage" requires the following:

i) A "source" is a substance which is in, on or under the land and which has the potential to cause significant harm to a relevant receptor, or to cause significant pollution of controlled waters;

ii) A "receptor" is something that could be adversely affected by a contaminant, for example a person, an organism, an ecosystem, property, or controlled waters; and

iii) A "pathway" is a route by which a receptor is or might be affected by a contaminant.

Identification of the source, pathway and receptor enables management interventions to be made to manage the environmental risks and avoid pollution reaching the receptor.

In this section the potential sources (environmental risks) of pollution at the Facility are identified and screened for their significance, and the potential pathways and receptors are identified.

## 1.2 Environmental Risks

The Operator is required to identify the environmental risks (sources of potential contamination) which could occur during the operation of the Facility, including any risks which may arise from accidents. The EA online guidance[1] stipulates that the Operator must consider the following potential risks:

- any discharge (e.g. sewage or trade effluent to surface water or groundwater);
- accidents;
- odour;
- noise and vibration;
- uncontrolled and unintended ('fugitive') emissions (for which risks include dust, litter, pests; and pollutants that shouldn't be in the discharge); and
- visible emissions (e.g. smoke or visible plumes).

In considering the risk, the Operator can determine that a potential risk is not considered to be significant in terms of its potential impact on the environment; however, a justification must be provided for any risk which is 'screened out'.

Based on the guidance summarised above the potential environmental risks at the Facility have been identified and have been determined either applicable or not applicable based on the potential environmental impact arising from the risk. A summary of these risks is presented in the table below which also provides justifications where risks are considered to be insignificant. The risks which have been identified as significant have been included in the risk assessment in Section 5 of this report.

[1] https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit#risks-from-your-site

**Table 1.1: Screening of Environmental Risks**

| Environmental Risk | Applicability | Justification |
|---|---|---|
| Controlled discharges to surface waters | Applicable | Under its Environmental Permit (BX7282IS), the Facility has three permitted discharges to surface water: discharge of treated effluent from the ETP into the Severn Estuary; disposal of surface water at the main brewery site to the Waundeilad Reen; and disposal of surface water at the effluent treatment plant site to the Mill Reen. |
| Controlled discharges to Groundwater | Not Applicable | There are no controlled discharges to groundwater from the Facility. This risk has not been considered for further assessment. |
| Accidents | Applicable | Plant or Equipment Failure: Large quantities of equipment are in-use across the Facility. The failure of plant or equipment may result in an incident occurring which could potentially impact on the environment.<br>Materials Handling: Raw materials and wastes are stored on both the main site and the ETP site in bulk and are transported across the Facility via pipework and in IBCs on fork lift trucks. There is the potential for accidents (e.g. spills, leaks etc.) to occur during the filling of bulk storage vessels and the movement of materials, which may result in contaminated run-off.<br>Vandalism: The Facility is located in a relatively remote rural area and may be a target for vandalism and theft.<br>Operator Error: Whilst the majority of the processing plant is automated, the potential for operator error cannot be ruled out. |
| Odour | Applicable | Emissions from the Installation have the potential to be odorous, particularly the brewing process and operations at the off-site effluent treatment plant. In addition, odours may be produced at the on-site waste water treatment plant and from the storage of waste at the recycling area of the main brewery site. |
| Noise & Vibration | Applicable | Operations at the Installation have the potential to produce noise, in particularly the movement of Heavy Goods Vehicles making deliveries to and collections from the site. In addition, the use of machinery on-site, the movement of barrels and the boilers have the potential to cause emissions of noise from the site. |
| Visual Impact | Not Applicable | The Facility is positioned adjacent to the M4 within a predominantly agricultural area with some commercial land uses and sparse residential properties.<br>Visible emissions from the Facility are limited to steam/ water vapour from the evaporative condensers and cooling towers and permitted releases from the boiler stacks.<br>These emissions are not considered to be significant in terms of visual impact. There are no records of complaints regarding the visual impact of emissions at the Facility. Based on this, visual impact has not been considered to be |

| Environmental Risk | Applicability | Justification |
|---|---|---|
| | | significant and has not been included for further assessment. |
| Fugitive Emissions to air and water | Applicable | Surface Water: potential for blocked/ damaged drains or misconnections in the drainage system to result in an uncontrolled release of process wastewater to ground or surface water.<br>Storm water discharges: storm water run-off from the site roofs and yard areas is directed via an integrated wastewater and storm water drainage system to the on-site wastewater treatment plant and then pumped to the off-site ETP. In the event of a flood, process water, diluted by flood water is pumped into the Waundeilad Reen. Although the pH is tested prior to release, there remains the potential for polluted discharges to enter surface water due to failure of the penstock valve or failure of monitoring systems.<br>Dust: The delivery and collection of dry raw materials and wastes give rise to the potential of generation of dust emissions. Whilst dry materials are delivered in internal areas, dry waste materials are currently collected in bulk in a dedicated external area of the site. There is a therefore potential for dust generation in external areas.<br>Litter: Wastes are produced at the Facility which are stored in secure containers at a dedicated, central location of the site, limiting the potential for litter to be windblown. At the off-site ETP, wastes are stored in secure waste skips and are collected by a waste contractor at appropriate intervals. |
| Controlled releases to air | Applicable | Air emissions comprise combustion products from the Facility's natural gas fired HTHW and steam boilers at the main brewery site and from the CHP plant and flare stack from the anaerobic digestion plant at the effluent treatment plant. In addition, water vapour/ steam from cooling towers and evaporative condensers from brewing vessels, and at various locations around the site. |
| Global Warming Potential | Applicable | Both direct and indirect greenhouse gas emissions arise from the operation of the Facility. Direct emissions arise from the burning of gas / oil in the on-site boilers and off-site CHP, and operation of the chiller and cooling systems (which use regulated greenhouse gases). Indirect emissions arise from the use of electricity, and water. There are also other indirect impacts from both in the production and supply process. |
| Facility Waste | Applicable | Hazardous and non-hazardous wastes are produced at the Facility as a result of the production processes, maintenance and administrative functions. |

# 2. IDENTIFICATION OF RECEPTORS

A receptor is defined as something that could be adversely affected by a pollutant. Based on visual observations of the Facility and the information relating to its environmental setting (provided in the SCR) Ramboll has identified the receptors within the vicinity of the site. The receptors are depicted on Figure 8 of Appendix 1 of the SCR which shows the Facility boundary and the location of each receptor; a summary of the identified receptors is provided in Table 2.1 below.

**Table 2.1: Summary of Identified Receptors**

| Receptor | Location |
|---|---|
| *Groundwater:* The Brewery site is situated on a Secondary A Aquifer; however, it is not in a Groundwater Source Protection Zone. The Tidal Mud Flats underlying the ETP are classified as Unproductive Strata.<br>There no records of groundwater abstraction wells within 1km of the Brewery or ETP sites. | Across the entirety of the Facility and in the immediate vicinity of the Facility |
| *Surface Water:*<br>Brewery Site<br>A pond is located on-site, outside the restaurant area and includes several ornamental carp. A surface water pond feature is present outside of the installation boundary, adjacent to the west of the pumping station. Other nearby water features include drainage channels adjacent to a roadway approximately 100m to the south of the site, connecting to a series of drainage reens across Caldicot Level.<br>ETP<br>The ETP is surrounded by interconnected reens, all of which drain to the Severn Estuary via the Magor Pill.<br>The Facility is permitted to discharge treated process effluent from the ETP to the Severn Estuary, and to discharge uncontaminated surface water from the main brewery site to the Waundeilad Reen and from the ETP site to the Mill Reen.<br>There are no records of surface water abstraction licences recorded within 1km of the Brewery or ETP sites. | On-site and in the immediate vicinity of the Facility. |
| *Ground:*<br>Brewery Site<br>The site is underlain by Made Ground across the majority of the site to a maximum depth of 1.7m bgl; underlain by gravelly silty sandy clay to a maximum depth of 4.5m bgl; underlain by Sandstone bedrock; or in the far west of the site, Made Ground was found to be underlain by Mercia Mudstone.<br>ETP<br>The ETP site is underlain by Made Ground to a maximum depth of 1.8m bgl comprising sandy gravelly clay; underlain by clay and gravelly clay to 5m bgl; underlain by Mercia Mudstone. | Across the entirety of the Facility and in the immediate vicinity of the Facility |
| *Atmosphere:*<br>Brewery Site<br>Air emissions comprise combustion products from the Facility's natural gas fired HTHW and steam boilers. In addition, water vapour/ steam from operations on-site. In addition, water vapour/ steam from cooling towers and evaporative condensers from brewing vessels, and at various locations around the site. | Across the entirety of the Facility and in the immediate vicinity of the Facility |

| **Receptor** | **Location** |
|---|---|
| ETP<br>Air emissions at the ETP site comprise combustion products from the CHP plant and from the flare stack from the anaerobic digestion plant. | |
| *Designated Ecological Sites:*<br>Brewery Site<br>The Gwent Levels Site of Special Scientific Interest (SSSI) is located 358m south of the site, designated due to rich assemblages of invertebrate species. The area also contains a number of nationally rare plant species.<br>ETP<br>The ETP is located within the Gwent Levels SSSI. The Severn Estuary is located 42m south-east of the site at its closest point and is designated as a SSSI, Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar site. | 358 m south of the brewery site and 42 m south- east of the ETP. |
| *Human Occupation:* Facility workers and visitors are present across the internal and external areas of the brewery site, and at operational areas of the ETP site.<br>Brewery Site<br>There are public footpaths within 36 m south, 136 m south-west and 166 m west of the site. In addition, a hotel is located approximately 161 m north-east, and the M4 approximately 223 m north-east from the site, a police station is present 141 m north-east of the north- eastern site boundary, and the residential area of Magor is situated from 305 m east. A railway line is located approximately 314 m south.<br>ETP<br>Public footpaths run adjacent to the south-eastern site boundary and within 154 m south-west and 175 m north of the ETP site. The nearest residential properties are situated approximately 530 m north- west. Human receptors are present intermittently at these locations. | On-site and directly adjacent |

# 3. POTENTIAL POLLUTION PATHWAYS

## 3.1 Identification of Possible Pathways from the Sources of the Risks to Receptors

The potential pollution pathways between the sources identified in Section 1 (excluding those which have been screened out) and the receptors identified in Section 2 are summarised in the table below.

**Table 3.1: Potential Pollution Pathways**

| Source | Potential Pathway | Receptor |
|---|---|---|
| *Controlled discharges to surface waters.* | Surface water pumped from the brewery site to the Waundeilad Reen.<br>Surface water runoff from the lorry park area to highways surface water drainage.<br>Below ground pipe from the ETP to the Severn Estuary.<br>Surface water at the effluent treatment plant site, discharged to the Mill Reen. | Waundeilad Reen<br>Mill Reen. |
| *Odour:* arising from the brewing process; waste materials; effluent at the on-site waste water treatment plant; and operations at the off-site ETP. | Through the air. | *Humans including:* Facility workers/visitors; workers on adjacent premises; local residents; intermittent presence on pedestrian routes / roadways surrounding the Facility. |
| *Visual emissions:* arising from combustion activities; cooling towers and evaporative condensers. | Through the air. | *Humans including:* Facility workers/visitors; workers on adjacent premises; local residents; intermittent presence on pedestrian routes / roadways surrounding the Facility. |
| *Noise and Vibration:* arising from vehicle movements; site operations; process machinery; and ETP. | Transmitted through the air and through ground vibration. | *Humans including:* Facility workers/visitors; workers on adjacent premises; local residents; intermittent presence on pedestrian routes / roadways surrounding the Facility. |
| *Accidents:* including plant or equipment failure; materials handling; vandalism; operator error; fire; and, flooding. | Over site surfaces; through site drainage systems; and through the air. | *Surface water; Groundwater; Ground; Atmosphere, and Humans including:* Facility workers/visitors; workers on adjacent premises; local residents; intermittent presence on pedestrian routes / |

| Source | Potential Pathway | Receptor |
|---|---|---|
| | | roadways surrounding the Facility. |
| *Fugitive Emissions:* including dust; litter; and surface water run-off. | Through the air; windblown; over Facility surfaces; through Facility drainage systems. | *Surface water; groundwater; ground; atmosphere, and humans including:* facility workers/visitors; workers on adjacent premises; local residents; intermittent presence on pedestrian routes / roadways surrounding the brewery. |
| *Controlled release to air:* from point sources. | Through the air; windblown. | *Atmosphere, and humans including:* Facility workers/visitors; workers on adjacent premises; local residents; intermittent presence on pedestrian routes / roadways surrounding the brewery. |
| *Global Warming Potential:* from direct and indirect use of fossil fuels. | Through the air. | *Atmosphere.* |
| *Installation Waste:* hazardous and non-hazardous wastes arising as a result of production processes; maintenance; and administrative functions undertaken at the Facility. | Windblown over ground; surface water run-off. | *Groundwater; surface water; ground; and atmosphere.* |

# 4. RISK ASSESSMENT METHODOLOGY

The risk assessment provides a simple representation of the hypothesised relationships between contaminants, pathways and receptors. This allows the identification of potential contamination linkages and, therefore, an interpretation of the potential for pollution to occur at the Facility or within the vicinity of the site as a result of the activities at the Facility.

The potential for pollution to occur at the site is determined by assessing the likelihood of an identified receptor being exposed to pollution emanating from a source at the Facility and the resultant consequences of any such exposure. In determining the likelihood and the consequence of a pollution exposure the risk management techniques which are used at the Facility, and the effect on any such exposure are considered. Where the risk management techniques are considered to have a mitigating impact, the resultant overall likelihood of the pollution exposure occurring and its consequences on a receptor are lowered.

## 4.1 Assessing Likelihood and Consequence

Within the risk assessment, each hypothesised relationship between contaminants, pathways and receptors is assessed to determine the likelihood of the receptor being exposed to pollution and the consequences of exposure using the rankings listed in the tables below.

**Table 4.1: Likelihood Rankings**

| Very Low | Low | Medium | High |
|---|---|---|---|
| Exposure to pollution is considered to be *highly unlikely*. | Exposure is considered to be *unlikely*. | Exposure is considered to be *likely*. | Exposure is considered to be *highly likely* to occur. |

**Table 4.2: Consequence Rankings**

| Very Low | Low | Medium | High |
|---|---|---|---|
| No impact or imperceptible impact on the receptor. | Low level impact easily and quickly mitigated or may not require any intervention to rectify any impact. | Moderate impact which will not be rectified without some mitigation / intervention. | High impact requiring significant intervention / mitigation and may have caused irreparable damage to the receptor. |

## 4.2 Assessment of Risk

Following the determination of the likelihood and consequence rankings for the hypothesised relationships developed using the source-pathway-receptor concept, the matrix in the table below is used to determine the overall risk of the pollution exposure occurring.

**Table 4.3 Risk Matrix**

| | | Likelihood | | | |
|---|---|---|---|---|---|
| | | **Very Low** | **Low** | **Medium** | **High** |
| **Consequence** | **High** | Low | Medium | High | High |
| | **Medium** | Low | Medium | Medium | High |
| | **Low** | Low | Low | Medium | Medium |
| | **Very Low** | Very Low | Low | Low | Low |

# 5. RISK ASSESSMENT

## 5.1 Controlled Discharge to Surface Water

The Operator is permitted to discharge to surface water at three locations; two at the ETP (uncontaminated surface water to the Mill Reen and treated effluent discharge from the ETP to the Severn Estuary) and one at the main brewery site (uncontaminated surface water to the Waundeilad Reen). The Permit stipulates that, for the discharge from the ETP to the Severn Estuary, continuous flow monitoring is required, and that the volume of discharge is not to exceed 10,000m$^3$ per day or 126 l/s. Continuous monitoring is also required for pH, which is required to be >5 and <9 and temperature, which has a maximum limit of 30$^o$C. In addition, the permit stipulates that current discharge limits are: 200 mg/l biochemical oxygen demand (BOD); 150 mg/l suspended solids; 0.01 mg/l Total copper; 0.005 mg/l Total cadmium; 0.015 mg/l Total chromium; 0.0005 Total mercury, 0.03 mg/l Total nickel; 0.07 mg/l Total zinc; and 0.025 mg/l Total arsenic.

*The 2019 application to vary the EP includes the addition of a discharge of surface water runoff from the new lorry park at the south of the site, to highways drainage (discharge point W5).*

Management of the off-site ETP and the discharge to the estuary is contracted to Suez, who are responsible for all monitoring of the discharge, and for investigating and reporting any exceedances to the main brewery site. Suez reported one incident during 2017 of an exceedance of the permitted temperature limit of 30$^o$C, by a discharge measured at 31.8$^o$C. The exceedance was measured during a period of weather with extreme temperatures, and was reported to be caused by natural heating of the water. The exceedance was reported to NRW who did not consider the exceedance to be a breach. In addition, a pollution incident occurred during September 2017 when a pump at the off-site ETP failed, allowing an uncontrolled discharge to surface water. Further information on the incident and corrective action is provided in section 6 of the SCR.

*Ramboll anticipates that tighter discharge limits may be stipulated following the publishing of the reviewed Food & Drink BREF. The Operator is in discussion with NRW regarding how this will affect current operations.*

**Table 5.1: Controlled Discharge to Surface Water**

| **Source-Pathway-Receptor Hypothetical Model** | | | **Risk Management Techniques** | **Assessing the Risk** | | |
|---|---|---|---|---|---|---|
| **Source of Pollution** | **Receptor** | **Pathway** | | **Likelihood of Exposure** | **Consequence of Exposure** | **Overall Risk** |
| *Controlled Discharge to Surface Water:* out of specification effluent | Severn Estuary (SSSI, SAC, SPA, Ramsar) | Below ground pipe | • Trade effluent is managed by Suez, who monitor effluent at all stages of the process to identify the potential for, and prevent the occurrence of, any exceedances of the parameters stipulated in the Environmental Permit. The actions to be taken, and personnel responsible, should there be an increased risk of an exceedance are documented in Suez's work instruction 'ONRAMS-OP-MAG-ABI-ETP-0069(1)- Action to be Taken in the Event of an Environmental Incident'.<br>• Suez use a SCADA system to automatically monitor effluent at certain points, from when it leaves the on-site wastewater treatment plant, throughout the process, to final discharge to surface water. Suez have set thresholds which, if exceeded, SCADA sends an automatic alarm to connected mobile phones. If any threshold is exceeded, then effluent can be transferred to the calamity tank and gradually released back into the wastewater treatment process.<br>• Samples of final effluent are taken and analysed daily by Suez at the off-site ETP laboratory. Composite samples are sent to an external certified laboratory every 7 to 8 days for verification of Suez's data.<br>• Pumps and tanks are subject to a Planned Preventative Maintenance schedule to reduce the risk of out of specification effluent arising due to failure of equipment. | Low | Medium | **Low** |
| | Mill Reen | Below ground pipe | • Surface water from the off-site ETP is passed through an interceptor prior to discharge to the Mill Reen. The interceptor is maintained on a 6-monthly basis. | Medium | Medium | **Medium** |
| | Waundeilad Reen | Below ground pipe | • All surface water from the main brewery site is directed via the drainage system to the on-site waste water treatment plant, where it is combined with process effluent and pumped to the off-site ETP for treatment and discharge to the Severn Estuary.<br>• In the event of a flood, the dilution factor provided by the additional surface water is considered, and agreed by NRW, to be sufficient in diluting the process effluent to an acceptable level to discharge to the Waundeilad Reen. The pH of the discharge is monitored prior to discharge. | Low | Low | **Low** |

| Source-Pathway-Receptor Hypothetical Model | | | Risk Management Techniques | Assessing the Risk | | |
|---|---|---|---|---|---|---|
| **Source of Pollution** | **Receptor** | **Pathway** | | **Likelihood of Exposure** | **Consequence of Exposure** | **Overall Risk** |
| *Controlled Discharge to Surface Water*: pump failure | Mill Reen | Surface water drainage | • With the exception of Pump Pit Zero and the Inlet Sump Pump, all pumps at the off-site ETP have a back-up pump. If a pump fails, the potential for the sump to overflow would arise, resulting in a potential release of untreated effluent to surface water. In the event of a pump failure or sump overflow, the SCADA system would send an automatic alarm to Suez. Out of manned ours, a member of Suez personnel is on call, who has remote access to the SCADA via laptop.<br>• In the event of failure, untreated effluent could be diverted to the Calamity Tank, which has the capacity to hold sixteen hours' worth of effluent. Effluent can then be re-circulated if required.<br>• In the event that the capacity of the Calamity Tank and other tanks is reached, the brewery would cease operations until the ETP was back in full operation. | Medium | Medium | **Medium** |
| | Severn Estuary (SSSI, SAC, SPA, Ramsar) | Discharge pipeline | • In the event of failure of equipment at the off-site ETP, there is potential for effluent to be discharged to the estuary. Effluent is monitored by Suez during all stages of treatment, from the point it leaves the brewery, throughout the process, to final discharge. | Low | Medium | **Medium** |
| | Waundeilad Reen | Surface water drainage | • Surface water at the main brewery site is retained on site, at the wastewater treatment plant by a penstock valve, before being pumped to the off-site ETP. In the event that the pump to the ETP fails, operations at the brewery would cease until the failure was corrected. Any effluent already in the drainage system would be collected by a tanker for disposal off-site. | Low | Medium | **Low** |
| *Controlled Discharge to Surface Water:* breach of the drainage system | Gwent Levels SSSI<br>Secondary A Aquifer | Directly from cracks in the drains to ground/ groundwater | • AB InBev is committed to undertaking a drainage condition survey of the entire site including the ETP and the effluent pipeline. It is anticipated that some drainage maintenance work will be required to maintain integrity. | Medium | Medium | **Medium** |
| *Controlled Discharge to Surface Water:* contamination of surface water | Mill Reen<br>Waundeilad Reen<br>Gwent Levels SSSI<br>Severn Estuary (SSSI, SAC, SPA, Ramsar) | Overland<br>Via pump/ pipe | • Surface water at the brewery site combines with process effluent on-site, before being pumped to the ETP for treatment. Therefore, any small-scale contamination would be pH balanced and treated at the ETP prior to discharge.<br>• In the event of a flood, process water, diluted by surface water, is pumped to the Waundeilad Reen. It has been agreed with NRW that the dilution of process water by uncontaminated flood water would be sufficient to consider the discharge 'uncontaminated'. The pH of this effluent is monitored prior to discharge.<br>• In the event of potential contamination of surface water at the lorry park area, the spillage procedure is followed to prevent contaminated runoff from entering the drainage system. | Low | Low | **Low** |

## 5.2 Odour

The potential sources of odour at the Facility have been identified and used to develop the risk assessment for odour (see Table 5.2 below). There are no records of complaints relating to odour at the main brewery site; however historically there have been odour complaints at the ETP, from a local landowner. There have been no complaints relating to odour at either site in recent years.

**Table 5.2: Odour**

| **Source-Pathway-Receptor Hypothetical Model** | | | **Risk Management Techniques** | **Assessing the Risk** | | |
|---|---|---|---|---|---|---|
| **Source of Pollution** | **Receptor** | **Pathway** | | **Likelihood of Exposure** | **Consequence of Exposure** | **Overall Risk** |
| *Odour:* brewing process | *Humans including:* Facility workers/visitors; workers on adjacent premises; local residents; intermittent presence on pedestrian routes / roadways surrounding the Facility. | Fugitive emissions to air from building openings / air handling units | • Fugitive emissions from buildings are minimised by fast-acting doors, keeping them closed whenever they are not needed for access. | Medium | Low | **Low** |
| *Odour:* waste materials | | Fugitive emissions to outdoor air | • Wastes produced at the site include general, card and plastics, waste cans and small amounts of hazardous wastes. These wastes are stored in designated covered containers and skips, and are considered to be at low risk of becoming malodourous.<br>• The wastes are stored at the 'Recycling Area', which is situated at a central location of the site, reducing the risk of odour from any waste reaching the site boundary.<br>• Frequent collections of wastes are scheduled. | Low | Low | **Low** |
| *Odour:* effluent at the on-site waste water treatment plant | | Fugitive emissions to outdoor air | • The on-site waste water treatment plant is located towards the south of the brewery site, away from the majority of human receptors on-site. The area is approximately 200 m from the nearest residential building; however, the warehouse buildings lie in between and would prevent any potential odour at the site boundary.<br>• Minimal treatment of the effluent is carried out on-site, and therefore the potential for offensive odours to be produced is low. | Low | Low | **Low** |
| *Odour:* operations at the off-site ETP | | Fugitive emissions to outdoor air | • The off-site ETP is situated on the coastline, in a remote location approximately 450 m from the nearest receptor.<br>• The performance and operation of the ETP is managed and monitored daily by Suez.<br>• Sludge is removed by a tanker daily. Although some odour is generated during sludge removal, the distance between the ETP and local receptors makes it unlikely that odour would cause a nuisance.<br>• High concentrations of hydrogen sulphide ($H_2S$) had been observed at the ETP. Ramboll carried out an investigation into the causes of the elevated concentrations and recommended actions to reduce these levels (Report Ref: 1700003278-Magor Brewery Hydrogen Sulphide Investigation). The facility is currently implementing actions and planning to address the issue. | Medium | Low | **Medium** |

## 5.3 Noise

The potential sources of noise at the Facility have been identified and used to develop the risk assessment for noise (see Table 5.3 below). There is the potential for noise to arise through the transport and receipt of raw materials and through the collection and distribution of finished products and wastes by heavy goods vehicles. Forklift trucks are also used to transport goods on-site. Production processes including the boilers and steam are also potential sources of noise on the site. The risk assessment for individual noise sources is provided in the table below.

**Table 5.3: Noise**

| **Source-Pathway-Receptor Hypothetical Model** | | | **Risk Management Techniques** | **Assessing the Risk** | | |
|---|---|---|---|---|---|---|
| **Source of Pollution** | **Receptor** | **Pathway** | | **Likelihood of Exposure** | **Consequence of Exposure** | **Overall Risk** |
| *Noise:* arising from the movement of heavy goods vehicles (HGVs) & forklift trucks across the Facility, and engine noise / alarms from other vehicles working on, and visiting the site. | *Humans including:* Facility workers/visitors; workers on adjacent premises; local residents; intermittent presence on pedestrian routes / roadways surrounding the factory | Through the air and ground vibration | • A site speed limit of 10 miles per hour is in operation across the Facility to minimise engine noise.<br>• The site is located close to Junction 23A of the M4 motorway, meaning disruption from transport vehicles off-site is minimised.<br>• The car park for operatives and visitors is located next to the site entrance minimising the movements of traffic on the site.<br>• Noise embankments have been built around the site perimeter to minimise the risk of noises on site travelling off-site. | Low | Low | **Low** |
| *Noise and vibration:* arising from the operation of ancillary plant (comprising boiler, air compressors, chillers). | | | • The boilers and other process equipment is contained within buildings with fast-acting doors, minimising noise to the external environment.<br>• All plant at the site is maintained in accordance with manufacturers' specifications and managed through a Planned Preventative Maintenance schedule to minimise excessive noise from poor performance.<br>• Noise embankments have been built around the site perimeter to minimise the risk of noises on site travelling off-site. | Low | Low | **Low** |
| *Noise and Vibration:* arising from the internal handling of raw materials and production equipment. | | | • All production processes are undertaken within buildings.<br>• Fast-acting building doors are kept closed whenever they are not needed for access.<br>• All plant is maintained periodically in accordance with manufacturers' specifications to minimise excessive noise from poor performance. | Low | Low | **Low** |
| *Noise and Vibration:* arising from vehicles and operations at the off-site ETP. | | | • The remote location of the off-site ETP restricts noise disturbance from its operations.<br>• Waste collections from the off-site ETP are restricted to between the hours of 7:30 and 16:30. | Low | Low | **Low** |

## 5.4 Accidents

The risk assessment for accidents at the site is included in the table below.

**Table 5.4: Accidents**

| Source-Pathway-Receptor Hypothetical Model | | | Risk Management Techniques | Assessing the Risk | | |
|---|---|---|---|---|---|---|
| **Source of Pollution** | **Receptor** | **Pathway** | | **Likelihood of Exposure** | **Consequence of Exposure** | **Overall Risk** |
| *Accident:* Failure in containment of diesel oil storage tank (or other bulk storage) and associated equipment (valves, pipes etc.). Overfilling of oil tank or other spillage / operator error during filling or decanting from tank. | *Ground* | Over Installation surfaces; and, through Installation drainage systems. | • The Facility maintains a register of bulk storage tanks/ containers and their contents. All bulk storage is provided with secondary bunding. An assessment of bunding was carried out by Ramboll in December 2018/ January 2019 and maintenance is ongoing.<br>• The Facility has a spillage emergency response procedure in place which is detailed in the EMS and the Accident Management Plan (dated November 2018).<br>• In the event that primary and secondary containment of a substance failed, the substance may enter the site drainage system. The substance could either be retained on-site and collected by tanker; or personnel at the main brewery site would alert personnel at the off-site WWTP to allow time for preparation for appropriate treatment. From the off-site WWTP, the substance could be diverted to the Calamity Tank and drip-fed through the process, to add a dilution factor; or could be collected from the off-site by tanker.<br>• The Facility is committed to commissioning a CCTV drainage survey to inspect the integrity of site drainage, i.e. in order to ensure there are no pathways to groundwater or surface water. | Medium | Medium | **Medium** |
| | *Groundwater* | | | | | |
| | *Surface Water* | | | | | |
| *Accident:* Failure in containment of effluent storage: various tanks, sumps and associated equipment (valves, pipes etc.). | *Ground* | Over surfaces & through drainage systems<br>Directly into the Severn Estuary, Waundeilad Reen or Mill Reen. | • In the event of containment failure at the off-site ETP, untreated effluent could be diverted to the Calamity Tank, which has the capacity to hold sixteen hours' worth of effluent.<br>• In the event that the capacity of the Calamity Tank and other tanks is reached, the brewery would cease operations until the ETP was back in full operation.<br>• In the event of pump failure, most pumps have a back-up that would be automatically engaged.<br>• The Axel-Maint maintenance system used by Suez produces daily tasks, based on daily, monthly or weekly schedules. All assets at the off-site ETP are included on the Axel-Maint platform, including containment and bunding.<br>• In the event of a spillage at the off-site ETP, Suez follow the work instruction 'ONRAMS-OP-MAG-ABI-ETP-0070(1)- Response to a Chemical Spill at the BTS'. | Medium | Low | **Medium** |
| | *Groundwater* | | | Medium | Medium | **Medium** |
| | *Surface Water* | | | Medium | Medium | **Medium** |
| | *Atmosphere* | Odours directly to outdoor air | • The off-site ETP is situated on the coastline, in a remote location approximately 450 m from the nearest receptor.<br>• The performance and operation of the ETP is managed and monitored daily by Suez.<br>• Sludge is removed by a tanker daily. Although some odour is generated during sludge removal, the distance between the ETP and local receptors makes it unlikely that odour would cause a nuisance. | Medium | Low | **Medium** |
| *Accident: release from ammonia tank* | Atmosphere | Odour directly to outdoor air & potentially indoor air | • Ammonia is used in refrigeration plant at the facility, which is maintained as required, and at a minimum of 6-monthly intervals under a service contract with Integral. The plant is included in the facility's "SAP" (planned preventative maintenance schedule), which records required maintenance frequencies for infrastructure and equipment at the facility and send alerts when routine maintenance is due. Integral are on call 24/7 in case of an ammonia leak. | Low | High | **Medium** |

| Source-Pathway-Receptor Hypothetical Model | | | Risk Management Techniques | Assessing the Risk | | |
|---|---|---|---|---|---|---|
| **Source of Pollution** | **Receptor** | **Pathway** | | **Likelihood of Exposure** | **Consequence of Exposure** | **Overall Risk** |
| | | | • Areas where ammonia are in use are fitted with automatic leak detection and alarms. In the event of a leak, the facility has implemented a response and evacuation procedure: Ammonia Emergency Evacuation Procedure. | | | |
| | Surface water | Drainage system | • In the event of a leak of ammonia entering the drainage system, the facility has the potential to hold water at the on-site wastewater treatment plant. If effluent contaminated with ammonia had been pumped to the off-site ETP, Suez would be informed to allow them to prepare to treat the effluent appropriately. | Low | High | **Medium** |
| *Accident:* Spillage / Release of raw materials during internal handling and storage | *Ground* | Through Facility drainage systems (it is noted that the pathway would only occur if a failure in the Facility drainage associated with the process effluent occurred). | • All internal areas of the Facility feature impermeable surfaces.<br>• Interceptors are present across the site and are inspected regularly, in line with the PPM schedule recorded via the Facility's 'SAP' system.<br>• All effluent from the production areas drains to the waste water treatment plant on-site prior to pumping to the off-site ETP.<br>• Spill kits are available in key risk areas.<br>• The spill response procedure is defined in sites Accident Management Plan, revised November 2018.<br>• In the event of a spillage at the off-site ETP, Suez follow the work instruction 'ONRAMS-OP-MAG-ABI-ETP-0070(1)- Response to a Chemical Spill at the BTS'. | Low | Low | **Low** |
| | Groundwater | | | Low | Low | **Low** |
| | Surface Water | | | Low | Low | **Low** |
| *Accidents (Vandalism):* Damage / theft of externally located equipment / tanks | *Ground* | Over Facility surfaces; and, through drainage systems. | • CCTV covers the site, which is secured by fencing and with authorised access only. All visitors and contractors enter via the gatehouse, which is manned 24/7 by site security.<br>• The Facility is operational 24/7, 365 days a year, so is manned at all times.<br>• The off-site ETP is covered by CCTV, which is monitored remotely out of hours. The off-site is manned 7:30-16:30, 7 days a week and the gates are padlocked out of hours. Suez are on call at all times when personnel are not present at the ETP. | Low | Low | **Low** |
| | Groundwater | | | Low | Low | **Low** |
| | Surface Water | | | Low | Low | **Low** |
| *Accidents (Fire):* Fire and arson attacks | *Ground* | Over Facility surfaces; through the air; and, through Installation drainage systems. | • A Site Emergency Evacuation Plan is in place along with departmental fire plans and fire risk assessments.<br>• Fire alarm systems are subject to monthly maintenance.<br>• Trained Fire Marshals are in place to respond to alarms.<br>• Firefighting equipment is available on site for handling small fires.<br>• Fire water would be discharged to the off-site ETP for treatment, or may be discharged to the Waundeilad Reen if it meets set criteria (e.g. pH).<br>• In the event of a fire at the off-site ETP, operations at the brewery would cease until the ETP was fully operational and able to effectively treat brewery effluent. | Low | Low | **Low** |
| | Groundwater | | | Low | Low | **Low** |
| | Surface Water | | | Low | Low | **Low** |
| | Atmosphere | | | Low | Low | **Low** |
| *Accidents: Explosion* | *Ground* | Over Facility surfaces; through the air; | • In the Accident Management Plan (dated November 2018), areas at risk of explosion have been identified as: the boiler house (natural gas), brew house (cereal dust), refrigeration plant (ammonia), fork lift refuelling area, and the use of biogas for the CHP at the off-site ETP. | Low | Low | **Low** |

| Source-Pathway-Receptor Hypothetical Model | | | Risk Management Techniques | Assessing the Risk | | |
|---|---|---|---|---|---|---|
| **Source of Pollution** | **Receptor** | **Pathway** | | **Likelihood of Exposure** | **Consequence of Exposure** | **Overall Risk** |
| | Groundwater | and, through Installation drainage systems. | • A DSEAR Assessment was undertaken during December 2018 and actions arising from the assessment are ongoing. | Low | Low | **Low** |
| | Surface Water | | | Low | Low | **Low** |
| | Atmosphere | | | Low | Low | **Low** |

## 5.5 Fugitive Emissions

The risk assessment for fugitive emissions is presented in the table below.

**Table 5.5: Fugitive Emissions**

| Source-Pathway-Receptor Hypothetical Model | | | Risk Management Techniques | Assessing the Risk | | |
|---|---|---|---|---|---|---|
| **Source of Pollution** | **Receptor** | **Pathway** | | **Likelihood of Exposure** | **Consequence of Exposure** | **Overall Risk** |
| *Fugitive Emissions:* dust and particulates from production areas | *Humans including:* Facility workers/visitors; workers on adjacent premises; local residents; intermittent presence on pedestrian routes / roadways surrounding the factory. | Through the air | • Grains, yeast and rice are delivered to an internal area which is a designated ATEX area. In addition, the potential for fugitive emissions of dust arises from the grinding of grains in the Mill House. Emissions of dust from these internal areas to the environment is reduced by fast-acting doors, and by abatement equipment.<br>• The potential for emissions of dust in external areas arises from the collection of spent yeast and wood chip by lorry. Emissions of dust are minimised, however, due to the production process producing damp waste yeast rather than dry. | Medium | Medium | **Medium** |
| | A*tmosphere* | | | Low | Low | **Low** |
| *Fugitive Emissions:* litter and debris from Facility activities | *Humans including: Facility workers/visitors; workers on adjacent premises; local residents; intermittent presence on pedestrian routes / roadways surrounding the factory.* | Through the air | • All wastes produced at the Facility are segregated and provided with suitable containment.<br>• All wastes are stored within a dedicated recycling and waste area close to the centre of the site, protecting the area form wind, and reducing the risk of litter being windblown.<br>• Wastes are stored either in a container skip or are baled ready for collection.<br>• Wastes at the Off-Site ETP are stored in wheelie bins and collected by Biffa as required. | Low | Low | **Low** |
| *Fugitive Emissions:* surface water run-off from external areas at the brewery site | *Surface Water* | Through drainage systems | • Surface water run-off from site roofs and yard areas is directed via the surface water drainage system to the on-site waste water treatment plant, where it is combined with process effluent, pH-balanced, and then pumped to the Off-site ETP.<br>• In the event of a spill on site resulting in contamination of the surface water system, personnel at the Off-site ETP are alerted and the run-off is treated appropriately prior to discharge to the Severn Estuary.<br>• Although the Facility is permitted to discharge uncontaminated surface water to the Waundeilad Reen, this discharge point is only utilised in the event of a flood when the Off-site ETP would not cope with the volume of flood water. The flood water is tested for pH prior to release to the reen.<br>*The Facility is committed to undertaking a CCTV survey of the drainage system to establish whether there are any pathways from surface water to ground water.* | Medium | Medium | **Medium** |
| | *Ground water* | | | | | |
| *Fugitive Emissions:* surface water run-off from the Off-site ETP | *Surface Water* | Through drainage systems | • Surface water from the Off-site ETP flows through an interceptor prior to discharge to the Mill Reen. The interceptor is subject to 6-monthly emptying and maintenance.<br>• In the event of a spill at the Off-site ETP, surface water drainage channels are protected using the spill kit available. | Medium | Medium | **Medium** |
| *Fugitive Emissions:* surface water run-off from the lorry park | *Surface Water* | Through drainage systems | • Surface water run-off from the lorry park area is to enter the municipal highways stormwater drainage system at discharge point W5.<br>• In the event of a spill at the lorry park, the emergency spillage response procedure is to be followed (as detailed in the EMS and the Accident Management Plan (dated November 2018)). Skill kits will be available at the location.<br>• All surface water runoff from the new lorry park area is to flows to aco drainage channels, from where it is to be directed through a Kings Bypass Separator (or similar approved interceptor) to | Low | Low | **Low** |

| Source-Pathway-Receptor Hypothetical Model | | | Risk Management Techniques | Assessing the Risk | | |
|---|---|---|---|---|---|---|
| **Source of Pollution** | **Receptor** | **Pathway** | | **Likelihood of Exposure** | **Consequence of Exposure** | **Overall Risk** |
| | | | remove any oil-type substances, before passing through a cellular storage tank to control flow to the municipal stormwater drainage system. Drainage plans have been provided in Appendix 1. | | | |

## 5.6 Controlled Releases to Air

The risk assessment for controlled releases to air is presented in the table below.

| **Source-Pathway-Receptor Hypothetical Model** | | | **Risk Management Techniques** | **Assessing the Risk** | | |
|---|---|---|---|---|---|---|
| **Source of Pollution** | **Receptor** | **Pathway** | | **Likelihood of Exposure** | **Consequence of Exposure** | **Overall Risk** |
| *Controlled Releases to Air:* Boiler Stack Emissions | *Atmosphere*<br>*Humans including:* Facility workers/visitors; workers on adjacent premises; local residents; intermittent presence on pedestrian routes / roadways surrounding the factory | Through the air | • The Facility operates four boilers at the main brewery site with a combined thermal input of greater than 50 MW. The boilers are maintained under a Planned Preventative Maintenance schedule, and are operated and monitored in compliance with the Facility's Environmental Permit (BX7282IS) and Greenhouse Gas Emissions Permit (UK-W-IN-11421).<br>• A Flue-Ace heat recovery system has recently been installed and modelling has been carried out to estimate the effect on air emissions from the boiler (Appendix 2).<br>• Two redundant CHP plant are present at the Facility which were taken out of operation approximately six years ago. The Facility has no plans to reinstate the units in the future. | High | Medium | **Medium** |
| *Controlled Releases to Air:* CHP and biogas flare | *Atmosphere*<br>*Humans including: Facility workers/ visitors;* intermittent presence on pedestrian routes / roadways surrounding the factory | Through the air | • Process biogas produced at the Off-site ETP is burned to power a CHP plant, which is used to power the off-site. Approximately 50% of the gas produced is used by the CHP, with the remaining gas being flared off. Emissions from the CHP and the biogas flare are permitted and are monitored as required by the permit.<br>• The CHP is maintained under contract by Veolia. | High | Medium | **Medium** |
| *Controlled Releases to Air:* water vapour from cooling towers and evaporative condensers | *Atmosphere*<br>*Humans including:* Facility workers/visitors; workers on adjacent premises; local residents; intermittent presence on pedestrian routes / roadways surrounding the factory | Through the air | • The emissions from these point sources comprises water vapour only. | Low | Low | **Low** |

## 5.7 Global Warming Potential

**Table 5.7: Global Warming Potential**

| Source-Pathway-Receptor Hypothetical Model | | | Risk Management Techniques | Assessing the Risk | | |
|---|---|---|---|---|---|---|
| **Source of Pollution** | **Receptor** | **Pathway** | | **Likelihood of Exposure** | **Consequence of Exposure** | **Overall Risk** |
| *Global Warming Potential:* Combustion of natural gas within boiler to support production processes resulting in direct emissions of greenhouse gasses | *Atmosphere* | Through the air | • The Facility operates four boilers at the main brewery site with a combined thermal input of greater than 50 MW. A Flue-Ace heat recovery system has recently been installed to recover heat to pre-heat the water for the boilers.<br>• The boilers are operated in accordance with the Facility's Environmental and Greenhouse Gas Emissions permits. | High | Medium | **Medium** |
| *Global Warming Potential:* Combustion of biogas at the Off-site ETP resulting in direct emissions of greenhouse gasses | *Atmosphere* | Through the air | • Biogas produced at the off-site ETP is burned by a CHP plant, which is used to power the off-site. Approximately 50% of the gas produced is used by the CHP, with the remaining gas being flared off. Emissions from the CHP and the biogas flare are permitted and are monitored as required by the permit. | Medium | Low | **Low** |
| *Global Warming Potential:* Use of grid-sourced electricity to support production processes resulting in in-direct emissions of greenhouse gasses. | *Atmosphere* | Through the air | • Energy consumption is monitored, recorded, and reported on a monthly basis to the corporate function in Europe.<br>• The Facility is investigating renewable energy sources for the future, including the potential to use solar power.<br>• The off-site ETP is powered by biogas produced during the effluent treatment process, reducing the amount of electricity used from the grid. If more electricity is produced than is needed, some electricity is fed back to the grid. | High | Very Low | **Low** |
| *Global Warming Potential:* Use of refrigerant gases in the chiller systems in the Cold Store Warehouse & refrigerated trailers | *Atmosphere* | Through the air | • The comfort cooling systems at the Facility contain refrigerants including R410A, which is a hydro fluorocarbon (HFC), and a regulated greenhouse gas. The systems are maintained and leak checked by qualified personnel, under contract by Apleona. | Medium | Medium | **Medium** |

## 5.8 Installation Waste

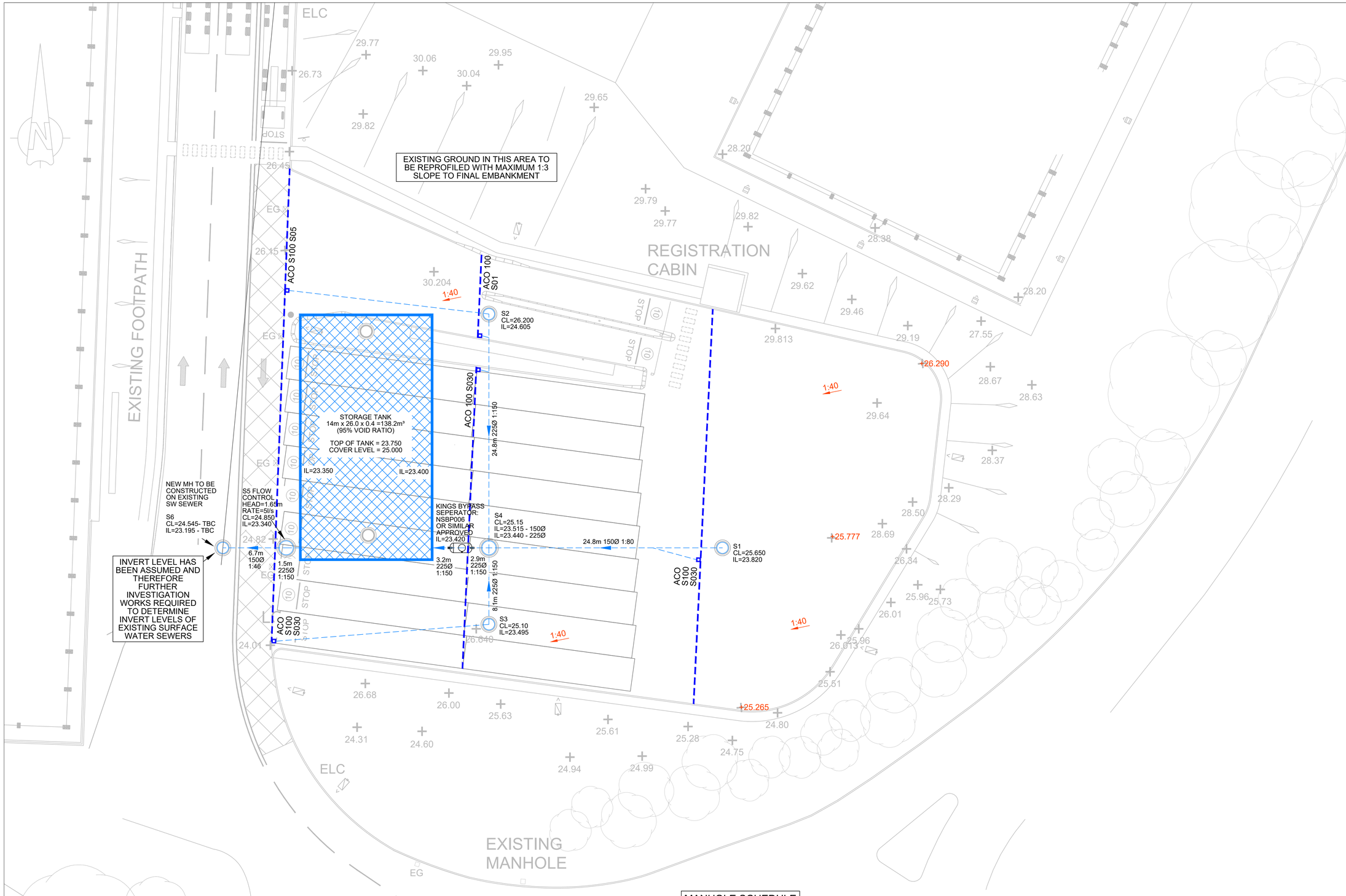
**Table 5.8: Installation Waste**

| Source-Pathway-Receptor Hypothetical Model | | | Risk Management Techniques | Assessing the Risk | | |
|---|---|---|---|---|---|---|
| **Source of Pollution** | **Receptor** | **Pathway** | | **Likelihood of Exposure** | **Consequence of Exposure** | **Overall Risk** |
| *Facility Waste:* Wastes which arise from production and administrative activities at the site comprising: card; plastic; general waste; food waste; metals; wood; Waste Electronic and Electrical Equipment (WEEE); batteries; waste oils; fluorescent tubes; and used spill kits. | *Humans including:* Facility workers/visitors; workers on adjacent premises; local residents; intermittent presence on pedestrian routes / roadways surrounding the factory | Through the air | • All wastes produced at the Facility are segregated and provided with suitable containment.<br>• All wastes are stored within a dedicated recycling and waste area close to the centre of the site, protecting the area from wind, and reducing the risk of litter being windblown.<br>• Wastes are stored either in a container skip or are baled ready for collection.<br>• Wastes at the off-site ETP are stored in wheelie bins and collected by Biffa as required.<br>• Wastes produced at the Facility are unlikely to produce significant quantities of leachate.<br>• The management of waste is contracted to Biffa, who manage storage and arrange collections on behalf of the Facility.<br>• All wastes removed from the Facility are recovered / disposed of at permitted facilities. | Low | Low | **Low** |
| | *Surface Water* | Over Facility surfaces; and through drainage systems | | Low | Low | **Low** |
| | Groundwater | | | Low | Low | **Low** |
| | Ground | | | Low | Low | **Low** |
| *Facility Waste:* Process effluent storage tank and sump and associated equipment (valves, pipes etc.); and ETP sludge | *Ground* | Over Facility surfaces; and through drainage systems. | • All assets at the ETP are included in the Axel-Maint maintenance system, managed by Suez on behalf of the Facility. The system provides for daily, weekly, monthly and annual checks and maintenance of all equipment as necessary, and includes all equipment and infrastructure including tanks and bunds and pipework.<br>• In the event of equipment failure in the ETP, backup pumps are in place, and systems are in place to divert effluent to the Calamity Tank for holding if required.<br>• A SCADA system is used to monitor effluent, which sends automatic alarms and notifications in the event of an incident.<br>• Duty of care checks are completed for all waste contractors to ensure they are appropriately licensed for the carriage of waste.<br>• All wastes removed from the site is recovered / disposed of at permitted facilities. | Medium | Low | **Medium** |

# 6. ERA CONCLUSION

Ramboll has identified potential environmental risks at the Facility and determined the potential environmental impact arising from each risk. The assessment has demonstrated that with the appropriate management controls in place, risks identified are acceptable, i.e. low to medium.

# APPENDIX 1
# EXOVA AIR MODELLING REPORT

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DRAINAGE STRATEGY
SURFACE WATER TO BE DISCHARGED TO EXISTING SEWER IN ACCESS ROAD AT A RESTRICTED RATE OF 5l/s.

THIS REQUIRES THE FOLLOWING STORAGE:
1 IN 30-YEAR = 74m³
1 IN 100-YEAR + 20%CC = 138m³

## LEGEND

- EXISTING SURFACE WATER SEWER
- PROPOSED SURFACE WATER SEWER
- PROPOSED SURFACE WATER CHAMBER
- ACO CHANNEL DRAIN OR SIMILAR APPROVED
- +61.32 EXISTING LEVEL
- +61.32 PROPOSED LEVEL
- 1:100 GRADIENT
- DIRECTION OF FALL
- ACCESS CHAMBER

MANHOLE SCHEDULE

| Manhole Reference | Cover Level (m.A.O.D) | Invert Level (m.A.O.D) | Depth To Invert (m) | Depth To Soffit (m) | Pipe Size Dia (mm) | Manhole Dia (mm) | Manhole Type | Grade Of Cover | Adopting Authority |
|---|---|---|---|---|---|---|---|---|---|
| **S1** | 25.650 | 23.820 | 1.830 | 1.680 | 150 | 1200 | TYPE B | E600 | (PRIVATE) |
| **S2** | 26.200 | 24.605 | 1.595 | 1.370 | 225 | 1200 | TYPE B1/E | E600 | (PRIVATE) |
| **S3** | 25.100 | 23.495 | 1.605 | 1.380 | 225 | 1200 | TYPE B1/E | E600 | (PRIVATE) |
| **S4** | 25.150 | 23.440 | 1.710 | 1.485 | 225 | 1500 | TYPE B1/E | E600 | (PRIVATE) |
| **S5** | 24.850 | 23.340 | 1.510 | 1.360 | 150 | 1500 | FLOW CONTROL MH | E600 | (PRIVATE) |
| **S6** | 24.545 | 23.195 | 1.350 | #VALUE! | EX. | 1200 | TYPE B1/E | E600 | (PRIVATE) |

Cover levels may vary to suit on site working conditions

| Rev. | Amendments | Date | By |
|---|---|---|---|
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Revisions

PATRICK PARSONS
5 Waverley Road
Huddersfield
West Yorkshire
HD1 5NA
United Kingdom
T. +44 (0)1484 516 977
E. info@patrickparsons.co.uk
W. www.patrickparsons.co.uk

Client: AB INBEV UK LTD

Project: HGV HOLDING AREA MAGOR

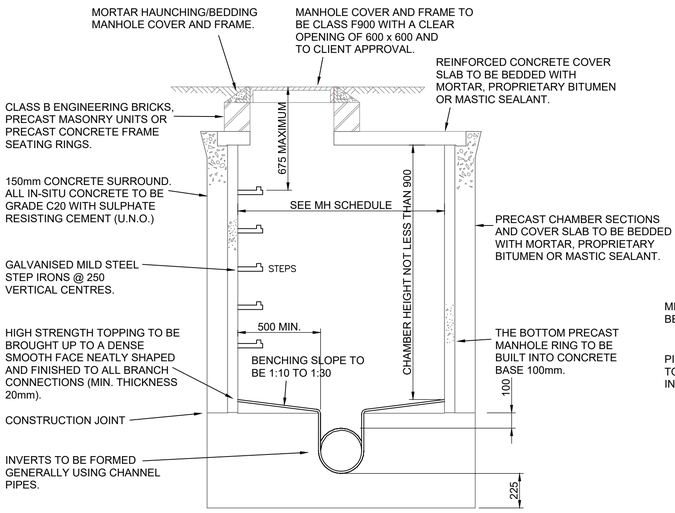
Drawing: DRAINAGE LAYOUT

Scales 1:200 At original size A1

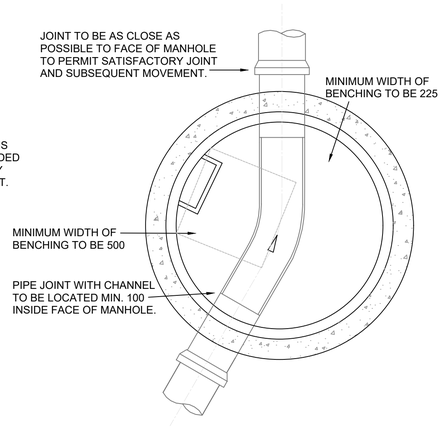
Drawn TE Checked MJM
Date FEB 2019

Status PRELIMINARY

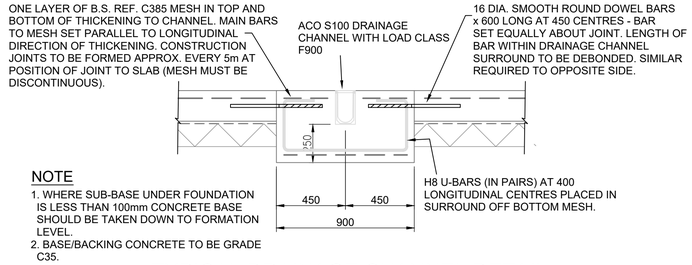
Drawing No. H18143-200 Rev. P1




## TYPICAL MANHOLE DETAILS (GROUND LEVEL TO SOFFIT OF PIPE < 3m)

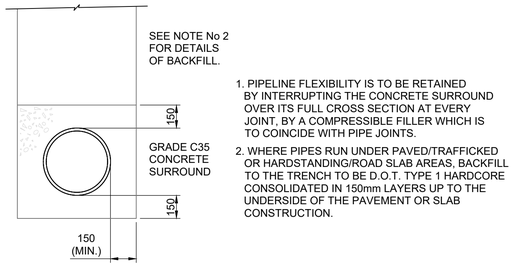



SECTIONAL PLAN ON MANHOLE



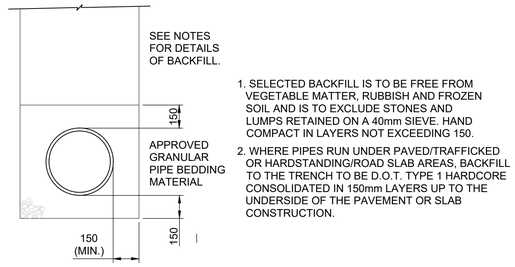

NOTE
1. WHERE SUB-BASE UNDER FOUNDATION IS LESS THAN 100mm CONCRETE BASE SHOULD BE TAKEN DOWN TO FORMATION LEVEL.
2. BASE/BACKING CONCRETE TO BE GRADE C35.

## TYPICAL DRAINAGE CHANNEL DETAIL (ALL DETAILS AS FOR TYPICAL HARDSTANDING U.N.O.)



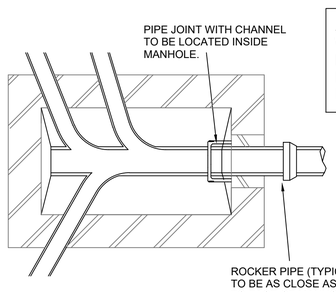

1. PIPELINE FLEXIBILITY IS TO BE RETAINED BY INTERRUPTING THE CONCRETE SURROUND OVER ITS FULL CROSS SECTION AT EVERY JOINT, BY A COMPRESSIBLE FILLER WHICH IS TO COINCIDE WITH PIPE JOINTS.
2. WHERE PIPES RUN UNDER PAVED/TRAFFICKED OR HARDSTANDING/ROAD SLAB AREAS, BACKFILL TO THE TRENCH TO BE D.O.T. TYPE 1 HARDCORE CONSOLIDATED IN 150mm LAYERS UP TO THE UNDERSIDE OF THE PAVEMENT OR SLAB CONSTRUCTION.

## TYPICAL PIPE BEDDING DETAIL WHERE COVER FROM GROUND TO PIPE SOFFIT LESS THAN 1200mm



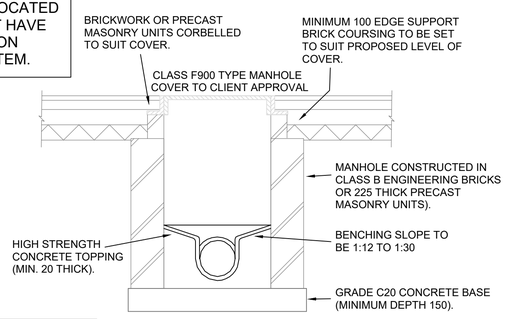

1. SELECTED BACKFILL IS TO BE FREE FROM VEGETABLE MATTER, RUBBISH AND FROZEN SOIL AND IS TO EXCLUDE STONES AND LUMPS RETAINED ON A 40mm SIEVE. HAND COMPACT IN LAYERS NOT EXCEEDING 150.
2. WHERE PIPES RUN UNDER PAVED/TRAFFICKED OR HARDSTANDING/ROAD SLAB AREAS, BACKFILL TO THE TRENCH TO BE D.O.T. TYPE 1 HARDCORE CONSOLIDATED IN 150mm LAYERS UP TO THE UNDERSIDE OF THE PAVEMENT OR SLAB CONSTRUCTION.

## TYPICAL PIPE BEDDING DETAIL WHERE COVER FROM GROUND TO PIPE SOFFIT GREATER THAN 1200mm




TYPICAL PLAN

NOTE
WHERE MANHOLES ARE LOCATED INTERNALLY COVER MUST HAVE FACTORY FITTED VIBRATION RESISTANT LOCKING SYSTEM.

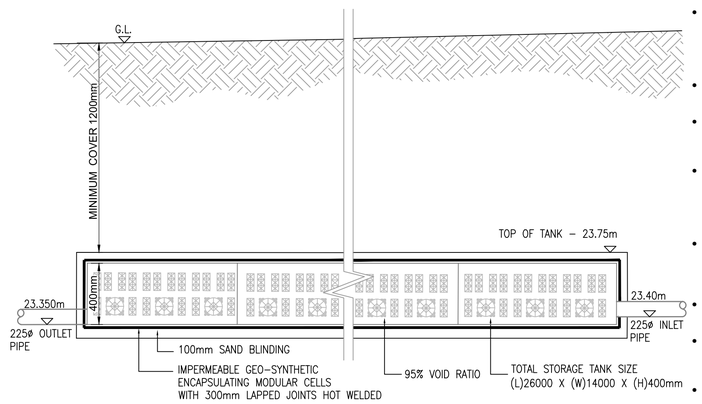



TYPICAL SECTION

INTERNAL DIMENSIONS OF MANHOLE NOMINALLY 1200mm x 600mm BUT MANHOLE WIDTH SHOULD BE INCREASED FOR PIPES LARGER THAN 225 DIA. TO GIVE 225mm BENCHING EACH SIDE AND THE BRICKWORK/MASONRY UNITS CORBELLED DOWN TO SUIT COVER

NOTE
INVERTS TO BE FORMED USING CHANNEL PIECES

## TYPICAL MANHOLE DETAILS WHERE GROUND LEVEL TO PIPE SOFFIT LESS THAN 1.5m




## TYPICAL CELLULAR STORAGE TANK SECTION DETAIL

- EXCAVATE THE TRENCH TO THE REQUIRED DEPTH ENSURING THAT THE PLAN AREA IS SLIGHTLY GREATER THAN THAT OF THE STORAGE CELL UNITS.
- LAY 100mm BED COURSE SAND, LEVEL AND COMPACT.
- LAY THE GEO-SYNTHETIC OVER THE BASE AND UP THE SIDE OF THE TRENCH.
- LAY THE STORAGE CELL UNITS PARALLEL WITH EACH OTHER OR IN A BRICK BONDED FORMATION. FOR MULTI LAYERS USE THE CLIPS AND THE SHEAR CONNECTERS.
- LAP AND SEAL THE GEO-TEXTILE AROUND THE UNITS, IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS.
- DRAINAGE CONNECTIONS TO BE MADE USING PROPRIETRY ADAPTORS.
- LAY 100mm OF COURSE SAND BETWEEN THE TRENCH WALLS AND THE STORAGE UNITS AND COMPACT.
- LAY 100mm BED OF COARSE SAND OVER THE GEO-TEXTILE AND COMPACT. BACKFILL WITH SELECTED AS DUG MATERIAL LAID AND COMPACTED IN LAYERS

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Revisions

PATRICKPARSONS
5 Waverley Road
Huddersfield
West Yorkshire
HD1 5NA
United Kingdom
T. +44 (0)1484 516 977
E. info@patrickparsons.co.uk
W. www.patrickparsons.co.uk

Client
AB InBev UK Ltd

Project
HGV HOLDING AREA
MAGOR

Drawing
DRAINAGE DETAILS

Scales 1:200 At original size A1

Drawn TE Checked MJM
Date FEB 2019

Status PRELIMINARY

Drawing No. H18143-201 Rev. P1

# APPENDIX 2
# FLUE ACE AIR QUALITY ASSESSMENT

# Inbev
# Mangor
# Air Quality Assessment
# NOx Emmissions
# Flue Ace system

**File reference number: CNE9N**

**February 2018**

| Project | NOx Air Quality Assessment |
|---|---|
| Client | INBEV Mangor |
| **Report No:** | CNE9N |
| **Status & Version** | Final |
| **Date of Release** | 20/2/18 |

| Name | Signature | Position | Date |
|---|---|---|---|
| Jeff hood | | Senior Consultant | 20/2/2018 |

## Table of contents



## Appendices

# Air Quality Assessment - NOx Impact

## 1 Introduction

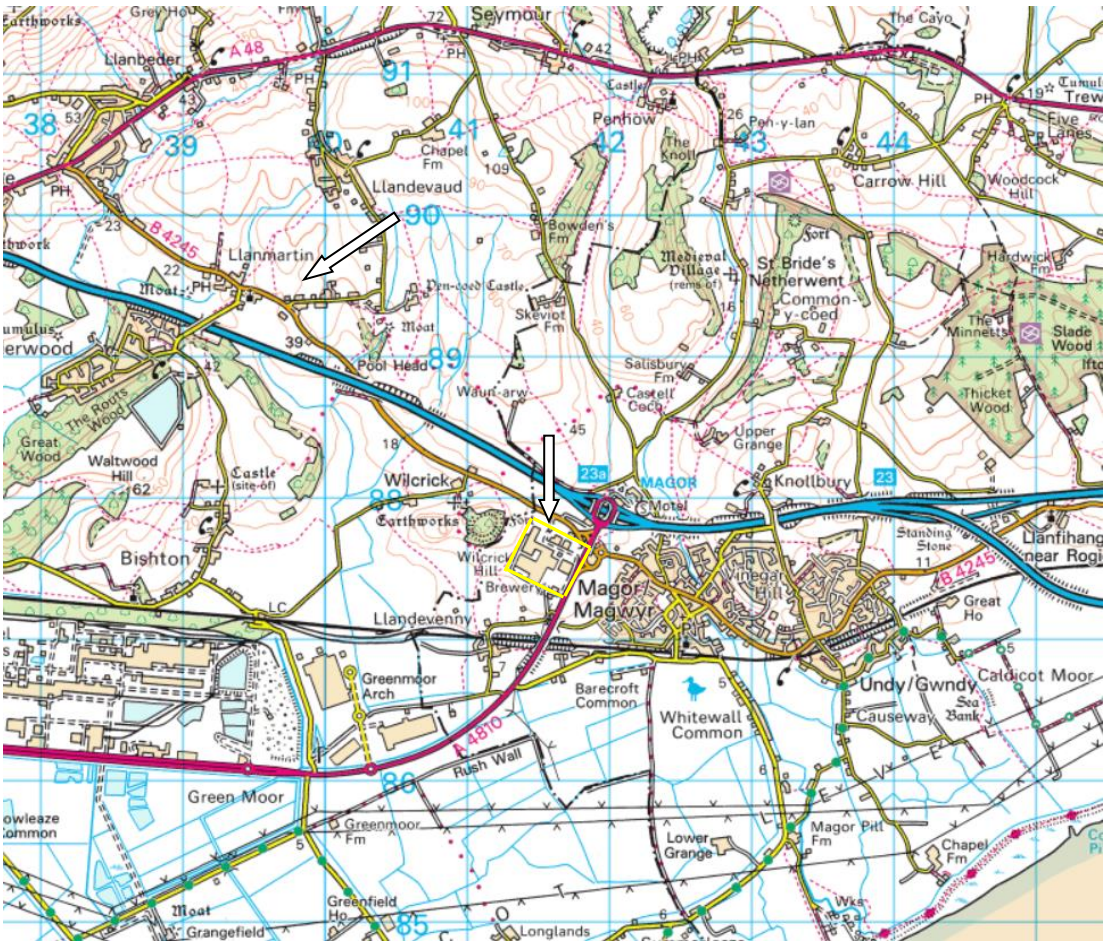
The impact on $NO_x$ emissions from the works with the addition of an energy recovery system (Flue Ace )has been assessed. Three scenarios were assessed with the Flu Ace at 100%,50% and 0% operational. The output of the model will be compared with existing background $NO_x$ levels around the works and at the closest receptor locations. The Dispersion modelling package ISC-AERMOD has been used to determine the $NO_x$ impact from the works at these receptor locations.

The scenarios to be assessed have been selected through discussion with the site, and represent the existing scenario and possible options for the introduction of the energy recovery system. The results are presented as tabular data and in the form of contour plots, allowing comparisons to be made against the long and short-term Air Quality Standards as quoted within The Air Quality Strategy for England, Scotland, Wales & Northern Ireland.

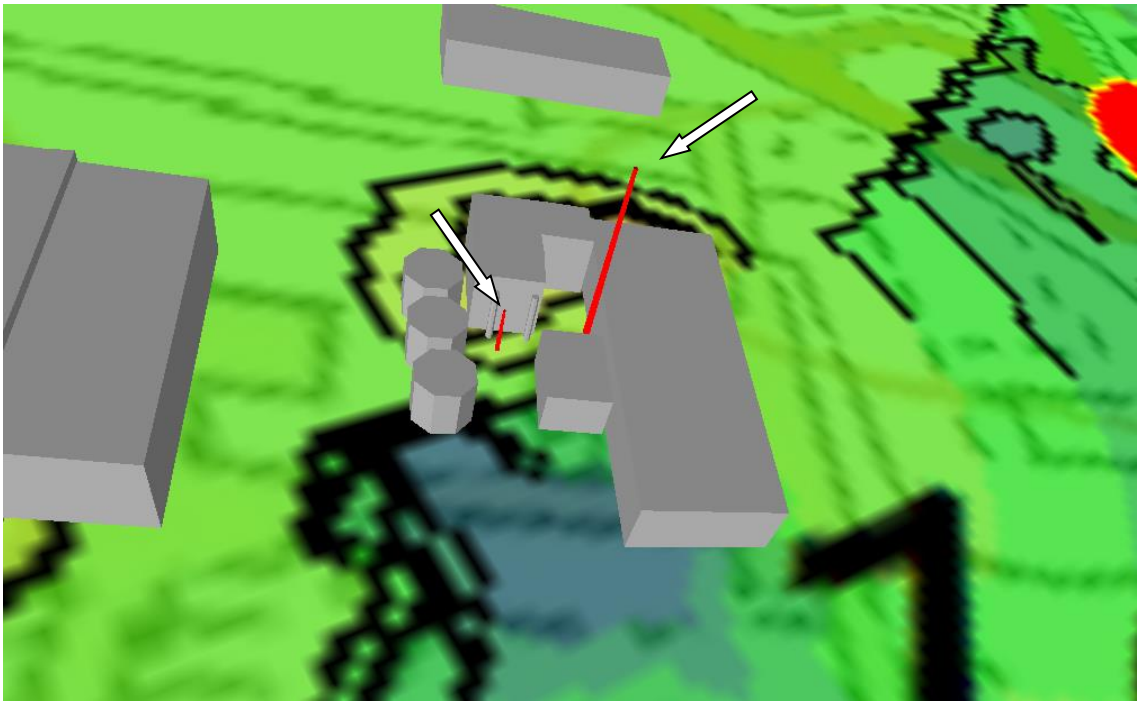
The appraisal has been undertaken using manufacturers information or data from the most recent round of emissions testing performed at the site by Exova.

Inbev Mangor works boundary

Inbev is situated to the east of the town of Mangor. The closest residents have been chosen as receptors to assess any impact on air quality from the works.



Emission sources



The emissions from the works have emission points that vent externally. Emission points are mechanically vented from chimney stacks.

## 1.1 Scope of the Assessment

An assessment was performed using dispersion modelling to determine the ground level concentrations of $NO_x$ that local residential areas will potentially be exposed.
The following aspects will be considered:

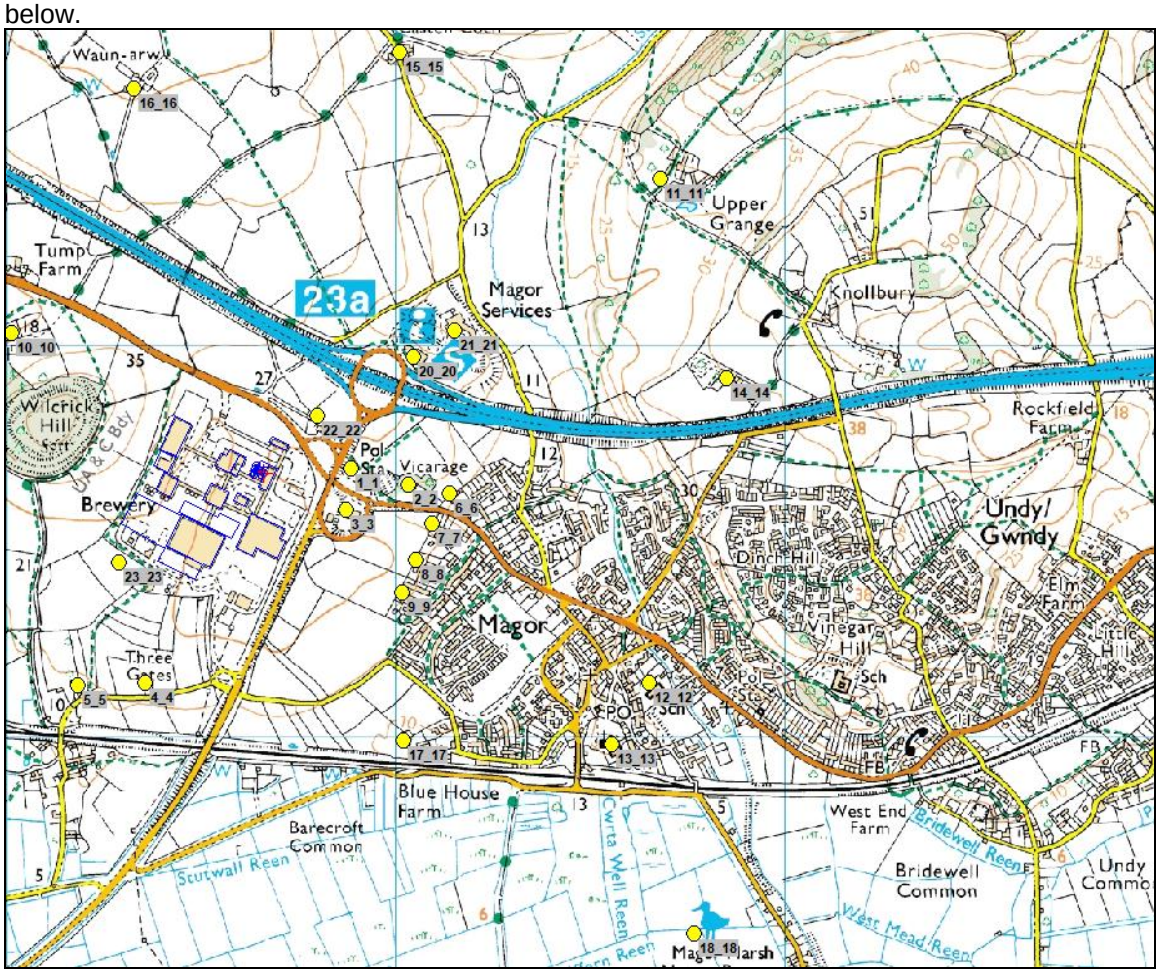
- The existing air quality in the locality - to allow addition of process contribution;
- The predicted impact on the air quality at surrounding residential properties as a consequence of $NO_x$ emissions for the following scenarios:

Scenario 1 Flue ace stack not operational 0% flow rate
Scenario 2 Flue ace stack 100% flow rate
Scenario 3 Flue ace stack 50% flow rate

- Future trends in background air quality that may affect the overall impact

# 2 Receptors and measurement locations considered within the Assessment

The location of the site and the position of the sensitive receptors considered in model are shown below.




The closest receptors to the site which have been highlighted that could receive an increase percentage of the annual mean air quality standard.

# 3 Criteria

## 3.1 The UK Air Quality Standards and Objectives

The UK Air Quality Strategy states a number of air quality standards and objectives with compliance dates, for the purposes of local air quality management. A summary of the objectives and standards taken from the National Air Quality Information Archive is provided below:

| National air quality objectives and European Directive limit and target values for the protection of human health | | | | | | |
|---|---|---|---|---|---|---|
| **Pollutant** | **Applies** | **Objective** | **Concentration measured as[1]** | **Date to be achieved by (and maintained thereafter)** | **European Obligations** | **Date to be achieved by (and maintained thereafter)** |
| Nitrogen dioxide | UK | 200 µg/m³ not to be exceeded more than 18 times a year | 1 hour mean | 31 December 2005 | 200 µg/m³ not to be exceeded more than 18 times a year | 1 January 2010 |
| | UK | 40 µg/m³ | annual mean | 31 December 2005 | 40 µg/m³ | 1 January 2010 |

| National air quality objectives and European Directive limit and target values for the protection of vegetation and ecosystems | | | | | | |
|---|---|---|---|---|---|---|
| **Pollutant** | **Applies** | **Objective** | **Concentration measured as[1]** | **Date to be achieved by (and maintained thereafter)** | **European Obligations** | **Date to be achieved by (and maintained thereafter)** |
| Nitrogen oxides | UK | 30 µg/m³ | annual mean | 31 December 2000 | 30 µg/m³ | 19 July 2001 |

The Air Quality Standards for $NO_2$ which are highlighted above are considered to be the most relevant for making comparisons within this assessment.

# 4 Existing and Future Background Air Quality

In the diffusion tube monitoring information gathered has been compared with the derived background from the National Air Quality Information Archive. Figures have also been provided for predicted levels in 2018. The background values have been calculated for the square centred on the X and Y grid coordinates detailed below for the area surrounding the plant which resides in the X341500 Y187500 square.

| X | Y | $NO_2$ 2017 ugm-3 as $NO_2$ annual mean | $NO_2$ 2018 ugm-3 as $NO_2$ annual mean |
|---|---|---|---|
| 352500 | 18500 | 8.07 | 7.77 |
| 341500 | 187500 | 12.86 | 12.36 |
| 342500 | 187500 | 15.68 | 14.99 |

The figures indicate a downward trend in the predicted background $NO_2$ levels form 32% of the 40µg/m³ annual mean UK Air Quality Standard in 2017, and 31% in 2018.

# 5 Industrial Emissions and Modelling Details

## 5.1 Emissions Data for the Site

The table below indicates the parameters modelled for the site, existing stack emissions are based upon the most recent emissions testing. These figures are assumed to be typical. Practical estimations have been made on fugitive emissions from doorways and roof vents.

| Emission point | Release height (m) | NOx as NO2 (g/s) | Gas Temperature (K) | Inside Duct diameter (m) | Gas exit Velocity (m/s) | Flow rate (m3/s) |
|---|---|---|---|---|---|---|
| Boiler main stack (boiler 2) | 38 | 0.58 | 459 | 1.29 | 7.4 | 9.65 |
| Flu Ace Stack 0% | 9 | 0.0001 | 302 | 0.8 | 1.77 | 0.89 |
| Flu Ace Stack 50% | 9 | 0.734 | 383 | 0.8 | 9.07 | 4.56 |
| Flu Ace Stack 100% | 9 | 0.986 | 383 | 0.8 | 11.34 | 5.7 |

All predictions have been performed using operating times/conditions - 100% operation.

## 5.2 Modelling Details

The AERMOD dispersion model has been used to perform the predictions provided in the Appraisal Section and the contour maps in Appendix I. This model has been used extensively for assessing air quality impacts and is accepted as an appropriate air quality modelling tool by the EA, SEPA and local authorities. It is the regulatory model used by the USEPA.

Topographic features can have significant effect on the dispersion of pollutants, especially when the gradient exceeds 1 in 10. Terrain to the east of the site has a significant gradient and this needs to be taken into account. Terrain data provided by the Ordnance Survey has been used within the model. The terrain pre-processing module was utilised within the model to predict topographic effects and to generate elevations of receptors, buildings and stack bases.

5 years of meteorological data was used for the location. This data is thought to be representative of the met conditions experienced by the site and required no additional adjustment for local topography. The AERMET pre-processor provided the surface and profile files for the model. As the site is located in an urban area, the urban option was selected within the model to allow for any additional heating from properties. Seasonal surface roughness, Albedo figures and Bowen Ratios for each of 16 wind quadrants were used for the areas surrounding the site representing the urban landscape.

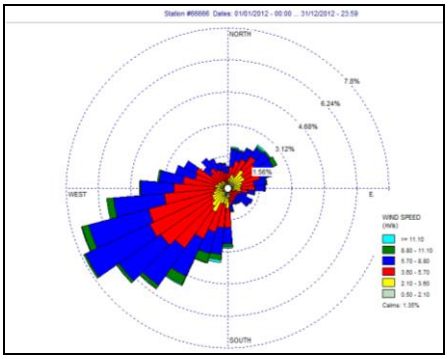
The buildings module was also utilised in each modelling run to allow for downwash. All major site buildings were input into the model. The revised building layout is indicated by the 3D visualisation below. The vertical height is exaggerated to illustrate the buildings more clearly.

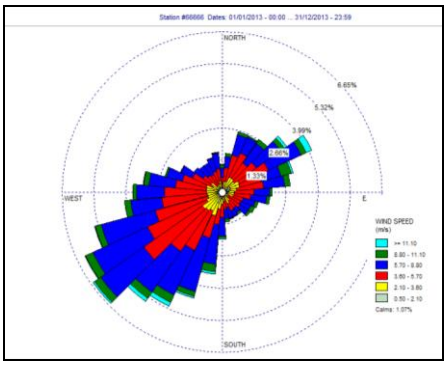

Emissions of oxides of nitrogen from combustion processes are typically 95% nitric oxide (NO) or greater. Atmospheric reactions with ozone and oxygen cause the oxidation of NO to nitrogen dioxide ($NO_2$). For the purposes of the modelling exercise, it has been assumed that there is 35% conversion of NO to $NO_2$ for the short-term concentrations and 70% conversion to $NO_2$ for the long term concentrations.

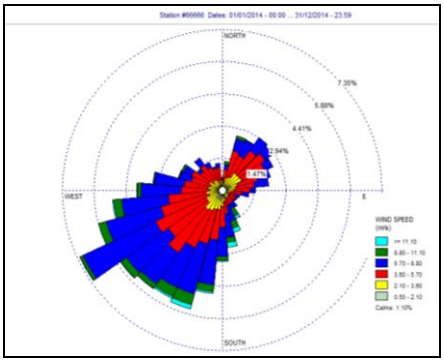
The area surrounding the site was modelled using a polar grid. The grid has a 20m ring spacing with 4 degree incremental radials.

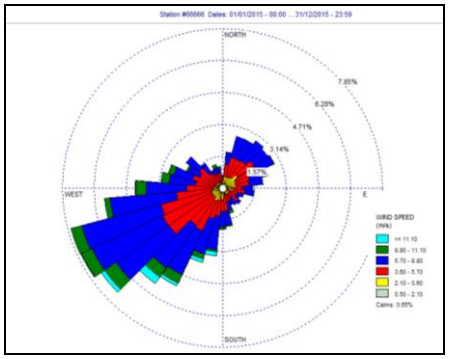
The input data for this assessment has been compiled using a worst case scenario view point as typical furnace usage will be lower than the modelled run time values. This will tend to provide an overestimation of ground level concentrations and the actual figures are expected to be lower, or sometimes significantly lower.

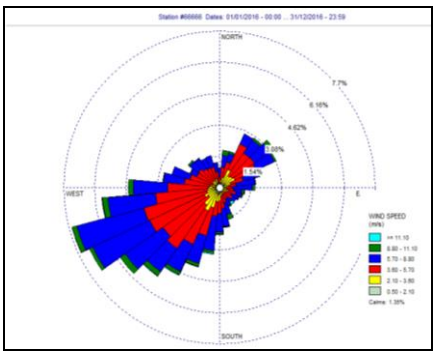
Meteorological data has been used in the AERMOD dispersion model. Analysis of the worst case year for dispersion has been undertaken and was deemed to be 2015. Wind roses for a five year period are provided below.

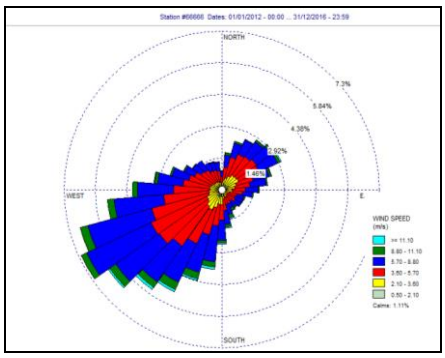





The wind roses indicate that typically the prevailing winds are from the west and south which will significantly affect the pattern of the long term concentrations of pollutants surrounding the site. Poorer dispersion usually occurs during periods of lighter winds, potentially giving rise to higher short term concentrations.

# 6.0 Assessment of Scenarios

The following scenarios have been considered within the assessment:

Scenario 1 Flue ace stack not operational 0% flow rate
Scenario 2 Flue ace stack 100% flow rate
Scenario 3 Flue ace stack 50% flow rate

The results of the dispersion modelling for each scenario are presented in this section and compare the predicted ground levels concentrations to the air quality standards applicable for the receptors surrounding the site. The predicted ground level concentrations are presented alongside a combined figure taking into account the background concentrations in the area as determined in Section 4.

H1 document provides criteria for assessing the significance of plant releases to be used for screening purposes within the H1 software tool, in order to decide whether more detailed modelling is required. These criteria may also be considered suitable for assessing the significance of the results obtained from the detailed modelling. Predicted ground level concentrations may be considered insignificant based on the following criteria:

- Long-term Process Contribution < 1% of the long-term environmental benchmark
- Short-term Process Contribution < 10% of the short-term environmental benchmark
- Short-term Process Contributions not exceeding 30% of the short-term benchmark “may be considered to be tolerable”

The short-term process contribution may be considered to be significant if it forms more than 20% of the headroom between the background concentration and the short term Air Quality Standard or EAL, or if the long-term Process Contribution plus background concentration (Predicted Environmental Concentration or PEC) is greater than 70% of the long term benchmark.

Predicted 2017 background concentrations in the area forms 31% of the long-term benchmark. A PEC of between 65% and 70% of the benchmark figures is deemed as being a borderline issue, whereas a PEC >70% of the benchmark must be re assessed.

As a consequence of the background figures, significant process additions are required for the PEC to exceed 65% of the benchmark. This means that achieving a PEC of <65% of the benchmark will be achievable with significant head space when operating the flue ace and boiler at 100% operation.

Contour plots for each scenario are presented in Appendix I.

## 6.1 Scenario 1

Table illustrates the predicted $NO_2$ concentrations at specific receptor positions for the worst case meteorological year (2015) boiler 2 with flue ace system off (0%).

**NO2 Impacts at Sensitive Human Receptors and NOx Impacts at Sensitive Ecological Receptors**

**Boiler 2 with Flue ace 0% operational**

| | | | Predicted Ground Level Concentrations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | $NO_2$ Annual Mean (µg/m$^3$) | | | | $NO_x$ Annual Mean (µg/m$^3$) | | | $NO_2$ 99.79 %ile of 1hr means (µg/m$^3$) | | | |
| Air Quality Standard (µg/m$^3$) | | | | | | 40 | | | | | | | 200 |
| Vegetation based Air Quality Standard (µg/m$^3$) | | | | | | - | | | 30 | | | | - |
| Average Background $NO_x$ concentration (µg/m$^3$) | | | | | | - | | | 19 | | | | - |
| Average Background $NO_2$ concentration (µg/m$^3$) | | | | | | 13 | | | - | | | | 26 |
| | Receptor location | | | | | | | | | | | | |
| Receptor Number | X - Coordinates | Y - Coordinates | Process Contribution Excluding Background | PEC Including Background | Process Contrib as % of AQS | % PEC of AQS | Process Contribution Excluding Background | PEC Including Background | Process Contrib as % of Veg AQS | Process Contribution Excluding Background | PEC Including Background | Process Contrib as % of AQS | % PC of headroom |
| 1 | 341887.65 | 187683.25 | 0.33 | 13.3 | 0.8 | 33.3 | 0.47 | 19.5 | 1.6 | 3.04812 | 29.0 | 1.5 | 1.8 |
| 2 | 342035.68 | 187640.27 | 0.36 | 13.4 | 0.9 | 33.4 | 0.52 | 19.5 | 1.7 | 3.27126 | 29.3 | 1.6 | 1.9 |
| 3 | 341875.71 | 187575.8 | 0.19 | 13.2 | 0.5 | 33.0 | 0.27 | 19.3 | 0.9 | 3.12082 | 29.1 | 1.6 | 1.8 |
| 4 | 341359.98 | 187134.09 | 0.16 | 13.2 | 0.4 | 32.9 | 0.22 | 19.2 | 0.7 | 2.38827 | 28.4 | 1.2 | 1.4 |
| 5 | 341185.69 | 187129.32 | 0.13 | 13.1 | 0.3 | 32.8 | 0.19 | 19.2 | 0.6 | 2.13206 | 28.1 | 1.1 | 1.2 |
| 6 | 342140.74 | 187618.78 | 0.29 | 13.3 | 0.7 | 33.2 | 0.41 | 19.4 | 1.4 | 2.8525 | 28.9 | 1.4 | 1.6 |
| 7 | 342095.37 | 187542.38 | 0.24 | 13.2 | 0.6 | 33.1 | 0.35 | 19.3 | 1.2 | 2.95323 | 29.0 | 1.5 | 1.7 |
| 8 | 342054.78 | 187449.26 | 0.20 | 13.2 | 0.5 | 33.0 | 0.29 | 19.3 | 1.0 | 3.00385 | 29.0 | 1.5 | 1.7 |
| 9 | 342018.97 | 187365.69 | 0.17 | 13.2 | 0.4 | 32.9 | 0.24 | 19.2 | 0.8 | 3.06923 | 29.1 | 1.5 | 1.8 |
| 10 | 341016.17 | 188029.45 | 0.06 | 13.1 | 0.2 | 32.7 | 0.09 | 19.1 | 0.3 | 2.20344 | 28.2 | 1.1 | 1.3 |
| 11 | 342682.73 | 188423.41 | 0.14 | 13.1 | 0.3 | 32.8 | 0.19 | 19.2 | 0.6 | 1.57274 | 27.6 | 0.8 | 0.9 |
| 12 | 342654.08 | 187134.09 | 0.07 | 13.1 | 0.2 | 32.7 | 0.10 | 19.1 | 0.3 | 1.50581 | 27.5 | 0.8 | 0.9 |
| 13 | 342558.57 | 186976.51 | 0.06 | 13.1 | 0.1 | 32.6 | 0.09 | 19.1 | 0.3 | 1.45124 | 27.5 | 0.7 | 0.8 |
| 14 | 342852.25 | 187914.85 | 0.13 | 13.1 | 0.3 | 32.8 | 0.19 | 19.2 | 0.6 | 1.65406 | 27.7 | 0.8 | 1.0 |
| 15 | 342014.79 | 188745.75 | 0.09 | 13.1 | 0.2 | 32.7 | 0.13 | 19.1 | 0.4 | 1.55049 | 27.6 | 0.8 | 0.9 |
| 16 | 341330.74 | 188652.63 | 0.04 | 13.0 | 0.1 | 32.6 | 0.06 | 19.1 | 0.2 | 1.59174 | 27.6 | 0.8 | 0.9 |
| 17 | 342022.29 | 186987.48 | 0.06 | 13.1 | 0.2 | 32.7 | 0.09 | 19.1 | 0.3 | 1.78354 | 27.8 | 0.9 | 1.0 |
| 18 | 342771.22 | 186492.89 | 0.03 | 13.0 | 0.1 | 32.6 | 0.04 | 19.0 | 0.1 | 0.95387 | 27.0 | 0.5 | 0.5 |
| 19 | 343850.93 | 184869.88 | 0.01 | 13.0 | 0.0 | 32.5 | 0.01 | 19.0 | 0.0 | 0.38056 | 26.4 | 0.2 | 0.2 |
| 20 | 342047.54 | 187968.39 | 0.50 | 13.5 | 1.3 | 33.8 | 0.72 | 19.7 | 2.4 | 3.06264 | 29.1 | 1.5 | 1.8 |
| 21 | 342154.91 | 188034.85 | 0.38 | 13.4 | 0.9 | 33.4 | 0.54 | 19.5 | 1.8 | 2.50101 | 28.5 | 1.3 | 1.4 |
| 22 | 341801.26 | 187816.99 | 0.40 | 13.4 | 1.0 | 33.5 | 0.57 | 19.6 | 1.9 | 3.15116 | 29.2 | 1.6 | 1.8 |
| 23 | 341292.8 | 187440.59 | 0.23 | 13.2 | 0.6 | 33.1 | 0.32 | 19.3 | 1.1 | 3.08316 | 29.1 | 1.5 | 1.8 |

## 6.2 Scenario 2

Table illustrates the predicted $NO_2$ concentrations at specific receptor positions for the worst case meteorological year (2015) Boiler 2 with flue ace at 100%.

| | | | Predicted Ground Level Concentrations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | $NO_2$ Annual Mean (µg/m$^3$) | | | | $NO_x$ Annual Mean (µg/m$^3$) | | | $NO_2$ 99.79 %ile of 1hr means (µg/m$^3$) | | | |
| Air Quality Standard (µg/m$^3$) | | | | | | 40 | | | | | | | 200 |
| Vegetation based Air Quality Standard (µg/m$^3$) | | | | | | - | | | 30 | | | | - |
| Average Background $NO_x$ concentration (µg/m$^3$) | | | | | | - | | | 19 | | | | - |
| Average Background $NO_2$ concentration (µg/m$^3$) | | | | | | 13 | | | - | | | | 26 |
| | Receptor location | | Process Contribution Excluding Background | PEC Including Background | Process Contrib as % of AQS | % PEC of AQS | Process Contribution Excluding Background | PEC Including Background | Process Contrib as % of Veg AQS | Process Contribution Excluding Background | PEC Including Background | Process Contrib as % of AQS | % PC of headroom |
| Receptor Number | X - Coordinates | Y - Coordinates | | | | | | | | | | | |
| 1 | 341887.65 | 187683.25 | 4.37 | 17.4 | 10.9 | 43.4 | 6.24 | 25.2 | 20.8 | 35.8 | 61.8 | 17.9 | 20.5 |
| 2 | 342035.68 | 187640.27 | 2.04 | 15.0 | 5.1 | 37.6 | 2.91 | 21.9 | 9.7 | 25.6 | 51.6 | 12.8 | 14.7 |
| 3 | 341875.71 | 187575.8 | 2.83 | 15.8 | 7.1 | 39.6 | 4.04 | 23.0 | 13.5 | 35.8 | 61.8 | 17.9 | 20.6 |
| 4 | 341359.98 | 187134.09 | 0.66 | 13.7 | 1.7 | 34.2 | 0.94 | 19.9 | 3.1 | 11.7 | 37.7 | 5.8 | 6.7 |
| 5 | 341185.69 | 187129.32 | 0.52 | 13.5 | 1.3 | 33.8 | 0.74 | 19.7 | 2.5 | 9.5 | 35.5 | 4.8 | 5.5 |
| 6 | 342140.74 | 187618.78 | 1.36 | 14.4 | 3.4 | 35.9 | 1.94 | 20.9 | 6.5 | 22.2 | 48.2 | 11.1 | 12.8 |
| 7 | 342095.37 | 187542.38 | 1.27 | 14.3 | 3.2 | 35.7 | 1.81 | 20.8 | 6.0 | 23.4 | 49.4 | 11.7 | 13.5 |
| 8 | 342054.78 | 187449.26 | 1.09 | 14.1 | 2.7 | 35.2 | 1.55 | 20.6 | 5.2 | 20.3 | 46.3 | 10.2 | 11.7 |
| 9 | 342018.97 | 187365.69 | 0.92 | 13.9 | 2.3 | 34.8 | 1.32 | 20.3 | 4.4 | 27.0 | 53.0 | 13.5 | 15.5 |
| 10 | 341016.17 | 188029.45 | 0.31 | 13.3 | 0.8 | 33.3 | 0.44 | 19.4 | 1.5 | 9.9 | 35.9 | 4.9 | 5.7 |
| 11 | 342682.73 | 188423.41 | 0.42 | 13.4 | 1.1 | 33.6 | 0.61 | 19.6 | 2.0 | 6.0 | 32.0 | 3.0 | 3.5 |
| 12 | 342654.08 | 187134.09 | 0.24 | 13.2 | 0.6 | 33.1 | 0.35 | 19.3 | 1.2 | 5.6 | 31.6 | 2.8 | 3.2 |
| 13 | 342558.57 | 186976.51 | 0.22 | 13.2 | 0.6 | 33.1 | 0.31 | 19.3 | 1.0 | 5.9 | 31.9 | 2.9 | 3.4 |
| 14 | 342852.25 | 187914.85 | 0.42 | 13.4 | 1.0 | 33.5 | 0.59 | 19.6 | 2.0 | 6.5 | 32.5 | 3.2 | 3.7 |
| 15 | 342014.79 | 188745.75 | 0.30 | 13.3 | 0.8 | 33.3 | 0.43 | 19.4 | 1.4 | 5.5 | 31.5 | 2.7 | 3.1 |
| 16 | 341330.74 | 188652.63 | 0.17 | 13.2 | 0.4 | 32.9 | 0.24 | 19.2 | 0.8 | 7.7 | 33.7 | 3.8 | 4.4 |
| 17 | 342022.29 | 186987.48 | 0.29 | 13.3 | 0.7 | 33.2 | 0.42 | 19.4 | 1.4 | 7.9 | 33.9 | 4.0 | 4.6 |
| 18 | 342771.22 | 186492.89 | 0.10 | 13.1 | 0.3 | 32.8 | 0.15 | 19.1 | 0.5 | 3.3 | 29.3 | 1.6 | 1.9 |
| 19 | 343850.93 | 184869.88 | 0.03 | 13.0 | 0.1 | 32.6 | 0.04 | 19.0 | 0.1 | 1.1 | 27.1 | 0.6 | 0.7 |
| 20 | 342047.54 | 187968.39 | 2.24 | 15.2 | 5.6 | 38.1 | 3.21 | 22.2 | 10.7 | 22.6 | 48.6 | 11.3 | 13.0 |
| 21 | 342154.91 | 188034.85 | 1.41 | 14.4 | 3.5 | 36.0 | 2.01 | 21.0 | 6.7 | 13.3 | 39.3 | 6.7 | 7.7 |
| 22 | 341801.26 | 187816.99 | 9.57 | 22.6 | 23.9 | 56.4 | 13.68 | 32.7 | 45.6 | 92.9 | 118.9 | 46.4 | 53.4 |
| 23 | 341292.8 | 187440.59 | 1.26 | 14.3 | 3.2 | 35.7 | 1.80 | 20.8 | 6.0 | 21.7 | 47.7 | 10.9 | 12.5 |

## 6.3 Scenario 3

Table illustrates the predicted $NO_2$ concentrations at specific receptor positions for the worst case meteorological year (2015) Boiler 2 with flue ace at 50%.

| | | | Predicted Ground Level Concentrations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | $NO_2$ Annual Mean (µg/m$^3$) | | | | $NO_x$ Annual Mean (µg/m$^3$) | | | $NO_2$ 99.79 %ile of 1hr means (µg/m$^3$) | | | |
| Air Quality Standard (µg/m$^3$) | | | | | | 40 | | | | | | | 200 |
| Vegetation based Air Quality Standard (µg/m$^3$) | | | | | | - | | | 30 | | | | - |
| Average Background $NO_x$ concentration (µg/m$^3$) | | | | | | - | | | 19 | | | | - |
| Average Background $NO_2$ concentration (µg/m$^3$) | | | | | | 13 | | | - | | | | 26 |
| | Receptor location | | Process Contribution | | | | Process Contribution | | Process | Process Contribution | | | |
| Receptor Number | X - Coordinates | Y - Coordinates | Excluding Background | PEC Including Background | Process Contrib as % of AQS | % PEC of AQS | Excluding Background | PEC Including Background | Contrib as % of Veg AQS | Excluding Background | PEC Including Background | Process Contrib as % of AQS | % PC of headroom |
| 1 | 341887.65 | 187683.25 | 3.61 | 16.6 | 9.0 | 41.5 | 5.16 | 24.2 | 17.2 | 31.4 | 57.4 | 15.7 | 18.0 |
| 2 | 342035.68 | 187640.27 | 1.64 | 14.6 | 4.1 | 36.6 | 2.34 | 21.3 | 7.8 | 19.8 | 45.8 | 9.9 | 11.4 |
| 3 | 341875.71 | 187575.8 | 2.26 | 15.3 | 5.6 | 38.1 | 3.23 | 22.2 | 10.8 | 28.2 | 54.2 | 14.1 | 16.2 |
| 4 | 341359.98 | 187134.09 | 0.55 | 13.5 | 1.4 | 33.9 | 0.78 | 19.8 | 2.6 | 9.3 | 35.3 | 4.6 | 5.3 |
| 5 | 341185.69 | 187129.32 | 0.43 | 13.4 | 1.1 | 33.6 | 0.61 | 19.6 | 2.0 | 7.5 | 33.5 | 3.7 | 4.3 |
| 6 | 342140.74 | 187618.78 | 1.09 | 14.1 | 2.7 | 35.2 | 1.56 | 20.6 | 5.2 | 15.0 | 41.0 | 7.5 | 8.6 |
| 7 | 342095.37 | 187542.38 | 1.02 | 14.0 | 2.6 | 35.1 | 1.46 | 20.5 | 4.9 | 18.7 | 44.7 | 9.3 | 10.7 |
| 8 | 342054.78 | 187449.26 | 0.88 | 13.9 | 2.2 | 34.7 | 1.25 | 20.3 | 4.2 | 13.6 | 39.6 | 6.8 | 7.8 |
| 9 | 342018.97 | 187365.69 | 0.74 | 13.7 | 1.8 | 34.3 | 1.06 | 20.1 | 3.5 | 13.5 | 39.5 | 6.8 | 7.8 |
| 10 | 341016.17 | 188029.45 | 0.25 | 13.3 | 0.6 | 33.1 | 0.36 | 19.4 | 1.2 | 8.0 | 34.0 | 4.0 | 4.6 |
| 11 | 342682.73 | 188423.41 | 0.35 | 13.4 | 0.9 | 33.4 | 0.51 | 19.5 | 1.7 | 4.9 | 30.9 | 2.4 | 2.8 |
| 12 | 342654.08 | 187134.09 | 0.20 | 13.2 | 0.5 | 33.0 | 0.29 | 19.3 | 1.0 | 4.6 | 30.6 | 2.3 | 2.6 |
| 13 | 342558.57 | 186976.51 | 0.18 | 13.2 | 0.5 | 33.0 | 0.26 | 19.3 | 0.9 | 4.3 | 30.3 | 2.1 | 2.5 |
| 14 | 342852.25 | 187914.85 | 0.34 | 13.3 | 0.9 | 33.4 | 0.49 | 19.5 | 1.6 | 5.0 | 31.0 | 2.5 | 2.9 |
| 15 | 342014.79 | 188745.75 | 0.25 | 13.3 | 0.6 | 33.1 | 0.36 | 19.4 | 1.2 | 4.7 | 30.7 | 2.3 | 2.7 |
| 16 | 341330.74 | 188652.63 | 0.14 | 13.1 | 0.4 | 32.9 | 0.20 | 19.2 | 0.7 | 6.3 | 32.3 | 3.1 | 3.6 |
| 17 | 342022.29 | 186987.48 | 0.24 | 13.2 | 0.6 | 33.1 | 0.34 | 19.3 | 1.1 | 6.3 | 32.3 | 3.1 | 3.6 |
| 18 | 342771.22 | 186492.89 | 0.09 | 13.1 | 0.2 | 32.7 | 0.12 | 19.1 | 0.4 | 2.7 | 28.7 | 1.3 | 1.5 |
| 19 | 343850.93 | 184869.88 | 0.02 | 13.0 | 0.1 | 32.6 | 0.03 | 19.0 | 0.1 | 0.9 | 26.9 | 0.5 | 0.5 |
| 20 | 342047.54 | 187968.39 | 1.84 | 14.8 | 4.6 | 37.1 | 2.62 | 21.6 | 8.7 | 17.8 | 43.8 | 8.9 | 10.2 |
| 21 | 342154.91 | 188034.85 | 1.17 | 14.2 | 2.9 | 35.4 | 1.68 | 20.7 | 5.6 | 11.1 | 37.1 | 5.6 | 6.4 |
| 22 | 341801.26 | 187816.99 | 7.23 | 20.2 | 18.1 | 50.6 | 10.33 | 29.3 | 34.4 | 69.2 | 95.2 | 34.6 | 39.8 |
| 23 | 341292.8 | 187440.59 | 1.21 | 14.2 | 3.0 | 35.5 | 1.73 | 20.7 | 5.8 | 23.9 | 49.9 | 12.0 | 13.7 |

# 7 Conclusions

An assessment of several operational scenarios has been performed for the Mangor site based upon viable options that exist for the plant. The ground level concentrations at nearby receptors have been predicted using AERMOD, a recognised Gaussian dispersion model. Metrological data from 2015 has been used in the model and represents the works case conditions of the last five years data.

The following scenarios have been modelled and represent a worst case situation:

Scenario 1 Flue ace stack not operational 0% flow rate
Scenario 2 Flue ace stack 100% flow rate
Scenario 3 Flue ace stack 50% flow rate

The long term $NO_2$ air quality standard is not predicted to be breached at any of the receptor positions for any of the options presented.

There are no exceedences of the short-term limit value even with the addition of background concentrations under any of the scenarios presented.

The findings for each of the scenarios are as follows:

- **Scenario 1)** Predicted PEC figures are <70% of the long-term AQS at all of the receptors considered. The short-term process contributions are not predicted to exceed 20% of the headroom at any of the receptors considered. The highest 1 hour average is predicted to be 29µg/$m^3$ and predictions therefore indicate that there will be no exceedances of the short-term limit value.

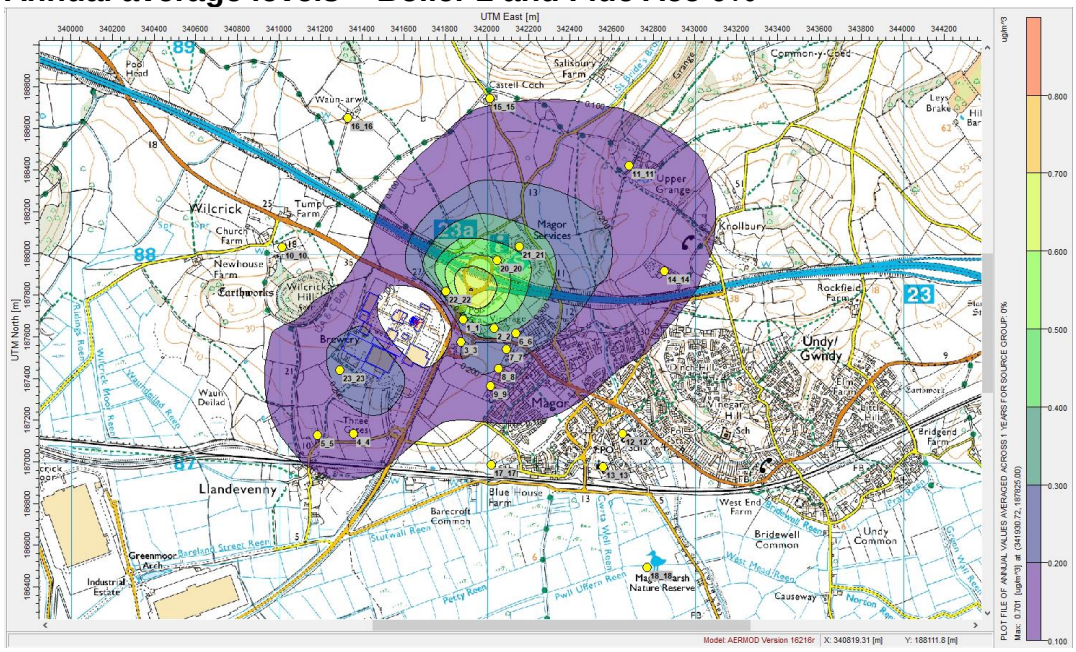
- **Scenario 2)** Predicted PEC figures are <70% of the long-term AQS at all of the receptors considered. The short-term process contributions are predicted to exceed 20% of the headroom at 3 receptor site considered. However, the highest 1 hour average is predicted to be 119µg/$m^3$ which indicates that there will be no exceedances of the short-term limit value.
- **Scenario 3)** Predicted PEC figures are <70% of the long-term AQS at all of the receptors considered. The short-term process contributions are predicted to exceed 20% of the headroom at 1 receptor considered. The highest 1 hour average at the receptor locations is predicted to be 95µg/$m^3$ which indicates that there will be no exceedances of the short-term limit value.

The following conclusions can be made:

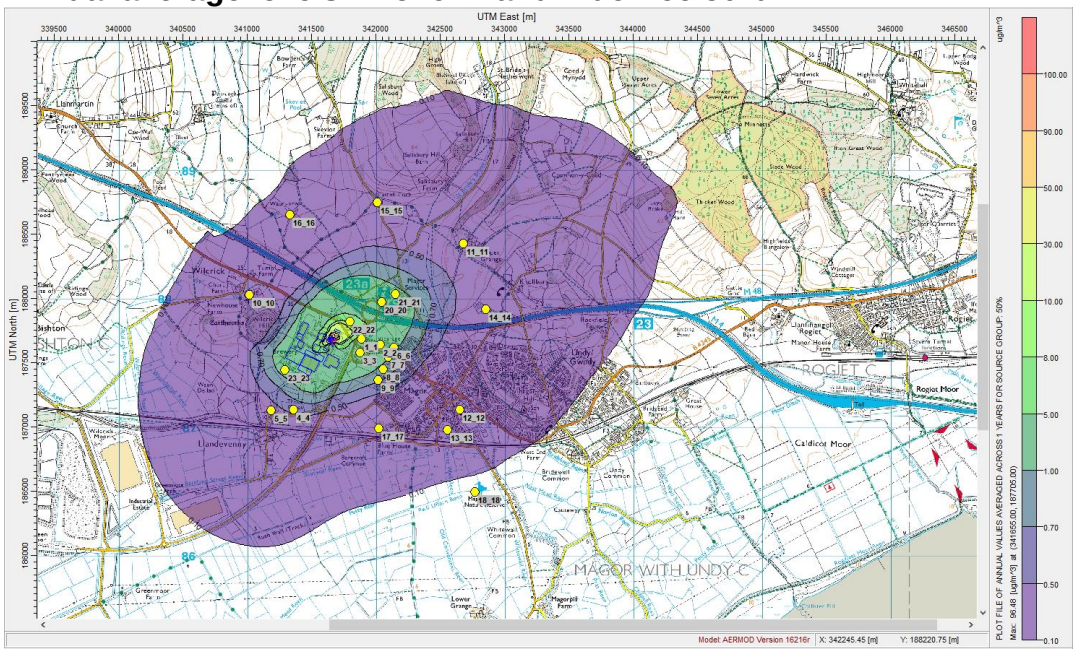
- The modelling indicates that PEC's in the range of 32% and 56% of the long-term benchmark with no exceedances of the short-term limit value are predicted for both scenarios.
- Achieving a PEC of around 56% or less of the long-term AQS will provide a good margin for uncertainty and provide an allowance for local variations in background concentrations.
- All non-residential receptors gave predicted levels were well below the vegetation air quality standard.
- The addition of a new emission point on the works shows an increases in NOx at the closest residential receptors when operational. When assessed against the air quality standards the emissions are well below the long and short term limit values. The downward trend in background NOx levels will also have a positive impact on the percentage headroom of the AQS.

# Appendix I

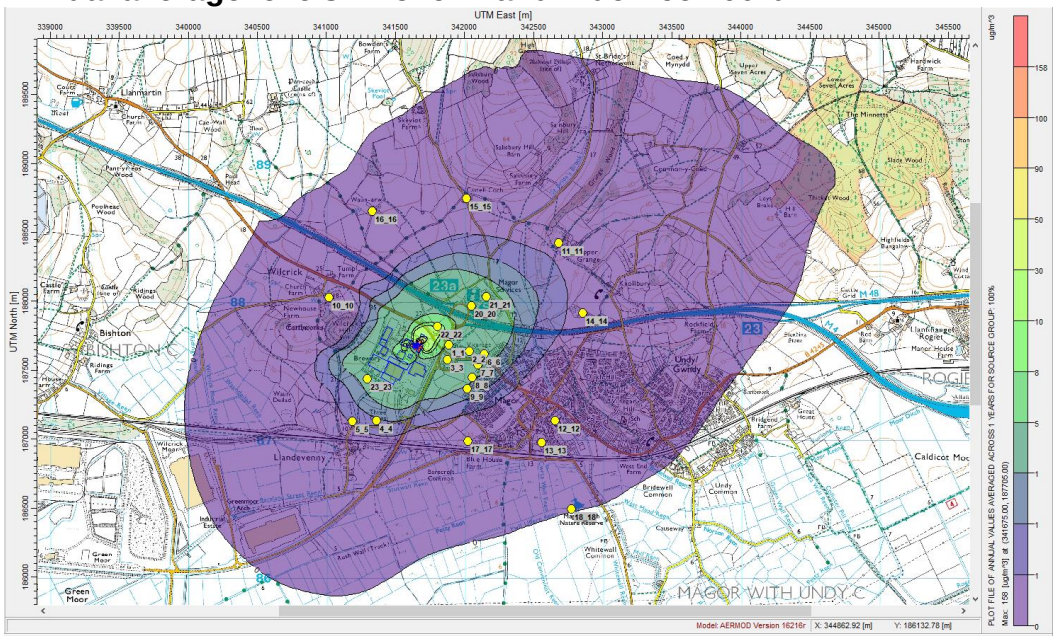
## Annual average levels – Boiler 2 and Flue Ace 0%



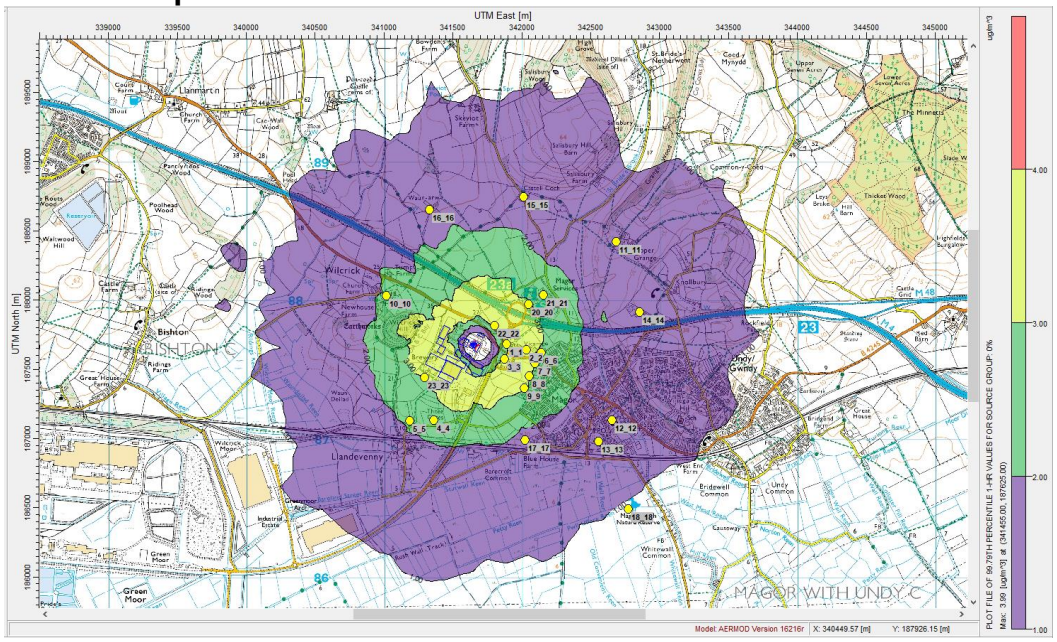

## Annual average levels - Boiler 2 and Flue Ace 50%



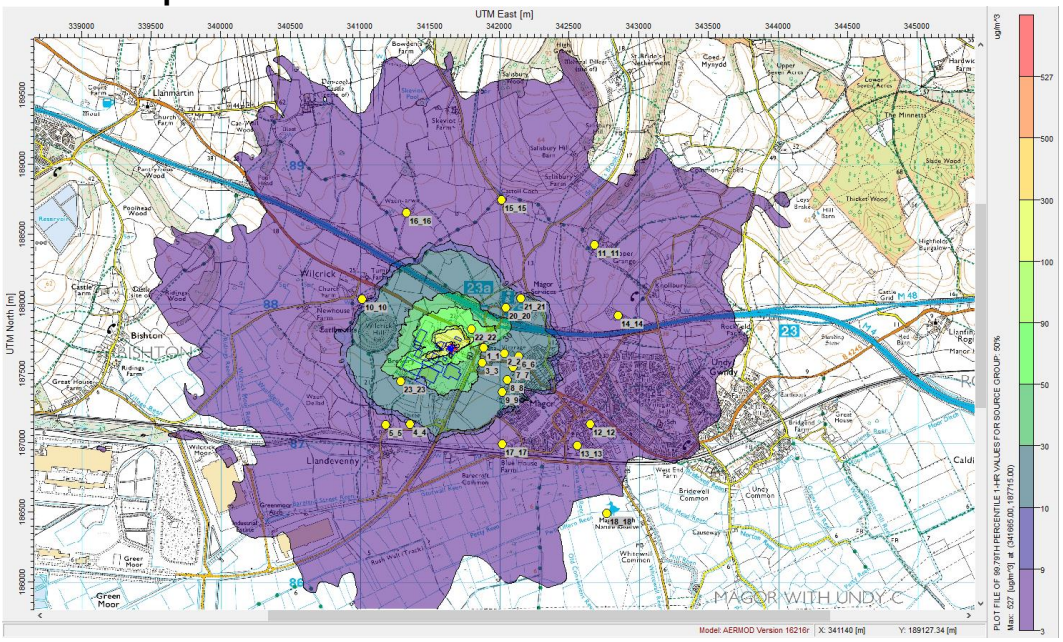
## Annual average levels - Boiler 2 and Flue Ace 100%




## 1hr 99.7th percentile levels Boiler 2 and Flue Ace 0%



## 1hr 99.7th percentile levels Boiler 2 and Flue Ace 50%




## 1hr 99.7th percentile levels Boiler 2 and Flue Ace 100%