March 2022

Air Dispersion Modelling Report

Additional and Refined Scenarios

William Connolly & Sons Unlimited Company

Grange Lower, Goresbridge, Co. Kilkenny

MALONE O'REGAN ENVIRONMENTAL

MALONE O'REGAN

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Ground Floor – Unit 3
Bracken Business Park
Bracken Road, Sandyford
Dublin 18, D18 V32Y
Tel: +353- 1- 567 76 55
Email: enviro@mores.ie

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Prepared By: Margaret Gleeson **Signed: pp**

Checked By: Klara Kovacic **Signed:**

Approved By: Kevin O'Regan **Signed:**

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1 INTRODUCTION

Malone O'Regan Environmental (MOR) was commissioned by William Connolly & Sons Unlimited Company (herein referred to as Red Mills) to undertake an Air Dispersion Modelling study of emissions to air from their facility located at Goresbridge, Co. Kilkenny (the Site). The Site is shown in Figure 1-1. This study has been prepared in support of the Request for Further Information (RFI) issued by the EPA dated 16th December 2021, and subsequent reminder issued by the EPA on 24th January 2022, with respect to the Industrial Emission (IE) Licence Application, Reference No. P1069-01.

Figure 1-1: Site Location

This report presents the findings of this Air Dispersion Modelling Study and has been prepared in accordance with the Environmental Protection Agency's (EPA) updated "Air Dispersion Modelling from Industrial Installations Guidance Note (AG4)" [1].

1.1 Overview

The primary objective of this study was to evaluate the impact of emissions to air arising from major emission point sources, from the Site to the surrounding environment, outside the Site boundary, and to propose mitigation measures if and where applicable.

There are 45 major emission points currently at the Site as of March 2022:

It is important to note that there are three distinct operations at the Site:

- Feed Mill – produces feed for various animals (horses, sheep, chicken), both in bulk and bagged. The Feed Mill operates 24/5, year-round. The Feed Mill does not operate at the weekends most of the time; however, there are occasions when it is required to operate the Feed Mill at weekends.

- Dryers – this is a grain drying process which only happens during the harvest season. Drying operates season is typically mid-July to mid-September; however, this depends on the weather and success of the harvest (i.e. amount of grain harvested), and is typically 8 weeks.
- Dryers 2, 4A and 4B are specialist seed dryers that produce seed for planting. Separate dryers must be used for seed and grain in order to avoid the potential for cross-contamination.
- Dryer 5 and replacement Dryer 6 are intended to dry grain for production of animal feed.
- Seed Plant – this is also a seasonal process, with 2 major emission points; and only operates ca. 23% of total annual operational hours. It is modelled in the same operating regime as the Dryers, as the number of actual operating hours is very similar to Dryer 5.

The dominant pollutant emitted into air from the Site is dust arising from various processes at the Site. Boiler and dryer burners associated with the combustion of fuel – LPG - emit both NO_x and SO_2 and therefore separate models were generated for NO_x/SO_2 and particulate matter. Table 1-1 below details the number of emission points associated with particulate matter (PM_{10}), NO_x and SO_2.

Table 1-1:Number of major emission points associated with the emissions to air assessment

Pollutant	Number of Emission Points
Particulate Matter (PM_{10}) – all emission points except boilers	43
NOx – boilers and Dryers	17
SO_2 – boilers and Dryers	17

All major emission points will be further examined in Section 4 of this report.

1.2 Aims of the Study

The aim of this study was to provide additional information on NO_x and SO_2, clarify the EPA's questions and refine the modelling by providing the following:

- A revised Air Dispersion Model using typical operating conditions at the Site; rather than a very unlikely conservative approach.
- Modelling of NO_x emissions from burners associated with dryers, in addition to boilers.
- Modelling of SO_2 emissions from burners associated with dryers and boilers.
- Sensitivity study for all scenarios presented, by modelling at 75% of volumetric flows. For this, only the worst-met year was modelled.
- Modelling refined mitigation measures to demonstrate their effectiveness.

1.3 Air Dispersion Model Used for the Study

AERMOD View software was used for this study. AERMOD View is a user interface for AERMOD, Gaussian Plume Air Dispersion Model, created and distributed by Lakes Environmental [2] (www.weblakes.com). The AERMOD model was developed by the American Meteorological Society (AMS) and United States Environmental Protection Agency (US EPA). AERMOD is the next generation air dispersion model based on planetary boundary layer theory. It is a steady-state Gaussian plume model used to assess pollutant concentrations from a wide variety of sources associated with an industrial complex. It fully incorporates building downwash algorithms, advanced depositional parameters, local terrain effects, and advanced meteorological turbulence calculations.

Key feature includes:

- Settling and dry deposition of particles.
- Building downwash.
- Point, area, line, open pit, flare, and volume sources.
- Flat and complex terrain.

AERMOD has enhanced plume dispersion coefficients due to the building turbulent wake. It incorporates reduced plume rise caused by a combination of descending streamlines in the lee of the building and the increased entrainment in its wake.

AERMOD is recommended for use in the EPA's AG4 document [1] as well as by the US EPA and is commonly used in Ireland for air dispersion modelling of point source emissions from licenced facilities.

Further information related to AERMOD is provided in Appendix F.

2 RELEVANT AMBIENT AIR QUALITY STANDARDS

Assessment of the significance of a particular level of pollution is made with reference to limit values established in the latest EU legislation, the Clean Air for Europe (CAFE) Directive (2008/50/EC) (European Parliament, 2008), which was transposed into Irish law as S.I. 180 of 2011 [3].

Air Quality Standards (AQSs) are usually based on the effects of pollutants on human health, although other factors such as effects on vegetation are sometimes taken into consideration.

The relevant limit values for AQSs as set by S.I. 180 of 2011 are presented in Table 2-1.

Table 2-1: EU and Irish Air Quality Standards

Pollutant	Objective			
	Concentration	Maximum No. of Exceedances permitted	Exceedance Expressed as Percentile	Measured as
PM_{10}	50 µg/m^3	35 times per year	90.4th percentile	24-hour mean
PM_{10}	40 µg/m^3	~	~	Annual mean (calendar year)
Nitrogen Dioxide	200 µg/m^3 as NO_2	18 times per year	99.8th percentile	1-hour mean
	40 µg/m^3 as NO_2	~	~	Annual mean
Nitrogen Dioxide	30 µg/m^3 as NO_2	~	~	Annual mean (protection of ecosystems)
Sulphur Dioxide	350 µg/m^3	24 times per year	99.7th percentile	1-hour mean
Sulphur Dioxide	125 µg/m^3	3 times per year	99.2th percentile	24-hour mean
Sulphur Dioxide	20 µg/m^3	~	~	Annual mean (protection of vegetation)

3 EMISSION POINTS AT RED MILLS

3.1 Major Emission Points

For the Air Dispersion Modelling Report submitted to the EPA in November 2021, MOR undertook a review of the Major Emission Points list previously submitted with the IEL application for the Site. A more accurate list of emission points for the facility was provided within the Eden submission on 30th November 2021, drawing from the existing list along with site visits and several meetings with the Site staff.

This list was later amended in agreement with the EPA resulting in the proposed Dryer 1 and proposed Dryer 3 emission points as well as Oat Cleaning process being removed from the list. These emission points were referenced as follows:

- A2-50A Replacement Dryer 3;
- A2-50B Replacement Dryer 3;
- A251-A Replacement Dryer 3;
- A2-51B Replacement Dryer 3;
- A2-52 Replacement Dryer 1/3 Pre-cleaner;
- A2-53 Oat Cleaner at Feed Mill.

The locations of all emission points were refined based on two drone surveys, observations during site visits and discussions with site staff. Refer to Appendix A for details and locations of emission points.

Monitoring of emission points was undertaken as far as practicable in August 2021 during the harvest season (refer to Air Dispersion Modelling Report dated 30th November 2021). Volumetric flows and Total Particulate Matter (TPM) were monitored, as the Emission Limit Values (ELVs) for other Feed Mills are set for TPM. As Air Quality Standards are set for PM_{10}, this study presumes TPM results are equivalent to PM_{10}, and therefore PM_{10} is modelled and assessed throughout this study. This results in overestimate of PM_{10} emissions and ground level concentrations, in line with overall conservative approach taken in this assessment.

3.2 Boilers

There are two diesel (MGO – marked gas oil) boilers at the Site. However, Red Mills management committed that these diesel boilers would be converted to LPG (liquid petroleum gas), which has already been installed at the Site to fuel burners on the dryers. During 2021, burners for Dryers 4A, 4B and 5 were converted to LPG.

This conversion will be completed by end of May 2022. The emissions associated with these boilers will be NO_x and SO_2.

These boilers run as duty and stand-by:

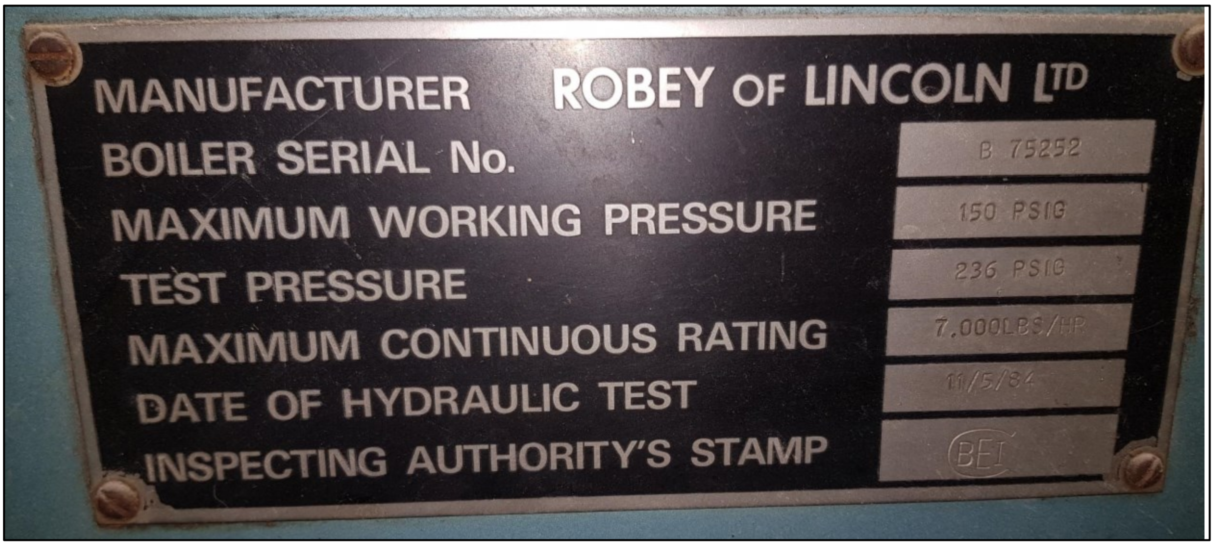
- Duty boiler – Danstoker, 6,000kg/steam per hour. This boiler runs 24/7/365, except for maintenance, and typically runs at 70-80% of load.
- Standby boiler – Robey of Lincoln, 3,175 kg/steam per hour. This boiler runs only during maintenance of duty boiler, and for about 5-6 hours per week.

For oil burners associated with these boilers, neither thermal input nor volumetric flow is available. In addition, the monitoring ports in accordance with AG1 [4] were not available and only NO_x was monitored (result: 169.85 mg/Nm^3).

The only available information is what is provided on the labels on the boilers (Figures 3-1 and 3-2). MOR contacted the manufacturer to obtain volumetric flow data but although the manufacturer provided some information, volumetric flows or emission data was not available.

Figure 3-1: Duty Boiler Label

Figure 3-2: Stand-by boiler label



The boiler modelling is based on the new LPG burners, to be installed imminently.

The specification for the new LPG burners states that thermal input is 4MW for the duty boiler. A smaller thermal input is required for the stand-by boiler, based on steam generated, ca. 53% or very approximately 2.2MW. Both boilers are therefore regulated under the Medium Combustion Plant Directive (MCPD).

A NO_x limit of 200mg/Nm^3 in proposed, as the current monitoring data for NO_x (169.85 mg/Nm^3) indicates that boilers perform below this limit. Once converted to LPG, it is expected that NO_x emissions will decrease. This limit is lower than the limit applicable for the existing plant in the MCPD.

Volumetric flow was estimated via energy usage at 5,000 m^3/hour, as a conservative scenario.

Additionally, volumetric flow for other industrial boilers at similar facilities were reviewed and proved to be largely in line with the conservative estimate of 5,000 Nm^3/hour. For the stand-by boiler, which is significantly smaller (see steam rating above), volumetric flow was estimated at 3,000Nm^3/hour, and the same ELV of 200 mg/Nm^3 for NO_x is proposed. This is an overestimation as no monitoring or manufacturer specification is available, so a conservative approach has been taken.

Boilers will be modelled under the operating regime specified below. This information was obtained by the operations manager at the Site:

- Duty boiler running 24hours/7days a week/365days a year;
- Stand-by boiler running 6 hours per week, year round;
- All met years modelled at 100% volumetric flow;
- Sensitivity analysis: for the met year with highest ground level concentration at 100% volumetric flow, volumetric flows at 75% was run.

3.3 Burners

As the dryers mentioned above combust natural gas, an investigation into emissions arising from the burners was carried out. Red Mills provided the following details regarding the burners:

- Dryer 2 has one (1no.) Weishaupt WM-GL20/3-A dual fuel burner (2 emission points);
- Dryer 4A has one (1no.) Reillo RS130/M modulating natural gas burner (2 emission points);
- Dryer 4B has one (1no.) Reillo RS130/M modulating natural gas burner (2 emission points);
- Dryer 5 has one (1no.) Reillo RS310/M modulating natural gas burner (5 emission points); and,
- Dryer 6 has six (6no.) Reillo RS190/M natural gas burner (4 emission points).

The combustion gases from these burners heat the air inside the dryer and are emitted through the dryer stacks. The number of dryers and number of stacks are not the same as some dryers have a single burner and multiple stacks. The key point is that volume of drying air is up to two orders of magnitude higher than combustion air, and therefore, any pollutant in the combustion air is diluted accordingly in the drying air.

Burners for Dryer 6 will be new and utilise LPG. Burners for Dryers 4A, 4B and 5 were converted to LPG prior to Harvest 2021. The burner for Dryer 2 will be converted to LPG prior to Harvest 2022.

Specification for these burners was obtained (refer to Appendix D), and it specifies that they are designed to EN 676 standard which sets NO_x emissions per kWh (in laboratory conditions). Table 3-1 below details mg of NO_x per kWh per burner, and conversion to g/s used in this assessment.

Table 3-1:Specifications for the burners associated with the NO_x emissions

Burner Name (Dryer Associated)	Model	Number of emission points	EN 676 Class	Megawatts (MW)	Emissions (mg/kWh)	Emissions per second (g/s)
F 1 (Dryer 2)	WM-GL20/3-A ZMR	2	Class 2	2.45	180	0.123
F 2 (Dryer 4A)	Reillo RS 130M	2	Class 2	1.6	180	0.080

Burner Name (Dryer Associated)	Model	Number of emission points	EN 676 Class	Megawatts (MW)	Emissions (mg/kWh)	Emissions per second (g/s)
F 3 (Dryer 4B)	Reillo RS 130M	2	Class 2	1.6	180	0.080
F 4 (Dryer 5)	Reillo RS 130M	5	Class 2	3.9	180	0.195
F 6.1 (Dryer 6)	Reillo RS 190M	4	Class 1	1.97	230	0.126
F 6.2 (Dryer 6)	Reillo RS 310M	4	Class 1	1.97	230	0.126
F 6.3 (Dryer 6)	Reillo RS 310/M	4	Class 1	1.97	230	0.126
F 6.4 (Dryer 6)	Reillo RS 310/M	4	Class 1	1.97	230	0.126
F 6.5 (Dryer 6)	Reillo RS 310/M	4	Class 1	1.97	230	0.126
F 6.6 (Dryer 6)	Reillo RS 310/M	4	Class 1	1.97	230	0.126

To determine the mass emissions to be used in the model for each emission point associated with dryers, the emissions per second calculated above was divided by the number of stacks (refer to Appendix A for specific model input data for each emission point).

MOR carried out desk-top research to identify actual NO_x monitoring data for any dryer, but this could not be identified. In addition, the burner manufacturer was contacted but proved to have no such data either. Burners are mostly used for boiler applications, where NO_x in combustion gas is monitored. In this application, combustion gas is used for direct drying of grain and is diluted - for example, in the case of Dryer 5 by a factor of ca.40. Figures presented in Table 3-1 above are applicable to combustion gas arising from the burner. However, as NO_x interacts with grain and dust in the dryer column, it is not possible to accurately predict NO_x levels at the top of the Dryer stacks.

Additional verification of the burners mass emissions was carried out by comparison with boilers. The burner for Dryer 5 has similar thermal input to the duty boiler. Therefore, mass emissions emitted by the burner should be comparable. For the boiler, 0.2778 g/s is modelled and 0.195 g/s for the Dryer 5 burner (split over 5 stacks). It should be noted that for the boiler, the 0.2778 g/s figure is calculated from flow (Nm^3/s) x ELV concentration (g/Nm^3), where flow is overestimated and concentration is based on MCDP, rather than the actual design, resulting in likely additional overestimate.

Desk-top research did not identify any actual monitoring data on SO_2 emissions from dryers. SO_2 emissions are directly proportional to the levels of sulphur in the fuel and in MOR experience, SO_2 emissions from the existing LPG-converted boilers are as low as $6mg/Nm^3$. To provide a conservative estimate, this figure was doubled to allow an estimation of burner mass emissions and then adjusted for dilution arising from the high volume of drying air.

3.4 Dryers

As outlined in the previous report, the flat-bed Dryer 6 has been replaced with Replacement Dryer 6. This new Dryer has been installed since January 2022.

Replacement Dryer 6 is a brand new, efficient dryer with high throughput to shorten the drying season. It includes 5 stacks, i.e. major emission points – 4 dryer stacks and 1 pre-cleaner stack.

Schematic, elevation and description of New Dryer 6 provided by the manufacturer, is presented in Appendix E of this report.

It is important to note that in terms of emissions to air, this type of dryer will emit dust for a period of 10 seconds every 3 to 5 minutes. This means that in space of an hour, this dryer will emit for a total of 200 seconds or 3 minutes and 20 seconds (Appendix E).

Given the significant fluctuation in emission rate from this type of dryer, it is proposed that the ELV for this dryer is set as a mass emission in kg/hr for TPM, rather than as TPM concentration in mg/Nm^3. Please refer to Table 3-2 below. Volumetric flow will be 136,000Nm^3/hr per stack.

An emission rate of 1.36 kg/hr of dust is equivalent to a constant emission rate of 10mg/Nm^3 over 1 hour x volumetric flow. However, as the emission rate in mg/Nm^3 (i.e. as concentration) is not constant, but in 10 second pulses every 3 to 5 minutes, it is considered appropriate to apply an emission rate of 1.36kg/hr for each stack (and 0.2 kg/hr for pre-cleaner).

Table 3-2: ELVs proposed for Dryer 6 for Total Particulates

Emission Point Ref	Emission Point Name	Volume Flow - proposed ELV (Nm^3/hr)	Emission rate (g/s)	Emission rate – proposed ELV (kg/hr) (Total Particulates)
A2-45A	Replacement Dryer 6	136,000	0.378	1.36
A2-45B	Replacement Dryer 6	136,000	0.378	1.36
A2-46A	Replacement Dryer 6	136,000	0.378	1.36
A2-46B	Replacement Dryer 6	136,000	0.378	1.36
A2-46C	Replacement Dryer 6 – pre-cleaner	20,000	0.056	0.2

Although other dryers at the site are older, these operate in a similar manner to Dryer 6, i.e. dust emissions fluctuate, rather than being emitted at a constant rate. Therefore, an ELV in mg/Nm^3 is not considered appropriate, and ELVs should be applied as mass emissions in kg/hr.

4 MODELLING SCENARIOS IN THIS ASSESSMENT

Scenario 1 presented in the Air Dispersion Modelling Report submitted to the EPA in November 2021 covered Harvest 2021. Since then, multiple changes related to the emission points were implemented. This Scenario will therefore not be further refined in this assessment, as it is no longer considered relevant.

Scenario 4 presented in the same Air Dispersion Modelling Report is also no longer considered relevant, as Dryers 1 and 3, as well as Oat Cleaning Process have now been removed from the IE Licence application, as per the letter submitted to the EPA on 7th January 2022 via EDEN.

Based on these amendments, which will result in removing a total of 6No. proposed major emission points to air and taking cognisance of the feedback from the EPA received during online meetings, phone calls in December 2021 and January 2022, this report presents results from scenarios, emission points and pollutants detailed below.

Sensitive receptors for SAC were relocated to the SAC boundary closest to the Site boundary, as requested by the EPA and results are presented in Section 9 below.

4.1 NO_x model (updated to include burners)

The model was prepared as follows:

- Boiler NO_x emissions were modelled at an ELV of 200mg/Nm^3.
- As there is no monitoring data available for the burners, manufacturer's specifications have been obtained and were used for determining NO_x emissions (see Table 3-1 above);
- As the boilers run in duty and stand-by mode and dryers only operate for 8 weeks of the drying season, the operating regime in the model was set as follows:
  - Duty boiler operating 24/7/365.
  - Standby-boiler operating 6 hours per week, year round.
  - Burners operating during the harvest season only.

In this assessment, dryer emissions during harvest season were assessed for two 8-week (56 days) periods. This is to demonstrate impact regardless of the start of harvest. The variable emissions for each of the periods were calculated as follows:

- The first 8-week-period (ending in the month of August) consisted of 100% emissions during the month of July (31 days) and 81% for the month of August (25.04 days) totalling 56.04 days; and,
- The second 8-week-period (ending in the month of September) consisted of 84% of emissions ran for the month of August (26.04 days) and 100% of emissions for the month of September (30 days) totalling 56.04 days.

For sensitivity analysis, for the met year with highest ground level concentration at 100% volumetric flows, volumetric flows at 75% were run.

4.2 SO_2 model (new)

The Medium Combustion Plant Directive sets SO_2 limit for gaseous fuels other than natural gas, which is applicable to combustion sources at Red Mills as these are fuelled by LPG. For new plant this is 35mg/Nm^3 and for existing plant this is 200mg/Nm^3.

Therefore, an ELV of 35mg/Nm^3 (applicable to new plant) is proposed for both boilers at the Site.

The emission rates applied to burners were calculated in section 3.3 above.

The operating regime in this model was the same as NO_x model, as it applies to the same emission points (2 x boilers, 4 x existing burners, 6 x new burners).

The same model was run with volumetric flows (boilers & burners) at 75% for sensitivity analysis for the met year that has the highest offsite ground concentrations at 100% of volumetric flow.

4.3 PM model – Scenario 2 – Harvest 2022 (updated)

This scenario will present configuration of emission points that will be in place for Harvest season 2022. In Air Dispersion Modelling assessment carried out in 2021 (report submitted in November 2021), in all scenarios the Feed Mill emission points were set as operating 24/7/365. However, such operations never occur. Based on a review of actual operating hours (refer to MOR Report submitted via Eden on 7th January 2022), 24/7/365 presents a significant overestimate of operating hours (by a factor of ca. 3). Therefore, a realistic operating regime, presented below, is included in the updated Scenario 2.

<u>As it is not possible to limit operation of the Feed Mill to specific times in a day, week or year</u>; a typical operating regime detailed below was modelled to demonstrate more realistic PM_{10} process contribution.

The following sub-scenarios were modelled:

- **Scenario 2.1**:
    - Feed Mill:
        - 1st October to 30th April inclusive, Feed Mill operating 5 days a week, 24hr a day, when there is a higher demand for manufactured animal feed;
        - 1st May to 30th September inclusive, Feed Mill operating 5 days a week, 16hr a day, as feed demand is lower in the summer months when animals are mostly outdoors and grass-fed;
    - Dryers operating 12 weeks as a conservative scenario[1].
    - Seed Plant - same operating regime as Dryers.
    - For met years where 75% of AQS was exceeded, dryers were run in 8-week periods, as per NO_x and SO_2 models.
    - All sub-scenarios were run with volumetric flows at 75% for sensitivity analysis, for the worst met year only.

- **Scenario 2.2:**
    - Feed Mill:
        - 1st October to 30th April inclusive, Feed Mill operating 5 days a week, 16 hours a day, when there is a higher demand for manufactured animal feed;
        - 1st May to 30th September inclusive, Feed Mill operating 5 days a week, 12 hours a day, as feed demand is lower in the summer months when animals are mostly outdoors and grass-fed;
    - Dryers operating in two 8-week harvest periods.
    - Seed Plant - same operating regime as Dryers.

[1] Conservative 12-week operational window for Dryers is utilised in PM model, to avoid the need for having additional two sub-scenarios, where dryers are run for 8 weeks to cover possible different spans of the harvest season (as per NO_x and SO_2 models).

Please note that modelled operational hours for Feed Mill in Scenario 2.1 amount to ca. 57% of total hours in a year, and in Scenario 2.2 amount to ca. 39% of total hours in a year compared to overall average operational hours of 35% of total hours in a year for Feed Mill.

4.4 PM model - Scenario 3 – Post Harvest 2022 (updated)

In Scenario 3, proposed mitigation measures are modelled. These mitigation measures are based on the assessment of the process equipment.

Proposed mitigation measures include:

- Cubers 1-4 (pelleting cooling process)
    - Four emission points (A2-1, A2-2, A2-3, A2-4) are located on the side of a building in the southern portion of the site, all facing downwards.
    - It is proposed to bring all these emission points to the roof with vertical unobstructed dispersion.
    - All stacks to be +3m above roof level.
- Flaker Lines
    - Currently, most of flaker line vents are at the side of the building pointing downwards.
    - A total of 6 emission points (A2-6, A2-7, A2-8, A2-9, A2-13, A2-26) will be routed into the same stack. Each of these has a separate filter and a separate fan.
    - The stack will be positioned at the highest point of the building with discharge point 3m above the building, with vertical unobstructed dispersion.
- Grinders
    - A2-18, A2-19 and A2-20 are currently located relatively low, in a gap between two buildings with horizontal dispersion.
    - These will be routed into the same stack. Each of these will have a separate filter and a separate fan.
    - The stack will be positioned at the highest point of the building with discharge point 3m above the building, with vertical unobstructed dispersion.
- Flaker Cyclone
    - Emission point A2-10 is currently at the side of the building with horizontal orientation.
    - This point will be brought to the top of the roof, with discharge point 3m above the building, with vertical unobstructed dispersion.
- Main Grain Intake
    - Emission point A-21 is currently at the top of 11m building.
    - This emission point will be brought to the top of the adjacent 29m high building.
    - Discharge point will be 3m above the building, with vertical unobstructed dispersion.

The following sub-scenarios were modelled:

- **Scenario 3.1** – Feed Mill stacks/abatement changes at 365/7/24, for the met year with the highest ground level concentrations from Scenario 3.2.
- **Scenario 3.2** – Feed Mill stacks/abatement changes as per operating regime specified in section 4.4 above, presenting more realistic case.
- All sub-scenarios were run with volumetric flows at 75% for sensitivity analysis, for the worst met year only.

These mitigation measures will result in a total of 38No. emission points at the Site.

In both sub-scenarios Dryers will operate 12 weeks of harvest (refer to footnote 1), except in Scenario 3.2, where threshold of 75% of AQS was exceeded, and therefore Dryers were run in 2 x 8-week periods.

5 MODEL INPUTS

5.1 Background Concentrations of Relevant Pollutants

As recommended in the AG4 Guidance document [1], background concentration available from the representative monitoring stations operated by the EPA is used in this study. The selected background concentrations are based on the average of the appropriate zonal concentrations – Zone D, Rural Ireland, in this case.

The current trends in air quality in Ireland are reported in the EPA publication 'Air Quality in Ireland 2020' [5], which is currently the most up-to-date analysis of air quality data for Ireland. AG4 recommends that the average of 2 to 3 years of data is used [1]. Table 5-1 below shows the baseline air quality data for Zone D for PM_{10}, taken from the past five years of EPA Air Quality reports [6] [7] [8] [9] [5].

Table 5-1: Summary of relevant pollutants from Zone D EPA monitoring stations (2016-2020)

Parameter / Station	2016 Annual Mean (µg/m³)	2017 Annual Mean (µg/m³)	2018 Annual Mean (µg/m³)	2019 Annual Mean (µg/m³)	2020 Annual (µg/m³)
Emo Court					
NO_2	4.1	3.4	3	4	4
Shannon Estuary (2017) / Askeaton (2019, 2020)					
SO_2	2.0	2.3	-	1.8	1.6
PM_{10}	-	-	-		7
Enniscorthy					
PM_{10}	17.3	-	-	18.0	15.0
NO_2	9.6	-	-	-	-
SO_2	2.5	-	-	-	-
Castlebar					
PM_{10}	11.9	11.2	11	16	14
NO_2	8.5	7.4	8	8	6
Kilkitt					
PM_{10}	8.1	7.8	9	7	8
NO_2	3.0	2.3	3	5	2
SO_2	1.8	1.6	2.6	0.7	1.4
Claremorris					
PM_{10}	10.1	10.8	12	11	10
Carrick-on-Shannon					
NO_2	-	-	-	-	17
PM_{10}	-	-	-	-	10
Birr					
NO_2	-	-	-	-	9
PM_{10}	-	-	-	-	10
Cavan					
PM_{10}	-	-	-	-	9
Cobh					

Parameter / Station	2016 Annual Mean ($\mu g/m^3$)	2017 Annual Mean ($\mu g/m^3$)	2018 Annual Mean ($\mu g/m^3$)	2019 Annual Mean ($\mu g/m^3$)	2020 Annual ($\mu g/m^3$)
PM_{10}	-	-	15.0	13.0	13.0
Cork Harbour					
SO_2	-	-	-	-	1.8
Letterkenny					
SO_2	-	-	-	6.8	11.8
Roscommon Town					
PM_{10}	-	-	12.0	12.0	11.0
Tipperary Town					
PM_{10}	-	-	-	9.0	10.0
Macroom					
PM_{10}	-	-	-	28.0	15.0
	Average Zone D 2016-2020 ($\mu g/m^3$)				
	PM_{10}		**11.8**		
	NO_2		**5.7**		
	SO_2		**2.8**		

Note 1: In 2018, Kilkitt was the only station in Zone D that monitored SO_2.

The overall average annual mean concentration of PM_{10} for the Zone D monitoring locations from 2016-2020 is 11.8 $\mu g/m^3$.

The overall average annual mean concentrations for NO_2 for the Zone D monitoring locations from 2016-2020 is 5.7$\mu g/m^3$.

The overall average annual mean concentration for SO_2 for the Zone D monitoring locations from 2016-2020 is 2.8$\mu g/m^3$.

5.2 Meteorology

Detailed meteorological data was required for the model to construct realistic planetary boundary layer (PBL) similarity profiles and adequately characterise the dispersive capacity of the atmosphere.

In this study, five consecutive years of hourly meteorological data was used for all Scenarios as per AG4. This data was obtained from Met Éireann. The nearest synoptic station that provides hourly historical data is Oak Park, Co. Carlow, ca.26km northeast of the Site.

Table 5-2 below provides summary of meteorological data for Oak Park.

Table 5-2: Oak Park Meteorological Data 2017-2021

Year	Average wind speed (m/s)	Maximum wind speed (m/s)	Average temperature (°C)	No. of calm hours
2017	3.81	19	10.5	4
2018	3.83	16.9	10.5	2
2019	3.85	13.9	10.2	1
2020	4.15	15.9	10.2	0
2021	3.58	15.9	10.3	4

A wind rose for each of the 5 modelled years (2017-2021 is shown in Figures 5-1 to 5-6).

Figure 5-1: Wind rose for Oak Park 2016

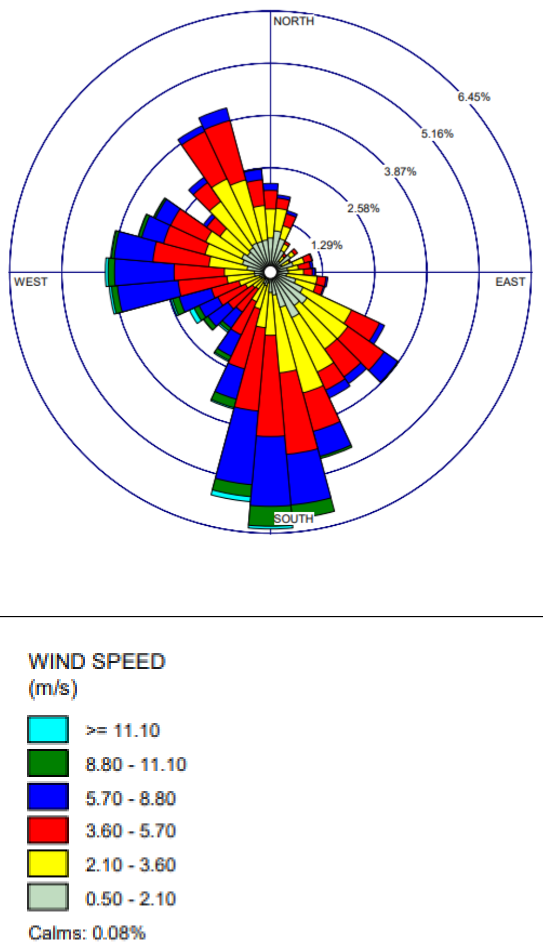


Figure 5-2: Wind rose for Oak Park 2017

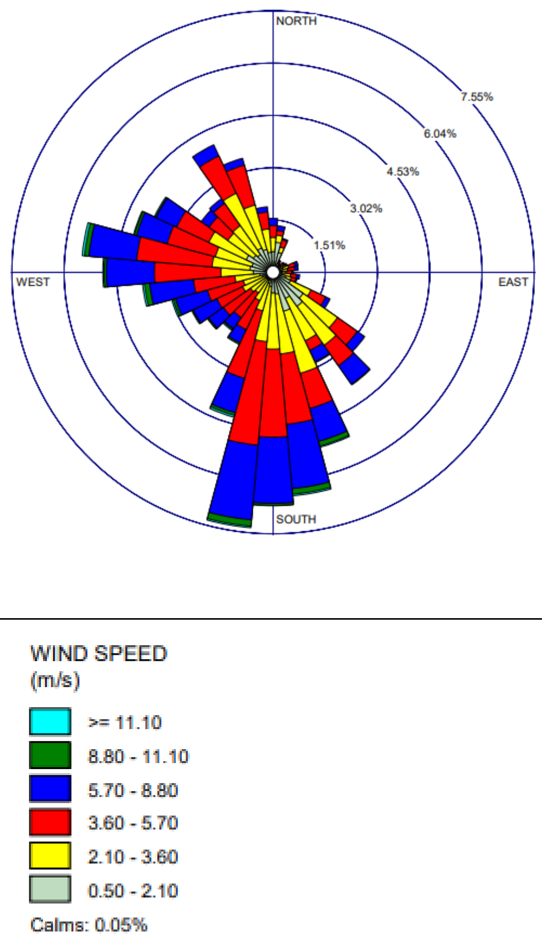


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Figure 5-3: Wind rose for Oak Park 2018

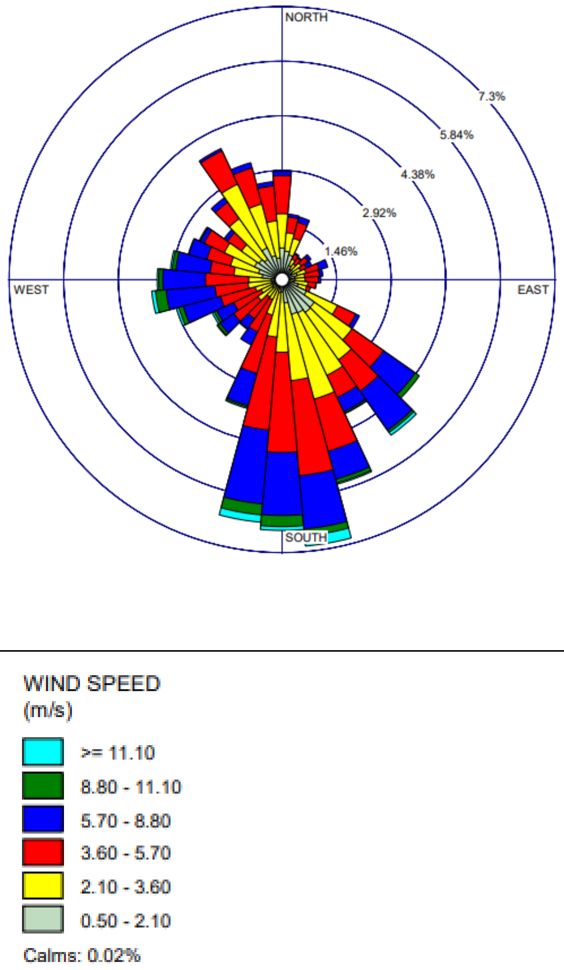


Figure 5-4: Wind rose for Oak Park 2019

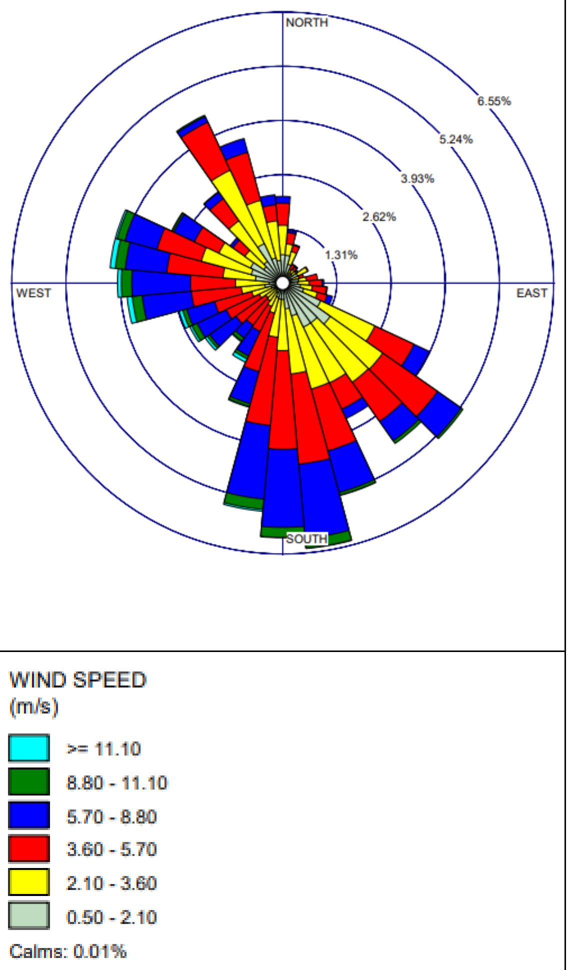


Figure 5-5: Wind rose for Oak Park 2020

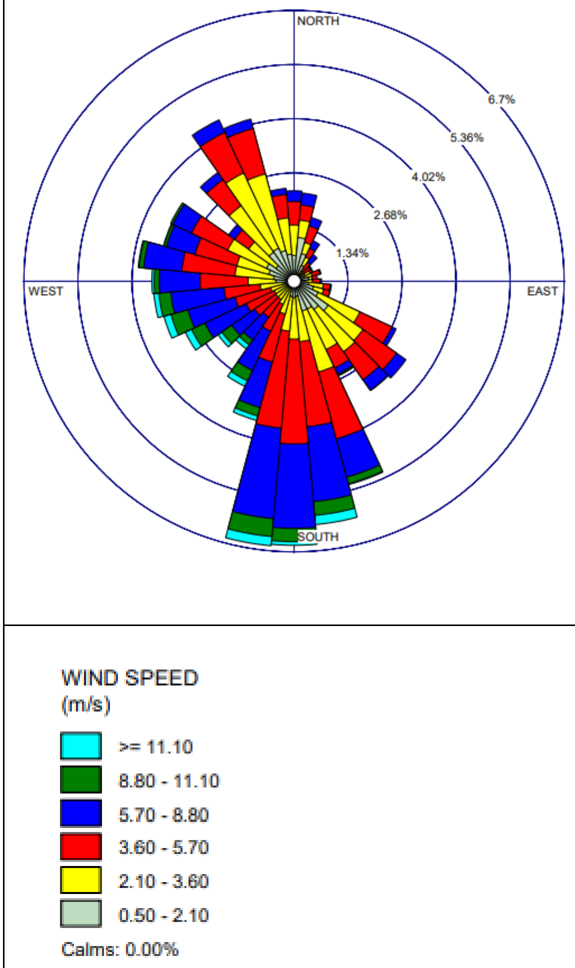
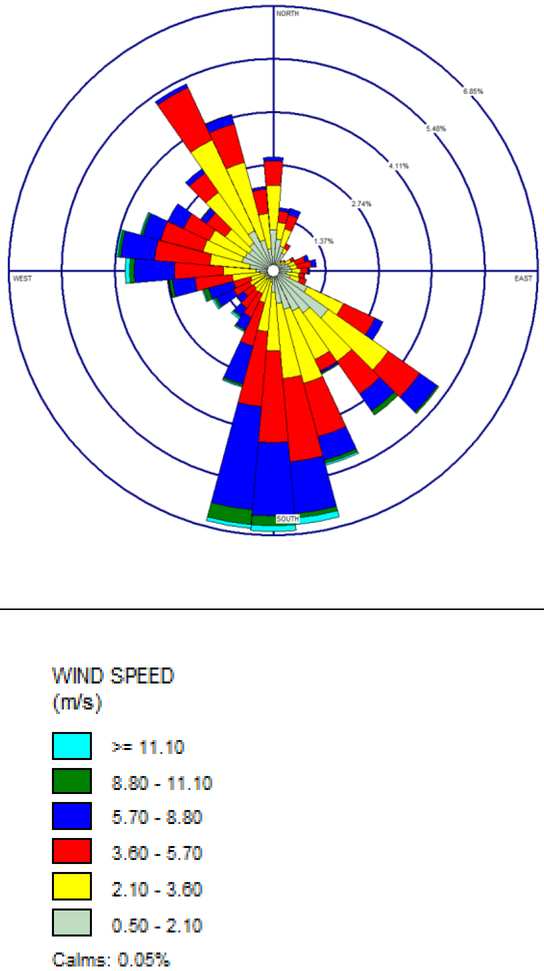


Figure 5-6: Wind rose for Oak Park 2021



5.3 Geophysical Considerations

AERMOD incorporates a meteorological pre-processor AERMET(24). The AERMET meteorological pre-processor requires the input of surface characteristics, including surface roughness (z0), Bowen Ratio and albedo by sector and season, as well as hourly observations of wind speed, wind direction, cloud cover, and temperature. The values of albedo, Bowen Ratio and surface roughness depend on land-use type (e.g., urban, cultivated land etc.) and vary with seasons and wind direction.

The assessment of appropriate land-use type was carried out to 10km from the meteorological station for Bowen Ratio and albedo, and to 1km for surface roughness in line with USEPA recommendations.

The surface roughness length is related to the height of obstacles to the wind flow and is, in principle, the height at which the mean horizontal wind speed is zero based on a logarithmic profile. The surface roughness length influences the surface shear stress and is an important factor in determining the magnitude of mechanical turbulence and the stability of the boundary layer.

Although the terrain surrounding the site is relatively flat, Satellite terrain data (Shuttle Regional Topographic Mission (SRTM) (Global ~30m)- Version 3) is included in the model.

5.4 Designated Areas

One Natura 2000 designated site, the River Barrow and River Nore Special Area of Conservation (SAC), was identified within 5km of the Site (refer to Table 5-3 below). Part of the SAC is outside the riverbanks, covering terrestrial habitats.

Table 5-3: Natura 2000 designated sites within 5km

Site Name	Code	Distance (km)	Direction from the Site
Special Areas of Conservation (SAC)			
River Barrow and River Nore SAC	002162	~	within

5.5 Sensitive Receptors

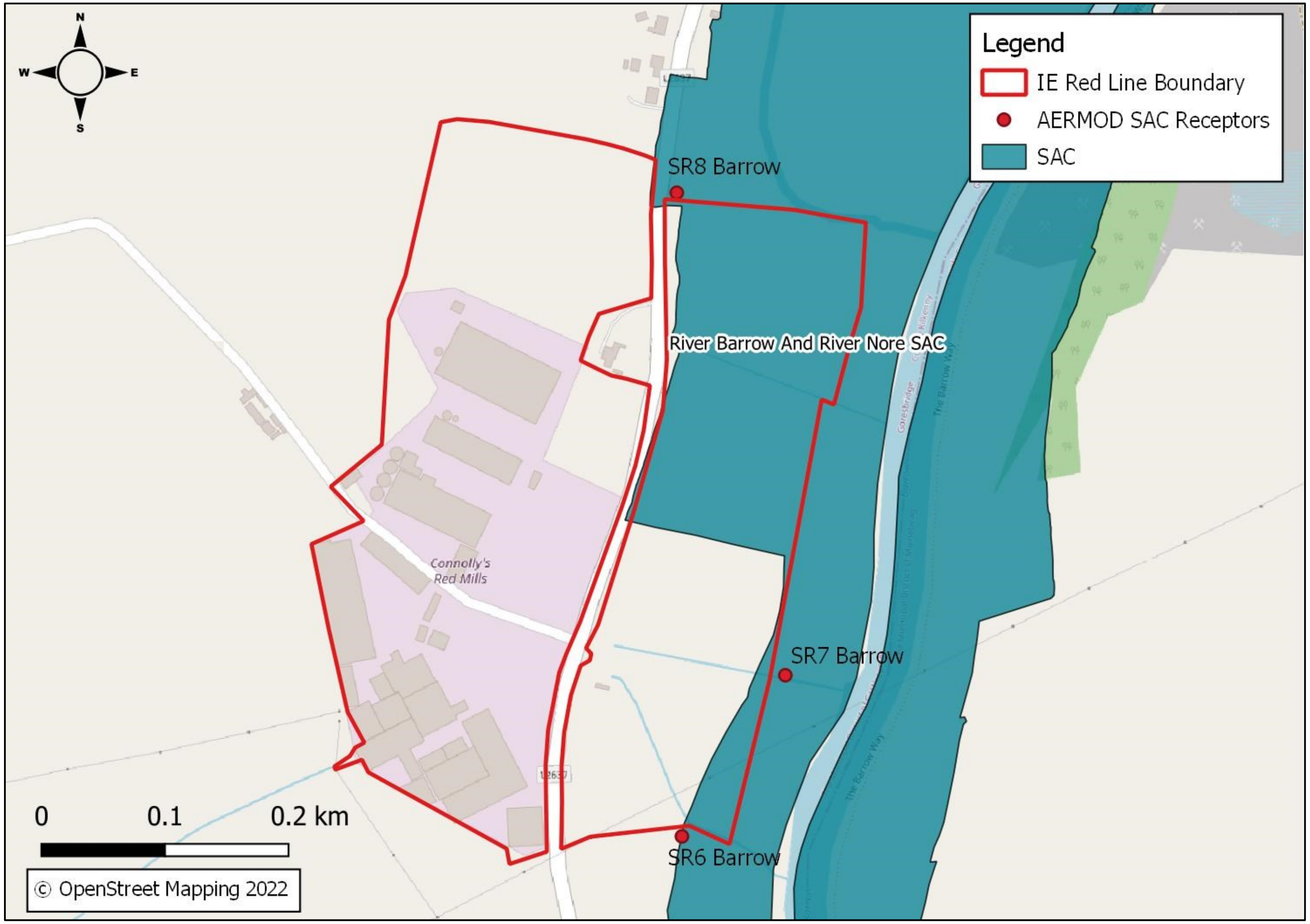
Sensitive Receptors (SRs) and their distance to the Site are detailed in Table 5-4 below and shown in Figure 5-7 below. The nearest SR (SR1) is located ca.6metres from the Site boundary to the east, situated between the public road and the Site's boundaries. Receptors within the SAC are shown in Figure 5-8 below.

Table 5-4:Identification of Sensitive Receptors

ID	Location Relevant to Site	Distance to Site Boundary (m)	Note
SR1	Dwelling on road between Site boundary	ca.6	Residential property
SR2	Dwellings to the north of the Site	ca.40	Residential properties
SR3	Dwelling to the west of the Site	ca.350	Residential property
SR4	Dwelling to the west of the Site.	ca.759	Residential property
SR5	Church to south of the Site	ca.110	Church/ community amenity
SR6	River Barrow SAC	ca.10	SAC
SR7	River Barrow SAC	ca.12	SAC
SR8	River Barrow SAC	ca.7	SAC
SR9	School to south of the Site	ca.430	School

Figure 5-7:Receptor identification around the Site Boundary

Figure 5-8: Sensitive Receptors in the SAC



5.6 Modelling Assumptions

- Steady-state is applicable to the Site.
- Due to flat terrain (less than 10% slope), satellite terrain data is sufficiently accurate.
- Met data from Oak Park synoptic station is representative.
- Background data for Zone D is representative.

5.7 Emissions and Stack Data

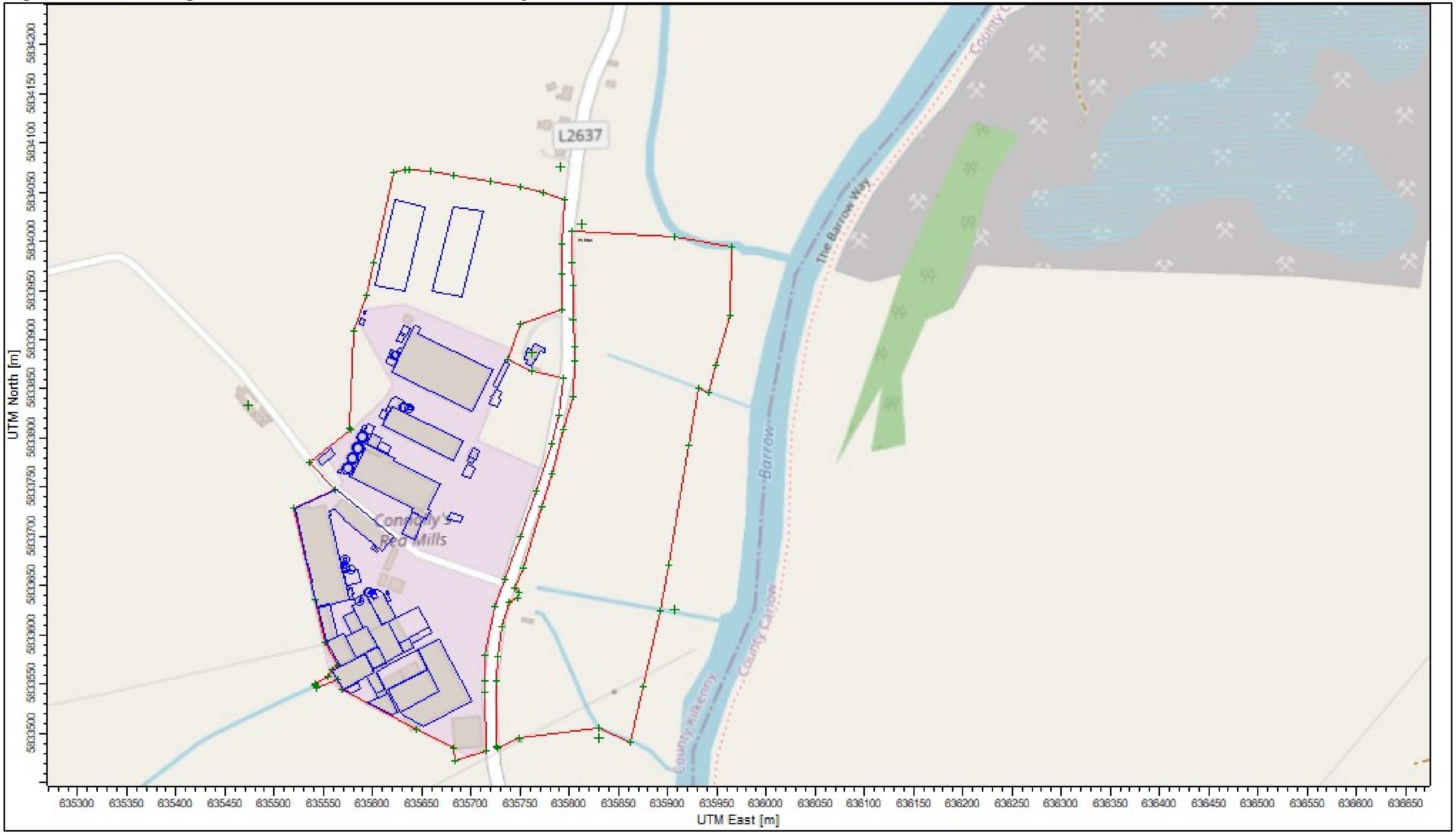
Due to there being 45 emission points, it was considered that the data set was too large to include in the main body of the report. The raw emissions and stack data input into the model are available in Appendix A – a separate table is provided for each modelled scenario.

Please note that only one scenario for NO_x and SO_2 was modelled.

5.8 Buildings

All on-site buildings and significant process structures were mapped into the model to create a three-dimensional visualisation of the Site and its emission points. Buildings and process structures can influence the passage of airflow over the emission stacks and draw plumes down towards the ground (termed ‘building downwash’). Figure 5-9 below details the buildings drawn into the air dispersion model.

Figure 5-9: Buildings located within the Site boundary



5.9 Receptor Grid

In the model, a receptor grid was created and a ground level concentration of pollutants was modelled for each grid point. Receptors were mapped with sufficient resolution to ensure all localised "hot-spots" were identified without adding unduly to processing time. The receptor grid was based on Cartesian grid with the Site at the centre.

As per AG4, a uniform cartesian receptor grid was utilised measuring 2.45km x 2.45km, with 50m between the points.

In addition, 9No. sensitive receptors, i.e. residential houses and points within the adjacent SAC specified in section 5.5 were also set up in the model as receptors.

5.10 NO_2/NO_x Conversion

NO_x emissions resulting from the combustion process are comprised of both NO and NO_2. Once in the atmosphere, most NO is converted to NO_2 through complex reactions with ozone and sunlight. However, the relevant AQS are expressed as NO_2 (see section 2 above).

Although there are various approaches suggested by different agencies (the US EPA and the UK EA) to calculate annual average it is commonly assumed that full conversion takes place; i.e., all emitted NO_x converts to NO_2. This approach is taken in this study.

For short term (1-hr average) emissions, the UK EA recommends [10] a conversion factor of 0.5, i.e., $NO_2/NO_x = 0.5$. This method is also referred to in the EPA's AG4 Guidance [1]. This approach is taken in this study.

A review of the EPA maps [11] showed that there are no other licensed facilities within 5km of Red Mills site in Goresbridge. Any emissions associated with traffic or unlicensed activities would be included in the background concentrations. Therefore, cumulative assessment is not required.

6 RESULTS - NO_X MODEL

Full input data is presented in Appendix A. Results for sensitive receptors are presented in Appendix B, with contour plots presented in Appendix C.

The results are shown for the two 8-week-periods explained in section 4.1 above. Throughout this report, the first 8-week period is referred to as the August ending harvest and the second 8-week-period is referred to as the September ending harvest.

All Tables in this section show maximum predicted process contributions at ground level (PC) (emissions to air from the stacks) and maximum predicted environmental concentration (PEC) (process contribution plus background contribution) outside the Site boundary at ground level. These represent predicted maximum concentrations that occur at a limited area near the site boundary and fall rapidly with distance to the Site boundary.

Sensitivity testing at 75% volumetric flow for all emission points are displayed for the met year that showed the highest short-term ground level concentrations.

6.1 Predicted Environmental Concentrations – Annual Mean NO_2

Table 6-1 and Table 6-2 below detail the results of the air dispersion modelling for NO_2 annual mean for both 8-week harvest periods. Section 1.1 in Appendix B presents the long-term results for sensitive receptors for NO_2, with section 1.1 in Appendix C displaying the long-term contour plots along with the plots for the 75% volumetric flow.

Table 6-1: Maximum Predicted Environmental Concentration of Pollutants – Annual Mean NO_2 in µg/Nm^3 for the August Ending Harvest Season (8 weeks)

NO_2 (annual mean) (µg/Nm^3)	2017	2018	2019	2020	2021	@75% vol. flow for 2021
Maximum Process Contribution	4.66	4.81	4.11	4.33	3.92	4.79
Background Concentration	5.7	5.7	5.7	5.7	5.7	5.7
Predicted Environmental Concentration(PEC)	10.36	10.3	9.81	10.03	9.62	10.49
Air Quality Standards (AQS)	40	40	40	40	40	40
PEC as a percentage of AQS	25.91%	26.26%	24.52%	25.08%	24.05%	26.22%

Table 6-2: Maximum Predicted Environmental Concentrations of Pollutants- Annual Mean NO_2 in µg/Nm³ for the September Ending Harvest Season (8 weeks)

NO_2 (annual mean) (µg/Nm³)	2017	2018	2019	2020	2021	@75% vol. flow for 2021
Maximum Process Contribution	4.69	4.6	4.3	4.48	3.89	4.85
Background Concentration	5.7	5.7	5.7	5.7	5.7	5.7
Predicted Environmental Concentration(PEC)	10.39	10.3	10	10.18	9.59	10.54
Air Quality Standards (AQS)	40	40	40	40	40	40
PEC as a percentage of AQS	25.98%	25.75%	25.01%	25.44%	23.98%	26.3%

6.2 Predicted Environmental Concentrations- Short Term 1-hr NO_2

Table 6-3 and Table 6-4 below detail the results of the air dispersion modelling for 1-hr NO_2 concentrations (short term). Section 1.2 in Appendix B presents the short-term results for sensitive receptors for NO_2, with section 1.1 in Appendix C displaying the short-term contour plots along with the plots for the 75% volumetric flow.

To assess the conservative concentrations for short-term events, annual mean background concentrations were doubled, as recommended in the EPA's AG4 Guidance [1].

Table 6-3:Maximum Predicted Environmental concentration of NO_2 (1hr 99.79%ile) (µg/Nm³) for the August Ending harvest (8 weeks)

NO_2 (1-hr mean) (µg/Nm³)	2017	2018	2019	2020	2021	@75% vol. flow for 2021
Maximum Process Contribution	57.97	67.49	73.82	55.64	128.77	121.04
Background Concentration	11.4	11.4	11.4	11.4	11.4	11.4
Predicted Environmental Concentration(PEC)	69.37	78.89	85.22	67.04	140.17	132.44
Air Quality Standards (AQS)	200	200	200	200	200	200
PEC as a percentage of AQS	34.68%	39.44%	42.61%	33.52%	70.08%	62.22%

Table 6-4:Maximum Predicted Environmental concentration of NO_2 (1hr 99.79%ile) (µg/Nm^3) for the September Ending harvest (8 weeks)

NO_2 (1-hr mean) (µg/Nm^3)	2017	2018	2019	2020	2021	@75% vol. flow for 2021
Maximum Process Contribution	64.93	55.51	101.54	87.5	121.73	128.88
Background Concentration	11.4	11.4	11.4	11.4	11.4	11.4
Predicted Environmental Concentration(PEC)	76.33	66.91	112.94	98.9	133.13	140.28
Air Quality Standards (AQS)	200	200	200	200	200	200
PEC as a percentage of AQS	38.16%	33.46%	56.47%	49.45%	66.56%	70.1%

7 RESULTS - SO_2 MODEL

Full input data is presented in Appendix A. Results for sensitive receptors are presented in Appendix B, with contour plots displayed in Appendix C.

For SO_2, annual, 1-hr (99.79%ile) and 24-hr (99.1%ile) results are presented.

The results are shown for the two 8-week-periods explained in section 4.1 above. Throughout this report, the first 8-week period is referred to as the August ending harvest and the second 8-week-period is referred to as the September ending harvest.

All Tables in this section show maximum predicted process contributions at ground level (PC) (emissions to air from the stacks) and maximum predicted environmental concentration (PEC) (process contribution plus background contribution) outside the Site boundary at ground level. These represent predicted maximum concentrations that occur at a limited area near the site boundary and fall rapidly with distance to the Site boundary.

Sensitivity testing at 75% volumetric flow for all emission points are displayed for the met year that showed the highest short-term ground level concentrations.

7.1 Predicted Environmental Concentrations – Annual Mean SO_2

Table 7-1 to Table 7-2 below details the results of the air dispersion modelling for SO_2 annual mean for both 8-week harvest periods. Section 2.1 in Appendix B displays the long-term results at SRs across the 5-met-years for the variable emission August and September ending harvests. Section 1.2 in Appendix C displays the contour plots for SO_2 concentrations along with the contour plots for the 75% volumetric flow.

Table 7-1: Maximum Predicted Environmental Concentration of Pollutants – Annual Mean SO_2 in µg/Nm^3 for the August Ending Harvest Season (8 weeks)

SO_2 (annual mean) (µg/Nm^3)	2017	2018	2019	2020	2021	@75% vol. flow for 2021
Maximum Process Contribution	0.84	0.87	0.75	0.78	0.76	0.86
Background Concentration	2.8	2.8	2.8	2.8	2.8	2.8
Predicted Environmental Concentration (PEC)	3.64	3.67	3.55	3.58	3.56	3.66
Air Quality Standards (AQS)	20	20	20	20	20	20
PEC as a percentage of AQS	18.20%	18.33%	17.76%	17.88%	17.82%	18.30%

Table 7-2: Maximum Predicted Environmental Concentration of Pollutants – Annual Mean SO_2 in µg/Nm³ for the September Ending Harvest Season (8 weeks)

SO_2 (annual mean) (µg/Nm³)	2017	2018	2019	2020	2021	@75% vol flow for 2021
Maximum Process Contribution	0.85	0.82	0.89	0.81	0.72	0.87
Background Concentration	2.8	2.8	2.8	2.8	2.8	2.8
Predicted Environmental Concentration(PEC)	3.65	3.62	3.69	3.61	3.52	3.67
Air Quality Standards (AQS)	20	20	20	20	20	20
PEC as a percentage of AQS	18.23%	18.10%	18.45%	18.03%	17.60%	18.34%

7.2 Predicted Environmental Concentrations- Short Term 24-hr SO_2

Table 7-3 to Table 7-4 below details the results of the air dispersion modelling for SO_2 short term (24-hr, 99.1%ile). To assess the conservative concentrations for short-term events, annual mean background concentrations were doubled, as recommended in the EPAs AG4 Guidance, Appendix D [1]. Section 2.2 in Appendix B details the short-term concentrations at SRs across the 5-met-years, with Section 1.2 in Appendix C showing the contour plots including the concentrations at 75% Volumetric Flow for the highest met-year.

Table 7-3: Maximum Predicted Environmental Concentration of Pollutants – Short-Term (24hr, 99.10%ile) Mean SO_2 in µg/Nm³ for the August Ending Harvest Season (8 weeks)

SO_2 (24-hr mean) (µg/Nm³)	2017	2018	2019	2020	2021	@75% vol flow for 2021
Maximum Process Contribution	8.47	8.45	10.97	8.22	14.26	14.4
Background Concentration	5.6	5.6	5.6	5.6	5.6	5.6
Predicted Environmental Concentration(PEC)	14.07	14.05	16.3	13.82	19.86	20.
Air Quality Standards (AQS)	125	125	125	125	125	125
PEC as a percentage of AQS	11.26%	11.24%	13.04%	11.06%	15.89%	16.00%

Table 7-4: Maximum Predicted Environmental Concentration of Pollutants – Short-Term (24hr, 99.10%ile) Mean SO_2 in µg/Nm³ for the September Ending harvest (8 weeks)

SO_2 (24-hr mean) (µg/Nm³)	2017	2018	2019	2020	2021	@75% vol flow for 2021
Maximum Process Contribution	8.23	7.82	12.48	10.89	11.22	9.68
Background Concentration	5.6	5.6	5.6	5.6	5.6	5.6
Predicted Environmental Concentration(PEC)	13.83	13.42	18.06	16.49	16.82	15.28
Air Quality Standards (AQS)	125	125	125	125	125	125
PEC as a percentage of AQS	11.06%	10.74%	14.46%	13.19%	13.45%	12.22%

7.3 Predicted Environmental Concentrations – Short Term 1-hr SO_2

Table 7-5 and Table 7-6 below details the results of the air dispersion modelling for SO_2 short term (1-hr, 99.79%ile). To assess the conservative concentrations for short-term events, annual mean background concentrations were doubled, as recommended in the EPAs AG4 Guidance, Appendix D [1]. Section 2.3 in Appendix B shows the 1-hr results at SRs for SO_2, with section 1.2 showing the contour plots in Appendix C.

Table 7-5: Maximum Predicted Environmental Concentration of Pollutants – Short-Term (1hr, 99.79%ile) Mean SO_2 in µg/Nm³ for the August Ending Harvest Season (8 weeks)

SO_2 (1-hr mean) (µg/Nm³)	2017	2018	2019	2020	2021	@75% vol flow for 2021
Maximum Process Contribution	27.91	32.08	34.8	25.65	62.35	62.39
Background Concentration	5.6	5.6	5.6	5.6	5.6	5.6
Predicted Environmental Concentration(PEC)	33.51	37.68	40.39	31.25	67.95	67.99
Air Quality Standards (AQS)	350	350	350	350	350	350
PEC as a percentage of AQS	9.57%	10.77%	11.54%	8.93%	19.41%	19.43%

Table 7-6: Maximum Predicted Environmental Concentration of Pollutants – Short-Term (1hr, 99.79%ile) Mean SO_2 in µg/Nm^3 for the September Ending harvest (8 weeks)

SO_2 (annual mean) (µg/Nm^3)	2017	2018	2019	2020	2021	@75% vol flow for 2021
Maximum Process Contribution	29.34	26.59	49.01	39.55	58.91	58.57
Background Concentration	5.6	5.6	5.6	5.6	5.6	5.6
Predicted Environmental Concentration(PEC)	34.94	32.19	56.61	45.15	64.51	64.17
Air Quality Standards (AQS)	350	350	350	350	350	350
PEC as a percentage of AQS	9.98%	9.20%	15.60%	12.90%	18.43%	18.33%

8 RESULTS – PM_{10} MODEL

Full input data is presented in Appendix A. Results for sensitive receptors are presented in Appendix B, with contour plots displayed in Appendix C.

All tables in this section show maximum predicted process contributions at ground level (PC) (emissions to air from the stacks) and maximum predicted environmental concentration (PEC) (process contribution plus background contribution) outside the Site boundary at ground level. These represent predicted maximum concentrations that occur at a limited area near the site boundary and fall rapidly with distance to the Site boundary.

Sensitivity testing at 75% volumetric flow for all emission points are displayed for the met year that showed the highest short-term ground level concentrations.

8.1 Scenario 2.1 Revised Harvest 2022

This scenario presents predicted PCs and PECs based on the current operational scenario at the Site, as detailed in section 4.3 above.

8.1.1 Predicted Environmental Concentrations – Annual Mean PM_{10}

Table 8-1 details the results of the air dispersion modelling for PM_{10} annual mean.

Table 8-1: Annual Mean PM_{10} Scenario 2.1

PM_{10} (annual mean) (µg/Nm^3)	**2017**	**2018**	**2019**	**2020**	**2021**	**@75% vol flow for 2021**
Maximum Process Contribution	10.48	10.60	15.04	10.60	15.03	12.29
Background Concentration	11.80	11.80	11.80	11.80	11.80	11.80
Predicted Environmental Concentration(PEC)	22.28	22.40	26.84	22.40	26.83	24.09
Air Quality Standards (AQS)	40	40	40	40	40	40
PEC as a percentage of AQS	55.7%	56.0%	67.1%	56.0%	67.1%	60.2%

8.1.2 Predicted Environmental Concentrations – 24-hr Mean PM_{10}

Table 8-2 details the results of the air dispersion modelling for PM_{10} 24-hr mean.

Table 8-2: 24-hr Mean PM_{10} Scenario 2.1

PM_{10} (24-hr mean) (µg/Nm^3)	**2017**	**2018**	**2019**	**2020**	**2021**	**@75% vol flow for 2021**
Maximum Process Contribution	33.25	36.28	52.23	34.75	49.36	43.23
Background Concentration	11.80	11.80	11.80	11.80	11.80	11.80
Predicted Environmental Concentration(PEC)	45.05	48.08	64.03	46.55	61.16	55.03
Air Quality Standards (AQS)	50	50	50	50	50	50
PEC as a percentage of AQS	90%	96%	128%	93%	122%	110%

8.2 Scenario 2.2 Revised Harvest 2022 – average operating hours

Given the 24-hr PM_{10} results in section 8.1.2, the modelled operating hours were further refined for both the Feed Mill and the Dryers. Based on SCADA output for the previous 5 years, the Feed Mill operates on average 35% of hours in a year (24 hours x 365 days) – however, results in section 8.1.2 are for 57% hours on a year. Due to the way the variable emissions file is set up in AERMOD, the modelled number of hours works out as 39% of hours in a year. In addition, this was run for two 8-week harvest periods, rather than a single 12-week harvest period.

For this scenario, only the worst met year, 2019, from Scenario 2.1 was modelled. For PM_{10} model it is clearly demonstrated in all other scenarios that reducing volumetric flow results in reduction in PC, therefore this model was not run with 75% volumetric flow, as it can be deduced that the results would be lower.

8.2.1 Predicted Environmental Concentrations – Annual Mean PM_{10}

Table 8-3 details the results of the air dispersion modelling for PM_{10} annual mean.

Table 8-3: Annual Mean PM_{10} Scenario 2.2

PM_{10} (annual mean) (µg/Nm^3)	**2019 August Ending Harvest Season**	**2019 September Ending Harvest Season**
Maximum Process Contribution	9.97	10.88
Background Concentration	11.80	11.80
Predicted Environmental Concentration (PEC)	21.77	22.68
Air Quality Standards (AQS)	40	40
PEC as a percentage of AQS	54.4%	56.7%

8.2.2 Predicted Environmental Concentrations – 24-hr Mean PM_{10}

Table 8-4 details the results of the air dispersion modelling for PM_{10} 24-hr mean.

Table 8-4: 24-hr Mean PM10 Scenario 2.2

PM_{10} (annual mean) (µg/Nm³)	**2019 August Ending Harvest Season**	**2019 September Ending Harvest Season**
Maximum Process Contribution	34.27	39.64
Background Concentration	11.80	11.80
Predicted Environmental Concentration (PEC)	46.07	51.44
Air Quality Standards (AQS)	50	50
PEC as a percentage of AQS	92%	103%

8.3 Scenario 3.1 Mitigation

Table 8-5 details the results of the air dispersion modelling for both annual and PM_{10} 24-hr mean for 2021. This year was selected as it showed the highest predicted maximum 24-hr mean PEC for Scenario 3.2, see section 8.4.2 below. Other met years were not run, as this Scenario includes all emissions running at 24/7/365, which is an unrealistic scenario. Please see discussion on operating hours in Section 4.3 above.

Table 8-5: Annual and 24-hr Mean PM_{10} Scenario 3.1

PM_{10} (µg/Nm³)	**Annual mean(µg/Nm³)**	**24-hr mean(µg/Nm³)**
Maximum Process Contribution	13.6	36.14
Background Concentration	11.80	11.80
Predicted Environmental Concentration (PEC)	24.86	47.95
Air Quality Standards (AQS)	40	50
PEC as a percentage of AQS	62.1%	96%

8.4 Scenario 3.2 Variable Emissions

8.4.1 Predicted Environmental Concentrations – Annual Mean PM_{10}

Table 8-6 details the results of the air dispersion modelling for PM_{10} annual mean for Scenario 3.2.

Table 8-6: Annual Mean PM_{10} Scenario 3.2

PM_{10} (annual mean) (µg/Nm³)	**2017**	**2018**	**2019**	**2020**	**2021**
Maximum Process Contribution	6.23	6.08	8.78	6.44	9.75
Background Concentration	11.80	11.80	11.80	11.80	11.80

PM_{10} (annual mean) (µg/Nm^3)	2017	2018	2019	2020	2021
Predicted Environmental Concentration (PEC)	18.03	17.88	20.58	18.24	21.55
Air Quality Standards (AQS)	40	40	40	40	40
PEC as a percentage of AQS	45.1%	44.7%	51.4%	45.6%	53%

8.4.2 Predicted Environmental Concentrations – 24-hr Mean PM_{10}

Table 8-7 details the results of the air dispersion modelling for PM_{10} 24-hr mean (short term).

Table 8-7: 24hr Mean PM_{10} Scenario 3.2

PM_{10} (24-hr mean) (µg/Nm^3)	2017	2018	2019	2020	2021
Maximum Process Contribution	18.60	19.20	25.71	19.82	31.34
Background Concentration	11.80	11.80	11.80	11.80	11.80
Predicted Environmental Concentration(PEC)	30.40	31.00	37.51	31.62	43.14
Air Quality Standards (AQS)	50	50	50	50	50
PEC as a percentage of AQS	61%	62%	75%	63%	86%

As results for 2021 exceeded 75% of AQS at the site boundary, Dryers in two sub-scenarios covering the 8-week harvest, July-August or August-September (refer to section 4.1 for detail on the operational regime for dryers) were modelled to demonstrate compliance in all met years. This sub-scenario was also run at 75% of the volumetric flow. Results are presented in Table 8-8 and 8-9 below.

Table 8-8: Annual Mean PM_{10} Scenario 3.2 – 8-week harvest

PM_{10} (Annual mean) (µg/Nm^3)	**2021 – Aug harvest**	**2021 – Sept harvest**	**@75% vol flow for 2021– Aug harvest**	**@75% vol flow for 2021 – Sept harvest**
Maximum Process Contribution	7.93	7.44	6.11	5.72
Background Concentration	11.80	11.80	11.80	11.80
Predicted Environmental Concentration(PEC)	19.73	19.24	17.91	17.52
Air Quality Standards (AQS)	40	40	40	40
PEC as a percentage of AQS	49.32%	48.09%	44.77%	43.80%

Table 8-9: 24-hr Mean PM_{10} Scenario 3.2 – 8-week harvest

PM_{10} (24-hr mean) (µg/Nm^3)	**2021 – Aug harvest**	**2021 – Sept harvest**	**@75% vol flow for 2021– Aug harvest**	**@75% vol flow for 2021– Sept harvest**
Maximum Process Contribution	24.01	23.90	19.46	19.39
Background Concentration	11.80	11.80	11.80	11.80
Predicted Environmental Concentration(PEC)	35.81	35.70	31.26	31.19
Air Quality Standards (AQS)	50	50	50	50
PEC as a percentage of AQS	71.6%	71.40%	62.53%	62.39%

9 RESULTS – RECEPTORS WITHIN AN SAC

To assess potential impact on the adjacent Natura 2000 area – the River Barrow and Nore Special Area of Protection (SAC) – the three sensitive receptors (SRs) located within this SAC closest to the Site boundary, were selected.

For the protection of vegetation for NO_2, for August ending harvest and September ending harvest, only the higher NO_2 annual mean PEC for the worst met year (2017), is presented in Table 9-1. The results for the individual met years for NO_2 is presented in Appendix B, with the contour plots displayed in Appendix C.

Table 9-1: River Barrow Receptors and NO_2 concentrations relating to the protection of ecosystems for the September-ending harvest (2017)

Receptor ID	Process Contribution (PC) (µg/Nm^3)	Background (µg/Nm^3)	Predicted Environmental Concentration (PEC) (µg/Nm^3)	AQS for the Protection of Vegetation	% of AQS
SR6	1.68	5.7	7.38	30	24.61%
SR7	1.31	5.7	7.02	30	23.38%
SR8	0.69	5.7	6.39	30	21.31%

According to AG4, the protection of ecosystems for SO_2 should be assessed through an Annual and Winter limit of 20 µg/Nm^3 [1]. Winter Period is between the 1st of October and the 31st of March.

The assessment of impacts to ecosystems from SO_2 for the winter period is not influenced by the Harvest, as this takes place in the summer. Table 9-2 below shows the predicted SO_2 concentrations at ecological SRs for the winter period 2020-2021, which has the highest concentrations recorded over the 5-year met period.

Table 9-2: SO_2 Concentrations for the Winter at SAC receptors

Receptor ID	Process Contribution (PC) (µg/Nm^3)	Background (µg/Nm^3)	Predicted Environmental Concentration (PEC) (µg/Nm^3)	AQS for the Protection of Ecosystems	% of AQS
SR6	0.29	2.8	3.09	20	15.44%
SR7	0.19	2.8	2.99	20	14.94%
SR8	0.12	2.8	2.92	20	14.58%

Table 9-3 presents SO_2 annual mean PEC. For August ending harvest and September ending harvest, only the higher SO_2 annual mean PEC is presented for the worst met year - 2017.

Table 9-3: Annual SO_2 Concentrations at SAC receptors

Receptor ID	Process Contribution (PC)	Background	Predicted Environmental Concentration (PEC)	AQS for the Protection of Ecosystems	% of AQS
SR6	0.304	2.8	3.10	20	15.52%
SR7	0.238	2.8	3.04	20	15.19%
SR8	0.125	2.8	2.92	20	14.62%

The full set of results for both pollutants, both harvests and all met years are presented in Appendix B, with contour plots presented in Appendix C.

10 DISCUSSION

10.1 Boiler Emissions

To allow for a margin of error in calculations, NO_x and SO_2 emissions from the LPG-run boilers were modelled at over-estimated volumetric flows. However, even when combined with the emissions from dryer burners, all Predicted Environmental Contributions – for annual mean and short-term mean, outside the Site boundary and at sensitive receptors – were well below the EPA Guidance threshold of 75% of relevant Air Quality Standards at both 100% and 75% of volumetric flow.

10.2 Dryer Burner Emissions

NO_x and SO_2 emissions from burners running on LGP were modelled in combination with emissions from boilers and all Predicted Environmental Contributions for annual mean and short-term, outside the Site boundary and at sensitive receptors, at 100% and 75% of volumetric flow, were well below the EPA Guidance threshold of 75% of relevant AQS's.

Sensitivity study shows that reducing volumetric flow results in increase in PEC. This is due to the fact that volumetric flow is completely independent of burners, i.e. it is generated by dryer fans. Therefore, mass emissions remain the same while exit velocity decreases, resulting in decreased dispersion.

We consider that setting ELVs or monitoring requirements for dryer burners in the IE Licence is not applicable due to the following:

- Medium Combustion Plant Directive (MCPD) is not applicable to dryer burners. In Scope, part 4 (3) states: *These Regulations shall not apply to:*
  (iv) combustion plants in which the gaseous products of combustion are used for direct heating, drying or any other treatment of objects or materials;
- Nonetheless, we compared the predicted concentration of NO_x at the top of dryer stacks to ELVs set out in MCPD. Based on dryer volumetric flows and mass emissions presented in section 3.3, a NO_x concentration would be between 3.47 and 10.01 mg/Nm^3 at the top of Dryer stacks, which is by almost two orders of magnitudes lower than MCPD limit of 200 mg/Nm^3 applicable to new combustion plant.
- EPA's definition of Main Emissions, to which ELVs and monitoring are applicable is: *"Main emissions include all emissions of environmental significance. Where a* ***mass emission threshold*** *is specified in a BAT document (BAT Conclusions, National BAT note or BREF), emissions which exceed this threshold prior to abatement are regarded as significant, i.e., 'main emissions'. (In some cases emissions below the threshold can still be significant and qualify as Main Emissions)."* However:
  - This assessment (in particular, sections 6 and 7 above) shows that these emissions are not of environmental significance, even with very significant overestimates and in combination with boilers and background concentrations.
  - In BAT Conclusions for Food and Drinks Manufacturing, 2019 or in the National BAT for Production of Food Products for Vegetable and Animal Raw Materials, 2008 there are no applicable mass thresholds for NO_x for SO_2 either combustion plant or for drying process.

Regarding monitoring, any NO_x or SO_2 emissions would be highly diluted at the top of dryer stacks. In comparison with boilers, where combustion gases are emitted and monitored, in this case combustion gases are diluted by a factor of up to 30, depending on the thermal input of burner versus volumetric flow of the dryer, resulting in very low concentrations of relevant pollutants. This would cause issues with monitoring due to limit of detection and inaccuracies when monitoring such low concentrations.

10.3 Dust Emissions - Scenarios 2.1 and 2.2

This scenario includes some changes to emission points compared to Harvest 2021. These include installation of stacks for Dryer 4A/B (A2-40) and Dryer 5 (A2-32) pre-cleaners and other improvements to these emission points, and installation of an abatement system (cyclo-dust separation) for Dryers 4A and 4B (A2-38 to A2-41).

At sensitive receptors, both annual mean and 24-hr mean Predicted Environmental Concentrations (PEC), for all modelled sub-scenarios and met years, were below AG4 threshold of 75% of AQS, when modelling with 100% and 75% of volumetric flow.

Annual mean PEC outside the Site boundary, at 100% and 75% of volumetric flow, for all modelled sub-scenarios and met years, was below AG4 threshold of 75% of AQS.

However, 24-hr mean PEC outside the Site boundary, at 100% of volumetric flow ranged between 90% and 128% of AQS. This is predicted to occur at the western Site boundary (see Appendix C, Figure 3-5). The model was run to show impact of different groups of sources to determine the source which contributes the most to process contribution (PC) at this location, as shown in Figure 3-6 (Appendix C). It was clearly determined that the cause of this PC were predicted emissions from the Feed Mill.

Further modelling was carried out in Scenario 2.2 to show PEC at average number of operating hours. Compared to Scenario 2.1, this is a reduction of 18% of operating hours for Feed Mill and a reduction of 33% of operating hours for Dryers and Seed Plant. This scenario was run for 2019 met year, which resulted in highest 24-hr mean PEC in Scenario 2.1. This resulted in ca. 24% reduction in 24-hr mean PC and PEC was 103% of AQS.

Although average operating hours are included in Scenario 2.2, there are still other overestimates in the model which make this very slight exceedance unlikely to occur in reality:

- All volumetric flows were set at ca. 20% higher than monitoring results. This was to account for measurement error and slight variation that is present in all operations. It is very unlikely that maximum cumulative volumetric flow would coincide with specific met conditions when such exceedance could occur.
- Background PM_{10} concentrations were likely overestimated. Ambient PM_{10} monitoring carried out during Harvest 2021 showed 9.37 µg/Nm^3 (refer to Air Dispersion Report submitted on 30th November 2021), versus 11.8 µg/Nm^3 used in this study. When monitored value used as background, the result for 24-hr PEC for Scenario 2.2 would be 98%.
- It is very unlikely that all Feed Mill emission points would operate simultaneously as per this model, e.g. Cuber 4 is still being fine-tuned and currently only operates for couple of hours a week. One of the grinders did not operate at all during 2021, due to a technical fault.

Finally, this exceedance occurs in an agricultural field adjacent to the Site's western boundary (see Appendix C, Figure 3-5) which is not used or occupied on a regular basis. The PEC falls to 75% of AQS within ca. 20 metres of the site boundary.

The sensitivity study showed that with reduction in volumetric flow, reduced PEC can be expected as the most important determinant of PC are mass emissions which are calculated from the volumetric flow for dust emission points. Exit velocity also decreases, resulting in reduced dispersion. This is not, however, a dominant factor.

10.4 Dust Emissions - Scenarios 3.1 and 3.2

To reduce emissions from the Feed Mill and futureproof the Site, multiple mitigation measures are proposed for Scenario 3 as listed in section 4.4 and section 11 of this report. These mitigation measures will necessitate a significant capital expenditure by Red Mills, which they are fully committed to making.

In Scenario 3.1, all emission points were run with mitigation measures under an operating regime of 24/7/365 for Feed Mill points and 12 weeks harvest season for Dryers. Although there was no exceedance of 75% of AQS at SRs, the short-term PEC outside the site boundary was 96% of AQS. As this is an unrealistic scenario in terms of operating hours, and would never occur, only one met year was run.

In Scenario 3.2, PEC for annual mean and short-term PM_{10} (at 100% volumetric flow) outside the Site boundary and at sensitive receptors is predicted to be well below the EPA Guidance threshold of 75% of relevant AQS's.

Comparison of PC in Scenario 2.1 and 3.2 indicates that mitigation measures will result in reduction of Feed Mill emissions by up to 63%. This shows that the proposed mitigation measures will be very effective.

Further, the predicted reduction in Feed Mill emissions was so drastic that Feed Mill emissions were no longer the main source of ground level PM_{10} concentrations at the Western Site boundary. Therefore, reducing the harvest season from 12 to 8 weeks, i.e. reducing operating hours for Dryers, resulted in a significant reduction in PEC outside the Western site boundary.

In terms of sensitivity study, the same applies as in Scenario 2.1 above:- reducing either volumetric flow or number of operating hours will result in reduced PEC.

10.5 Special Area of Conservation

Impact on the adjacent SAC was assessed by applying relevant annual NO_2 limit for protection of vegetation and SO_2 limits for protection of ecosystems at SRs adjacent to the Site boundary. This part of the SAC is terrestrial (refer to Natura Impact Statement submitted with this IEL application for full description of the SAC).

NO_x PEC for the worst met year is ca. 24.6% of AQS at SR6. PC is ca.3.4 times lower than background concentration.

Winter SO_2 PEC for the worst assessed period is ca. 154% of AQS at SR6. PC is ca.10 times lower than background concentration.

SO_2 annual mean PEC for the worst met year is ca. 15.6% of AQS at SR6. PC is ca.10 times lower than background concentration.

Emissions to air from Red Mill Site will have no significant impact on SAC and are insignificant in comparison to the background concentration of the same pollutants.

11 PROGRAMME OF IMPROVEMENTS

11.1 Immediate Improvements

Since 2021 the following improvement works have been completed:

- Replacement of old flat-bed Dryer 6, which emitted uncontrolled fugitive emissions, with a new highly-efficient, high-throughput dryer.
    - This new dryer has controlled emissions and monitoring ports.
    - Monitoring of a dryer equivalent to replacement Dryer 6 was carried out in December 2021, and therefore ELVs proposed in this report were validated for replacement Dryer 6.

Prior to Harvest Season 2022, the following is scheduled for completion:

- Conversion of two diesel boilers to LPG, to be completed by the end of May 2022.
    - At that juncture, ports will be installed to carry out monitoring and confirm volumetric flows.
- Installation of ports and access at all emission points not currently in place:
    - A2-12 (Cyclone GVRSA and GVRSB);
    - A2-21 (main grain intake);
    - A2-13 (fines);
    - A2-26 (Flaker Clean 1) and
    - A2-17 (Soya Cyclone – Bin Filling).
- New abatement to be installed at Dryers 4A and 4B, as these dryers do not currently have dust abatement equipment. It is proposed to install a cyclo-dust separation system. With such abatement, it is expected that very low emissions will be achieved, similar to Dryer 5.
- Cyclone and stack improvements, as well as installation of monitoring ports and access at:
    - A2-32 (Dryer 5, Pre-Cleaner)
    - A2-40 (Dryer 4A/B, Pre-Cleaner)
- Stack improvements:
    - Dryer 2 (A2-30A, A2-30B) currently has exhausts on the side of the building with horizontal dispersion at relatively low height (8m). Stacks will be installed, with discharge point at 3m above the roof height with vertical unobstructed dispersion. Please note that this improvement is not included in any of the above scenarios; however, it is expected to result in much improved dispersion.
    - A2-10 currently has exhausts on the side of the building with horizontal dispersion below building roof height. This stack will be brought to the to 3m above the roof with vertical unobstructed dispersion.
    - Cubers A2-1, A2-2, A2-3, A2-4 – are located on the side of a building in the southern portion of the site, all facing downwards. It is proposed to bring all of these emission points to the roof with vertical unobstructed dispersion. All stacks to be +3m above roof level.
    - Intake A-21 is currently at the top of an 11m building. This emission point will be brought to the top of the adjacent much higher building. Discharge point will be 3m above the building, with vertical unobstructed dispersion.

Red Mills will endeavour to complete the above works within the stated timeframes. Given the current global supply chain issues, Red Mills are working closely with the relevant suppliers to ensure the necessary supply chains will remain open so as much as practicable the above timeframes will be met.

11.2 Mitigation Measures proposed in Scenario 3.2

Given the very low emission rates proposed for most of the Feed Mill emission sources in Scenario 2 and limitations in reducing these any further due to the configuration of the building, available space, type of process and most importantly type of dust (which in some cases has a high moisture content), the most efficient way to reduce impact on the environment will be to improve dispersion by increasing stack heights.

Sensitivity analysis was carried out, and stacks with highest contributions to the maximum off-site PEC were selected. A detailed engineering analysis was carried out from both a process perspective as well as structural perspective. Based on the findings of this analysis, the following changes are proposed:

- Stack improvements detailed in section 11.1
- Flaker Lines
  - Currently, most of flaker line vents are at the side of the building pointing downwards (highest ca. 23 to 29m height, depending on flaker).
  - A total of 6No. emission points – A2-6, A2-7, A2-8, A2-9, A2-13, A2-26 - will be routed into the same stack. Each of these has a separate filter and a separate fan.
  - The stack will be positioned at the highest point of the building with discharge point 3m above the building, with vertical unobstructed dispersion at 34m height.
- Grinders
  - A2-18, A2-19 and A2-20 are currently located relatively low, in a gap between two buildings with horizontal dispersion.
  - These will be routed into the same stack. Each of these will have a separate filter and a separate fan.
  - The stack will be positioned at the highest point of the building with discharge point 3m above the building, with vertical unobstructed dispersion.

As expected and visible from results for Scenario 3.2, a very significant drop in impact will be achieved once these measures are implemented.

11.3 Programme

The programme of improvements outlined in sections 11.1 and 11.2 is summarised in Table 11-1 below. This is the same table as issued in November 2021 with updated completion dates. As can be seen, many actions have been successfully completed or are scheduled for completion by the end of Q3 2022.

Table 11-1: Programme of Improvements in relation to Emissions to Air

No.	Action	To be completed by
1.	Installation of replacement Dryer 6 and monitoring of a dryer that is equivalent to replacement Dryer 6 to obtain exact emission rates.	December 2021 - COMPLETED
2.	Installation of monitoring ports / access on all points in Feed Mill where this is missing	Q2 2022
3.	Boilers conversion to LPG and installation of monitoring ports / access and monitoring to validate volumetric flows / NOx emissions	May 2022
4.	Dryer 4 and Dryer 5 pre-cleaners – improvements to cyclones, installation of stacks above the roof of nearest building with vertical dispersion	June 2022

No.	Action	To be completed by
5.	Installation of abatement on Dryers 4A and 4B (cyclone similar to Dryer 5 cyclones)	June 2022
6.	Feed Mill Stack changes: 6.1 Review of processes and ducting to assess the most efficient way to increase stacks to required height, including merging several emission points into one stack 6.2 Engineering design 6.3 Validation of stack height increase / location and engineering design impact via air dispersion modelling 6.4 Prepare implementation plan, which must accommodate ongoing operations, i.e. minimum disruption to production 6.5 Carry out installation of abatement equipment and the stack changes	Completed in March 2022 Completed in March 2022 Completed in March 2022 Ongoing As soon as practical, given the supply chain issues.
7.	Seed Plant emission points – reconfiguration of cyclones and ducting to allow installation of monitoring ports and access. Current grinder filters will be reused for this purpose.	After 6.5 has been completed

12 CONCLUSIONS

There are three relevant air pollutants emitted from point sources at the Red Mills Site in Goresbridge – PM_{10}, NO_x and SO_2. All were assessed by means of detailed air dispersion modelling. This assessment included two scenarios: emissions at Harvest 2022 and emissions with mitigation measures.

This study has shown that once realistic operating hours are modelled as opposed to assuming 24/7/365 operation, Predicted Environmental Concentrations (PEC) for all pollutants - both the annual mean and the short-term mean - will be below 75% of relevant AQS at sensitive receptors and at all locations outside the site boundary, at 100% and 75% volumetric flow. The only exception to this is the PM_{10} Harvest 2022 (Scenario 2.1) model, for short-term (24-hr mean) concentration at a localised area outside the western Site boundary.

Therefore, this model was then run at average hours (Scenario 2.2). In this case, short-term PEC was predicted to be 103% of AQS at the western Site boundary, which is an agricultural field with no public access. However, this is very unlikely to occur in reality as significant overestimates were built into the model as well as the likely over-estimate of background PM_{10} concentration.

To reduce ground-level PM_{10} concentrations at the western Site boundary, to futureproof the operations at the Site and to improve dispersion, a number of mitigation measures and improvements are proposed. These proposed improvements were modelled in Scenario 3.2. The results clearly demonstrate that these proposed mitigation measures will achieve drastic reductions in ground-level PM_{10} concentrations arising from the Feed Mill, achieving the annual and 24-hr mean PM_{10} well below 75% of relevant AQS at all locations outside the site boundary, at 100% and 75% volumetric flow.

To reiterate, due to business reasons outlined in the letters dated 30th November 2021 and 7th January 2022, any restriction on operational hours for the Feed Mill or Dryers is not possible.

Finally, it is considered that burners do not fall under any licencing regime and therefore ELVs or monitoring are not required, as discussed in section 10.2.

13 PROPOSED EMISSION LIMIT VALUES

13.1 Boilers

NO_x and SO_2 is emitted from two boilers. Proposed ELVs are based on boilers running on LPG at NO_x emission rate of 200 mg/Nm^3 and SO_2 emission rate of 35 mg/Nm^3.

MOR propose that Table 13-1 below be incorporated into Schedule B: Emission Limits of the IEL for boilers.

Table 13-1: Proposed B. Emission Limits for Boilers

Ref. No.	Minimum Discharge Height (m)	Volumetric Flow (Nm^3/hr)	NO_x Emission Rate (mg/Nm^3)	SO_2 Emission Rate (mg/Nm^3)
A1-1	18	5,000	200	35
A1-2	18	3,000	200	35

13.2 Feed Mill and Seed Plant

Dust (total particulates) is emitted from a total of 45No. (current) major emission points at the Site. These include Feed Mill processes, Seed Plant and Dryers. Once mitigation measures are implemented this will fall to 36No. emission points.

Co-ordinates and minimum discharge heights for all points below are provided in Appendix A, for both current emission points (Scenario 2.1) and with Mitigation Measures (Scenario 3.2).

We propose that ELV should be applied as mass emission (in kg/hr). This will allow for variability in the process, both from volumetric flow aspect and from dust level, while protecting the air quality. These ELVs are based on maximum volumetric flow (Nm^3/hr) and PM_{10} concentration of 5 or 10 mg/Nm^3, as applicable to each emission point. These concentrations are presented in Appendix A.

MOR has reviewed BAT Conclusions for Food, Drink and Milk Industries [12]. BAT limits in mg/Nm^3 for feed manufacture apply to grinding and pellet cooling only (refer to Figure 13-1). In Red Mills case, this covers emission points A2-1 to A2-4 (Cubers, which are pellet cooling process), A2-18, A2-19 and A2-20 which are Grinders, as well as A2-15 – Soya Grinder. As specified in Input Data in Appendix, these emission points will be compliant with BAT:

- For Cubers (pellet cooling), A2-1 to A2-4, mass emission ELV is based on 10mg/Nm^3.
- For Grinders (A2-18 to A2-20), mass emission ELV is based on 5mg/Nm^3, in current scenario as well as following implementation of mitigation measures.
- For soya grinder (A2-15), mass emission ELV is based on 5mg/Nm^3.

Figure 13-1: BAT Limits for Grinders and Pellet Cooling

Table 4

BAT-associated emission levels (BAT-AELs) for channelled dust emissions to air from grinding and pellet cooling in compound feed manufacture

Parameter	Specific process	Unit	BAT-AEL (average over the sampling period)	
			New plants	Existing plants
Dust	Grinding	mg/Nm³	< 2-5	< 2-10
	Pellet cooling		< 2-20	

The associated monitoring is given in BAT 5.

MOR propose that Table 13-2 below be incorporated into Schedule Proposed Schedule B: Emission Limits of the IEL for Feed Mill. ELVs are proposed for the current emission points, and after implementation of mitigation measures. Most of these measures involve stack parameters changes – increasing stack heights, moving them to top of highest adjacent buildings, changing discharge orientation (from horizontal/downwards to vertical and unobstructed), and changing stack diameter in some cases. All stack parameters are detailed in Appendix A Input Data: Scenario 2.1 and Scenario 3.2.

Table 13-2: Proposed B. Emission Limits for Feed Mill and Seed Plant

Emission Point Ref	Emission Point Name	Current		After implementation of Mitigation Measures	
		Volumetric Flow (Nm^3/hr)	TPM Mass Emissions (kg/hr)	Volumetric Flow (Nm^3/hr)	TPM Emissions (kg/hr)
A2-1	Cuber 1	26,000	0.260	Stack parameters change	
A2-2	Cuber 2	24,000	0.240	Stack parameters change	
A2-3	Cuber 3	28,000	0.280	Stack parameters change	
A2-4	Cuber 4	28,000	0.280	Stack parameters change	
A2-6	Flaker 1	8,000	0.080	50,000	0.250
A2-7	Flaker 1	10,000	0.100		
A2-8	Flaker 2	12,000	0.060		
A2-9	Flaker 2	3,000	0.030		
A2-13	Flaker Cleaner	11,000	0.110		
A2-26	Flaker Cleaner	6,000	0.030		
A2-10	Flaker Cyclone	30,000	0.150	Stack parameters change	
A2-11	Flaker Cyclone	10,000	0.050	No change proposed	
A2-12	Cyclone GVRSA and GVRSB	26,000	0.260		
A2-15	Soya Grinder	5,000	0.050		
A2-16	Soya Extruder	8,000	0.040		
A2-17	Soya Cyclone - Bin Filling	3,000	0.030		
A2-18	Grinder 1	7,000	0.035	30,000	0.150
A2-19	Grinder 3	6,500	0.033		
A2-20	Grinder 4	8,000	0.040		
A2-21	Main Intake Grain	6,500	0.033	Stack parameters change	
A2-22	Extruder Vent	14,000	0.070	No change proposed	
A2-23	Extruder Dryer/ Cooler Vent	28,000	0.140		
A2-48	Seed Plant	20,000	0.200		
A2-49	Seed Plant	10,000	0.100		

13.3 Dryers

MOR propose that Table 13-3 below be incorporated into Schedule Proposed Schedule B: Emission Limits of the IEL for current Dryers.

Limits are proposed as mass emissions in kg/hr due to the nature of Dryers, i.e. impulse emissions rather than emissions that are continuously at the same or similar concentration (see section 3.4).

Table 13-3: Proposed Schedule B. Emission Limits for Current Dryers

Emission Point Ref	Emission Point Name	Volumetric Flow (Nm3/hr)	Total Particulates Mass Emissions (kg/hr)
A2-30A	Dryer 2	59,000	0.295
A2-30B	Dryer 2	59,000	0.295
A2-31	Dryer 2	2,000	0.020
A2-32	Dryer 5	10,000	0.100
A2-33	Dryer 5	42,000	0.210
A2-34	Dryer 5	39,000	0.195
A2-35	Dryer 5	32,000	0.160
A2-36	Dryer 5	39,000	0.195
A2-37	Dryer 5	39,000	0.195
A2-38	Dryer 4A2	53,000	0.265
A2-39	Dryer 4A1	83,000	0.415
A2-40	Dryer 4	10,000	0.100
A2-41	Dryer 4B	59,000	0.295
A2-42	Dryer 4B	78,000	0.390
A2-45A	Dryer 6	136,000	1.360
A2-45B	Dryer 6	136,000	1.360
A2-46A	Dryer 6	136,000	1.360
A2-46B	Dryer 6	136,000	1.360
A2-46C	Dryer 6 Pre-cleaner	20,000	0.200

14 REFERENCES

[1] EPA, *"Air Dispersion Modelling from Industrial Installations Guidance Note (AG4)",* Office of Environmental Enforcement, 2020.

[2] Lakes Environmental, Proposed Guideline for Air Dispersion Modelilng for Ontario Ministry of Environment, 2003.

[3] Irish Statute Book, “Air Quality Standards and Regulations,” 2011.

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[5] EPA, “Air Quality In Ireland 2020,” Environmental Protection Agency, Wexford, 2021.

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Appendices

Appendix A

Scenario 2.1 (Harvest 2022) - TPM				Stack Parameters				Flow Parameters and Emissions					
Emission Point Ref	**Emission Point Name**	**Abatement**	**Building Height (m)**	**Minimum Discharge Height (m) - above ground**	**Stack Orientation**	**Stack Inside Diameter (m)**	**Flue Gas Exit Temp (K)**	**TPM Concentration (mg/Nm3)**	**Volumetric Flow (Nm3/hr)**	**Volumetric Flow (Nm3/hr)@75%**	**Model Input - Gas Exit Flow Rate (m3/s)**	**Model Input - Mass emission rate (g/s)**	**Mass Emission Rate (kg/hr)**
Feed Mill													
A2-1	Cuber 1	Cyclone	24	21	Horizontal	0.71	324.55	10	26,000	19,500	7.222	0.072	0.260
A2-2	Cuber 2	Cyclone	24	21	Horizontal	1.13	329.05	10	24,000	18,000	6.667	0.067	0.240
A2-3	Cuber 3	Cyclone	24	21	Horizontal	0.80	313.65	10	28,000	21,000	7.778	0.078	0.280
A2-4	Cuber 4	Cyclone	27	19	Horizontal	0.50	329.05	10	28,000	21,000	7.778	0.078	0.280
A2-6	Flaker 1	Cyclone and Sock filter	31	29	Horizontal	0.91	300.50	10	8,000	6,000	2.222	0.022	0.080
A2-7	Flaker 1	Cyclone and Sock filter	31	29	Horizontal	0.62	298.25	10	10,000	7,500	2.778	0.028	0.100
A2-8	Flaker 2	Cyclone and Sock filter	22.5	23.5	Vertical	0.78	297.95	5	12,000	9,000	3.333	0.017	0.060
A2-9	Flaker 2	Cyclone and Sock filter	31	30	Horizontal	0.27	299.55	10	3,000	2,250	0.833	0.008	0.030
A2-10	Flaker Cyclone	Cyclone	22.5	20	Vertical	1.69	298.25	5	30,000	22,500	8.333	0.042	0.150
A2-11	Flaker Cyclone	Cyclone	31	32	Vertical	0.41	333.25	5	10,000	7,500	2.778	0.014	0.050
A2-12	Cyclone GVRSA and GVRSB	Cyclone	24	25	Vertical	0.50	333.25	10	26,000	19,500	7.222	0.072	0.260
A2-13	Fines	None	24	23	Horizontal	0.50	298.25	10	11,000	8,250	3.056	0.031	0.110
A2-15	Soya Grinder	Cyclone	24	3	Horizontal	0.23	300.15	10	5,000	3,750	1.389	0.014	0.050
A2-16	Soya Extruder	Cyclone	24	24	Horizontal	0.65	304.25	5	8,000	6,000	2.222	0.011	0.040
A2-17	Soya Cyclone - Bin Filling	Cyclone	31	30.5	Horizontal	0.50	289.15	10	3,000	2,250	0.833	0.008	0.030
A2-18	Grinder 1	Sock Filter	22.5	3	Horizontal	0.85	301.15	5	7,000	5,250	1.944	0.010	0.035
A2-19	Grinder 3	Sock Filter	22.5	3	Horizontal	0.50	306.15	5	6,500	4,875	1.806	0.009	0.033
A2-20	Grinder 4 - Dust Extraction	Sock Filter	22.5	3	Horizontal	0.34	306.15	5	8,000	6,000	2.222	0.011	0.040
A2-21	Main Intake Grain	Sock Filter	11	15.9	Vertical	0.50	301.15	5	6,500	4,875	1.806	0.009	0.033
A2-22	Extruder Vent	Cyclone	12	13.5	Vertical	0.40	295.65	5	14,000	10,500	3.889	0.019	0.070
A2-23	Extruder Dryer/ Cooler Vent	None	24	23	Horizontal	0.65	316.25	5	28,000	21,000	7.778	0.039	0.140
A2-26	Flaker Clean 1	Cyclone	22.5	23	Horizontal	0.50	289.15	5	6,000	4,500	1.667	0.008	0.030
Dryers													
A2-30A	Dryer 2	None	11	8	Horizontal	1.65	299.15	5	59,000	44,250	16.389	0.082	0.295
A2-30B	Dryer 2	None	11	8	Horizontal	1.65	299.15	5	59,000	44,250	16.389	0.082	0.295
A2-31	Dryer 2	None	11	9	Horizontal	0.23	291.45	10	2,000	1,500	0.556	0.006	0.020
A2-32	Dryer 5	Cyclofan	11	13	Vertical	0.50	289.15	10	10,000	7,500	2.778	0.028	0.100
A2-33	Dryer 5	Cyclofan	20	21.5	Vertical	1.13	293.55	5	42,000	31,500	11.667	0.058	0.210
A2-34	Dryer 5	Cyclofan	20	21.5	Vertical	1.13	293.75	5	39,000	29,250	10.833	0.054	0.195
A2-35	Dryer 5	Cyclofan	20	21.5	Vertical	1.00	300.15	5	32,000	24,000	8.889	0.044	0.160
A2-36	Dryer 5	Cyclofan	20	21.5	Vertical	1.13	299.85	5	39,000	29,250	10.833	0.054	0.195
A2-37	Dryer 5	Cyclofan	20	21.5	Vertical	1.13	303.55	5	39,000	29,250	10.833	0.054	0.195
A2-38	Dryer 4A2	Cyclofan	10	11	Vertical	0.95	311.45	5	53,000	39,750	14.722	0.074	0.265
A2-39	Dryer 4A1	Cyclofan	10	11	Vertical	0.97	310.25	5	83,000	62,250	23.056	0.115	0.415
A2-40	Dryer 4	Cyclone	8.5	10.5	Vertical	0.50	289.15	10	10,000	7,500	2.778	0.028	0.100
A2-41	Dryer 4B	Cyclofan	18	19.5	Vertical	1.35	307.85	5	59,000	44,250	16.389	0.082	0.295
A2-42	Dryer 4B	Cyclofan	18	19.5	Vertical	1.35	306.85	5	78,000	58,500	21.667	0.108	0.390
A2-45A	Replacement Dryer 6	none	22	24.5	Vertical	1.86	299.85	10	136,000	102,000	37.778	0.378	1.360
A2-45B	Replacement Dryer 6	none	22	24.5	Vertical	1.86	299.85	10	136,000	102,000	37.778	0.378	1.360
A2-46A	Replacement Dryer 6	none	22	24.5	Vertical	1.86	299.85	10	136,000	102,000	37.778	0.378	1.360
A2-46B	Replacement Dryer 6	none	22	24.5	Vertical	1.86	299.85	10	136,000	102,000	37.778	0.378	1.360
A2-46C	Replacement Dryer 6	Fabric Filter	10	20	Vertical	0.50	289.15	10	20,000	15,000	5.556	0.056	0.200
Seed Plant													
A2-48	Seed Plant	Screening and Dressing Seeds	11	12	Vertical	0.50	289.15	10	20,000	15,000	5.556	0.056	0.200
A2-49	Seed Plant	Cyclone	11	12	Vertical	0.50	289.15	10	10,000	7,500	2.778	0.028	0.100

Scenario 3.1 & 3.2 - TPM				Stack Parameters				Flow Parameters and Emissions					
Emission Point Ref	Emission Point Name	Abatement	Building Height (m)	Minimum Discharge Height (m) - above ground	Stack Orientation	Stack Inside Diameter (m)	Flue Gas Exit Temp (K)	TPM Concentration (mg/Nm3)	Volumetric Flow (Nm3/hr)	Volumetric Flow (Nm3/hr)@75%	Model Input - Gas Exit Flow Rate (m3/s)	Model Input - Mass emission rate (g/s)	Mass Emission Rate (kg/hr)
Feed Mill													
A2-1	Cuber 1	Cyclone	24	27	Vertical	0.71	324.55	10	26,000	19,500	7.222	0.072	0.260
A2-2	Cuber 2	Cyclone	24	27	Vertical	1.13	329.05	10	24,000	18,000	6.667	0.067	0.240
A2-3	Cuber 3	Cyclone	24	27	Vertical	0.80	313.65	10	28,000	21,000	7.778	0.078	0.280
A2-4	Cuber 4	27	27	29	Vertical	0.50	329.05	10	28,000	21,000	7.778	0.078	0.280
A2-6	Flakers	Fabric Filter	31	34 (3m above building)	Vertical	1.20	300.50	5	50,000	37,500	13.889	0.069	0.250
A2-7													
A2-8													
A2-9													
A2-13													
A2-26													
A2-10	Flaker Cyclone	Cyclone	22.5	25.5	Vertical	1.69	298.25	5	30,000	22,500	8.333	0.042	0.150
A2-11	Flaker Cyclone	Cyclone	31	32	Vertical	0.41	333.25	5	10,000	7,500	2.778	0.014	0.050
A2-12	Cyclone GVRSA and GVRSB	Cyclone	24	25	Vertical	0.50	333.25	10	26,000	19,500	7.222	0.072	0.260
A2-15	Soya Grinder	Cyclone	24	3	Horizontal	0.23	300.15	10	5,000	3,750	1.389	0.014	0.050
A2-16	Soya Extruder	Cyclone	24	24	Horizontal	0.65	304.25	5	8,000	6,000	2.222	0.011	0.040
A2-17	Soya Cyclone - Bin Filling	Cyclone	31	30.5	Horizontal	0.50	289.15	10	3,000	2,250	0.833	0.008	0.030
A2-18	Grinders	Sock Filter	31	34 (3m above building)	Vertical	0.90	301.15	5	30,000	22,500	8.333	0.042	0.150
A2-19													
A2-20													
A2-21	Main Intake Grain	Sock Filter	29	32	Vertical	0.50	301.15	5	6,500	4,875	1.806	0.009	0.033
A2-22	Extruder Vent	Cyclone	12	13.5	Vertical	0.40	295.65	5	14,000	10,500	3.889	0.019	0.070
A2-23	Extruder Dryer/ Cooler Vent	None	24	23	Horizontal	0.65	316.25	5	28,000	21,000	7.778	0.039	0.140
Dryers													
A2-30A	Dryer 2	None	11	8	Horizontal	1.65	299.15	5	59,000	44,250	16.389	0.082	0.295
A2-30B	Dryer 2	None	11	8	Horizontal	1.65	299.15	5	59,000	44,250	16.389	0.082	0.295
A2-31	Dryer 2	None	11	9	Horizontal	0.23	291.45	10	2,000	1,500	0.556	0.006	0.020
A2-32	Dryer 5	Cyclofan	11	13	Vertical	0.50	289.15	10	10,000	7,500	2.778	0.028	0.100
A2-33	Dryer 5	Cyclofan	20	21.5	Vertical	1.13	293.55	5	42,000	31,500	11.667	0.058	0.210
A2-34	Dryer 5	Cyclofan	20	21.5	Vertical	1.13	293.75	5	39,000	29,250	10.833	0.054	0.195
A2-35	Dryer 5	Cyclofan	20	21.5	Vertical	1.00	300.15	5	32,000	24,000	8.889	0.044	0.160
A2-36	Dryer 5	Cyclofan	20	21.5	Vertical	1.13	299.85	5	39,000	29,250	10.833	0.054	0.195
A2-37	Dryer 5	Cyclofan	20	21.5	Vertical	1.13	303.55	5	39,000	29,250	10.833	0.054	0.195
A2-38	Dryer 4A2	Cyclofan	10	11	Vertical	0.95	311.45	5	53,000	39,750	14.722	0.074	0.265
A2-39	Dryer 4A1	Cyclofan	10	11	Vertical	0.97	310.25	5	83,000	62,250	23.056	0.115	0.415
A2-40	Dryer 4	Cyclone	8.5	10.5	Vertical	0.50	289.15	10	10,000	7,500	2.778	0.028	0.100
A2-41	Dryer 4B	Cyclofan	18	19.5	Vertical	1.35	307.85	5	59,000	44,250	16.389	0.082	0.295
A2-42	Dryer 4B	Cyclofan	18	19.5	Vertical	1.35	306.85	5	78,000	58,500	21.667	0.108	0.390
A2-45A	Replacement Dryer 6	none	22	24.5	Vertical	1.86	299.85	10	136,000	102,000	37.778	0.378	1.360
A2-45B	Replacement Dryer 6	none	22	24.5	Vertical	1.86	299.85	10	136,000	102,000	37.778	0.378	1.360
A2-46A	Replacement Dryer 6	none	22	24.5	Vertical	1.86	299.85	10	136,000	102,000	37.778	0.378	1.360
A2-46B	Replacement Dryer 6	none	22	24.5	Vertical	1.86	299.85	10	136,000	102,000	37.778	0.378	1.360
A2-46C	Replacement Dryer 6	Fabric Filter	10	20	Vertical	0.50	289.15	10	20,000	15,000	5.556	0.056	0.200
Seed Plant													
A2-48	Seed Plant	Screening and Dressing Seeds	11	12	Vertical	0.50	289.15	10	20,000	15,000	5.556	0.056	0.200
A2-49	Seed Plant	Cyclone	11	12	Vertical	0.50	289.15	10	10,000	7,500	2.778	0.028	0.100

***Changes noted in red.**

Input Data			Stack Parameters				Flow Parameters				NOx Emissions		SO2 Emissions	
Emission Point Ref	Emission Point Name	Building Height (m)	Minimum Discharge Height (m) - above ground	Stack Orientation	Stack Inside Diameter (m)	Flue Gas Exit Temp (K)	Volumetric Flow (Nm3/hr)	Volumetric Flow (Nm3/hr)@75%	Model Input - Gas Exit Flow Rate (m3/s)	Model Input- Gas Exit Flow Rate (m3/s) @75% *	NOx concentration (mg/Nm3)	Model Input - NOx Emission rate (g/s)	SO2 concentration (mg/Nm3)	Model Input - SO2 Emission rate (g/s)
A1-1	Boiler 1	10.00	18.00	Vertical	0.50	438.85	5,000.00	3,750.00	1.39	1.04	200.00	0.278	35.00	0.049
A1-2	Boiler 2	10.00	18.00	Vertical	0.50	438.85	3,000.00	2,250.00	0.83	0.63	200.00	0.278	35.00	0.029
A2-30A	Dryer 2	7.00	7.00	Vertical	1.65	299.15	59,000.00	44,250.00	16.39	12.29	3.75	0.167	0.91	0.015
A2-30B	Dryer 2	7.00	7.00	Vertical	1.65	299.15	59,000.00	44,250.00	16.39	12.29	3.75	0.062	0.91	0.015
A2-39	Dryer 4a	10.00	11.00	Vertical	0.97	310.25	83,000.00	62,250.00	23.06	17.29	1.73	0.062	0.42	0.010
A2-38	Dryer 4a	10.00	11.00	Vertical	0.95	311.45	53,000.00	39,750.00	14.72	11.04	2.72	0.040	0.66	0.010
A2-41	Dryer 4b	18.00	19.50	Vertical	1.35	307.85	59,000.00	44,250.00	16.39	12.29	2.44	0.040	0.59	0.010
A2-42	Dryer 4b	18.00	19.50	Vertical	1.35	306.85	78,000.00	58,500.00	21.67	16.25	1.85	0.040	0.45	0.010
A2-37	Dryer 5	20.00	21.50	Vertical	1.13	303.55	39,000.00	29,250.00	10.83	8.13	3.60	0.040	0.88	0.009
A2-36	Dryer 5	20.00	21.50	Vertical	1.13	299.85	39,000.00	29,250.00	10.83	8.13	3.60	0.039	0.88	0.010
A2-34	Dryer 5	20.00	21.50	Vertical	1.13	293.75	39,000.00	29,250.00	10.83	8.13	3.60	0.039	0.88	0.010
A2-33	Dryer 5	20.00	21.50	Vertical	1.13	293.55	42,000.00	31,500.00	11.67	8.75	3.34	0.039	0.81	0.010
A2-35	Dryer 5	20.00	21.50	Vertical	1.00	300.15	32,000.00	24,000.00	8.89	6.67	4.39	0.039	1.07	0.010
A2-45A	Dryer 6	22.00	24.50	Vertical	1.86	299.85	136,000.00	102,000.00	37.78	28.33	5.00	0.039	0.63	0.024
A2-45B	Dryer 6	22.00	24.50	Vertical	1.86	299.85	136,000.00	102,000.00	37.78	28.33	5.00	0.189	0.63	0.024
A2-46A	Dryer 6	22.00	24.50	Vertical	1.86	299.85	136,000.00	102,000.00	37.78	28.33	5.00	0.189	0.63	0.024
A2-46B	Dryer 6	22.00	24.50	Vertical	1.86	299.85	136,000.00	102,000.00	37.78	28.33	5.00	0.189	0.63	0.024

*Note: Emission rate in g/s does not change with volumetric flow, as volumetric flow is generated by fans, and mass emissions arise from burner combustions.

Scenario 2		
Emission Point Ref	Eastings	Northings
Feed Mill		
A2-1	268040	154205
A2-2	268038	154203
A2-3	268035	154164
A2-4	268041	154208
A2-6	268001	154208
A2-7	268000	154208
A2-8	268006	154206
A2-9	267998	154206
A2-10	268005	154207
A2-11	268010	154209
A2-12	268007	154224
A2-13	268002	154226
A2-15	267993	154239
A2-16	268003	154221
A2-17	267985	154209
A2-18	268008	154203
A2-19	268007	154205
A2-20	268006	154203
A2-21	268025	154164
A2-22	268002	154209
A2-23	268002	154238
A2-26	268009	154204
Dryers		
A2-30A	267972	154247
A2-30B	267972	154246
A2-31	268019	154252
A2-32	268028	154447
A2-33	268042	154460
A2-34	268040	154461
A2-35	268038	154459
A2-36	268038	154462
A2-37	268037	154463
A2-38	268022	154417
A2-39	268030	154418
A2-40	268005	154443
A2-41	268013	154424
A2-42	268016	154422
A2-45A	268045	154531
A2-45B	268047	154535
A2-46A	268049	154539
A2-46B	268051	154543
A2-46C	268042	154549
Seed Plant		
A2-48	268022	154392
A2-49	268019	154292
Boilers		
A1-1	268010	154241
A1-2	268009	154242

Note* Scenario 3 stacks changes are available in Attachment 7.4.1. Emissions to Air - Main and Fugitive, submitted on 31st March 2022.

Appendix B

Contents

TABLES

1 NO_2 CONCENTRATIONS AT SENSITIVE RECEPTORS (SR)

1.1 Long-Term (Annual) Concentrations

Table 1-1: NO_2 annual mean at SRs for Harvest ending in August

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2017	SR1	1.23	5.7	6.93	40	17.31%
	SR2	0.84	5.7	6.54	40	16.35%
	SR3	0.45	5.7	6.15	40	15.36%
	SR4	1.69	5.7	7.39	40	18.49%
	SR5	1.2	5.7	6.9	40	17.24%
	SR6	1.65	5.7	7.35	40	18.38%
	SR7	1.31	5.7	7.01	40	17.51%
	SR8	0.74	5.7	6.44	40	16.10%
	SR9	0.38	5.7	6.08	40	15.20%
2018	SR1	0.99	5.7	6.69	40	16.73%
	SR2	0.68	5.7	6.38	40	15.94%
	SR3	0.51	5.7	6.21	40	15.53%
	SR4	2.01	5.7	7.71	40	19.27%
	SR5	1.43	5.7	7.13	40	17.82%
	SR6	1.41	5.7	7.11	40	17.76%
	SR7	0.91	5.7	6.61	40	16.52%
	SR8	0.61	5.7	6.31	40	15.77%
	SR9	0.49	5.7	6.19	40	15.48%
2019	SR1	0.95	5.7	6.65	40	16.61%
	SR2	0.63	5.7	6.33	40	15.83%
	SR3	0.80	5.7	6.50	40	16.25%
	SR4	2.10	5.7	7.80	40	19.50%
	SR5	1.38	5.7	7.08	40	17.71%
	SR6	1.58	5.7	7.28	40	18.19%
	SR7	1.07	5.7	6.77	40	16.93%

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
	SR8	0.60	5.7	6.30	40	15.75%
	SR9	0.34	5.7	6.04	40	15.10%
2020	SR1	1.09	5.7	6.79	40	16.97%
	SR2	0.65	5.7	6.35	40	15.88%
	SR3	0.49	5.7	6.19	40	15.47%
	SR4	1.66	5.7	7.36	40	18.39%
	SR5	1.50	5.7	7.20	40	18.01%
	SR6	1.57	5.7	7.27	40	18.18%
	SR7	1.04	5.7	6.74	40	16.85%
	SR8	0.65	5.7	6.35	40	15.87%
	SR9	0.52	5.7	6.23	40	15.54%
2021	SR1	0.94	5.7	6.64	40	16.59%
	SR2	0.73	5.7	6.43	40	16.07%
	SR3	0.70	5.7	6.4	40	16.00%
	SR4	1.70	5.7	7.40	40	18.49%
	SR5	1.81	5.7	7.51	40	18.78%
	SR6	1.66	5.7	7.36	40	18.39%
	SR7	1.21	5.7	6.91	40	17.27%
	SR8	0.6	5.7	6.3	40	15.75%
	SR9	0.56	5.7	6.25	40	15.63%

Table 1-2: NO_2 annual mean at SRs for Harvest ending in September

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2017	SR1	1.17	5.7	6.87	40	17.18%
	SR2	0.77	5.7	6.47	40	16.17%
	SR3	0.42	5.7	6.12	40	15.30%
	SR4	1.75	5.7	7.45	40	18.63%

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
	SR5	1.22	5.7	6.92	40	17.31%
	SR6	1.68	5.7	7.38	40	18.46%
	SR7	1.32	5.7	7.02	40	17.54%
	SR8	0.69	5.7	6.39	40	15.99%
	SR9	0.38	5.7	6.08	40	15.21%
2018	SR1	1.11	5.7	6.81	40	17.03%
	SR2	0.69	5.7	6.39	40	15.97%
	SR3	0.5	5.7	6.2	40	15.49%
	SR4	2.03	5.7	7.73	40	19.32%
	SR5	1.3	5.7	7.	40	17.50%
	SR6	1.33	5.7	7.03	40	17.58%
	SR7	0.92	5.7	6.62	40	16.54%
	SR8	0.67	5.7	6.37	40	15.91%
	SR9	0.48	5.7	6.18	40	15.44%
2019	SR1	1.07	5.7	6.77	40	16.94%
	SR2	0.7	5.7	6.4	40	16.00%
	SR3	0.84	5.7	6.54	40	16.36%
	SR4	2.14	5.7	7.84	40	19.59%
	SR5	1.26	5.7	6.96	40	17.39%
	SR6	1.52	5.7	7.22	40	18.05%
	SR7	1.04	5.7	6.74	40	16.86%
	SR8	0.72	5.7	6.42	40	16.05%
	SR9	0.34	5.7	6.04	40	15.10%
2020	SR1	1.02	5.7	6.72	40	16.80%
	SR2	0.65	5.7	6.35	40	15.86%
	SR3	0.51	5.7	6.21	40	15.52%
	SR4	1.76	5.7	7.46	40	18.65%

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
	SR5	1.52	5.7	7.22	40	18.05%
	SR6	1.55	5.7	7.25	40	18.12%
	SR7	1.01	5.7	6.71	40	16.77%
	SR8	0.66	5.7	6.35	40	15.87%
	SR9	0.57	5.7	6.27	40	15.67%
2021	SR1	1.04	5.7	6.74	40	16.84%
	SR2	0.76	5.7	6.46	40	16.14%
	SR3	0.68	5.7	6.38	40	15.94%
	SR4	1.77	5.7	7.47	40	18.66%
	SR5	1.72	5.7	7.42	40	18.56%
	SR6	1.63	5.7	7.33	40	18.32%
	SR7	1.18	5.7	6.88	40	17.20%
	SR8	0.65	5.7	6.35	40	15.86%
	SR9	0.53	5.7	6.23	40	15.57%

1.2 Short-Term (1-Hr) Concentrations

Table 1-3:Short-term NO_2 (1-hr 99.79%ile) for the Harvest ending in August

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2017	SR1	19.03	11.4	30.43	200	15.22%
	SR2	17.12	11.4	28.52	200	14.26%
	SR3	13.08	11.4	24.48	200	12.24%
	SR4	27.10	11.4	38.5	200	19.25%
	SR5	19.03	11.4	30.43	200	15.21%
	SR6	27.82	11.4	39.22	200	19.61%
	SR7	19.33	11.4	30.73	200	15.37%
	SR8	17.07	11.4	28.47	200	14.23%
	SR9	18.86	11.4	30.26	200	15.13%
2018	SR1	18.14	11.4	29.54	200	14.77%
	SR2	16.46	11.4	27.86	200	13.93%
	SR3	14.43	11.4	25.83	200	12.91%
	SR4	28.58	11.4	39.98	200	19.99%
	SR5	21.7	11.4	33.1	200	16.55%
	SR6	31.18	11.4	42.58	200	21.29%
	SR7	14.24	11.4	25.64	200	12.82%
	SR8	15.53	11.4	26.93	200	13.47%
	SR9	17.15	11.4	28.55	200	14.28%
2019	SR1	15.68	11.4	27.08	200	13.54%
	SR2	18.38	11.4	29.78	200	14.89%
	SR3	16.53	11.4	27.93	200	13.97%
	SR4	29.36	11.4	40.76	200	20.38%
	SR5	21.59	11.4	32.99	200	16.50%
	SR6	27.62	11.4	39.02	200	19.51%
	SR7	16.73	11.4	28.13	200	14.07%

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
	SR8	16.15	11.4	27.55	200	13.78%
	SR9	12.96	11.4	24.36	200	12.18%
2020	SR1	18.53	11.4	29.93	200	14.96%
	SR2	16.17	11.4	27.57	200	13.79%
	SR3	12.85	11.4	24.25	200	12.13%
	SR4	29.56	11.4	40.96	200	20.48%
	SR5	20.27	11.4	31.67	200	15.83%
	SR6	33.44	11.4	44.84	200	22.42%
	SR7	17.59	11.4	28.99	200	14.50%
	SR8	16.15	11.4	27.55	200	13.78%
	SR9	23.9	11.4	35.3	200	17.65%
2021	SR1	17.9	11.4	29.3	200	14.65%
	SR2	17	11.4	28.4	200	14.20%
	SR3	14.17	11.4	25.57	200	12.78%
	SR4	22.75	11.4	34.15	200	17.08%
	SR5	19.41	11.4	30.81	200	15.41%
	SR6	19.19	11.4	30.59	200	15.29%
	SR7	13.94	11.4	25.34	200	12.67%
	SR8	15.62	11.4	27.02	200	13.51%
	SR9	16.36	11.4	27.76	200	13.88%

Table 1-4: Short-term NO_2 (1-hr NO_2 99.79%ile) for the Harvest ending in September

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2017	SR1	18.97	11.4	30.37	200	15.19%
	SR2	16.98	11.4	28.38	200	14.19%
	SR3	11.81	11.4	23.21	200	11.60%
	SR4	27.7	11.4	39.1	200	19.55%
	SR5	19.37	11.4	30.77	200	15.39%
	SR6	29.1	11.4	40.5	200	20.25%
	SR7	18.27	11.4	29.67	200	14.84%
	SR8	16.89	11.4	28.29	200	14.14%
	SR9	17.81	11.4	29.21	200	14.61%
2018	SR1	19.89	11.4	31.29	200	15.64%
	SR2	16.15	11.4	27.55	200	13.78%
	SR3	13.11	11.4	24.51	200	12.26%
	SR4	29.67	11.4	41.07	200	20.54%
	SR5	19.92	11.4	31.32	200	15.66%
	SR6	23.07	11.4	34.47	200	17.24%
	SR7	13.94	11.4	25.34	200	12.67%
	SR8	15.53	11.4	26.93	200	13.47%
	SR9	17.15	11.4	28.55	200	14.28%
2019	SR1	16.6	11.4	28	200	14.00%
	SR2	18.5	11.4	29.90	200	14.95%
	SR3	17.88	11.4	29.32	200	14.64%
	SR4	29.68	11.4	41.11	200	20.54%
	SR5	17.77	11.4	29.21	200	14.58%
	SR6	27.61	11.4	39.02	200	19.51%
	SR7	16.73	11.4	28.13	200	14.07%
	SR8	16.79	11.4	28.19	200	14.10%
	SR9	15.62	11.4	27.02	200	13.51%

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2020	SR1	18.53	11.4	29.93	200	14.96%
	SR2	15.97	11.4	27.37	200	13.69%
	SR3	13.70	11.4	25.10	200	12.55%
	SR4	30.79	11.4	42.19	200	21.10%
	SR5	20.75	11.4	32.15	200	16.07%
	SR6	32.30	11.4	43.70	200	21.85%
	SR7	20.44	11.4	31.84	200	15.92%
	SR8	15.55	11.4	26.95	200	13.47%
	SR9	26.71	11.4	38.11	200	19.06%
2021	SR1	18.10	11.4	29.50	200	14.75%
	SR2	17.25	11.4	28.65	200	14.33%
	SR3	12.92	11.4	24.32	200	12.16%
	SR4	25.99	11.4	37.39	200	18.69%
	SR5	17.88	11.4	29.28	200	14.64%
	SR6	21.20	11.4	32.60	200	16.30%
	SR7	13.94	11.4	25.34	200	12.67%
	SR8	16.29	11.4	27.69	200	13.85%
	SR9	16.28	11.4	27.68	200	13.84%

2 SO_2 CONCENTRATIONS AT SENSITIVE RECEPTORS

2.1 Long-Term (Annual) Concentrations

Table 2-1: Annual mean SO_2 at SRs for Harvest ending in August

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2017	SR1	0.25	2.8	3.05	20	15.23%
	SR2	0.15	2.8	2.95	20	14.77%
	SR3	0.08	2.8	2.88	20	14.40%
	SR4	0.31	2.8	3.11	20	15.53%
	SR5	0.22	2.8	3.02	20	15.09%
	SR6	0.3	2.8	3.1	20	15.49%
	SR7	0.24	2.8	3.04	20	15.18%
	SR8	0.13	2.8	2.93	20	14.67%
	SR9	0.07	2.8	2.87	20	14.34%
2018	SR1	0.22	2.8	3.20	20	15.00%
	SR2	0.13	2.8	2.93	20	14.62%
	SR3	0.09	2.8	2.89	20	14.46%
	SR4	0.36	2.8	3.16	20	15.81%
	SR5	0.27	2.8	3.07	20	15.33%
	SR6	0.26	2.8	3.06	20	15.28%
	SR7	0.16	2.8	2.96	20	14.82%
	SR8	0.11	2.8	2.91	20	14.56%
	SR9	0.09	2.8	2.89	20	14.44%
2019	SR1	0.19	2.8	2.99	20	14.94%
	SR2	0.12	2.8	2.92	20	14.58%
	SR3	0.15	2.8	2.95	20	14.73%
	SR4	0.38	2.8	3.18	20	15.89%
	SR5	0.26	2.8	3.06	20	15.28%
	SR6	0.29	2.8	3.09	20	15.43%
	SR7	0.19	2.8	2.99	20	14.96%

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
	SR8	0.11	2.8	2.91	20	14.53%
	SR9	0.06	2.8	2.86	20	14.31%
2020	SR1	0.21	2.8	3.01	20	15.06%
	SR2	0.12	2.8	2.92	20	14.59%
	SR3	0.09	2.8	2.89	20	14.44%
	SR4	0.30	2.8	3.11	20	15.50%
	SR5	0.28	2.8	3.08	20	15.39%
	SR6	0.29	2.8	3.09	20	15.44%
	SR7	0.19	2.8	2.99	20	14.94%
	SR8	0.12	2.8	2.92	20	14.58%
	SR9	0.09	2.8	2.89	20	14.46%
2021	SR1	0.18	2.8	2.98	20	14.90%
	SR2	0.13	2.8	2.93	20	14.65%
	SR3	0.13	2.8	2.93	20	14.64%
	SR4	0.31	2.8	3.11	20	15.57%
	SR5	0.33	2.8	3.13	20	15.64%
	SR6	0.3	2.8	3.1	20	15.50%
	SR7	0.22	2.8	3.02	20	15.09%
	SR8	0.1	2.8	2.91	20	14.54%
	SR9	0.1	2.8	2.9	20	14.50%

Table 2-2: Annual mean SO_2 at SRs for Harvest ending in September

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2017	SR1	0.23	2.8	3.03	20	15.16%
	SR2	0.14	2.8	2.94	20	14.70%
	SR3	0.08	2.8	2.88	20	14.38%
	SR4	0.32	2.8	3.12	20	15.61%
	SR5	0.23	2.8	3.03	20	15.12%
	SR6	0.3	2.8	3.1	20	15.52%
	SR7	0.24	2.8	3.04	20	15.19%
	SR8	0.13	2.8	2.93	20	14.62%
	SR9	0.07	2.8	2.87	20	14.34%
2018	SR1	0.23	2.8	3.03	20	15.13%
	SR2	0.136	2.8	2.93	20	14.63%
	SR3	0.09	2.8	2.89	20	14.44%
	SR4	0.37	2.8	3.17	20	15.84%
	SR5	0.24	2.8	3.04	20	15.19%
	SR6	0.24	2.8	3.04	20	15.20%
	SR7	0.17	2.8	2.97	20	14.83%
	SR8	0.12	2.8	2.92	20	14.60%
	SR9	0.09	2.8	2.896	20	14.43%
2019	SR1	0.22	2.8	3.02	20	15.09%
	SR2	0.13	2.8	2.93	20	14.63%
	SR3	0.16	2.8	2.96	20	14.78%
	SR4	0.39	2.8	3.19	20	15.93%
	SR5	0.23	2.8	3.03	20	15.13%
	SR6	0.28	2.8	3.08	20	15.37%
	SR7	0.19	2.8	2.99	20	14.94%
	SR8	0.13	2.8	2.93	20	14.64%
	SR9	0.06	2.8	2.86	20	14.31%

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2020	SR1	0.20	2.8	3.00	20	15.00%
	SR2	0.12	2.8	2.92	20	14.58%
	SR3	0.09	2.8	2.89	20	14.46%
	SR4	0.33	2.8	3.13	20	15.63%
	SR5	0.28	2.8	3.08	20	15.41%
	SR6	0.28	2.8	3.08	20	15.41%
	SR7	0.18	2.8	2.98	20	14.91%
	SR8	0.11	2.8	2.91	20	14.57%
	SR9	0.10	2.8	2.90	20	14.52%
2021	SR1	0.21	2.8	3.00	20	15.03%
	SR2	0.14	2.8	2.94	20	14.69%
	SR3	0.12	2.8	2.92	20	14.62%
	SR4	0.33	2.8	3.13	20	15.65%
	SR5	0.31	2.8	3.11	20	15.54%
	SR6	0.3	2.8	3.1	20	15.48%
	SR7	0.21	2.8	3.01	20	15.07%
	SR8	0.12	2.8	2.92	20	14.58%
	SR9	0.1	2.8	2.9	20	14.48%

2.2 Short-Term (24-hr) Concentrations

Table 2-3: Short-term SO_2 at SRs (24-hr mean 99.2%tile) for Harvest ending in August

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2017	SR1	2.09	5.6	7.69	125	6.15%
	SR2	1.28	5.6	6.88	125	5.51%
	SR3	0.68	5.6	6.28	125	5.02%
	SR4	1.85	5.6	7.45	125	5.96%
	SR5	1.84	5.6	7.44	125	5.95%
	SR6	2.14	5.6	7.74	125	6.19%
	SR7	1.59	5.6	7.19	125	5.75%
	SR8	1.09	5.6	6.69	125	5.35%
	SR9	0.76	5.6	6.37	125	5.09%
2018	SR1	2.31	5.6	7.91	125	6.33%
	SR2	1.27	5.6	6.87	125	5.50%
	SR3	0.89	5.6	6.49	125	5.19%
	SR4	2.02	5.6	7.62	125	6.09%
	SR5	2.53	5.6	8.13	125	6.50%
	SR6	2.07	5.6	7.67	125	6.14%
	SR7	1.14	5.6	6.74	125	5.39%
	SR8	1.16	5.6	6.76	125	5.41%
	SR9	0.91	5.6	6.51	125	5.21%
2019	SR1	1.94	5.6	7.54	125	6.03%
	SR2	1.19	5.6	6.79	125	5.43%
	SR3	1.25	5.6	6.85	125	5.48%
	SR4	1.93	5.6	7.53	125	6.02%
	SR5	2.4	5.6	8	125	6.40%
	SR6	2.27	5.6	7.88	125	6.30%
	SR7	1.1	5.6	6.7	125	5.36%
	SR8	0.86	5.6	6.46	125	5.17%

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
	SR9	0.84	5.6	6.44	125	5.15%
2020	SR1	2.46	5.6	8.06	125	6.45%
	SR2	0.99	5.6	6.59	125	5.27%
	SR3	0.71	5.6	6.31	125	5.05%
	SR4	2.02	5.6	7.62	125	6.10%
	SR5	2.33	5.6	7.93	125	6.34%
	SR6	1.89	5.6	7.49	125	5.99%
	SR7	1.34	5.6	6.94	125	5.55%
	SR8	0.97	5.6	6.57	125	5.26%
	SR9	1.04	5.6	6.64	125	5.31%
2021	SR1	1.97	5.6	7.57	125	6.06%
	SR2	0.92	5.6	6.52	125	5.22%
	SR3	1.16	5.6	6.76	125	5.41%
	SR4	2.59	5.6	8.19	125	6.55%
	SR5	2.03	5.6	7.63	125	6.11%
	SR6	2.03	5.6	7.63	125	6.10%
	SR7	1.44	5.6	7.04	125	5.63%
	SR8	0.99	5.6	6.59	125	5.28%
	SR9	1.04	5.6	6.64	125	5.31%

Table 2-4: Short-term SO_2 at SRs (24-hr mean 99.2%tile) for Harvest ending in September

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2017	SR1	2.04	5.6	7.64	125	6.11%
	SR2	1.08	5.6	6.68	125	5.34%
	SR3	0.66	5.6	6.26	125	5.00%
	SR4	1.9	5.6	7.5	125	6.00%
	SR5	2.65	5.6	8.25	125	6.60%
	SR6	2.09	5.6	7.69	125	6.15%
	SR7	1.59	5.6	7.19	125	5.75%
	SR8	1.04	5.6	6.64	125	5.31%
	SR9	0.93	5.6	6.53	125	5.22%
2018	SR1	2.56	5.6	8.16	125	6.53%
	SR2	1.31	5.6	6.91	125	5.53%
	SR3	0.69	5.6	6.29	125	5.03%
	SR4	2.32	5.6	7.92	125	6.34%
	SR5	2.62	5.6	8.22	125	6.58%
	SR6	1.59	5.6	7.19	125	5.75%
	SR7	1.28	5.6	6.88	125	5.50%
	SR8	1.39	5.6	6.99	125	5.59%
	SR9	0.95	5.6	6.55	125	5.24%
2019	SR1	2.50	5.6	8.10	125	6.48%
	SR2	1.26	5.6	6.86	125	5.49%
	SR3	1.34	5.6	6.94	125	5.56%
	SR4	2.29	5.6	7.89	125	6.31%
	SR5	1.55	5.6	7.15	125	5.72%
	SR6	1.83	5.6	7.43	125	5.94%
	SR7	1.05	5.6	6.65	125	5.32%
	SR8	1.45	5.6	7.05	125	5.64%

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
	SR9	1.1	5.6	6.7	125	5.36%
2020	SR1	2.64	5.6	8.24	125	6.59%
	SR2	1.4	5.6	7	125	5.60%
	SR3	0.73	5.6	6.33	125	5.06%
	SR4	2.97	5.6	8.57	125	6.86%
	SR5	2.34	5.6	7.94	125	6.35%
	SR6	1.8	5.6	7.4	125	5.92%
	SR7	1.35	5.6	6.95	125	5.56%
	SR8	1.24	5.6	6.84	125	5.47%
	SR9	1.4	5.6	7	125	5.60%
2021	SR1	2.23	5.6	7.83	125	6.26%
	SR2	1.08	5.6	6.68	125	5.34%
	SR3	0.94	5.6	6.54	125	5.23%
	SR4	2.66	5.6	8.26	125	6.61%
	SR5	1.9	5.6	7.5	125	6.00%
	SR6	1.92	5.6	7.52	125	6.02%
	SR7	1.38	5.6	6.98	125	5.58%
	SR8	1.12	5.6	6.72	125	5.37%
	SR9	0.96	5.6	6.56	125	5.25%

2.3 Short-Term (1-hr) Concentrations

Table 2-5: Short-term SO_2 at SRs (1-hr mean 99.7%tile) for Harvest ending in August

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2017	SR1	6.72	5.6	12.32	350	3.52%
	SR2	5.99	5.6	11.59	350	3.31%
	SR3	4.75	5.6	10.35	350	2.96%
	SR4	9.69	5.6	15.29	350	4.37%
	SR5	7.12	5.6	12.72	350	3.64%
	SR6	9.97	5.6	15.57	350	4.45%
	SR7	7.18	5.6	12.78	350	3.65%
	SR8	6.28	5.6	11.88	350	3.39%
	SR9	6.59	5.6	12.19	350	3.49%
2018	SR1	6.71	5.6	12.31	350	3.52%
	SR2	5.97	5.6	11.57	350	3.30%
	SR3	5.09	5.6	10.69	350	3.06%
	SR4	10.75	5.6	16.35	350	4.67%
	SR5	8.96	5.6	14.56	350	4.16%
	SR6	11.15	5.6	16.75	350	4.79%
	SR7	4.98	5.6	10.58	350	3.02%
	SR8	5.69	5.6	11.29	350	3.23%
	SR9	6.11	5.6	11.71	350	3.35%
2019	SR1	5.79	5.6	11.39	350	3.26%
	SR2	6.47	5.6	12.07	350	3.45%
	SR3	6	5.6	11.6	350	3.31%
	SR4	10.39	5.6	15.99	350	4.57%
	SR5	9.02	5.6	14.62	350	4.18%
	SR6	9.66	5.6	15.26	350	4.36%
	SR7	6.09	5.6	11.69	350	3.34%
	SR8	5.69	5.6	11.29	350	3.23%

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
	SR9	4.66	5.6	10.26	350	2.93%
2020	SR1	6.48	5.6	12.08	350	3.45%
	SR2	5.81	5.6	11.41	350	3.26%
	SR3	4.5	5.6	10.1	350	2.88%
	SR4	10.34	5.6	15.94	350	4.56%
	SR5	8.21	5.6	13.81	350	3.95%
	SR6	11.91	5.6	17.51	350	5.00%
	SR7	6.38	5.6	11.98	350	3.42%
	SR8	5.65	5.6	11.25	350	3.21%
	SR9	8.58	5.6	14.18	350	4.05%
2021	SR1	6.26	5.6	11.86	350	3.39%
	SR2	5.95	5.6	11.55	350	3.30%
	SR3	5.84	5.6	11.44	350	3.27%
	SR4	9.63	5.6	15.23	350	4.35%
	SR5	7.75	5.6	13.35	350	3.81%
	SR6	7.67	5.6	13.27	350	3.79%
	SR7	5.32	5.6	10.92	350	3.12%
	SR8	5.46	5.6	11.06	350	3.16%
	SR9	6.24	5.6	11.84	350	3.38%

Table 2-6: Short-term SO_2 at SRs (1-hr mean 99.7%tile) for Harvest ending in September

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2017	SR1	6.73	5.6	12.33	350	3.52%
	SR2	5.99	5.6	11.59	350	3.31%
	SR3	4.2	5.6	9.8	350	2.80%
	SR4	9.72	5.6	15.32	350	4.38%
	SR5	7.12	5.6	12.72	350	3.64%
	SR6	10.33	5.6	15.93	350	4.55%
	SR7	6.81	5.6	12.41	350	3.55%
	SR8	6.25	5.6	11.85	350	3.38%
	SR9	6.23	5.6	11.83	350	3.38%
2018	SR1	6.96	5.6	12.56	350	3.59%
	SR2	5.65	5.6	11.25	350	3.21%
	SR3	4.88	5.6	10.48	350	3.00%
	SR4	10.88	5.6	16.48	350	4.71%
	SR5	7.39	5.6	12.99	350	3.71%
	SR6	8.44	5.6	14.04	350	4.01%
	SR7	5.1	5.6	10.7	350	3.06%
	SR8	5.88	5.6	11.48	350	3.28%
	SR9	6.31	5.6	11.91	350	3.40%
2019	SR1	6.13	5.6	11.73	350	3.35%
	SR2	6.47	5.6	12.07	350	3.45%
	SR3	6.25	5.6	11.85	350	3.39%
	SR4	10.54	5.6	16.14	350	4.61%
	SR5	6.66	5.6	12.26	350	3.50%
	SR6	10.95	5.6	16.55	350	4.73%
	SR7	5.92	5.6	11.52	350	3.29%
	SR8	5.93	5.6	11.53	350	3.30%
	SR9	5.46	5.6	11.06	350	3.16%

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2020	SR1	6.48	5.6	12.08	350	3.45%
	SR2	5.76	5.6	11.36	350	3.25%
	SR3	4.93	5.6	10.53	350	3.01%
	SR4	11.79	5.6	17.39	350	4.97%
	SR5	8.48	5.6	14.08	350	4.02%
	SR6	11.7	5.6	17.3	350	4.94%
	SR7	7.42	5.6	13.02	350	3.72%
	SR8	5.56	5.6	11.16	350	3.19%
	SR9	9.35	5.6	14.95	350	4.27%
2021	SR1	6.33	5.6	11.93	350	3.41%
	SR2	6.06	5.6	11.66	350	3.33%
	SR3	4.88	5.6	10.48	350	2.99%
	SR4	12.2	5.6	17.8	350	5.08%
	SR5	7.45	5.6	13.05	350	3.73%
	SR6	8.08	5.6	13.68	350	3.91%
	SR7	5.06	5.6	10.66	350	3.05%
	SR8	5.91	5.6	11.51	350	3.29%
	SR9	6.22	5.6	11.82	350	3.38%

3 PM_{10} CONCENTRATIONS AT SENSITIVE RECEPTORS

3.1 Scenario 2.1 PM_{10}

3.1.1 Long-Term (Annual Mean) Concentrations for PM_{10}

Table 3-1: Annual mean PM_{10} at SRs

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2017	SR1	3.05	11.80	14.85	40	37.13%
	SR2	1.78	11.80	13.58	40	33.95%
	SR3	0.85	11.80	12.65	40	31.63%
	SR4	2.71	11.80	14.51	40	36.29%
	SR5	2.61	11.80	14.41	40	36.04%
	SR6	2.66	11.80	14.46	40	36.16%
	SR7	2.06	11.80	13.86	40	34.65%
	SR8	1.80	11.80	13.60	40	34.00%
	SR9	0.70	11.80	12.50	40	31.26%
2018	SR1	2.68	11.80	14.48	40	36.22%
	SR2	1.63	11.80	13.43	40	33.59%
	SR3	0.84	11.80	12.64	40	31.62%
	SR4	3.01	11.80	14.81	40	37.03%
	SR5	2.91	11.80	14.71	40	36.79%
	SR6	2.58	11.80	14.38	40	35.96%
	SR7	1.80	11.80	13.60	40	34.02%
	SR8	1.65	11.80	13.45	40	33.64%
	SR9	0.95	11.80	12.75	40	31.89%
2019	SR1	2.52	11.80	14.32	40	35.80%
	SR2	1.60	11.80	13.40	40	33.51%
	SR3	1.51	11.80	13.31	40	33.29%
	SR4	3.11	11.80	14.91	40	37.29%
	SR5	2.62	11.80	14.42	40	36.05%
	SR6	2.83	11.80	14.63	40	36.59%

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
	SR7	1.94	11.80	13.74	40	34.36%
	SR8	1.62	11.80	13.42	40	33.55%
	SR9	0.61	11.80	12.41	40	31.03%
2020	SR1	2.59	11.80	14.39	40	35.99%
	SR2	1.37	11.80	13.17	40	32.94%
	SR3	0.91	11.80	12.71	40	31.78%
	SR4	2.61	11.80	14.41	40	36.05%
	SR5	3.42	11.80	15.22	40	38.06%
	SR6	3.20	11.80	15.00	40	37.51%
	SR7	1.96	11.80	13.76	40	34.41%
	SR8	1.50	11.80	13.30	40	33.27%
	SR9	1.09	11.80	12.89	40	32.23%
2021	SR1	2.62	11.80	14.4	40	36.06%
	SR2	1.45	11.80	13.2	40	33.11%
	SR3	1.25	11.80	13.0	40	32.63%
	SR4	3.43	11.80	15.23	40	38.06%
	SR5	3.74	11.80	15.54	40	38.86%
	SR6	2.96	11.80	14.76	40	36.90%
	SR7	2.00	11.80	13.80	40	34.50%
	SR8	1.42	11.80	13.22	40	33.06%
	SR9	1.07	11.80	12.87	40	32.19%

3.1.2 Short-Term (24-Hr) Concentrations for PM_{10}

Table 3-2: Short-term PM_{10} at SRs (24-hr mean 90.4%tile)

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2017	SR1	10.83	11.80	22.63	50	45.26%
	SR2	5.43	11.80	17.23	50	34.46%
	SR3	3.23	11.80	15.06	50	30.13%
	SR4	8.69	11.80	20.48	50	40.98%
	SR5	10.05	11.80	21.85	50	43.70%
	SR6	8.68	11.80	20.48	50	40.97%
	SR7	6.55	11.80	18.35	50	36.70%
	SR8	5.77	11.80	17.57	50	35.14%
	SR9	2.50	11.80	14.30	50	28.61%
2018	SR1	9.33	11.80	21.13	50	42.27%
	SR2	5.11	11.80	16.91	50	33.83%
	SR3	2.74	11.80	14.54	50	29.09%
	SR4	9.27	11.80	21.07	50	42.15%
	SR5	11.02	11.80	22.82	50	45.65%
	SR6	9.17	11.80	20.97	50	41.95%
	SR7	6.43	11.80	18.23	50	36.46%
	SR8	5.50	11.80	17.30	50	34.62%
	SR9	3.58	11.80	15.38	50	30.77%
2019	SR1	7.74	11.80	19.54	50	39.08%
	SR2	5.00	11.80	16.80	50	33.61%
	SR3	5.17	11.80	16.97	50	33.94%
	SR4	9.42	11.80	21.22	50	42.45%
	SR5	10.63	11.80	22.43	50	44.86%
	SR6	10.17	11.80	21.97	50	43.96%
	SR7	6.22	11.80	18.02	50	36.05%
	SR8	4.86	11.80	16.66	50	33.34%

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
	SR9	1.65	11.80	13.45	50	26.90%
2020	SR1	7.61	11.80	19.41	50	38.83%
	SR2	3.92	11.80	15.72	50	31.44%
	SR3	3.91	11.80	15.71	50	31.43%
	SR4	7.72	11.80	19.52	50	39.04%
	SR5	12.44	11.80	24.24	50	48.48%
	SR6	10.61	11.80	22.41	50	44.83%
	SR7	7.17	11.80	18.98	50	37.95%
	SR8	4.12	11.80	15.92	50	31.85%
	SR9	4.23	11.80	16.03	50	32.06%
2021	SR1	8.48	11.80	20.28	50	40.57%
	SR2	4.78	11.80	16.58	50	33.18%
	SR3	4.35	11.80	16.15	50	32.31%
	SR4	10.59	11.80	22.39	50	44.80%
	SR5	14.88	11.80	26.68	50	53.37%
	SR6	10.17	11.80	21.97	50	43.95%
	SR7	7.00	11.80	18.80	50	37.60%
	SR8	4.23	11.80	16.00	50	32.01%
	SR9	3.76	11.80	15.56	50	31.14%

3.2 Scenario 2.2 PM_{10}

3.2.1 Long-Term (Annual) Concentrations for PM_{10}

Table 3-3: Annual mean PM_{10} at SRs for the August ending Harvest

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2019	SR1	1.57	11.80	13.37	40	33.42%
	SR2	1.02	11.80	12.82	40	32.05%
	SR3	1.04	11.80	12.84	40	32.11%
	SR4	2.15	11.80	13.95	40	34.87%
	SR5	2.02	11.80	13.82	40	34.56%
	SR6	1.98	11.80	13.78	40	34.46%
	SR7	1.35	11.80	13.15	40	32.88%
	SR8	0.95	11.80	12.75	40	31.87%
	SR9	0.44	11.80	12.24	40	30.59%

Table 3-4: Annual mean PM_{10} at SRs for the September ending Harvest

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2019	SR1	1.84	11.80	13.64	40	34.10%
	SR2	1.22	11.80	13.02	40	32.55%
	SR3	1.14	11.80	12.94	40	32.35%
	SR4	2.24	11.80	14.04	40	35.11%
	SR5	1.77	11.80	13.57	40	33.93%
	SR6	1.78	11.80	13.58	40	33.96%
	SR7	1.23	11.80	13.03	40	32.57%
	SR8	1.30	11.80	13.10	40	32.76%
	SR9	0.43	11.80	12.23	40	30.57%

3.2.2 Short-Term (24-hr) Concentrations for PM_{10}

Table 3-5: 24-hr mean PM_{10} at SRs for the August ending Harvest

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2019	SR1	4.49	11.80	16.29	50	32.58%
	SR2	2.58	11.80	14.38	50	28.75%
	SR3	3.68	11.80	15.48	50	30.95%
	SR4	7.33	11.80	19.13	50	38.27%
	SR5	8.91	11.80	20.71	50	41.42%
	SR6	7.71	11.80	19.51	50	39.02%
	SR7	4.47	11.80	16.27	50	32.53%
	SR8	2.36	11.80	14.16	50	28.31%
	SR9	1.02	11.80	12.82	50	25.64%

Table 3-6: 24-hr mean PM_{10} at SRs for the September ending Harvest

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2019	SR1	5.13	11.80	16.93	50	33.85%
	SR2	3.66	11.80	15.46	50	30.93%
	SR3	4.23	11.80	16.03	50	32.06%
	SR4	7.65	11.80	19.45	50	38.90%
	SR5	7.47	11.80	19.27	50	38.53%
	SR6	7.05	11.80	18.85	50	37.71%
	SR7	4.31	11.80	16.11	50	32.23%
	SR8	3.66	11.80	15.46	50	30.92%
	SR9	0.93	11.80	12.73	50	25.45%

3.3 Scenario 3.1 PM_{10}

3.3.1 Long-Term (Annual) Concentrations for PM_{10}

Table 3-7: Annual mean PM_{10} at SRs for Worst Case Met Year 2021

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2021	SR1	2.79	11.80	14.59	40	36.47%
	SR2	1.62	11.80	13.42	40	33.55%
	SR3	1.48	11.80	13.28	40	33.19%
	SR4	3.21	11.80	15.01	40	37.54%
	SR5	3.04	11.80	14.84	40	37.10%
	SR6	2.54	11.80	14.34	40	35.85%
	SR7	1.95	11.80	13.75	40	34.37%
	SR8	1.56	11.80	13.36	40	33.39%
	SR9	1.11	11.80	12.91	40	32.27%

3.3.2 Short-Term (24-Hr) Concentrations for PM_{10}

Table 3-8: Short-term PM_{10} at SRs (24-hr mean 90.4%tile) for Worst Case Met Year 2021

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2021	SR1	8.38	11.80	20.18	50	40.35%
	SR2	4.50	11.80	16.30	50	32.60%
	SR3	5.53	11.80	17.33	50	34.66%
	SR4	8.63	11.80	20.43	50	40.85%
	SR5	9.54	11.80	21.34	50	42.67%
	SR6	8.29	11.80	20.09	50	40.18%
	SR7	6.06	11.80	17.86	50	35.73%
	SR8	4.44	11.80	16.24	50	32.48%
	SR9	3.28	11.80	15.08	50	30.16%

3.4 Scenario 3.2 PM_{10}

3.4.1 Long-Term (Annual) Concentrations for PM_{10}

Table 3-9: Annual mean PM_{10} at SRs

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2017	SR1	2.88	11.80	14.68	40	36.71%
	SR2	1.68	11.80	13.48	40	33.70%
	SR3	0.69	11.80	12.49	40	31.22%
	SR4	1.95	11.80	13.75	40	34.37%
	SR5	1.76	11.80	13.56	40	33.90%
	SR6	2.04	11.80	13.84	40	34.61%
	SR7	1.62	11.80	13.42	40	33.56%
	SR8	1.71	11.80	13.51	40	33.78%
	SR9	0.58	11.80	12.38	40	30.96%
2018	SR1	2.54	11.80	14.34	40	35.85%
	SR2	1.55	11.80	13.35	40	33.37%
	SR3	0.71	11.80	12.51	40	31.27%
	SR4	2.14	11.80	13.94	40	34.84%
	SR5	2.03	11.80	13.83	40	34.57%
	SR6	1.97	11.80	13.77	40	34.42%
	SR7	1.47	11.80	13.27	40	33.18%
	SR8	1.58	11.80	13.38	40	33.46%
	SR9	0.83	11.80	12.63	40	31.57%
2019	SR1	2.36	11.80	14.16	40	35.41%
	SR2	1.48	11.80	13.28	40	33.21%
	SR3	1.26	11.80	13.06	40	32.65%
	SR4	2.24	11.80	14.04	40	35.09%
	SR5	1.75	11.80	13.55	40	33.86%
	SR6	2.06	11.80	13.86	40	34.66%
	SR7	1.50	11.80	13.30	40	33.24%

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
	SR8	1.53	11.80	13.33	40	33.31%
	SR9	0.52	11.80	12.32	40	30.80%
2020	SR1	2.43	11.80	14.23	40	35.58%
	SR2	1.30	11.80	13.10	40	32.75%
	SR3	0.75	11.80	12.55	40	31.37%
	SR4	1.92	11.80	13.72	40	34.29%
	SR5	2.36	11.80	14.16	40	35.41%
	SR6	2.50	11.80	14.30	40	35.76%
	SR7	1.58	11.80	13.38	40	33.46%
	SR8	1.42	11.80	13.22	40	33.05%
	SR9	0.93	11.80	12.73	40	31.83%
2021	SR1	2.39	11.80	14.19	40	35.48%
	SR2	1.29	11.80	13.09	40	32.72%
	SR3	0.94	11.80	12.74	40	31.86%
	SR4	2.38	11.80	14.18	40	35.45%
	SR5	2.18	11.80	13.98	40	34.95%
	SR6	1.89	11.80	13.69	40	34.22%
	SR7	1.45	11.80	13.25	40	33.13%
	SR8	1.27	11.80	13.07	40	32.68%
	SR9	0.84	11.80	12.64	40	31.60%

3.4.2 Short-Term (24-Hr) Concentrations for PM_{10}

Table 3-10: Short-term PM_{10} at SRs (24-hr mean 90.4%tile)

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2017	SR1	10.34	11.80	22.14	50	44.28%
	SR2	5.24	11.80	17.04	50	34.08%
	SR3	2.73	11.80	14.53	50	29.05%
	SR4	6.31	11.80	18.11	50	36.22%
	SR5	6.69	11.80	18.49	50	36.98%
	SR6	6.82	11.80	18.62	50	37.25%
	SR7	5.39	11.80	17.19	50	34.38%
	SR8	5.49	11.80	17.29	50	34.58%
	SR9	1.97	11.80	13.77	50	27.55%
2018	SR1	8.21	11.80	20.01	50	40.01%
	SR2	4.85	11.80	16.65	50	33.30%
	SR3	2.42	11.80	14.22	50	28.45%
	SR4	6.82	11.80	18.62	50	37.23%
	SR5	7.24	11.80	19.04	50	38.09%
	SR6	7.65	11.80	19.45	50	38.89%
	SR7	5.15	11.80	16.95	50	33.90%
	SR8	5.42	11.80	17.22	50	34.44%
	SR9	2.58	11.80	14.38	50	28.76%
2019	SR1	7.43	11.80	19.23	50	38.45%
	SR2	4.39	11.80	16.19	50	32.39%
	SR3	4.42	11.80	16.22	50	32.44%
	SR4	6.58	11.80	18.38	50	36.76%
	SR5	6.95	11.80	18.75	50	37.51%
	SR6	7.33	11.80	19.13	50	38.25%
	SR7	5.06	11.80	16.86	50	33.72%
	SR8	4.46	11.80	16.26	50	32.51%

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
	SR9	1.49	11.80	13.29	50	26.59%
2020	SR1	6.64	11.80	18.44	50	36.88%
	SR2	3.20	11.80	15.00	50	30.01%
	SR3	3.26	11.80	15.06	50	30.12%
	SR4	5.28	11.80	17.08	50	34.15%
	SR5	8.17	11.80	19.97	50	39.94%
	SR6	8.33	11.80	20.13	50	40.27%
	SR7	5.36	11.80	17.16	50	34.31%
	SR8	3.93	11.80	15.73	50	31.46%
	SR9	3.35	11.80	15.15	50	30.30%
2021	SR1	7.15	11.80	18.95	50	37.90%
	SR2	4.13	11.80	15.93	50	31.85%
	SR3	3.71	11.80	15.51	50	31.02%
	SR4	6.77	11.80	18.57	50	37.13%
	SR5	8.09	11.80	19.89	50	39.78%
	SR6	6.12	11.80	17.92	50	35.84%
	SR7	5.31	11.80	17.11	50	34.22%
	SR8	3.41	11.80	15.21	50	30.41%
	SR9	2.46	11.80	14.26	50	28.52%

3.5 Scenario 3.2 Sub Scenario PM_{10}

3.5.1 Long-Term (Annual) Concentrations for PM_{10}

Table 3-11: Annual mean PM_{10} at SRs for the August ending Harvest

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2021	SR1	1.77	11.80	13.57	40	33.92%
	SR2	1.02	11.80	12.82	40	32.06%
	SR3	0.84	11.80	12.64	40	31.60%
	SR4	2.01	11.80	13.81	40	34.52%
	SR5	2.00	11.80	13.80	40	34.49%
	SR6	1.69	11.80	13.49	40	33.72%
	SR7	1.25	11.80	13.05	40	32.62%
	SR8	0.95	11.80	12.75	40	31.89%
	SR9	0.74	11.80	12.54	40	31.36%

Table 3-12: Annual mean PM_{10} at SRs for the September ending Harvest

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2021	SR1	1.98	11.80	13.78	40	34.45%
	SR2	1.13	11.80	12.93	40	32.33%
	SR3	0.80	11.80	12.60	40	31.50%
	SR4	2.03	11.80	13.83	40	34.58%
	SR5	1.79	11.80	13.59	40	33.98%
	SR6	1.51	11.80	13.31	40	33.27%
	SR7	1.15	11.80	12.95	40	32.37%
	SR8	1.12	11.80	12.92	40	32.30%
	SR9	0.67	11.80	12.47	40	31.17%

3.5.2 Short-Term (24-Hr) Concentrations for PM10

Table 3-13: Short-term PM_{10} at SRs (24-hr mean 90.4%tile) for the August ending Harvest

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2021	SR1	5.15	11.80	16.95	50	33.90%
	SR2	3.56	11.80	15.36	50	30.73%
	SR3	3.21	11.80	15.01	50	30.01%
	SR4	6.02	11.80	17.82	50	35.64%
	SR5	7.68	11.80	19.48	50	38.95%
	SR6	5.29	11.80	17.09	50	34.19%
	SR7	4.40	11.80	16.20	50	32.40%
	SR8	2.97	11.80	14.77	50	29.54%
	SR9	2.32	11.80	14.12	50	28.24%

Table 3-14: Short-term PM_{10} at SRs (24-hr mean 90.4%tile) for the September ending Harvest

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS	PEC as % of AQS
2021	SR1	1.98	11.80	13.78	50	34.45%
	SR2	1.13	11.80	12.93	50	32.33%
	SR3	0.80	11.80	12.60	50	31.50%
	SR4	2.03	11.80	13.83	50	34.58%
	SR5	1.79	11.80	13.59	50	33.98%
	SR6	1.51	11.80	13.31	50	33.27%
	SR7	1.15	11.80	12.95	50	32.37%
	SR8	1.12	11.80	12.92	50	32.30%
	SR9	0.67	11.80	12.47	50	31.17%

4 NO_2 CONCENTRATIONS AT THE SAC RECEPTORS

Table 4-1: Annual mean NO_2 at the SAC receptors for August ending Harvest

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS for Protection of Vegetation	PEC as % of AQS
2017	SR6	1.65	5.6	7.350	30	24.50%
	SR7	1.30	5.6	7.005	30	23.35%
	SR8	0.74	5.6	6.439	30	21.46%
2018	SR6	1.41	5.6	7.105	30	23.68%
	SR7	0.91	5.6	6.609	30	22.03%
	SR8	0.61	5.6	6.306	30	21.02%
2019	SR6	1.57	5.6	7.275	30	24.25%
	SR7	1.07	5.6	6.772	30	22.57%
	SR8	0.60	5.6	6.298	30	20.99%
2020	SR6	1.57	5.6	7.272	30	24.24%
	SR7	1.04	5.6	6.740	30	22.47%
	SR8	0.65	5.6	6.349	30	21.16%
2021	SR6	1.65	5.6	7.355	30	24.52%
	SR7	1.21	5.6	6.910	30	23.03%
	SR8	0.60	5.6	6.300	30	21.00%

Table 4-2: Annual mean NO_2 at the SAC receptors for August ending Harvest

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS for Protection of Vegetation	PEC as % of AQS
2017	SR6	1.68	5.6	7.384	30	24.61%
	SR7	1.31	5.6	7.015	30	23.38%
	SR8	0.69	5.6	6.394	30	21.31%
2018	SR6	1.33	5.6	7.033	30	23.44%
	SR7	0.92	5.6	6.616	30	22.05%
	SR8	0.67	5.6	6.365	30	21.22%
2019	SR6	1.52	5.6	7.221	30	24.07%
	SR7	1.04	5.6	6.744	30	22.48%
	SR8	0.72	5.6	6.418	30	21.39%
2020	SR6	1.55	5.6	7.247	30	24.16%
	SR7	1.01	5.6	6.710	30	22.37%
	SR8	0.65	5.6	6.346	30	21.15%
2021	SR6	1.63	5.6	7.330	30	24.43%
	SR7	1.18	5.6	6.882	30	22.94%
	SR8	0.64	5.6	6.345	30	21.15%

5 SO_2 CONCENTRATIONS AT THE SAC RECEPTORS

5.1 Winter Periods

Table 5-1: Annual Mean SO_2 at the SAC Receptors for the Winter Periods (October 1st to March 31st)

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS for Protection of Ecosystems	PEC as % of AQS
2017 to 2018	SR6	0.24	2.8	3.04	20	15.19%
	SR7	0.17	2.8	2.97	20	14.87%
	SR8	0.06	2.8	2.86	20	14.32%
2018 to 2019	SR6	0.23	2.8	3.03	20	15.17%
	SR7	0.14	2.8	2.94	20	14.70%
	SR8	0.07	2.8	2.87	20	14.34%
2019 to 2020	SR6	0.15	2.8	2.95	20	14.72%
	SR7	0.12	2.8	2.92	20	14.60%
	SR8	0.09	2.8	2.89	20	14.46%
2020 to 2021	SR6	0.29	2.8	3.09	20	15.44%
	SR7	0.19	2.8	3.0	20	14.94%
	SR8	0.12	2.8	2.92	20	14.58%

5.2 Annual Concentrations

Table 5-2: Annual Mean SO_2 at the SAC Receptors for August ending Harvest

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS for the Protection of Ecosystems	PEC as % of AQS
2017	SR6	0.30	2.8	3.10	20	15.49%
	SR7	0.24	2.8	3.04	20	15.18%
	SR8	0.13	2.8	2.93	20	14.67%
2018	SR6	0.26	2.8	3.06	20	15.28%
	SR7	0.16	2.8	2.96	20	14.82%
	SR8	0.11	2.8	2.91	20	14.56%
2019	SR6	0.29	2.8	3.09	20	15.43%
	SR7	0.19	2.8	2.99	20	14.96%
	SR8	0.11	2.8	2.91	20	14.53%
2020	SR6	0.29	2.8	3.09	20	15.44%
	SR7	0.19	2.8	2.99	20	14.94%
	SR8	0.12	2.8	2.92	20	14.58%
2021	SR6	0.30	2.8	3.10	20	15.50%
	SR7	0.22	2.8	3.02	20	15.09%
	SR8	0.11	2.8	2.91	20	14.54%

Table 5-3: Annual Mean SO_2 at the SAC Receptors for August ending Harvest

Year	Receptor	Process Contribution	Background Concentration	Predicted Environmental Concentration	AQS for the Protection of Ecosystems	PEC as % of AQS
2017	SR6	0.30	2.8	3.10	20	15.52%
	SR7	0.24	2.8	3.04	20	15.19%
	SR8	0.12	2.8	2.92	20	14.62%
2018	SR6	0.24	2.8	3.04	20	15.20%
	SR7	0.17	2.8	2.97	20	14.83%
	SR8	0.12	2.8	2.92	20	14.60%
2019	SR6	0.27	2.8	3.07	20	15.37%
	SR7	0.19	2.8	2.99	20	14.94%
	SR8	0.13	2.8	2.93	20	14.64%
2020	SR6	0.28	2.8	3.08	20	15.41%
	SR7	0.18	2.8	2.98	20	14.91%
	SR8	0.11	2.8	2.91	20	14.57%
2021	SR6	0.30	2.8	3.10	20	15.48%
	SR7	0.21	2.8	3.01	20	15.07%
	SR8	0.12	2.8	2.92	20	14.58%

Appendix C

APPENDIX C: CONTOUR PLOTS

Contents

FIGURES

1 CONTOUR PLOTS FOR NO_2 CONCENTRATIONS

Please note that contour plots display Process Contribution, i.e. background concentrations are not included. Contour plots are displayed for the met year when highest maximum off-site concentration occurred.

NO_x to NO_2 conversion has been completed at a 0.50 ratio as discussed in section 5.10 in the main body of the report for short-term (1-hr mean) concentrations.

1.1 Long-term (Annual Mean)

Figure 1-1:Process Contribution for NO_2 – Annual Mean for 2018 for August ending harvest at 100% volumetric flow

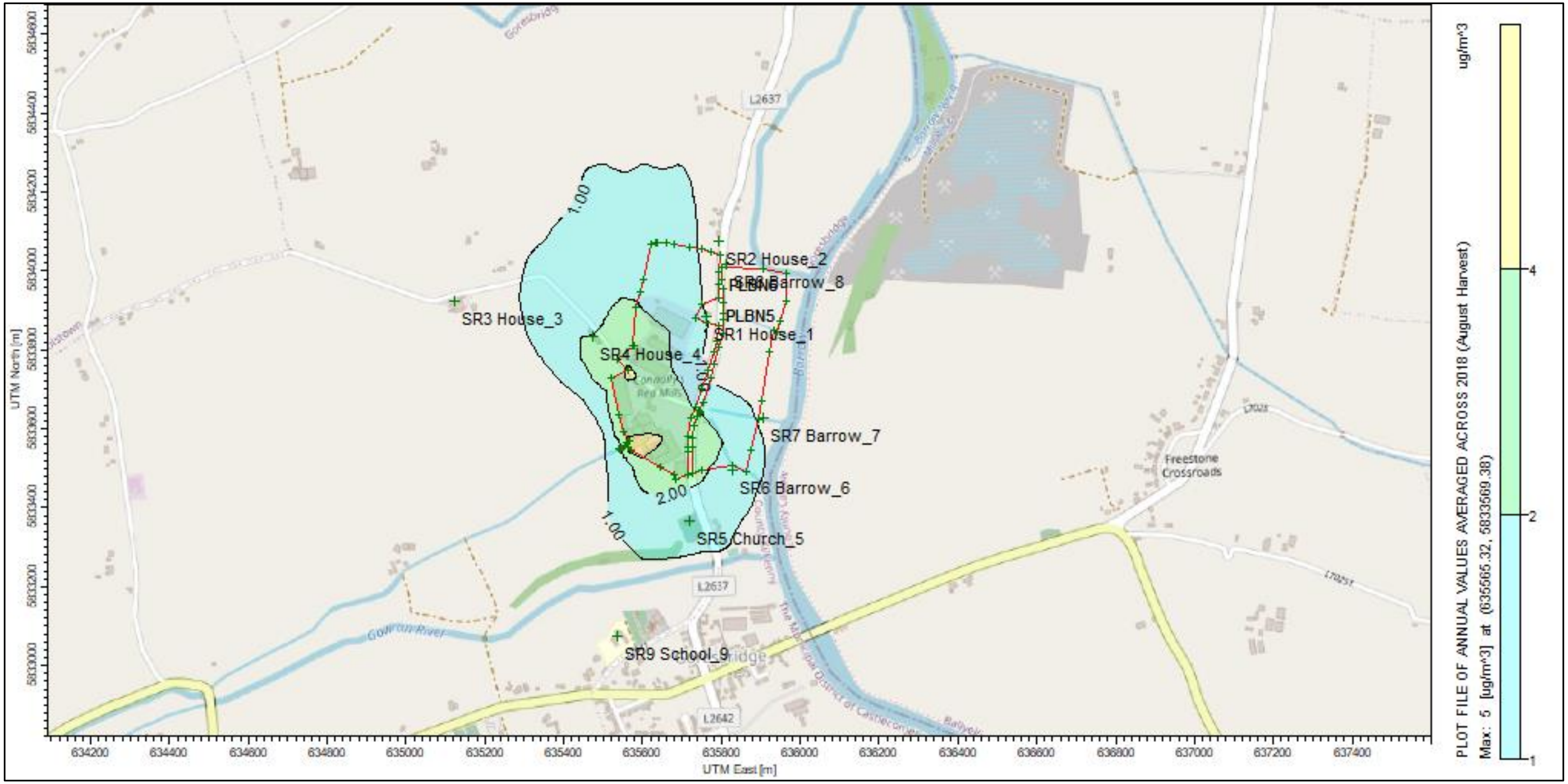


Figure 1-2: Process Contribution NO_2 – Annual Mean for 2021 for August ending harvest at 75% volumetric flow

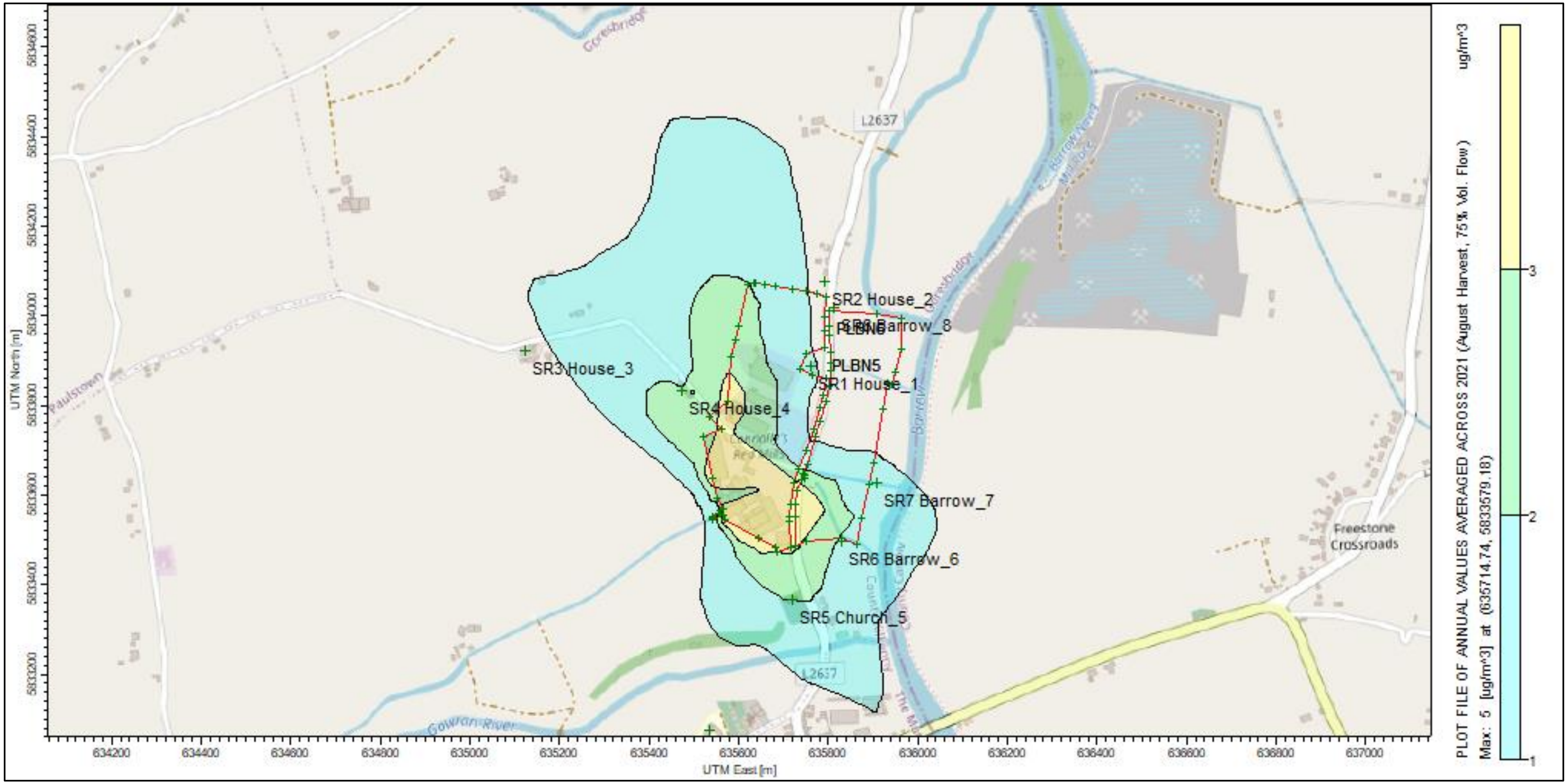


Figure 1-3: Process Contribution NO_2 – Annual Mean for 2017 for September ending harvest at 100% volumetric flow

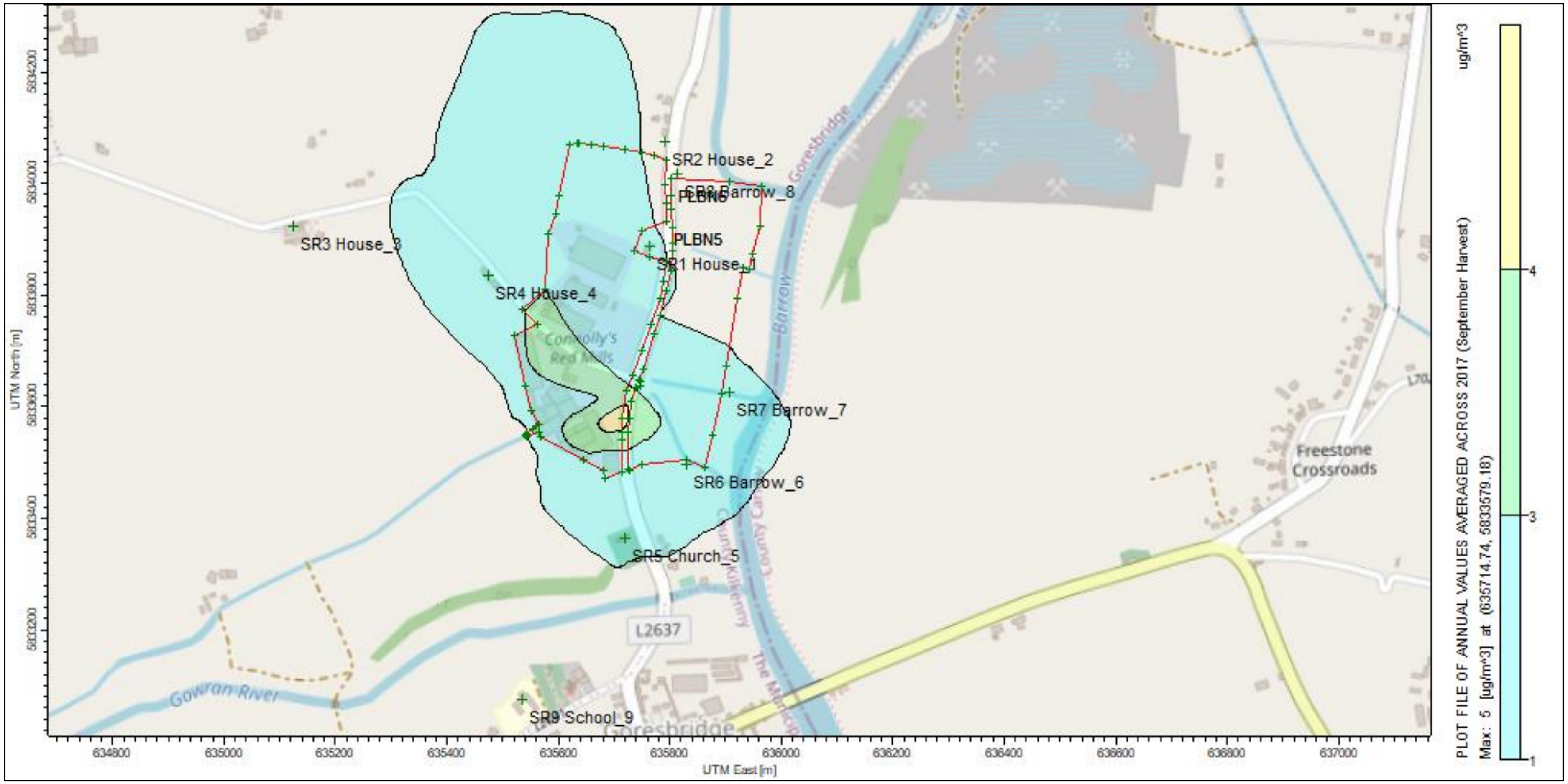
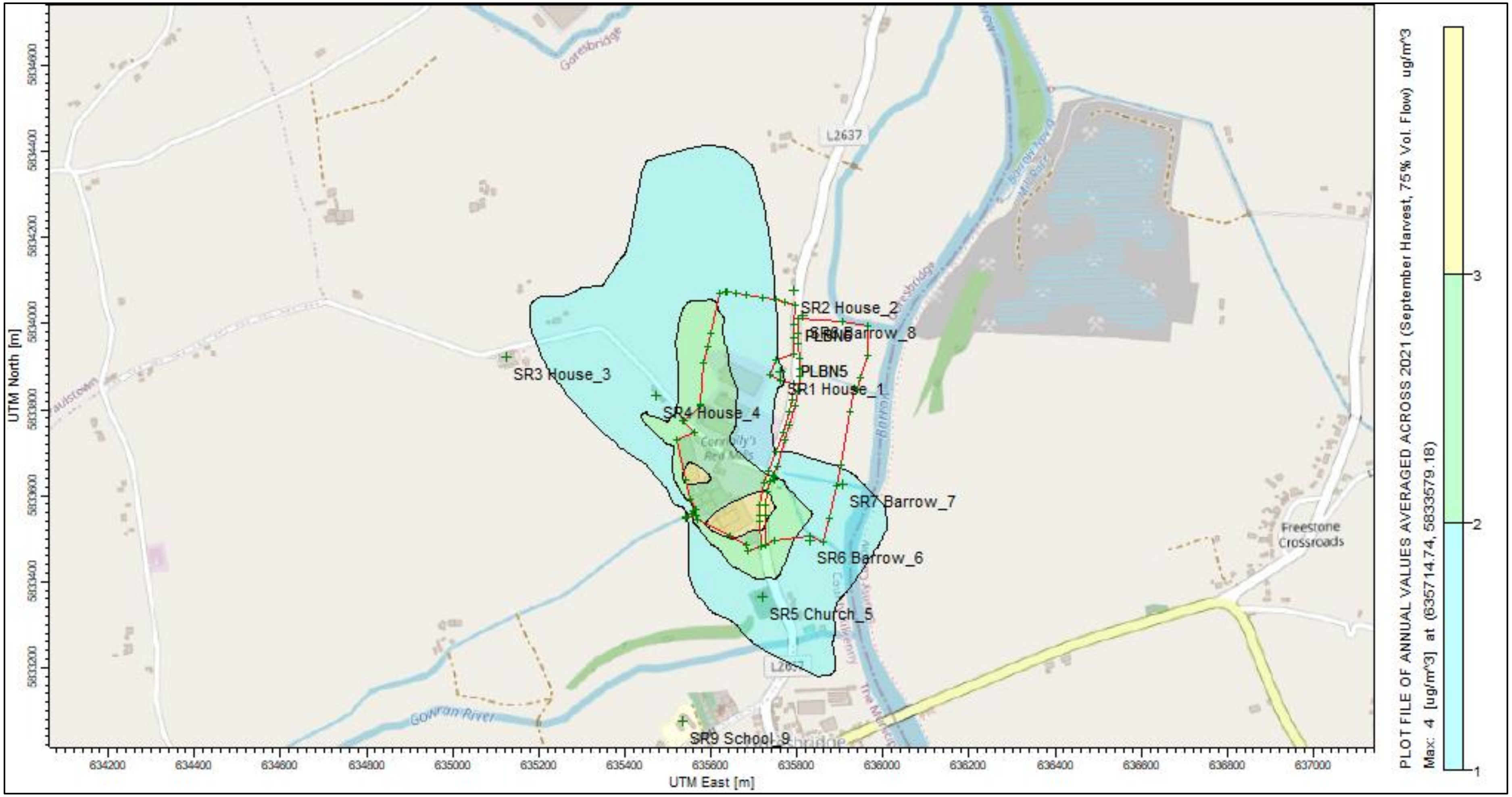


Figure 1-4: Process Contribution NO_2 – Annual Mean for 2021 for September ending harvest at 75% volumetric flow



1.2 Short-term (1-hr mean)

Figure 1-5:Process Contribution NO_2 – Short Term (1-hr-99.79th%ile) for 2021 for August ending harvest at 100% volumetric flow

Figure 1-6: Process Contribution NO_2 – Short Term (1-hr-99.79th%ile) for 2021 for August ending harvest at 75% volumetric flow

Figure 1-7:Process Contribution NO_2 – Short-term (1-hr Mean 99.79th%ile) for 2021 for September ending harvest at 100% volumetric flow

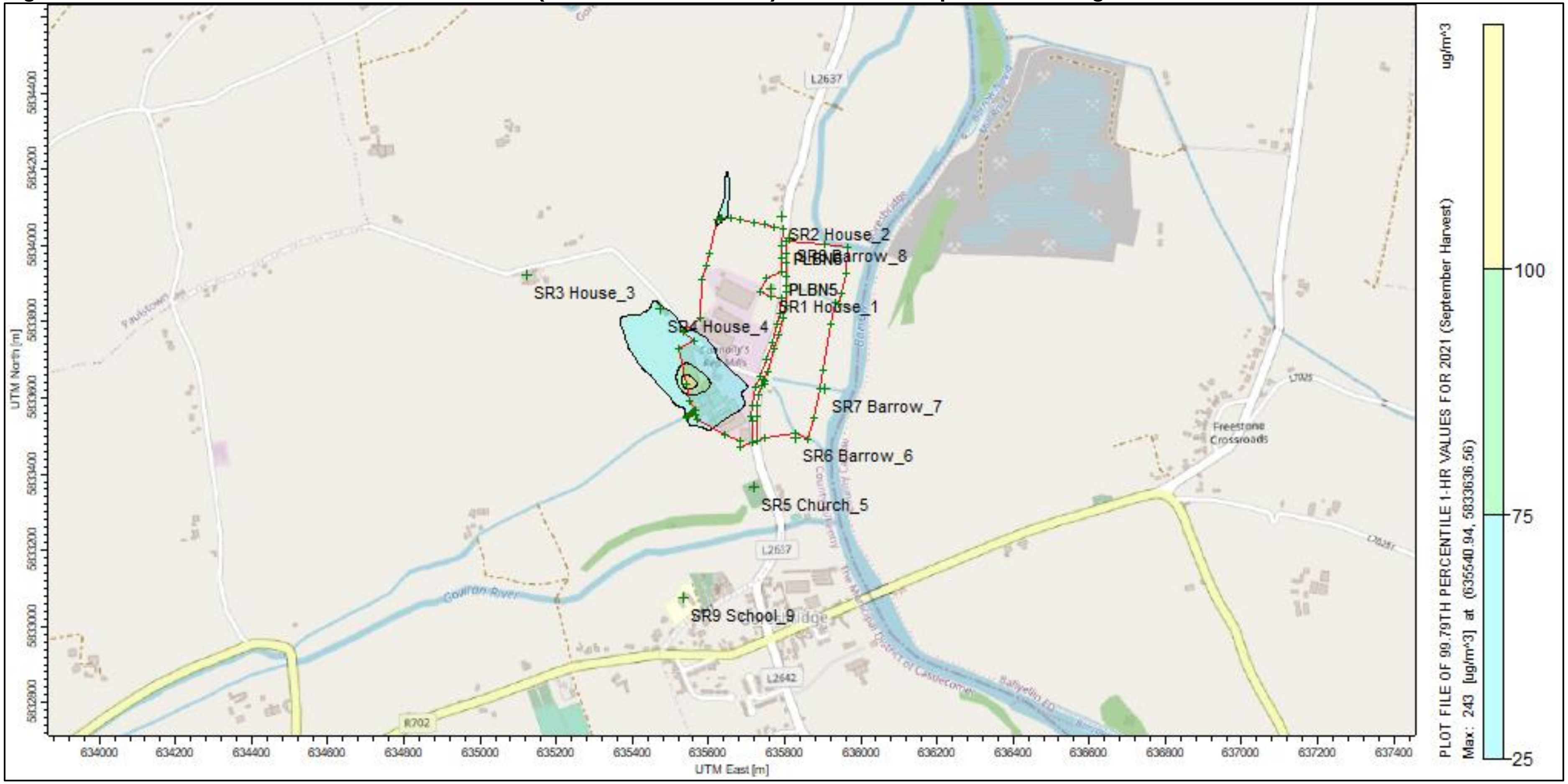
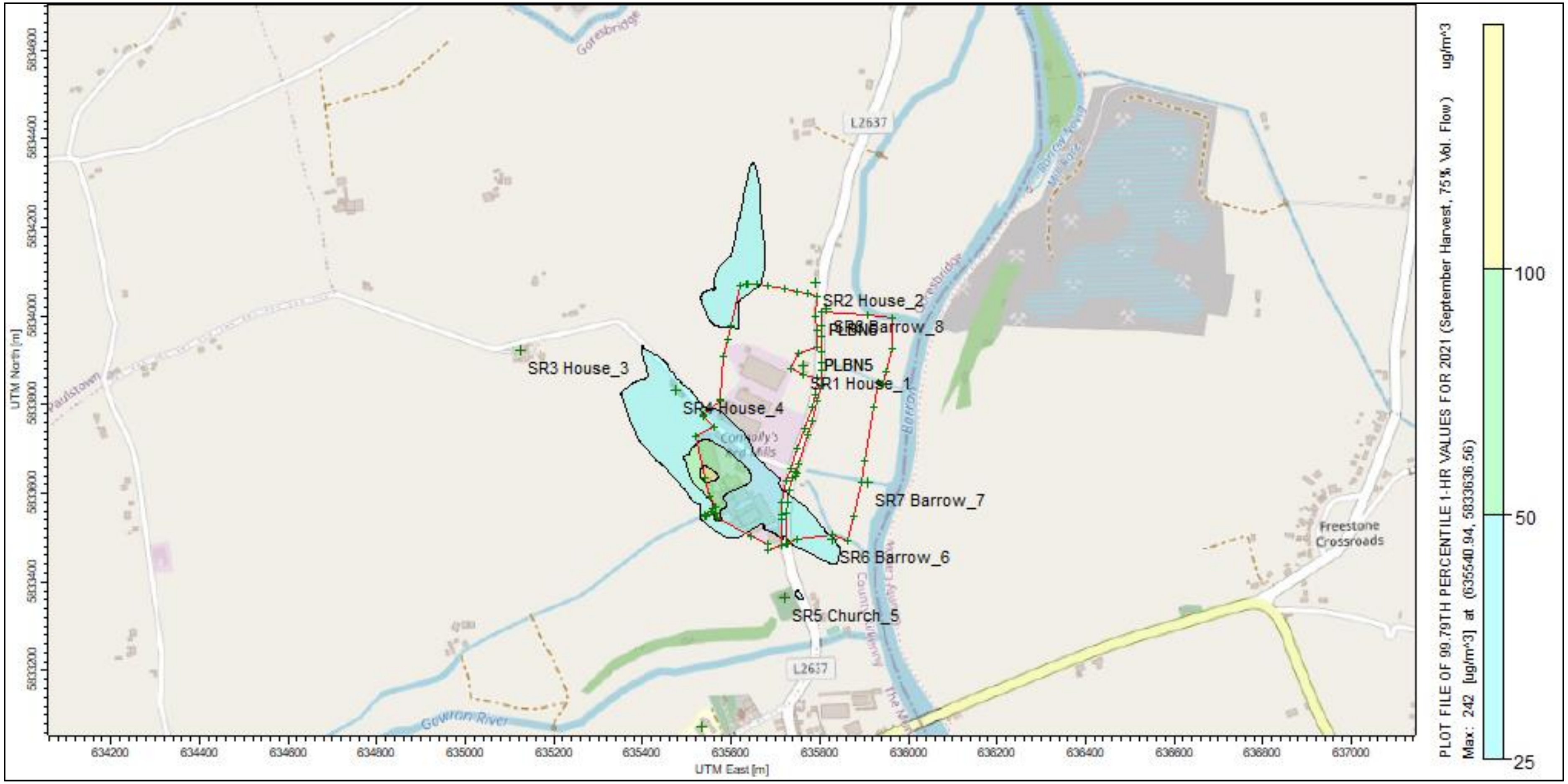


Figure 1-8: Process Contribution NO_2 – Short-term (1-hr Mean 99.79th%ile) for 2021 for September ending harvest at 75% volumetric flow



2 CONTOUR PLOTS FOR SO_2 CONCENTRATIONS

Please note that contour plots display Process Contribution, i.e. background concentrations are not included. Contour plots are displayed for the met year when highest maximum off-site concentration occurred.

2.1 Long-term (Annual mean)

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Figure 2-1:Process Contribution SO2 – Annual Mean for 2017 for August ending harvest at 100% volumetric flow

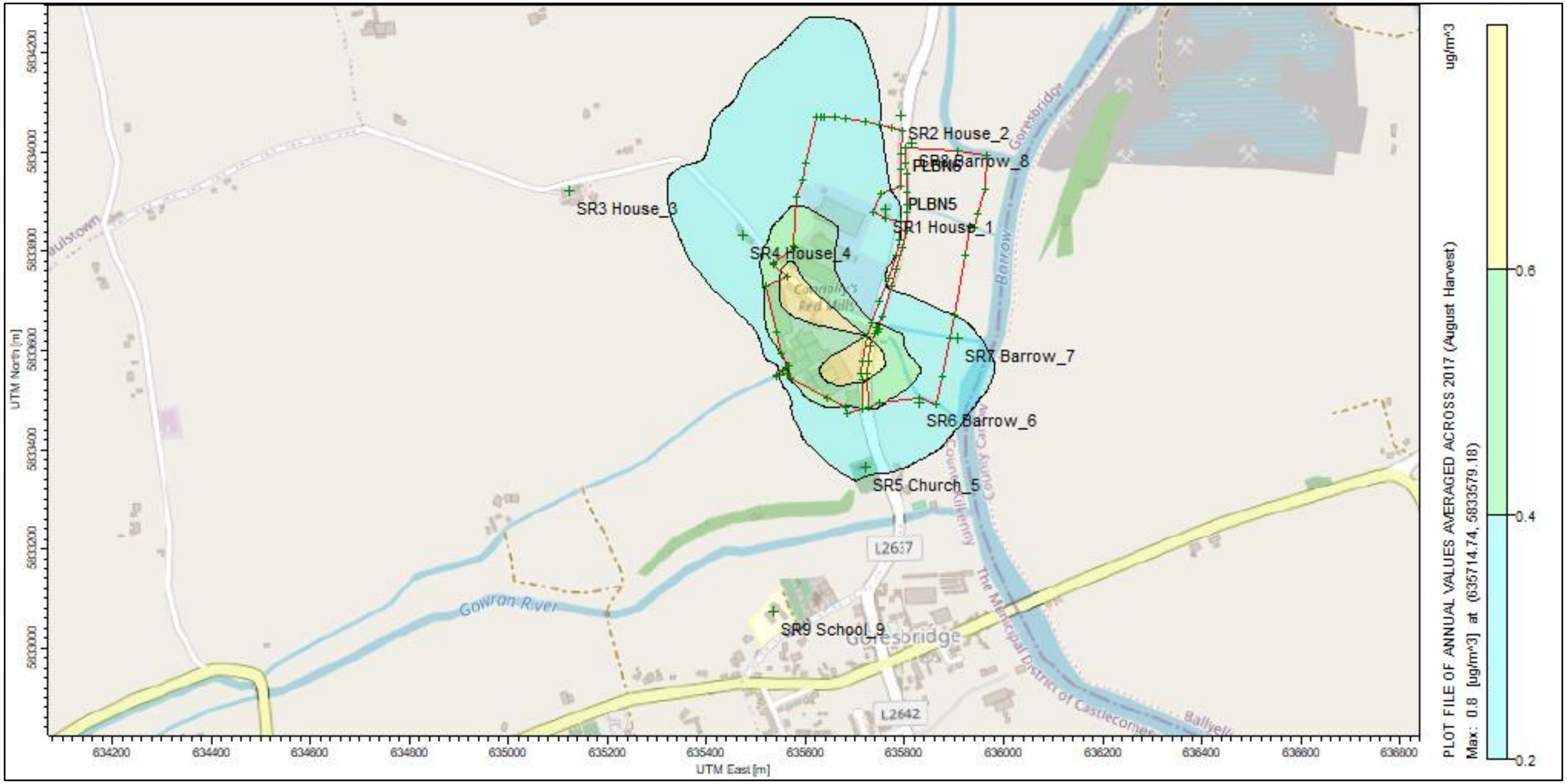


Figure 2-2: Process Contribution SO2- Annual Mean for 2021 for August ending harvest at 75% volumetric flow

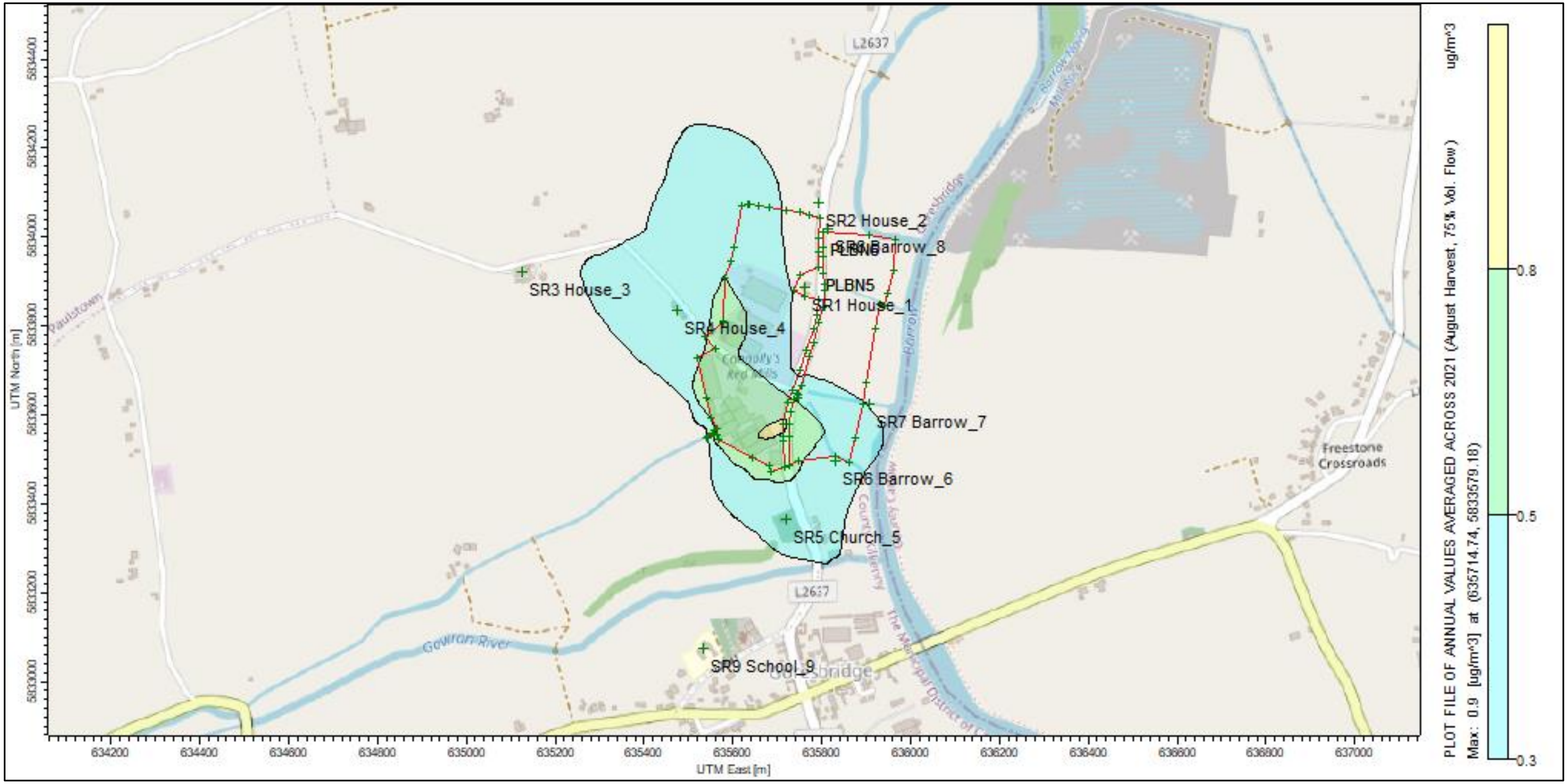


Figure 2-3: Process Contribution SO2- Annual Mean for 2019 for September ending harvest at 100% volumetric flow

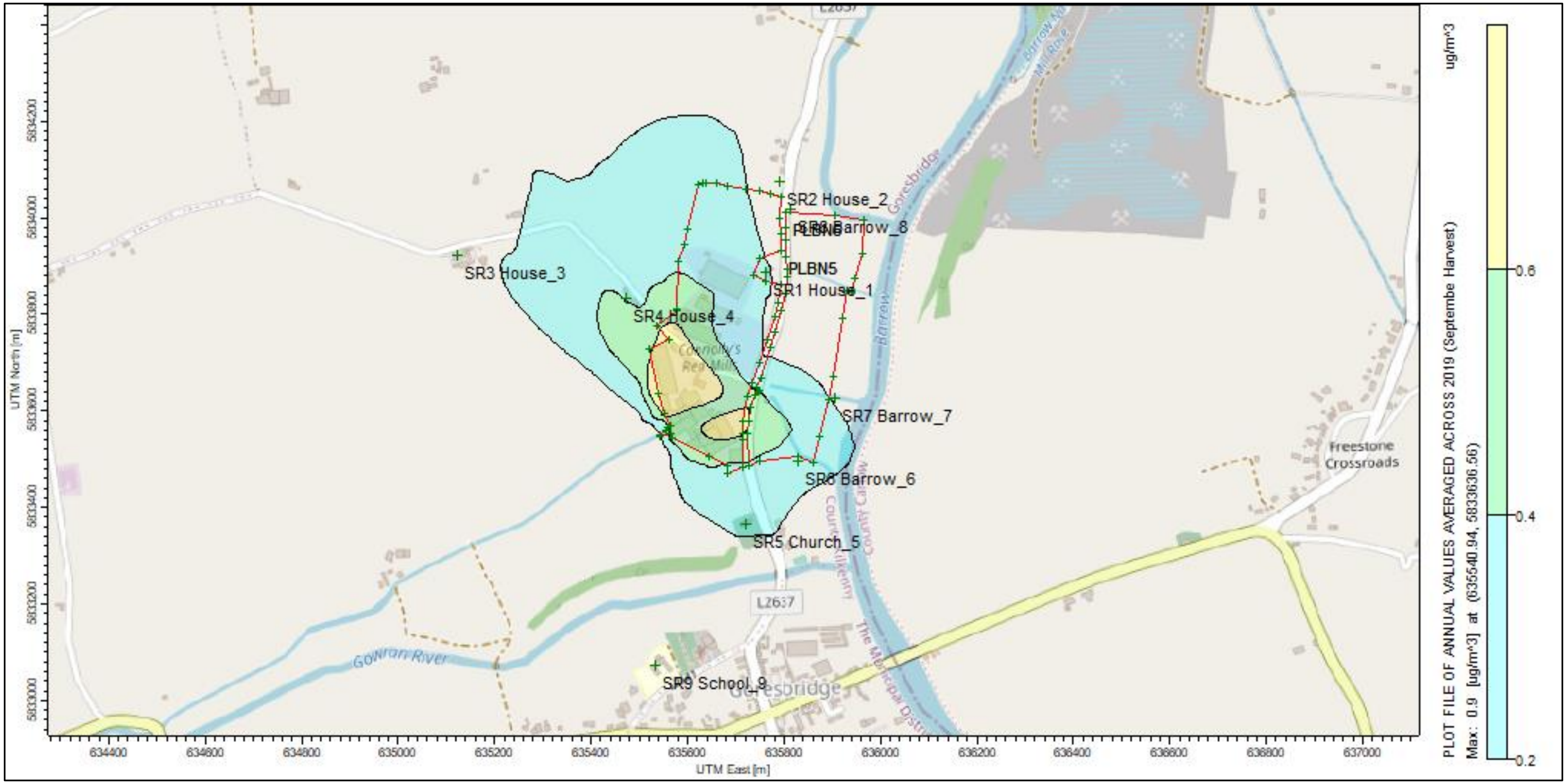
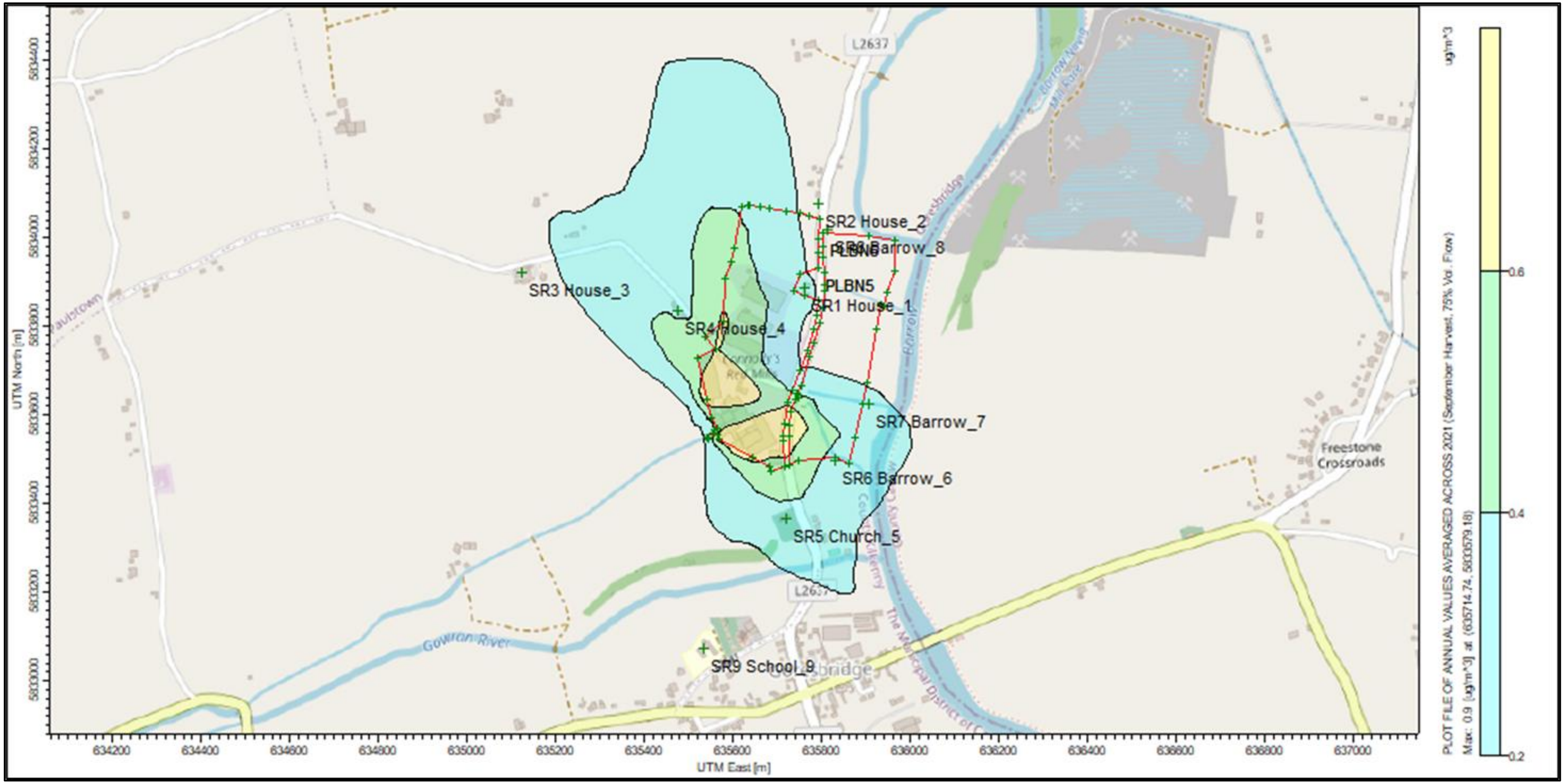


Figure 2-4:Process Contribution SO2- Annual Mean for 2021 for September ending harvest at 75% volumetric flow



2.2 Short-term (1-hr mean)

Figure 2-5: Process Contribution SO_2- Short Term (1-hr-99.79th%ile) Mean for 2021 for August ending harvest at 100% volumetric flow

Figure 2-6: Process Contribution SO_2 - Short-Term (1-hr Mean 99.8%ile) for 2021 for August ending harvest at 75% volumetric flow

Figure 2-7: Process Contribution SO_2- Short Term (1-hr-99.79th%ile) Mean for 2021 for September ending harvest at 100% volumetric flow

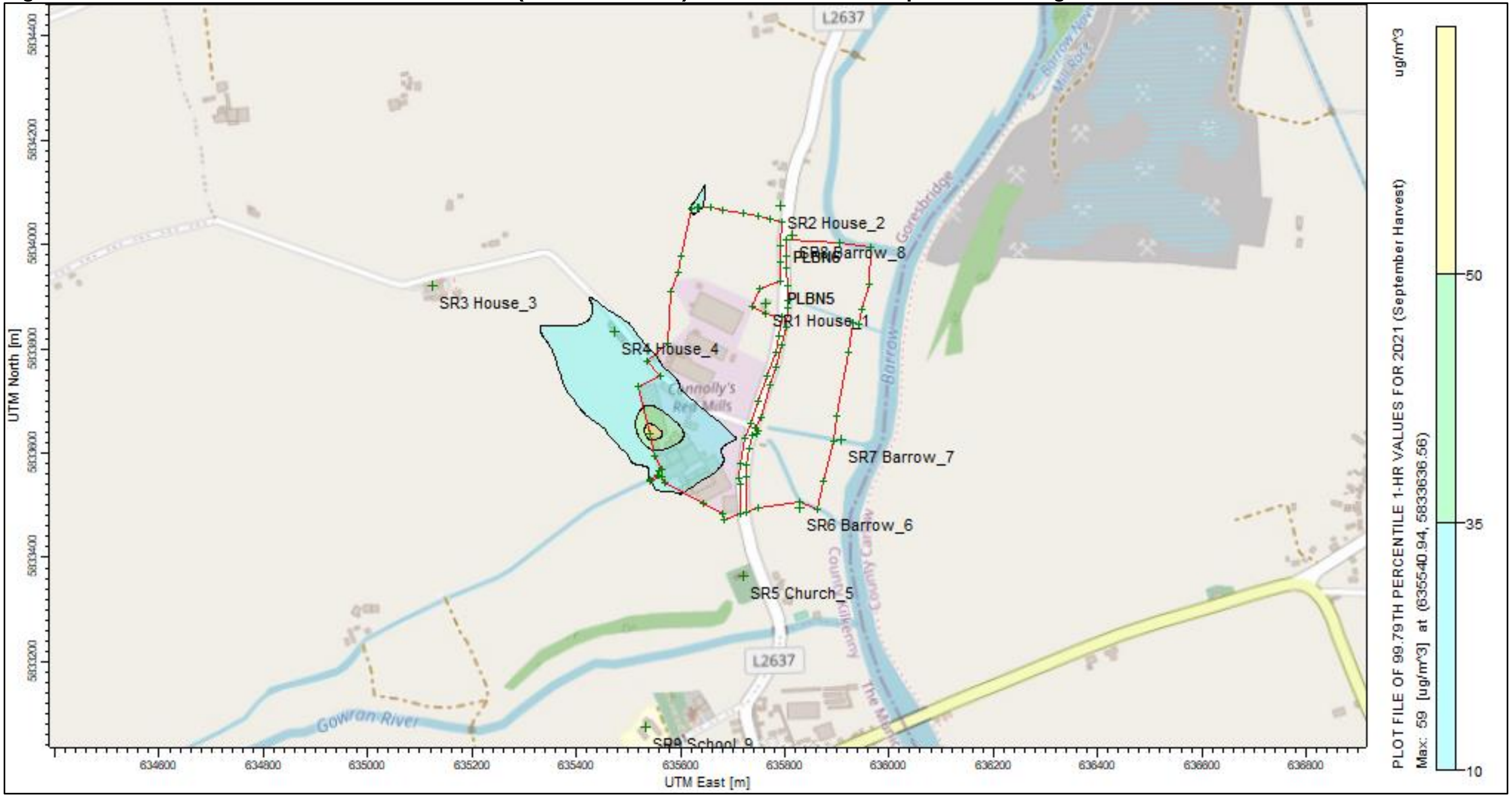


Figure 2-8: Process Contribution SO_2- Short Term (1-hr Mean 99.78%itle) for 2021 for September ending harvest at 75% volumetric flow

2.3 Short Term (24-hr mean)

.

Figure 2-9: Process Contribution SO2 – Short Term (24-hr Mean 99.10%itle) for 2021 for August ending harvest at 100% volumetric flow

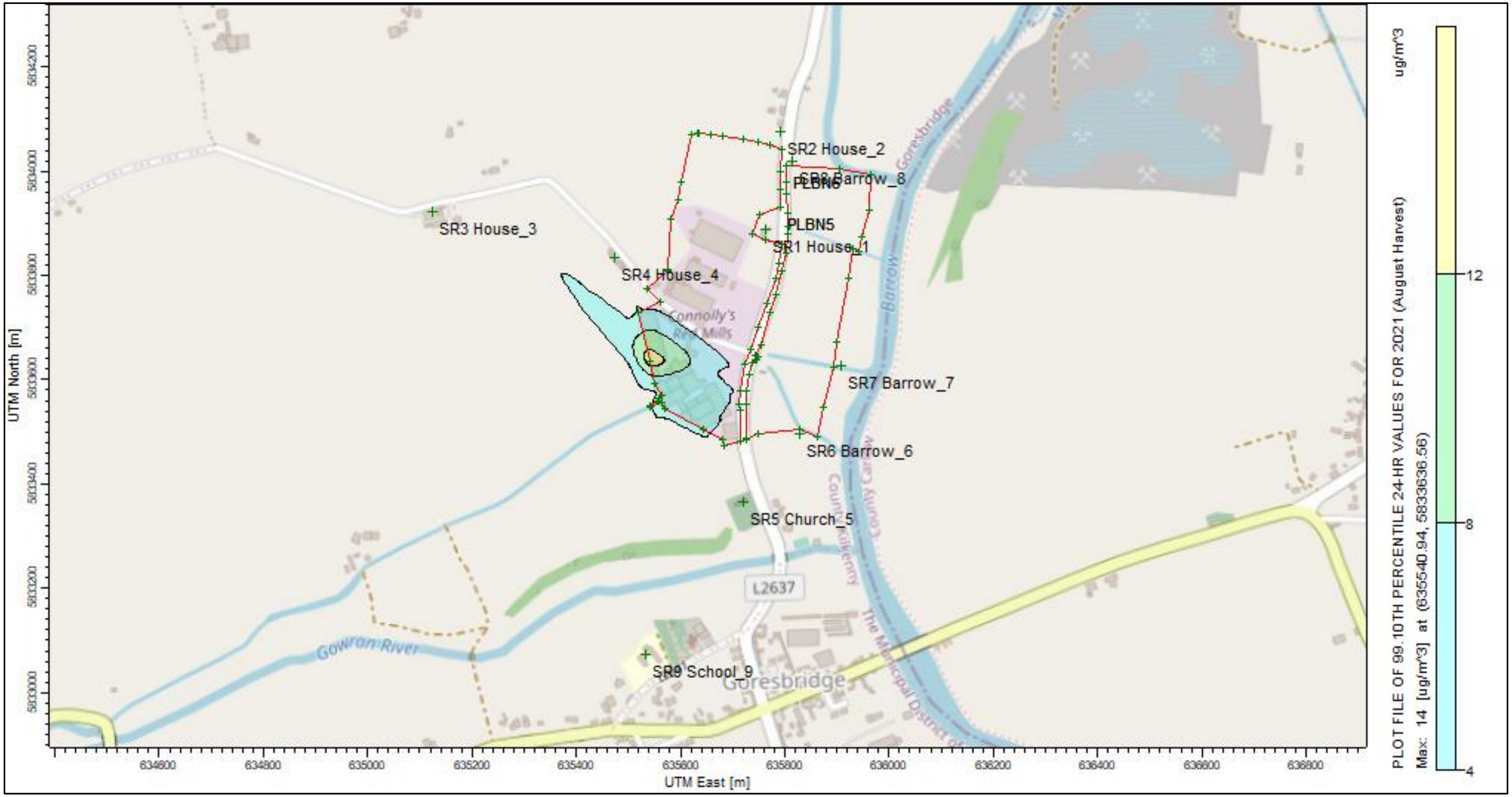
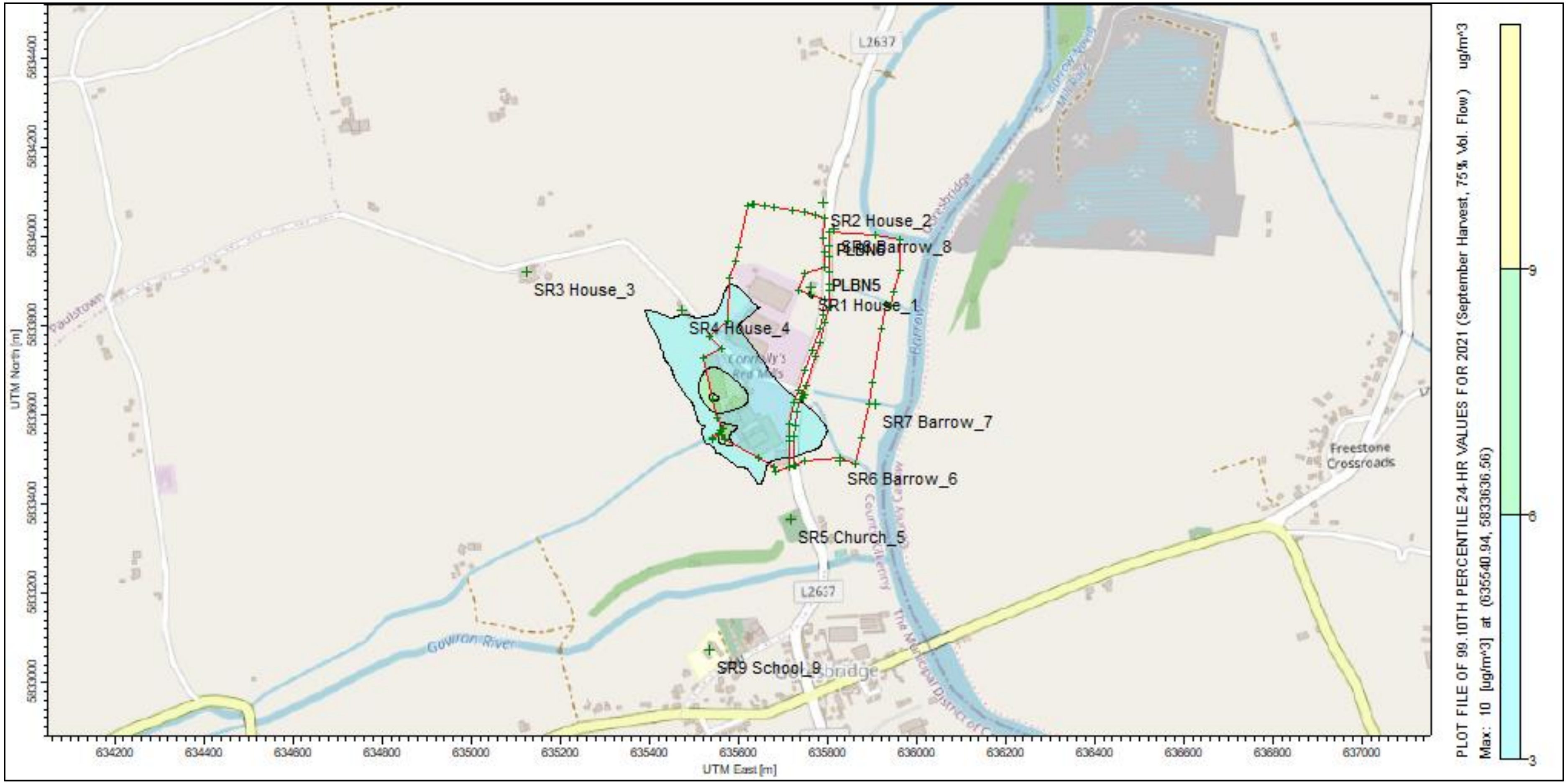


Figure 2-10: Process Contribution SO2 – Short Term (24-hr Mean 99.10%itle) for 2021 for August ending harvest at 75% volumetric flow

Figure 2-11: Process Contribution SO2 – Short Term (24-hr Mean 99.10%itle) for 2021 for September ending harvest at 100% volumetric flow

Figure 2-12: Process Contribution SO2 – Short Term (24-hr Mean 99.10%itle) for 2021 for September ending harvest at 75% volumetric flow



3 CONTOUR PLOTS FOR PM_{10} CONCENTRATIONS

Please note that contour plots display Process Contribution, i.e. background concentrations are not included. Contour plots are displayed for the met year when highest maximum off-site concentration occurred.

3.1 Scenario 2.1

3.1.1 Long-term (Annual Mean)

Figure 3-1:Process Contribution PM10 – Annual Mean (90.4th%ile) for 2019 for 12 week harvest at 100% volumetric flow

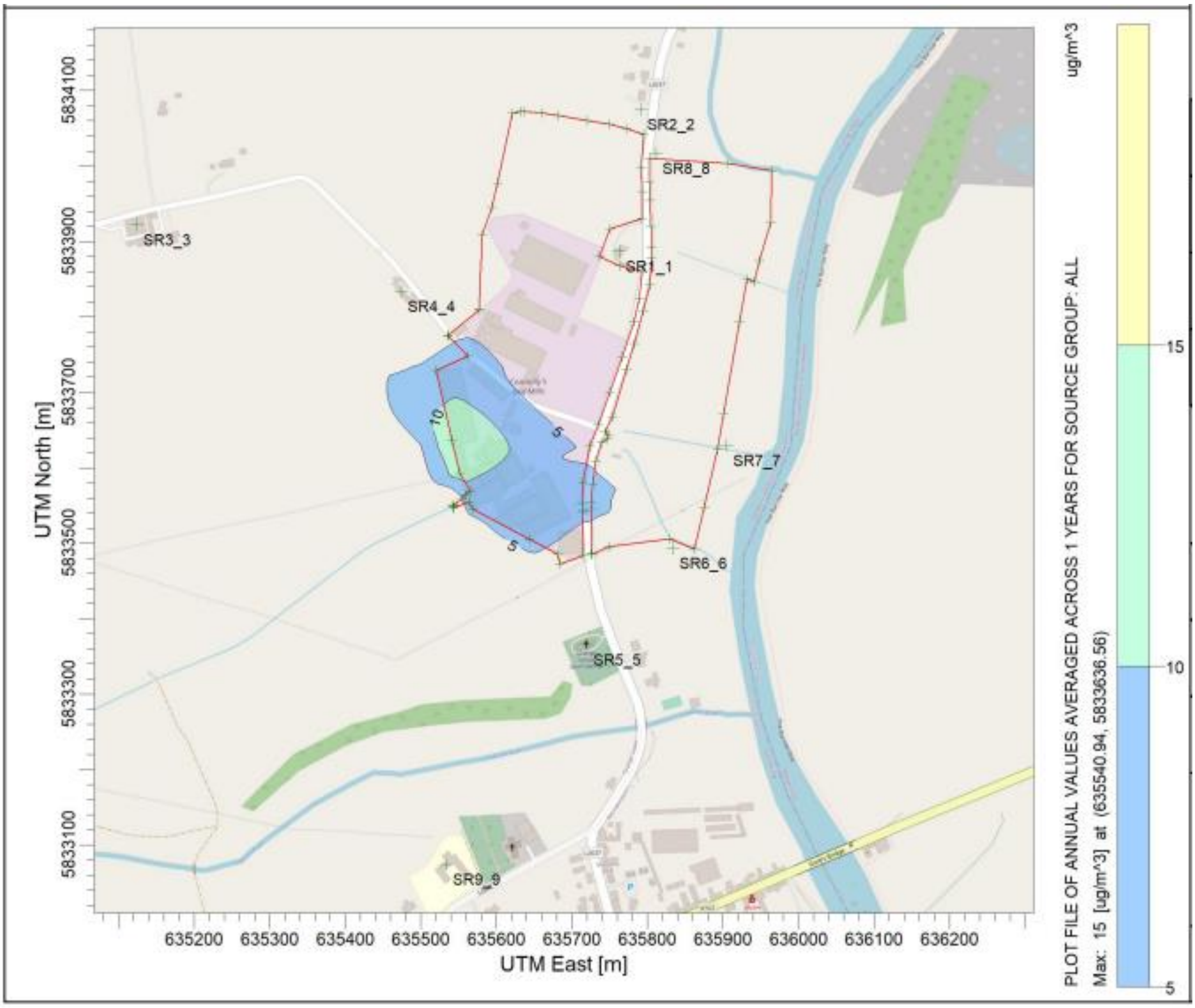
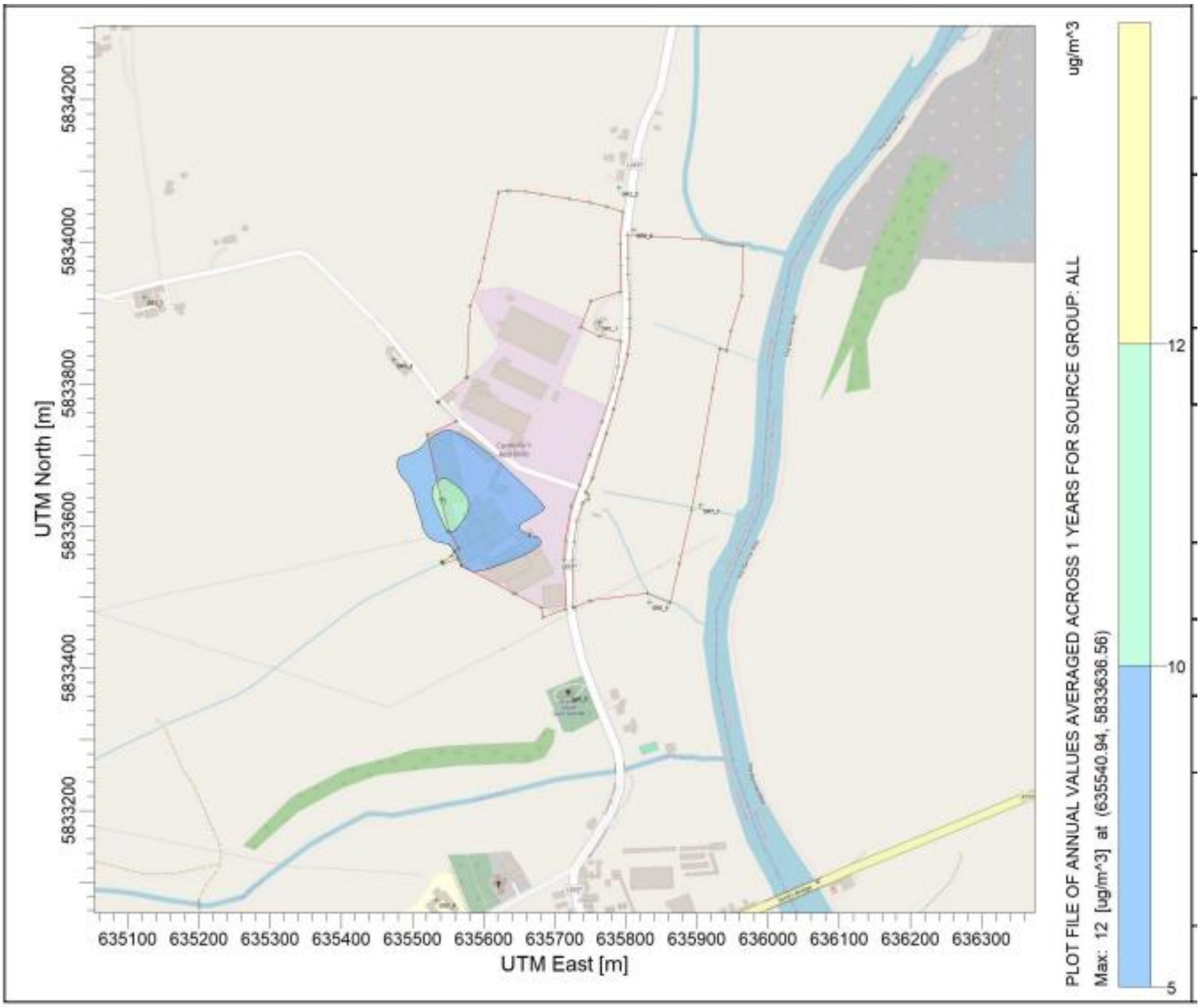


Figure 3-2:Process Contribution PM10 – Annual Mean (90.4th%ile) for 2019 for 12 week harvest at 75% volumetric flow



3.1.2 Scenario 2.2 Long-term (Annual Mean)

Figure 3-3: Process Contribution PM10 – Annual Mean (90.4th%ile) for 2019 for August (2019) ending harvest at 100% volumetric flow

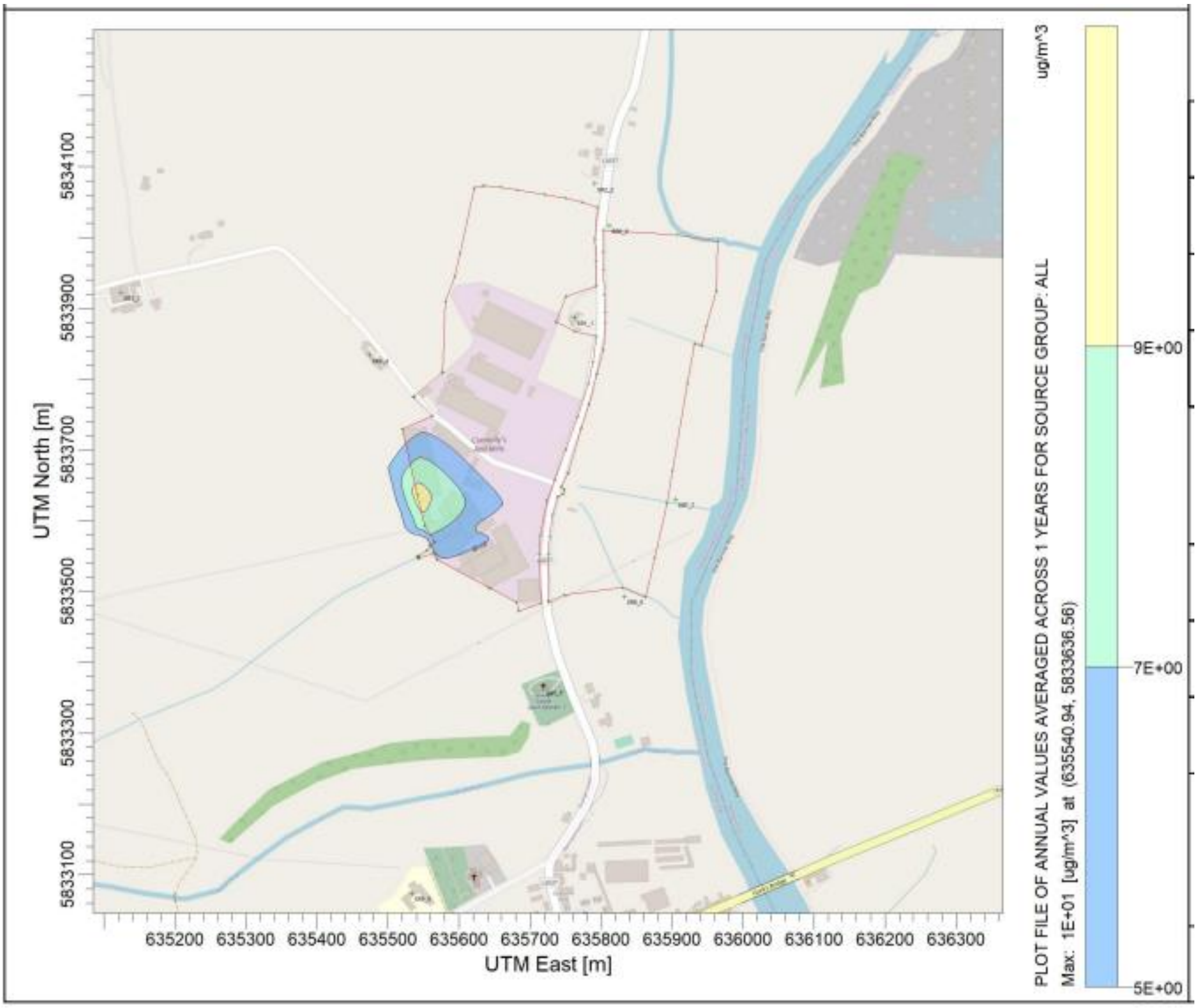
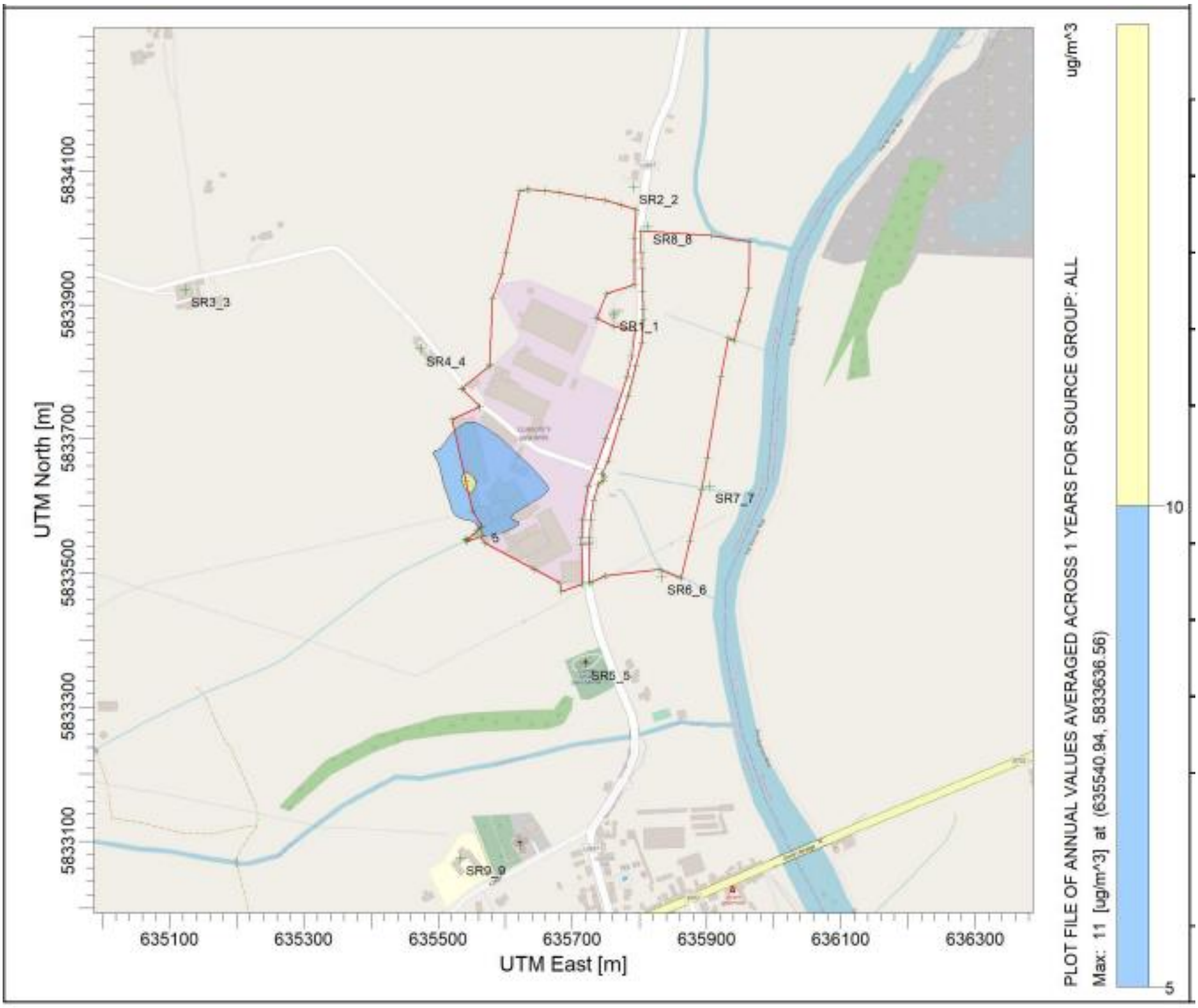


Figure 3-4: Process Contribution PM10 – Annual Mean (90.4th%ile) for 2019 for September (2019) ending harvest at 100% volumetric flow



3.1.3 Short-term (24-hr Mean)

Figure 3-5:Process Contribution PM_{10} – 24-hr (90.4th%ile) for 2019 for 12 week harvest at 100% volumetric flow

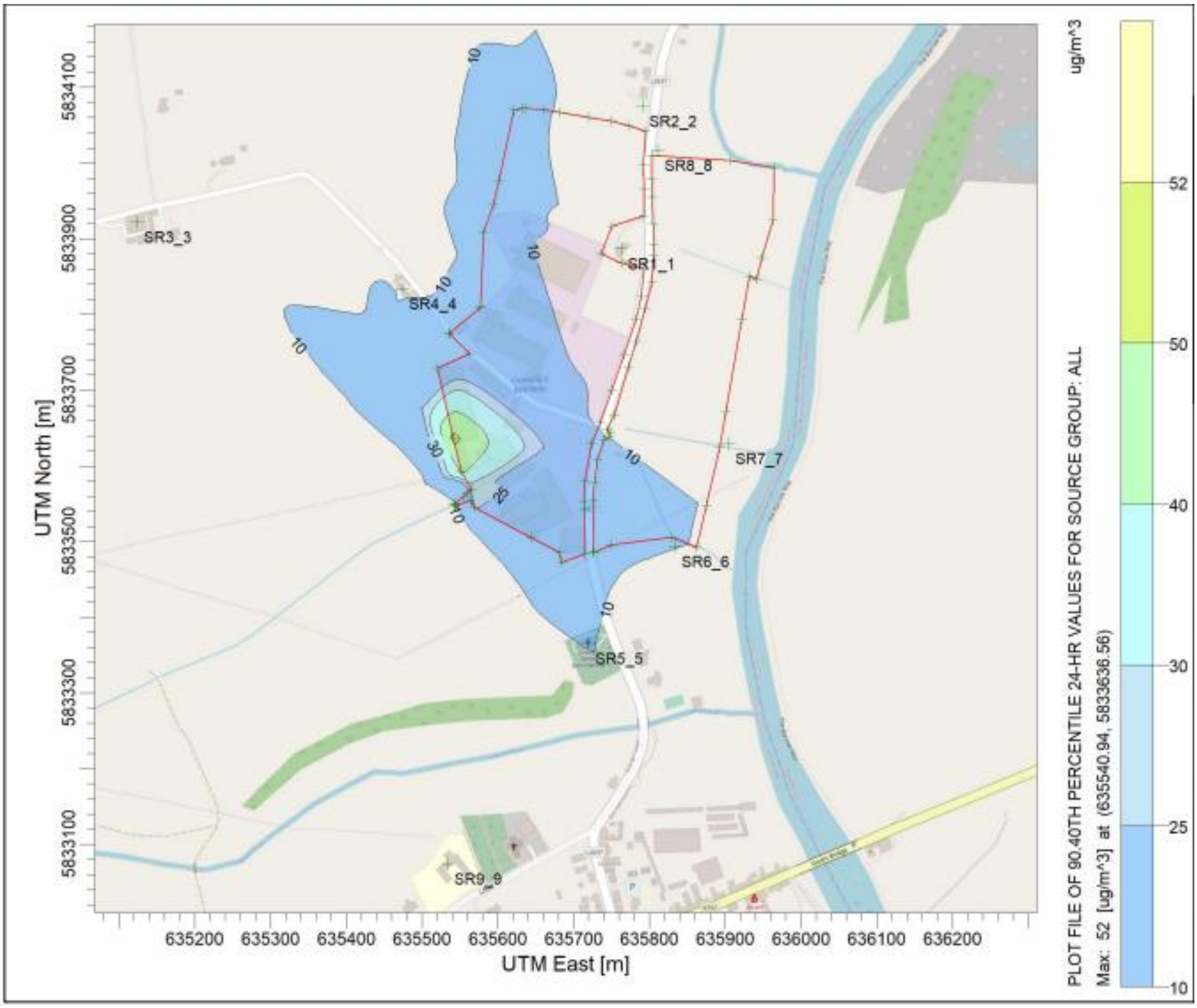


Figure 3-6:Process Contribution PM10 – 24-hr (90.4th%ile) Feed Mill for 2019 for 12 week harvest at 100% volumetric flow

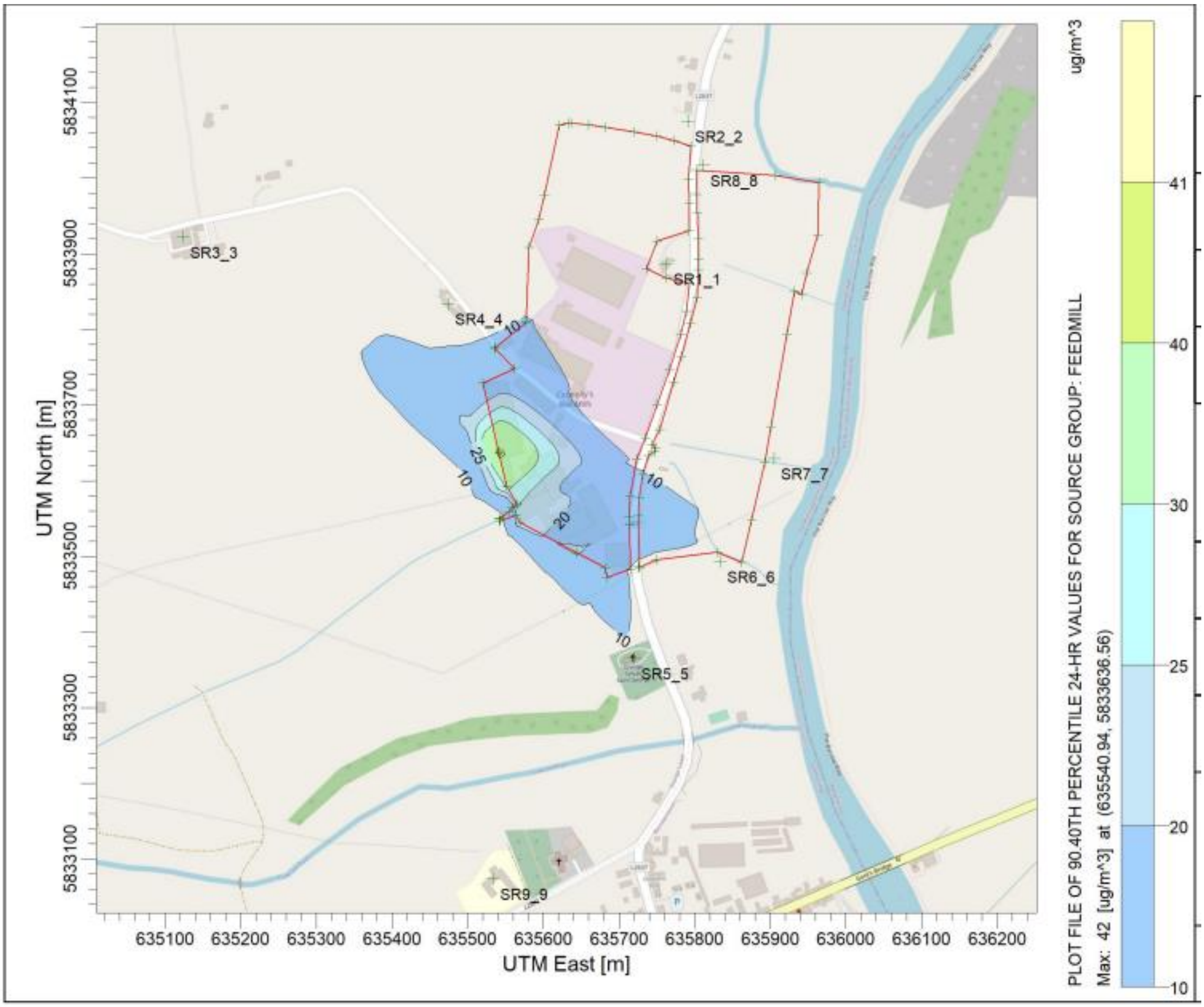
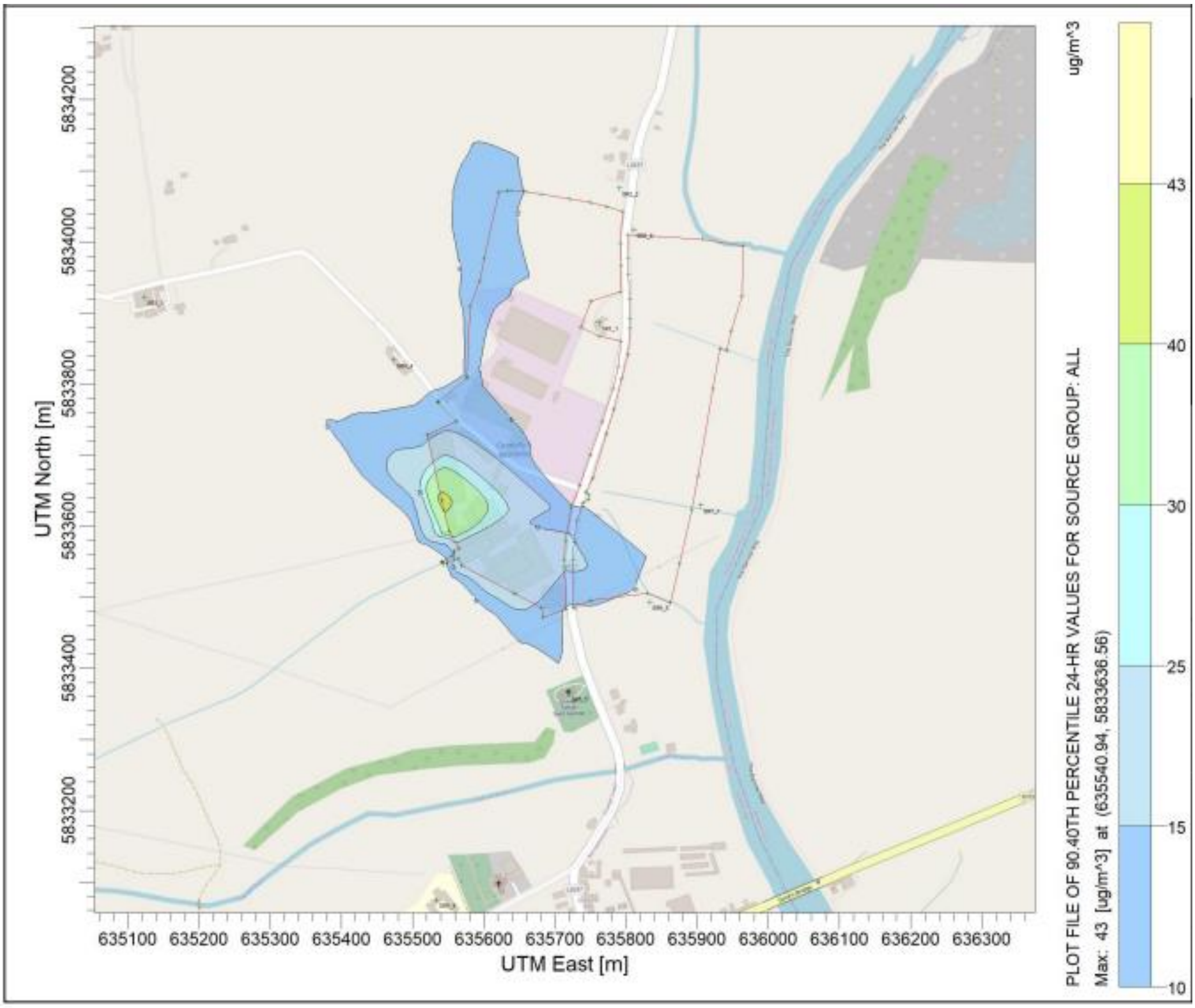


Figure 3-7: Process Contribution PM10 – 24-hr (90.4th%ile) for 2019 for 12 week harvest at 75% volumetric flow



3.1.4 Scenario 2.2 Short-term (24-hr Mean)

Figure 3-8:Process Contribution PM10 – 24-hr (90.4th%ile) for 2019 for August (2019) ending harvest at 100% volumetric flow

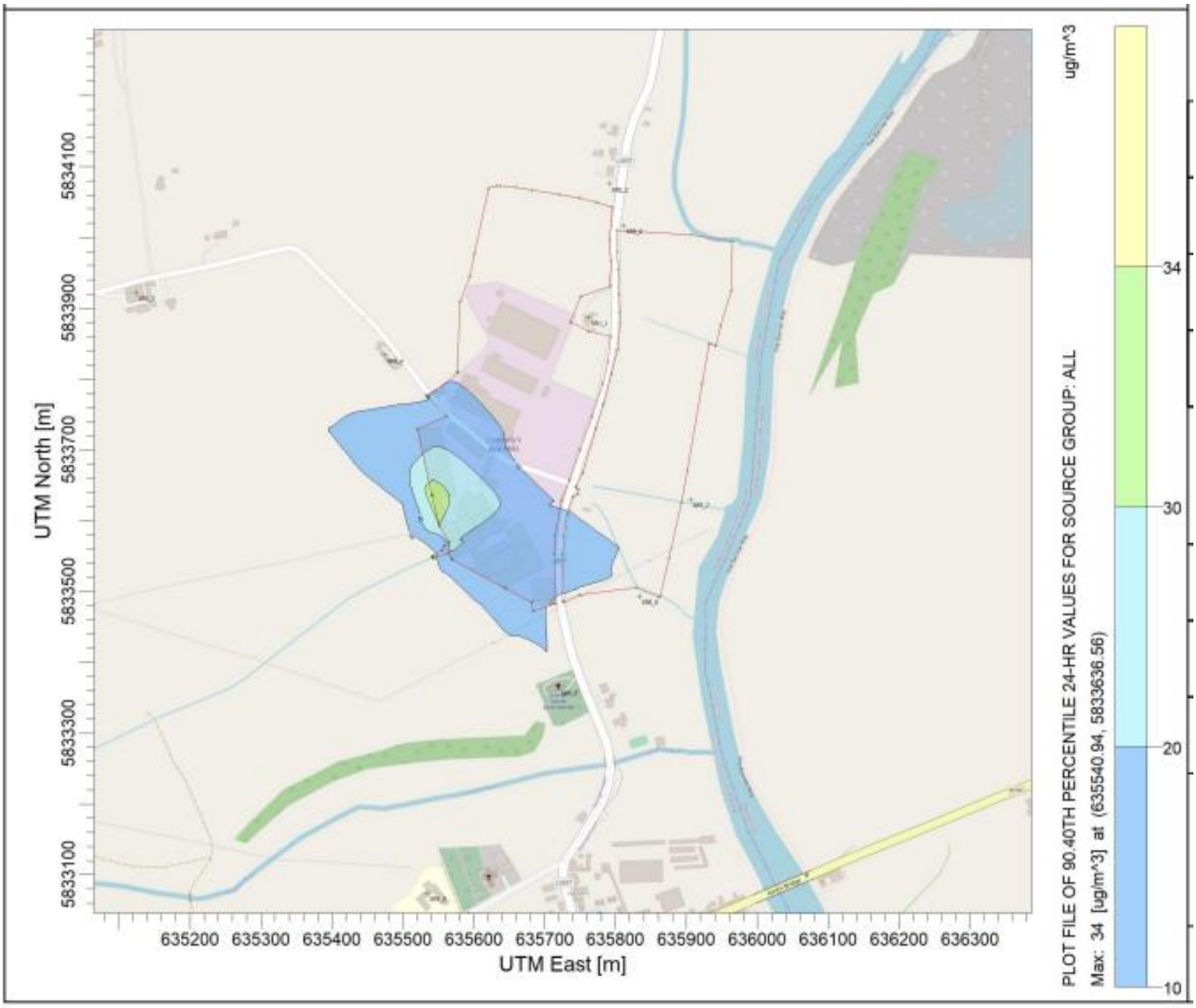
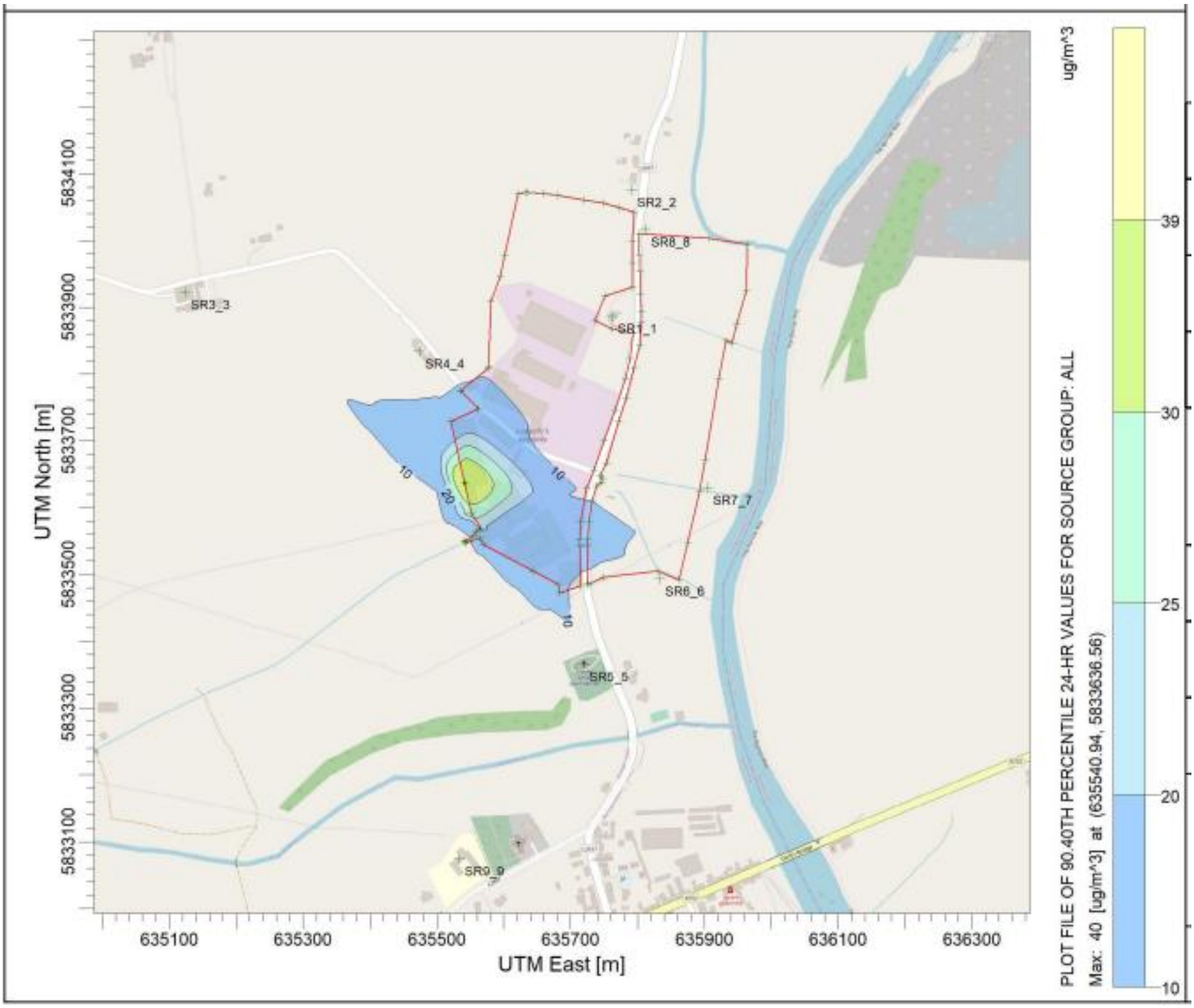


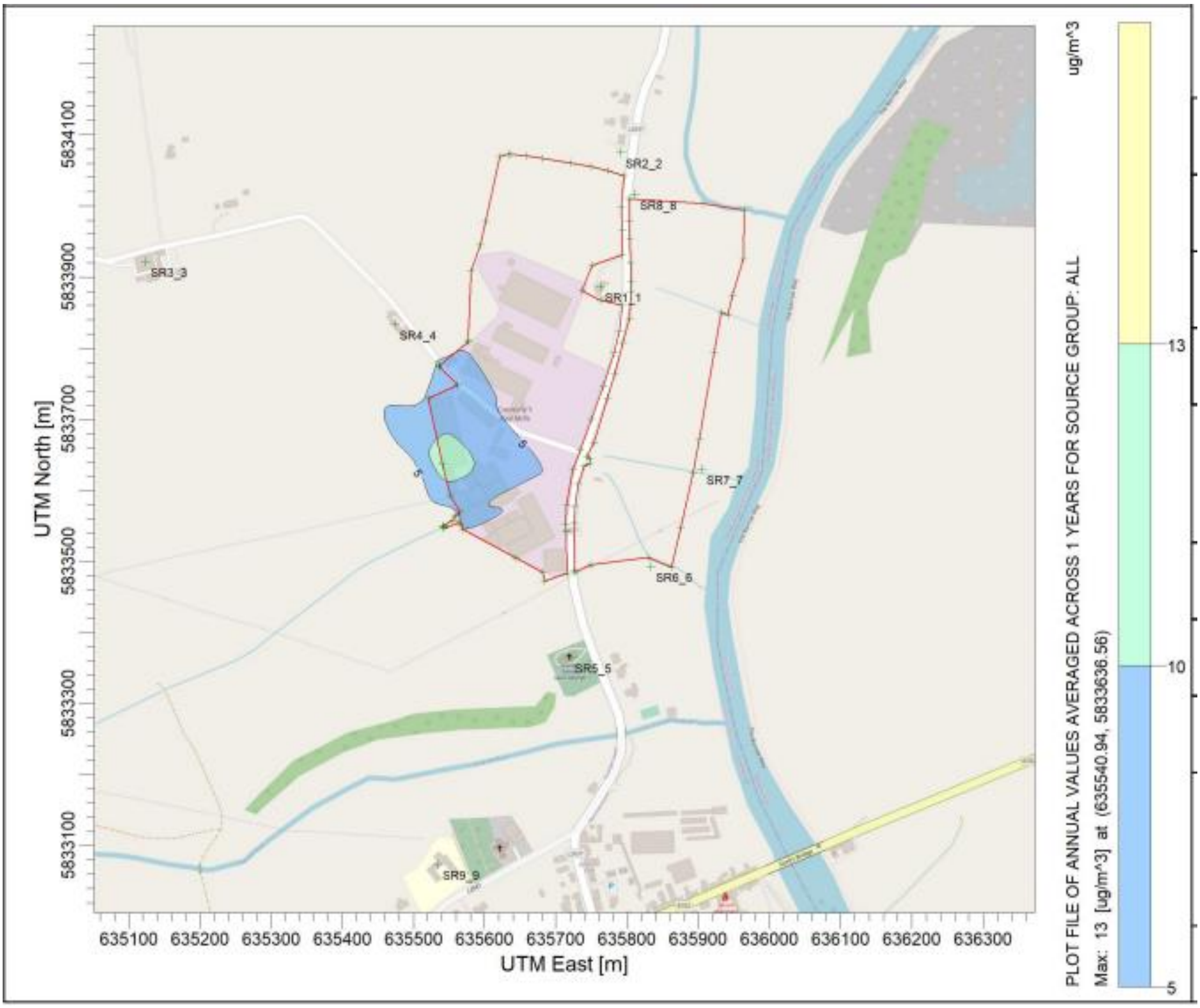
Figure 3-9: Process Contribution PM10 – 24-hr (90.4th%ile) for 2019 for September (2019) ending harvest at 100% volumetric flow



3.2 Scenario 3.1

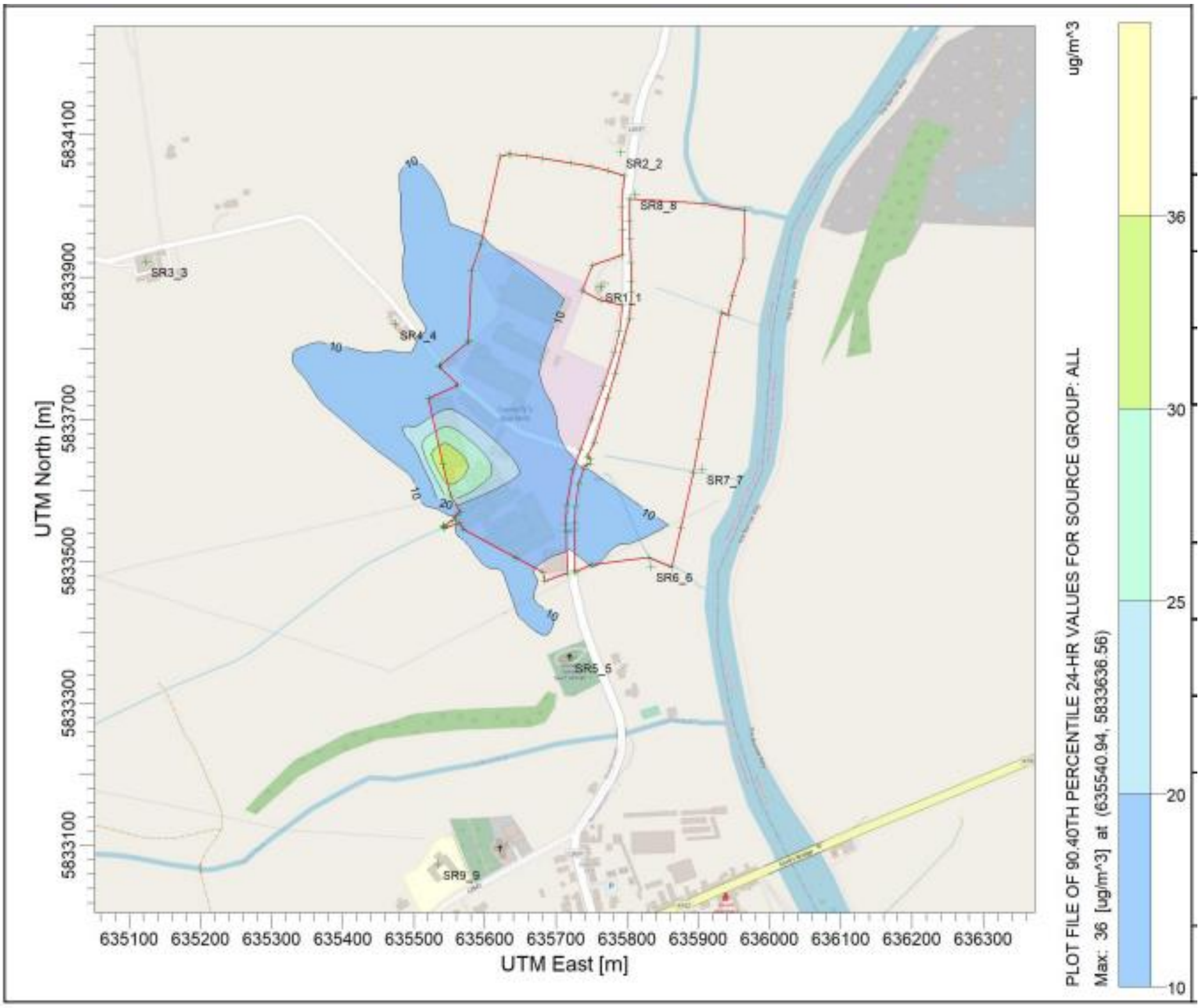
3.2.1 Long-term (Annual Mean)

Figure 3-10: Process Contribution PM10 – Annual Mean (90.4th%ile) for 2021 for 12 week harvest at 100% volumetric flow



3.2.2 Short-term (24-hr Mean)

Figure 3-11:Process Contribution PM10 – 24-hr (90.4th%ile) for 2021 for 12 week harvest at 100% volumetric flow



3.3 Scenario 3.2

3.3.1 Long-term (Annual Mean)

Figure 3-12: Process Contribution PM10 – Annual Mean (90.4th%ile) for 2021 for 12 week harvest at 100% volumetric flow

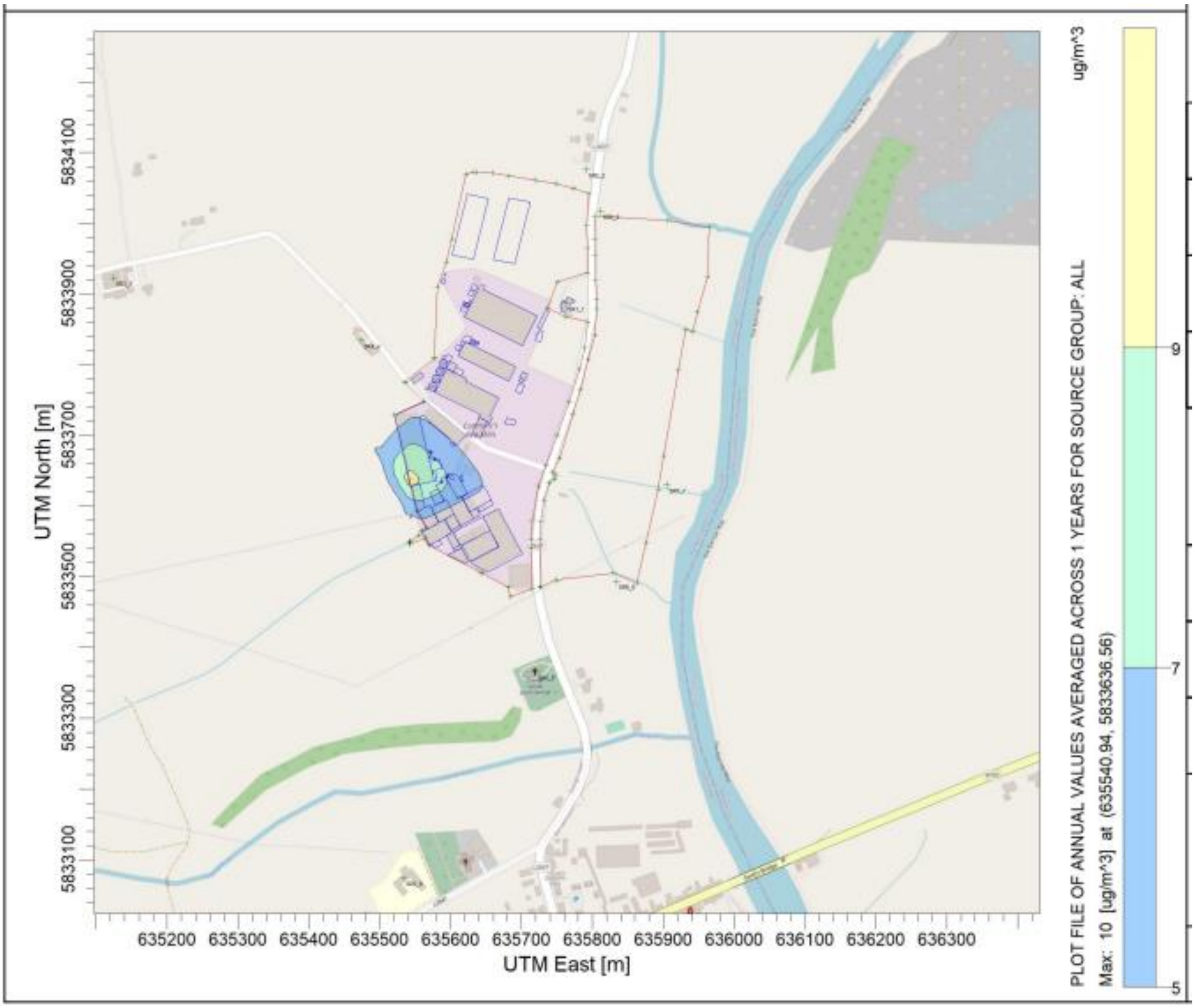


Figure 3-13:Process Contribution PM10 – Annual Mean (90.4th%ile) for 2021 for August (2021) ending harvest at 100% volumetric flow

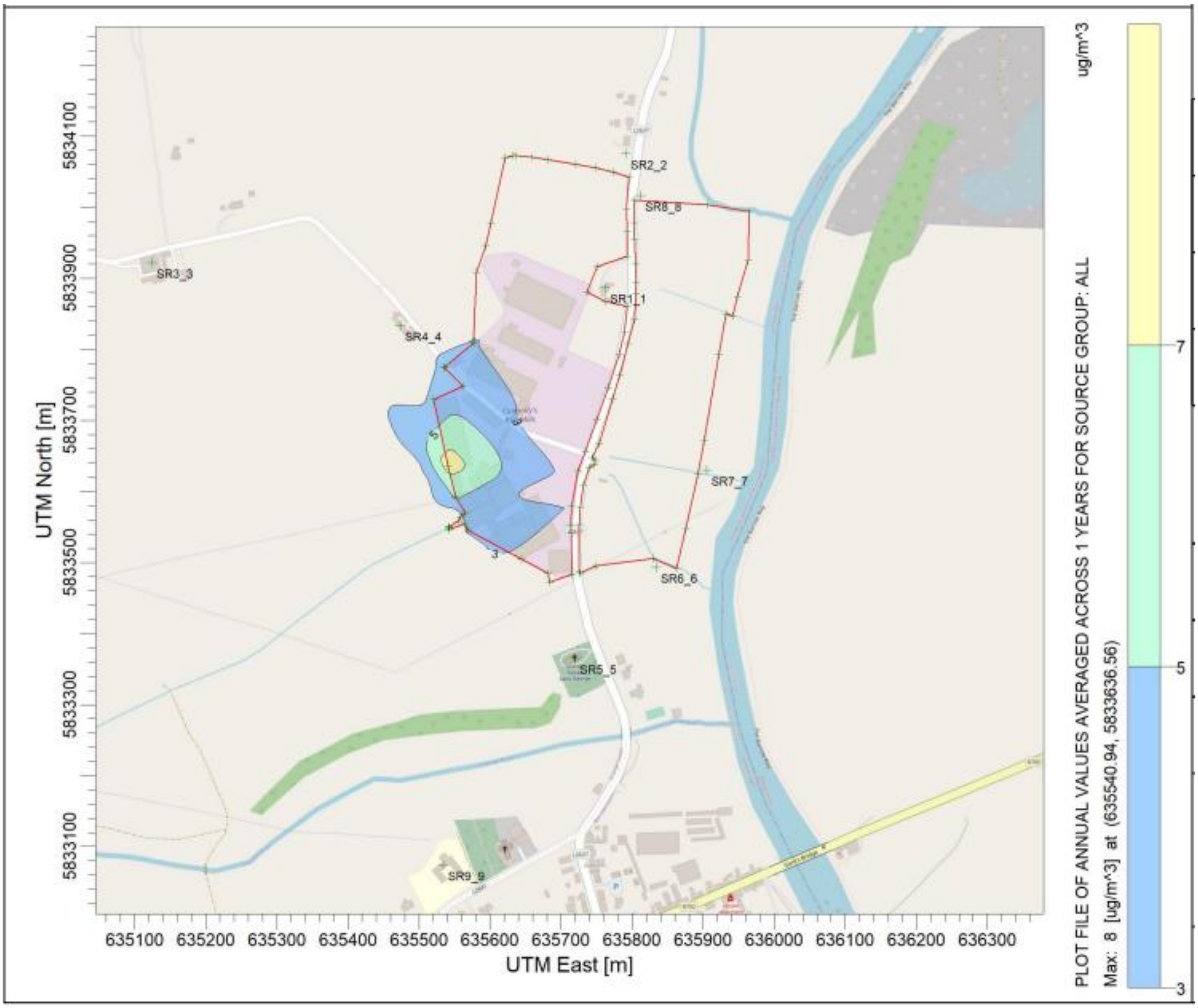


Figure 3-14: Process Contribution PM10 – Annual Mean (90.4th%ile) for 2021 for September (2021) ending harvest at 100% volumetric flow

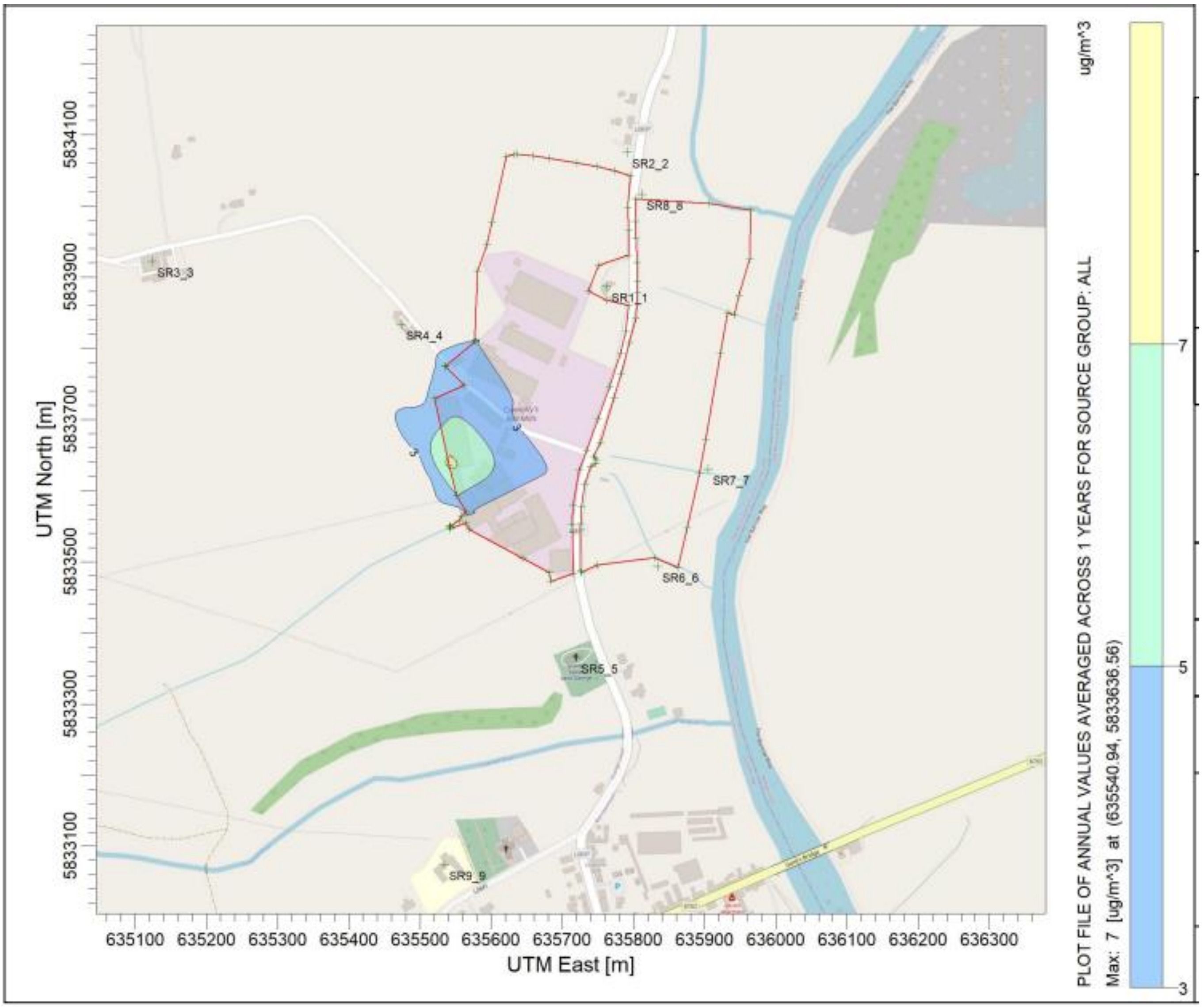
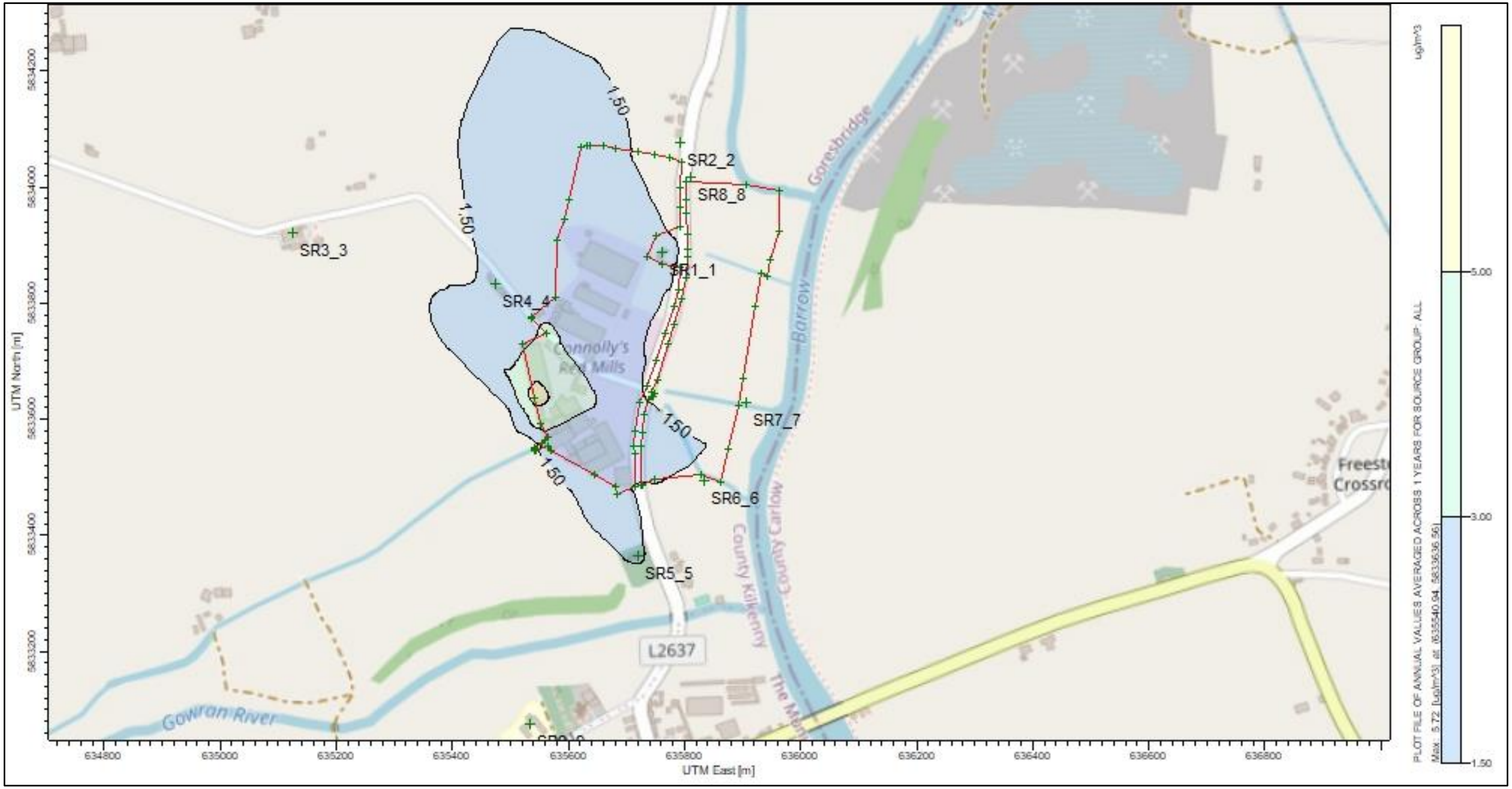


Figure 3-15: Process Contribution PM10 – Annual Mean (90.4th%ile) for 2021 for August (2021) ending harvest at 75% volumetric flow

Figure 3-16: Process Contribution PM10 – Annual Mean (90.4th%ile) for 2021 for September (2021) ending harvest at 75% volumetric flow



3.3.2 Short-term (24-hr Mean)

Figure 3-17: Process Contribution PM10 – 24-hr (90.4th%ile) for 2021 for 12 week harvest at 100% volumetric flow

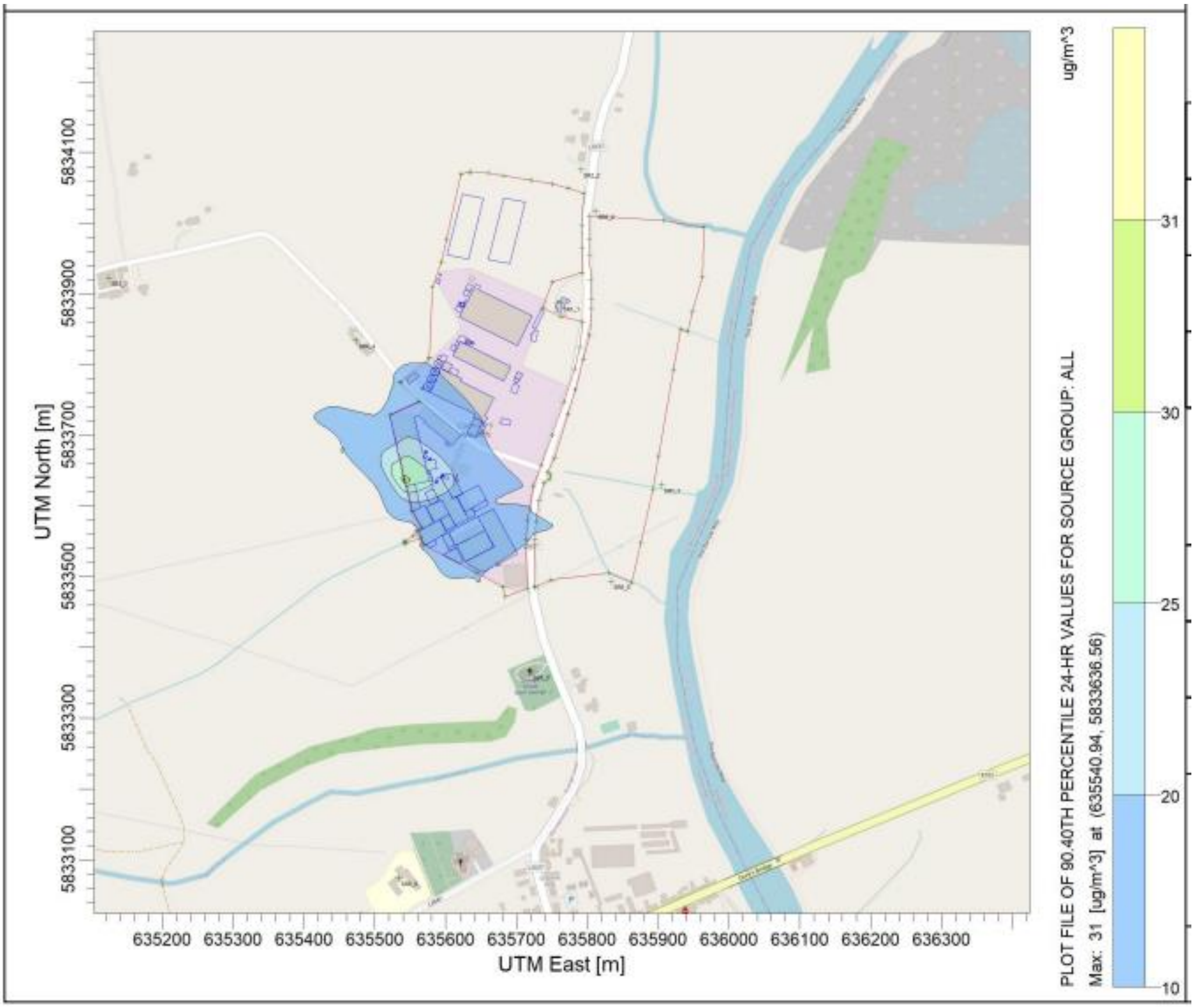


Figure 3-18:Process Contribution PM10 – 24-hr (90.4th%ile) for 2021 for August (2021) ending harvest at 100% volumetric flow

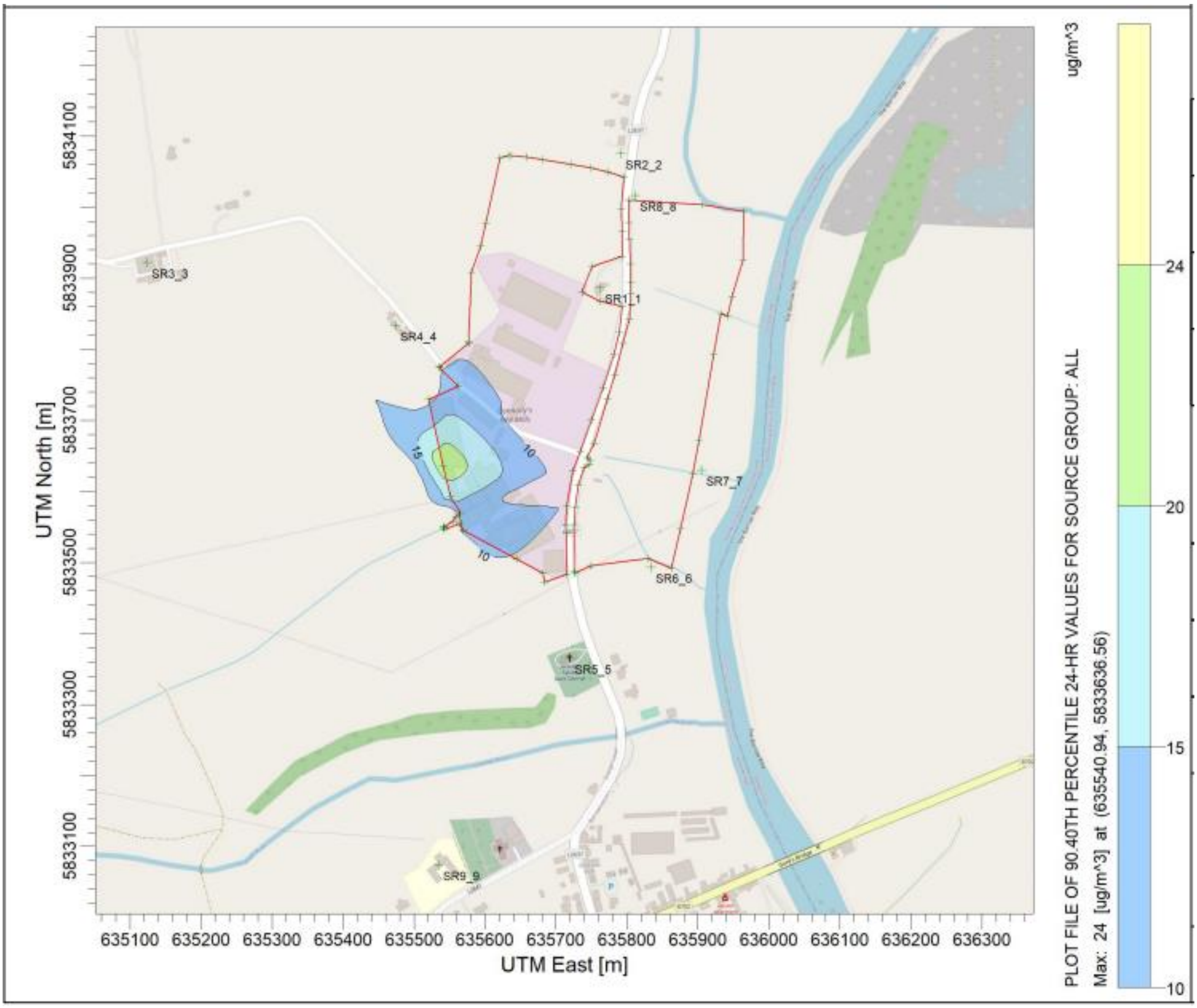


Figure 3-19: Process Contribution PM10 – 24-hr (90.4th%ile) for 2021 for September (2021) ending harvest at 100% volumetric flow

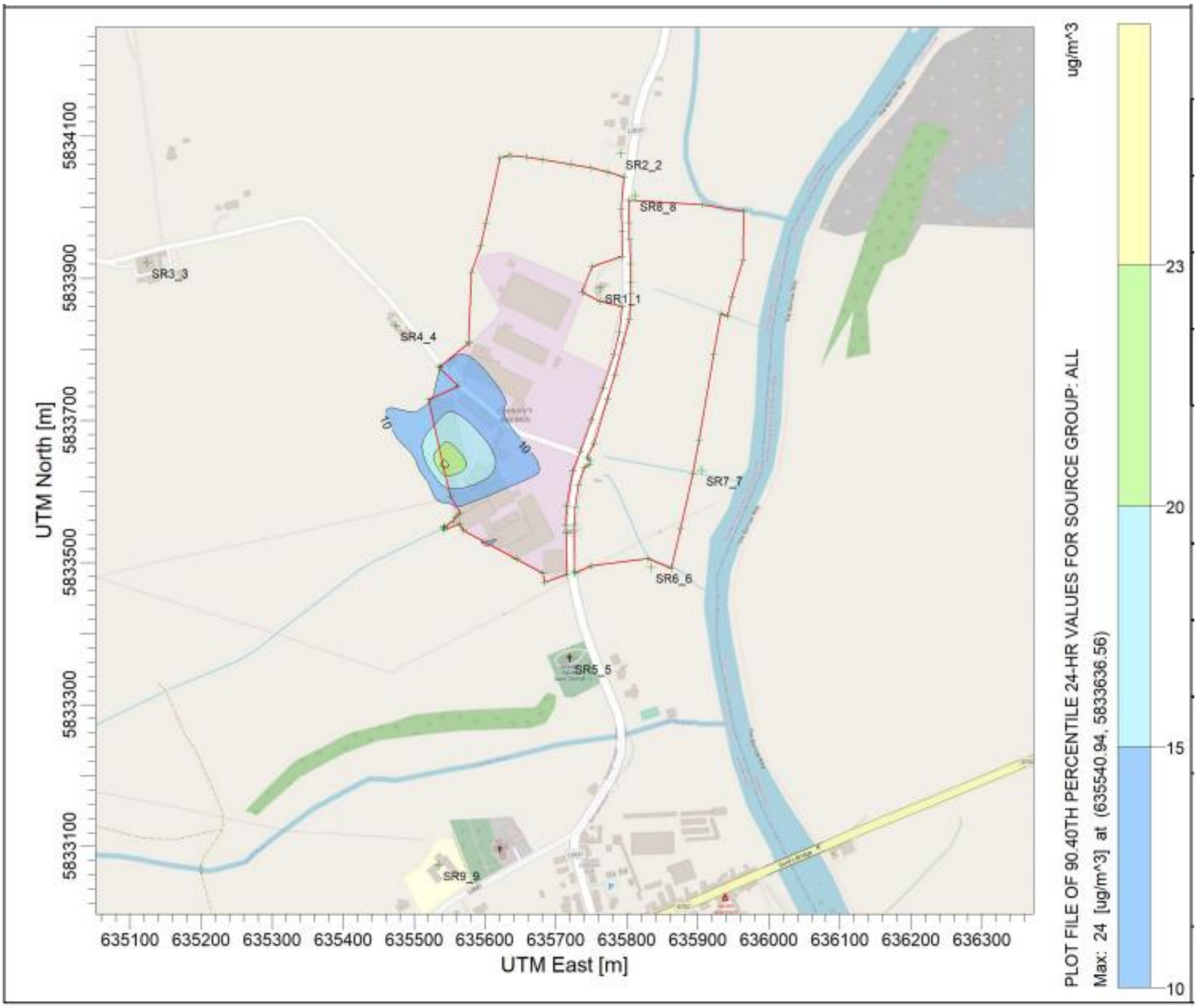


Figure 3-20: Process Contribution PM10 – 24-hr (90.4th%ile) for 2021 for August (2021) ending harvest at 75% volumetric flow

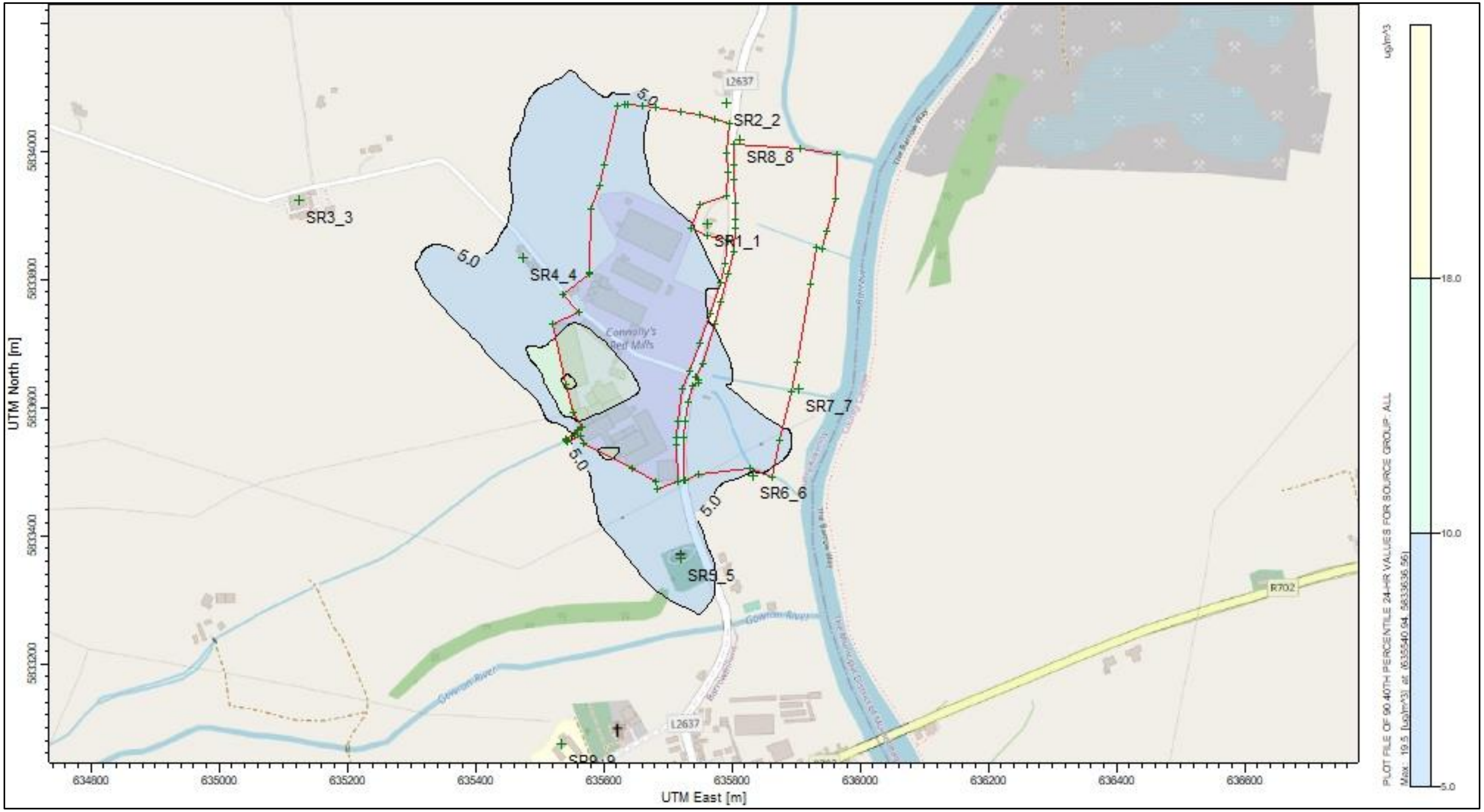
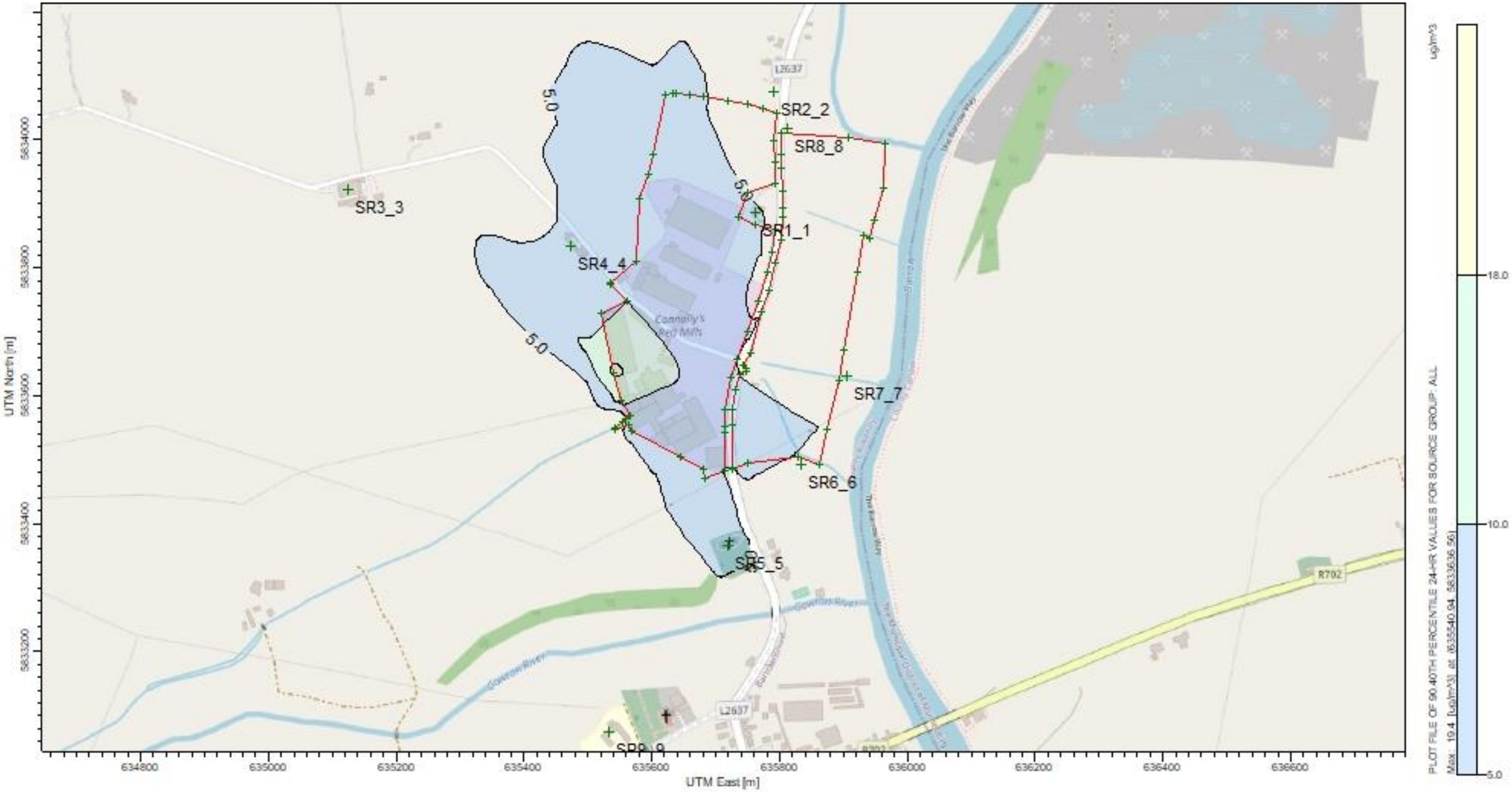


Figure 3-21: Process Contribution PM10 – 24-hr (90.4th%ile) for 2021 for September (2021) ending harvest at 75% volumetric flow

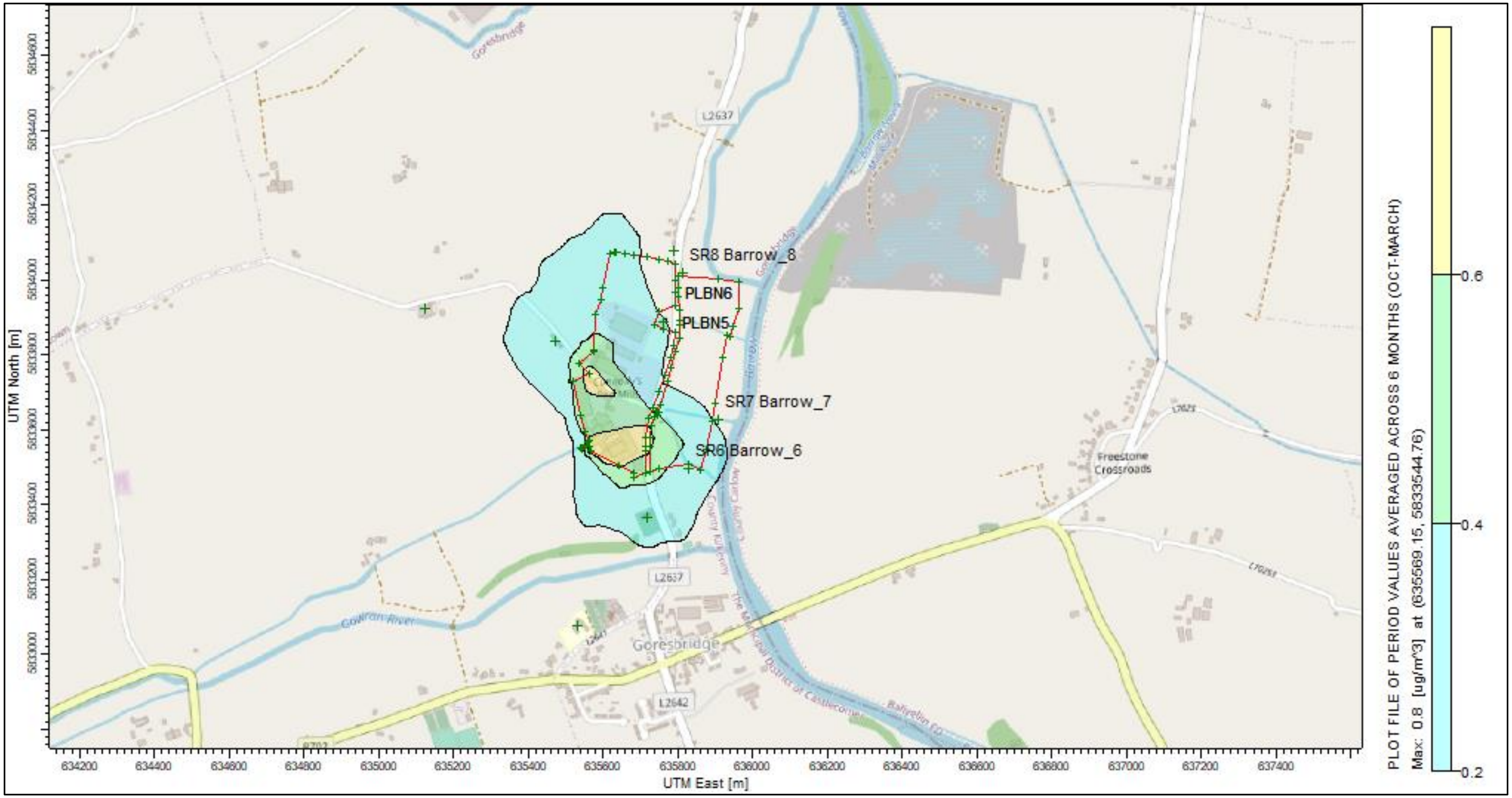


4 SO_2 FOR THE PROTECTION OF ECOSYSTEMS

Please note that contour plots display Process Contribution, i.e. background concentrations are not included. Contour plots are displayed for the met year when highest maximum off-site concentration occurred.

The contour plots below detail SO_2 concentrations for the Winter (October 1st to March 31st). Contour plot for annual mean SO_2 is shown in section 3 above.

Figure 4-1: Process Contribution for SO_2 - Winter period mean for October 2020 to March 2021 for 100% volumetric flow



Appendix D

Appendix D: Burner Specification Plots

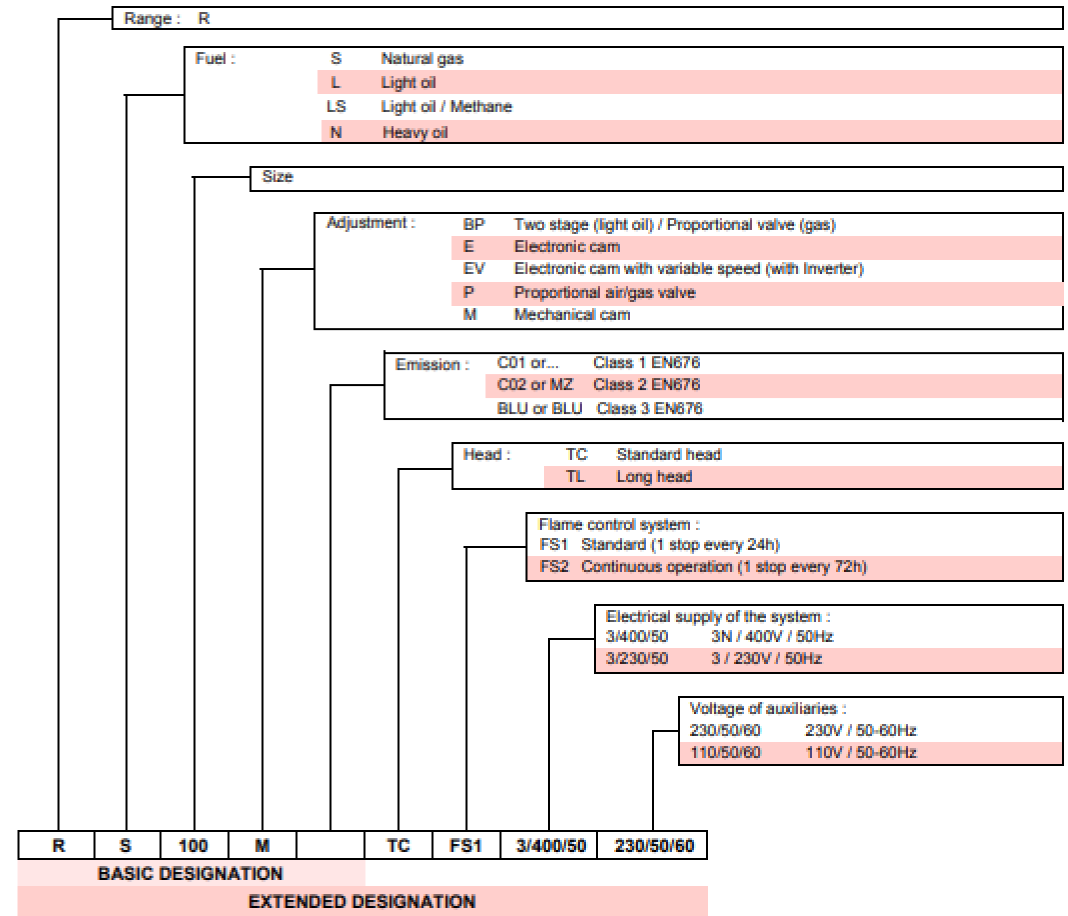
Contents

FIGURES

1 BURNER SPECIFICATION – RIELLO BURNERS 130/M

Figure 1-1:Riello Burners specification for model 130/M

3.1 Burner designation



3.2 Models available

Designation		Voltage	Diagnostic	Voltage	Diagnostic
RS 70/M	TC	3 ~ 400 / 230V - 50Hz	3789600 - 3789610	3 ~ 380 / 220V - 60Hz	3787082
RS 70/M	TL	3 ~ 400 / 230V - 50Hz	3789601 - 3789611	3 ~ 380 / 220V - 60Hz	3787083
RS 100/M	TC	3 ~ 400 / 230V - 50Hz	3789700 - 3789710	3 ~ 380 / 220V - 60Hz	3787282
RS 100/M	TL	3 ~ 400 / 230V - 50Hz	3789701 - 3789711	3 ~ 380 / 220V - 60Hz	3787283
RS 130/M	TC	3 ~ 400 / 230V - 50Hz	3789800 - 3789810	3 ~ 380 / 220V - 60Hz	3787482
RS 130/M	TL	3 ~ 400 / 230V - 50Hz	3789801 - 3789811	3 ~ 380 / 220V - 60Hz	3787483

3.3 Burner categories - Countries of destination

Country of destination	Gas category
BE	I2E(R) - I3
CY - CZ - MT	I3B/P
LU - PL	II2E3B/P
DE	II2ELL3B/P
FR	II2Er3P
IT	II2H3
ES - GB - IE - PT	II2H3
AT - CH - CZ - DK - EE - FI - GR - HU - IE IS - LT - NO - SE - SI - SK - TR	II2H3B/P
NL	II2L3B/P

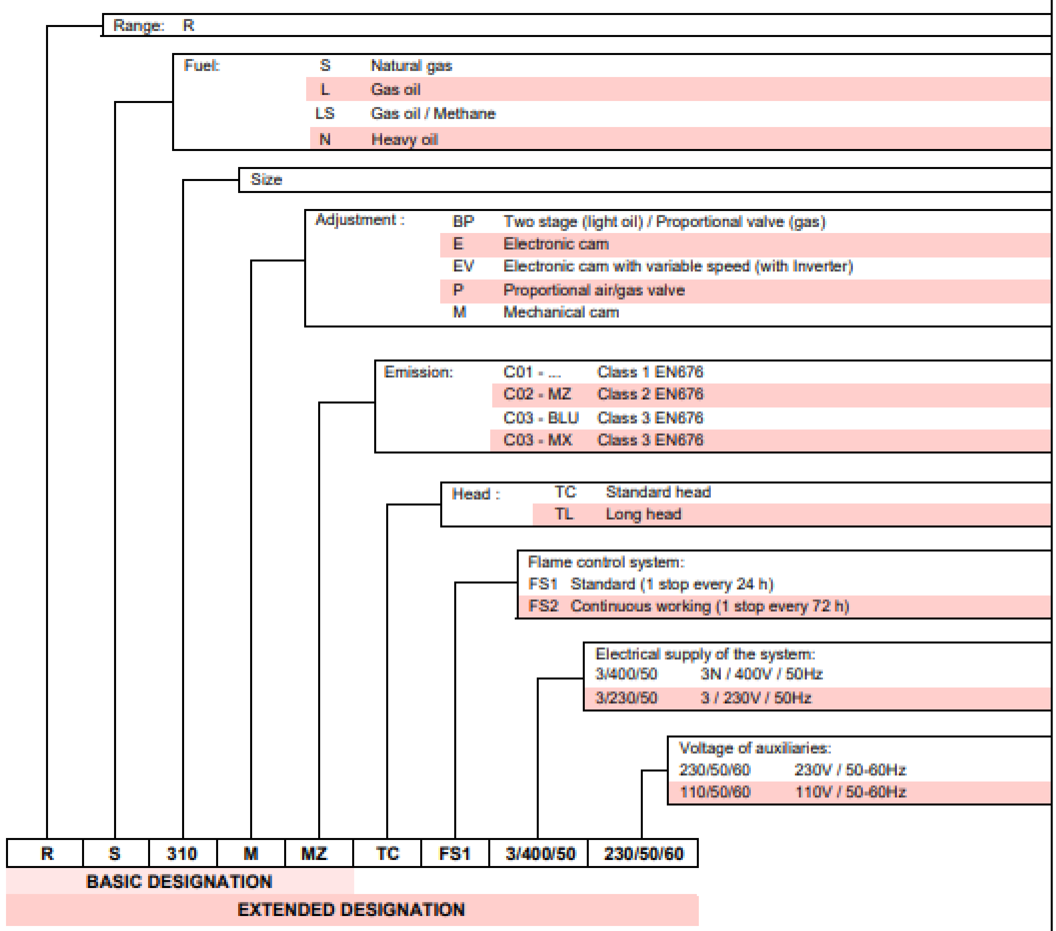
5 GB

6461

2 BURNER SPECIFICATION – RIELLO BURNERS 310/M

Figure 2-1:Burner Specification for Riello Burners Model 310/M

4.1 Burner designation



4.2 Models available

Designation	Voltage	Start-up	Code
RS 310/M MZ	3/400/50	Star/Triangle	20061373
	3/230/50	Direct	20068343
	3/400/50	Direct	20068351

3 EXTRACT FROM EN676 FORCED BROUGHT BURNERS FOR GASEOUS FUELS

- The NO_x content NO_x of the combustion products is expressed under the following reference conditions:
  - Ambient temperature: 20°C degrees; and,
  - Abs humidity 10g H_2O/kg dry air.

Where the burner is designed to operate on more than one gas family, after adjustments, the maximum NO_x levels shall be given as below:

- 170 mg/kWh when the burner is tested at the supply voltage given in the instructions with reference gas G20 for 2nd family gases of group H and Ep;
- 170 mg/kWh when the burner is tested at the supply voltage given in the instructions with reference gas G25 for 2nd family gases of group L;
- 230 mg/kWh when the burner is tested at the supply voltage given in the instructions with reference gas 31 for 3rd family gases

3.1 NOx classes for burners relevant to the Red Mills Facility

Where the burner is designed to operate on 2nd family gas and/or 3rd family gases the maximum NO_x levels shall be in accordance with:

Figure 3-1:NOx emissions relevant to the burner class, extracted from the EN676 standard

Class	NO_x-emissions Q_{NO_x} in mg/kWh	
	2nd family groups H, E and L	3rd family
1	≤ 170	≤ 230
2	≤ 120	≤ 180
3	≤ 80	≤ 140
4	≤ 60	≤ 110

Note that:

- The maximum NOx value shall not exceed 170 mg/KwH for 2nd family gas and 230 mg/kWh for 3rd family gas;
- No measured value shall exceed that of the next NO_x class up.

Appendix E

17 February 2022

Klara Kovacic

Malone O'Regan Environmental

Ground Floor - Unit 3

Bracken Business Park

Bracken Road, Sandyford

Dublin 18, D18 V32Y

Klara,

Please find below a brief description in relation to the dryer operation.

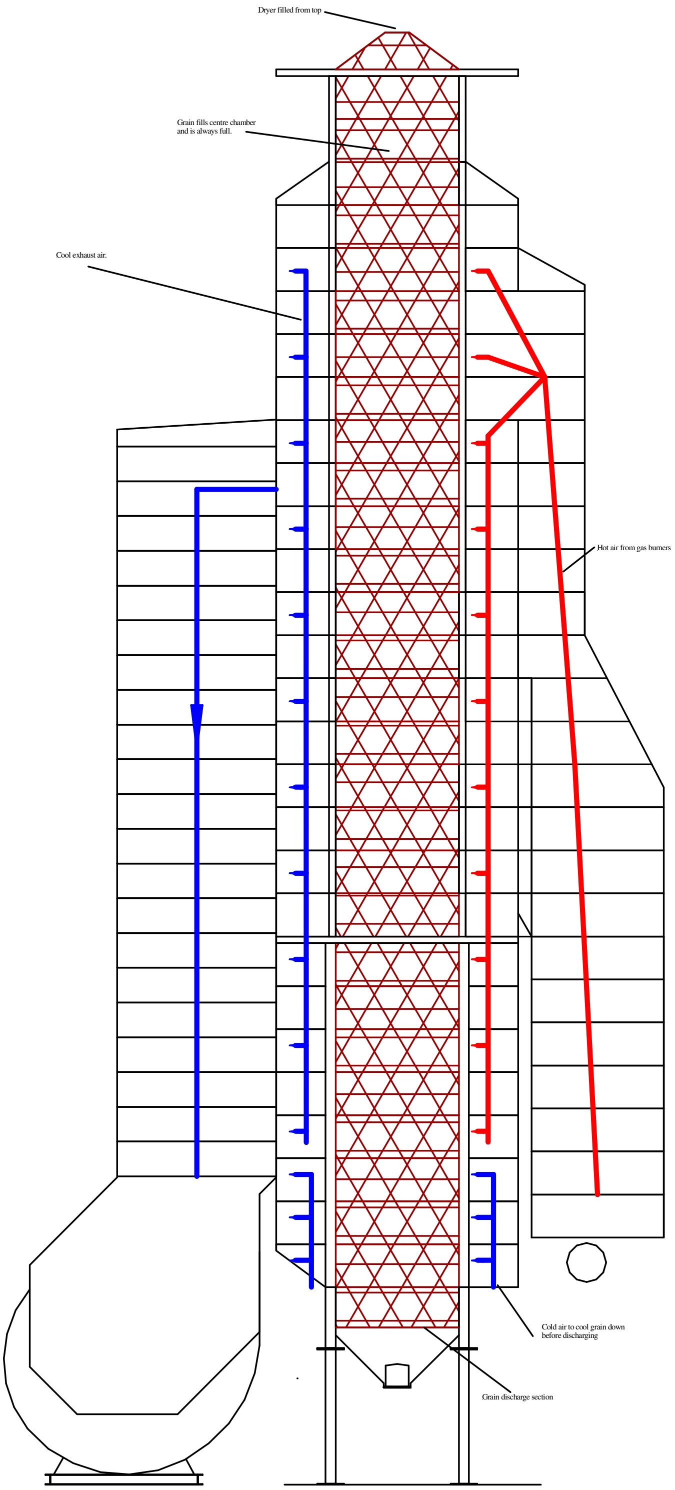
1. The dryer is initially filled with grain. It is the centre column of the dryer as shown in the attached schematic, and it is filled to the top.
2. The dryers fans are then switched on, and subsequently the gas burners are switched on.
3. Hot air from the burner side of the dryer is drawn across the column of the grain and is exhausted on the opposite side via the fans. Note that the grain is not moving and is static.
4. At intervals which can vary from 3minutes to 5 minutes, a series of slides open at the bottom discharge section of the dryer.
5. When this occurs grain flows out of the bottom of the dryer, and the column of grain within the dryer moved down over a 10 second period.
6. During this 10 seconds discharge period (as the grain is in motion) a fine dust will be emitted from the fan exhaust.
7. However, to significantly reduce this, during this 10 seconds discharge period, the airflow through the dryer is reduced to approximately 30%.

8. The exhaust air directed into the high stack.
9. After the 10 second period the grain will have settled in the dryer and is static again.
10. Full airflow is resumed.
11. This cycle continuously repeats during the drying process.
12. Note that when the airflow through the dryer is reduced on discharge, the firing rate of the gas burners are set reduce so as not to have excessive heat during the discharge period.

I hope that you find this quotation of interest and if you have any questions please do not hesitate to contact me.

Yours sincerely,

Fergus O'Brien.



Panford Ltd	Parkway Building, Whitestown Ind Est, Tallaght, Dublin 24. Tel: 01-4596756; Fax: 01-4610452
Proposal For: Connelly's Redmills Project: Grain Dryer elevation view Drawn By: Fergus O'Brien Date: 21-11-21 Scale: Not to scale Reference: CR211121P1	Grain Dryer

Appendix F

MODEL OVERVIEW

AERMOD is applicable to rural and urban areas, flat and complex terrain, surface and elevated releases, and multiple sources (including, point, area and volume sources). Every effort has been made to avoid model formulation discontinuities wherein large changes in calculated concentrations result from small changes in input parameters.

AERMOD is a steady-state plume model. In the stable boundary layer (SBL), the concentration distribution is assumed to be Gaussian in both the vertical and horizontal. In the convective boundary layer (CBL), the horizontal distribution is assumed to be Gaussian, but the vertical distribution is described with a bi-Gaussian probability density function (p.d.f.). Additionally, in the CBL, AERMOD treats “plume lofting,” whereby a portion of plume mass, released from a buoyant source, rises to and remains near the top of the boundary layer before becoming mixed into the CBL. AERMOD also tracks any plume mass that penetrates into elevated stable layer, and then allows it to re-enter the boundary layer when and if appropriate.

AERMOD incorporates, with a new simple approach, current concepts about flow and dispersion in complex terrain. Where appropriate the plume is modelled as either impacting and/or following the terrain. This approach has been designed to be physically realistic and simple to implement while avoiding the need to distinguish among simple, intermediate and complex terrain, as is required by present regulatory models. As a result, AERMOD removes the need for defining complex terrain regimes; all terrain is handled in a consistent, and continuous manner that is simple while still considering the dividing streamline concept (Snyder, et al., 1985) in stably-stratified conditions.

One of the major improvements that AERMOD brings to applied dispersion modelling is its ability to characterize the PBL through both surface and mixed layer scaling. AERMOD constructs vertical profiles of required meteorological variables based on measurements and extrapolations of those measurements using similarity (scaling) relationships. Vertical profiles of wind speed, wind direction, turbulence, temperature, and temperature gradient are estimated using all available meteorological observations. AERMOD was designed to run with a minimum of observed meteorological parameters. AERMOD can operate using data of a type that is readily available from an NWS station. AERMOD requires only a single surface (generally, 10m) measurement of wind speed (reference wind speed (between 7 z0 and 100m)), direction and ambient temperature (reference temperature). AERMOD also needs observed cloud cover and requires the full morning upper air sounding (RAWINSONDE). In addition to the morning and afternoon mixing heights derived form that sounding, AERMOD needs surface characteristics (surface roughness, Bowen ratio, and albedo) in order to construct its PBL profiles.

AERMOD accounts for the vertical inhomogeneity of the PBL. This is accomplished by “averaging “ the parameters of the actual PBL into “effective” parameters of an equivalent homogenous PBL.

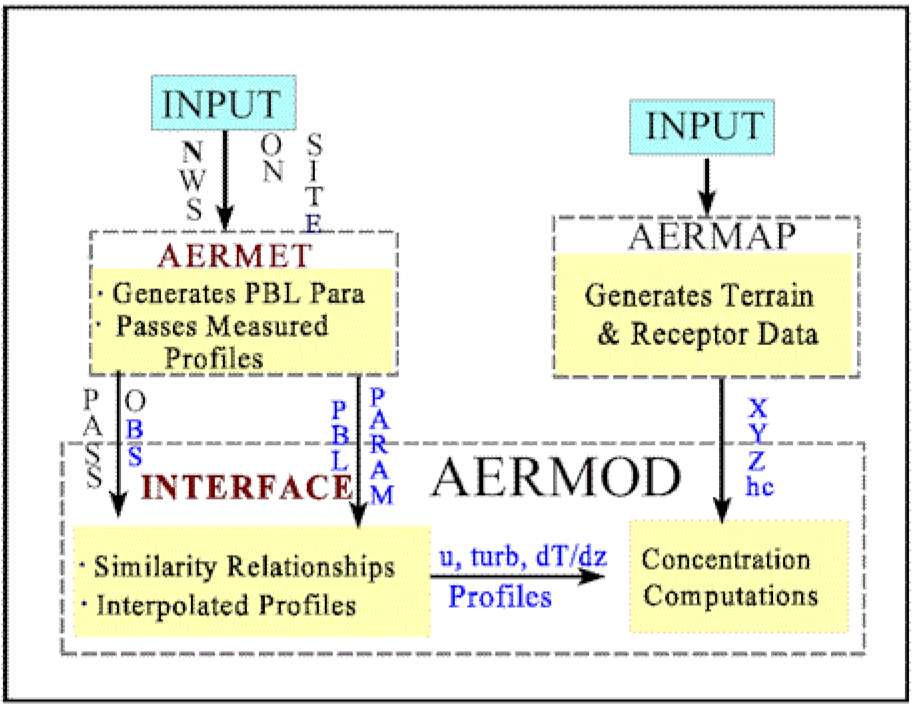


Figure 1: Data Flow in the AERMOD Modelling System

Figure 1 shows the flow and processing of information in AERMOD. The modelling system consists of one main program (AERMOD) and two pre-processors (AERMET and AERMAP). The major purpose of AERMET is to calculate boundary layer parameters for use by AERMOD. The meteorological INTERFACE, internal to AERMOD, uses these parameters to generate profiles of the needed meteorological variables. In addition, AERMET passes all meteorological observations to AERMOD.

Surface characteristics in the form of albedo, surface roughness and Bowen ratio, plus standard meteorological observations (wind speed, wind direction, temperature, and cloud cover), are input to AERMET. AERMET then calculates the PBL parameters: friction velocity (u*), Monin-Obukhov length (L), convective velocity scale (w*), temperature scale (*), mixing height (z i), and surface heat flux (H). These parameters are then passed to the INTERFACE (which is within AERMOD) where similarity expressions (in conjunction with measurements) are used to calculate vertical profiles of wind speed (u), lateral and vertical turbulent fluctuations (v , w), potential temperature gradient (d/dz), potential temperature, and the horizontal Lagrangian time scale (TLy).

The AERMOD terrain pre-processor AERMAP uses gridded terrain data to calculate a representative terrain-influence height (hc), also referred to as the terrain height scale. The terrain c height scale h , which is uniquely defined for each receptor location, is used to calculate the c dividing streamline height. The gridded data needed by AERMAP is selected from Digital Elevation Mapping (DEM) data. AERMAP is also used to create receptor grids. The elevation for each specified receptor is automatically assigned through AERMAP. For each receptor, AERMAP passes the following information to AERMOD: the receptor's location (xr , yr), its height above mean sea level (zr), and the receptor specific terrain height scale (hc).

Further detailed information about AERMOD can be found at https://www.epa.gov/scram/air-quality-dispersion-modeling-preferred-and-recommended-models

Appendix G


N
W
E
S
Legend
IE Red Line Boundary
Major Emission Points to Air - Dryers
Major Emissions Points to Air - Seed Plant
Major Emission Points to Air - Feed Mill
Major Emission Points to Air - Replacement Dryer 6
Map 1
Map 2
Map 3
0
400
800 m
© Google Satellites 2022.
MALONE O'REGAN ENVIRONMENTAL
Ground Floor – Unit 3, Bracken Business Park, Bracken Road, Sandyford, Dublin 18. D18V32Y
Tel: +353 1 567 7655
Email: enviro@mores.ie
Client
Connolly's Red Mills
Job No.
E1835
Drawing
Major Air Emission Points
Drawing No.
01
Status
Final
Sheet Size & Scale
A3 1:3450
Date
31/03/22
Drawn
MG


N
W
E
S
Legend
IE Red Line Boundary
Major Emission Points to Air - Replacement Dryer 6
A2-46B
A2-46A
A2-45B
A2-45A
A2-46C
0
60
120 m
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MALONE O'REGAN ENVIRONMENTAL
Ground Floor – Unit 3, Bracken Business Park, Bracken Road, Sandyford, Dublin 18. D18V32Y
Tel: +353 1 567 7655
Email: enviro@mores.ie
Client
Connolly's Red Mills
Job No.
E1835
Drawing
Major Air Emission Points - Map 1
Drawing No.
02
Status
Final
Sheet Size & Scale
A4 1:500
Date
31/03/22
Drawn
MG

N
W
E
S
Legend
IE Red Line Boundary
Major Emission Points to Air - Dryers
Major Emissions Points to Air - Seed Plant
A2-37
A2-36
A2-34
A2-33
A2-35
A2-32
A2-40
A2-41
A2-42
A2-39
A2-38
A2-49
A2-48
0
60
120 m
© Google Satellites 2022.
MALONE O'REGAN ENVIRONMENTAL
Ground Floor – Unit 3, Bracken Business Park, Bracken Road, Sandyford, Dublin 18. D18V32Y
Tel: +353 1 567 7655
Email: enviro@mores.ie
Client
Connolly's Red Mills
Job No.
E1835
Drawing
Major Air Emission Points - Map 2
Drawing No.
03
Status
Final
Sheet Size & Scale
A4 1:500
Date
31/03/22
Drawn
MG


N
S
W
E
Legend
IE Red Line Boundary
Major Emission Points to Air - Dryers
Major Emission Points to Air - Feed Mill (Scenario 2 Harvest 2022)
A1-2
A1-1
A2-15
A2-31
A2-30A
A2-30B
A2-23
A2-12
A2-13
A2-16
A2-22
A2-17
A2-11
A2-4
A2-7
A2-6
A2-10
A2-9
A2-8
A2-20
A2-18
A2-19
A2-26
A2-1
A2-3
A2-2
A2-21
0
60
120 m
© Google Satellites 2022.
MALONE O'REGAN ENVIRONMENTAL
Ground Floor – Unit 3, Bracken Business Park, Bracken Road, Sandyford, Dublin 18. D18V32Y
Tel: +353 1 567 7655
Email: enviro@mores.ie
Client
Connolly's Red Mills
Job No.
E1835
Drawing
Major Air Emission Points - Map 3 (Feed Mill Scenario 2)
Drawing No.
04
Status
Final
Sheet Size & Scale
A4 1:500
Date
31/03/22
Drawn
MG

N
S
W
E
Legend
IE Red Line Boundary
Major Emission Points to Air - Dryers
Major Emission Points to Air - Feed Mill Scenario 3
A1-2
A1-1
A2-15
A2-31
A2-30A
A2-30B
A2-23
A2-12
A2-16
A2-22
A2-17
A2-11
A2-4
Grinders
A2-10
Flakers
A2-1
A2-3
A2-2
A2-21
MALONE O'REGAN ENVIRONMENTAL
Ground Floor – Unit 3, Bracken Business Park, Bracken Road, Sandyford, Dublin 18. D18V32Y
Tel: +353 1 567 7655
Email: enviro@mores.ie
Client
Connolly's Red Mills
Job No.
E1835
Drawing
Major Air Emission Points - Feed Mill Scenario 3
Drawing No.
04
Status
Final
Sheet Size & Scale
A4 1:500
Date
31/03/22
Drawn
MG
0
60
120 m
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