



GS YUASA BATTERY MANUFACTURING UK LIMITED

PERMIT NUMBER – EPR/BV5386IX

DIFFUSE DUST MANAGEMENT PLAN DECEMBER 2017



1. Introduction

Following a review of the Best Available Techniques (BAT) specified for the non-ferrous metals sector and the provision of associated BAT Conclusions, Environmental Permit Number EPR/BV5386IX has been revised and includes a requirement for GS Yuasa Battery Manufacturing UK Limited to:

“Produce a documented action plan on diffuse dust emissions to ensure the most relevant diffuse dust emission sources are identified and appropriate actions and techniques for the reduction or prevention of diffuse dust emissions are implemented where BAT is not currently achieved.”

The purpose of this plan, therefore, is to identify all potential diffuse dust emissions on the site and implement systems and procedures to reduce or prevent such emissions from the site.

2. Sources of Diffuse Dust Emissions

The site includes five factories, each having different processes and potential diffuse dust emissions. The areas with potential for emissions are as follows:

Factory 1

This is the highest risk area for dust emissions as this area contains the main plate and paste manufacturing processes. The main materials and process operations in this factory are:

- **Lead Oxide Powder** – This is formed on site in purpose built mills in Factory 2 and is then stored in six sealed silos which have breather vents, in Factories 1 and 2. When required, the Lead Oxide is transported across the factory on a sealed conveyor, and is added to the paste mixer machine which is operated under extraction.
- **Pasting Operations / Paste Manufacture Platform** – This is where Lead Oxide powder is mixed with other ingredients to form a paste which is then applied to the Lead plates later in the process. Various liquids are mixed with the Lead Oxide along with other bagged additives, which could create dust when they are added to the mix, to form a damp paste. The mixing machine is under extraction to capture any dusts. Between the shifts, all areas are cleaned to minimise the potential for residual paste to dry out and thereby create dust. Dust emissions are kept to a minimum by the use of extraction, sealed conveyors and damping / cleaning down of work areas. This has the highest potential for dust due to the use of the Lead Oxide powder and other dusty raw materials, however it is in the middle of the factory away from external openings and therefore any dust emissions are either captured by the site dust abatement systems or will be retained within the factory. It is unlikely therefore, that this process will cause diffuse dust emissions.
- **Casting** – Lead grids for the batteries are cast here and the area has high and low-level dust extraction systems which are cleaned monthly. The area has a large amount of overhead racks and piping etc., and these are all cleaned on an annual basis during the Christmas shutdown.
- **Expanded grid line machine** – this is an all in one process which adds Lead paste onto a continuous expanded Lead strip which is cut into individual plates of the required size. The machine has dust extraction fitted at the cutting point after the flash drying oven and the plates

are taken off the line by hand and placed onto a table for inspection. The table also has a dust extraction system. The plates are then placed onto boards where they are layered and, at this point, the majority of the dust is removed through the extraction system. The expanded grid line is not continually running as it can only manufacture negative plates, whereas positive and negative plates are produced in separate stages elsewhere in the factory.

- **Cutting & Plate Inspection** – Plates are cut inside the machines and all machines have individual extraction. Arm extraction system are used which are movable flexible extraction points to ensure optimum extraction when the plates are removed from the cutting processes. The extraction arms are usually located above the waste off-cut bins at the side of the machine to capture any dust. Dust from the cutting processes is captured in small waste bins which are located beneath the machines whilst off-cuts are placed into the larger bins to the side. Both types of waste bin are lined with thick polythene bags. The small bins are located underneath the cutting machines and may be emptied up to twice per week. The machine operator regularly checks both bins to ensure they are not full or overflowing. During emptying, the polythene lining bag is wrapped and then another bag is placed over the top, sealing the bin before it is moved to the Lead waste / recycling area which is situated inside the factory building. Off-cut bins are similarly sealed and taken to the waste storage area before sending for recycling. The cutting and plate inspection area is in the middle of the factory away from external openings and therefore any dust emissions are either captured by the dust abatement systems or are retained within the factory and are cleared as part of general housekeeping measures.
- **Lead Dross Recovery** – This machine has a dedicated extraction system directly above it and also has an extendable / movable arm for capturing dust emissions.

Factory 2 Link

This contains the following areas:

- **Casting** – As in Factory 1, this is an area where Lead grids are cast and has high and low-level dust extraction which is cleaned out monthly. It is located near to an external doorway, however, the doorway is kept closed when possible, and a wash-down area just outside the door is regularly damp and would reduce the potential for dust emissions from this area.
- **Lead Waste Storage Area** – All Lead waste is stored in bins within the factory and therefore has minimal potential to create dust emissions.
- **Outside** – Extraction points A6 & A10 collect the captured dusts in sealed containers but these are also surrounded by plastic curtains to further prevent weather damage and the release of any fugitive dust from the collection points. Bags within the collection bins are sealed and removed when required. The curtains around the collection points are an additional measure to prevent any dust releases from this area, due to the location of the bins outside.
- **Compactor** – This is for storage of general wastes with limited potential for dust emission.

Factory 2

This contains the following areas:

- **Oxide Mills** – This is where the Lead Oxide powder is manufactured. The mills are sealed contained systems with extraction units to minimise and capture dust emissions. Sealed bags at the bottom of the system capture dust and when these are full, they are sealed and taped before being placed into 45-gallon drums for storage prior to recycling. Care is taken to minimise any potential dust emissions.
- **Small parts casting** – This mainly uses molten Lead and therefore has limited potential for dust emissions.
- **Stacking** – This is where the plates are stacked together with fibreglass mat insulation material to manufacture the battery cells before being added to the battery casing. All work stations

have dedicated extraction systems. This is potentially dusty due to the movement of the plates which have dried paste on them. Plates are stored in boxes before use, and the boxes may contain excess dust when all of the plates have been removed. When emptied, the boxes are placed into the back of the extraction unit and turned so as to capture the dust in a water tray which is situated directly below the perforated work surface.

- **Burning** – This is where the stacked cells are placed into the compartments of a burning box where a lead strap is formed to join the lugs of the plates together thus forming the connections. The lead cells are all joined together to form the completed internal components of a battery which are inserted into a battery container. There is the potential for dust release from the plates when they are inserted into the battery casing, and there is a dust extraction system on the line to minimise any release.
- **Lid Bonding** – The battery is fitted with a lid which has a resin material applied to it which seals the lid and container together. With the lid fitted and sealed, there is very limited potential for dust emissions.
- **Acid Fill / Charging** – Batteries are injected with precise amounts of dilute Sulphuric acid and are electrically charged. There is little potential for dust as the battery cases are sealed and the charging areas are located within the factory.

Throughout Factory 1 and Factory 2, mobile wet scrubbing machines are used to clean the floor around the site. On completion of floor cleaning, the water from these sweepers is sent to the effluent treatment plant through the site drainage system. The internal drainage has settling pits to settle out the Lead dust, which is collected and sent to the waste storage area.

Factory 3

This contains the following areas:

- **Injection moulding** – This is where the battery lids, cases and covers are manufactured. The machines are fully enclosed and sealed, and thus there is little potential for dust emissions.
- **Granulation** – ABS recycling area. This machine granulates any out of specification battery casing for re-use. Granulate falls into a bag which has a small extraction system on top to capture any dust emissions.
- **Storage** – Storage of battery cases and other items, with limited potential for dust emissions.

Factory 4

This contains the following areas:

- **Assembly and Inspection line** – This is where the completed batteries are inspected and printed to identify them and then packaged for onward transportation to customers. There is limited potential for dust emissions from the assembly and inspection area.
- **Storage of raw materials and products** – There is no storage of powders in this area, and there is therefore, limited potential for dust emissions.

Factory 5

This contains the following areas:

- **Storage and finished goods loading bay** - No potential dust issues in this area.

Outside Areas

There are no raw materials stored outside, or any areas which are identified as being likely to cause dust emissions. The site has a formal road sweeping programme to minimise any emissions from vehicle movements around the site, and this is undertaken on a quarterly basis.

3. Current Diffuse Dust Management

The site has a comprehensive dust extraction system fitted to all main pieces of plant and equipment, as well as smaller individual abatement systems throughout the process. All process dust goes through the abatement systems. In general, the abatement system along with good housekeeping practices, minimise dust emissions from the site.

None of the dust extraction systems can be by-passed, and some of the bag filters can have banks isolated, allowing units to remain operational until servicing can be arranged, in the event that a bank of filters requires attention. Various types of filter systems are used across the site, and each type is identified in the European Commission's Reference Document on Best Available Techniques in Common Waste Water and Waste Gas Treatment / Management Systems in the Chemical Sector; updated in June 2016, as being BAT for Particulate (and therefore Lead) abatement if suitable in design and purpose for the particular application, and if used in conjunction with suitable management and maintenance techniques.

Daily visual checks are carried out on the abatement systems with any issues being reported and repairs carried out as a priority. All abatement equipment has a planned maintenance schedule in accordance with the manufacturers recommendations or would be scheduled for additional maintenance if faults are identified. HEPA filters are changed either quarterly or 6 monthly dependent on the process. Pressure gauges are fitted to systems to enable the identification of any blockages and if an increase in pressure is noted during the daily checks, the HEPA filter will be changed. Curtains are used around some of the dust bins below the extraction systems to contain dust.

Table 1 over the page details all emissions points and abatement system details and a site layout showing emissions points and ambient monitoring locations can be seen in **Appendix A**.

Table 1 Details of Abatement Systems

Emission Point (ref. & location)	Abatement System
A1 Factory 2	Bag filters & 2 x HEPA filters
A2 Factory 2	Bag filters & 3 x HEPA filters
A3 Factory 1	Bag filters (isolation possible)
A4 Factory 1	Metal mesh filter
A6 Factory 1	Venturi scrubber & sprays
A7 Factory 1	Perforated plates with filters & sprays
A8 Factory 1	Packed tower with polymesh
A9 Factory 1	Bag filters (isolation possible)
A11 Factory 2	Bag filters
A12 Factory 2	Bag filters
A13 Factory 2	Bag filters and HEPA cartridge
A14 Factory 2	Bag filters
A15 Factory 2	Bag filters
A16 Factory 4	Ceramic filters (isolation possible)
A17 Factory 4	Ceramic filters (isolation possible)
A18 Factory 1	Ceramic filters (isolation possible) & 1 x HEPA filter
A19 Factory 1	Bag filters (isolation possible)
A20 Factory 2	Bag filters & 3 x HEPA filters (isolation possible)
A22 Factory 4	Ceramic filters (isolation possible)
A23 Factory 2	Bag filters & 6 x HEPA filters (isolation possible)
A24 Factory 2	Bag filters (isolation possible)
A25 Factory 2	Ceramic filters
A26 Factory 1	Metal mesh filter
A27 Factory 2	1 x HEPA filter
A28 Factory 2	Mesh filter & electrostatic precipitator
A29 Factory 2	Mesh filter & electrostatic precipitator
A30 Factory 2	Mesh filter & electrostatic precipitator
A31 Factory 2	Mesh filter & electrostatic precipitator
A32 Factory 2	Mesh filter & electrostatic precipitator
A33 Factory 2	Mesh filter & electrostatic precipitator
A34 Factory 2	Mesh filter & electrostatic precipitator
A69 Factory 4	Mesh filters x 3
A78 Factory 1	Mesh grill
A79 Factory 1	Mesh Filters x 2
A81 Factory 1	Mesh grill

Should any of the filter systems cease to operate, e.g. due to an electrical power outage, a warning light would indicate an issue and processing would be stopped to enable investigation and repair or replacement as necessary, prior to re-commencing the activity.

Process emissions of Lead to air are monitored on a quarterly basis by a third party, MCERTS accredited contractor. The following emissions are currently monitored, or will be, where stacks currently not in use are re-commissioned:

Measures to Monitor Emissions

Emission Points	Parameter	Monitoring Method
A1 – A4, A6, A7, A9, A11 – A20, A22 – A26, A28 -A34 (stacks currently monitored are: A1, A2, A4, A6, A7, A9, A11, A12, A18 – A20, A23, A24, and A26)	Lead	BS EN 14385:2004 for total Particulate and vapour phase Lead

The site also has a DT990 PCME multi-channel system to provide process monitoring of extraction system filters. Data from the DT990 Particulate monitor is not reported to Natural Resources Wales, with quarterly extractive testing being reported in preference. However, the Particulate monitor does enable the site engineers to assess the efficiency of the filter systems and forward plan maintenance as required.

The site emission monitoring points have previously been assessed for compliance with Monitoring Guidance Note M1 (Technical Guidance Note (Monitoring) M1, Sampling requirements for stack emission monitoring), and a report of compliance and a timetable for improvements was submitted to the Environment Agency in response to the original Permit improvement programme (IP17) in February 2006.

The site also monitors Lead in ambient air at two locations around the site, with one monitor located to the south west of the site and the other to the north east. The samplers used at the site are the Turnkey Instruments, TOPAS range, which are indicative ambient Particulate monitors, and are MCERTS accredited. Photographs of monitoring equipment can be seen in **Appendix B**.

The monitors use a light scattering technique to give a continuous and simultaneous indication of the PM₁, PM_{2.5}, PM₁₀ and TSP mass fractions, with a sample pump continuously drawing ambient air into the instrument with a flow rate set by the microprocessor at 0.000001 m³ per second. The incoming dusty air passes through a laser beam in a photometer and then through a 25 mm filter to remove the particles before reaching the pump.

The filters are collected and replaced on a monthly basis by Environmental Compliance Ltd, and are sent for analysis by Inductively Coupled Plasma - Emission Spectroscopy (ICP / ES) to determine the quantity of total Lead. The collected filter cassettes are sent to RPS Laboratories, Manchester, who hold UKAS accreditation for the analysis of Lead collected on filters and a field blank is also taken for each sampling campaign. The quantity of Lead on each filter is then divided by the volume of air sampled through that filter to provide a concentration of either background Lead in ambient air, or Lead in air from the direction of the site.

Data from 2016 suggested an average Lead in air result of 0.085 ug m⁻³ to the south west of the site, and 0.152 ug m⁻³ to the north east. These concentrations represent approximately 17 % and 30 % respectively of the European Air Quality Standard (0.5 ug m⁻³), and 34 % and 61 % respectively of the current UK Air Quality Objective (0.25 ug m⁻³). There is also an offsite monitor at Garnlydan School (East of the site) which will show any potential impacts from the site and other sites on the Rassau Industrial Estate (including the Envirowales Battery Recycling Plant). The 2016 average Lead in air concentration for this location was 0.039 ug m⁻³ which is well within the Air Quality Objective.

Appendix C shows graphs of monitoring results from the above monitoring points for 2016 and 2017. As can be seen, the trend shows that ambient levels have remained constant or decreased over the years.

In addition, members of the site management team carry out weekly environmental compliance checks, which include consideration of the two ambient monitoring locations as well as occupational health monitoring within the factories.

Good housekeeping practices are employed across the site with mobile wet-sweeper machines being used daily to clean the factory floors. External doors are kept closed as often as possible to minimise any potential emissions and all process lines are cleaned at the end of each shift. As well as the extraction abatement systems employed across the site operations, some processes employ additional methods to capture potential dust emissions, such as the use of water trays on the stacking process and pallet board extraction to capture dust.

Staff undergo induction and regular training sessions on environmental controls and spillage procedures which, amongst other things, highlight the potential for diffuse dust to occur and the importance of the management and control of environmental issues. There are safe working systems in place for all site processes and staff are trained in spillage procedures. Staff overalls are regularly dry cleaned by a specialist laundry company with occasional washing performed on site. Wash water from on-site uniform cleaning, passes through the effluent plant where any dust is captured.

4. Proposed Changes and Improvements for Diffuse Dust Management

As shown in the graphs in **Appendix C**, the ambient levels have decreased over the years due to the improvements in the abatement systems and good housekeeping at the site. Improvement options which are now to be reviewed and considered for implementation at the site include the following:

- Factory 2 has roof extraction fans which draw out warm air from the factory. The discharge points include mushroom cap heads to minimise dust emissions from the release points. GS Yuasa Battery Manufacturing UK Limited plan to undertake a sampling campaign in order to assess the levels of dust and Lead in the area around the discharges, and will schedule regular cleaning of these caps / roof areas should it be deemed necessary, and may also add dust filters to the release points to further reduce the potential for dust emissions as required.
- In general, staff do not go outside the factory wearing dirty overalls, however, there is the potential to install a vacuum system near to external exit points whereby staff would vacuum overalls to prevent any dust from overalls being blown off when outside.
- Curtains are used around some of the dust bins below the extraction systems to prevent weather damage and to contain dust from the collection area. As this technique has proved to be successful, it is planned to install these curtains around all external dust capture bins in the future.

The timescales for implementing the above actions will be finalised and Natural Resources Wales will be notified of ongoing improvements to diffuse dust emissions from the site.

5. Summary

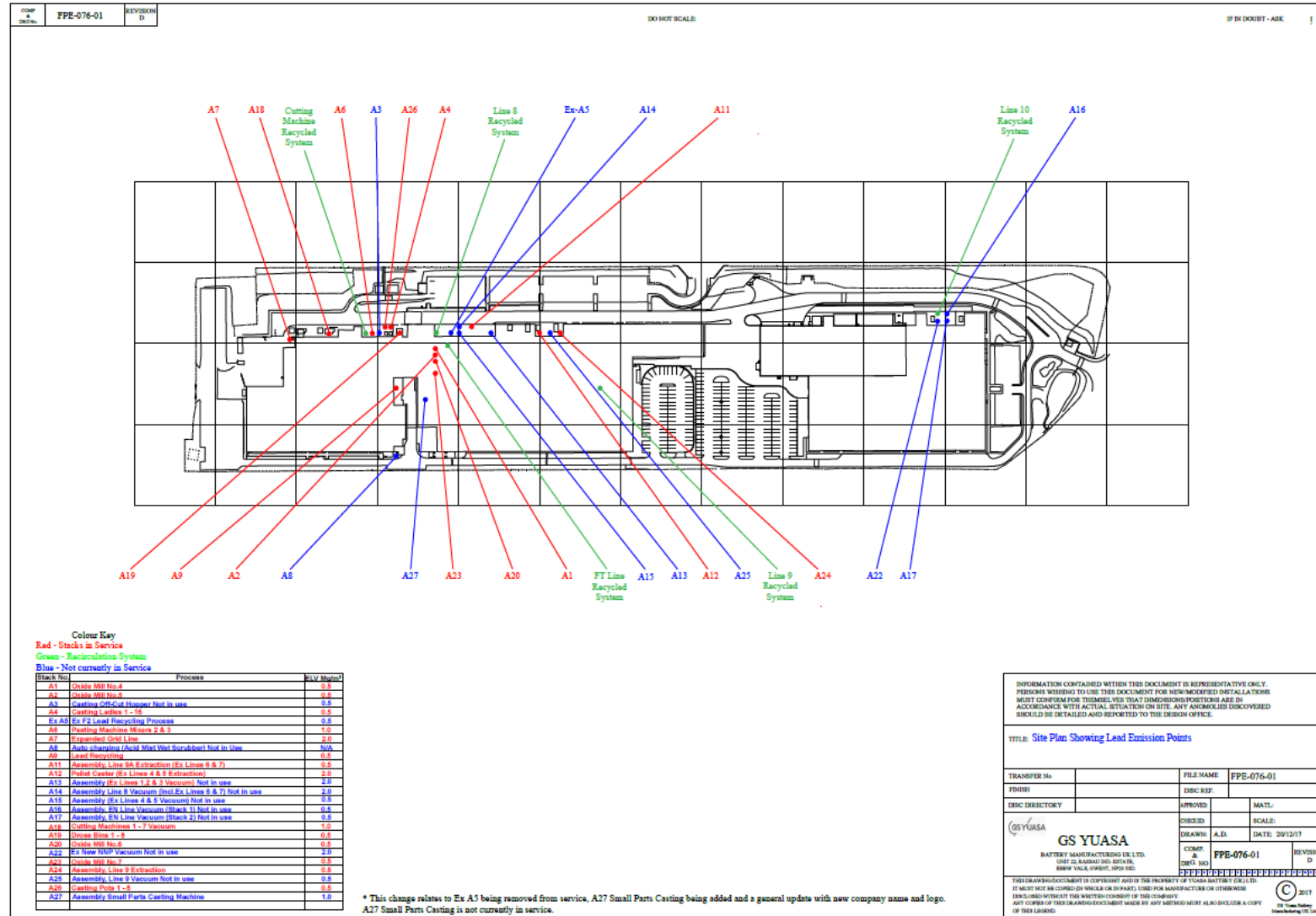
In general, diffuse dust emissions from the GS Yuasa Battery Manufacturing UK Limited site are not an issue and levels are low due to the strict control procedures, abatement systems and good housekeeping practices. The site operates an ongoing scheduled maintenance programme to ensure that abatement systems operate efficiently, and diffuse dust emissions kept to a minimum and within the limits set in the Environmental Permit.

GS Yuasa Battery Manufacturing UK Limited has an ISO 14001 Environmental Management System and as part of this system any complaints received at the site will be reviewed, assessed and any issues identified and resolved quickly.

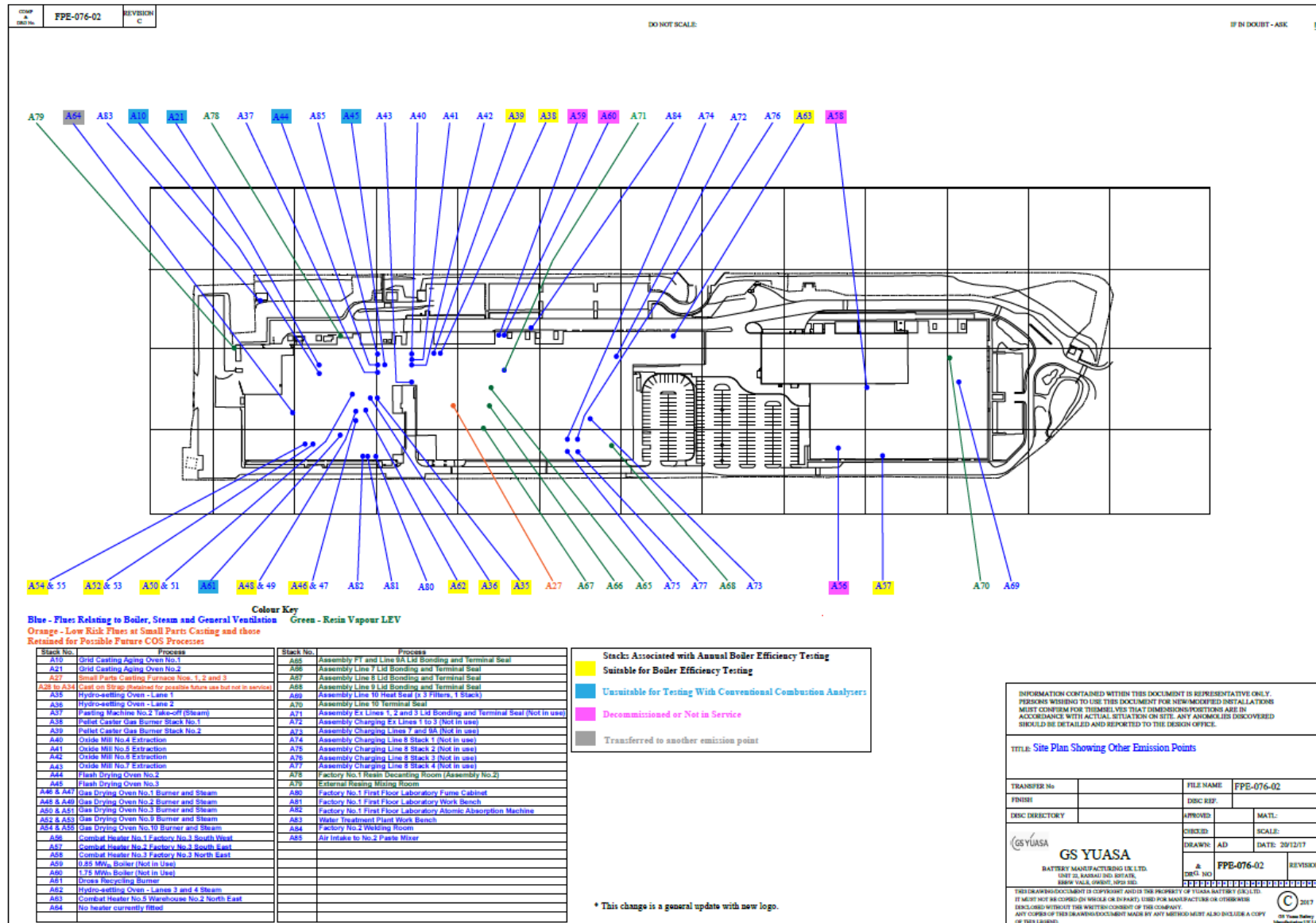
Some improvements have been identified to manage diffuse dust emissions and these will be assessed and implemented where feasible. Natural Resources Wales will be kept informed of any planned improvement works to manage diffuse dust emissions.

Appendix A – Emission Points & Ambient Monitoring Locations

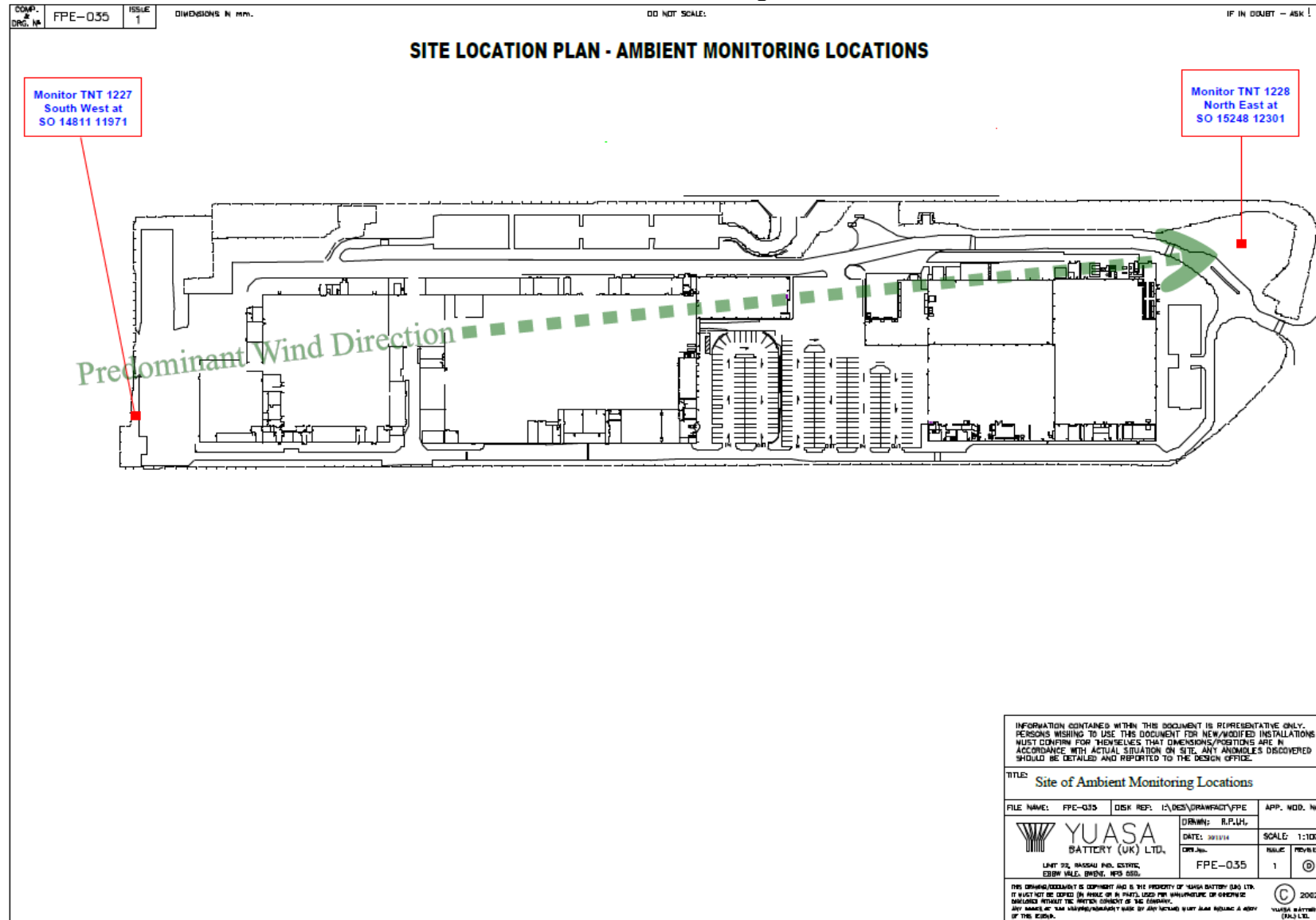
Plan of Lead Emission Points



Plan of Other Emission Points



Plan of Ambient Monitoring Locations



Appendix B – Photos of Ambient Monitoring Locations

Monitor 1227 – South West



Monitor 1228 & Weather Station – North East

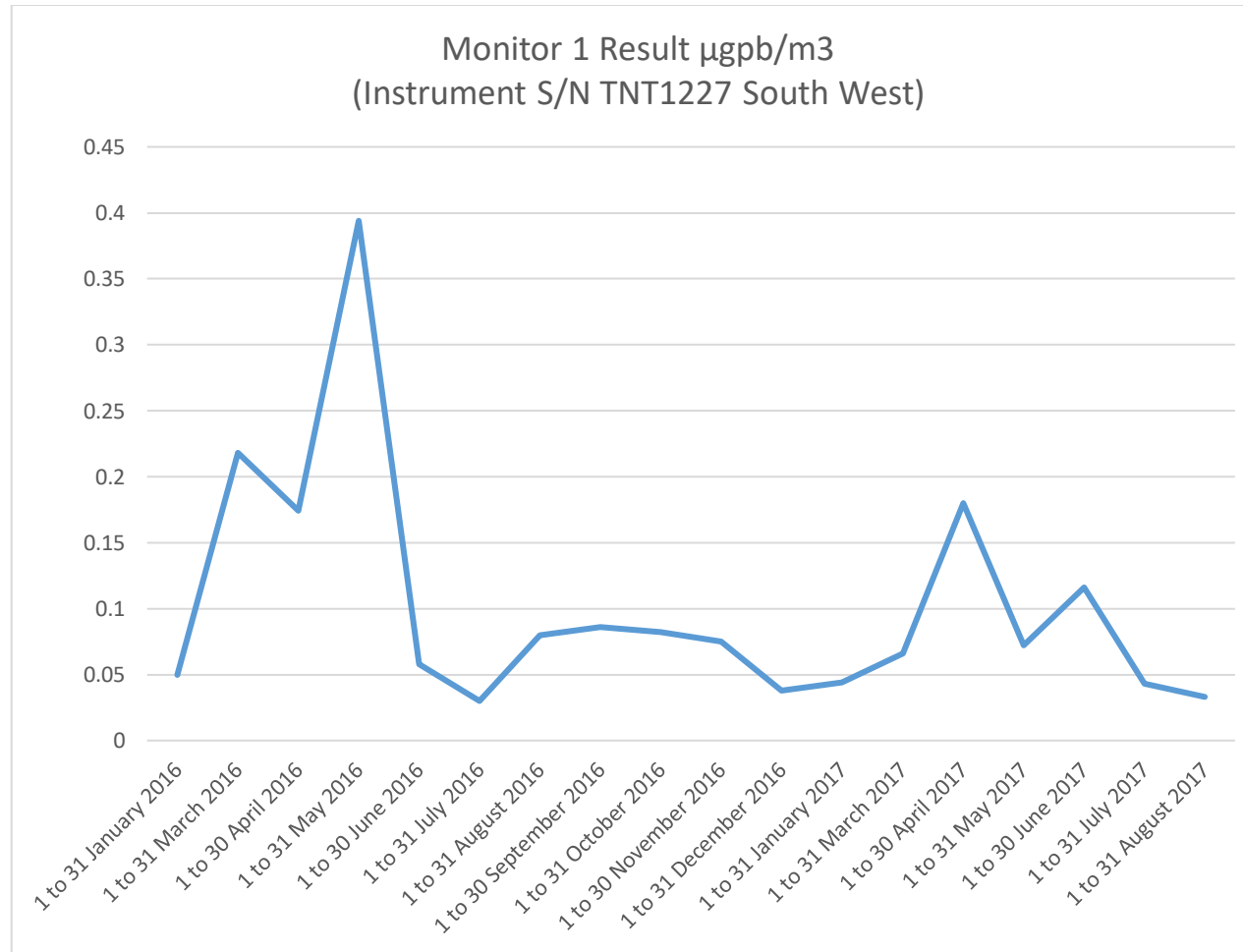


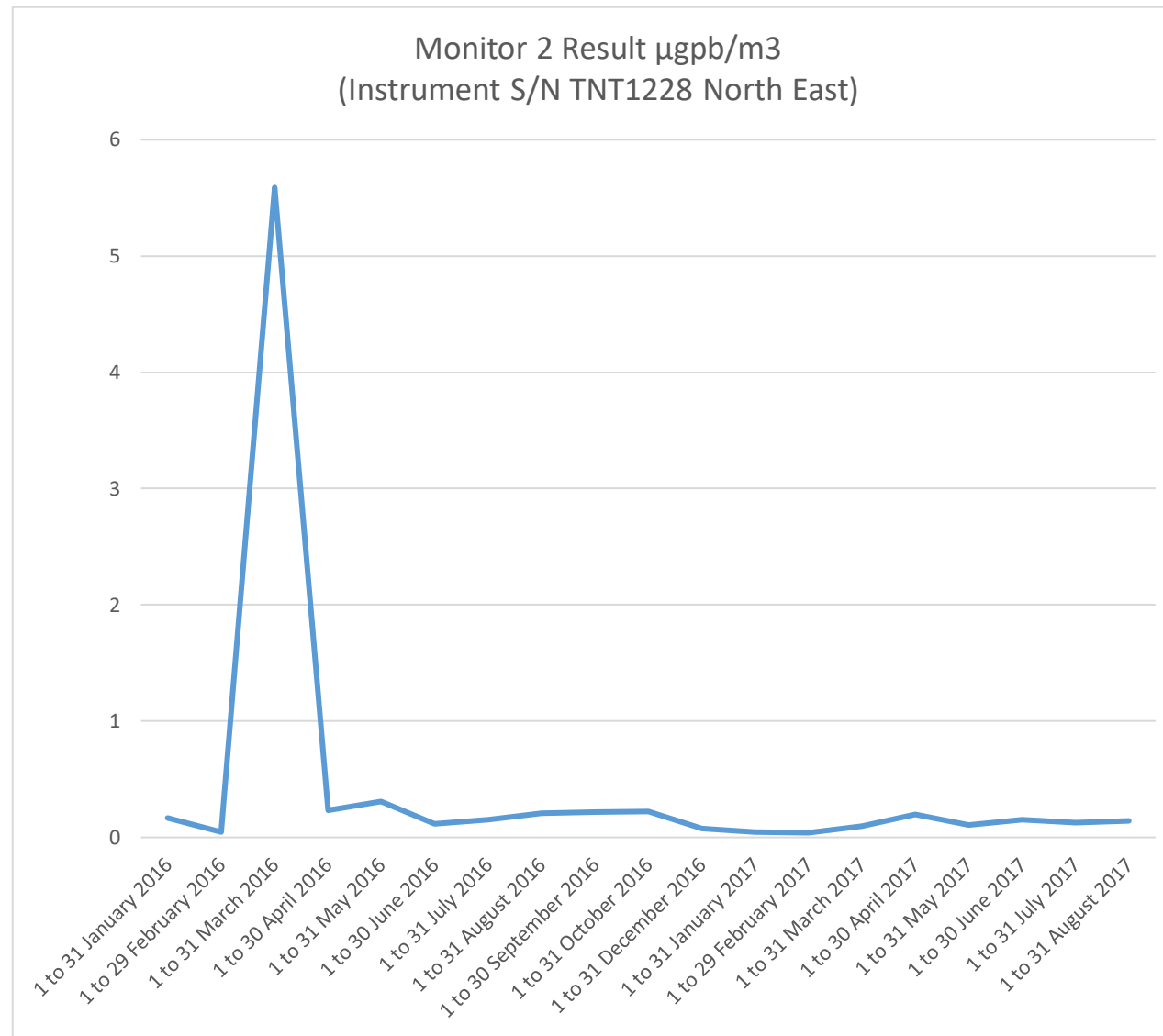


Appendix C – Ambient Air Monitoring Historical Results and Trend

2016 – 2017 Ambient Air Monitoring Data

South West Monitor TNT1227



North East Monitor TNT1228

Garnlydan School Monitor TN02899