Non-Technical Summary

Variation to Bespoke Installation

Herriard Bio Power Limited Anaerobic Digestion (AD) Plant

Herriard Bio Power Limited, Bushywarren Lane, Herriard, Basingstoke, RB25 2NS

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Abbreviations

AD	Anaerobic Digestion/er
AQMA	Air Quality Management Area
AQOIA	Air Quality and Odour Impact Assessment
AW	Ancient woodland
BAT	Best Available Techniques
BUP	Biogas upgrading plant
CHP	Combined heat and power
CO_2	Carbon dioxide
EA	Environment Agency
EMS	Environmental Management System
EP	Emission Point
ETL	Earthcare Technical Limited
EWC	European Waste Catalogue
HBP	Herriard Bio Power
H_2S	Hydrogen sulphide
kWthi	Kilowatts of thermal input
LWS	Local Wildlife Site
MCPD	Medium Combustion Plant Directive
NVZ	Nitrate Vulnerable Zone
NH_3	Ammonia
PHI	Priority Habitat Inventory
PVRV	Pressure and vacuum relief valve
SAC	Special Area of Conservation
SCADA	Supervisory Control and Data Acquisition
SCR	Site Condition Report
SPA	Special Protection Area
SR	Standard Rules
SSSI	Site of Special Scientific Interest
TPA	Tonnes per annum
UV	Ultra violet

1 Introduction

This Non-Technical Summary has been prepared by Earthcare Technical Ltd (ETL) on behalf of Herriard Bio Power (HBP) Limited in support of an application for a substantial variation of a bespoke waste operation permit to a bespoke installation permit for an anaerobic digestion (AD) plant, including the use of resultant biogas, at Herriard Bio Power AD Plant, Bushywarren Lane, Herriard, Basingstoke, RG25 2NS herein termed 'the Site'. The plant is operated by Herriard Bio Power Limited, herein termed 'the Operator'.

A full Environmental Risk Assessment has been carried out and is provided in Appendix A of the Environmental Management System (EMS) Manual (HBP-OD-01) which accompanies this permit variation application. This Non-Technical Summary highlights the key control measures that are employed and that are proposed to minimise any impacts from the site and its operations and signposts the reader to the key supporting documents for the application.

The Operator is currently making a number of site infrastructure improvements. A full site engineering survey has been undertaken of primary and secondary containment and the current drainage system. Whilst the initial survey work has been completed at the time of writing, recommendations arising from this work are pending and will be included within the permit application supporting documents. The Operator is fully committed to making any recommended improvements in line with Best Available Techniques.

2 Planning

The original planning permission for the Herriard Bio Power AD plant was issued by Hampshire County Council on 9 October 2012 (Ref: BDB/76332) and permitted up to 16,700 tonnes per annum (tpa) of food waste and 12,500 tpa of crop material. On 23 March 2015 an amendment was approved to increase the maximum permitted annual tonnages of food waste to 40,000 tpa with the limit of 12,500 tpa still applying to crop feedstocks and associated vehicle movements (Ref: 14/03351/CMA).

On 13 August 2018 permission was granted for Installation of Biogas Upgrader, Gas Storage Container, Biomethane Off Take Vehicle Bays and Ancillary Equipment (Ref: 18/01659/CMA).

On 30 July 2021 planning permission was granted to implement tanks approved under 2012 permission for the original AD Plant along with similar works to those approved under the 2018 permission for the Installation of Biogas Upgrader, Gas Storage Container, Biomethane Off Take Vehicle Bays and Ancillary Equipment (including repositioning of two digester tanks approved under reference BDB/76332) and works, installation of a carbon dioxide recovery unit and subdivision and covering of existing lagoon for odour control and erection of office/welfare and classroom block (Ref: 21/00578/CMA).

On 28 November 2023 Hampshire County Council issued a variation of condition 2 of 21/00578/CMA to allow weekend and further bank holiday deliveries of food waste.

3 Permitting

The bespoke waste operation permit for the site was issued on 20 January 2014 (EPR/AB3807KW) and now requires updating to reflect the current and proposed site infrastructure.

The operation does not meet the location criteria for the equivalent Standard Rules permit for food waste (SR2021 No6) as the site is within 50m of Ancient Woodland and Priority Habitat Inventory (PHI) sites namely Great Bushy Warren Copse to the south and an area adjacent to the permitted boundary at the site access to the east; these sites are classified as both Ancient Woodland and PHI deciduous woodland. Therefore, a bespoke installation permit is required for the operation.

The activity is classified as an 'Installation' and therefore the requirements of the Industrial Emissions Directive apply, since the AD plant has a treatment capacity of more than 100 tonnes per day. The proposed Schedule 1 Listed Activity is S5.4 Part A(1)(b)(i)) *Recovery or a mix of recovery and disposal of non-hazardous waste with a capacity exceeding 75 tonnes per day (or 100 tonnes per day if the only waste treatment activity is anaerobic digestion involving biological treatment*. The proposed Directly Associated Activities are detailed in the supporting Permitted Activities document.[1]

An assessment against the relevant Best Available Techniques (BAT) for waste treatment[2] supports the permit variation application.[3]

The substantial permit variation which this Non-Technical Summary supports is to:

a) Reflect site upgrades, namely:

- The addition of a raw waste buffer tank (452m^3) with mixing and gas storage and 2 No. Primary Digesters (2,440m^3 each) for food waste all within an extended secondary containment area.
- The addition of a second combined heat and power engine (CHP). The existing CHP will become the 'standby' CHP and a new proposed CHP which will become the 'duty' CHP.
- The installation of an emergency generator.
- An upgrade to the Waste Reception Building including the installation of a new biofilter odour abatement system to replace the existing UV system.
- Installation of a new digestate pasteuriser (180m^3).
- Remodelling of the existing uncovered digestate storage lagoon into 2 No. new covered digestate storage lagoons.
- Addition of 2. No process water tanks (100m^3 each) within the secondary containment area for optimisation of use of dirty water on site.
- Addition of a lined surface water storage lagoon (3,000m^3).
- Addition of biogas upgrading plant (BUP) for the production of biomethane for transport off site via virtual gas pipeline and injection to the National Gas Grid and use of biomethane in an onsite vehicle refuelling facility.

[1] ETL813/HBP/PermittedActivities/V1.0
[2] Best Available Techniques (BAT) Reference Document for Waste Treatment, European IPPC Bureau, 2018
[3] ETL813/HBP/BAT/V1.0 December 2023

- Addition of carbon dioxide (CO_2) capture from the gas upgrade plant, storage and transport.
- Replacement of the existing non-BAT compliant flare with a BAT compliant one and addition of a second flare to increase capacity to accommodate additional biogas generated from the site expansion.

b) Change the permit from a waste operation permit to an installation permit to reflect an increase in biological treatment capacity to over 100 tonnes per day.

c) Increase the maximum permitted quantity of treated waste from 36,500 to 40,000 tonnes per annum in line with the current planning permission.

d) Bring the permitted waste types in line with Appendix B of the Anaerobic Digestion Quality Protocol by removing six European Waste Catalogue (EWC) codes and adding one EWC code. Waste codes for wastes from wood processing and the production of panels and furniture (03 01 01 & 03 01 05) have not been requested although they are included in Appendix B of the ADQP as the process is not designed to treat these waste types.

e) Amend emission points to include the addition of:

- the outlet from the new biofilter odour abatement system.
- pressure and vacuum relief valves (PVRVs) on the new raw waste buffer tank, the 2 No. new digesters and the pasteuriser;
- a replacement to the existing flare;
- a second flare;
- the second combined heat and power engine (CHP) raising the aggregated net rated thermal input of onsite combustion plant to 5,700kWthi (excluding emergency generator). Calculations are carried out in accordance with the guidance[4] and are presented in Appendix A;
- the emergency generator (414kWe or 1,254kWthi);
- a carbon dioxide vent on the biogas upgrading plant; and
- a single vent from an impregnated carbon filter which serves the channelled emissions from the 2 No. new covered lagoons.

f) Change the registered address of Herriard Bio Power Limited.

The Environmental Risk Assessment (Appendix A of the EMS Manual **(HBP-OD-01)**) is based upon the generic risk assessment for SR2021 No6. However, it also considers the additional hazards and risks associated with the proximity of sensitive ecological receptors and the findings within the Air Quality and Odour Impact Assessment[5] which supports this permit variation application.

Basic pre-application advice has been sought from the Environment Agency (EA) with respect to this permit variation application (Reference EPR/AB3807KW/P002) to ensure that all relevant nature and conservation sites have been considered.

There is no current Site Condition Report for the site as it was not a requirement at the time for a waste operation permit application. A Site Condition Report has been developed for this permit

[4] Determination of thermal input power of an engine driven generator, Association of Manufacturers of Power generating Systems (AMPS) Technical Committee, 2016
[5] ETL813/AQOIA/Final/V1.0 December 2023

variation application as the site is becoming an Installation The SCR includes details of the previous land uses and current site condition.[6]

The existing CHP engine is a MWM TCG2020V12 TG 2020-3-1191 with a rated power (electrical) of 1,200kWel. The thermal input power is 2,850kWthi. The CHP engine was put into operation before 20th December 2018 and is therefore classified as 'existing' with respect to the Medium Combustion Plant Directive (MCPD) and associated emission limit values.

The new proposed CHP is an updated version of the existing also with a rated power (electrical) of 1,200kWel. The thermal input power is 2,850Wthi. The CHP is 'new' with respect to the MCPD and associated emission limit values.

4 Site Details

4.1 Location

Site Address: Bushywarren Lane, Herriard, Basingstoke, RG25 2NS

National Grid Reference: SU 65490 46638

Local Authorities: Hampshire County Council & Basingstoke and Deane District Council

The site is situated approximately 6km south of the town Basingstoke, Hampshire and the M3 motorway which runs along the south side of the town. The site is accessed off Bushywarren Lane which itself comes directly off the A339 between the villages of Winslade to the north and Herriard to the south.

The surrounding land use is agricultural and horticultural, grassland and woodland: ancient woodland that is partly semi-natural and partly replanted i.e., part deciduous and part coniferous.

To the west of the site is an agricultural field and beyond that a solar PV development. The immediate surrounding area is sparsely populated however, there is an open windrow composting facility accepting up to 100,000 tonnes of green waste a year, operated by Veolia, adjacent to the north easterly site boundary.

The permitted area is approximately 7.7 hectares (19.0 acres) in extent.

4.2 Environmental Sensitivities

4.2.1 Geology

The bedrock geology on which the Site is located is chalk namely, Seaford Chalk Formation. The superficial geology is Clay-with-flints Formation - Diamicton.[8]

4.2.2 Groundwater

[6] ETL813/HBP/SCR/V1.0 December 2023

The site is situated over an unproductive superficial aquifer and a principal bedrock aquifer. Groundwater vulnerability is classified as medium risk due to soluble rock risk. However, the site is not within a Groundwater Source Protection Zone nor is it within a Drinking Water Protected Area or Safeguard Zone.[7]

The site is within two Nitrate Vulnerable zones for groundwater namely, Hampshire Chalk NVZ (G143) and Kingsclere and Greywell NVZ (145).

There are no licensed groundwater abstractions within 2,000m.[8]

The site is within the Basingstoke Chalk Water Framework Directive groundwater body which was assigned an overall rating of Poor in 2019.

4.2.3 Surface Water

The site is not within a Drinking Water (Surface Water) Protected Area or Drinking Water (Surface Water) Safeguard Zone.[7]

The site is within the Water Framework Directive of the Candover Brook which was classified as having a Moderate ecological rating and a chemical rating of Fail in 2019. The nearest Water Framework Directive surface water body is the Candover Brook 10,946m south west of the site. There are no watercourses within the vicinity of the site.[8]

There is an engineered reedbed system and leachate pond for the adjacent compost site over 25 m north of the site boundary.

The site is within the Hamble Estuary Eutrophic Nitrate Vulnerable Zones (NVZ) (TraC) for Eutrophic Water (ET3).

There are no licensed surface water abstractions within 2,000m.[8]

4.2.4 Flood Risk

The site is situated in a location which has a low probability of flooding (Flood Zone 1).[9] There is a negligible risk of surface water flooding on site.[8]

4.2.5 Ecological Receptors – Statutory Designated Sites

There are no Sites of Special Scientific Interest (SSSIs) within 2km of the Site; no Special Areas of Conservation (SACs), Special Protection Areas (SPAs) or Ramsar sites within 10km of the Site.

4.2.6 Ecological Receptors – Priority Habitats & Species

There are 15 areas of Ancient Woodland (AW) within 2km of the Site including: Great Bushywarren Copse which lies to the south of the Site and partly within the Site boundary; Kingsmore, Allwood &

[7] https://magic.defra.gov.uk/MagicMap.aspx Accessed 18 September 2023
[8] Enviro+Geo Insight Report, GS-7RZ-5CU-15N-7H3, Groundsure, 19 September 2023
[9] https://flood-map-for-planning.service.gov.uk Accessed 18 September 2023

Fryingdown Copses which lie approximately 60m away at the close point; Cowdray's Copse to the north; and Hen Wood to the northeast.

The nature and heritage conservation sites for consideration are identified in a screening report provided by the Environment Agency in October 2023 and are shown in Table 2 below.[10] The screening report with associated maps is in Appendix B. The impact of the proposed changes upon these receptors has been assessed through a Nature and Heritage Conservation Risk Assessment which forms Appendix C.

Table 1 Nature and Heritage Conservation sites within relevant screening distance

Site / Species name and type	Screening distance (m)	Distance from site boundary (m)	Direction from site
Sites of Special Scientific Interest (SSSi)	**2,000**		
Mapledurwell Fen		6km however the site is within 2000m of the nearest stretch of the Detailed River Network to the site location	North east
Local Wildlife Sites	**2,000**		
A339 Alton Road, Herriard		425	North east
Buckshorn Copse		1,102	North
C12 Bagmore Lane		1,718	South
Coombe Wood, Tunworth		1,535	North east
Ellisfield Road Verge		1,587	South west
Great Bushywarren Copse		Adjacent	South
Guy's Copse		1,046	North east
Kingsmore, Allwood & Fryingdown Copses		50	West
Kit Lane & Longfield Dells		1,788	South west
Herriard Common		1,815	south
Hen Wood		679	North east
Hook's Copse, Weston Corbett		1,701	North east
Honeyleaze Copse		1,427	East
Hummocks Clump		1,585	North west

[10] Nature and Heritage Conservation Screening Report, EPR/AB3807KW/P002, Environment Agency, 31/10/2023

Site / Species name and type	Screening distance (m)	Distance from site boundary (m)	Direction from site
Little Bushywarren Copse		Adjacent	East
Merritt's Copse		992	South west
Parkfield Copse Complex & Lower Common Pit		1,895	South west
Picked Craft Copse		2,039	North west
Platts Copse		1,079	South west
Smallhill Clump		2,000	North east
Tom's Copse		1,482	North east
Protected Species	**2,000**		
Bullhead		**6,750**	**North east**
Protected Habitats	**500**		
Chalk Rivers		4,635	North east
Coastal & Floodplain Grazing Marshes		4,635	North east

4.2.7 Air Quality Management Areas

The nearest Air Quality Management Area (AQMA) lies over 18km to the east, it is Waverley AQMA No.1 – Farnham in Waverley Borough Council area.

4.3 Human Receptors

The next nearest residential receptors lie in the village of Herriard, the centre of which lies approximately 1km to the southeast of the Site.

Human receptors within proximity to the site are captured in Table 1 below and are shown in Figure 5 – Human Receptor Plan.

Table 2 Human receptor locations around 1km from the site

ID	Location	Type	NGR X	NGR Y	Distance from Site boundary (m)	Direction from Site
H1	Little Bushy Warren Composting Facility	Workplace	465779	146705	79	East
H2	Herriard Estates office	Workplace	466303	146137	714	Southeast
H3	Manor Court, Herriard	Workplace	466135	145922	744	Southeast
H4	Manor Farmhouse	Residential	466173	145962	745	Southeast
H5	Houses on Scratchface Lane	Residential	466303	146008	806	Southeast
H6	3, Parsonage Cottage	Residential	466430	145784	1,061	Southeast
H7	Winslade Cottages	Residential	465340	147794	952	North
H8	Widmoor bungalows	Residential	464454	145787	1,095	Southwest

4.4 Process Summary

The process is depicted in a Process Flow Diagram included as Appendix D of this document. A full process description is provided in Section 5 of the EMS Manual **(HBP-OD-01)** which accompanies this permit variation application.

There are three primary digesters and one post digester in total, all are operated within the mesophilic temperature range. There is one primary digester (Digester 1) which is fed predominantly on energy crops (up to 12,500 tonnes per annum) in addition to some food waste, silage effluent and dirty water generated on-site.

There are two primary digesters (Digesters 2 & 3) operating in parallel utilising solid and liquid waste feedstocks in addition to dirty water and silage effluent. The three primary digesters all feed into a shared post digester (Digester 4).

Digestate is then screened to 12mm, then pasteurised before passing through FAN Screw Press separators to produce separated fibre digestate and a separated digestate liquor. The fibre is temporarily stored in a bay and taken off site for storage in destination field heaps and the liquor digestate is stored in two covered lagoons (covers awaiting installation at time of writing). Both products are used on Herriard Estates as a biofertiliser.

Biogas is upgraded to biomethane and exported to the National gas network, via a virtual gas pipeline transported within vehicles and gas trailers to a Grid Injection Hub. There is also a vehicle refuelling station onsite. There are plans for CO_2 capture and storage pending removal for off-site use.

There will be two CHP engines onsite. There is one existing CHP which provides the heat for the digesters and pasteuriser. An additional CHP is proposed to effectively use biogas generated on site when the biogas upgrading plant is non-operational for extended periods and to allow continuity of operations when is the existing CHP is unavailable due to maintenance or breakdown.

The existing CHP will become the 'standby' CHP and a new proposed CHP which will become the 'duty' CHP. The new CHP provides surety of electricity supply given that the existing CHP is over 10 years old and becoming less reliable and also allows capacity to burn biogas should the gas upgrader unit and export of biomethane be compromised. If this happens feeding will be markedly reduced or stopped to reduce gas production levels, but in the interim any biogas can be effectively used to generate electricity from both CHPs. Though only enough biogas will be produced to fuel both CHPs at 80% capacity due to the treatment/production capacity of the AD plant. The site has a capacity to export 2 MW of electricity to the grid. Each CHP can produce 1.2 MW of electricity. There is capacity to use 2.4 MW of electricity from both CHPs to supply the grid and the Pentair gas upgrade unit, but it is preferable to run one CHP as the 'duty' CHP at 100% and use the second CHP as standby. All heat produced from the CHPs can be used on site at certain times of the year dependent on ambient temperature at the time of production.

4.5 Infrastructure

The site infrastructure prior to site upgrade work comprises:

- Access road
- Weighbridge
- 2 No. silage clamps (7,500m^3 capacity each)
- 1 No. external solids feeder (Crop / 40 tonnes capacity)
- Mixing pumps
- Waste Reception Building comprising:
  - Mavitec depackaging line – paddle de-pack with hopper (4m^3 capacity) with screen (12mm)
  - UV odour abatement system
  - Roller shutter doors
  - Quarantine bay
  - Sealed drainage sump
  - 2.5m high concrete walls inside building structure
- 1 No. primary digester (2,440m^3 each)
- 1 No. post digester (2,440m^3)
- A pasteuriser with three tanks
- Secondary containment for tanks
- 1 No. screw press separator, buffer tank (100m^3) and associated fibre storage bay
- 1. No uncovered digestate storage lagoon
- Gas compressors
- 1 No. carbon filter prior to combined heat and power engine (CHP)
- 1 No. CHP (1,200kWel)
- 1 No. Emergency flare (500Nm^3/hour)
- Emergency diesel generator (414kWel)
- Heat exchangers
- Control room / site office
- 40m^3 process water tank

The additional infrastructure as part of site upgrade work comprises:

- Upgrades to the Waste Reception Building to incorporate:
  - fast acting roller shutter doors (maximum opening speed of 0.5m/s and a closing speed of 0.3m/s)
  - new biofilter odour abatement plant
  - improved internal surfacing and drainage.
  - system to ensure washed packaging material is stored inside the building.
  - Liquid waste delivery point
- 2 No. Primary digesters (2,440m^3 each) with mixing, heating, and gas storage.
- 2 No. carbon filters in series serving biogas upgrading plant.
- Biogas upgrading plant including vent to atmosphere.
- Biomethane compressors
- 2 No. Biomethane trailer bays
- Biomethane vehicle fuel dispensing pump
- Carbon dioxide recovery unit
- Carbon dioxide compressor
- Carbon dioxide storage (2 No. 20 tonne tanks)
- Lined surface water storage lagoon (3,000m^3)
- 1 No. additional Emergency flare (1,000Nm^3/hour)

Changes to the existing infrastructure due to ongoing site upgrade works:

- Silage clamps resurfaced and drainage improved.
- Replacement of liquid waste tanks adjacent to Waste Reception Building with a Raw waste buffer tank (452m^3) with mixing and gas storage
- Secondary containment area extended to include Raw Waste Buffer Tank and the two new primary digester tanks.
- 1 No. single tank pasteuriser (180m^3) to replace 3 No. tank system.
- Replacement of single screw press separator with 2. No FAN Screw Press separators.
- Upgrade the fibre storage bay (4.5m x 5.3m x 1.85m high), surfacing and drainage.
- Installation of tented structure over separators and around 3 sides of fibre storage bay.
- Digestate lagoon remodelled into two covered lagoons (16,500m^3 each) with gas treatment.
- Existing flare upgraded from C-Deg to BAT compliant Uniflare 500Nm^3/hour.
- Replacement of single 40m^3 process water tank with 2 No. 100m^3 process water tanks within secondary containment system.

The site layout is shown on Figure 3 - Site Layout.

5 Management

The site is operated by HBP. There is an Plant Manager, who is responsible for the day-to-day operation of the AD plant and acts as the Technically Competent Manager. They manage the Plant Operatives, Plant Technicians, Maintenance Engineers and Weighbridge Operator who assist in day to day operations and night shifts.

The Plant Manager is managed by the Managing Director and supported by the wider HBP team.

Roles and responsibilities are summarised in the Staff Organogram (Appendix E) and are detailed in Section 11 of the EMS Manual **(HBP-OD-01).**

There is a contract in place with Herriard Estates to supply all the crop feedstocks and off-take of all digestate produced to be applied to land for agricultural benefit. Waste feedstocks are sourced by the Commercial Manager.

The EMS Manual **(HBP-OD-01**) forms part of the permit application and has been developed by ETL in conjunction with the Operator to replace the existing EMS. The management system documents to which the EMS Manual refers including management plans, policies and standard operating procedures have been developed by the Operator and ETL. The Master Document Control File **(HBP-OD-02)** lists the documents within the management system and enables document control.

6 Control of Emissions to Land and Water

Under normal operational conditions, there are no emissions to water or land.

6.1 Primary Containment

6.1.1 Silage clamps & leachate tank

There are 2 No. silage clamps (7,500 m^3 capacity each). They have a concrete base and concrete walls running longitudinally. Silage effluent is collected in an underground tank (126m^3 capacity) made from a Composite Steel Reinforced (CSR) material. The leachate tank has a level switch and a submersible pump which pumps the leachate to the process water tank(s) for storage and then use within the AD process.

At the time of writing improvement work to the silage clamp surfacing and drainage is ongoing and review of the primary containment infrastructure including the silage clamps and the leachate tank is being undertaken by a suitably qualified engineer. The Operator is committed to undertaking any required improvements and ensuring appropriate inspection and maintenance is implemented. The Environmental Management System will be updated accordingly.

The silage clamps are inspected annually when empty and repairs made as necessary, to be signed off by a suitably qualified engineer.

6.1.2 Ancillary tanks

There are 2 No. process water tanks (100m^3 each) proposed which will be constructed of steel.

The Raw Waste Buffer Tank (RWBT) (452m^3 capacity) is an Aconsult pre-cast post tensioned tank. The roof is made from a double-membrane gas tight cover. Tankers may currently discharge liquid waste directly to the RWBT within the secondary containment area but this discharge point is to be moved to within the Waste Reception Building which benefits from being fully enclosed with odour abatement.

The pasteuriser is a glass lined stainless steel tank with a capacity of 180m^3.

The ancillary tanks all benefit from level sensors linked to SCADA.

All tanks are inspected during installation and by a competent qualified engineer every 5 years. At the time of writing a review of all primary containment infrastructure, including the ancillary tanks, is being undertaken by a suitably qualified engineer. The Operator is committed to undertaking any required improvements and ensuring any additional appropriate inspection and maintenance is implemented. The Environmental Management System will be updated accordingly.

6.1.3 Digesters

The existing primary and post digester (Digester 1 and Post Digester) are concrete pre-cast post tensioned tanks built by Aconsult which were pressure tested upon commissioning and were reinspected by Aconsult in 2018. An annual external inspection is being undertaken until the digesters are next scheduled to be degritted, when a full internal inspection will be carried out.

The two new digesters (Digesters 2 and 3) are also Aconsult pre-cast post tensioned tanks. The roofs of the three digester and one post digester tanks are made from a double-membrane gas tight cover.

At the time of writing a review of all primary containment infrastructure, including the digesters, is being undertaken by a suitably qualified engineer. The Operator is committed to undertaking any required improvements and ensuring any additional appropriate inspection and maintenance is implemented. The Environmental Management System will be updated accordingly.

All tanks will be inspected by a suitably qualified engineer every 5 years as part of a scheduled degrit programme.

The digesters all benefit from level sensors linked to SCADA.

6.1.4 Digestate Storage

The two digestate storage lagoons are lined with leak detection, each have a storage capacity of 16,500m^3 excluding freeboard of 750mm. At the time of writing covers are to be installed. The installation of floating covers, with channelled emissions from both lagoons to a vent fitted with impregnated carbon filter is scheduled for 2024.

The volume of digestate entering the lagoon from the separator is measured via flow meters and recorded on a daily basis. The volume within the lagoon is restricted to 16,500m^3 per lagoon so as to maintain a 750mm freeboard at all times.

At the time of writing a review of all primary containment infrastructure, including the digestate storage lagoons, is being undertaken by a suitably qualified engineer. The Operator is committed to undertaking any required improvements and ensuring any additional appropriate inspection and maintenance is implemented. The Environmental Management System will be updated accordingly.

6.1.5 Storage of oils and chemicals

Fresh oil and waste oil associated with the operation of the CHPs are stored in bunded tanks within the CHP Containers.

Diesel for the operation of the back-up generator is stored in a bunded integral tank with locked valves. Diesel for on-site vehicles is stored in a bunded store.

Ferric hydroxide powder for the control of hydrogen sulphide (H_2S production is stored within the Waste Reception Building / chemical store.

Any potentially polluting chemicals including glycol are stored within the chemical store.

An Inventory of Substances is maintained; Appendix B of the Accident Management Plan Manual **(HBP-OD-08)**.

6.2 Secondary Containment

The secondary containment system has been extended around the Raw Waste Buffer Tank and Digesters 2 and 3 as part of the current improvement and expansion works.

The extended secondary containment lining work was carried out by Enviroseal Lining Solutions and at the time of writing is undergoing a construction quality assurance review by Plandescil Consulting Engineers which includes checking compliance with the relevant guidance (CIRIA C736). The Operator is committed to undertaking any required improvements and ensuring any additional appropriate inspection and maintenance is implemented. The Environmental Management System will be updated accordingly.

The secondary containment infrastructure is inspected as part of the Daily Checks **(HBP-MP-01).**

6.3 Drainage

At the time of writing the site drainage is under review. Currently the entire site drainage is managed as dirty with minimal clean and dirty water separation.

The drainage strategy is being redesigned by Plandescil Consulting Engineers who are experienced in the development of drainage systems for AD plants and will follow the guiding principles of BAT:

- Minimisation of underground structure and pipework where possible and suitable leak detection and containment to be provided.
- Segregation of clean and dirty areas and reuse of water where possible.
- Clean surface water collected from the digester roofs and designated clean areas of the site drains to a new proposed lined surface water storage lagoon (3,000m^3) for storage and use within the process.
- Use of an impermeable surface with a sealed drainage system for any areas where the runoff is potentially polluting i.e., silage clamps and apron, waste reception building, solids feeder, separator, and fibre bay.
- The secondary containment area will collect to a sump or sumps with a system for actively pumping out to dirty water or clean water storage as appropriate in accordance with the Secondary Containment Checking & Emptying Procedure **(HBP-SOP-07)**. Typically, water from the secondary containment bund will be treated as dirty and pumped to the Process Water Tanks for treatment in the AD process. If visibly contaminated the source of the contamination will be immediately investigated in accordance with the Spill Control Procedure **(HBP-SOP-13),** and steps taken to resolve it.
- It will be ensured that the secondary containment system is designed in accordance with CIRIA 736 accounting for extreme rainfall events including climate change predictions. In the case of abnormal excess water levels due to extreme rainfall event clean water from the surface water lagoon may be released to the wider environment following pre-determined checks outlined within the Discharge of Flood Water Procedure **(HBP-SOP-23)** which is part of the Accident Management Plan **(HBP-OD-08).**
- If the visual and olfactory checks confirm that there have been no spillages, and laboratory analysis confirms that parameters for emissions to water are at acceptable levels, then the water will be pumped out to the surface water lagoon as clean water.

Following a full drainage survey, there will be as-built drawings produced showing the route of all sub-surface drains.

A revised inspection, maintenance and repair schedule will be implemented in accordance with the recommendations provided by Plandescil Consulting Engineers. The Environmental Management System will be updated accordingly.

The majority of pipework is above ground however there are two stretches of underground pipework which are surveyed every 5 years:

- Pipe from crop feeder and associated mixing pump to Digester 1.
- Pipe between Digester 1 and the Post Digester.

7 Control of Emissions to Air

The emission points (EP) to air EP1 to EP14 inclusive are shown on Figure 2 – Permit Boundary & Emission Point Plan and are shown in Table 3 below:

Table 3: Emission Points

Emission Point Reference	Source
EP1	Biofilter outlet
EP2	Combined Heat and Power Engine Stack 1 (Duty)
EP3	Combined Heat and Power Engine Stack 2 (Standby)
EP4	Flare stack 1 (1,000Nm^3/h)
EP5	Flare stack 2 (500Nm^3/h)
EP6	Emergency diesel generator stack
EP7	Carbon dioxide vent stack on biogas upgrade plant
EP8	Combined lagoon gas carbon filter vent
EP9	PVRV on Raw Waste Buffer Tank
EP10	PVRV on Digester 1
EP11	PVRV on Digester 2
EP12	PVRV on Digester 3
EP13	PVRV on Post digester
EP14	PVRV on Pasteuriser

The control of emissions from the biofilter (EP1) is discussed under Control of Amenity Impacts (odour) (Section 8).

The control of emissions from the CHP stacks (EP2 & EP3) is through use of a carbon filter prior to the CHP(s) and planned preventative maintenance and inspection of the engine which is carried out by a specialist third party contractor.

The PVRVs are an emergency safety device which will only be activated in the event of an over or under pressure within the tanks to which they are fitted. The emissions from the two flares (EP3 & EP4) and the PVRVs (EP9 – EP14 inclusive) will be controlled through effective process monitoring and management of biogas production. The AD plant feeding regime will be varied to optimise biogas production and load to the CHP (normally only one CHP will operate at any one time) and the biogas upgrading plant. Matching production to use correctly ensures that the production of excess biogas and hence emissions of raw biogas through the PVRVs and use of the flares is minimised. The PVRVs will release at higher set pressures than the flares. Therefore, emissions of raw biogas will be minimised. Control of gas pressures is described in detail in the BAT Assessment which supports this application (BAT 8 & BAT 15).

The existing flare (EP3) was a non- BAT compliant flare (ignition temperature of 700^{o}C) which has been replaced by a BAT compliant ground- enclosed flare (ignition temperature of 1000^{o}C and residence time of 0.3 seconds) capable of burning 500Nm^3/h. The new flare (EP4) is a BAT compliant, high temperature, ground enclosed flare capable of burning 1,000Nm^3/h. The flares will only be used during abnormal operations and are subject to planned preventative maintenance.

The emergency generator (EP6) will only be used infrequently during abnormal operations and will be subject to planned preventative maintenance.

The vent on the biogas upgrading plant (EP7) is currently used for the release of CO_2 arising from the upgrade of biogas to biomethane. Once the CO_2 recovery plant is operational this gas will be captured and the stack will only be used in the case of breakdown or maintenance of the recovery unit. Trace gases are removed from the biogas through two carbon filters operating in series and this system is continuously monitored via the Biosense monitoring system which is linked to SCADA.

Emissions of residual biogas from the digestate storage lagoons will be minimised by the covering of the lagoons (scheduled for 2024) and by channelling emissions from both lagoons through an impregnated carbon filter. There will be two carbon filters operating in series to remove ammonia (NH_3) and residual odour including volatile organic compounds and hydrogen sulphide (H_2S) respectively. The emission point from the final carbon filter is Emission Point (EP8).

Fugitive emissions to air are primarily controlled through the covering of the silage clamps with an impermeable cover, enclosure of fibre digestate storage and the covering of the digestate storage lagoon (the latter scheduled for 2024). Solid waste pending treatment is stored in the Waste Reception Building which benefits from fast acting roller shutter door, an air handling system, and an odour abatement biofilter system. Liquid waste is stored in the Raw Waste Buffer Tank, the headspace of which is connected to the biogas system. In addition, the AD process is fully contained with the exception of the emission points detailed above.

The Air Quality and Odour Impact Assessment Air[5] which supports this application provides a full assessment of potential impacts of emissions to air from the operation upon human and ecological receptors.

8 Control of Amenity Impacts

8.1 Overview

As previously noted, the Environmental Risk Assessment (Appendix A of the EMS Manual **(HBP-OD-01**)) is based upon the generic risk assessment for SR2021 No.6. The additional risk factors which determined the need for a bespoke permit, namely the proximity to ecological receptors has been considered within the Environmental Risk Assessment.

8.2 Odour

The Air Quality and Odour Impact Assessment (AQOIA)[5] which supports this permit variation application concludes that the Site operation is not likely to be an odour nuisance at human receptors.

The primary control of odour is at source:

- Silage clamps will be covered and only exposed for removal of feedstocks.
- All solid waste feedstocks will be stored and treated within the Waste Reception Building which benefits from a bespoke air handling and odour abatement system.
- The digestate storage lagoons will be covered and will benefit impregnated carbon filter to treat channelled emissions.
- The fibre digestate is not produced or stored inside a building. However, the proposal is that the separators will be enclosed in a tented structure, open on one side to allow easy access for vehicles to remove fibre digester which will be removed from the Site. A derogation from BAT has been stipulated in the Section 3 (Conclusions and recommendations) of the BAT Assessment.

Odour emissions from the biofilter stack (EP1) will be controlled via adherence to a planned preventative maintenance schedule specified by the manufacturer.

An updated Odour Management Plan **(HBP-OD-07)** has been developed by ETL for use as part of the management system. This document has been submitted for assessment as part of the permit variation application.

8.3 Bioaerosols

A Site Specific Bioaerosol Risk Assessment has been undertaken by Redmore Environmental and forms Appendix F. Their report concludes:

“The results of the assessment indicated residual risk from all sources was determined as low or very low. As such, potential impacts as a result of bioaerosol emissions from the facility are considered to be not significant and no further control measures, other than those specified, are required in order reduce the potential for impacts at sensitive locations in the vicinity of the site”.

8.4 Noise

Noise emissions will be minimised through planned preventative maintenance for all equipment including the CHPs, flares and the gas storage dome fans which are potential sources of noise emissions, in accordance with the Maintenance Schedule **(HBP-MP-03)**.

Planning applications to date have not required a quantitative Noise Impact Assessment. The fact that there are no residential receptors within 750m have meant that a qualitative assessment has been deemed to be sufficient.

The planning permission restricts delivery of waste to the site such that there can be up to 18 waste deliveries per day. Waste can only be delivered to the site between the hours of 07:00 and 18:00 Monday to Friday, between 07:00 and 12:00 on Saturday mornings and between 7:00 and 15:00 on Bank Holidays except Christmas Day and Easter Sunday.

The applicability of BAT 17 requirements is restricted to cases where a noise or vibration nuisance at sensitive receptors is expected and/or has been substantiated. It is understood that there have not been any noise complaints related to the site operations, noise or vibration at sensitive receptors is not expected, and therefore a Noise and Vibration Management Plan (NVMP) has not been prepared.

8.5 Other Amenity Impacts

The use of the Waste Reception Building for the storage and treatment of waste feedstocks reduces the probability of exposure of other potential amenity impacts such as litter, pests, and scavengers.

There is a pest control contract in place. A Pest Management Plan **(HBP-OD-09)** has been developed by ETL and is submitted as part of the variation application supporting documents.

Management techniques for the control of dust are detailed within Section 4 of the EMS Manual **(HBP-OD-01).**

In accordance with the Environmental Risk Assessment (Appendix A of the EMS Manual **(HBP-OD-01)**), there are no other significant amenity hazards.

9 Operating Techniques

Part C3 Section 3, Operating Techniques, Question 3a1 asks:

Does your permit (in Table 1.2 Operating Techniques or similar stable on the permit) have any references to your own documents or parts of documents submitted as part of a previous application for this site?

Table S1.2 within the existing permit does refer to documents submitted as part of the original permit application in 2013. Table 4 provides a summary of document references which are no longer valid or have been superseded and why.

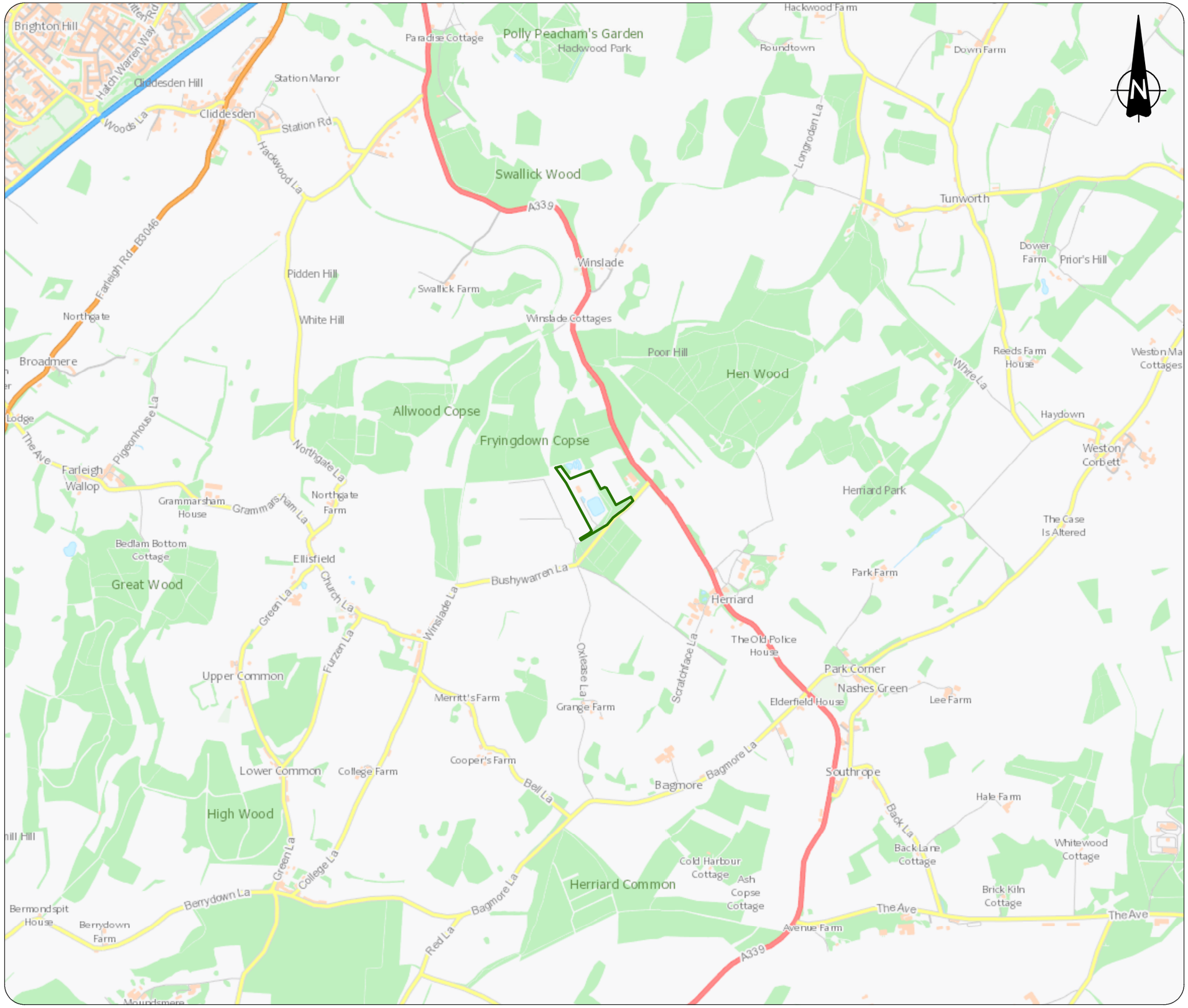
Table 4 – Operating Techniques referenced in existing permit and their relevance or why they have been superseded

Description	Parts	Previous Date Received	Relevance or details on why superseded
Application	Part B4, Table 3a – Technical Standards	01/10/13	This document is superseded by the Technical Standards within Part C3, Table 3.[11]
Application	All parts of the supporting documents submitted with the application.	01/10/13	The control measures detailed within these documents are still relevant. Additional control measures relating to the proposed variation are detailed within Sections 4-7 inclusive of this Non-Technical Summary.
Additional information received by email	Revised non-technical summary.	04/11/13	As above.
Additional information received by email	Odour Management Plan – October 2013 Revision 1	08/11/13	Superseded. A r new version of the Odour Management Plan is submitted as part of this permit variation application **(HBP-OD-07).**
Additional information received by email	Revised H1 risk assessment.	26/11/13	Superseded. A new version of the H1 risk assessment is submitted as part of this permit variation application.[12]
Additional information received by email	Emissions to Air H1 Screening and Atmospheric Dispersion Modelling – December 2013 SLR Ref: 402-04805-00001.	16/12/13	Superseded. A new Air Quality and Odour Impact Assessment[5] is submitted as part of this permit variation application.

[11] ETL813/HBP/PartC3/V1.0 December 2023

[12] ETL813/H1/Final/V1.0 December 2023

Figures



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REVISIONS

REV	DATE	DESCRIPTION	DWN	CHK	APP
-	12/12 2023	First Issue	JJ	EP	MF

LEGEND

Permit Boundary

0 250 500 750 1,000 m

Scale at A3: 1:25,000

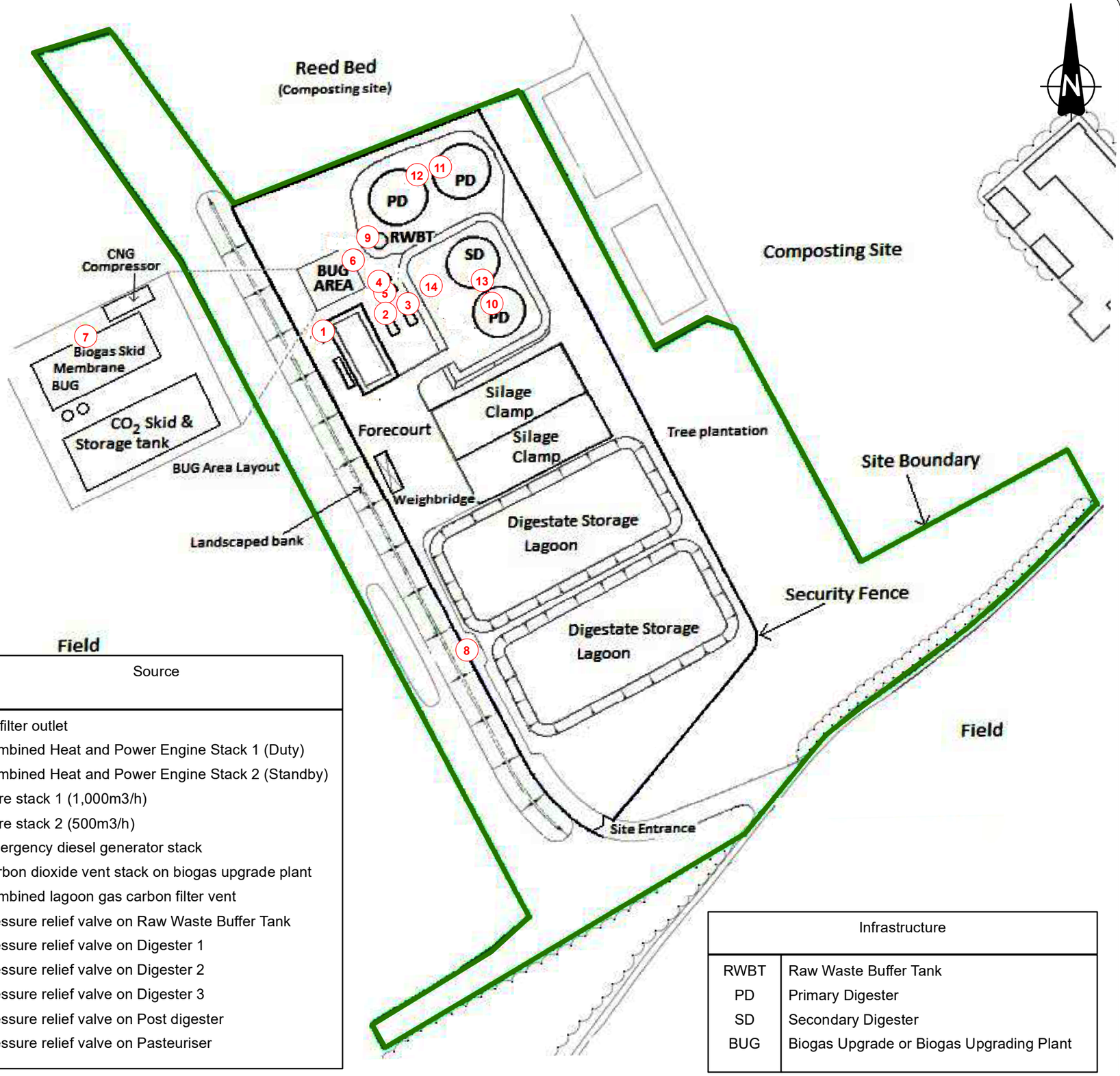
Client
Herriard Bio Power Limited

Project
Substantial Permit Variation

Title
Site Location Plan

Earthcare TECHNICAL
Manor Farm
Chalton
Waterlooville
Hants PO8 0BG
Tel: 02392 290488
enquiries@earthcaretechnical.co.uk
www.earthcaretechnical.co.uk

Drawn	Checked	Approved	Revision
JJ	EP	MF	
Date		**Scale**	**Sheet Size**
December 2023		1:25,000	A3
Drawing Number			**File Reference**
ETL813/HBP/EPR01			ETL813.mxd



Emission Point Reference	Source
EP1	Biofilter outlet
EP2	Combined Heat and Power Engine Stack 1 (Duty)
EP3	Combined Heat and Power Engine Stack 2 (Standby)
EP4	Flare stack 1 (1,000m3/h)
EP5	Flare stack 2 (500m3/h)
EP6	Emergency diesel generator stack
EP7	Carbon dioxide vent stack on biogas upgrade plant
EP8	Combined lagoon gas carbon filter vent
EP9	Pressure relief valve on Raw Waste Buffer Tank
EP10	Pressure relief valve on Digester 1
EP11	Pressure relief valve on Digester 2
EP12	Pressure relief valve on Digester 3
EP13	Pressure relief valve on Post digester
EP14	Pressure relief valve on Pasteuriser

Infrastructure	
RWBT	Raw Waste Buffer Tank
PD	Primary Digester
SD	Secondary Digester
BUG	Biogas Upgrade or Biogas Upgrading Plant

REVISIONS

REV	DATE	DESCRIPTION	DWN	CHK	APP
-	12/12 2023	First Issue	JJ	EP	MF

LEGEND

Permit Boundary

1 EP1

0 25 50 75 m

Scale at A3: 1:2,000

Client
Herriard Bio Power Limited

Project
Substantial Permit Variation

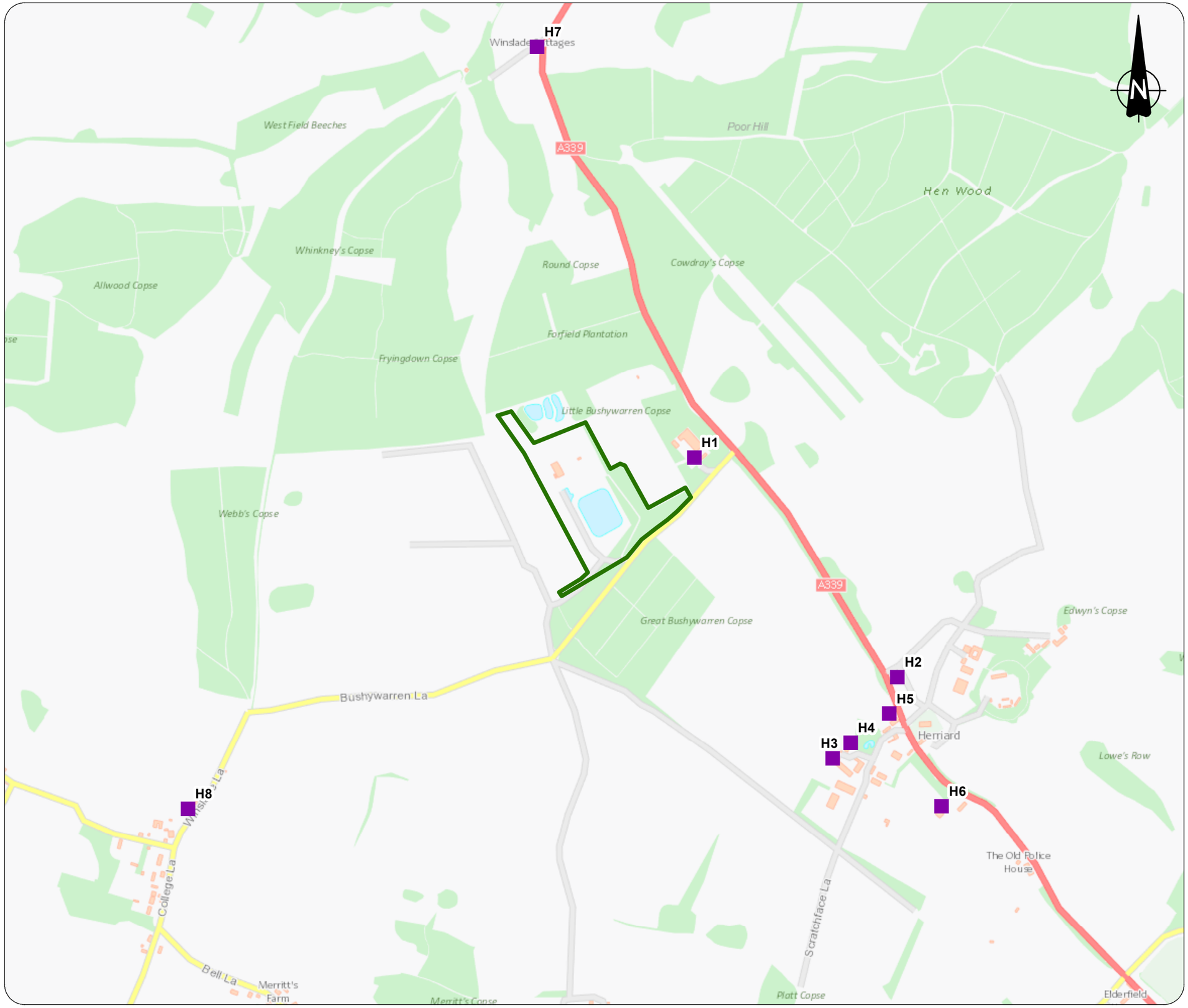
Title
Permit Boundary & Emission Point Plan

Earthcare TECHNICAL
Manor Farm
Chalton
Waterlooville
Hants PO8 0BG
Tel: 02392 290488
enquiries@earthcaretechnical.co.uk
www.earthcaretechnical.co.uk

Drawn	Checked	Approved	Revision
JJ	EP	MF	

Date	Scale	Sheet Size
December 2023	1:2,000	A3

Drawing Number	File Reference
ETL813/HBP/EPR02	ETL813.mxd



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REVISIONS

REV	DATE	DESCRIPTION	DWN	CHK	APP
-	12/12 2023	First Issue	JJ	EP	MF

LEGEND

- Permit Boundary
- Human Receptor

0 100 200 300 400 m

Scale at A3: 1:10,000

Client
Herriard Bio Power Limited

Project
Substantial Permit Variation

Title
Human Receptors Plan

Earthcare TECHNICAL
Manor Farm
Chalton
Waterlooville
Hants PO8 0BG
Tel: 02392 290488
enquiries@earthcaretechnical.co.uk
www.earthcaretechnical.co.uk

Drawn	Checked	Approved	Revision
JJ	EP	MF	

Date	Scale	Sheet Size
December 2023	1:10,000	A3

Drawing Number	File Reference
ETL813/HBP/EPR03	ETL813.mxd

Appendix A – Net Rated Thermal Input Calculations

The thermal input of the CHPs (existing and proposed) and the emergency generator have been calculated in accordance with Annex B of the AMPS Technical Committee document – Determination of the thermal input power of an engine driven generator.[13]

$P_{th} = P_{(r)} * 100/n_e$

Where:

P_{th} = thermal input power

$P_{(r)}$ = rated power (mechanical or electrical, whichever is available)

n_e = effective efficiency (relevant for mechanical or electrical power)

Table 5 Thermal input calculation

Combustion plant / Generator	**Rated power (electrical) kW**	**Effective efficiency (electrical) (%)**	**Thermal input power kWthi**
CHP (existing)	1,200	42.1 (at full load)	2,850
CHP (proposed)	1,200	42.1 (at full load)	2,850
Emergency generator	414	33*	1,254
Aggregated thermal input			**6,954**

* Used suggested efficiency from AMPS guidance for a <1MW compression ignition generator using liquid fuel.

[13] Determination of thermal input power of an engine driven generator, Association of Manufacturers of Power generating Systems (AMPS) Technical Committee, 2016

Appendix B - Nature and Heritage Conservation Screening Report & Maps

Nature and Heritage Conservation

Screening Report: Bespoke installation

Reference	**EPR/AB3807KW/P002**
NGR	**SU6545146699**
Buffer (m)	**170**
Date report produced	**31/10/2023**
Number of maps enclosed	**3**

This nature and heritage conservation report

The nature and heritage conservation sites, protected species and habitats, and other features identified in the table below **must be considered in your application**.

In the further information column, there are links which give more information about the site or feature type and indicate where you are able to self-serve to get the most accurate site boundaries or feature locations.

Most designated site boundaries are available on Magic map. Using Magic map allows you to zoom in and see the site boundary or feature location in detail, Magic map also allows you to measure the distance from these sites and features to your proposed boundary. Help videos are available on Magic map to guide you through.

Where information is not publicly available, or is only available to those with GIS access, we have provided a map at the end of this report.

Sites and Features within screening distance	Screening distance (km)	Further Information
Local Wildlife Sites (LWS) (see map below)	2	Appropriate Local Record Centre (LRC)
A339 Alton Road, Herriard		Appropriate Wildlife Trust
Buckshorn Copse		
C12 Bagmore Lane		
Coombe Wood, Tunworth		

Ellisfield Road Verge

Great Bushywarren Copse

Guy's Copse

Kingsmore, Allwood & Fryingdown Copses

Kit Lane & Longfield Dells

Herriard Common

Hen Wood

Hook's Copse, Weston Corbett

Hummocks Clump

Little Bushywarren Copse

Merritt's Copse

Parkfield Copse Complex & Lower Common Pit

Picked Craft Copse

Platts Copse

Smallhill Clump

Tom's Copse

Sites of Special Scientific Interest (SSSI)	2	Natural England and Magic map
Mapledurwell Fen		

Protected Species within screening distance	Screening distance (km)	Further Information
Bullhead	up to 2	Natural England Appropriate Local Record Centre (LRC)

National Biological Network (NBN)

Environment Agency. Dial 03708 506 506 for your local Fisheries and Biodiversity team

Protected Habitats within screening distance	Screening distance (km)	Further Information
Chalk Rivers	up to 2	Natural England
Coastal and Floodplain Grazing Marsh		

Where protected species are present, a licence may be required from Natural England to handle the species or undertake the proposed works.

The relevant Local Records Centre must be contacted for information on the features within local wildlife sites. A small administration charge may also be incurred for this service.

The following nature and heritage conservation sites, protected species and habitats, and other features have been checked for, where they are relevant for the permit type requested, but have not been found within screening distance of your site unless included in the list above.

Special Areas of Conservation (cSAC or SAC), Special Protection Area (pSPA or SPA), Marine Conservation Zone (MCZ), Ramsar, Sites of Special Scientific Interest (SSSI), National Nature Reserve (NNR), Local Nature Reserve (LNR), Local Wildlife Sites (LWS), Ancient Woodland, relevant species and habitats.

Please note we have screened this application for features for which we have information. It is however your responsibility to comply with all environmental and planning legislation, this information does not imply that no other checks or permissions will be required.

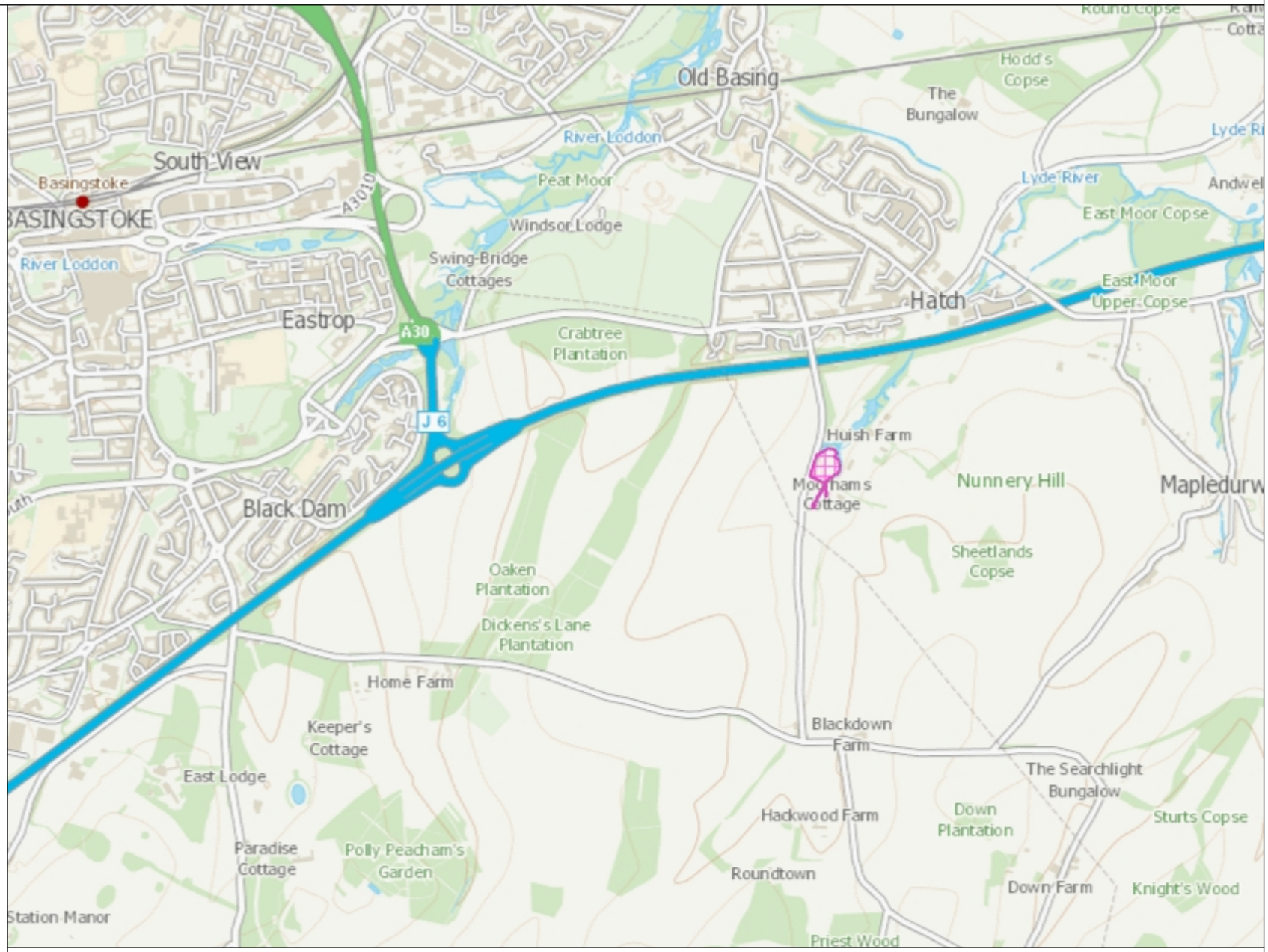
The nature and heritage screening we have conducted as part of this report is subject to change as it is based on data we hold at the time it is generated. We cannot guarantee there will be no changes to our screening data between the date of this report and the submission of the permit application, which could result in the return of an application or requesting further information

Protected Habitats

Environment Agency

Legend

Protected Habitats screened for Env Permits



1: 25,000

0 625

Metres

N W E S

Protected Species

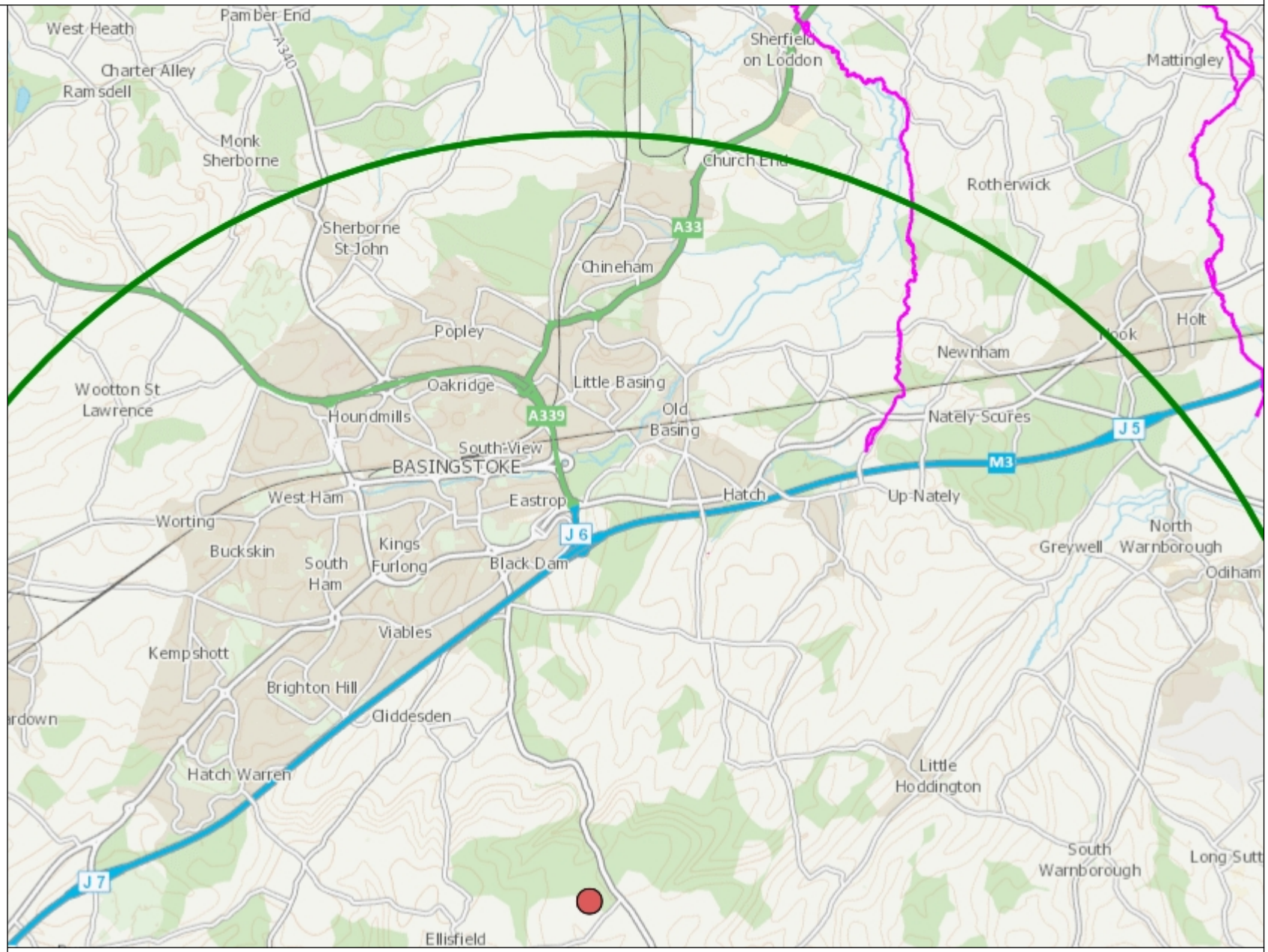
Environment Agency

Legend

Protected species screened for Env Permits - complete set

- Protected species, non fish
- Protected fish
- Protected fish migratory route

Fish migratory routes screened for Environmental Permits



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0 1,875

Metres

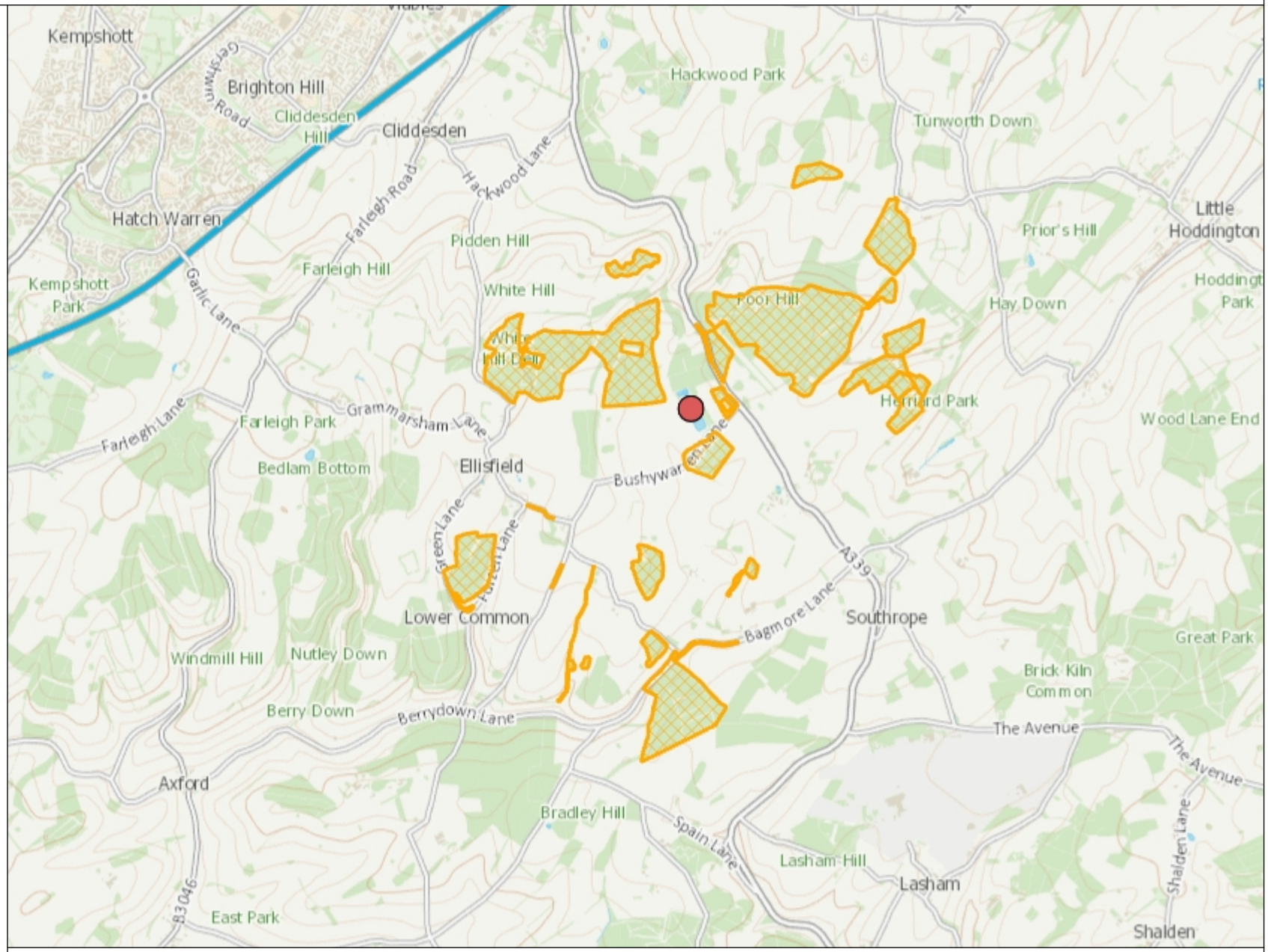
N W E S

Local Wildlife Sites

Environment Agency

Legend

Local Wildlife Sites



1: 50,000

0 1,250

Metres

N W E S

Appendix C - Nature and Heritage Conservation Risk Assessment

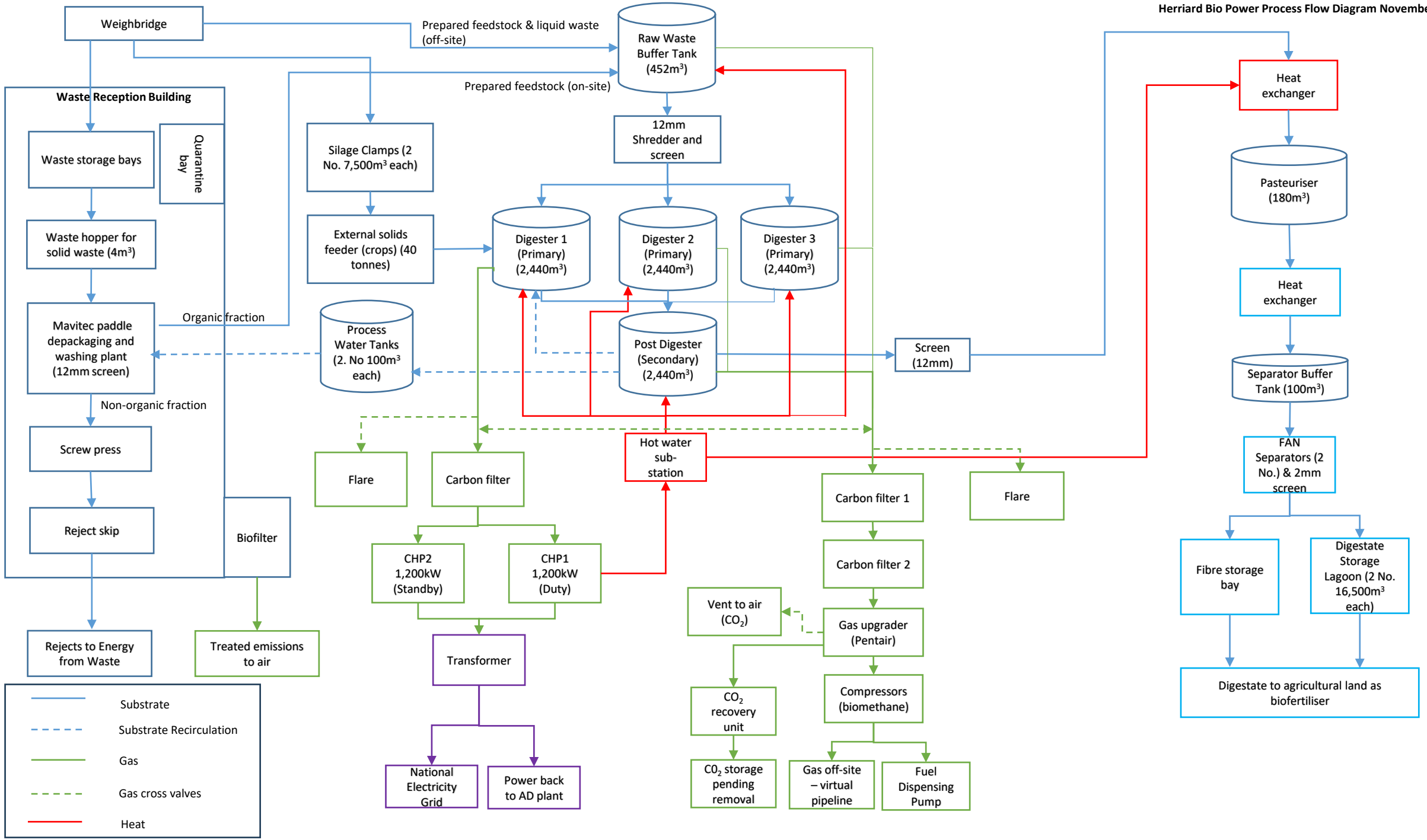
Site / Species name and type	Screening distance (m)	Distance from site boundary (m)	Direction from site	Assessment of risk upon protected site from proposed changes
Sites of Special Scientific Interest (SSSi)	**2,000**			
Mapledurwell Fen		6km however the site is within 2000m of the nearest stretch of the Detailed River Network to the site location	North east	Water quality impact - None. The site is in a different waterbody catchment to the protected habitat. Air quality impacts – None. The site has not been considered in the Air Quality and Odour Impact Assessment that supports this permit variation application as it is outside the relevant screening distance (2km).
Local Wildlife Sites (LWS)	**2,000**			
A339 Alton Road, Herriard		425	North east	The Air Quality and Odour Impact Assessment[5] supporting this permit variation application has considered the predicted impacts upon ecological receptors including LWS Sites and they have been screened out as not significant.
Buckshorn Copse		1,102	North	As above
C12 Bagmore Lane		1,718	South	As above

Site / Species name and type	Screening distance (m)	Distance from site boundary (m)	Direction from site	Assessment of risk upon protected site from proposed changes
Coombe Wood, Tunworth		1,535	North east	As above
Ellisfield Road Verge		1,587	South west	As above
Great Bushywarren Copse		Adjacent	South	As above
Guy's Copse		1,046	North east	As above
Kingsmore, Allwood & Fryingdown Copses		50	West	As above
Kit Lane & Longfield Dells		1,788	South west	As above
Herriard Common		1,815	South	As above
Hen Wood		679	North east	As above
Hook's Copse, Weston Corbett		1,701	North east	As above
Honeyleaze Copse		1,427	East	As above
Hummocks Clump		1,585	North west	As above
Little Bushywarren Copse		Adjacent	East	As above
Merritt's Copse		992	South west	As above
Parkfield Copse Complex & Lower Common Pit		1,895	South west	As above

Site / Species name and type	Screening distance (m)	Distance from site boundary (m)	Direction from site	Assessment of risk upon protected site from proposed changes
Picked Craft Copse		2,039	North west	As above
Platts Copse		1,079	South west	As above
Smallhill Clump		2,000	North east	As above
Tom's Copse		1,482	North east	As above
Protected Species	**2,000**			
Bullhead		6,750	North east	None. There are no emissions to water under normal operating conditions. The site is in a different waterbody catchment to the protected habitat.
Protected Habitats	**500**			
Chalk Rivers		4,635	North east	None. There are no emissions to water under normal operating conditions. The site is in a different waterbody catchment to the protected habitat.
Coastal & Floodplain Grazing Marshes		4,635	North east	None. There are no emissions to water under normal operating conditions. The site is in a different waterbody catchment to the protected habitat.

Appendix D - Process Flow Diagram

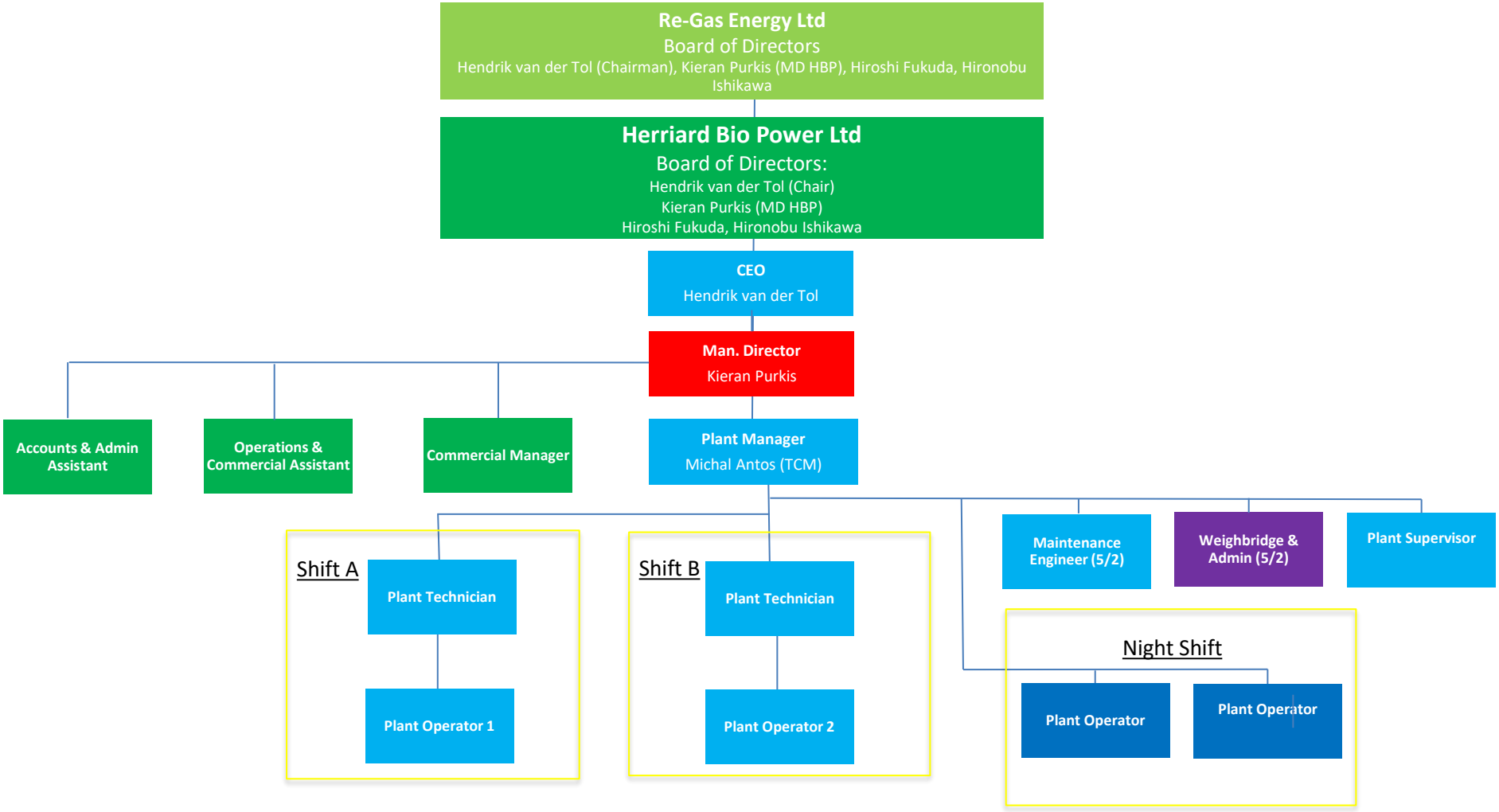
Herriard Bio Power Process Flow Diagram November 2023



Appendix E – Staff Organogram

Herriard Bio Power AD Plant - O&M Organisational Chart

Updated: 07 November 2023



Appendix F - Site Specific Bioaerosol Risk Assessment

Bioaerosol Risk Assessment

Herriad Anaerobic Digestion Plant, Herriad

Client: Herriad Bio Power

Reference: 2256-7r2

Date: 7th December 2023

Report Issue

Report Title: Bioaerosol Risk Assessment - Herriad Anaerobic Digestion Plant, Herriad

Report Reference: 2256-7

Field	Report Version			
	1	2	3	4
Prepared by	Ger Parry	Ger Parry		
Position	Associate Director	Director		
Reviewed by	Jethro Redmore	Jethro Redmore		
Position	Director	Director		
Date of Issue	16th December 2021	7th December 2023		
Comments	Updated following client comment	-		

Serendipity Labs, Building 7, Exchange Quay, Salford, M5 3EP

info@red-env.co.uk | 0161 706 0075 | www.red-env.co.uk

Table of Contents

1.0 INTRODUCTION

1.1 Background

1.1.1 Redmore Environmental Ltd was commissioned by Herriad Bio Power to undertake a Bioaerosol Risk Assessment in support of the anaerobic digestion (AD) plant operated by the company on land off Bushywarren Lane, Herriad.

1.1.2 During the operation of the facility there is the potential for bioaerosol emissions and associated impacts at sensitive receptor locations in the vicinity of the site. A Risk Assessment has therefore been undertaken to identify potential emission sources and evaluate effects in the local area.

1.1.3 The purpose of this Bioaerosol Risk Assessment is to:

- Establish the likely sources of bioaerosols arising from operations at the site;
- Assess the potential for significant risk of impact at sensitive locations due to emissions from the identified sources; and,
- Identify any additional mitigation required to control potential effects.

1.2 Site Location and Context

1.2.1 Herriad AD plant is located on land off Bushywarren Lane, Herriad, at National Grid Reference (NGR): 465480, 146626. Reference should be made to Figure 1 for a map of the site and surrounding area.

1.2.2 The site operates as a biological treatment facility under an Environmental Permit (No. AB3807KW/A001) issued by the Environment Agency (EA). The following types of input materials are accepted and processed at the plant:

- Liquid and solid food wastes; and,
- Energy crops.

1.2.3 An Environmental Permit Variation Application has recently been submitted to the EA in order to authorise a number of changes to operations at the facility. These include the installation of two new digester tanks, two new covered liquid digestate storage lagoons,

a biogas upgrade plant, a carbon dioxide (CO_2) recovery unit and a biofilter to treat extract air from the waste reception building prior to discharge to atmosphere.

1.2.4 The operation of the facility following implementation of the proposed changes may result in bioaerosol emissions from a number of activities. These have the potential to cause impacts at sensitive locations within the vicinity of the site and have therefore been assessed within this report.

2.0 PROCESS DESCRIPTION

2.1 Introduction

2.1.1 A brief summary of the AD process is provided in the following Sections. It should be noted that the description incorporates all activities which will be undertaken at the site following implementation of the proposed changes.

2.2 Management

2.2.1 The overall management responsibility for the plant will lie with Herriard Bio Power Limited. The day to day facility management will be undertaken by an appointed Manager who will deal specifically with the operation of the plant.

2.2.2 Daily checks and maintenance will be undertaken by the Manager. A range of spare parts will be kept on site. If additional items are required these will be available within a 24-hour period. In addition, there is certain amount of redundancy factored into the plant operation which allows for some items to be out of action temporarily but for the remainder of the facility to continue operating normally.

2.3 Feedstock Delivery and Storage

2.3.1 A summary of the feedstock delivery and storage procedures is provided in the following Sections.

Solid Food Waste

2.3.2 Unpackaged and packaged solid food waste will be transferred to the facility in enclosed Heavy Goods Vehicles (HGVs). These will drive directly into the reception building on the western section of the site and deposit loads within dedicated storage areas.

2.3.3 A fast-acting roller shutter door will be used to allow delivery vehicle entry and exit to/from the building. This will remain closed at all times except for when access is required in order to maintain a sealed environment as far as practicable and limit the potential for fugitive bioaerosol emissions to the external atmosphere.

2.3.4 Air will be extracted from the building at a rate equivalent to 3 air changes per hour (ac/hr) and transferred to a biofilter abatement system for treatment prior to discharge to atmosphere. The proposed extraction arrangements will help to promote negative pressure within the building and reduce the potential for fugitive bioaerosol emissions when the roller shutter door is opened to allow vehicle access.

Liquid Food Waste

2.3.5 Liquid wastes will be delivered to the site in vacuum tankers. Following arrival, the feedstocks will be transferred directly into a buffer tank on the northern section of the site using a mechanical pumping system. The arrangement is a closed system and therefore the feedstocks will not be exposed to atmosphere.

2.3.6 Air displaced from the tank during filling will vent directly to the headspaces of the digesters via sealed pipework. As such, there will be no bioaerosol release to atmosphere as a result of liquid waste delivery.

Energy Crops

2.3.7 Energy crops including maize and rye will be transferred to the facility using a tractor and trailer or HGVs during typical harvest periods. The feedstocks will be deposited within a storage clamp located on the southern section of the site.

2.3.8 Following delivery, the crops will be compacted and covered with protective sheeting. This will form an airtight layer to minimise emissions and preserve the feedstock throughout the year. It should be noted that any decomposition of the material would affect its effectiveness as a feedstock. As such, the protective sheeting will be specified to prevent water and air reaching the material and hence avoid any unwanted breakdown with associated bioaerosol emissions.

2.3.9 The clamp cover will remain slightly open at one end to allow access to the crops for transportation to the AD plant.

2.4 Preliminary Processing of Feedstocks

2.4.1 A summary of the preliminary feedstock processing operations is provided in the following Sections.

Solid Food Waste

2.4.2 Solid food waste will be removed from the storage areas and deposited into feed hoppers located within the building using a front-end loading shovel. These will remove any packaging and macerate the material prior to transfer via sealed pipework to the buffer tank on the northern section of the site. The pumping arrangement is a closed system and therefore the feedstocks will not be exposed to atmosphere during transfer to the tank.

Crop Feedstocks

2.4.3 Crop feedstocks will be transferred directly from the clamp to an open top hopper to the west of primary digester 1 using a bucket loader or similar. This will macerate and blend the material prior to processing within the AD plant. It is anticipated that transfer of crops and loading of the feed hopper will take place over a period of approximately 2-hours each working day.

2.5 AD Plant Operation

2.5.1 The feedstocks will be digested within four sealed AD tanks. These include all necessary non-return valves and pumps to ensure there are no losses from any part of the process. The facility will be fully automated to maintain maximum efficiency at all times.

2.5.2 The biogas produced within the digestion process (a mixture of methane (CH_4) and CO_2) will be combusted within a Combined Heat and Power (CHP) unit in order to generate electricity and heat. Exhaust gases from the CHP unit will be dispersed to atmosphere via a dedicated stack.

2.5.3 A proportion of the biogas produced from the AD process will be upgraded for injection into the gas grid. This involves stripping out impurities, mainly CO_2, specific Volatile Organic Compounds (VOCs) and hydrogen sulphide (H_2S), before treatment with an

odorant and transfer off-site. Exhaust gases generated by the upgrading process will be discharged to atmosphere via a dedicated vent.

2.5.4 The site has an automatic back-up flare that burns gas in a controlled manner if the CHP unit or upgrade system stops temporarily, or if the plant maintenance is required. Should the flare fail for any reason the tanks are fitted with emergency release valves to avoid over pressure. These are a necessary safety feature. A record of their use will be kept and the reason for utilisation fully documented.

2.5.5 Frequent or extended use of the pressure release valves would indicate the plant is not being managed correctly and would have financial consequences for the operator due to loss of biogas and potential impacts to the digester conditions. It is therefore in their best interest to ensure they are utilised as infrequently as possible.

2.1 Pasteurisation

2.1.1 The plant will produce digestate as a by-product of the process which can be used as a biofertiliser. Many types of AD feedstocks, including crops, are rich in plant nutrients. These remain within the material throughout the process, making digestate a valuable biofertiliser. By making the best possible use of digestate as a biofertiliser, nutrients are returned to the land through natural cycles to replace the input of inorganic fertiliser. Recycling in this way closes a loop to create more sustainable agricultural production systems.

2.1.2 The digestate generated by the process will be heated to a minimum of 70.5°C for at least 1-hour in a pasteurisation unit before being pumped to a screening buffer tank. Air displaced from the pasteuriser and screening buffer tank during filling will vent directly to the headspaces of the digesters via sealed pipework. As such, there will be no bioaerosol release to atmosphere from these sources during normal operation.

2.2 Digestate Separation

2.2.1 Following pasteurisation, the digestate will be separated into solid and liquid fractions using a Börger Bioselect unit. The whole digestate will remain completely enclosed within the plant during separation and there will be no associated bioaerosol emissions to atmosphere as a result of the process.

2.2.2 Solid digestate will be discharged from the separator via an enclosed chute into a covered trailer where it will be stored prior to removal from the site. The liquid fraction will be transferred to one of two lagoons located on the southern section of the facility. Both lagoons will feature impermeable membrane covers in order to prevent rain ingress and provide containment of the material. Any gases displaced from the headspace between the liquid surfaces of the digestate and the covers will be vented directly to the digesters via sealed pipework.

2.2.3 The liquid digestate will be pumped from the lagoons to the local estate for land application. The pumping arrangement is a closed system and therefore the materials will not be exposed to atmosphere during transfer.

3.0 BIOAEROSOL BACKGROUND

3.1 Bioaerosol Definition

3.1.1 Bioaerosol is a general term for microorganisms suspended in the air. These microorganisms include fungi and bacteria, as well as their components such as mycotoxins, endotoxins and glucans. Bioaerosols are generally less than 100µm in size and are not filtered out by hairs and specialised cells that line the nose. Due to their airborne nature and small size, many bioaerosols can penetrate the human respiratory system, resulting in inflammatory and allergic responses.

3.1.2 Although bioaerosols are ubiquitous, operations involving organic materials provide environments that are conducive to their growth. Bioaerosols are therefore likely to be associated with AD feedstocks and products, and in particular, handling activities, which release the microorganisms into the air.

3.2 Health Risks from Bioaerosols

3.2.1 Exposure to bioaerosols has been associated with human health effects, symptoms can include inflammation of the respiratory system, coughs and fever. Inhalation of bioaerosols may also cause or exacerbate respiratory diseases[1]. They have been known to cause gastrointestinal illness, eye irritation and dermatitis.

3.2.2 Possible links have also been made between exposure to bioaerosols and organic dust toxic syndrome. This is an acute disease that causes symptoms resembling those of influenza, such as shivering, an increase in body temperature, dry cough and muscle and joint pains. Of particular relevance to waste management facilities are infections caused by Aspergillus fumigatus. Invasive aspergillosis is a particularly severe infection, which may be fatal and is primarily a concern with at risk and immuno-suppressed patients.

3.2.3 Although some data is available, one of the major knowledge gaps for bioaerosols is their associated dose-response relationships. It is not currently possible to state with any certainty that a given concentration will result in a particular health impact. This is due to

[1] Guidance on the evaluation of bioaerosol risk assessments for composting facilities, EA, undated.

the number of bioaerosols that are naturally present within the environment as well as the complexities associated with human responses to different microorganisms.

3.3 Bioaerosol Emissions from Waste Management Operations

3.3.1 Most scientific research on bioaerosol emissions from waste management operations focusses on open windrow and In-Vessel Composting (IVC) systems. Although it is recognised that there are fundamental differences between composting and AD processes, there are similarities between the types of feedstocks, handling activities and infrastructure utilised. As such, a review of relevant research has been undertaken in order to inform the assessment. The findings are detailed in the following Section.

3.3.2 The EA document 'Health Effects of Composting - A Study of Three Compost Sites and Review of Past Data'[2] summarises the findings of emissions measurement work undertaken at three composting facilities, including two open air turned windrow sites and one IVC plant. The results from the work indicated a well-defined decline in concentrations of bioaerosols with increased distance from source. In most cases, measured concentrations were at or below background levels within 250m of the sources assessed.

3.3.3 The ADAS report 'Bioaerosol Monitoring and Dispersal from Composting Sites'[3] provides a summary of the findings from measurement work undertaken at three composting sites. Sampling for bioaerosols was undertaken downwind of a wide range of composting activities including shredding, turning, loading, unloading and screening. The results indicated that 91% of all micro-organisms sampled across all three sites were below 1,000cfu/m^3 at a downwind distance of 125m.

3.3.4 The Scotland and Northern Ireland Forum for Environmental Research (SNIFFER) report 'Measurement and Modelling of Emissions from Three Composting Sites'[4] provides a summary of the findings from monitoring work undertaken at three composting sites, which included two IVC facilities and one open windrow system. The findings indicated that there is the potential for seasonal variation in ambient concentrations of the mould of Aspergillus fumigatus, with concentrations being the highest in the autumn. In most

[2] Health Effects of Composting - A Study of Three Compost Sites and Review of Past Data, EA, 2001.

[3] Bioaerosol Monitoring and Dispersal from Composting Sites, ADAS, 2005.

[4] Measurement and Modelling of Emissions from Three Composting Sites, SNIFFER, 2007.

cases, levels of all bioaerosols assessed were at or below background equivalent concentrations within 250m of the sources assessed.

3.3.5 The Department for Environment Food and Rural Affairs (DEFRA) research report 'Bioaerosols and odour emissions from composting facilities'[5] focusses on the comparability of different sampling methodologies and the influence of spatial and temporal variation on ambient bioaerosol concentrations. Measurements were undertaken at four different composting facilities in England, which represent a range of system types. The results of the study corroborate existing research and suggest that concentrations of bioaerosols generally return to background levels within 250m of the source.

3.3.6 The findings of the review have been considered as appropriate throughout the assessment.

3.4 Legislative Control

3.4.1 Atmospheric emissions from industry are controlled in the UK through the Environmental Permitting (England and Wales) Regulations (2016) and subsequent amendments. The operation of an AD plant is included within the Regulations and as such the facility is required to operate in accordance with an Environmental Permit issued by the EA.

3.5 Environment Agency Policy

3.5.1 The EA Regulatory Position Statement (RPS) 'Bioaerosol monitoring at regulated facilities - use of M9: RPS 209'[6] outlines the conditions that apply to facilities in relation to bioaerosol emissions.

3.5.2 The RPS states that if a regulated facility is located within 250m of a sensitive receptor (a place where people live or work for more than 6-hours at a time), the operator must:

5 Bioaerosols and odour emissions from composting facilities, DEFRA, 2013.

6 Bioaerosol monitoring at regulated facilities - use of M9: RPS 209, EA, 2018.

- Monitor bioaerosols in accordance with EA guidance 'M9: environmental monitoring of bioaerosols at regulated facilities'[7]; and,
- Undertake a site specific Bioaerosol Risk Assessment.

3.5.3 The conditions outlined within the RPS have been considered as appropriate throughout the assessment.

3.6 Benchmark Levels

3.6.1 In the absence of dose-response data, the EA have adopted a precautionary risk-based approach in determining guidance levels for bioaerosols. The EA position statement 'Composting and potential health effects from bioaerosols: our interim guidance for permit applicants'[8] specifies the following criteria for acceptable concentrations of Aspergillus fumigatus and total bacteria at sensitive receptor locations:

- Aspergillus fumigatus - 500cfu/m^3; and,
- Total bacteria - 1,000cfu/m^3.

3.6.2 The relevant benchmark levels have been considered as appropriate throughout the assessment.

3.7 Technical Guidance

3.7.1 The EA guidance 'How to comply with your environmental permit. Additional technical guidance for: Anaerobic Digestion'[9] sets out indicative Best Available Technique (BAT) or appropriate measures for the AD of organic materials. The document provides practical guidance on how and why bioaerosol emissions occur, as well as measures that can be employed to prevent or minimise release.

3.7.2 The requirements of the guidance have been considered throughout the assessment.

7 M9: environmental monitoring of bioaerosols at regulated facilities, EA, 2017.

8 Composting and potential health effects from bioaerosols: our interim guidance for permit applicants, EA, 2010.

9 How to comply with your environmental permit. Additional technical guidance for: Anaerobic Digestion, EA, 2013.

4.0 PROBLEM DEFINITION

4.1 Introduction

4.1.1 The first stage of any risk assessment is to clearly set out the problem, including what will be addressed and what will not. This determines the scope, level of detail and focus. In particular, the temporal and spatial scales, contaminants to be assessed, persons at risk and the endpoint are identified. These factors are considered in the following Sections.

4.2 Conceptual Model

4.2.1 Potential hazards from bioaerosols are summarised in the conceptual model in Table 1.

Table 1 Conceptual Model

Criteria	Comment
Source	Feedstocks and products on the site as outlined in Section 4.3
Hazard	Potential adverse health impacts as outlined in Section 2.2
Transport Mechanism	Airborne
Medium of Exposure	Inhalation, ingestion, absorption, injection
Receptor	Human receptors at the proposed site as outlined in Section 4.4

4.3 Sources

4.3.1 The operation of the AD plant may result in bioaerosol emissions from a number of activities. A review of the proposed operations was undertaken in order to identify relevant emissions sources for inclusion in the assessment. This identified the following:

- Exposed crop feedstocks within the clamps;
- Exposed crop feedstocks during transfer to the hopper;
- Exposed crop feedstocks within the hopper;
- Fugitive emissions from the covered solid digestate trailer;
- Fugitive emissions from the covered liquid digestate storage lagoons; and,
- Emissions from the proposed biofilter.

4.3.2 Reference should be made to Figure 2 for a visual representation of the source locations.

4.3.3 As stated previously, the actual AD process itself is sealed and therefore does not form a source of bioaerosols under normal operation. The digesters will feature release valves to avoid over pressure. Any gases released from the valves are likely to contain bioaerosols as a result of the digestion processes. However, releases from these sources are expected to be extremely infrequent and short-term as they would only occur in an emergency situation. As such, the risk of impact from these emissions is not considered to be significant and they have not been evaluated further in the context of this assessment.

4.3.4 The CHP unit and flare stack will only emit products of combustion which do not contain any bioaerosols. As such, they have not been considered further in this report.

4.3.5 Biogas which is upgraded to biomethane for injection into the gas grid will be passed through an activated carbon filter to remove specific compounds before CO_2 is stripped through selective membranes and vented to atmosphere. The system is likely to provide beneficial reductions in bioaerosol concentrations between inlet and vented air due to the impaction of microorganisms onto the carbon media during operation. As such, the risk of impact from residual emissions is not considered to be significant and they have not been evaluated further in the context of this assessment.

4.3.6 As stated previously, emissions from other potential sources at the facility will be vented back to the headspaces of the digesters and there will be no associated bioaerosol release to atmosphere. The potential for bioaerosol emissions from each remaining source is considered further in the following Sections.

Exposed Crop Feedstocks During Delivery and Storage

4.3.7 Energy crops will be transferred to the facility using a tractor and trailer or HGVs during typical harvest periods. The feedstocks will be deposited within a storage clamp located on the southern section of the site. Disturbance of the material during delivery may cause bioaerosol release. However, the seasonal nature of deliveries and short amount of time required to deposit loads is likely to minimise potential exposure durations.

4.3.8 Following delivery, the crop feedstocks will be compacted and covered with protective sheeting. This will help to minimise bioaerosol release during storage.

4.3.9 The cover on the clamps will be slightly open at one end in order to allow access to the feedstock for removal and transportation to the AD plant feed hopper. The area of uncovered material will be kept to a minimum at all times in order to limit the potential for surface wind stripping of microorganisms.

4.3.10 The clamp will be inspected on a daily basis to ensure the sheeting is intact and providing effective coverage of the feedstock material.

4.3.11 Despite implementation of the stated controls, residual bioaerosol emissions may occur as a result of energy crop delivery and storage activities. As such, potential releases have been considered further as part of the assessment.

Exposed Crop Feedstocks During Transfer

4.3.12 Feedstocks will be transferred from the clamp to the hopper for maceration prior to incorporation into the AD process.

4.3.13 There is the potential for bioaerosol release during removal of feedstocks from the clamp and loading into the hopper. As such, all reasonable measures will be undertaken to minimise disturbance of the material during this operation. In addition, the shortest transfer routes will be utilised in order to limit potential exposure durations.

4.3.14 Full training will be provided to the bucket loader operative to avoid material spillage during transfer. Any spilled material will be cleared within the working day.

4.3.15 Despite implementation of the stated controls, residual bioaerosol emissions may occur as a result of crop transfer activities. As such, potential releases have been considered further as part of the assessment.

Crop Feedstock Hopper

4.3.16 The feed hopper will macerate and blend the crop feedstocks prior to processing within the AD plant.

4.3.17 There is the potential for bioaerosol release during loading and operation of the hopper. As such, all reasonable measures will be undertaken to minimise disturbance of the

material during loading and the operational periods of the plant.

4.3.18 Training in the use of relevant equipment will be provided to all staff. Any spilled material will be cleared by a site operative within the working day.

4.3.19 Despite implementation of the stated controls, residual bioaerosol emissions may occur as a result of operation of the feedstock hopper. As such, potential releases have been considered further as part of the assessment.

Solid Digestate

4.3.20 Digestate will be divided into solid and liquid fractions using a Börger Bioselect unit. The whole digestate will remain completely enclosed within the plant during separation and there will be no associated bioaerosol emissions to atmosphere as a result of the process.

4.3.21 Solid digestate will be discharged from the separator via an enclosed chute into a covered trailer. Although the AD process will reduce the quantities of some bioaerosols, particularly pathogens[10], there is the potential for emissions from this part of the process.

4.3.22 Solid digestate will remain covered within the trailer during storage in order to reduce the exposed surface area of material and limit the potential for surface wind stripping of microorganisms. However, residual emissions may occur and have therefore been considered further as part of the assessment.

Liquid Digestate

4.3.23 The liquid fraction will be transferred to one of two lagoons located on the southern section of the facility. Both lagoons will feature impermeable membrane covers in order to prevent rain ingress and provide containment of the material. Any gases displaced from the headspace between the liquid surfaces of the digestate and the covers will be vented directly to the digesters via sealed pipework.

10 Anaerobic digestion, storage, oligolysis, lime, heat and aerobic treatment of livestock manures, FEC Services Ltd, 2003.

4.3.24 It is anticipated that the lagoon covers will provide effective containment of bioaerosols. However, residual emissions may occur and have therefore been considered further as part of the assessment.

4.3.25 The liquid digestate will be pumped from the lagoons to the local estate for land application. The pumping arrangement is a closed system and therefore the materials will not be exposed to atmosphere during transfer. As such, there will be no associated bioaerosol emissions to atmosphere and releases as a result of liquid digestate transfer off-site and releases have not been considered further as part of the assessment.

Biofilter

4.3.26 Air extracted from the reception building will be vented through a woodchip biofilter located on the north-western of the site.

4.3.27 There is currently limited scientific evidence in regards the effectiveness of biofilters in reducing bioaerosol emissions. However, the SNIFFER document 'Understanding biofilter performance and determining emission concentrations under operational conditions'[11] indicates that biofilters have the capacity to remove large concentrations of bioaerosols, which is thought to be facilitated through physical impaction of microorganisms onto the media. However, it is also noted within the report that biofilters can act as emitters of bioaerosols, particularly bacteria, which naturally populate the media.

4.3.28 In accordance with EA guidance[12], the proposed biofilter will provide a minimum air residence time of 30s in order to promote effective capture and treatment of emissions. In addition, the biofilter will be maintained in accordance with the supplier's instructions and EA guidance[13] to ensure optimum performance. However, there is the potential for residual bioaerosol emissions from the system. As such, potential releases have been considered further as part of the assessment.

[11] Understanding biofilter performance and determining emission concentrations under operational conditions, Sniffer, 2014.

[12] How to comply with your environmental permit. Additional technical guidance for: composting and aerobic treatment sector, EA, 2013.

[13] How to comply with your environmental permit. Additional technical guidance for: composting and aerobic treatment sector, EA, 2013.

4.4 Other Sources of Bioaerosols

4.4.1 There is agricultural land use in the immediate vicinity of the site. Arable fields may form further sources of bioaerosols if fertilised with animal manures or slurries, as well as during crop harvest periods. However, likely impacts associated with these releases are not considered to be significant and would be expected for any rural location within the UK.

4.4.2 The AD plant is located immediately to the west of the Veolia UK Little Bushywarren open windrow composting facility. As detailed in Section 3.3, it is well established that composting operations have the potential to result in bioaerosol emissions. However, it should be noted that the stated facility operates under an Environmental Permit issued by the EA. In accordance with the provisions of the Environmental Permitting (England and Wales) Regulations (2016) and subsequent amendments, this should include appropriate conditions in order to restrict the potential for environmental impacts as a result of emissions and therefore the potential for cumulative bioaerosol effects at sensitive locations in the vicinity of the sites.

4.5 Receptors

4.5.1 EA guidance 'M9: environmental monitoring of bioaerosols at regulated facilities'[14] defines a sensitive receptor as follows:

> "Nearest sensitive receptor means the nearest place to the permitted activities where people are likely to be for prolonged periods. This term would therefore apply to dwellings (including any associated gardens) and to many types of workplaces. We would not normally regard a place where people are likely to be present for less than 6 hours at one time as being a sensitive receptor. The term does not apply to those controlling the permitted facility, their staff when they are at work or to visitors to the facility, as their health is covered by Health and Safety at Work legislation, but would apply to dwellings occupied by the family of those controlling the facility."

[14] M9: environmental monitoring of bioaerosols at regulated facilities, EA, 2017.

4.5.2 A desk-top study was undertaken in order to identify any sensitive receptors in the vicinity of the site that required specific consideration during the assessment. These are summarised in Table 2.

Table 2 Sensitive Receptors

Receptor		NGR (m)		Distance from AD Plant (m)	Direction from AD Plant
		X	Y		
R1	Residential - Manor Court	466170.9	145956.3	800	South-east
R2	Residential - A339	466293.7	146152.2	780	South-east
R3	Residential - Winslade Lane	464477.9	145825.8	1,200	South-west
R4	Residential - Winslade Cottages	465348.4	147792.5	1,000	North

4.5.3 It should be noted that the Veolia UK Little Bushywarren open windrow composting facility has not been considered as a sensitive receptor in this assessment due to the nature of operations undertaken at the site which are likely to result in a higher potential for exposure of staff to bioaerosol emissions than releases associated with the Herriad AD plant.

4.5.4 Reference should be made to Figure 3 for a visual representation of the identified receptors.

4.6 Prevailing Meteorological Conditions

4.6.1 The potential for bioaerosol emissions to impact at sensitive locations depends significantly on the meteorology, particularly wind direction, during release. In order to consider prevailing conditions at the site review of historical weather data was undertaken. Odiham meteorological station is located at NGR: 473411, 148391, which is approximately 8.7km east-north-east of the facility. It is anticipated that conditions would be reasonably similar over a distance of this magnitude. The data was therefore considered suitable for an assessment of this nature.

4.6.2 Meteorological data was obtained from Odiham meteorological station over the period 1st January 2014 to 31st December 2018 (inclusive). The frequency of wind from the eight sectors which best describe the directions which may cause impacts in the vicinity of the

site is shown in Table 3. Reference should be made to Figure 4 for a wind rose of the meteorological data.

Table 3 Wind Frequency Data

Wind Direction (°)	Frequency of Wind (%)
337.5 - 22.5	8.87
22.5 - 67.5	8.12
67.5 - 112.5	6.80
112.5 - 157.5	6.70
157.5 - 202.5	16.30
202.5 - 247.5	25.66
247.5 - 292.5	18.84
292.5 - 337.5	7.83
Sub-Total	99.12
Calms	0.26
Missing/Incomplete	0.62

4.6.3 All meteorological data used in the assessment was provided by Atmospheric Dispersion Modelling Ltd, which is an established distributor of meteorological data within the UK.

4.6.4 As shown in Table 3, the prevailing wind direction at the AD facility is from the south-west. Winds from the north and east are relatively infrequent, which is indicative of conditions throughout the UK.

5.0 RISK ASSESSMENT METHODOLOGY

5.1 Overview

5.1.1 The Bioaerosol Risk Assessment has been undertaken in accordance with the general principles of EA document 'Guidance on the evaluation of bioaerosol risk assessments for composting facilities'[15]. This included consideration of the following:

- Receptor - what is at risk? What do I wish to protect?
- Source - what is the agent or process with potential to cause harm?
- Harm - what are the harmful consequences if things go wrong?
- Pathway - how might the receptor come into contact with the source?
- Probability of exposure - how likely is this contact?
- Consequence - how severe will the consequences be if this occurs?
- Magnitude of risk - what is the overall magnitude of the risk? and,
- Justification for magnitude - on what did I base my judgement?

5.1.2 Based on the Bioaerosol Risk Assessment outcomes potential mitigation and control options were identified.

5.1.3 Further explanation for the key assessment areas is provided below.

5.2 Receptor

5.2.1 The first step was to consider how the activity could harm the environment. This involved identifying 'receptors' that may be affected and included people, property, and the natural and physical environment.

5.3 Probability of Exposure

5.3.1 The probability of exposure was defined based on the likelihood of exposure of the specific receptor to the identified sources. This depended on several factors, such as:

- Distance between source and receptor;

[15] Guidance on the evaluation of bioaerosol risk assessments for composting facilities, EA, undated.

- Dispersion potential of emission;
- Duration of emission; and,
- Frequency of emission.

5.3.2 Probability was categorised in accordance with the following criteria:

- High - exposure is probable, direct exposure likely with no/few barriers between source and receptor;
- Medium - exposure is fairly probable, barriers less controllable;
- Low - exposure unlikely, barriers exist to mitigate; or,
- Very low - exposure very unlikely, effective and multiple barriers.

5.4 Harm

5.4.1 The severity of harm from a risk depends on:

- How much a person or part of the environment is exposed; and,
- How sensitive a person or part of the environment is.

5.4.2 Some parts of the environment can be very sensitive. For example, serious health effects can occur if humans are exposed to certain chemicals for only short periods of time.

5.4.3 Harm can be described as follows:

- High - severe consequences, evidence that exposure may result in serious damage;
- Medium - significant consequences, evidence that exposure may result in damage that is not severe and is reversible;
- Low - minor consequences, damage not apparent, reversible adverse changes possible; and,
- Very low - negligible consequences, no evidence for adverse changes.

5.5 Magnitude of Risk

5.5.1 The level of risk is a combination of:

- How likely a problem is to occur; and,

- How serious the harm might be.

5.5.2 Risk is highest where both the likelihood of a problem is high and the potential harm is severe. Risk is lowest where a problem is unlikely to occur and the harm that might result is not serious.

5.5.3 Risk was defined based on the interaction between the probability of exposure and potential harm, as outlined in Table 4.

Table 4 Magnitude of Risk

Probability of Exposure	Potential Harm			
	Very Low	Low	Medium	High
High	Low	Medium	High	High
Medium	Low	Medium	Medium	High
Low	Low	Low	Medium	Medium
Very Low	Very Low	Low	Low	Medium

5.6 Further Requirements

5.6.1 Based on the outcomes of the risk assessment the EA document provides guidance on further requirements for different risks. These can be summarised as follows:

- High risks - additional assessment and active management;
- Medium risks - likely to require further assessment and may require either active management or monitoring; and,
- Low and very low risk - will only require periodic review.

5.6.2 Mitigation to reduce risk can also be applied to avoid the requirement for further assessment and/or monitoring.

6.0 RISK ASSESSMENT

6.1.1 The Bioaerosol Risk Assessment is shown in Table 5.

Table 5 Risk Assessment

Source	Probability of Exposure	Harm	Magnitude of Risk	Control Measures	Residual Risk	Justification for Residual Risk
Exposed maize crop feedstocks during delivery and storage	**Low** due to the separation distance between the receptors and source, the frequency of winds blowing towards the receptors and containment of feedstocks during storage	**Medium**	**Medium**	All reasonable measures will be undertaken to reduce the drop height of materials during unloading of the delivery vehicles Feedstocks will be stored under sheeting following delivery The area of uncovered material will be kept to a minimum during storage in order to limit the potential for surface wind stripping of microorganisms The clamp will be inspected on a daily basis to ensure the sheeting is intact and providing effective containment of emissions Training in the use of relevant equipment will be provided to all staff Any spilled material will be cleared by a site operative on the same working day	**Low**	The seasonal nature and short duration of delivery activities, as well as full implementation of the stated control measures is considered to result in a **low** risk of impact occurring

Source	Probability of Exposure	Harm	Magnitude of Risk	Control Measures	Residual Risk	Justification for Residual Risk
Exposed crop feedstocks during transfer to the feed hopper	**Very Low** due to the separation distance between the receptors and source, the frequency of winds blowing towards the receptors and the limited duration of transfer operations	**Medium**	**Low**	All reasonable measures will be undertaken to minimise disturbance of the feedstocks during removal from the clamp and transfer to the hopper The shortest transfer routes will be utilised in order to limit potential exposure durations Full training will be provided to the bucket loader operative to avoid material spillage during transfer Any spilled material will be cleared by a site operative within the working day	**Very Low**	The distance between source and receptors, limited duration of transfer operations, as well as and full implementation of the stated control measures, is considered to result in a **very low** risk of impact occurring
Exposed material within the feed hopper	**Low** due to the separation distance between the receptors and source and the frequency of winds blowing towards the receptors	**Medium**	**Medium**	Where practicable the drop height of material will be minimised in order to reduce release potential Full training will be provided to the bucket loader operative to avoid material spillage during transfer Any spilled material will be cleared by a site operative within the working day	**Low**	The distance between source and receptors, as well as and full implementation of the stated control measures, is considered to result in a **low** risk of impact occurring

Source	Probability of Exposure	Harm	Magnitude of Risk	Control Measures	Residual Risk	Justification for Residual Risk
Solid digestate trailer	**Very low** due to the distance between source and the receptors, the frequency of winds blowing towards the receptors, the limited quantity of solid digestate and minimal disturbance of material during storage	**Medium**	**Low**	Solid digestate will remain covered within the trailer during storage in order to reduce the exposed surface area of material and limit the potential for surface wind stripping of microorganisms The material will remain static during storage with minimal mechanical agitation All reasonable measures will be undertaken to minimise disturbance of the material during loading	**Very ow**	Full application of the proposed control measures is considered to result in a **very low** risk of impact occurring
Liquid digestate lagoons	**Very low** due to the distance between source and receptors and the prevailing meteorological conditions	**Medium**	**Low**	Liquid digestate will remain covered within the lagoons during storage in order to reduce the exposed surface area of material and limit the potential for surface wind stripping of microorganisms Any gases displaced from the headspace between the liquid surfaces of the digestate and the covers will be vented directly to the digesters via sealed pipework	**Very Low**	Full application of the proposed control measures is considered to result in a **very low** risk of impact occurring

Source	Probability of Exposure	Harm	Magnitude of Risk	Control Measures	Residual Risk	Justification for Residual Risk
Emissions from the biofilter	**Low** due to the distance between source and receptors and the prevailing meteorological conditions	**Medium**	**Medium**	The biofilter will provide a minimum air residence time of 30s in order to promote effective capture and treatment of emissions The biofilter will be maintained in accordance with the supplier's instructions and relevant best practice guidance. This will include irrigation of the media to ensure that sufficient moisture content is available and even air flow is maintained	**Low**	Biofilters have the capacity to remove large concentrations of bioaerosols, through physical impaction of microorganisms onto the media. Implementation of the stated control measures is considered to result in a **low** risk of impact occurring due to residual emissions

6.1.2 As shown in Table 5, the results of the assessment indicated residual risk from all sources was determined as **very low** or **low**. As such, it is concluded that no further control measures, other than those specified, are required in order reduce the potential for impacts at sensitive locations in the vicinity of the site.

7.0 CONCLUSION

7.1.1 Redmore Environmental Ltd was commissioned by Herriad Bio Power to undertake a Bioaerosol Risk Assessment in support of the AD plant operated by the company on land off Bushywarren Lane, Herriad.

7.1.2 During the operation of the facility there is the potential for bioaerosol emissions and associated impacts at sensitive receptor locations in the vicinity of the site. A Risk Assessment was therefore undertaken to identify potential emission sources and evaluate effects in the local area.

7.1.3 The following potential bioaerosol emission sources were identified:

- Exposed crop feedstocks within the clamps;
- Exposed crop feedstocks during transfer to the hopper;
- Exposed crop feedstocks within the hopper;
- Fugitive emissions from the covered solid digestate trailer;
- Fugitive emissions from the covered liquid digestate storage lagoons; and,
- Emissions from the proposed biofilter.

7.1.4 The risk of significant bioaerosol impact at sensitive locations in the vicinity of the site for each of the identified sources was assessed using a source - pathway - receptor approach. This considered the nature of the potential emission, any barriers to dispersion and the severity of harm.

7.1.5 The results of the assessment indicated residual risk from all sources was determined as **low** or **very low**. As such, potential impacts as a result of bioaerosol emissions from the facility are considered to be **not significant** and no further control measures, other than those specified, are required in order reduce the potential for effects at sensitive locations in the vicinity of the site.

8.0 ABBREVIATIONS

AD	Anaerobic Digestion
CH_4	Methane
CHP	Combined Heat and Power
CO_2	Carbon dioxide
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
HGV	Heavy Goods Vehicle
H_2S	Hydrogen sulphide
IVC	In-Vessel Composting
NGR	National Grid Reference
RPS	Regulatory Position Statement
SNIFFER	Scotland and Northern Ireland Forum for Environmental Research
VOC	Volatile Organic Compound

Figures

Legend

Site Boundary

Title
Figure 1 - Site Location Plan

Project
Bioaerosol Risk Assessment
Herriard AD Plant, Herriard

Project Reference
2256-7

Client
Herriad Bio Power

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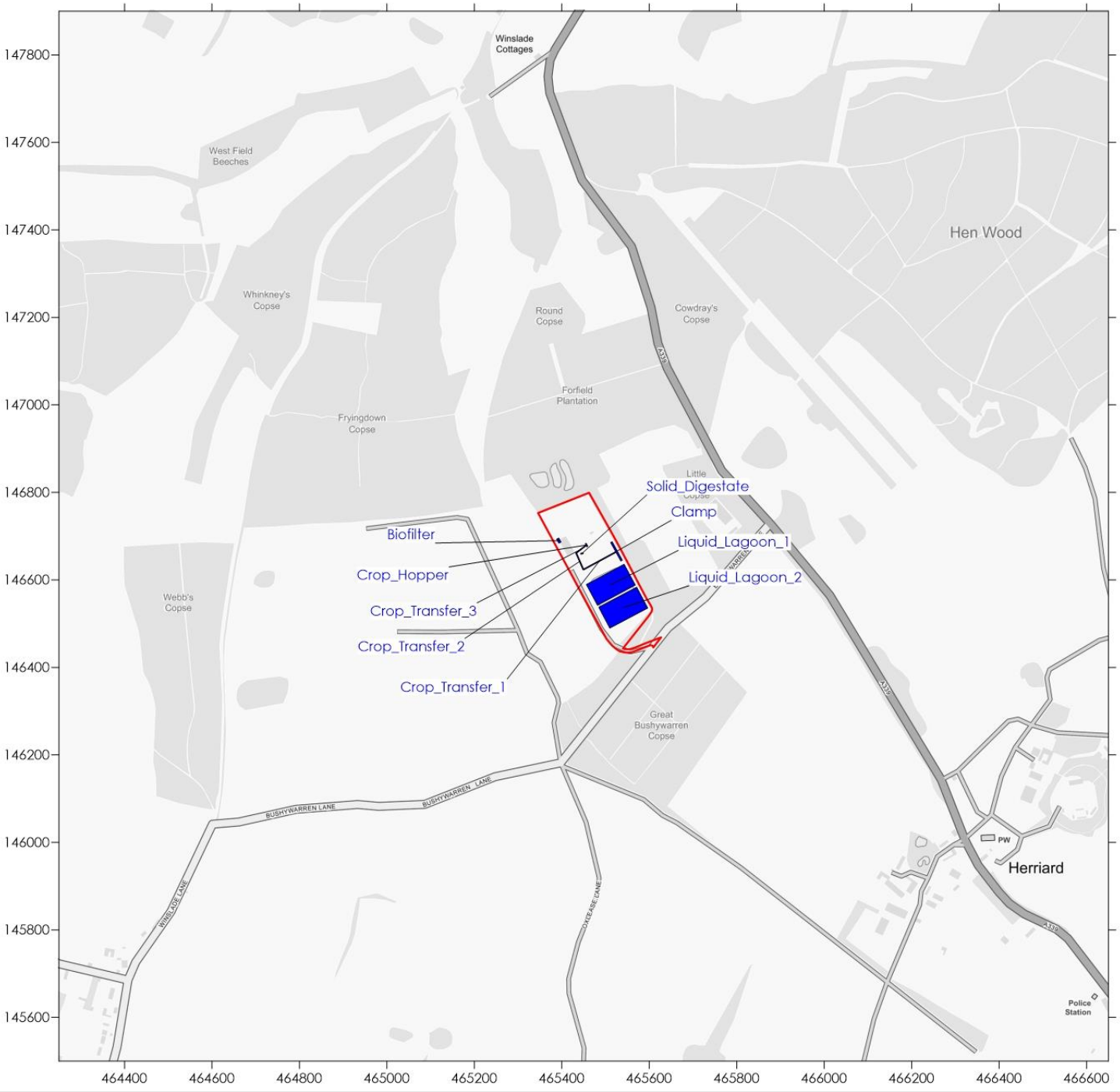

Legend

Site Boundary

Bioaerosol Source

Title
Figure 2 - Bioaerosol Emission Sources

Project
Bioaerosol Risk Assessment
Herriard AD Plant, Herriard

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Site Boundary

Sensitive Receptor

Title
Figure 3 - Sensitive Receptor Locations

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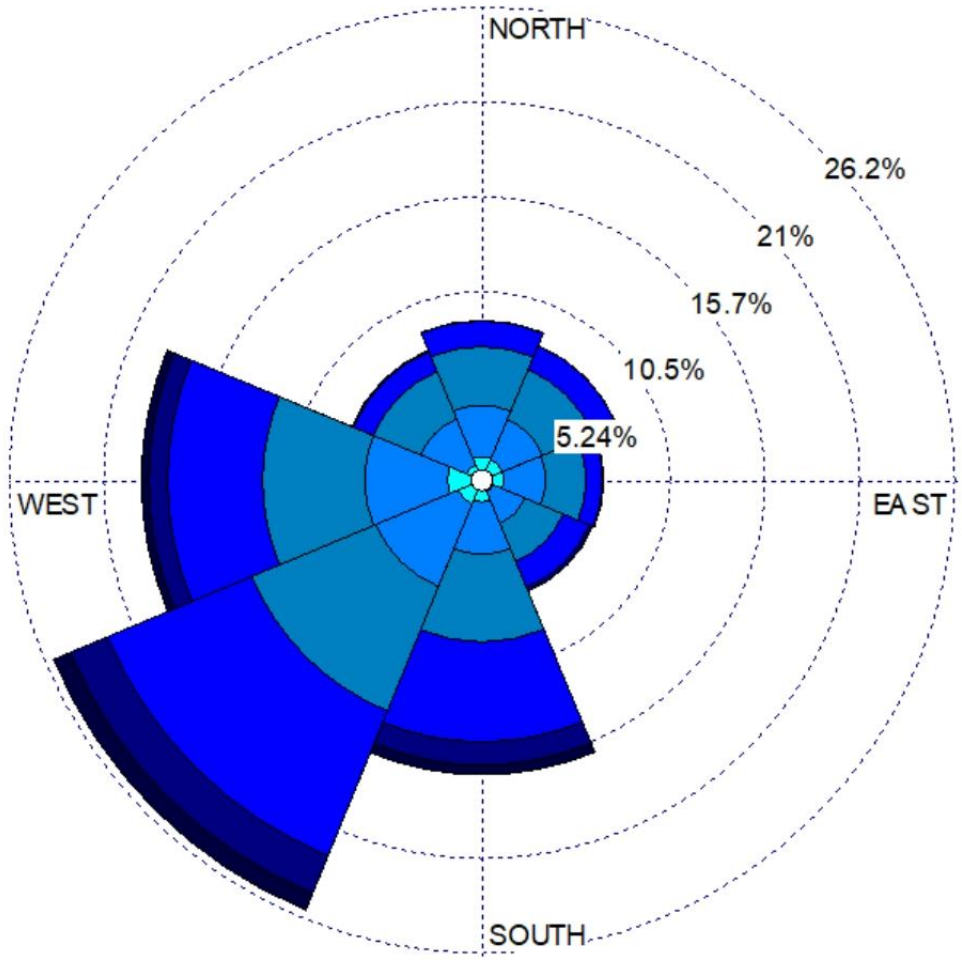

Legend

WIND SPEED (m/s)

- >= 11.10
- 8.80 - 11.10
- 5.70 - 8.80
- 3.60 - 5.70
- 2.10 - 3.60
- 0.50 - 2.10

Calms: 0.26%

Title
Figure 4 - Wind Rose of 2014 to 2018 Odiham Meteorological Data

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