



Non-Technical Summary Variation to Installation Permit

Site name: Piddlehinton AD Facility
Site address: Bourne Park Industrial Estate, Piddlehinton, Dorchester, Dorset, DT2 7YU
Operator name: Eco Sustainable Solutions Limited

Written by Emily Pitts, Shann Pitts Consulting, 26 January 2023

Document Ref: SPC0051/Variation/NTS/V1/EcoPH/January 2023

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1 Introduction

This Non-Technical Summary has been prepared by Shann Pitts Consulting Limited (SPC) on behalf of Eco Sustainable Solutions Limited to support a substantial variation permit application to vary the existing bespoke waste operation permit to a bespoke installation permit for the anaerobic digestion (AD) plant at Piddlehinton AD Facility, Bourne Park Industrial Estate, Piddlehinton, Dorchester, Dorset, DT2 7YU herein termed 'the Site'.

The application has been prepared by SPC in conjunction with and on behalf of the Operator Eco Sustainable Solutions.

Basic pre-application advice has been sought from the Environment Agency with respect to this permit variation application (Reference EA/ EPR/FP3692SU/V005)

A full Environmental Risk Assessment has been carried out and is provided as a supporting document to the permit application.¹ This Non-Technical Summary highlights the key control measures that will be employed to minimise any impacts from the operational site and signposts the reader to the key supporting documents.

2 Permitting

2.1 Permitting history

On 2 December 2010, Eco Sustainable Solutions were issued with the original bespoke waste operation permit to regulate the operation of the Piddlehinton AD Facility (EPR/FP3692SU).

Since its issue, the permit has been varied twice;

- In October 2017 to change the registered office address; and
- In January 2019 to increase the permitted maximum annual waste throughput from 37,000 tonnes to 42,000 tonnes.

2.2 Current permit

The current bespoke waste operation permit authorises the treatment of up to 42,000 tonnes per annum of biodegradable food wastes from source separated commercial and industrial sources as well as manures and slurries.

2.3 Proposed changes

2.3.1 Listed Activities

The regulated facility now requires a bespoke installation permit to reflect a treatment capacity of the AD plant of over 100 tonnes per day. This activity falls under S5.4 Part A(1)(b)(i) of the Environmental Permitting Regulations 2016 - *Recovery or a mix of recovery and disposal of non-hazardous waste with a capacity exceeding 100 tonnes per day involving biological treatment*. The treatment capacity calculations are in Appendix B.

¹ SPC0051/Variation/ERA/V1/EcoPH January 2023

The proposed Listed Activities and Directly Associated Activities, along with the relevant waste codes are detailed within the supporting Permitted Activities document.²

2.3.2 Tonnages

The substantial permit variation is required to reflect an increase in the maximum permitted annual tonnages of waste accepted from 42,000 tonnes per annum (tpa) to 50,000 tpa, due to process efficiencies over time. In addition, the heat exchanger is being upgraded (300kw to 600kw) which will significantly decrease times for heating up and cooling down digestate in the pasteurisers, a current pinch point in the process.

2.3.3 Waste Codes

2.3.3.1 Addition of waste codes

It is proposed to add the following European Waste Catalogue Codes (EWC), which are included in Appendix B of the Anaerobic Digestion Quality Protocol³, to the permitted waste types in the permit:

Table 1 – Waste Codes to be added to permit

European Waste Catalogue Code	Description	Restriction from Appendix B of ADQP (if applicable)
02 01 99	Wastes not otherwise specified.	Spent mushroom compost or discarded mushrooms from commercial mushroom cultivation only
02 02 04	Sludges from on-site effluent treatment	
02 02 99	Wastes not otherwise specified.	Sludges from gelatine production and animal gut contents only.
02 03 99	Wastes not otherwise specified	Only: <ul style="list-style-type: none"> • Sludge from production of edible fats and oils • Seasoning residues • Molasses residues • Residues from production of potato, corn or rice starch
02 04 99	Other biodegradable wastes	

² SPC0051/Variation/Permitted Activities/V1/EcoPH January 23

European Waste Catalogue Code	Description	Restriction from Appendix B of ADQP (if applicable)
02 07 99	spent grains, hops and whisky filter sheets/ cloths	Only: <ul style="list-style-type: none"> • Malt husks, malt sprouts, malt dust • Spent grains • Hops • Yeast and yeast like residues • Sludges from the production process
03 03 11	fibre rejects, fibre-, filler- and coating-sludges from mechanical separation	
07 01 08*	Other still bottoms and reaction residues	Glycerol residue from biodiesel manufacture from non-waste vegetable oils only
16 10 02	Aqueous liquid wastes other than those mentioned in 16 10 01	Allowed only if digestate from an aerobic digestion process that accepts only the waste input types allowed by this Quality Protocol.
19 05 99	Wastes not otherwise specified.	Restriction: Allowed only if: <ul style="list-style-type: none"> • – liquor/leachate from a composting process that accepts only the waste input types allowed by this Quality Protocol; or • – digestate from an aerobic digestion process that accepts only the waste input types allowed by this Quality Protocol.
19 12 12	Other wastes (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 19 12 11.	Acceptable only if derived solely from input types allowed by this Quality Protocol and remains segregated from, and uncontaminated by, any other waste type

2.3.3.2 Removal of waste codes

It is requested to remove the following EWC codes in line with Appendix B of the Anaerobic Digestion Quality Protocol³ as the acceptance of these currently permitted waste streams would compromise the producer status of Eco Sustainable Solutions under the Biofertiliser Certification Scheme.

Table 2 – Waste Codes to be removed from the permit

European Waste Catalogue Code	Description
02 03 02	wastes from preserving agents
02 07 05	sludges from on-site effluent treatment
03 03 02	green liquor sludge (from recovery of cooking liquor)
03 03 08	wastes from sorting paper and cardboard destined for recycling
04 01 05	Tanning liquor free of chromium
04 01 07	Sludges in particular from on-site effluent treatment free of chromium
15 01 02	Plastic packaging – must conform to BS EN 13432
02 03 02	wastes from preserving agents

2.3.4 Miscellaneous

There are two new on-site stand-by generators (1 No. Single phase and 1 No. 3-phase) for use when there is a mains power failure and the CHPs cannot operate.

There is a new BAT Complaint emergency biogas flare.

³ Anaerobic Digestion Quality Protocol, Wrap & Environment Agency, LIT 5020, January 2014

3 Site Details

3.1 Location

Site Address: Piddlehinton AD Facility, Bourne Park Industrial Estate, Piddlehinton, Dorchester, Dorset, DT2 7YU

National Grid Reference: SY 72423 97743

Local Authority: Dorset County Council

3.2 Site Sensitivities

3.2.1 Human Receptors

There are a number of sensitive receptors within 200m:

- Hansons Pig Unit (workplace) adjacent to southern boundary
- Mole Valley Farmers (workplace) 10m west
- Bride Valley Motors (workplace) 86m south west
- The Granary (residential) 136m north west

3.2.2 Surface Water

The site is not within a Drinking Water (Surface Water) Protected Area or Drinking Water (Surface Water) Safeguard Zone.⁴

There are no recorded surface water features within 500m of the site. The river Piddle runs in a southerly direction 980m west of the site and the Dole Brook runs in a southerly direction 1.1km east of the site and join the river Piddle further south.

The site is within the Upper Piddle Water Framework Directive catchment which assigned an ecological rating of poor in 2019 and failed with respect to chemical status.⁵

3.2.3 Groundwater

The bedrock aquifer across the whole site is a principal aquifer of high vulnerability with soluble rock risk (chalk). There are no records of superficial drift deposits. The site is within a groundwater source protection zone 1.⁴

The site is not within a Drinking Water (Groundwater) Safeguard Zone.⁴

3.2.4 Flood Risk

The site is within a Flood Zone 1 which is defined as land and property having a less than 1 in 1,000 annual probability of river or sea flooding.⁶

⁴ <https://magic.defra.gov.uk/MagicMap.aspx> Accessed 16 December 2022

⁵ <https://environment.data.gov.uk/catchment-planning/WaterBody/GB108044010120> Accessed 16 December 2022

⁶ <https://flood-map-for-planning.service.gov.uk> Accessed 16 December 2022

3.2.5 Ecological Receptors

The nature and heritage conservation sites identified through a screening report provided by the Environment Agency in November 2022⁷, identifies the sites in Table 3 below for consideration within the permit variation application:

Table 3: Nature and Heritage Conservation Sites within relevant screening distance

Site name and type	Screening distance (m)	Distance from site boundary (m)	Direction from site
Special Areas of Conservation (cSAC or SAC)	10,000		
Cerne & Sydling Downs		4,657	north west
Local Wildlife Sites	2,000		
Muston Copse		1,190	south east
Muston Farm		1,185	south west
Ancient Woodland	2,000		
Muston Copse		1,190	south east
Protected Species	500		
European eel and migratory route		980	south west
Bullhead		980	
Protected Habitats	500		south west
Chalk rivers		980	south west

The screening report with maps is in Appendix C. The impact of the proposed changes upon these receptors has been assessed through a Nature and Heritage Conservation Risk Assessment which forms Appendix D.

3.2.6 Air Quality Management Areas

The closest Air Quality Management Area is in Dorchester 7.5km to the south west of the site.

3.3 Process Summary

3.3.1 Overview

This section should be read with reference to the Process Flow Diagram (Appendix E).

3.3.2 Waste Acceptance & Storage

Subject to waste pre-acceptance procedures, solid and liquid waste is accepted over the weighbridge. Solid waste is deposited in the Reception Building. The roller shutter doors are opened to allow vehicles to enter and leave the building. Solid food waste is tipped in a reception pit inside the

⁷ Nature and Heritage Conservation Screening Report, EPR/FP3692SU/V005, Environment Agency, 07/11/2022

Reception Building. Most material is deposited directly by tipper vehicle into the reception pit. However, very dry material (>25% dry matter) is deposited into one of the holding bays for mixing with the food waste in the hopper as it is too dry to be fed directly into hammer mill. Liquid waste, namely milk washing is off-loaded via a tanker connection to the liquid tanks within the Reception Building.

3.3.3 Waste Pre-treatment

Solid waste is conveyed to a hammer mill to reduce particle size and remove packaging. Liquid waste is added to the mill and the resultant slurry is screened and discharged into a slurry pit from where it is pumped to the 2 No. Buffers Tanks (422m³ each) which are within the secondary containment area.

The screenings are washed in a drum washer and pressed to remove excess liquid, which is returned to the slurry pit, the dried screenings are stored in a bunker for removal off-site for energy from waste incineration. Digestate is not recirculated back to the feedstock preparation process.

3.3.4 Digestion

The prepared feedstock is pumped from Buffer Tanks into one of two Digester tanks (each with a working capacity of 2,227m³). The digesters are externally insulated circular tanks with heating coils within the digesters. The tanks are covered with an air inflated dual membrane gasholder roof. The outer membrane is inflated with air to form a dome shape. The inner gas tight membrane fills with gas as it is produced by the AD process.

The Digester tanks have high level viewing ports into the gas space. The gas space is fitted with a water seal over pressure / under pressure relief valve at roof level. The digester contents are mixed by an externally mounted Landia gas mix system which recirculates digestate and entrained biogas from the digester headspace and submersible propeller mixers in tank.

Small quantities of air and oxygen are pumped into the gas to support aerobic sulphide reducing bacteria which remove the bulk of the hydrogen sulphide from the gas.

3.3.5 Biogas Storage & Use

Biogas is collected from the roof space of the digesters and is distributed by underground PE pipework laid to falls with small bore condensate drains taken from the low points to condensate sumps. The pipework distributes biogas to the 4 No. CHPs and flare. There are 2 pairs of CHPs each packaged in containers. The biogas supplying the CHPs is treated to remove condensate and hydrogen sulphide by dedicated plant for each container. The clean biogas is fed by a gas booster to the CHP container to generate electricity for the site and for export to the local network. Hot water is recovered from the CHPs to a hot water plant room in a container. Hot water is supplied from here to the digesters and pasteurisers to meet the process temperatures.

Surplus biogas is burnt in a proprietary flare which has a dedicated gas booster to supply the burner.

3.3.6 Pasteurisation

Digestate is pumped from the digesters via a 6mm screen to a buffer tank in the Reception Building and is pasteurised in one of three pasteurisers. The pasteurisation process consists of a buffer tank and three pasteurisation tanks which operate as one filling and heating, one holding at pasteurisation temperature (70°C for 1 hour) and one emptying and cooling. The buffer tank and pasteurisers are

fitted with a dedicated system that extracts the air from the headspace and passes it through a biofilter outside the barn.

Pasteurised digestate is screened to remove plastics and the screened digestate is stored in a covered Digestate Storage Tank for use as agricultural biofertiliser.⁸

3.4 Infrastructure

3.4.1 Existing infrastructure

The existing site infrastructure comprises:

- Reception Building with fast acting roller shutter doors and air handling system containing:
 - Reception pit (circa 120 tonnes capacity)
 - 2 No. Holding bays (circa 50 tonnes each)
 - 2. No Liquid waste storage tanks (60m³ each)
 - Hammer mill
 - Depackaging plant (attritor)
 - Slurry pit
 - Drum washer
 - Pasteurisation area containing:
 - 6mm screen
 - Pasteurisation buffer tank
 - 3 No. Pasteurisation tanks
 - Hot water store
 - 2 No. Heat Exchangers
- Secondary containment system containing:
 - 2 No. Buffer tanks (working capacity 422m³ each)
 - 2 No. Digesters (working capacity 2,227m³ each)
 - 1 No. Digestate storage tank (maximum capacity 6,984 m³, restricted to xx) with Digestate dispatch point
- Compressors
- 4 No. Combined heat and power engines (2 No. 249kW and 2 No. 550kW)
- Flare (existing)
- Biofilter serving Reception Building
- Biofilter serving pasteurisation tanks and pasteurisation buffer tank
- Clean and dirty drainage system including a soakaway for clean water

3.4.2 Proposed infrastructure

Proposed infrastructure comprises:

- 2. No Back-up generator (1 No. single phase and 1 No. 3 -phase)
- BAT compliant flare (to replace existing)

⁸ Hazardous Area Classification, Eco Sustainable Solutions, David Woolgar Consulting, DWC-32-001, August 2021

4 Management

The operations on-site are controlled through an accredited ISO14001 environmental management system which covers all aspects of operation including preventative maintenance, staff competence and training and effective management of incidents and accidents.

There is also a Quality Management System in place for digestate quality in accordance with PAS110 requirements.

There are two Technically Competent Managers as detailed in Part C2 of the application form. This allows contingency for holiday and absence periods.

Roles and responsibilities are summarised within the Staff Organogram which forms Appendix F.

5 Control of Emissions to Land and Water

The key control measures will remain unchanged as a result of the proposed variation. They are summarised within the Environmental Risk Assessment.¹

A report on the design of the secondary containment system in line with C736 Containment systems for the prevention of pollution: Secondary, tertiary and other measures for industrial and commercial premises⁹ was commissioned in July 2022 and forms Appendix G.

6 Control of Emissions to Air

There are no changes to control of emissions to air as a result of the proposed changes.

7 Control of Amenity Impacts

The existing control measures in relation to noise and odour are all considered within the Environmental Risk Assessment.¹ There are no perceived required changes to the existing control measures in light of the proposed changes.

An Odour Management Plan (**ECO-SM-14**) has been developed in line with BAT.

⁹ Containment systems for the prevention of pollution: Secondary, tertiary and other measures for industrial and commercial premises, C736, Walton, I. L. W, CIRIA, 2014

8 Operating Techniques

In relation to question 3a within Part C3 of the permit application form, the Operating Techniques table within the existing permit (Table S1.2) refers to documents submitted as part of the original permit application in 2010. Table 3 below replicates Table S1.2 and details the relevance of the documents limited within it.

Table 3 – Operating Techniques referenced in existing permit

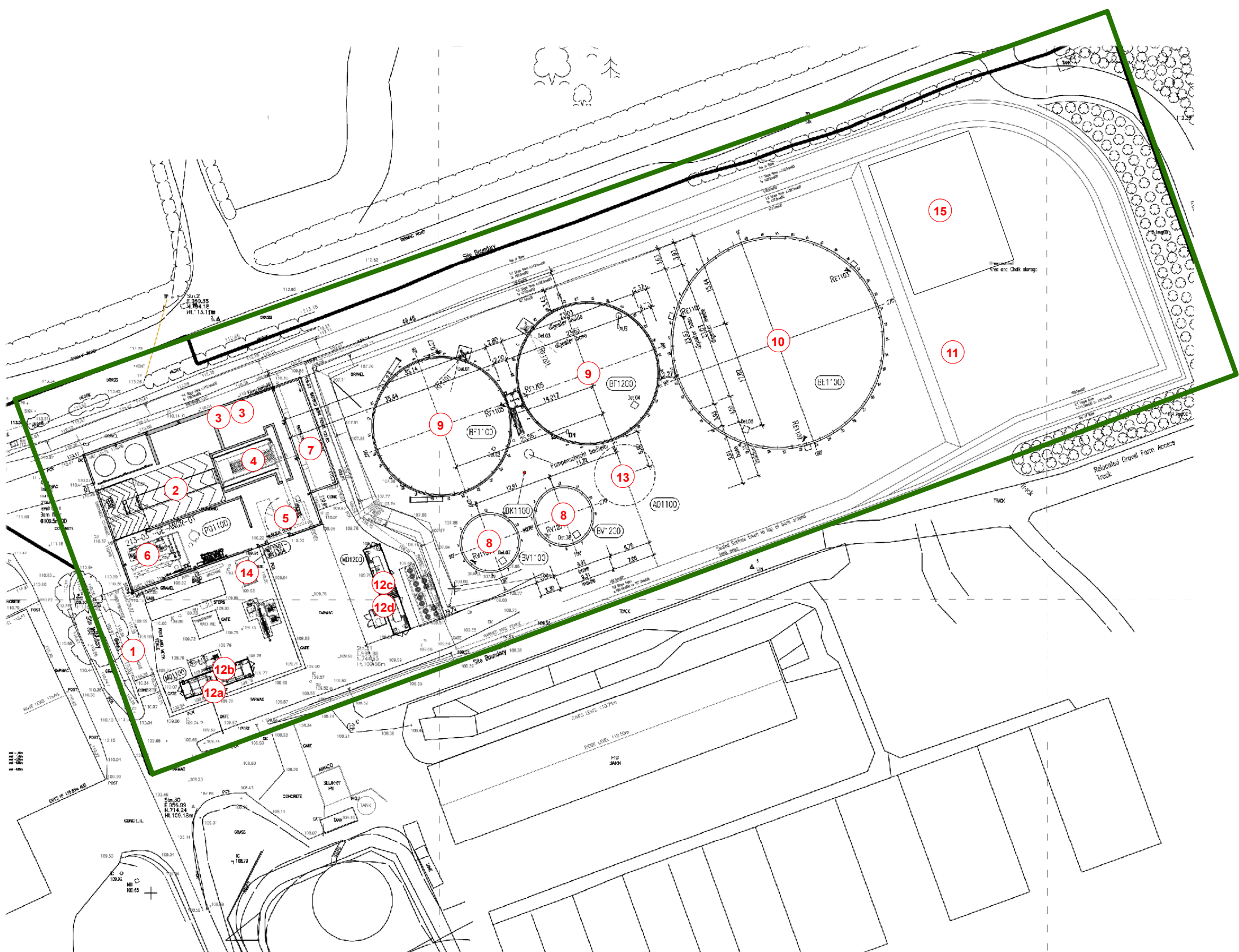
Description	Parts	Date Received	Current Relevance
Application	Application and supporting documentation submitted, including Working Plan and Appendices, or otherwise agreed in writing with the agency.	29/06/2010	The Working Plan and Appendices have been superseded by the current version of the Environmental Management System (ECO-OD-02). Whilst it has not been possible at this time to view the original permit application documents, it is deemed that many, if not all with be superseded by the current submission documents and the Regulation 61 response document submitted to the Environment Agency in October 2021. ¹⁰

¹⁰ Response to Regulation 61 notice in relation to Eco Piddlehinton AD Facility (EPR/FP3692SU), Shann Pitts Consulting in collaboration with Eco Sustainable Solutions, October 2021

Appendix A – Site Plans

Figure 1 – Site Layout and Permit Boundary Plan (SPC0051/Piddlehinton/Site Layout/October 2021)

Figure 2 – Emission Point Plan (SPC0051/Piddlehinton/Emission Point Plan/December 2022)



REVISIONS					
REV	DATE	DESCRIPTION	DWN	CHK	APP
-	12/10 2021	First Issue	JJ	MF	MF

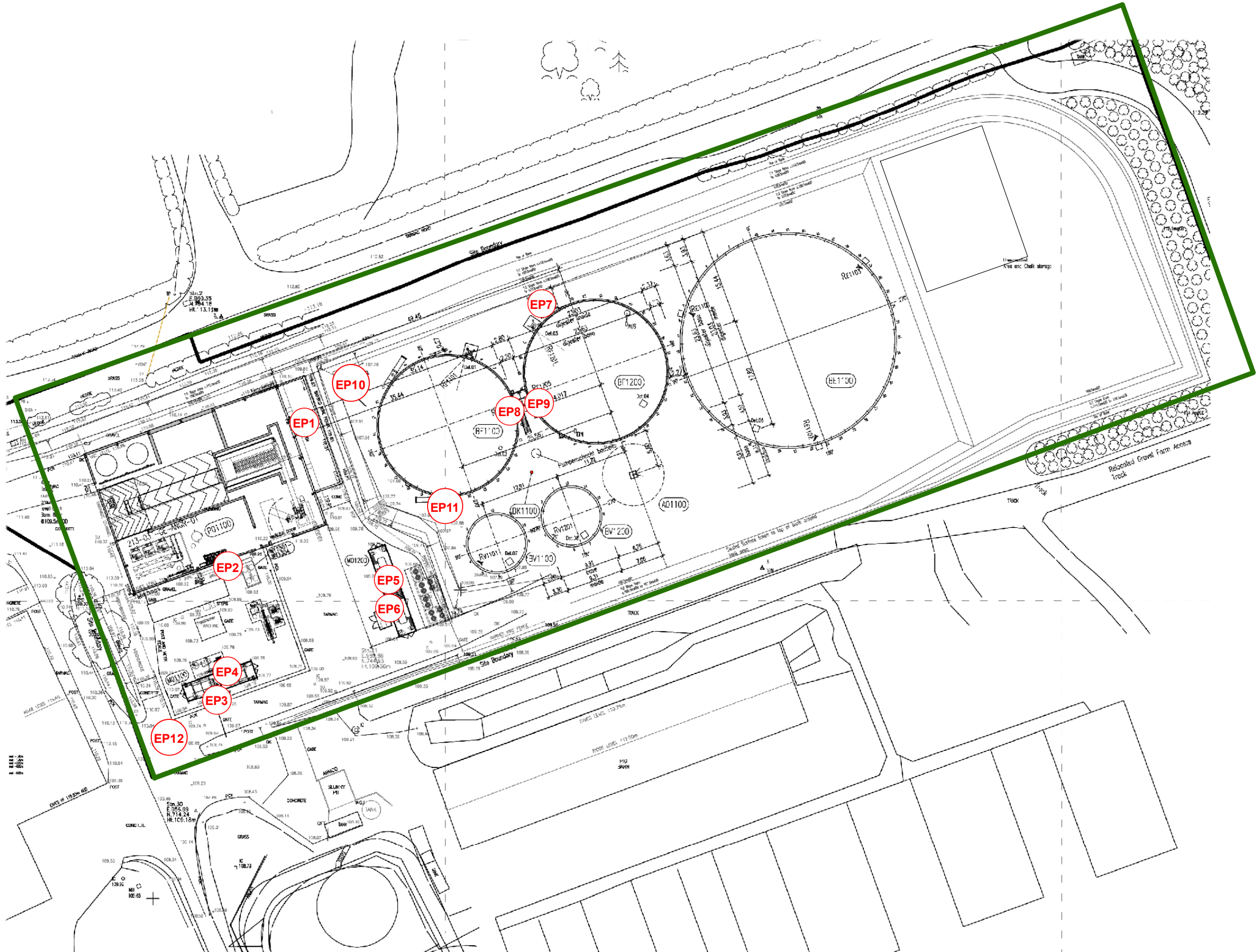
LEGEND	
	Permit boundary
	Site details
1.	Weighbridge
2.	Reception building
3.	2 No. Liquid waste storage tanks (30m ³ each)
4.	Reception pit
5.	Hammer mill
6.	Pasteurisers
7.	Biofilter
8.	2 No. Pre-storage tanks (422m ³ each)
9.	2 No. Digesters (2,227m ³ each)
10.	Digestate storage tank (6,984m ³)
11.	Digestate off-take point
12a.	Gas engine (249kw, G3005)
12b.	Gas engine (249kw, G3006)
12c.	Gas engine (550kw, G4036)
12d.	Gas engine (550kw, G4037)
13.	Flare
14.	Dump cooler
15.	Fire water bladder system (circa 150m ³)

Client	Eco Sustainable Solutions
Project	Piddlehinton Anaerobic Digester
Title	Site Layout and Permit Boundary Plan


SHANN PITTS CONSULTING

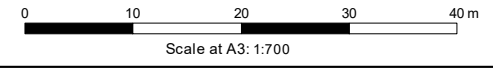
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Drawn JS	Checked EP	Approved EP	Revision
Date October 2021	Scale 1:700	Sheet Size A3	
Drawing Number SPC0051/Piddlehinton/Site Layout		File Reference SPC005.mxd	



REVISIONS					
REV	DATE	DESCRIPTION	DWN	CHK	APP
-	08/12 2022	First Issue	JJ	MF	MF

LEGEND	
	Permit boundary
EP1	Odour abatement for Reception Hall (biofilter)
EP2	Odour abatement for pasteuriser (biofilter)
EP3	Gas engine (249kw, G3005)
EP4	Gas engine (249kw, G3006)
EP5	Gas engine (550kw, G4036)
EP6	Gas engine (550kw, G4037)
EP7	Flare stack - new location
EP8	Pressure Relief valve Digester 1
EP9	Pressure Relief valve Digester 2
EP10	Back-up generator exhaust (single phase)
EP11	Back-up generator exhaust (3-phase)
EP12	Clean rainwater to soakaway



Client	Eco Sustainable Solutions
Project	Piddlehinton Anaerobic Digester
Title	Emission Point Plan

Westbrook Farm
 Westbrook
 Gillingham
 Dorset SP8 5DT
 Tel: 07866024096
 emily@shannpittsconsulting.co.uk
 www.shannpittsconsulting.co.uk

Drawn JS	Checked EP	Approved EP	Revision
Date December 2022	Scale 1:700	Sheet Size A3	
Drawing Number SPC0051/Piddlehinton/EmissionPointPlan		File Reference SPC005.mxd	

Appendix B – Treatment Capacity Calculations

Table 4 – Treatment Capacity Calculations

Tank with gas collection and mixing	(A) Working capacity (m3)	(B) Minimum hydraulic retention time (days)	(A/B) Treatment capacity (tonnes per day)*
Digester 1	2,227	35	64
Digester 2	2,227	35	64
Total Treatment Capacity			128

* Assume that 1m³ is equivalent to 1 tonne

Therefore the treatment capacity of this AD plant is above the Environmental Permitting Regulations threshold of 100 tonnes per day and requires an Installation permit.

Appendix C - Nature and Heritage Conservation Screening Report & Maps

Nature and Heritage Conservation

Screening Report: Bespoke Installation

Reference	EPR/FP3692SU/V005
NGR	SY 72418 97735
Buffer (m)	75
Date report produced	07/11/2022
Number of maps enclosed	5

The nature conservation sites identified in the table below must be considered in your application.

Nature and heritage conservation sites	Screening distance (km)	Further information
Special Areas of Conservation (cSAC or SAC)	10	Joint Nature Conservation Committee
Cerne & Sydling Downs		
Local Wildlife Sites (LWS)	2	Appropriate Local Record Centre (LRC)
Muston Copse		
Muston Farm		
Ancient Woodland	2	Woodland Trust
Woodland [see maps]		Forestry Commission Natural England



Protected Species	Screening distance (m)	Further Information
European eel	up to 500m	Natural England
European eel migratory route		Appropriate Local Record Centre (LRC)
Bullhead		

Protected Habitats	Screening distance (m)	Further Information
Chalk rivers	up to 500m	Natural England

Where protected species are present, a licence may be required from Natural England or the Welsh Government 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.

Please note we have screened this application for protected and priority sites, habitats and species 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.

Please note 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.

customer service line
03708 506 506


incident hotline
0800 80 70 60

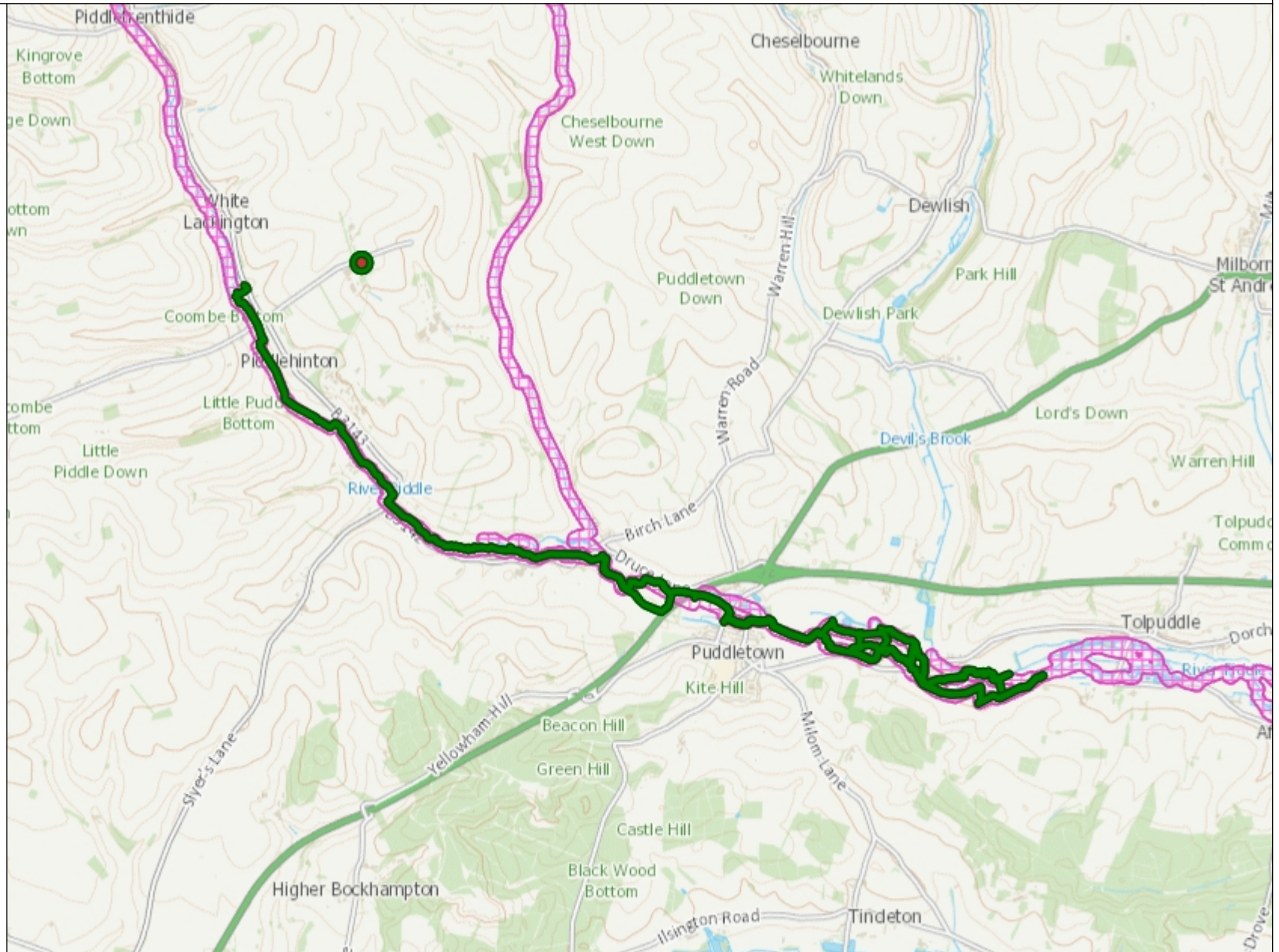
floodline
0845 988 1188

www.environment-agency.gov.uk

Protected Habitats

Legend




-  Protected Habitats screened for En Permits

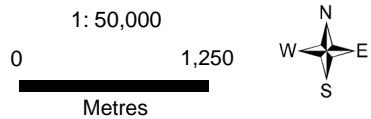
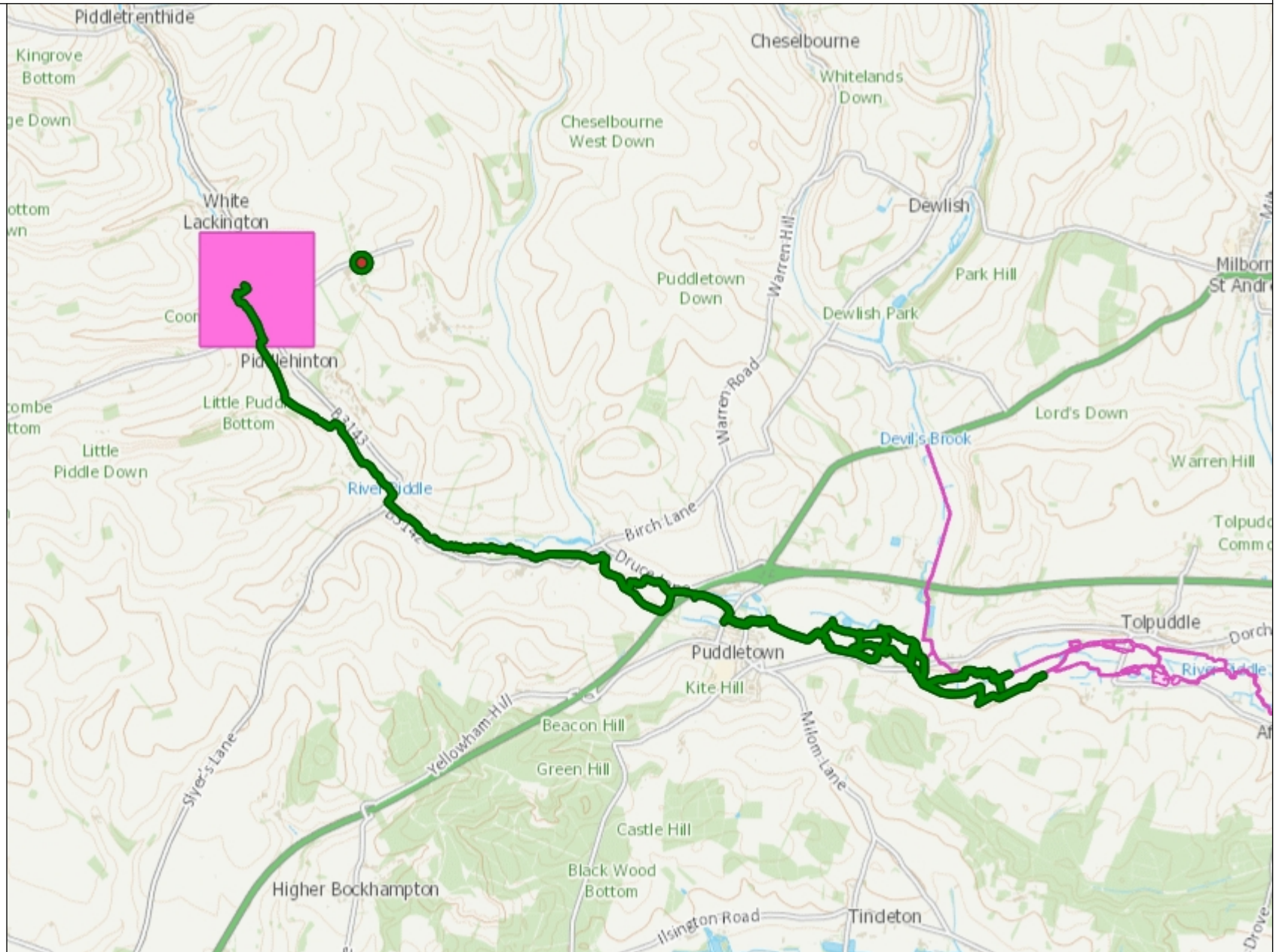


Protected Species

Legend


Protected species screened for Env Permits - complete set

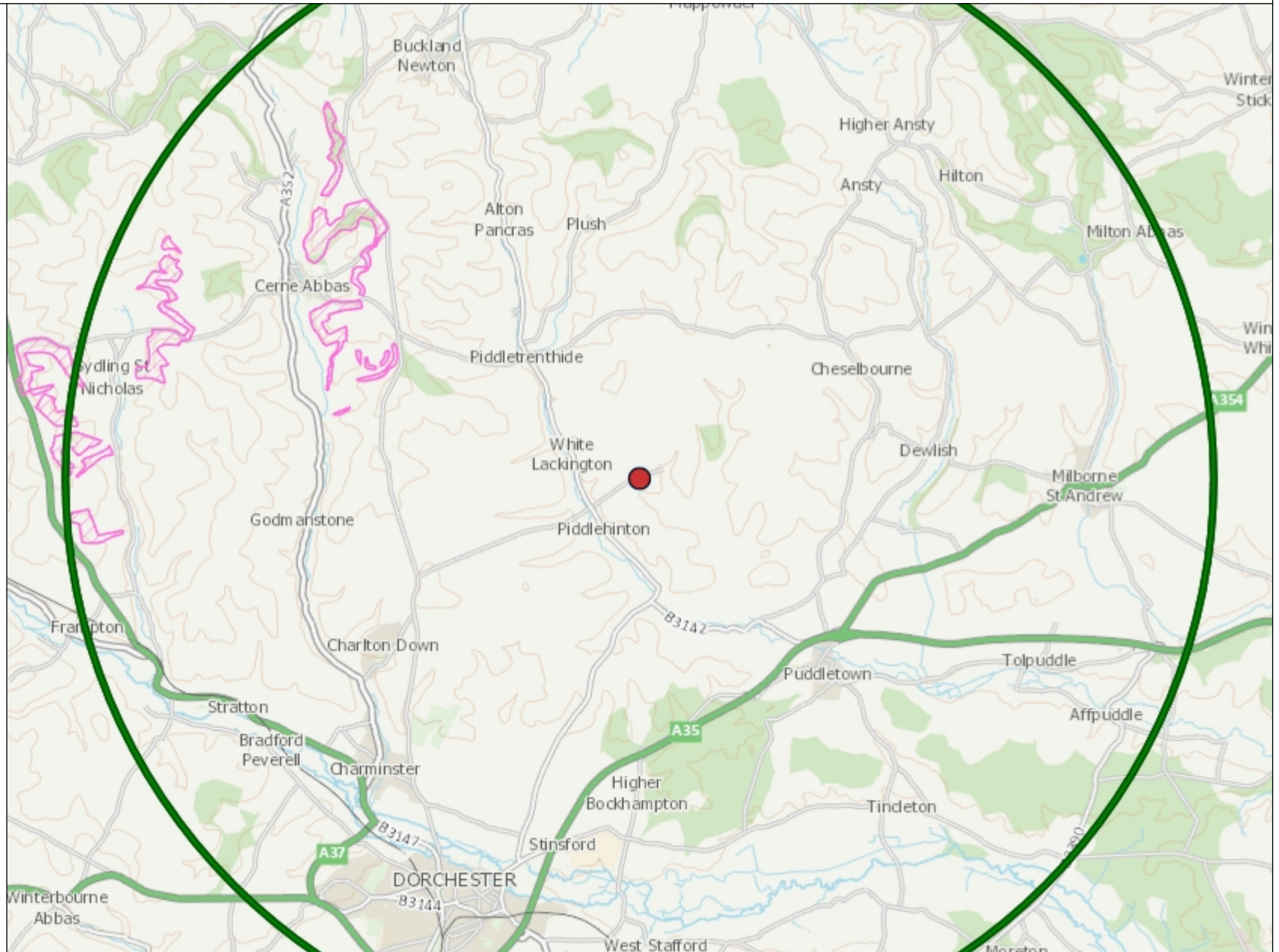
-  Protected species, non fish
-  Protected fish
-  Protected fish migratory route



Special Areas of Conservation

Legend

 SAC (England)



1: 100,000


0 2,500

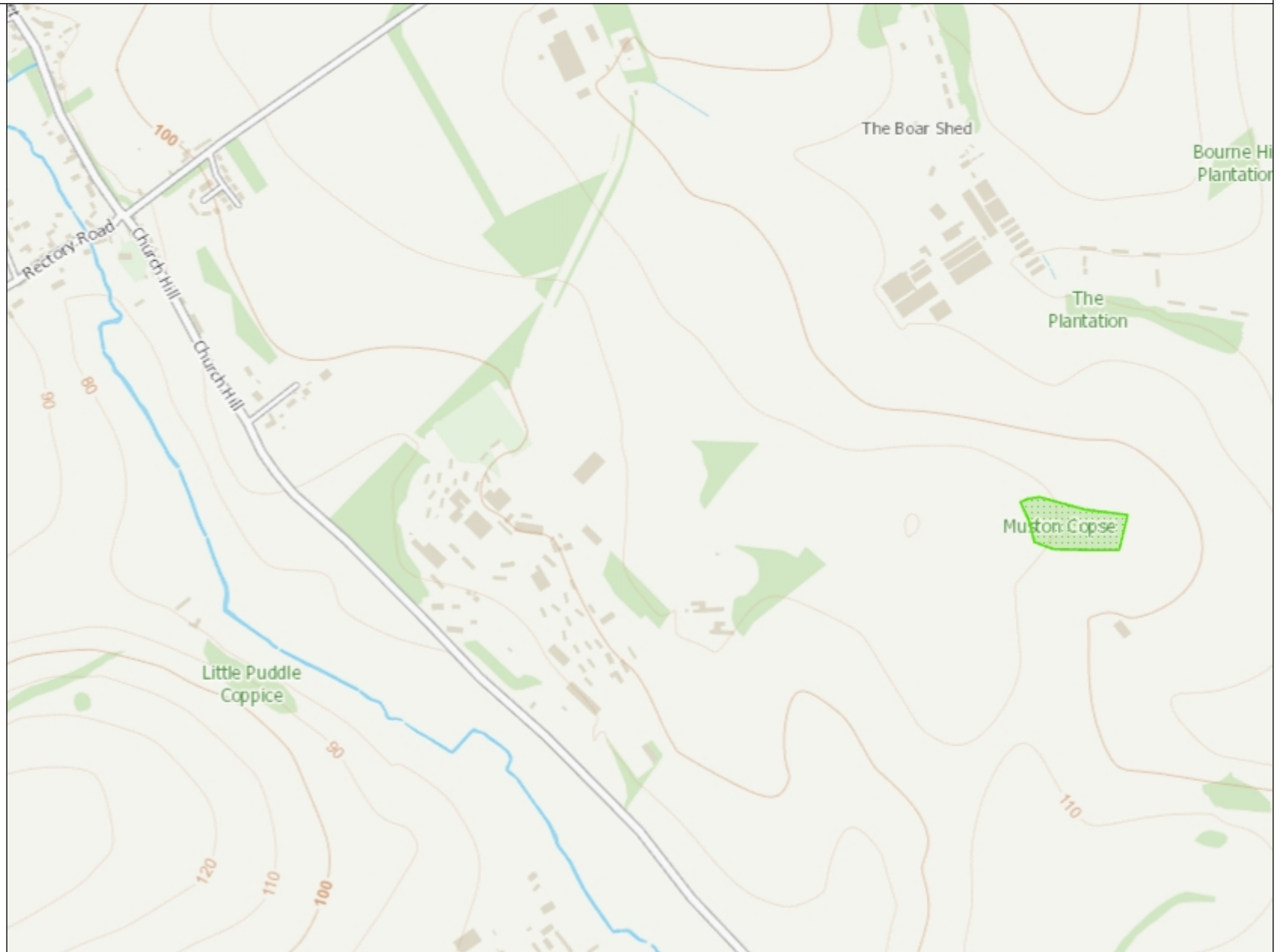
Metres



Ancient Woodland

Legend

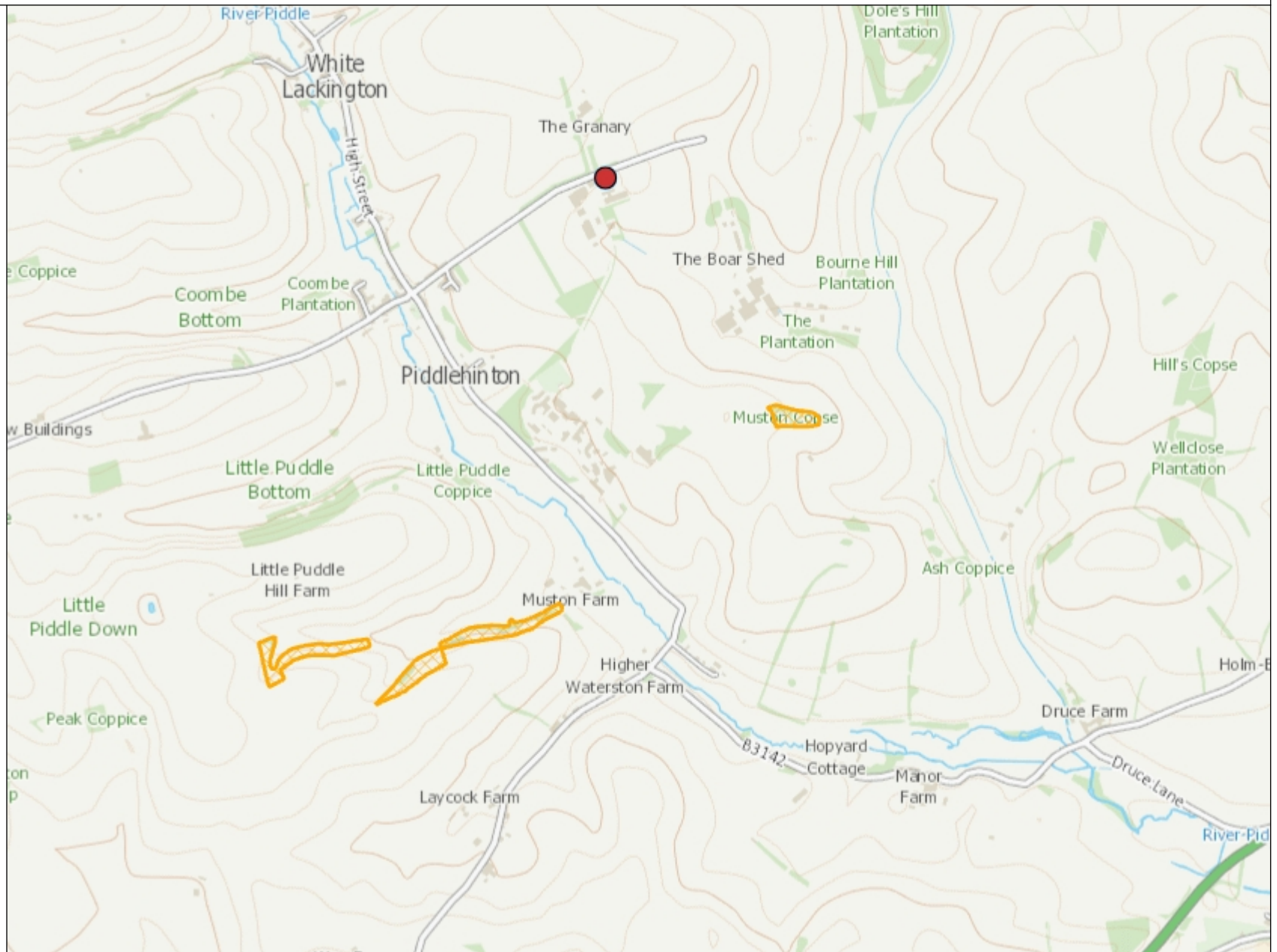
 Ancient Woodland (England)



Local Wildlife Sites

Legend

 Local Wildlife Sites



1: 25,000

0 625

Metres

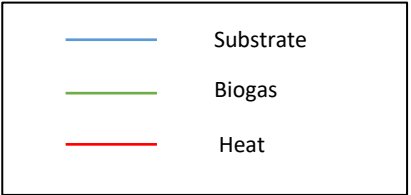
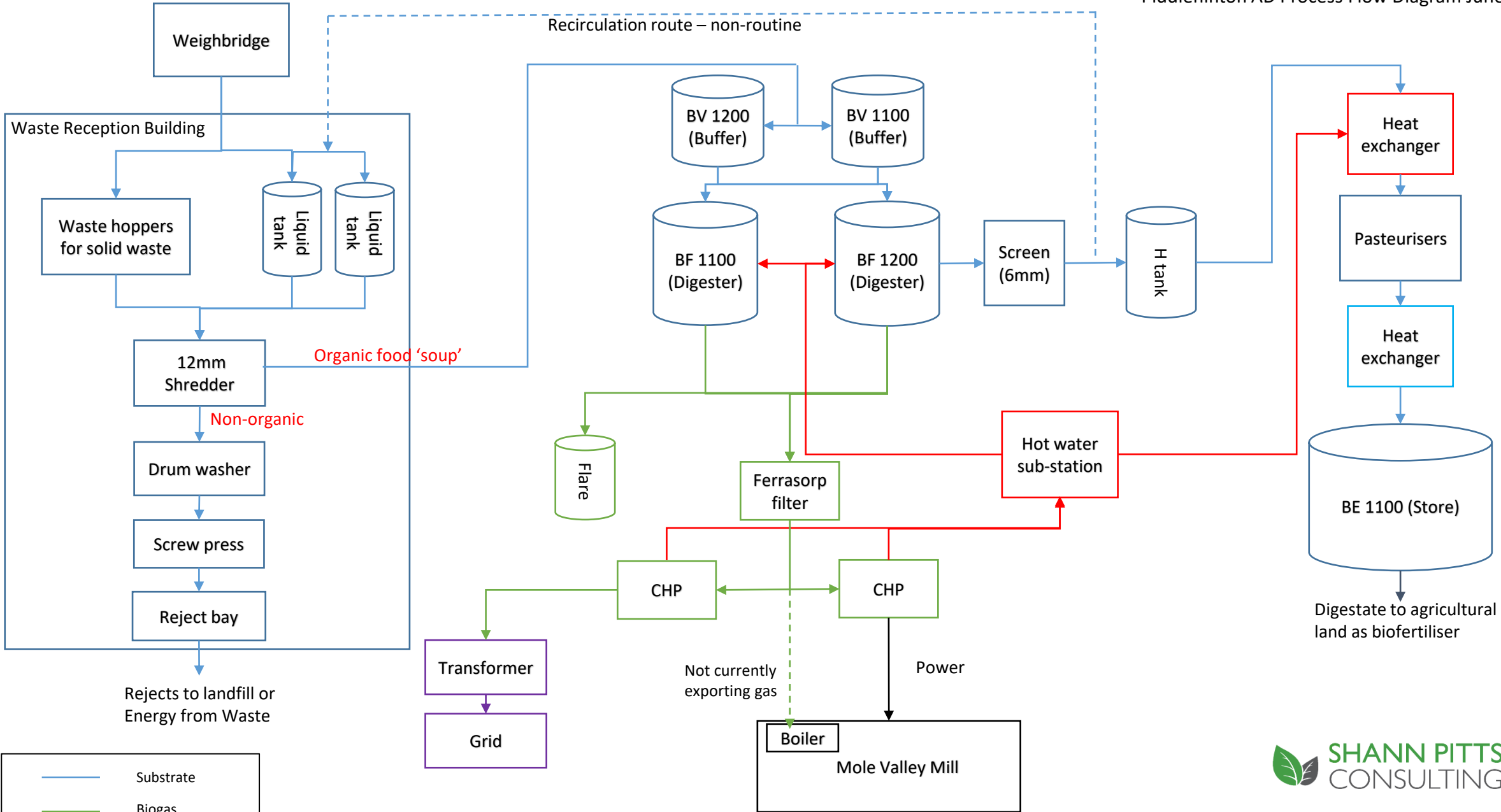


Appendix D - Nature and Heritage Conservation Risk Assessment

Table 5: Nature and Heritage Conservation Sites Risk Assessment

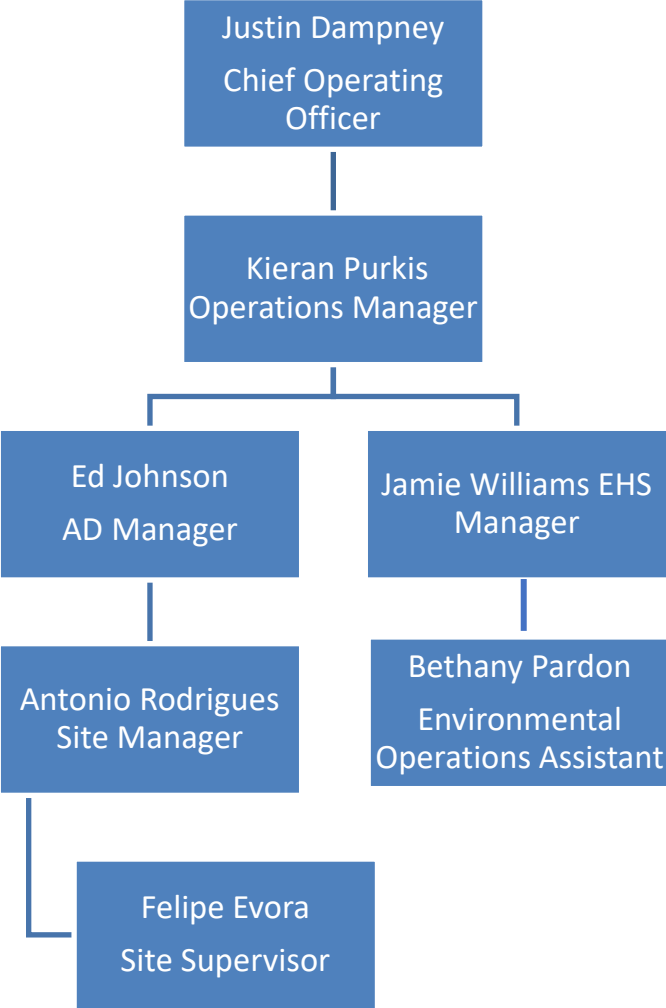
Site name and type	Screening distance (m)	Distance from site boundary (m)	Direction from site	Assessment of risk upon protected site from proposed changes
Special Areas of Conservation (cSAC or SAC)	10,000			
Cerne & Sydling Downs		4,657	north west	There are no changes to emissions to air as a result of the proposed variation.
Local Wildlife Sites	2,000			
Muston Copse		1,190	south east	There are no changes to emissions to air as a result of the proposed variation.
Muston Farm		1,185	south west	As above
Ancient Woodland	2,000			
Muston Copse		1,190	south east	As above
Protected Species	500			
European eel and migratory route		980	south west	There are no emissions to surface water and no change to emissions to groundwater (soakaway) as a result of the permit variation. The risks of waste storage and spillages have been addressed in the Environmental Risk Assessment.
Bullhead		980		As above
Protected Habitats	500		south west	
Chalk rivers		980	south west	As above

Appendix E – Process Flow Diagram



Appendix F – Staff Organogram

Piddlehinton AD Facility, Staff Organogram, January 2023



Appendix G - Preliminary Review of Anaerobic Digester Plant Secondary Containment (Key GS)



Geological & Geotechnical Consultants

Piddlehinton Anaerobic Digester Facility, Bourne Park

Site Condition Report

Preliminary Review of: Anaerobic Digester Plant Secondary Containment

Prepared for: Eco Sustainable Solutions Ltd

Date: July 2022



Job Number: 8060-001

Report Number: 8060-001-R-01

ECO SUSTAINABLE SOLUTIONS LTD

Piddlehinton Anaerobic Digester Facility, Bourne Park

Site Condition Report

Preliminary Review of: Anaerobic Digester Plant Secondary Containment

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1.0 INTRODUCTION

Key GeoSolutions Ltd (KeyGS) has been requested by Eco Sustainable Solutions Ltd (Eco) to undertake a review of the secondary containment area at their Piddlehinton Anaerobic Digester Facility, located at Bourne Park Industrial Estate on the east side of Piddlehinton, near Dorchester, Dorset.

Eco is providing a response for the Environment Agency (EA) in reply to a Regulation 61 notice in relation to Eco Piddlehinton Anaerobic Digester (AD) Facility (EPR/FP3692SU). This report has been produced as part of Section 4b of Eco's response to the Regulation 61 notice.

This report considers whether the existing construction of the secondary containment at the Piddlehinton AD Facility meets the requirements set-out in CIRIA C736 and the European Commission Best Available Techniques (BAT) Reference Document for Waste Treatment (see Section 2.0 of this report for full document references).

The work undertaken by KeyGS as part of the review of the secondary containment facility at the Piddlehinton AD Facility is summarised below:

- Site inspection
- Review of background information, surveys, construction records etc
- Review and assessment of secondary containment storage capacity (including 3D modelling to assess capacity and compare with CIRIA requirements)
- Review of freeboard capacity against required standards
- Review of jetting risk around perimeter of containment area
- Review of ground permeability (integrity of secondary containment area)
- Review of any "breaches" in containment area (underground pipes / drains etc)
- Review of clean water handling and discharge facility

The subsequent sections of this report summarise the findings of a data review and site inspection carried out by KeyGS (W Roberts) on 7 June 2022.

2.0 INFORMATION PROVIDED

The following information has been provided to KeyGS to assist preparation of this report:

- Appendix 5 of Regulation 61 Response – “Photographs taken during construction of site.”. (Copy included here as Appendix 1 of this report).
- Email from the Project Manager at the time of construction, Mike Thompson, with details of the construction and liner installation process. (Copy included here as Appendix 2 of this report).
- Topographic survey of the site dated March 2022 as “Bourne Park, Piddlehinton Topographical Survey 2D.dwg”.
- Additional photographs taken by Eco showing the construction – including the sealing around the tank foundations.
- Additional e-mail (see Appendix 3) and verbal information provided by Mr. Edward Johnson (AD Manager, Eco Sustainable Solutions Ltd) and further verbal information from staff members who were on-site when the site was constructed confirming various aspects of construction.

In addition, the following sources of information have been referred to:

- CIRIA C736 *Containment Systems for the Prevention of Pollution*
(London, 2014)
- European Commission *JRC Science for Policy Report (ref: EUR 29362-EN)
Best Available Techniques (BAT) Reference
Document for Waste Treatment.
Industrial Emissions Directive 2010/75/EU
(Integrated Pollution Prevention and Control)*
- www.bgs.ac.uk *BGS (British Geological Survey) website*
- www.defra.gov.uk *Defra website (Magic Map data)*
- <https://environment.data.gov.uk/farmers> *Environment Agency website (providing details
of NVZ areas)*

3.0 SITE DESCRIPTION

3.1 Site location and overview

The Piddlehinton AD Facility is located at Bourne Park Industrial Estate on the east side of Piddlehinton, near Dorchester, Dorset. The site is accessed from the south via a road off the B3143.

The site, which has been operating for approximately 11 years, comprises an Anaerobic Digester (AD) Plant within a secondary containment area formed below original ground levels such that it sits in an excavated bowl. The Combined Heat & Power (CHP) power plants sit outside of the containment area on higher ground to the west of the AD Plant along with site offices and plant control units, and a large building which accommodates a de-packaging/processing plant and a pasteurising plant.

The AD Plant comprises two pre-storage tanks, two digester tanks and one digestate storage tank. The secondary containment area is accessed via an access ramp from a small hardstanding area located to the immediate west of the AD Plant along the southern margin of the containment area slope. The small hardstanding area slopes to the east, where rainwater is allowed to run into the excavation.

Food waste is delivered to the delivery bay where it is fed into the de-packaging/processing plant which removes plastics from the food waste and adds waste brewer's yeast or recycled water to the food waste to form a "soup". This is then pumped to the pre-storage tanks and then the digester plants. Following anaerobic digestion, the digestate is pumped back to the plant to be pasteurised and then pumped to the digestate storage tank. The digestate is periodically pumped to tankers which take it offsite for use as a fertiliser or for further processing.

The nearest residential property is approximately 136m north-west of the permitted boundary.

Drawing No. 8060-001-001 shows the layout of the site.

3.2 AD Plant area – construction details

The following provides a summary of the various elements reviewed, based on discussions with the AD Plant Manager (Mr Edward Johnson) and site staff who were present when the plant was constructed/installed, with reference to the available design information and a number of

photographs taken at the time of construction, comments from the original Project Manager from the first phase of construction/installation and the findings of the recent site inspection by KeyGS.

Photo's 1-14, which are included at the back of this report, show the main elements of the AD Plant (the biodigester area) and the surrounding secondary containment area.

3.2.1 Secondary Containment Area Foundation

The entire floor of the secondary containment area lies within a bowl excavated into natural chalk. Following excavation, the chalk was flat bladed to grind down any flints and “chicken-picked” to remove flint fragments. Trenches for pipework were also excavated at this time. Photo's 1 & 2 show the chalk being excavated.

Once excavated to the required levels and flints ground down/removed, the entire floor, including the sides and bases of the trenches were covered with a Geosynthetic Clay Liner (GCL) (also referred to as a “bentonite membrane”), which was jointed & sealed as per manufacturer's instructions. The GCL was then covered with 300mm of clean recycled aggregate to both protect the GCL and to prevent it from splitting when the bentonite swells. Photo's 3 & 4 show the GCL being installed, and photo 13 shows the aggregate cover being placed.

The reinforced concrete foundations for the various tanks on site were constructed above the GCL, see photo's 7, 8 & 10. Any holes in the GCL made by shutter pins from the installation of the tank foundations, were sealed with bentonite powder (see photo 9).

All pipework was installed in trenches which were fully-lined with a GCL. A sump was also formed at the lowest part of the trench system; see photo's 10 to 12.

The elevation of the final surface is c.107.83mAOD (see Drawing Number 8060-001-001).

3.2.2 Perimeter Bund Walls

The perimeter bund walls were also formed from the excavation of a bowl in natural chalk (see Photo's 1 & 2). After being smoothed off, the bund walls were covered with a GCL which was jointed & sealed as per manufacturer's instructions. The GCL was secured on the bund walls in a trench along the crest of the slope and covered with two 150mm layers of “Envirogrid”, a honeycomb geotextile which was also secured in the trench and filled with soil. The soil-filled

Envirogrid is there to both protect the GCL and to prevent it from splitting when the bentonite swells. See photo's 5 & 6.

The crests of the perimeter walls are generally around c.109.6mAOD, however there is a low point of 109.23mAOD along the southern margin of the containment area.

The main access into the containment area is via a ramp running east to west on the south side of the site; the only other means of access into the secondary containment area is via pedestrian steps located along the eastern and western margins.

3.2.3 Digesters and Associated Tanks

A total of 5 no. tanks comprise the AD Plant at the Piddlehinton AD Facility.

These comprise 2 No. pre-storage tanks, 2 No. primary digesters, and a digestate storage tank. Photo's 15-17 and 20 show the various tanks. Drawing No. 8060-001-001 shows their location and configuration.

Summary details of each of the tanks comprising the AD Plant, all of which are wholly contained within the bunded (walled) secondary containment area, are provided below:

Tank	Internal dia (m)	External dia (m)	Tank Height (m)	Typical operating liquid level (m)	Maximum capacity (m ³)
Pre-storage tank No 1	9.31	9.49	6.3	6.2	422
Pre-storage tank No 2	9.31	9.49	6.3	6.2	422
Primary Digester No 1	22.50	22.76	6.3	5.6	2227
Primary Digester No 2	22.50	22.76	6.3	5.6	2227
Digestate storage tank	34.55	34.76	7.55	3.93	3684

Eco has advised that all tanks are constructed of steel sides on a reinforced concrete foundation and were constructed by Weltec.

The digesters and pre-stores are clad with plastic coated steel cladding over insulation. The digestate store is not believed to be insulated but is clad with plastic coated steel cladding.

The pre-stores, digesters and the digestate store all have fabric membrane roofs.

At the time of inspection, the digestate store was not operational.

3.2.4 Service pipework

A small number of pipes run over the surface of the containment area; the majority of the pipes run underground in a system of purpose-built GCL lined trenches. KeyGS understands that the lining of these trenches continues under the reception building and round to the Phase 1 engine set so any pipe that might carry liquid (digestate, feedstock or biogas condensate) is within the lined area. See photo's 8, 10, 11, 12 & 14.

A sump is located at the deepest part of the trench system to collect surface water (rainwater) run-off. This is described further in Section 3.2.5 below.

The draw-off point for the digestate store lies to the east of the site at a level of 112.6mAOD (see photo's 21 & 25), the draw-off pipe and pipe for the spill drain run up the side of the perimeter walls (see photo 22). Digestate must be pumped to reach this level.

KeyGS understands that there are no breaches in the base or perimeter walls of the containment area and that all pipes leaving the containment area must use pumps to move liquid and are unable to drain under gravity alone.

3.2.5 Surface water (clean water) collection and management

The containment area drains to a low-point in the GCL lined trench system where there is a sump and access point where collected surface water can be pumped out (see photo 12 and Drawing Number 8060-001-001).

Although some surface water from the small hardstanding to the west may run into the containment area, most of the surface water from surrounding land is channelled away by the fall of the land or by low bunds.

The facility has no discharge licence, and all collected surface water is reused as part of a closed loop system. Controlling the surface water in the sump is essential to the ongoing operation of the

AD plant as the site could potentially flood during rainstorm events if rainwater could not be efficiently collected and controlled.

It is important to note that the sump pump which removes the surface water from the containment area is manually operated and does not run on an automatic float switch. The water contained in the sump therefore requires to be inspected prior to being pumped out.

4.0 GROUND CONDITIONS

4.1 Geology, Hydrogeology and Hydrology

Geology – The 1:50,000 British Geological Survey (BGS) mapping data indicates the site to be underlain by chalk belonging to the Newhaven Chalk Formation of the Cretaceous Period (formed approximately 86.3-72.1 million years ago).

Hydrogeology – The site designated as a Principal Aquifer and is situated within a Groundwater Source Protection Zone 1.

Hydrology – There are no significant water courses in close proximity to the Piddlehinton AD Facility. The nearest significant surface water feature is the River Piddle, located approximately 1km to the southwest of the site.

4.2 Environmental protection

In addition to the above information, KeyGS understands that the site lies within Nitrate Vulnerable Zones for groundwater (South Wessex) and Eutrophic Water (Poole Harbour) (source of information www.defra.gov.uk (Magic map data)).

4.3 Site specific information

There is no additional site-specific ground investigation information available for the Piddlehinton AD Facility.

5.0 CONSTRUCTION STANDARDS – COMPLIANCE CRITERIA

5.1 Reference documents – CIRIA C736 and European Commission BAT Reference Document

The purpose of secondary containment is to provide emergency storage capacity in the event of catastrophic tank failure within the AD plant area and to prevent pollution off-site.

CIRIA C736 *Containment Systems for the Prevention of Pollution* is typically used as a basis for the design and construction of secondary containment facilities for industrial and commercial premises in the UK. The Environment Agency commonly requires that AD plant containment areas be constructed in general accordance with the requirements of CIRIA C736.

CIRIA C736 provides guidelines for emergency storage volumes for secondary containment areas, minimum heights for retaining bunds and walls (to prevent loss of fluid via dynamic surge or “jetting” effects) and minimum acceptable permeability for the foundations and retaining structures within such areas. The specific requirements of the CIRIA document are set-out in further detail in Section 5.2 of this report.

The European Commission BAT report discusses more generally the best practices that should be adopted during operation of AD plants and other waste facilities. The document does not add significantly to the specific detail provided in the CIRIA report and deals mainly with matters such as optimising feedstocks, methodology, the efficient use of water and energy etc and minimising the risk of emissions to air and water by optimising the processes and methods.

The most relevant information relating to the management of emissions to water is included in Section 6.1.5 of the BAT report.

The following excerpts from Section 6.1.5 are relevant to the review of AD secondary containment areas:

- Impermeable Surfaces:
Depending on the risks posed by the waste in terms of soil and / or water contamination, the surface of the whole waste treatment area (eg waste reception, handling, storage, treatment and dispatch areas) should be made impermeable to the liquids concerned.

- Techniques to reduce the likelihood and impact of overflows and failures from tanks:
Depending on the risks posed by the liquids contained in the tanks in terms of soil and / or water contamination, techniques such as those outlined below may be adopted:

- Overflow detectors;
 - Overflow pipes that are directed to a contained drainage system (ie the relevant secondary containment or another vessel);
 - Tanks for liquids that are located in a suitable secondary containment; the volume is normally sized to accommodate the loss of containment of the largest tank within the secondary containment;
 - Isolation of tanks, vessels and secondary containment (eg closing of valves).
- Segregation of water streams and adequate drainage infrastructure:
Each water stream (eg surface run-off water, process water) should be collected and treated separately.
Rainwater falling on treatment and storage areas should be collected in the drainage infrastructure along with washing water, occasional spillages, etc and, depending on the pollutant content, recirculated or sent for further treatment.
- Design and maintenance provisions to allow detection and repair of leaks:
Regular monitoring for potential leakages should be risk-based, and, when necessary, equipment should be repaired.
The use of underground components should be minimised. When underground components are used, and depending on the risks posed by the waste contained in those components in terms of soil and/or water contamination, secondary containment of underground components should be put in place.

5.2 Construction Requirements (CIRIA and BAT guidelines)

The following summarises the construction requirements and recommendations set-out in the CIRIA and BAT documents that have been used as a basis for the current inspection and audit of the secondary containment area at the Piddlehinton AD Facility.

The technical detail and recommendations provided in CIRIA C736 is generally more applicable to the design, operation and management of secondary containment areas than the BAT documents and so the review has been checked primarily against the CIRIA guidelines. Notwithstanding this approach, it should be recognised that the requirements to adhere to the CIRIA standard were introduced after a number of AD plants, including the Piddlehinton AD Facility, had become operational.

5.2.1 Storage capacity (110% and 25% Rules) (ref: Section 4.2.1; CIRIA C736):

Where two or more tanks are installed within the same bund, the recommended capacity of the bund should be the greater of:

- a) 110% of the capacity of the largest tank within the bund.
- b) 25% of the total capacity of all the tanks within the bund, except where tanks are hydraulically linked in which case they should be treated as if they were a single tank.

5.2.2 Freeboard in perimeter retaining walls / bunds (ref: Section 4.4; CIRIA C736):

Freeboard is the increased height allowed in the design of structures to account for uncertainty. In the context of the CIRIA C736 guidance, the freeboard represents an increase in the height of a containment wall or bund to provide additional capacity over and above the maximum predicted liquid level to allow for such things as rainwater and the surge effects that may result from catastrophic tank failure.

The following freeboard requirements are provided in CIRIA C736:

Type of structure	Allowance
In-situ reinforced concrete walls and blockwork bunds	250mm
Earthwork bunds	750mm

5.2.3 Allowance for Jetting effects (ref: Section 6.3.1; CIRIA C736):

The failure of a storage tank through, for example, a rupture of the sidewall or failure of a valve/pipework, could result in the escape of a jet of liquid with sufficient force that it projects over the perimeter bund wall. The potential for failure through jetting is minimised by:

- a) keeping primary storage tanks as low as possible
- b) increasing the height of the bund wall
- c) building the bund walls as far away from the tank as necessary

The following provides the method for calculating bund geometry, as outlined in CIRIA C736:

Box 6.1 Method for calculating bund geometry to prevent jetting

For a small diameter sharp edged discharge orifice, it can be demonstrated that:

$$l^2 = 4 C_v^2 (z-h) (H-z)$$

where C_v = coefficient of velocity

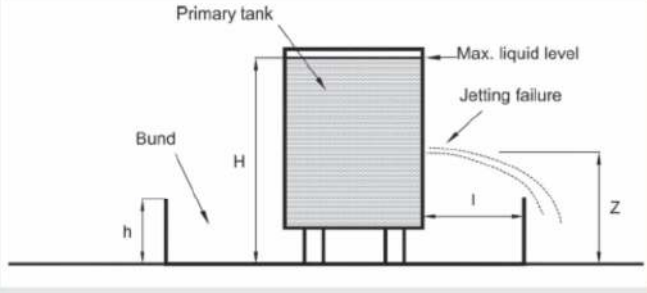
In practice, $C_v \cong 0.99$. Assuming $C_v = 1$ leads to the conservative solution:

$$l^2 = [4(z-h)(H-z)]^{0.5}$$

For a given value of h , it may be shown the l is a maximum when:

$$z = 0.5H + 0.5h$$

which leads to the solution:

$$l_{max} = H-h$$


5.2.4 Ground permeability within containment area (ref: Section 8.7.1; CIRIA C736):

The permeability of soils underlying the site and forming any earthwork retaining bunds within the containment area should not exceed the recommended permeability of 1×10^{-9} m/sec.

Various other physical characteristics are also outlined in CIRIA C736 and should be considered in the design process.

5.2.5 Underground pipes & infrastructure

Although specific requirements in relation to AD plants and underground pipework are not set-out in CIRIA C736, the Environment Agency (EA) generally recommends that new pipework installations be placed above ground, such that any breaches or leaks would be contained within the secondary containment area.

For existing plant sites that have underground pipework installations already operational, the EA would normally require these pipes to be located in trenches lined with impermeable material. If such secondary containment (i.e. lined pipe trenches) was not installed during construction (or it cannot be proven), it is generally considered acceptable to test and confirm the integrity of the pipework by regular condition surveys and pipe testing.

The European Commission BAT report states that adequate secondary containment should be maintained for underground components where there is a risk of soil and/or water contamination.

Any surface “breaches” within the floor of the secondary containment area should be adequately sealed, such that there is no preferential drainage pathway around the exterior of any pipework, manhole or other structure.

6.0 PIDDLEHINTON AD FACILITY SECONDARY CONTAINMENT AREA – COMPLIANCE

The following provides a summary of the current situation and compliance of the Piddlehinton AD Facility secondary containment area with the relevant CIRIA standard and BAT report (as set out in Section 5.2).

Where the current situation is deemed to be non-compliant with the CIRIA standard, recommendations for further investigation and / or remedial action is provided.

Requirement	Current situation / Compliance with CIRIA C736 & BAT report	Comments / Recommendations
Storage capacity (110% Rule)	<p>Based on the digester tank volumes, the required storage (spill) capacity to be accommodated in the secondary containment is equivalent to 110% of the capacity of the largest tank. Assuming that the digestate storage tank is filled to a height of 3.93m, this equates to a volume of 4,053m³.</p> <p>Using a 3D topographic survey (digitised from 2D CAD data) for the existing plant site and secondary containment area, "flood risk" modelling shows that a spillage of liquid equivalent to a volume of 4,053m³ will result in a "flood level" of 109.12mAOD within the secondary containment area. See Drawing No. 8060-001-002.</p> <p>The lowest point on the perimeter retaining bund is 109.23mAOD.</p> <p>The predicted flood level of 110% of the largest tank is lower than the lowest point on the perimeter retaining bund and so the existing secondary containment area has adequate storage capacity.</p> <p>The storage capacity is compliant with CIRIA C736.</p>	No recommendations for improvement works.

<p>Freeboard in perimeter retaining walls / bunds</p>	<p>The modelling indicates there is not sufficient freeboard capacity within the existing secondary containment area.</p> <p>Based on the level to which the largest tank operates at, the maximum predicted liquid level resulting from catastrophic failure of the largest tank is taken to be 109.01mAOD.</p> <p>The minimum freeboard, where the bund is at its lowest elevation of 109.23mAOD, therefore equates to 220mm, which is below the minimum freeboard requirement of 750mm (for earthen bunds).</p> <p>The freeboard requirement is <u>not</u> compliant with CIRIA C736.</p>	<p>For the secondary containment area to meet the minimum freeboard requirement, the following remedial measure will have to be made.</p> <p>The perimeter walls along the southern and western margins need to be raised to a level of at least 109.76mAOD.</p> <p>The perimeter walls may be raised by addition of an extra earthen bund, or by a suitable wall which is able to withstand the surge following a tank failure. Along the top of the access ramp the level difference may be made up by forming a shallow-sided concrete "sleeping-policeman" so that access is maintained. See details on Drawing 8060-001-003.</p>
<p>Jetting risk mitigation</p>	<p>A series of analyses to assess the "jetting risk" at the site, in accordance with the method set-out in Section 6.3.1 of CIRIA C736 (see Section 5.2.3 of this report) have been undertaken. The findings of these analyses are presented in Appendix 4 of this report.</p> <p>The analyses indicate (provided that the digestate storage tank is not filled to a height of above 7.0m) there is no hypothetical risks of fluid jetting over the perimeter retaining bund (and therefore beyond the confines of the secondary containment area) adjacent to any of the tanks.</p> <p>The perimeter bund walls comply with CIRIA C736.</p>	<p>No recommendations for improvement works, as long as the capacity of the digestate storage tank is such that the liquid level in the tank is at or below 7.0m.</p>
<p>Ground permeability (integrity of containment)</p>	<p>The base and perimeter sidewalls (including trenches) of the secondary containment area have been covered with a GCL (assumed to be a similar specification to Bentomat SS100 which has a permeability of $1 \times 10^{-11} \text{m/s}$ (100 times less permeable than required)). The GCL has been jointed and sealed as per manufacturer's instructions, with any holes made by shutter pins sealed with bentonite powder. The base and perimeter sidewalls of the secondary containment area are deemed to provide a sufficiently low permeability interface that will prevent the loss of potentially polluting fluids in the event of a spillage.</p>	<p>None.</p>

	The permeability of the floor and retaining bund around the perimeter of the containment area is compliant with CIRIA C736 .	
Security of buried pipework and service “breaches” in perimeter bund wall.	<p>All pipework and services run within a trench system which has been fully-lined with GCL, or over the surface of sidewalls, and there are no known breaches through the base or perimeter sidewall of the secondary containment area. Any leakages from buried pipework would be noted in the sump.</p> <p>The current arrangement is deemed to be acceptable and compliant with the general requirements of the European Commission BAT report.</p>	None.
Clean water segregation and management	<p>All surface water which lands within the secondary containment area (and some which lands on the small hardstanding to the west of the area), is directed to a sump at the deepest part of the trench system where it can be collected and pumped out of the containment area.</p> <p>There is no discharge licence for the facility and all surface water is manually pumped out and re-used on-site.</p> <p>The current arrangement is deemed to be acceptable and compliant with the general requirements of the European Commission BAT report.</p>	<p>No recommendations for improvement works.</p> <p>Maintain manual pumping of clean water from collection sump.</p>

7.0 POTENTIAL FOR INCREASING CAPACITY OF THE DIGESTATE STORAGE TANK

The capacity of the digestate storage tank is currently restricted by a float switch to a level of 3.93m; however, the tank can hold digestate up to a level of 7.45m.

As there is the potential to increase the capacity of the digestate storage tank, Eco has requested design options showing how far the existing secondary containment area needs to be extended so that it can accommodate the full capacity of the digestate storage tank.

As the northern, western, and southern margins are, or very close to, the site planning and permit boundary with a road, a building and a track beyond them, the only direction in which the secondary containment area can be extended in is towards the east.

KeyGS has produced two potential design options for the extension of the secondary containment area which are discussed individually below and can be seen on Drawings 8060-001-004 and 8060-001-005.

Option 1 (Drawing 8060-001-004)

The lateral extents of the design are defined by the site planning and permit boundary (shown in red on the drawing) and by the edge of the existing track to the east of the secondary containment area.

The design assumes, other than the remedial measures advised in Section 6 and detailed on Drawing 8060-001-003, that no further raising of the perimeter bund wall will take place. A perimeter wall level of 109.76mAOD and a maximum liquid level of 109.01mAOD were used for the design.

The cut slope profile mirrors the existing facility, with an intermediate bench at c.109.80mAOD; however, to achieve the required containment capacity, the side slopes extend down further than the existing floor level (c.107.83mAOD) so that the floor level in the extension area is 106.25mAOD.

This design requires the excavation of c.10,100m³ of material (c.750m³ of which appears to be tipped or stockpiled materials) to accommodate the full capacity of the digestate storage tank below 109.01mAOD.

Option 2 (Drawing 8060-001-005)

The lateral extents of the design are defined by the site planning and permit boundary (shown in red on the drawing) and by the edge of the existing track to the east of the secondary containment area.

The design assumes that the maximum liquid level can be up to the lowest point on the existing perimeter bund wall (109.23mAOD); this would require that the perimeter bund walls are raised to a level of at least 109.98mAOD, and that a “flood gate” is installed at the top of the access ramp with flood protection to at least 109.98mAOD.

The cut slope profile mirrors the existing facility, with an intermediate bench at c.110.00mAOD; however, to achieve the required containment capacity, the side slopes extend down further than the existing floor level (c.107.83mAOD) so that the floor level in the extension area is 107.30mAOD.

This design requires the excavation of c.9,000m³ of material (c.750m³ of which appears to be tipped or stockpiled materials) to accommodate the full capacity of the digestate storage tank below 109.23mAOD.

Any extension to, or modification of, the existing secondary containment area will need to be appropriately lined so that the permeability of soils underlying the site and forming any earthwork retaining bunds within the containment area do not exceed the recommended permeability of 1×10^{-9} m/sec. All lining will also need to tie into the lining of the existing secondary containment facility. All works should be undertaken in accordance with a suitable construction method statement and CQA Plan.

8.0 SUMMARY

This report has been prepared by KeyGS on behalf of Eco Sustainable Solutions Ltd and provides a review of the secondary containment facility for the AD Plant tanks at their Piddlehinton AD Facility.

Eco is providing a response for the Environment Agency (EA) in reply to a Regulation 61 notice in relation to Eco Piddlehinton Anaerobic Digester (AD) Facility (EPR/FP3692SU). This report has been produced as part of Section 4b of Eco's response to the Regulation 61 notice.

This report considers whether the existing construction of the secondary containment at the Piddlehinton AD Facility meets the requirements set-out in CIRIA C736 and the European Commission Best Available Techniques (BAT) Reference Document for Waste Treatment (see Section 2.0 of this report for full document references).

The findings of a site inspection undertaken by KeyGS on 7 June 2022 and a review of the available construction data has been used during compilation of this report. The various documents that have been reviewed are referenced in this report.

Based on inspection and data review, it is considered that the secondary containment area at the Piddlehinton AD Facility is mostly compliant with the requirements of CIRIA C736 and the European Commission BAT report.

The only area of deviation from the CIRIA requirements concerns the freeboard capacity within the existing secondary containment area. Based on the level to which the largest tank operates at, the maximum predicted liquid level resulting from catastrophic failure of the tank is 109.01mAOD. The minimum freeboard, where the existing perimeter wall is at its lowest elevation of 109.23mAOD, therefore equates to 220mm, which is less than the minimum freeboard requirement of 750mm (for earthen bunds).

For the secondary containment area to meet the minimum freeboard requirement, the following remedial measure is proposed:

- The perimeter walls along the southern and western margins need to be raised to a level of at least 109.76mAOD. See details on Drawing 8060-001-003.
 - The perimeter walls may be raised by addition of an extra earthen bund, or by the provision of a suitable wall which is able to withstand the surge following a tank failure.

- Along the top of the access ramp the level difference may be increased by forming a shallow-sided concrete “sleeping-policeman” so that access can be maintained.

As there is the potential to increase the capacity of the digestate storage tank, two design options have been produced to show how far the existing secondary containment area would need to be extended to accommodate the full capacity of the digestate storage tank.

Any extension to, or modification of, the existing secondary containment area will need to be appropriately lined so that the permeability of soils underlying the site and forming any earthwork retaining bunds within the containment area do not exceed the recommended permeability of 1×10^{-9} m/sec. All lining will also need to tie into the lining of the existing secondary containment facility. All works should be undertaken in accordance with a suitable construction method statement and CQA Plan.

PHOTOGRAPHS



Photo 1. View of chalk excavation looking south - west.



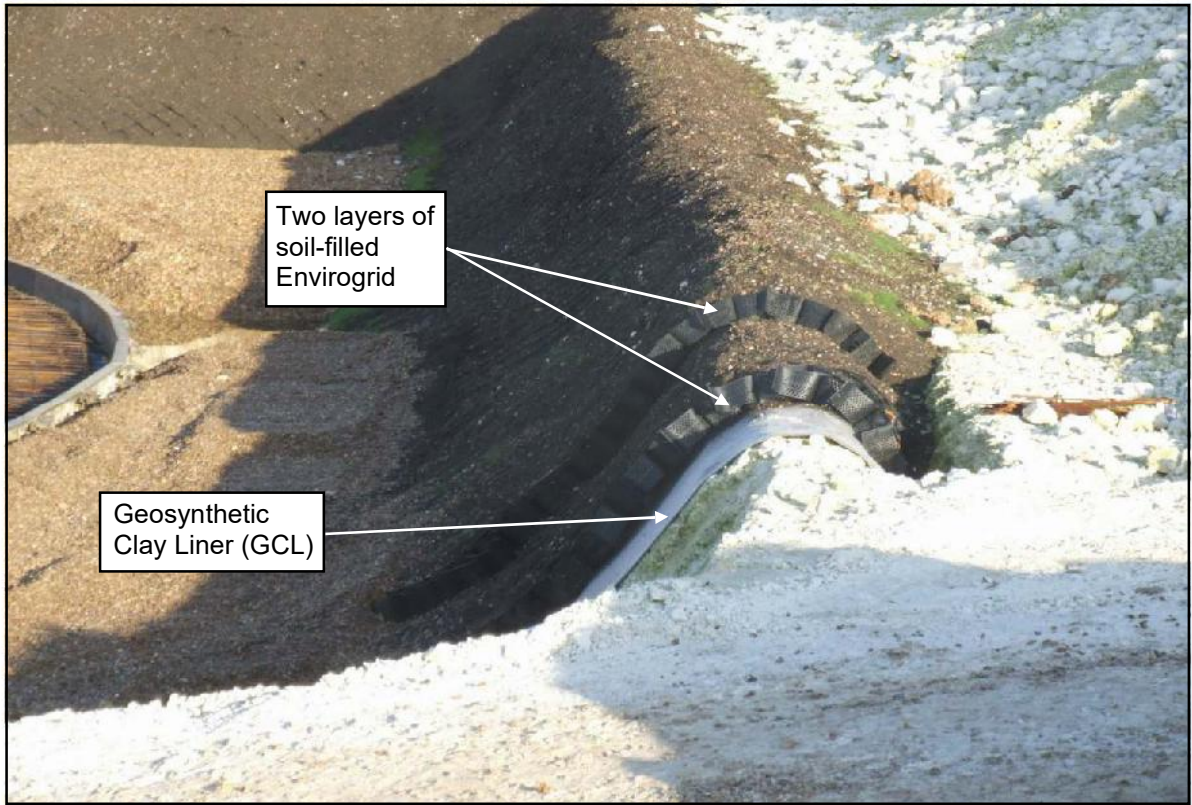
Photo 2. View of chalk excavation looking west.



Photo 3. Placement of Geosynthetic Clay Liner (GCL). View looking south.



Photo 4. Placement of Geosynthetic Clay Liners (GCL). View looking north.



Two layers of soil-filled Envirogrid

Geosynthetic Clay Liner (GCL)

Photo 5. GCL secured on sidewalls with “Envirogrid” filled with soils. View of eastern slope.



Photo 6. GCL secured on sidewall with “Envirogrid” filled with soils. View of northern slopes.



Photo 7. Reinforced concrete tank bases being laid over the top of the GCL.



Photo 8. Reinforced concrete tank bases being laid over the top of the GCL.



Photo 9. Holes in GCL from concrete shutter pins sealed with bentonite powder.



Photo 10. Reinforced concrete tank base for Digestive Storage Tank being laid and pipe work being installed.



Photo 11. Pipe work installed in GCL lined trench.



Photo 12. Sump installed in GCL lined trench.



Photo 13. GCL being covered with 300mm clean aggregate..



Photo 14. View looking west of concrete tank bases, grassed sideslopes, pipe work trench / Sump and aggregate covered GCL.



Photo 15. View of AD Facility from gate at top of access ramp looking north-east.

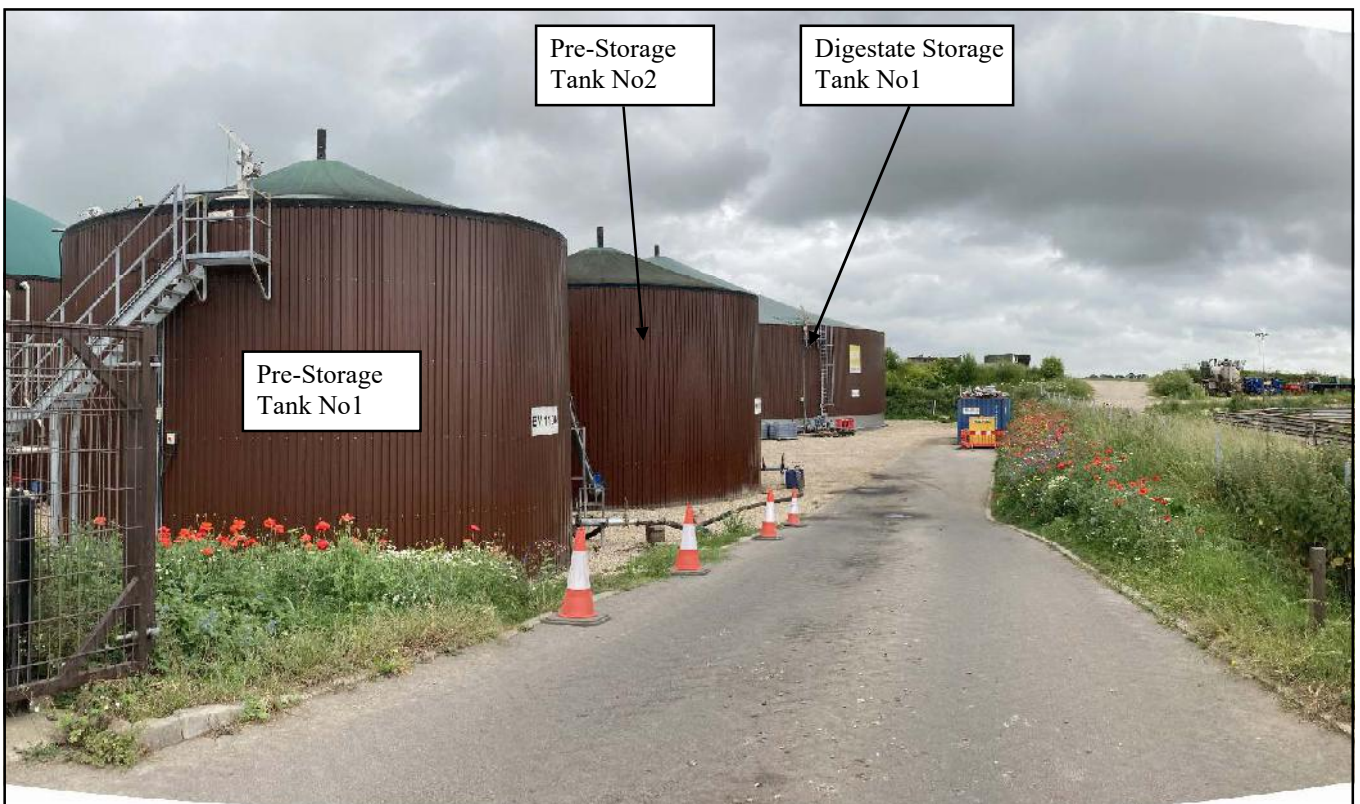


Photo 16. View of AD Facility from gate at top of access ramp looking east.

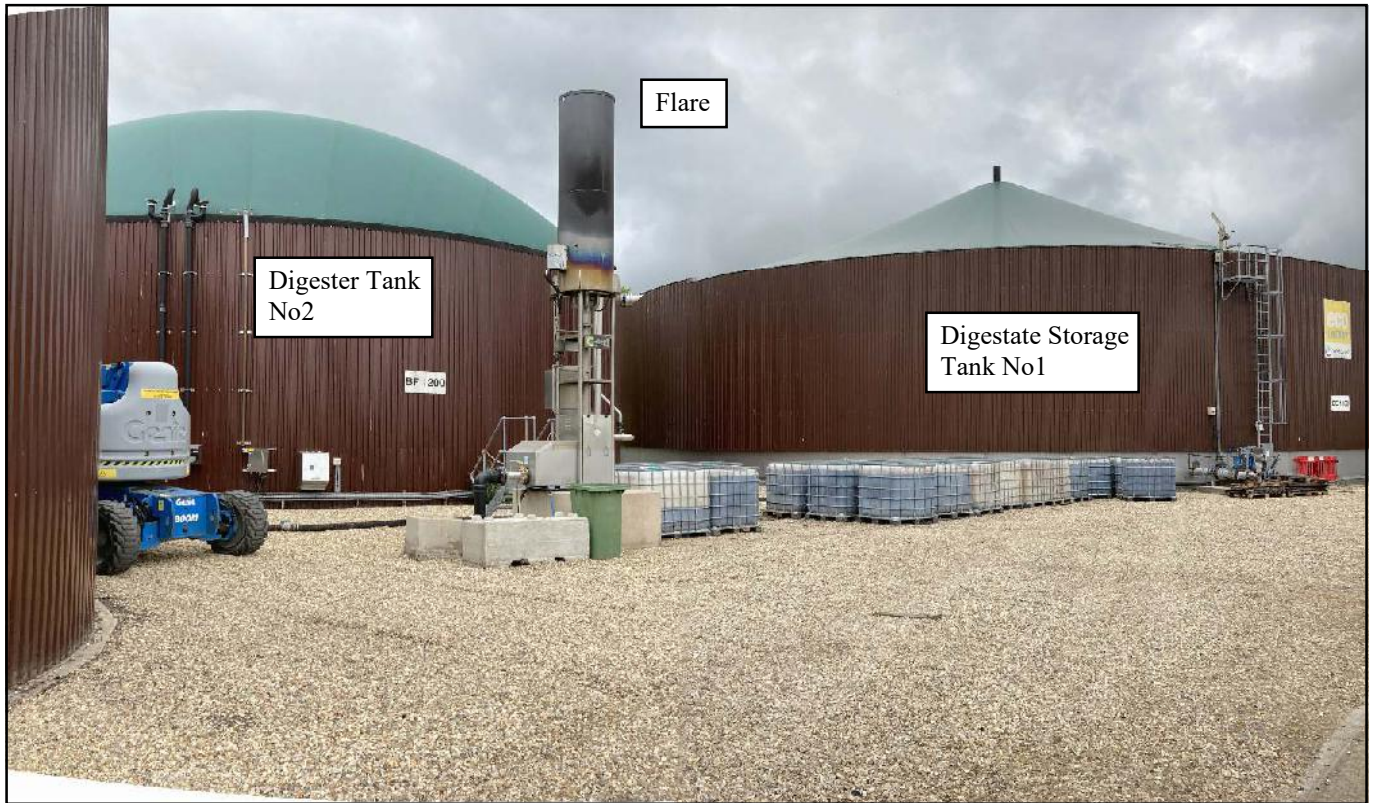


Photo 17. View of central part of facility looking north-east.



Photo 18. View of southern margin looking east.



Photo 19. View of southern margin and access ramp looking west.

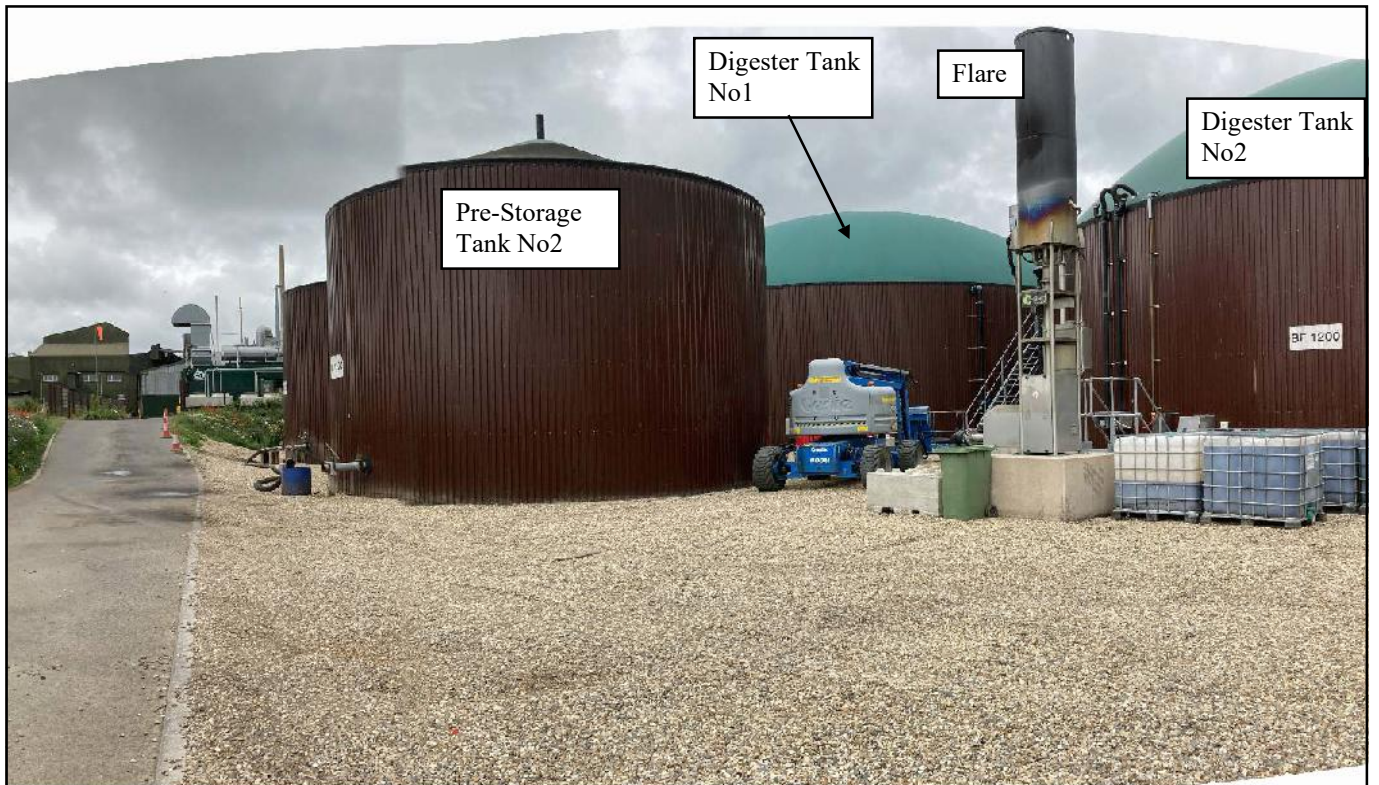


Photo 20. View of central part of facility looking west.

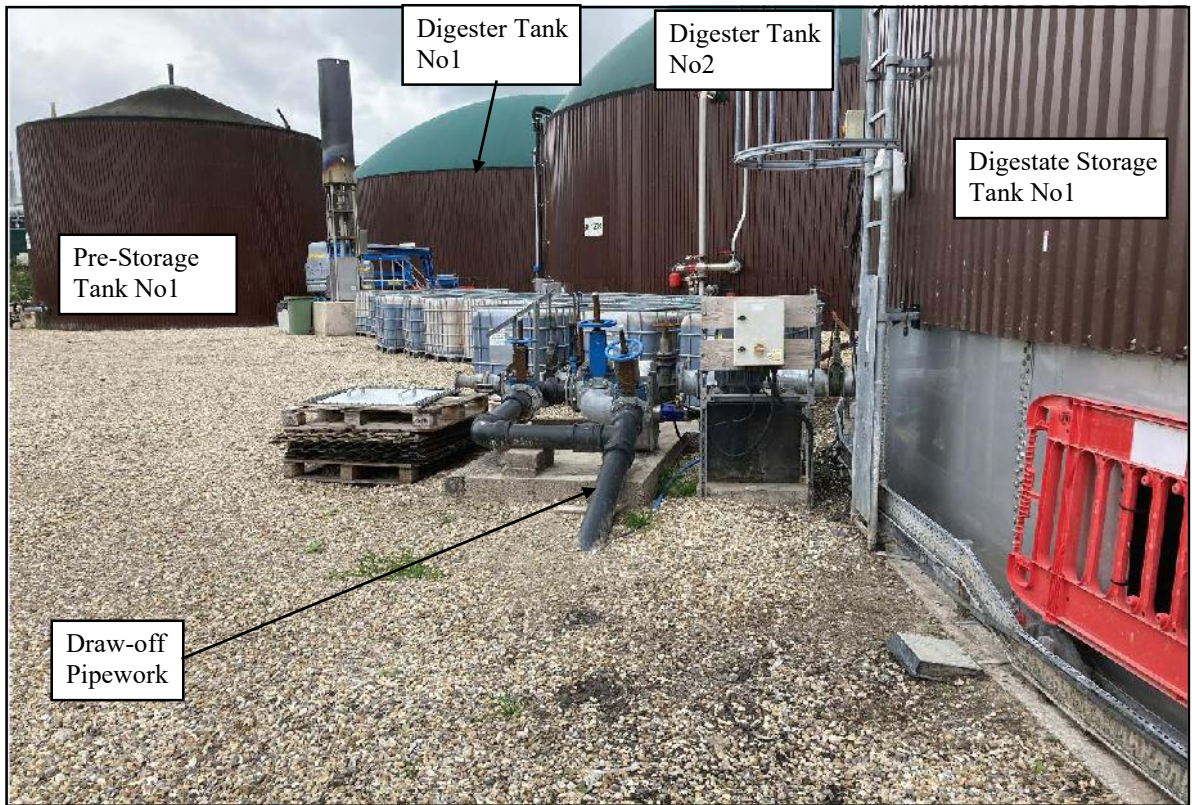


Photo 21. Digestate Storage Tank - digestate draw-off pipework.

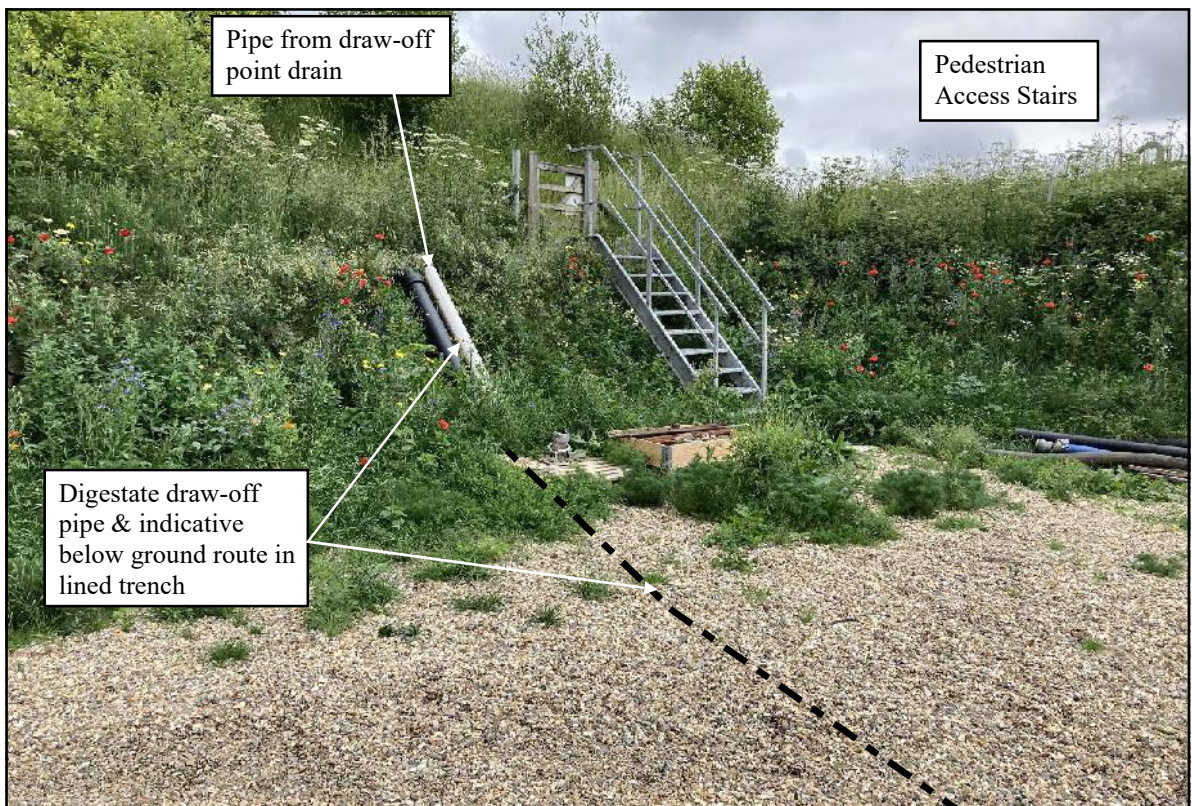


Photo 22. View of eastern corner of secondary containment area



Photo 23. View of eastern margin looking north.



Photo 24. View of eastern margin showing detail of soil-filled EnviroGrid.



Photo 25. View of digestate draw-off point and spill collection drain.



Photo 26. View of eastern margin looking south.

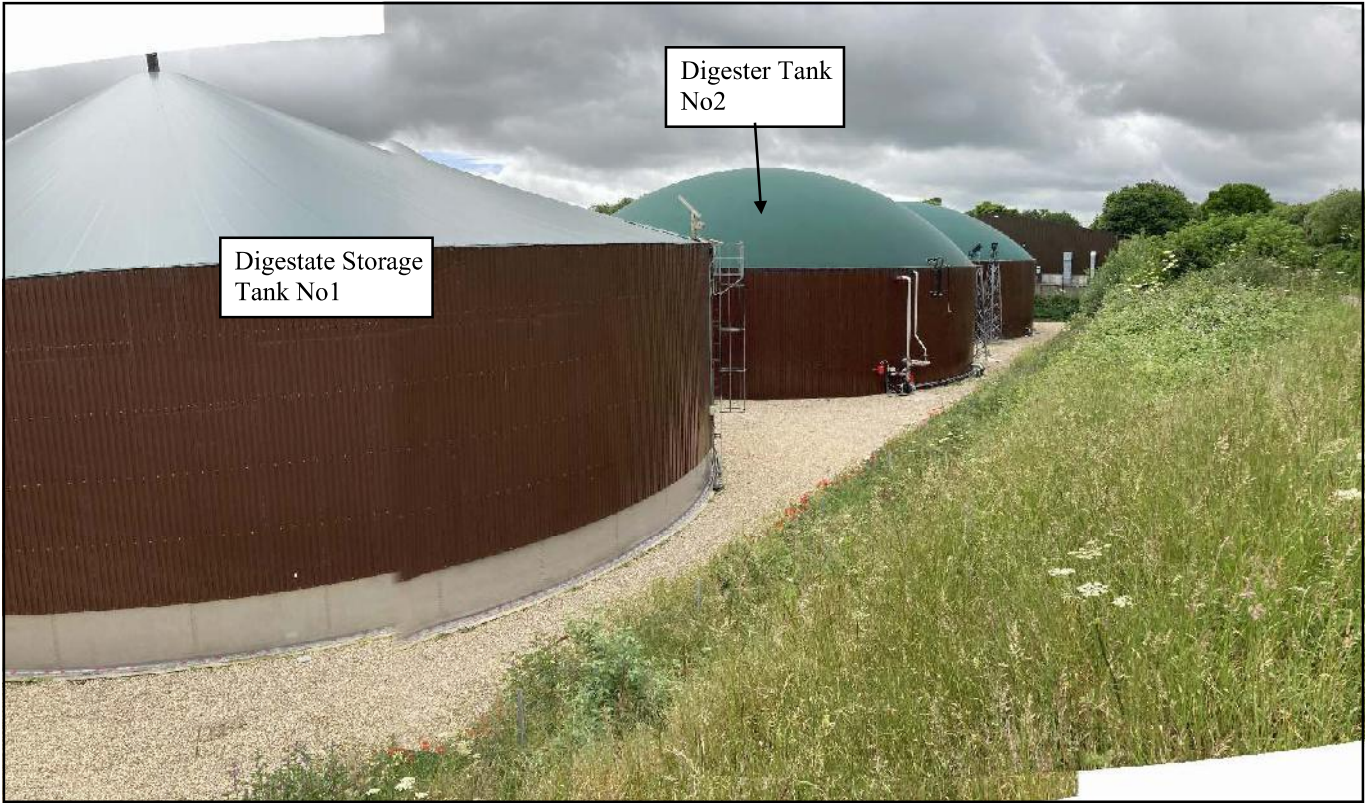


Photo 27. View of northern margin looking west.

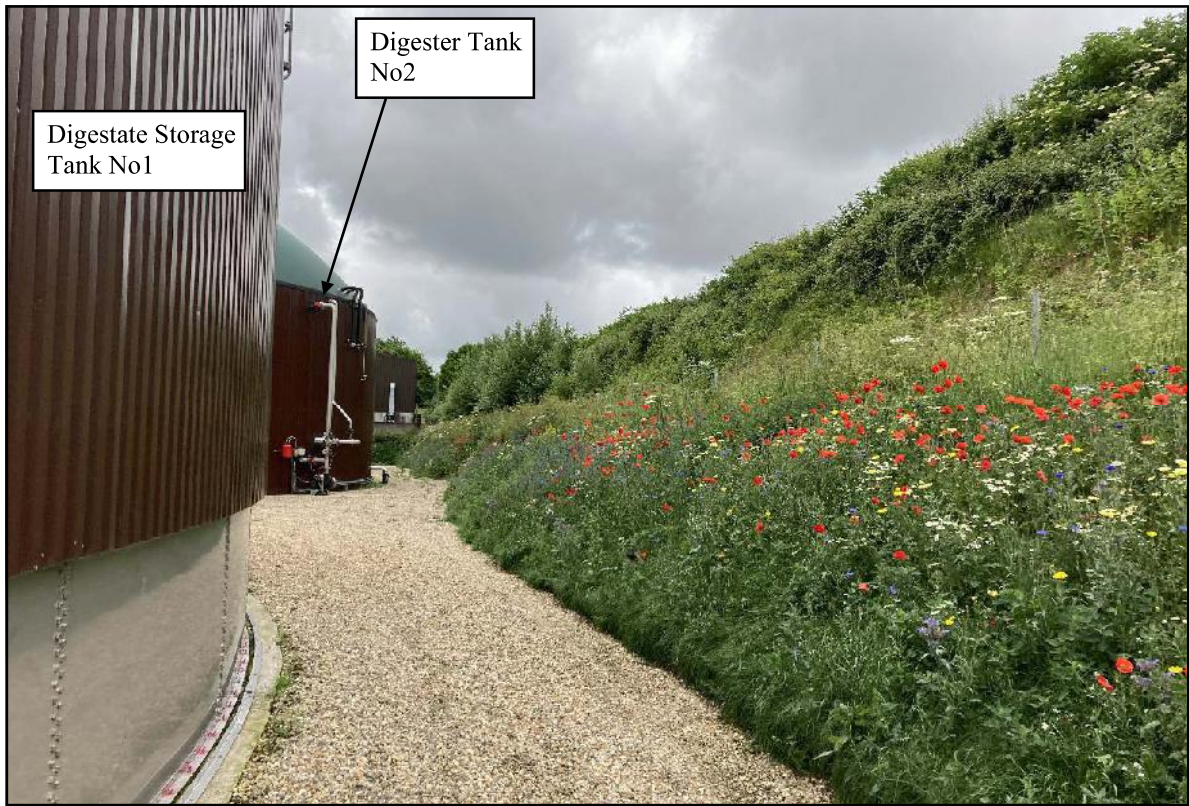


Photo 28. View of northern margin looking west.



Photo 29. View of northern margin showing detail of concrete sandbag wall retaining GCL.



Photo 30. View of western margin looking south.

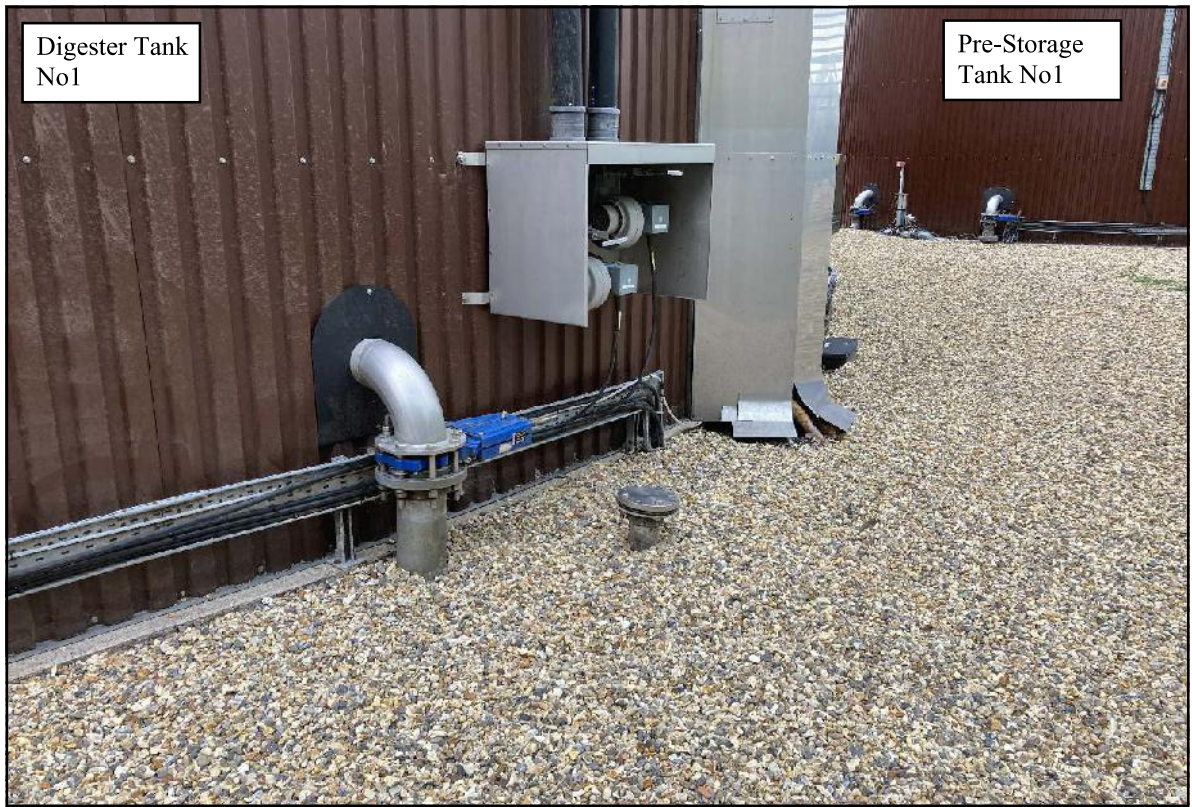


Photo 31. Typical view pipework and cables around tanks.



Photo 32. View of small hard standing area at a level above secondary containment area.



Photo 33. View of small hard standing area at a level above secondary containment area.

APPENDICES 1-4

DRAWINGS

Appendix 5 - Photographs taken during construction of site



Photograph 1 – Excavation of the chalk



Photograph 2- Excavation and tank bases



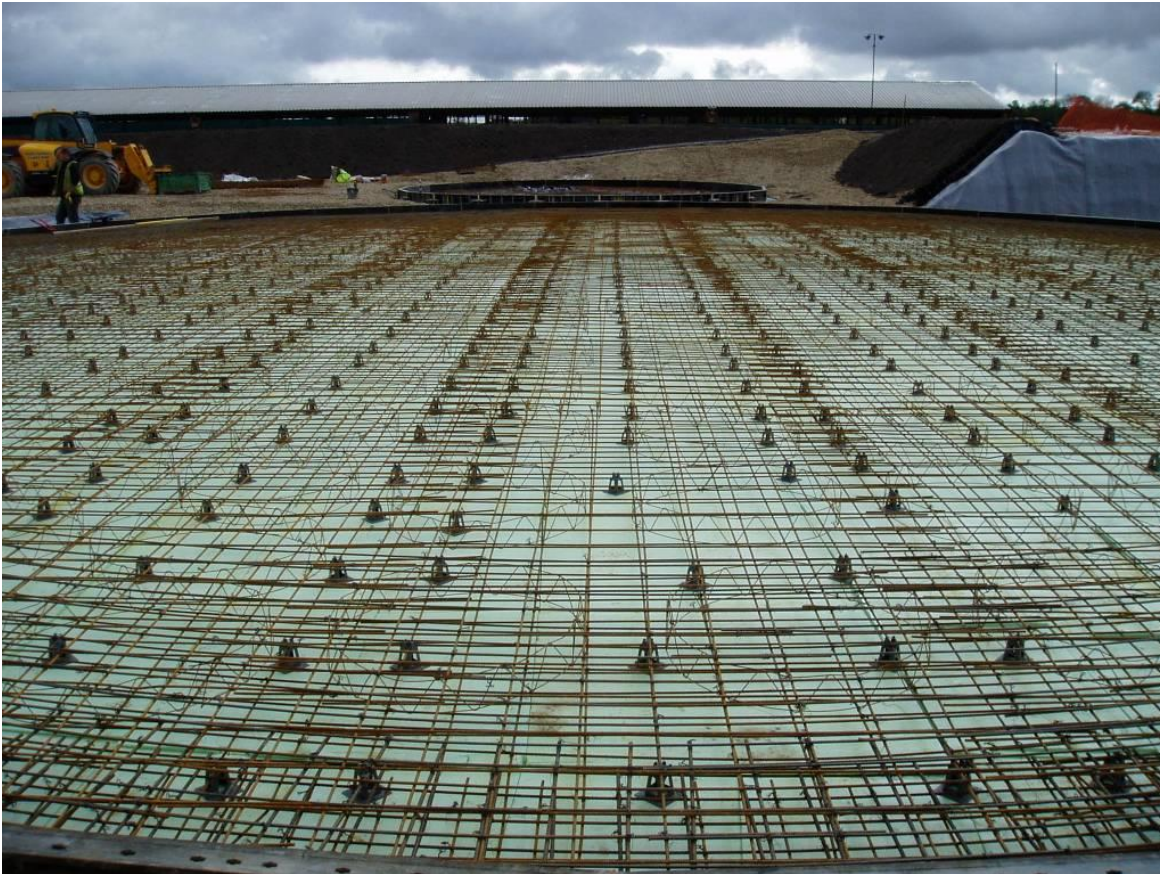
Photograh 3 – Placement of the bentonite liner



Photograph 4 – Placement of the bentonite liner 2



Photograph 5 – Liner secured on side wall using 'Envirogrid'



Photograph 6 Digestate Store base



Photograph 7- Tank bases



Photograph 8 – Concrete pouring



Photograph 9 – Concrete pouring 2



Photograph 10 – Sump within liner



Photograph 11 – Concrete tank bases

Response to Regulation 61 notice in relation to Eco Piddlehinton AD Facility (EPR/FP3692SU), October 2021
Written by Shann Pitts Consulting in collaboration with Eco Sustainable Solutions



Photograph 11- Site overview during concrete pouring



Photograph 12 – Lined trench for pipework



Photograph 13 – Concrete tank bases and grassed banks

Will Roberts

From: Mike Thompson <mike.thompson@mikethompsonpartnership.co.uk>
Sent: 13 October 2021 11:03
To: Jamie Williams
Cc: Emily Pitts; Edward Johnson
Subject: RE: Piddlehinton Bund Construction
Attachments: DSCF5532.JPG; DSCF5534.JPG; DSCF5553.JPG; DSCF5567.JPG; DSCF5411.JPG; PICT0212.JPG

Jamie,

There is no engineered bund at Piddlehinton. I specifically avoided any ground engineering due to hassle & cost. The whole tank farm sits in a bowl excavated from virgin chalk rock – PICT0212.JPG.

The bowl's inner surface is lined with a bentonite membrane, jointed & sealed as per manufacturer's instructions. The membrane is overlain by 300mm of soil on the sidewalls, retained by a honeycomb geotextile. Across the floor is a covering of 300mm of clean recycled aggregate. This cover is to stop the membrane splitting due to the bentonite swelling. Any holes in the membrane (shutter pins, etc) were sealed with bentonite powder (the photo with the watering can).

Everything was lined, including the pipe trenches right up under the reception barn and round to the phase 1 engine set so any pipe that might carry liquid (digestate, feedstock or biogas condensate) was within the lined area.

We had an engineer down from the suppliers for 2 days to go through the installation with the Farwell guys and myself to make sure everything we did conformed to their specifications.

Underneath the membrane is chalk – flat bladed prior to membrane placement to grind down any flints and then chicken picked for fragments.

You should have all the evidence you need at Eco. I left everything for all the projects I worked on filed in my office with instructions not to bin anything pertaining to an operating site. All electronic copies were left in my archive on the server. I have no idea what happened to them after I left. I know Jon salvaged some of my archive from the server when a load of stuff was dumped so it might be worthwhile talking to him. If my office was cleared in the same manner as the server you may have issues as a lot of the documents in there were originals without electronic copies.

I have a collection of photos from the build. Some of the bund excavation and liner installation are attached.

We pre-installed all the Phase 2 pipework when we did Phase 1. Steve Harman project managed Phase 2 as I was busy with the solar farms. I know he was told to maintain the integrity of the membrane but I have no photos from Phase 2 and any documents Steve generated would have been left in my archive or on site.

Kind regards

Mike Thompson B.Sc.(Hons.)

Mike Thompson Partnership Limited

56, Norton Road, Penygroes, LLANELLI, Carmarthenshire. SA14 7RS.

Tel: 07773 812410

Web: www.mikethompsonpartnership.co.uk

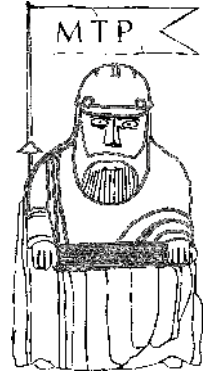
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From: Jamie Williams <jamie.williams@thisiseco.co.uk>

Sent: 13 October 2021 09:50

To: Mike Thompson <mike.thompson@mikethompsonpartnership.co.uk>

Cc: Emily Pitts <emily@shannpittsconsulting.co.uk>; Edward Johnson <edward.johnson@thisiseco.co.uk>

Subject: Piddlehinton Bund Construction

Hi Mike,

We are currently undertaking a regulation 61 permit review for Piddlehinton and I need to provide some information on the bund construction. Specifically design and build information such as what the membrane is made of, how were joints sealed, what is underneath the membrane etc. Are you aware of the existence of any documents (drawings, plans?) that would show this, and although a long shot where I might find them or who may be able to send me a copy?

Thanks for any help.

Cheers

Jamie

Best Regards

Jamie Williams CEnv, Tech IOSH
Tech EHS Manager

Eco Sustainable Solutions Ltd



Chapel Lane - Parley - Christchurch - Dorset - BH23 6BG

Tel: 01202 593601

Fax: 01202 581119

Web: www.thisiseco.co.uk

Will Roberts

From: Edward Johnson <edward.johnson@thisiseco.co.uk>
Sent: 07 June 2022 16:27
To: Will Roberts
Subject: bentonite

CAUTION: Stop and Think - This email originated from outside of the organisation. Do not click on links, open attachments or reply unless you are sure its genuine.

Hi Will,

As discussed earlier today when the tank leaked and we conducted following restoration works we did not go into the bentonite layer. All we did was re-batter the plastic geocell ground reinforcement with new soils and then we reseeded with grass and wild flower.

Edward Johnson
AD Manager

Eco Sustainable Solutions

Piddlehinton AD Facility
Bourne Park Ind Est, Piddlehinton, Dorchester, DT2 7TU, 01300 346435



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Edward Johnson
AD Manager

Eco Sustainable Solutions
Chapel Lane, Parley, Dorset, BH23 6BG, 01202 593601



Will Roberts

From: Edward Johnson <edward.johnson@thisiseco.co.uk>
Sent: 07 June 2022 14:01
To: Will Roberts
Subject: tank level adjustment following survey
Attachments: digestate storage tank high level adjusted

You don't often get email from edward.johnson@thisiseco.co.uk. [Learn why this is important](#)

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Will, please find attached for tank level adjustment

Edward Johnson
AD Manager

Eco Sustainable Solutions

Piddlehinton AD Facility

Bourne Park Ind Est, Piddlehinton, Dorchester, DT2 7TU, 01300 346435



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Edward Johnson
AD Manager

Eco Sustainable Solutions

Chapel Lane, Parley, Dorset, BH23 6BG, 01202 593601



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From: Edward Johnson <edward.johnson@thisiseco.co.uk>
Sent: 04 May 2022 11:02
To: Jamie Williams; Kieran Purkis; Antonio Rodrigues; Piddle Hinton Eco Sustainable Solutions
Subject: digestate storage tank high level adjusted
Attachments: RE: Piddlehinton permit support; PH Digestate store level conversion table.xlsx

Gents,

following on from the bund topographical survey conducted by Landmark Survey we have set the high level float to trigger at Safe fill (Max fill of 4,098m³ -10%) of 3,684m³. Please find attached supporting docs and communications for your convenience. The float switch was also function tested and seen to communicate with the SCADA for proper transfer pump, and PAS shut down.

Antonio, if you would be so kind to please communicate out to Filipe and Adam and have them sign in the diary under the my entry and signature.

Kind regards,

Edward Johnson
AD Manager

Eco Sustainable Solutions

Bourne Park Ind Est, Piddlehinton, Dorchester, DT2 7TU, 01300 346435



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Jetting Analyses **Figure 1**

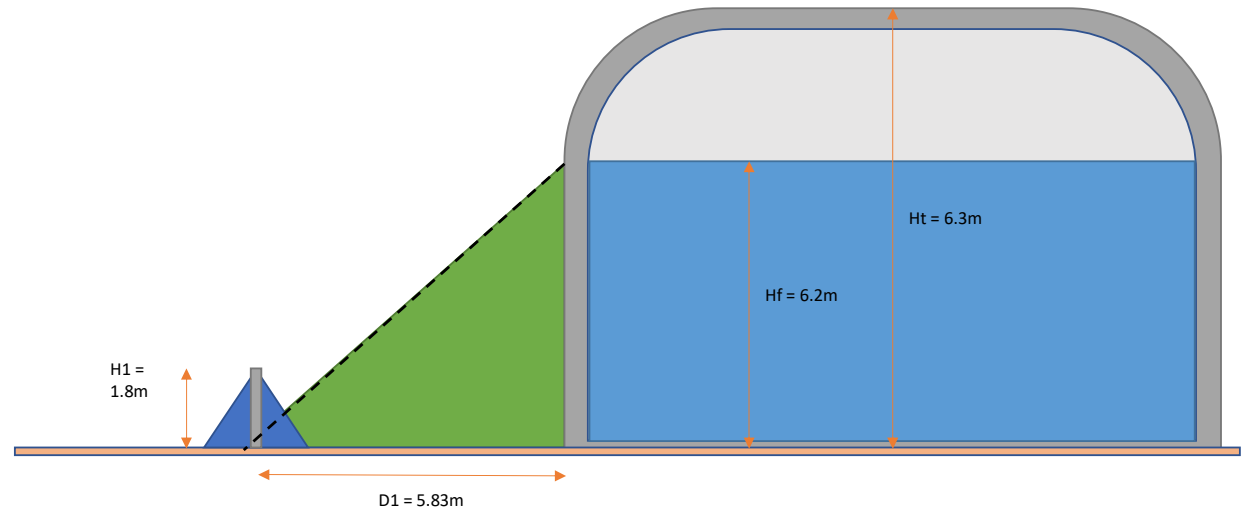
<u>Site Name</u>	Bourne park
<u>Section Number</u>	Section 1
<u>Tank Reference</u>	Pre-storage tank No 1

Internal Ø	9	
External Ø	9	
Tank Height	6.3 Ht	Ht = 6.3m
Fill Height	6.2 Hf	Hf = 6.2m
Distance From Wall/Bund Crest	5.83 D1	D1 = 5.83m
Height of Wall/Bund Crest	1.8 H1	H1 = 1.8m

Height Fixed		
Required Distance	4.4 Dr	
Difference from Existing Distance	-1.5	Bund/Wall ok, no jetting issues

Distance Fixed		
Required Height	0.37 Hr	
Difference from Existing Height	-1.5	Bund/Wall ok, no jetting issues

(CIRIA C736 $l = H - h \implies Dr = Hf - H1$)
 $h = H - l \implies Hr = Hf - D1$



Jetting Analyses **Figure 2**

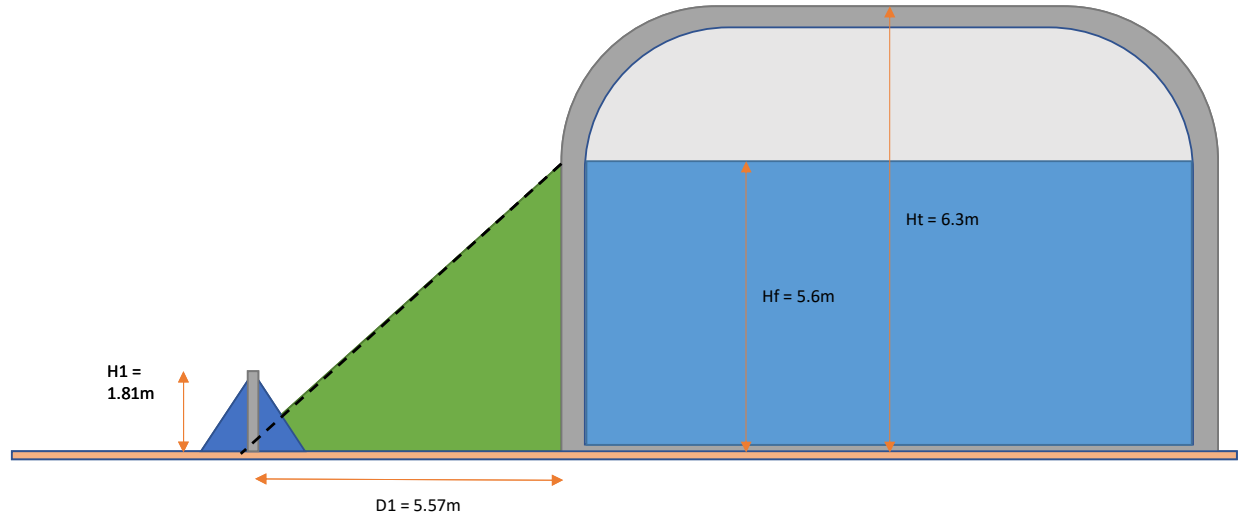
<u>Site Name</u>	Bourne park
<u>Section Number</u>	Section 2
<u>Tank Reference</u>	Pre-storage tank No 2

Internal Ø	23	
External Ø	23	
Tank Height	6.3 Ht	Ht = 6.3m
Fill Height	5.6 Hf	Hf = 5.6m
Distance From Wall/Bund Crest	5.57 D1	D1 = 5.57m
Height of Wall/Bund Crest	1.81 H1	H1 = 1.81m

Height Fixed		
Required Distance	3.79 Dr	
Difference from Existing Distance	-1.8	Bund/Wall ok, no jetting issues

Distance Fixed		
Required Height	0.03 Hr	
Difference from Existing Height	-1.8	Bund/Wall ok, no jetting issues

(CIRIA C736 $l = H - h \implies Dr = Hf - H1$)
 $h = H - l \implies Hr = Hf - D1$



Jetting Analyses **Figure 3**

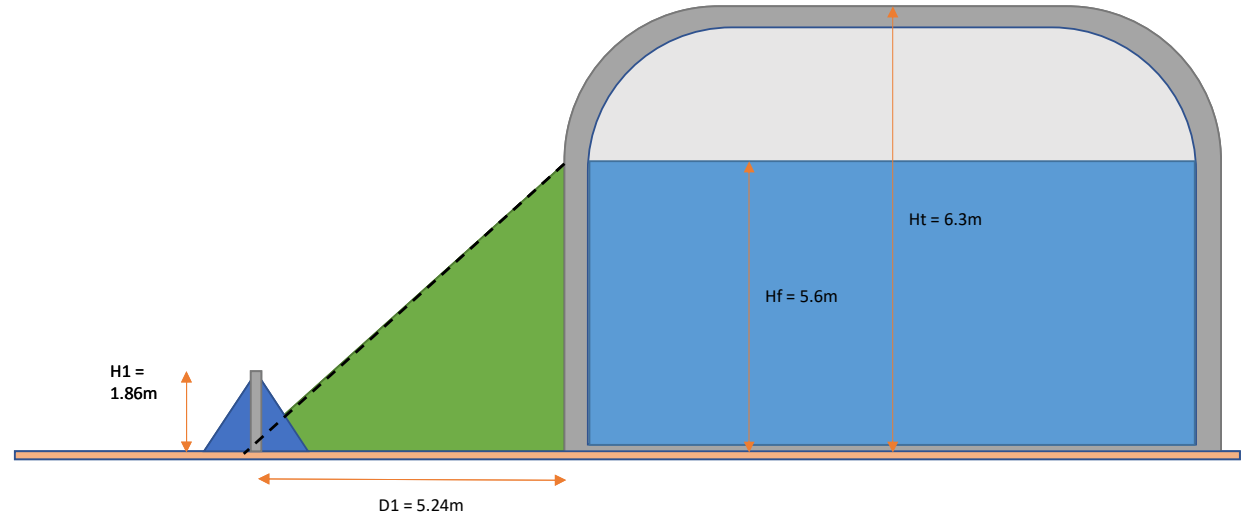
<u>Site Name</u>	Bourne park
<u>Section Number</u>	Section 3
<u>Tank Reference</u>	Digester 1

Internal Ø	23	
External Ø	23	
Tank Height	6.3 Ht	Ht = 6.3m
Fill Height	5.6 Hf	Hf = 5.6m
Distance From Wall/Bund Crest	5.24 D1	D1 = 5.24m
Height of Wall/Bund Crest	1.86 H1	H1 = 1.86m

<u>Height Fixed</u>		
Required Distance	3.74 Dr	
Difference from Existing Distance	-1.5	Bund/Wall ok, no jetting issues

<u>Distance Fixed</u>		
Required Height	0.36 Hr	
Difference from Existing Height	-1.5	Bund/Wall ok, no jetting issues

(CIRIA C736 $l = H - h \implies Dr = Hf - H1$)
 $h = H - l \implies Hr = Hf - D1$



Jetting Analyses **Figure 4**

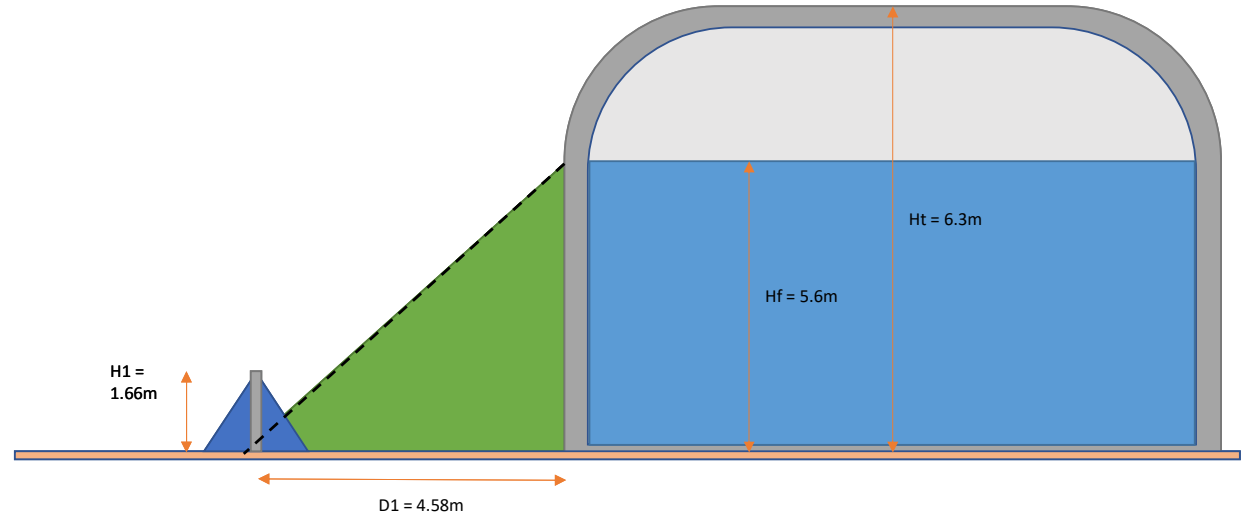
<u>Site Name</u>	Bourne park
<u>Section Number</u>	Section 4
<u>Tank Reference</u>	Digester 2

Internal Ø	23	
External Ø	23	
Tank Height	6.3 Ht	Ht = 6.3m
Fill Height	5.6 Hf	Hf = 5.6m
Distance From Wall/Bund Crest	4.58 D1	D1 = 4.58m
Height of Wall/Bund Crest	1.66 H1	H1 = 1.66m

Height Fixed		
Required Distance	3.94 Dr	
Difference from Existing Distance	-0.7	Bund/Wall ok, no jetting issues

Distance Fixed		
Required Height	1.02 Hr	
Difference from Existing Height	-0.7	Bund/Wall ok, no jetting issues

(CIRIA C736 $l = H - h \implies Dr = Hf - H1$)
 $h = H - l \implies Hr = Hf - D1$



Jetting Analyses **Figure 5**

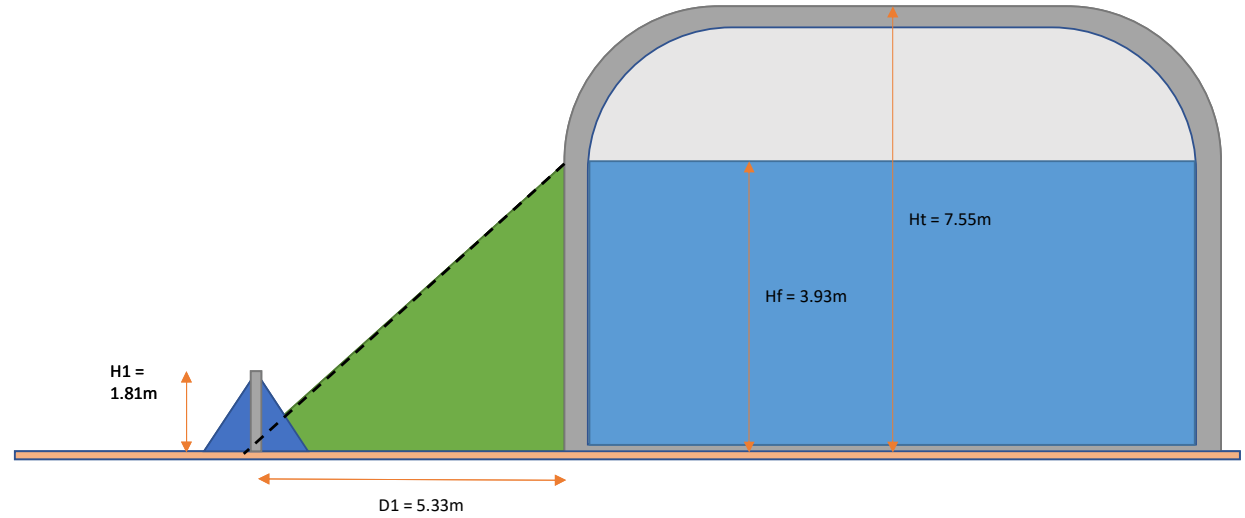
<u>Site Name</u>	Bourne park
<u>Section Number</u>	Section 5 - Current Capacity
<u>Tank Reference</u>	Digestate storage tank 1

Internal Ø	35	
External Ø	35	
Tank Height	7.55 Ht	Ht = 7.55m
Fill Height	3.93 Hf	Hf = 3.93m
Distance From Wall/Bund Crest	5.33 D1	D1 = 5.33m
Height of Wall/Bund Crest	1.81 H1	H1 = 1.81m

<u>Height Fixed</u>		
Required Distance	2.12 Dr	
Difference from Existing Distance	-3.3	Bund/Wall ok, no jetting issues

<u>Distance Fixed</u>		
Required Height	-1.4 Hr	
Difference from Existing Height	-3.3	Bund/Wall ok, no jetting issues

(CIRIA C736 $l = H - h \implies Dr = Hf - H1$)
 $h = H - l \implies Hr = Hf - D1$



Jetting Analyses **Figure 6**

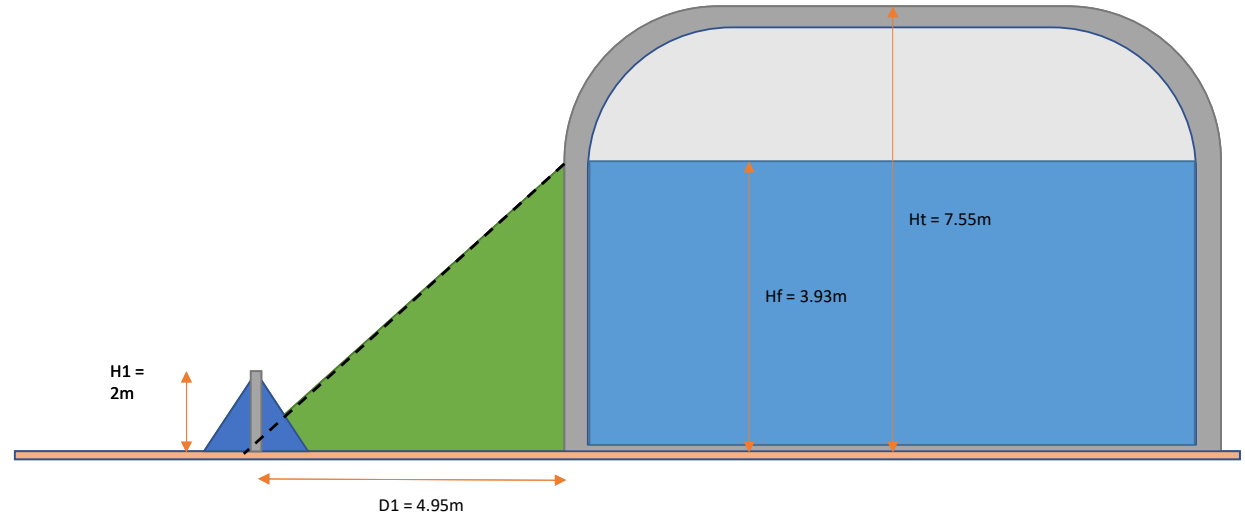
<u>Site Name</u>	Bourne park
<u>Section Number</u>	Section 6 - Current Capacity
<u>Tank Reference</u>	Digestate storage tank 1

Internal Ø	35	
External Ø	35	
Tank Height	7.55 Ht	Ht = 7.55m
Fill Height	3.93 Hf	Hf = 3.93m
Distance From Wall/Bund Crest	4.95 D1	D1 = 4.95m
Height of Wall/Bund Crest	2 H1	H1 = 2m

Height Fixed		
Required Distance	1.93 Dr	
Difference from Existing Distance	-3.1	Bund/Wall ok, no jetting issues

Distance Fixed		
Required Height	-1.02 Hr	
Difference from Existing Height	-3.1	Bund/Wall ok, no jetting issues

(CIRIA C736 $l = H - h \implies Dr = Hf - H1$)
 $h = H - l \implies Hr = Hf - D1$



Jetting Analyses **Figure 7**

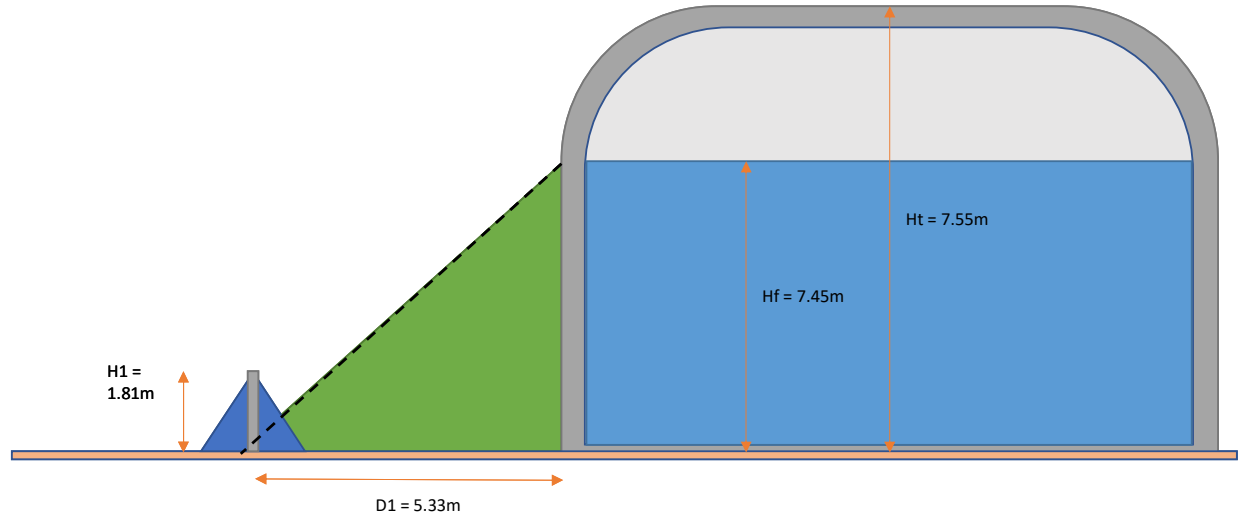
<u>Site Name</u>	Bourne park
<u>Section Number</u>	Section 5a - Max Capacity
<u>Tank Reference</u>	Digestate storage tank 1

Internal Ø	35		
External Ø	35		
Tank Height	7.55 Ht	Ht = 7.55m	
Fill Height	7.45 Hf	Hf = 7.45m	
Distance From Wall/Bund Crest	5.33 D1	D1 = 5.33m	
Height of Wall/Bund Crest	1.81 H1	H1 = 1.81m	

Height Fixed			
Required Distance	5.64 Dr		
Difference from Existing Distance	0.4	Bund/Wall needs to be moved out by	0.4m

Distance Fixed			
Required Height	2.12 Hr		
Difference from Existing Height	0.4	Bund/Wall needs to be raised by	0.4m

(CIRIA C736 $l = H - h \implies Dr = Hf - H1$)
 $h = H - l \implies Hr = Hf - D1$



Jetting Analyses **Figure 8**

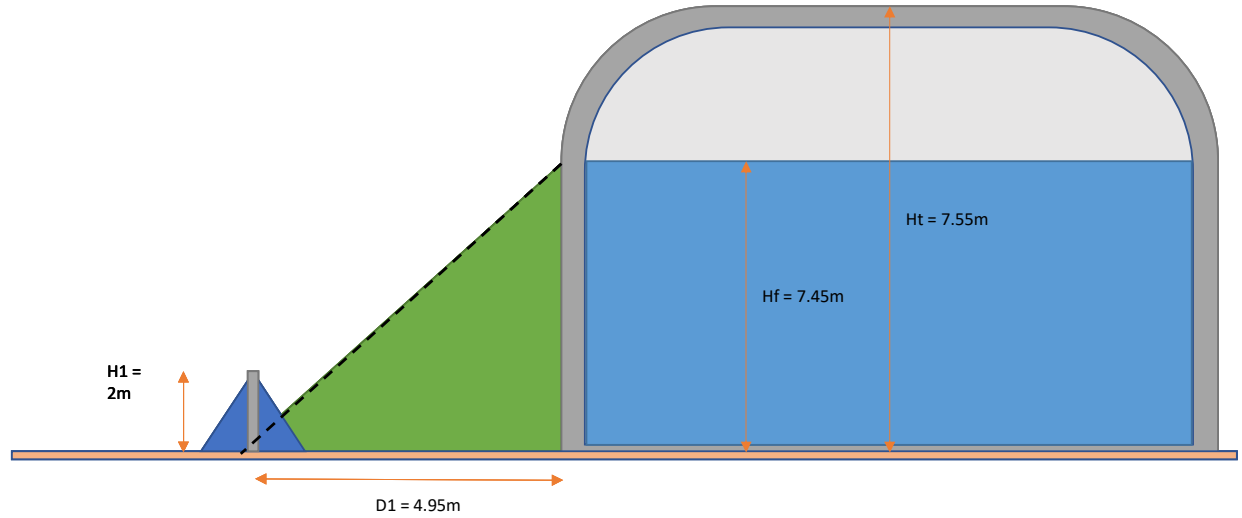
<u>Site Name</u>	Bourne park
<u>Section Number</u>	Section 6a - Max Capacity
<u>Tank Reference</u>	Digestate storage tank 1

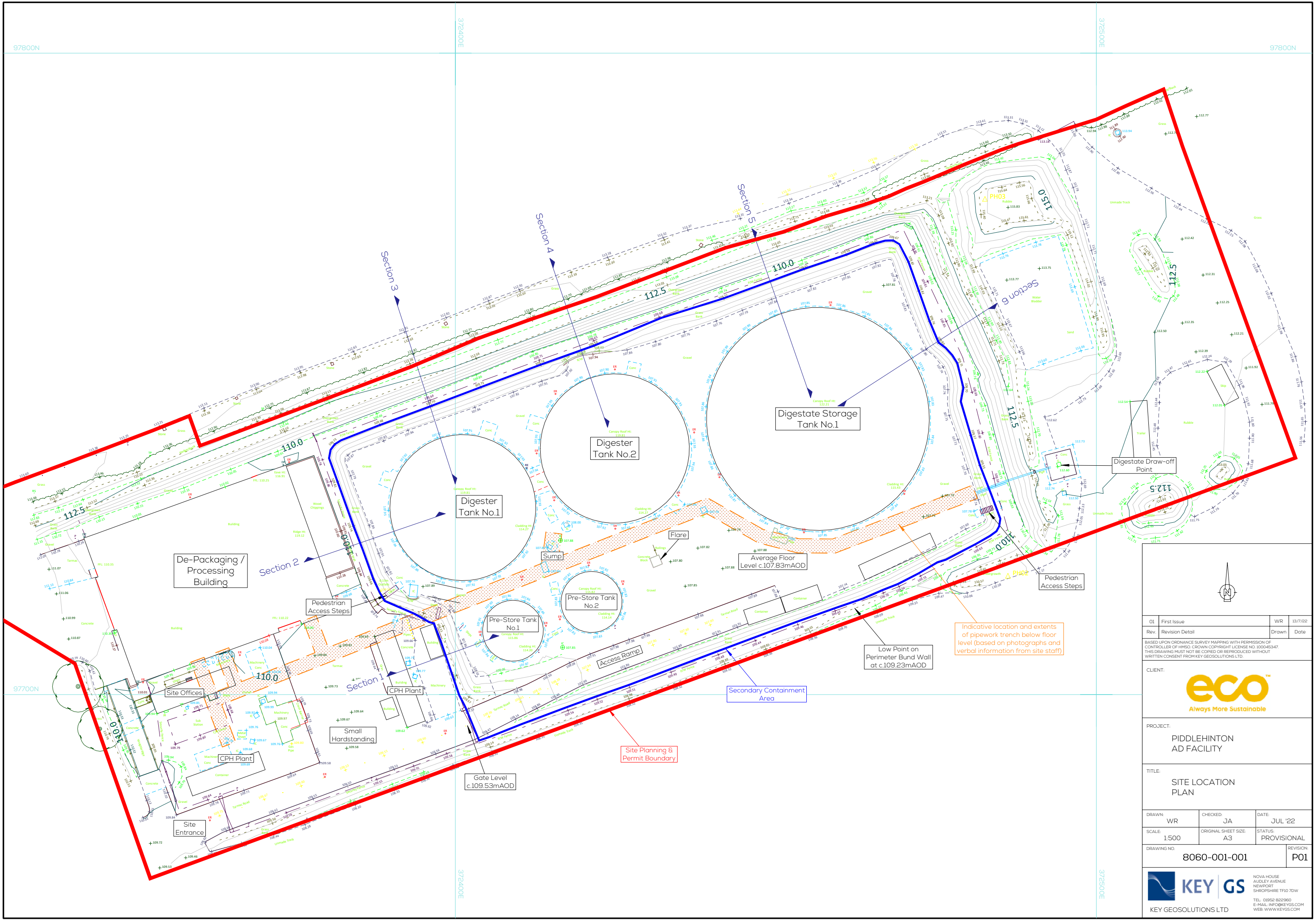
Internal Ø	35	
External Ø	35	
Tank Height	7.55 Ht	Ht = 7.55m
Fill Height	7.45 Hf	Hf = 7.45m
Distance From Wall/Bund Crest	4.95 D1	D1 = 4.95m
Height of Wall/Bund Crest	2 H1	H1 = 2m

Height Fixed		
Required Distance	5.45 Dr	
Difference from Existing Distance	0.5	Bund/Wall needs to be moved out by 0.5m

Distance Fixed		
Required Height	2.5 Hr	
Difference from Existing Height	0.5	Bund/Wall needs to be raised by 0.5m

(CIRIA C736 $l = H - h \implies Dr = Hf - H1$)
 $h = H - l \implies Hr = Hf - D1$





Indicative location and extents of pipework trench below floor level (based on photographs and verbal information from site staff)

01	First Issue	WR	13/7/22
Rev.	Revision Detail	Drawn	Date

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CLIENT:

PROJECT:
PIDDLIHINTON AD FACILITY

TITLE:
SITE LOCATION PLAN

DRAWN: WR	CHECKED: JA	DATE: JUL '22
SCALE: 1:500	ORIGINAL SHEET SIZE: A3	STATUS: PROVISIONAL

DRAWING NO: 8060-001-001 REVISION: PO1

NOVA HOUSE
AULLEY AVENUE
NEWPORT
SHROPSHIRE TF10 7DW
TEL: 01952 822960
E-MAIL: INFO@KEYGS.COM
WEB: WWW.KEYGS.COM

KEY GEOSOLUTIONS LTD

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97800N



372400E

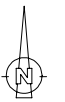
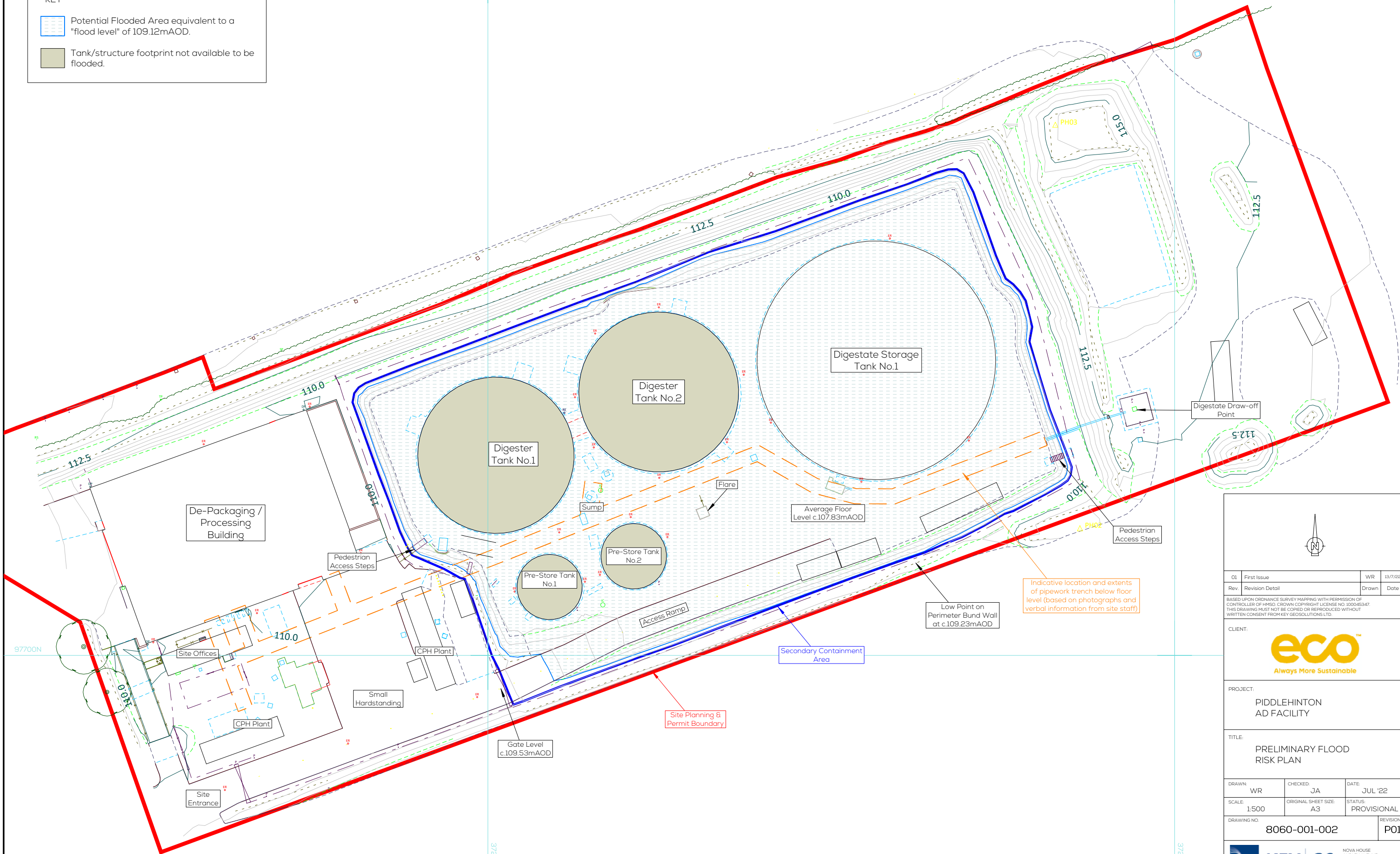
372500E

372400E

372500E

KEY

-  Potential Flooded Area equivalent to a "flood level" of 109.12mAOD.
-  Tank/structure footprint not available to be flooded.



01	First Issue	WR	13/7/22
Rev.	Revision Detail	Drawn	Date

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CLIENT:



Always More Sustainable

PROJECT:
PIDDLEHINTON
AD FACILITY

TITLE:
PRELIMINARY FLOOD
RISK PLAN

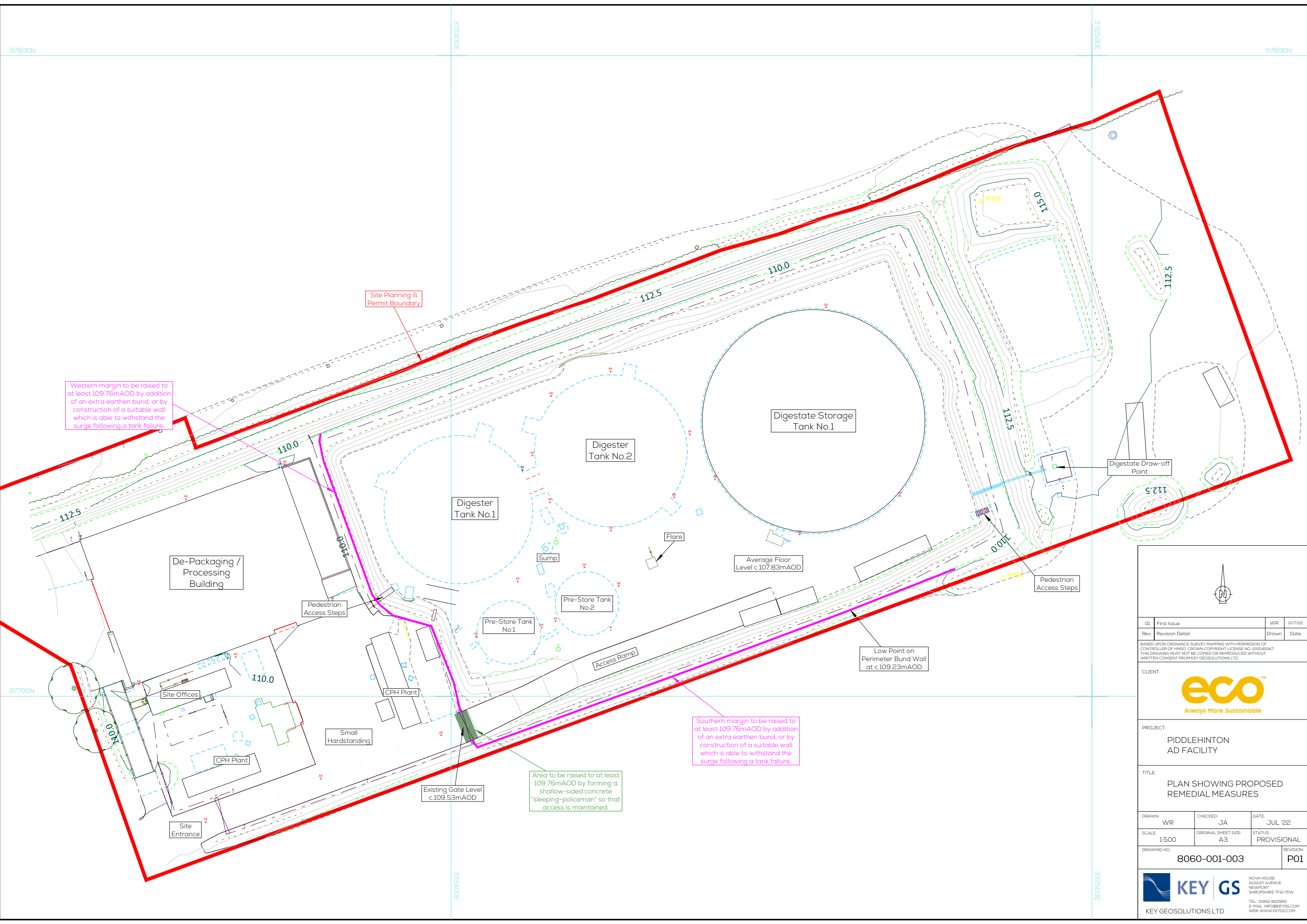
DRAWN: WR	CHECKED: JA	DATE: JUL '22
SCALE: 1:500	ORIGINAL SHEET SIZE: A3	STATUS: PROVISIONAL

DRAWING NO: 8060-001-002	REVISION: P01
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CLIENT: **eco**
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PROJECT: PIDDLEHINTON AD FACILITY

TITLE: PLAN SHOWING PROPOSED REMEDIAL MEASURES

DRAWN: WR	CHECKED: JA	DATE: JUL '22
SCALE: 1:500	ORIGINAL SHEET SIZE: A3	STATUS: PROVISIONAL

DRAWING NO. 8060-001-003 REVISION: PO1

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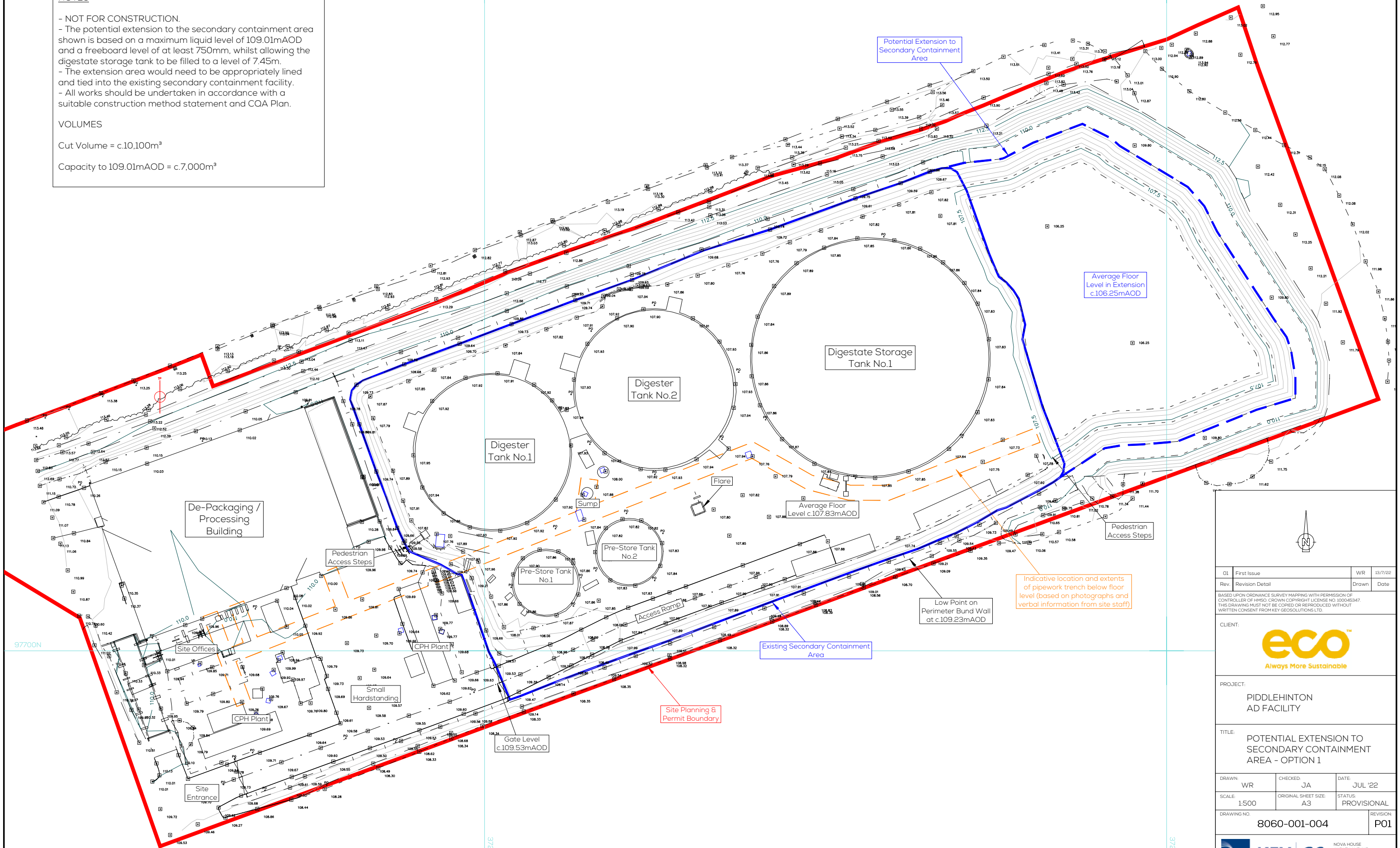
NOTES

- NOT FOR CONSTRUCTION.
- The potential extension to the secondary containment area shown is based on a maximum liquid level of 109.01m AOD and a freeboard level of at least 750mm, whilst allowing the digestate storage tank to be filled to a level of 7.45m.
- The extension area would need to be appropriately lined and tied into the existing secondary containment facility.
- All works should be undertaken in accordance with a suitable construction method statement and COA Plan.

VOLUMES

Cut Volume = c.10,100m³

Capacity to 109.01m AOD = c.7,000m³



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CLIENT:

PROJECT:
PIDDLIHINTON
AD FACILITY

TITLE:
POTENTIAL EXTENSION TO
SECONDARY CONTAINMENT
AREA - OPTION 1

DRAWN: WR	CHECKED: JA	DATE: JUL '22
SCALE: 1:500	ORIGINAL SHEET SIZE: A3	STATUS: PROVISIONAL

DRAWING NO: 8060-001-004
REVISION: P01

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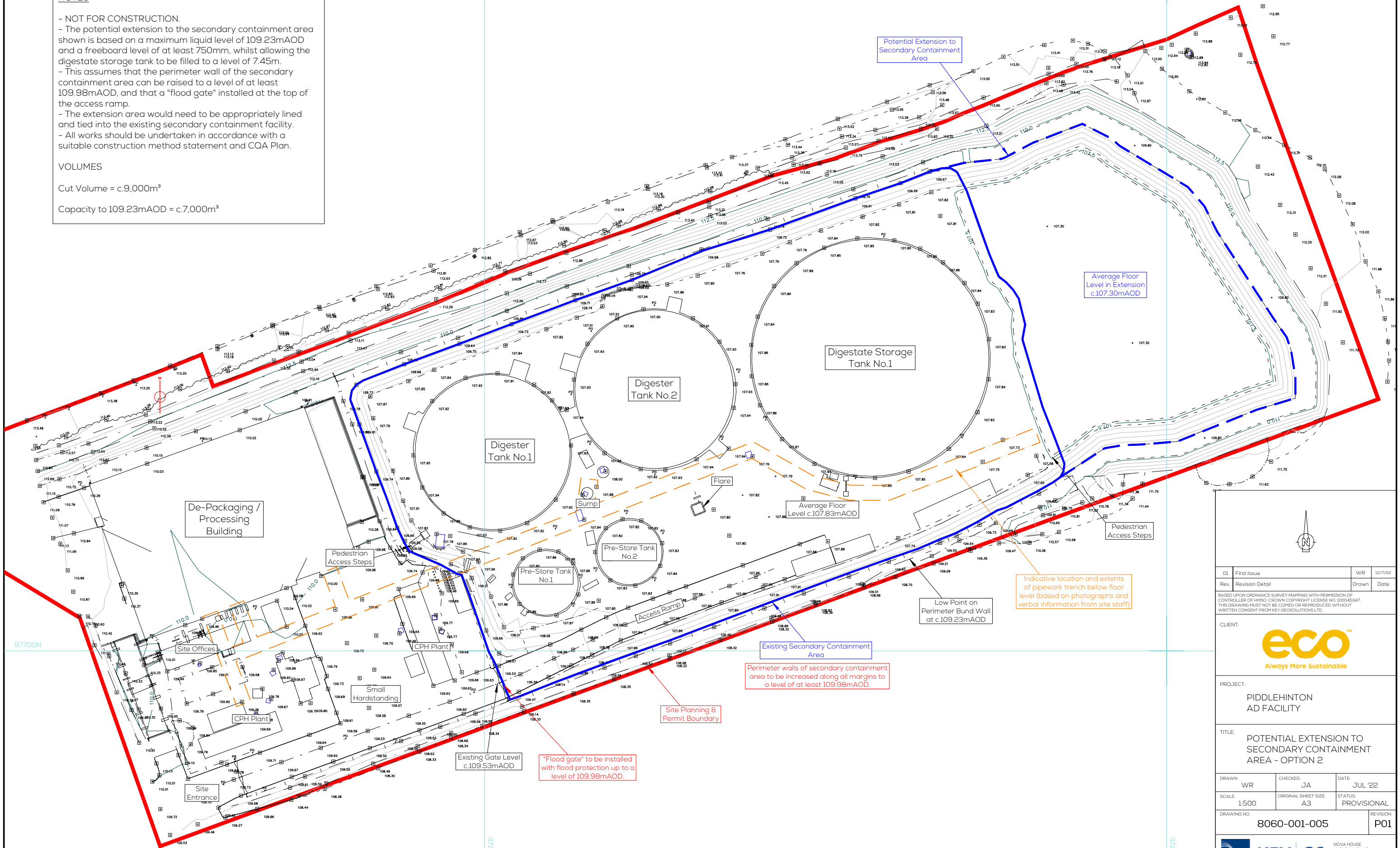
NOTES

- NOT FOR CONSTRUCTION.
- The potential extension to the secondary containment area shown is based on a maximum liquid level of 109.23m AOD and a freeboard level of at least 750mm, whilst allowing the digestate storage tank to be filled to a level of 7.45m.
- This assumes that the perimeter wall of the secondary containment area can be raised to a level of at least 109.98m AOD, and that a "flood gate" installed at the top of the access ramp.
- The extension area would need to be appropriately lined and tied into the existing secondary containment facility.
- All works should be undertaken in accordance with a suitable construction method statement and COA Plan.

VOLUMES

Cut Volume = c.9,000m³

Capacity to 109.23m AOD = c.7,000m³



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CLIENT:

PROJECT:
PIDDLIHINTON
AD FACILITY

TITLE:
POTENTIAL EXTENSION TO
SECONDARY CONTAINMENT
AREA - OPTION 2

DRAWN: WR	CHECKED: JA	DATE: JUL '22
SCALE: 1:500	ORIGINAL SHEET SIZE: A3	STATUS: PROVISIONAL

DRAWING NO: 8060-001-005
REVISION: P01

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