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Drainage Design Strategy and Philosophy Statement

Revision A

Job No. 27951

Proposed AD Plant
Land at Streetly Hall Farm
Webb's Road
West Wickham
Cambridgeshire
CB21 4RP

Client: Streetly Hall Estate

August 2023

pdc

civil / structural / environmental / surveying

REPORT CONTROL SHEET

Client: Streetly Hall Estate **Job No.:** 27951

Project Name: Proposed AD Plant
Land at Streetly Hall Farm
Webb's Road
West Wickham
Cambridgeshire
CB21 4RP

Issue		
Revision A	August 2023	**Report Prepared by:** Oliver Jones BSc (Hons), CEng MIET, EngTech MICE, GCInstCES, AMIMechE Director – Projects & Civils
		Report Reviewed & Authorised by: Oliver Jones BSc (Hons), CEng MIET, EngTech MICE, GCInstCES, AMIMechE Director – Projects & Civils

CONDITIONS OF INVESTIGATION & REPORTING

This report and its findings should be considered in relation to the terms of the brief and objectives agreed between Plandescil Ltd and the Client.

The details contained in this report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from whom it has been requested and that such information is accurate. Information obtained by Plandescil Ltd has not been independently verified by Plandescil Ltd, unless otherwise stated in the report.

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TABLE OF CONTENTS

REPORT CONTROL SHEET I
CONDITIONS OF INVESTIGATION & REPORTING I
TABLE OF CONTENTS 1
1.0 INTRODUCTION 2
1.1 Background Information 2
1.2 Proposal 2
1.3 Objectives 2
2.0 SURFACE WATER DRAINAGE DESIGN 3
2.1 Surface Water System Overview 3
2.2 Secondary Containment Bund 3
2.3 Fire Water Holding and Attenuation Lagoon 3
3.0 LEACHATE WATER DRAINAGE DESIGN 3
3.1 Leachate Water Design Overview 3
3.2 Silage Clamp Design and Leak Detection 3
3.3 Leachate Tank Design and Leak Detection 4
4.0 DRAINAGE STRATEGY SUMMARY AND MAINTENANCE REGIME 5
4.1 Drainage Strategy Summary 5
4.2 Maintenance Regime Overview 5
4.3 Digestate Lagoon 6
4.4 Maintenance Regime Schedule 6

APENDIX A - PLANDESCIL DRAWINGS

Drawing No. 27951/007 - Proposed Site Layout
Drawing No. 27951/150 - Site Location Plan
Drawing No. 27951/120 - Typical Containment Bund Joint Details
Drawing No. 27951/121 - Typical Hardstanding & Kerbing Details
Drawing No. 27951/122 - Typical Drainage Details
Drawing No. 27951/123 - Typical Silage Clamp Sections and Details
Drawing No. 27951/124 - Typical Containment Bund Drainage Details
Drawing No. 27951/125 - Typical Water Storage Pond Construction Details
Drawing No. 27951/126 - Typical Digestate Lagoon Construction Details

1.0 INTRODUCTION

1.1 Background Information

The Applicant, Streetly Hall Estate, is seeking planning permission for the construction of an Anaerobic Digestion (AD) Plant at Streetly Hall Farm, Webb's Road, West Wickham, Cambridgeshire, CB21 4RP.

The application site is outlined in red on Plandescil Ltd Drawing No. 27951/150 – Site Location Plan in the **Drawings Appendix** and indicatively shown on the Google Maps screenshot below.

Image 1.1 Existing site (taken from Google Maps)

1.2 Proposal

The Applicant is applying to Cambridgeshire County Council for the erection of an Anaerobic Digestion (AD) Plant which aims to produce and collect gas through the breakdown of organic material, as shown on Plandescil Ltd Drawing No. 27951/007 – Proposed Site Plan.

The Site is part of the existing farm holding and would help with part of the farm's diversification and the expansion of the site's operations.

The proposed development is to create an impermeable surface area of approximately 39.734m^2 in an area where currently has a permeable surface area of 75,556m^2.

1.3 Objectives

Plandescil Ltd. have been employed by Streetly Hall Estate (herein referred to as the Applicant) to produce this Drainage Design Strategy and Philosophy Statement in support of the planning application for the proposed development.

The purpose of this statement is to explain the methodology behind the drainage design strategy for clean and dirty areas of the site, with a key regard for environmental protection. Plandescil have designed the silage clamp, holding pond and site drainage in accordance with CIRIA C736, CIRIA C759F, BS5502, SSAFO and DEFRA (March 2015) standards, where applicable.

The drainage has been designed in accordance with best practice guidelines, using the experience Plandescil has gained from working within the Anaerobic Digestion Industry for more than 10 years.

This Drainage Design Strategy and Philosophy Statement should be read in conjunction with all other documents and drawings accompanying the planning application.

2.0 SURFACE WATER DRAINAGE DESIGN

2.1 Surface Water System Overview

The surface water drainage scheme proposals are to discharge all rainwater collected within hardstanding surface water drains, the concrete apron area and containment bund into the on-site holding lagoon, with no proposed off-site outfall.

All concrete and asphalt surfacing is designed with falls to the various drainage capture features, minimising standing water on the hardstanding areas, with a belowground surface water pumping station manhole being the final outfall point, prior to being pumped to the holding lagoon.

All clean roof water is to be discharged via gutters and downpipes into gravity pipes, out-falling to the lined holding lagoon. There is no requirement to test this water.

The surface water is a requirement of the process and as such is essential to capture and use within the process for the plant.

2.2 Secondary Containment Bund

A surface water perforated filter drainpipe is installed around the entire external concrete containment bund perimeter wall, linked by a series of inspection chambers and discharging to the holding lagoon, via a pumped surface water connection. The perimeter filter drain is specified to relieve any hydrostatic pressure from the external wall face and is used to double as leak detection.

The designed internal secondary containment structure and drainage strategy ensures all surface run-off liquid within bund cannot be discharged until it has been tested and is certified as clean. A series of sealed MDPE gully chambers encased in concrete are proposed within the containment floor at low points, reducing the volume of standing water on the concrete floor surface during rainfall periods. The chambers are connected via a series of plastic MDPE welded pipes, flowing to a final sump location where the water is to be manually tested by the site operators prior to pumping out of the bund into the clean or dirty water systems. If the containment sump water is tested as ‘clean’, the liquid will be pumped over the containment wall to the north, with the pumped surface water pipework routed directly to the proposed lined holding lagoon in the northwest corner of the site. Should the containment bund sump liquid be tested as ‘dirty’, the water will be pumped directly back into the Anaerobic Digestion process tanks within the containment bund.

The containment bund is proposed to be a reinforced concrete bund designed to comply with CIRIA C736 regulations. Plandescil has significant experience in designing and reviewing these structures across the UK. The bund will also be underlaid with a bentonite matting to ensure any potential risks are captured within either structure.

2.3 Fire Water Holding and Attenuation Lagoon

The lined holding lagoon in the southwest corner of the site provides a means of water storage for process water and buffer for high levels of rainfall. The lined pond is the final outfall location for the pumped containment bund clean external filter drains and internal floor sumps, in addition to the gravity roof drainage from the manure store.

The process provider has a requirement for an approximately 15,000m^3 volume of clean water within the Anaerobic Digestion process tanks, hence the liquid contained within the lined lagoon is expected to be re-used where the volume exceeds that required for firefighting storage.

For circumstances where the water level exceeds that required on-site, the holding/attenuation lagoon would have an overflow pump into the digestate lagoon or into the tanks. The surface water is needed in the process, so it is unlikely that offsite storage would be utilised.

3.0 LEACHATE WATER DRAINAGE DESIGN

3.1 Leachate Water Design Overview

The leachate water system is designed to comply with SSAFO and Ciria C759(f) and is comprised of a combination of gullies, sumps and manholes to collect the potentially dirty water run-off from the silage clamps and the dry digestate storage area. These areas are presumed to be dirty at all times, although they are to be designed to contain the dirty water within these areas as the concrete area run-off is to be considered clean water. The leachate system has been designed without the requirement for valves and remains open all year round. This design consideration mitigates the potential for contamination of surface water through potential errors during the AD Plant's operation. To maximise robustness and longevity of the leachate system, all dirty water manholes are to be fully coated internally with bitumen paint, preventing deterioration of the pre-cast concrete rings. Furthermore, UPVC foul water pipe has been specified for all gravity leachate pipework on the site to mitigate the potential for any future leakages at joint locations. This ensures that drainage pipes and fittings used are double-sealed as opposed to single-sealed twin-wall pipe, providing a further level of robustness and designed to take the concentration of leachate water seen on the plants.

3.2 Silage Clamp Design and Leak Detection

The silage clamp is to be made up of reinforced concrete wall panels at the north, east and south sides of an asphalt area, installed to fall east-to-west, directing the dirty water towards the V-formed asphalt channels. The silage clamp will be designed in accordance with the latest SSAFO regulations.

The connections between the interlocking wall panels are to be sealed with approved leachate resistant sealant, as specified by the wall supplier, followed by a layer of bitumen emulsion applied

to the bottom 0.3m of the wall panel to create a watertight seal at the interaction point with the asphalt floor. The precast panels have been engineered by the manufacturer to satisfy the silage clamp material loading requirements, in accordance with British Standards and SSAFO regulations.

The SSAFO compliance is aided by an external perimeter drain with intermittent monitoring chambers to ensure all dirty water run-off is captured in the leachate water drainage system. The monitoring points are to be installed in a reinforced concrete V-formed channel to the rear face of the wall panels, capturing any potential migrated leachate water from silage overspill during operation.

Asphalt was the chosen surface for the silage clamps; this was based upon historic testing and detailed discussion with DEFRA and the Environment Agency. This complies with both CIRIA and SSAFO regulations. We have used the chosen specification of asphalt due to the higher binder content and hardstone (granite or similar) material instead of the traditional limestone fillers which react with leachate. If you were to use a traditional jointed concrete mix, it would be susceptible to leakage via the joints, also the concrete will be worn away more quickly with the leachates/acids on the concrete. Experience tells us this will only last for approximately 2 years before the aggregate is exposed within the concrete, whereas the asphalt is expected to require minimal maintenance for beyond 10 years. Asphalt is a continuous lay and is therefore joint free, meaning the potential for leakages through the base/floor is highly unlikely. Furthermore, the designs adhere to the approved DEFRA clamp floor specifications.

The clamp floor consists of asphalt surfacing with designed falls to the centre, preventing leachate water accumulating at the wall panels. The surface levels fall from the back (east) to the front (west), capturing all run-off into 3No. bitumen coated, 1.35mØ pre-cast concrete sump pits, situated within a 1.2m wide V-formed asphalt surface channel.

Plandescil has been involved with the design of over 30 large silage clamps located across the United Kingdom and have engaged with the Environment Agency on numerous occasions to ensure the most rigorous design solutions are achieved. All of these prior silage clamp projects have resultantly been constructed with a similar design arrangement: installing pre-cast concrete wall panels, surfaced with asphalt (not concrete) and draining into sump pits located within V-formed asphalt channels.

3.3 Leachate Tank Design and Leak Detection

The leachate drainage system has been designed with gravity pipework, outfalling to a belowground silage effluent storage tank, by specialist manufacturer Kingspan. The Kingspan tank is a prefabricated GRP tank, with an 80,000l internal capacity, designed for such AD project applications, with a supplementary C397 chemical liner applied to the internal tank surface. Plandescil have specified a secondary line of protection, with a structural steel reinforced concrete surround to all faces, at minimum 300mm construction thickness.

Following the tank's installation, high level alarms and flow monitors in and out of the tank are to be installed, wired into the SCADA protection system to allow remote control and 24/7 alarms.

For the purpose of leak detection, 4 No. 63mmØ MDPE monitoring pipes are to be installed on each corner of the tank, protruding 1.0m above ground level for future inspection. These monitoring wells

are positioned externally to the secondary reinforced concrete containment and extend to a minimum of 1.5m below the base of the leachate storage tank.

Inspections are to be conducted with a testing sensor and checked on a regular basis. In the event that any leakages are detected, water in the monitoring pipes will be sampled and tested for pollutants. Groundwater on site, including ditches, will also be subject to water testing.

If there is cause for concern of leachate migration on site, the leachate tank is to be pumped out to an appropriately contained location on-site or into a suitable vehicular suction tanker. A prompt visual inspection of the tank shall take place and further intrusive investigation undertaken where deemed applicable.

4.0 DRAINAGE STRATEGY SUMMARY AND MAINTENANCE REGIME

4.1 Drainage Strategy Summary

The Streetly Hall AD Plant has a mixed drainage system proposed, utilising segregated clean and dirty water systems to maximise environmental protection. This drainage design statement outlines the various methods in which water is captured, stored, tested and discharged to and from different areas of the site.

4.2 Maintenance Regime Overview

The proposed maintenance regime consists of daily visual leak inspections within the bund and weekly inspections of the containment bund structure. The daily inspection will be carried out by the Client's site operatives, who will look for visual signs of leakage coming from the storage tanks or mechanical equipment located within the containment bund. If any tanks are found to be leaking, repair works will be undertaken by trained personnel immediately to prevent any contamination of surface water within the containment bund.

The weekly inspections will require the site operative to visually inspect the containment bund walls and floor for any signs of cracking within the concrete. If any cracks are found, remedial works will immediately be undertaken using Sikaflex resin injection 'Sikadur 52' to fill and seal the cracks. This process will be carried out by a trained operative or specialist.

The drainage system on site will be checked yearly. The site operators will check for sediment build up in manholes and pipes.

Any liquid which falls within the containment bund will be drained and collected into the primary sump pit within the bund. A manual switch operated pump will be located within the sump which will drain any liquid into the process. Prior to the pump being engaged by the site operative, a visual and odour inspection will be carried out to check for any contamination to the liquid. If the captured sump water is determined to be clean, the liquid will be pumped to the lined surface water system attenuation pond in the northwest corner, primarily used for fire water storage.

The drainage system on site should be reviewed yearly. The site operators will check for sediment build-up in manholes and pipes. Moreover, the drains will be jetted where required. Manholes will

be sludge gulped and checked for any signs of wear and tear, the joints will be resealed, and the internal chambers painted with bitumen paint if required.

The silage clamps will be inspected when empty; the surface should be pressure washed clean and inspected for damage and repaired if required. The walls should be sheeted with plastic as per the manufacturer's guidance to aid in the life expectancy of the walls. The walls should also be pressure washed clean before refilling. If the bitumen paint to the lower portion of the walls has been worn away this should be reapplied for sheeting, approximately every 3 years.

Refer to the 'Surface Water Maintenance Schedule' in the Section 4.4 for the maintenance details proposed for the clean water system.

4.3 Digestate Lagoon

A digestate lagoon is proposed on the western side of the site. This is to store separated liquid as a natural fertiliser to return to land and replace artificial fertiliser currently used by the farm. The design of the lagoon will be designed to comply with SSAFO, CIRIA C759 and C736. It will be a double lined HDPE with a cuspal drainage layer sandwiched between the layer of HDPE to act as a leak detection layer. The lagoon will have a floating cover installed. This is a tried and tested design installed across the UK.

4.4 Maintenance Regime Schedule

Feature	Schedule	Required Action	Frequency	Responsibility
Drainage Pipe Network	Regular Inspections	Inspect and identify any areas that are not operating correctly. If required take remedial action.	Monthly for 3 months then annually	Site Owner
		Remove debris from the catchment surface (where it may cause risks to performance).	Monthly	
		Maintain vegetation to designed limits within the vicinity of below ground drainage pipes to avoid damage to system.	Monthly or as required	
		Inspect rainwater down pipes, channel drains and road gullies, removing obstructions and silt as necessary. Check there is no physical damage.	Monthly	
	Occasional Maintenance	Remove silt and leaf build up from manholes, gutters etc.	Annually (or as required)	
		Remove sediment from pre-treatment inlet structures and inspection chambers.	Annually (or as required)	
		Remove inspection covers and inspect, ensuring that the water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt.	Annually	
		Removal of sediment, oil, grease and floatables from pre-treatment structures.	Half yearly (or as required)	
	Remedial Actions	Replacement of malfunctioning parts.	As required	
		Repair physical damage if necessary.	As required	

	Monitoring	Inspect inlets and pre-treatment systems for silt accumulation. Establish appropriate silt removal frequencies.	Half yearly	
		Undertake inspection after leaf fall in Autumn.	Annually	
		Inspect all inlets, outlets and vents to ensure that they are in good condition and operating as designed.	Annually	
		Survey inside of pipe runs for sediment build up and remove if necessary.	Every 5 years or as required	
		Check manholes, gutters etc. for silt and leaf build up.	Annually	
Drainage Channel	Regular Inspections	Inspect site for the presence of standing water 96 hours after precipitation events.	96 hours after major storms	Site Owner
		Inspect for up slope contributing sediment sources to reduce the accumulation of sediment in the channel drain.	Annually in spring and before major storms	
		Inspect for accumulated sediment, debris, and litter.	Annually in spring and after major storms	
	Remedial Actions	Inspect the concrete or asphalt apron of the channel drain for chipping, cracking, or other damage. Repair or replace structurally suspect or deteriorated aprons.	Annually	
		Inspect for channel drain structural integrity. Repair or replace structurally suspect or deteriorated channel drains.	Annually	
	Monitoring	Inspect to ensure the channel drain is properly capturing runoff from the impervious surface and conveying it to the infiltration/treatment system. The inspection crews should pour water using a hose or large water container on the surface to verify performance.	Annually in spring	
Filter Drains / Leak Detection Drains	Regular Maintenance	Remove litter (including leaf litter) and debris from filter drain surfaces, access chambers and pre-treatment devices.	Monthly (or as required)	Site Owner
		Inspect filter drain surface, inlet-outlet pipework and control systems for blockages, clogging, standing water and structural damage.	Monthly	
		Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies.	Six monthly	
		Remove sediment from pre-treatment devices.	Six monthly (or as required)	
	Occasional Maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (e.g. NJUG, 2007 or BS 3998:2010).	As Required	

		At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium.	Five yearly (or as required)	
		Clear perforated pipework of blockages.	As required	
Drainage	Regular	Inspect flow control manhole and check for blockages to grates and outlets.	Monthly and after large storm events	Site Owner
	Occasional	Remove silt and leaf build up from manholes, gutters etc.	Annually (or as required)	
		Removal of sediment, oil, grease and floatables.	Annually (or as required)	
	Remedial actions	Replacement of malfunctioning parts.	As required	
	Monitoring	Inspect inlets and pre-treatment systems for silt accumulation. Establish appropriate silt removal frequencies.	Half yearly	
		Check Flow control for blockages.	Three monthly	
		Check manholes, gutters etc. for silt and leaf build up.	Annually	
Lined Attenuation Pond	Regular	Litter, debris and trash removal.	Monthly	Site Owner
		Grass cutting – for landscaped areas and access routes.	Monthly (during growing season) (or as required)	
		Inspect marginal and bankside vegetation and remove nuisance plants (for first 3 years).	Monthly (at start, then as required)	
		Inspect banksides, structures, pipework etc. for evidence of blockage and/or physical damage.	Monthly	
		Inspect water body for signs of poor water quality.	Monthly (May - October)	
		Inspect silt accumulation rates in any forebay and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal options.	Half Yearly	
		Check any mechanical devices, e.g. penstocks.	Half Yearly	
		Hand cut submerged and emergent aquatic plants (at minimum of 0.1m above pond base; include max 25% of pond surface).	Annually	
		Tidy all dead growth (scrub clearance) before start of growing season (Note: tree maintenance is usually part of overall landscape management contract).	Annually	
		Remove sediment from any forebay.	Every 1 - 5 years (or as required)	
	Occasional	Re-seed areas of poor vegetation growth.	Annually (or as required)	

Remedial	Repair of erosion or other damage by re-seeding or compacting.	As required
	Repair/rehabilitation of inlets.	As required
	Patch repair liner if required by rewelding new liner by specialists.	As required
	Re-level uneven surfaces and reinstate design levels.	As required
Monitoring	Inspect and clear if required.	Monthly
	Inspect liners, structures, surfaces, etc. for evidence of physical damage.	Monthly
	Inspect concrete and banks to establish appropriate silt removal frequencies.	Half yearly
	Inspect lined surfaces for rips, tears, broken joints, broken welds or pest ingress.	Annually

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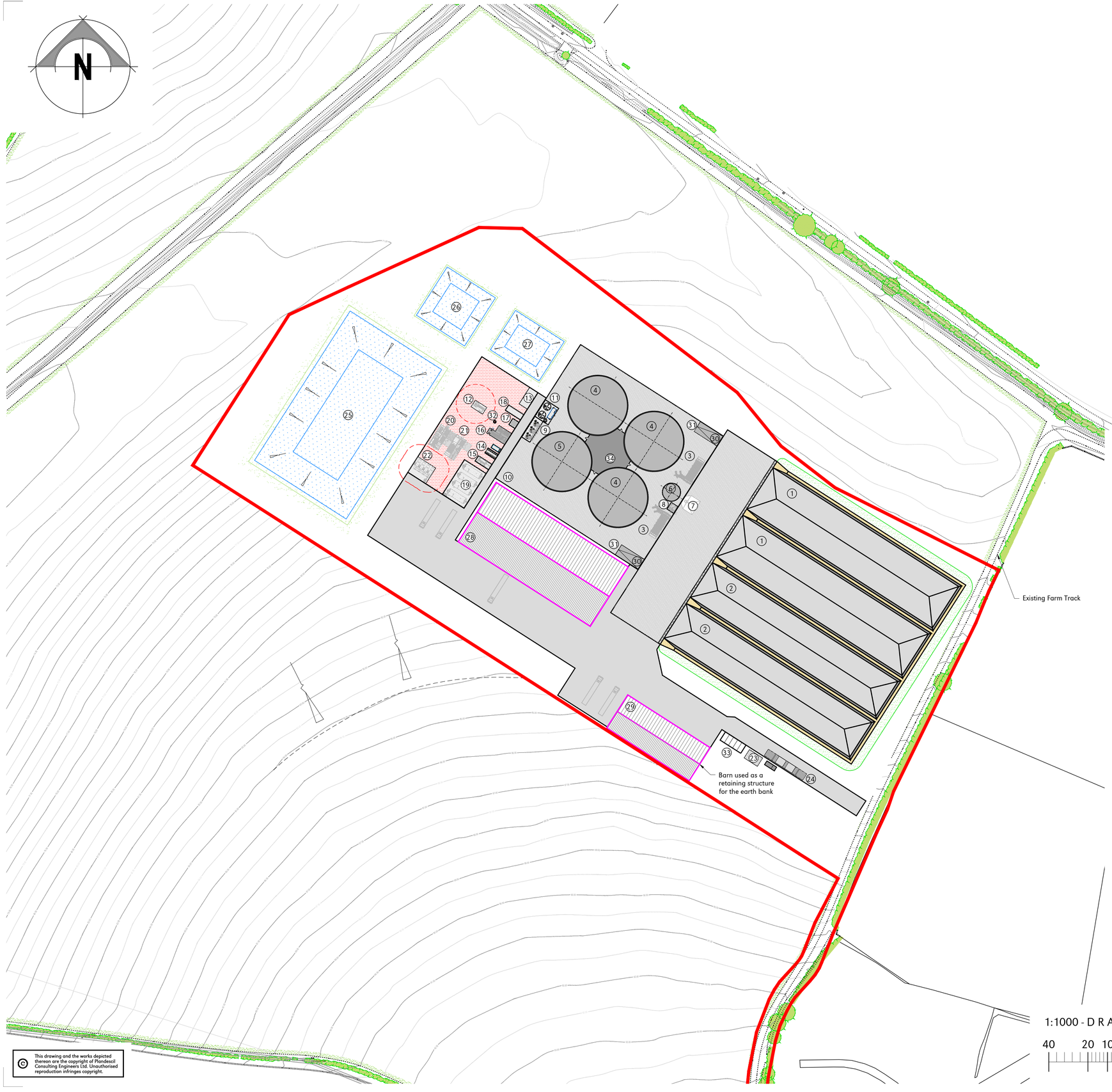
DRAWINGS APPENDIX



GENERAL NOTES:

1. All dimensions noted are in meters unless stated otherwise.
2. All levels to be above Ordnance Survey Datum defined levels (A.O.Dm) unless noted otherwise.
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5. Plandescil Ltd. to be immediately notified of any suspected omissions or discrepancies.
6. This drawing is to be read in conjunction with all other relevant documents relating to the project.
7. Layout based on received drawing from Bioconstruct. plant layout_Streetly Hall AD_WS_230522

PLANT KEY

1. Silage Clamps (2No. 94.75m x 13.48m)
2. Silage Clamps (2No. 94.75m x 11.32m)
3. Feed Hopper (2No.)
4. Fermenter (3No. 30mØ)
5. Post Fermenter (1No. 30mØ)
6. Pre-Storage Tank (1No. 9mØ)
7. Filling Station
8. Ferric Chloride Tank
9. Pasteurisation
10. Containment Bund
11. External Desulphurisation
12. Gas Flare
13. Gas Technology
14. LV Board + Emergency Generator
15. GEU
16. CHP
17. Buffer Tank
18. Power to Heat Module
19. CO2 Tanks
20. CO2 Recovering System
21. Gas Upgrading System
22. Propane Tanks
23. Weighbridge Office
24. Weighbridge
25. Digestate Storage Lagoon (15,260m³)
26. Surface Water Lagoon (1,100m³)
27. Dirty Lagoon (805m³)
28. Intake & Process Building - Straw Briquetting & Feedhopper (36.00m x 80.00m)
29. Straw Barn (20.00m x 50.00m)
30. Bund Gate (2No.)
31. Bund Ramp (2No.)
32. Condensate Pit
33. Car Parking Spaces (5No.)
34. Technical Building

GENERAL KEY:

- Proposed Site Boundary (75,556m²/7.5556ha)
- Proposed Concrete
- Proposed D.f.T Type 1
- Proposed Asphalt Surfacing
- Grassed Area
- Proposed Gravel Surface
- Proposed Building

FOR PLANNING

Rev	Date	Rev By	Chkd	Description
K	14-08-23	JA	OAJ	Area of Flooding Removed
J	27-07-23	MJP	OAJ	Amendments To Redline Boundary
H	21-07-23	MJP	OAJ	Proposed Site Levels Added
G	07-07-23	MJP	OAJ	Amendments To Redline Boundary
F	06-07-23	MJP	OAJ	Amendments Based on Client Comments
E	29-06-23	MJP	OAJ	Amendments to Site Layout Based on Received Drawing
D	14-12-22	MJP	OAJ	Amendments to Redline Boundary
C	06-12-22	MJP	OAJ	Site Layout Amended
B	03-11-22	JWD	OAJ	Amendments to Redline Boundary
A	21-10-22	MJP	OAJ	Proposed Site Levels Added
0	21-09-22	-	OAJ	First Issue

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Client

Streetly Hall Estate

Project

Streetly Hall Estate,
West Wickham,
CB21 4RP

Drawing Title

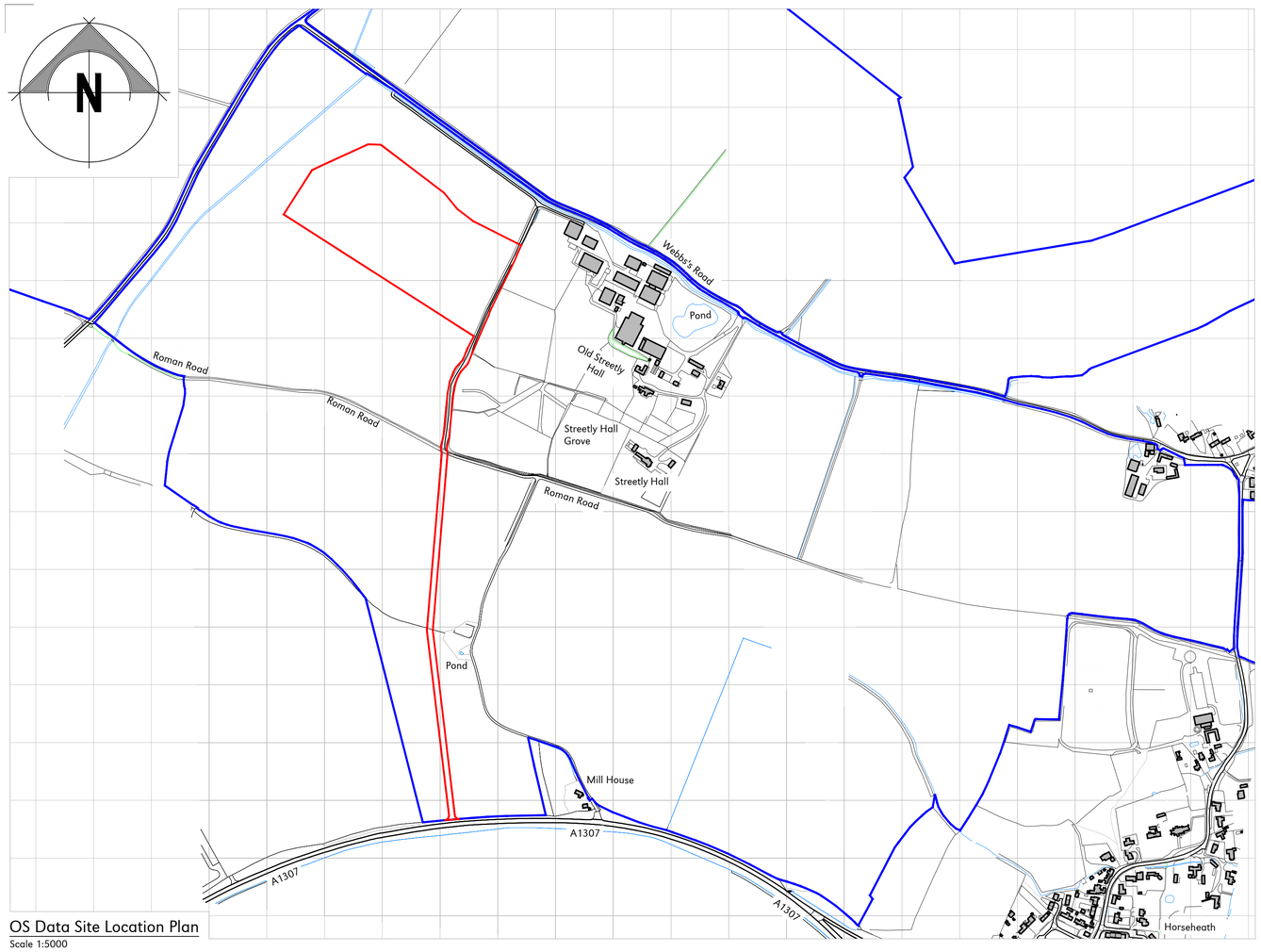
Proposed Site Layout

1:1000 - DRAWING SCALE REFERENCE (m)

40 20 10 0 20 40 60 80 100

Scale U.N.O.	Date	Drawn By
1:1000 (A1)	September 2022	MJP

Drawing No. 27951/007 Rev K



OS Data Site Location Plan

Scale 1:5000

Site Location Plan 1

Not To Scale

Site Location Plan 2

Not To Scale

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LEGEND:

Proposed Red Line Boundary (75,556m²/7.5556ha)

Ownership Boundary (1,497,201.10m²/149.720110ha)

FOR PLANNING

Rev	Date	Rev By	Chkd	Description
F	27-07-23	MJP	OAJ	Site Boundary Amended
E	13-07-23	MJP	OAJ	Site Boundary Amended
D	14-12-22	MJP	OAJ	Site Boundary Amended
C	20-10-22	RJG	OAJ	Site Boundary Amended
B	14-10-22	RJG	OAJ	Site Boundary Amended
A	07-10-22	RJG	OAJ	Site Boundary Amended
0	01-01-22	-	OAJ	First Issue

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civil / structural / environmental / surveying

Client

Streetly Hall Estate

Project

Streetly Hall Estate,
West Wickham,
CB21 4RP

Drawing Title

Site Location Plan

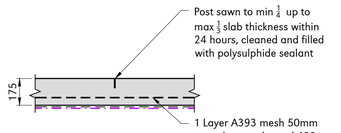
1:5000 - DRAWING SCALE REFERENCE (m)

200 100 50 0 100 200 300 400 500

Scale	U.N.O.	Date	Drawn By
As Noted (A1)		February 2022	JLB

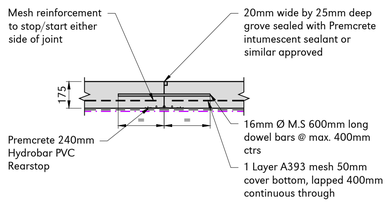
Drawing No. 27951/150 Rev F

NOTE: BENTOMAT AS 5000-1 GEOSYNTHETIC CLAY BARRIER TO BE CONTINUOUS UNDER ALL JOINT LOCATIONS. 1200G POLYTHENE DPM TO BE LAID ABOVE BENTOMAT BARRIER, LAPPED/SEALED IN STRICT ACCORDANCE TO MANUFACTURER SPECIFICATION



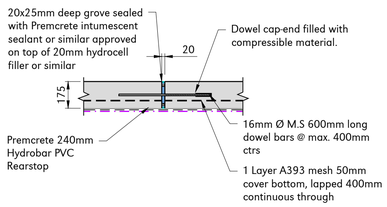
TANK FIBRE SLAB CONTRACTION JOINT (C.J.)

Scale 1:20



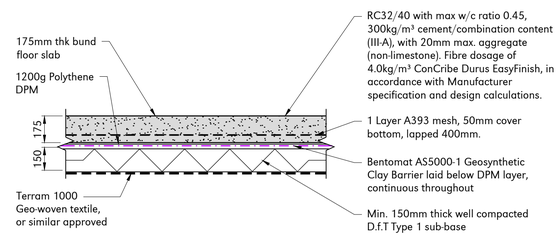
TANK FIBRE SLAB LONGITUDINAL JOINT (L.J.)

Scale 1:20



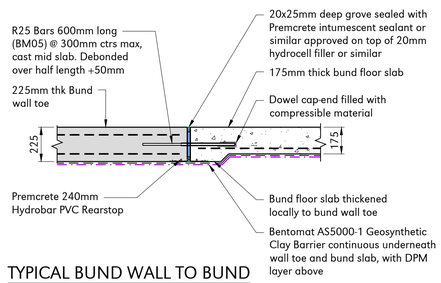
TANK FIBRE SLAB EXPANSION JOINT (E.J.)

Scale 1:20



TYPICAL FIBRE & MESH REINFORCED SLAB CONSTRUCTION

Scale 1:20



TYPICAL BUND WALL TO BUND SLAB EXPANSION JOINT DETAIL

Scale 1:20

NOTES:

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2. All levels to be above Ordnance Survey Datum defined levels (A.O.Dm) unless noted otherwise.
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5. Plandescil Ltd. to be immediately notified of any suspected omissions or discrepancies.
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7. All setting out to be coordinated by the Contractor and to be checked onsite prior to construction.

REINFORCED CONCRETE:

8. 175mm Containment slab Concrete to be RC32/40 with max w/c ratio 0.45, 300kg/m³ cement/combination content (III-A), with 20mm max. aggregate (non-limestone).
   - Fibre dosage of 4.0kg/m³ Adfil Durus EasyFinish, in accordance with Manufacturer specification and design calculations.
   - Slab nominal 175mm thick, 50mm cover to bottom and sides.
   - Above mix to be used in addition to A393 mesh reinforcement in the bottom with 50mm cover to all faces.
10. Insitu Concrete to be in accordance with BS 8110 & BS 8500-1.
11. Reinforcement to be Grade H 500N/mm² High Yield, Deformed Type 2 Bar detailed in accordance with BS 4449 and BS 8666.

CONCRETE JOINT NOTES:

12. All joint dowel/reinforcement shall be set level and perpendicular to the joint face prior to casting. Damage or bent dowels are to be re-aligned or replaced prior to casting.
13. All formed joints are to be cleaned of concrete overruns to ensure accidental restraint is not created
14. All joints are to be sufficiently cured and cleaned of all contaminations prior to sealing.
15. All sealants are to be installed as per manufacturers specification and must be suitable for the joint type.
16. Joints subject to confirmation by Fibres used in mix design supplies. Fibre Supplier/Designer to check and approve joints.

FOUNDATION NOTES:

17. Assumed GBP value of 150kN/m² taken in lieu of site investigation, Contractor to confirm on site and advise Engineer, prior to construction of foundations.
18. Any soft spots or deleterious material is to be removed & taken down to virgin ground level & replaced with compact D.f.T Type 1 or suitable hogging material.
19. Overdig to be made up in compacted D.f.T. Type 1 or lean mix concrete.

ALL PROPRIETARY MATERIALS TO BE FIXED STRICTLY IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS USING MATERIALS APPROVED BY THE MANUFACTURER.

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Rev	Date	Rev By	Chkd	Description
0	15-12-22	-	OAJ	First Issue

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civil / structural / environmental / surveying

Client

Streetly Hall Estate

Project

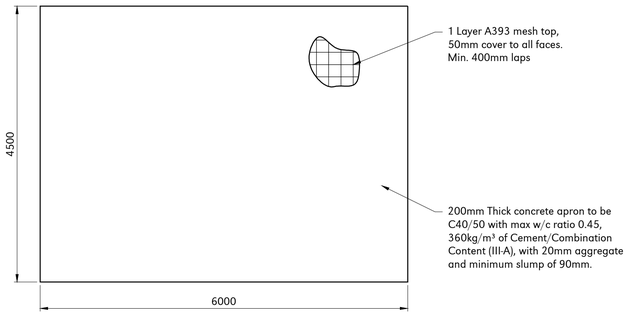
AD Plant
Streetly Hall Estate
West Wickham, CB21 4RP

Drawing Title

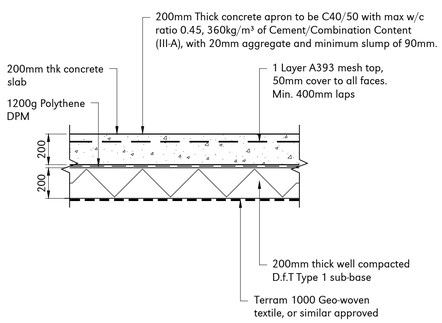
Typical Containment Bund Joint Details

Scale U.N.O.	Date	Drawn By
As Noted (A1)	December 2022	MJP

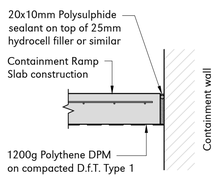
Drawing No.	Rev
27951/120	0



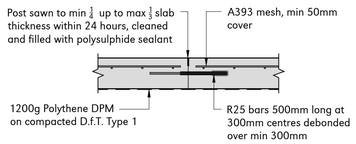
TYPICAL CONCRETE APRON SLAB PLAN
Scale 1:50



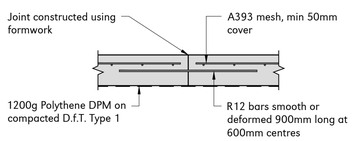
TYPICAL CONCRETE APRON SLAB CONSTRUCTION DETAIL
Scale 1:20



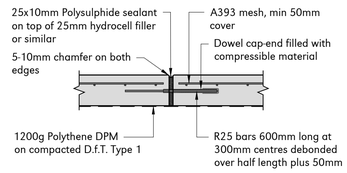
TYPICAL CONTAINMENT RAMP ISOLATION JOINT DETAIL (I.J.)
Scale 1:20



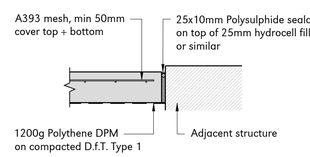
TYPICAL SAWN FREE-MOVEMENT CONTRACTION JOINT (C.J.)
Scale 1:20



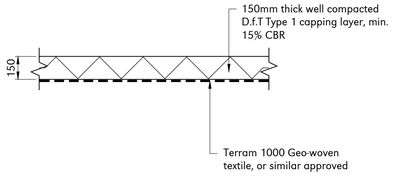
TYPICAL FORMED RESTRAINED-MOVEMENT LONGITUDINAL JOINT (L.J.)
Scale 1:20



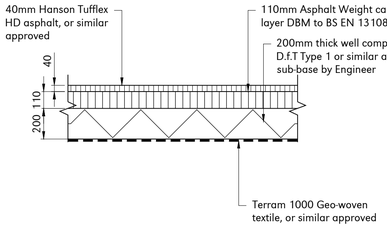
TYPICAL EXPANSION JOINT (E.J.)
Scale 1:20



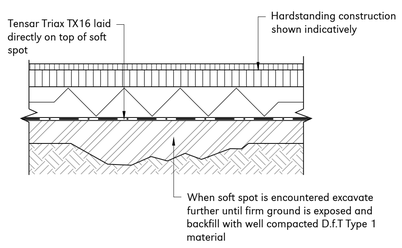
TYPICAL ISOLATION JOINT (I.J.)
Scale 1:20



TYPICAL TYPE 1 SURFACING CONSTRUCTION
Scale 1:20

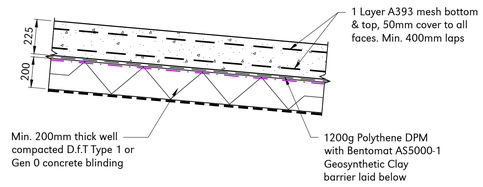


TYPICAL ASPHALT SURFACE CONSTRUCTION
(IF REQUIRED, EXCLUDING SILAGE CLAMP FLOORS)
Scale 1:20

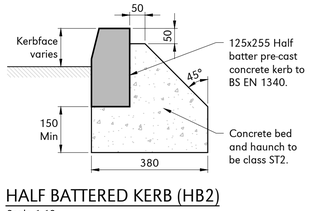


TYPICAL SOFT SPOT REMEDIAL DETAIL
Scale 1:20

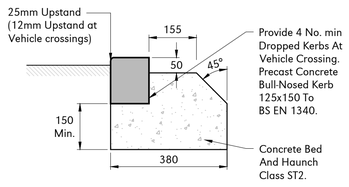
Concrete Slab to be C40/50 with max w/c ratio 0.45, 360kg/m³ of Cement/Combination Content (III-A), with 20mm aggregate and minimum slump of 90mm. Ramp details TBC.



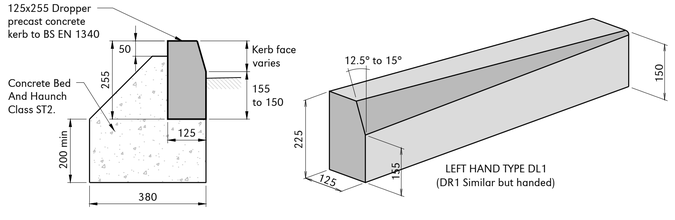
CONTAINMENT BUND RAMP TYPICAL CONSTRUCTION
Scale 1:20



HALF BATTERED KERB (HB2)
Scale 1:10



BULLNOSED KERB (BN)
Scale 1:10



DROPPER KERB (DL1)
DR1 Similar but handed
(For use with kerb types HB2 and BN)
Scale 1:10

NOTES:

1. All dimensions noted are in millimetres unless stated otherwise.
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8. To be read in conjunction with the following Plandescil Drawings, schedules and documents:
   - 27951/007 - Proposed Site Layout

CONCRETE APRON:

9. Concrete Slab to be C40/50 with max w/c ratio 0.45, 360kg/m³ of Cement/Combination Content (III-A), with 20mm aggregate (non-limestone) and minimum slump of 90mm.
10. Insitu Concrete to be in accordance with BS 8110 & BS 8500-1.
11. Reinforcement to be Grade H 500N/mm² High Yield, Deformed Type 2 Bar detailed in accordance with BS 4449 and BS 8666.
12. Slab nominal 200mm thick, 50mm cover to top and sides.

CONCRETE JOINT NOTES:

13. All joint dowel/reinforcement shall be set level and perpendicular to the joint face prior to casting. Damage or bent dowels are to be re-aligned or replaced prior to casting.
14. All formed joints are to be cleaned of concrete overruns to ensure accidental restraint is not created
15. All joints are to be sufficiently cured and cleaned of all contaminations prior to sealing.
16. All sealants are to be installed as per manufacturers specification and must be suitable for the joint type.

ASPHALT HARD STANDINGS:
(IF REQUIRED, EXCLUDING SILAGE CLAMP FLOORS)

17. Asphalt surface specification, 40mm Hanson Tufflex HD asphalt, 110mm Asphalt Weight carrying DPM, 200mm D.f.T Type 1 sub-base.

MATERIAL NOTES:

18. All D.f.T Type 1 must NOT contain limestone.
19. All Asphalt to be made with Granite or other acid resistant aggregate (No Limestone filler allowed).

FOUNDATION NOTES:

20. Assumed GBP value of 100kN/m² taken in lieu of site investigation, Contractor to confirm on site and advise Engineer, prior to construction of foundations.
21. Any soft spots or deleterious material is to be removed & taken down to virgin ground level & replaced with compact D.f.T Type 1 or suitable hogging material.
22. Overdig to be made up in compacted D.f.T. Type 1 or lean mix concrete.

ALL PROPRIETARY MATERIALS TO BE FIXED STRICTLY IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS USING MATERIALS APPROVED BY THE MANUFACTURER.

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Rev	Date	Rev By	Chkd	Description
0	15-12-22	-	OAJ	First Issue

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civil / structural / environmental / surveying

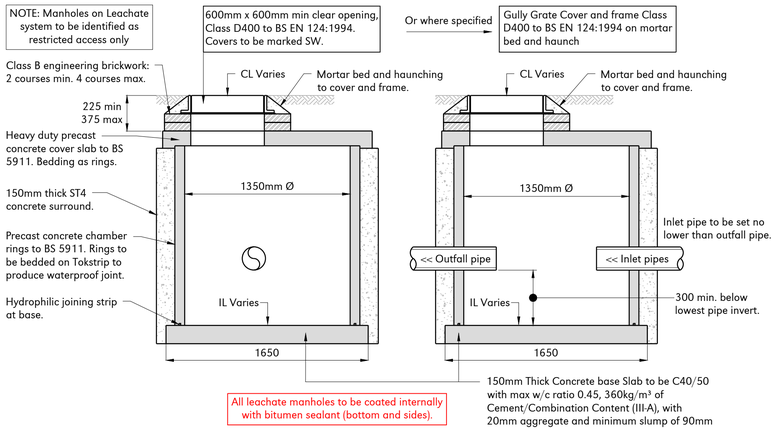
Client
Streetly Hall Estate

Project
AD Plant,
Streetly Hall Estate
West Wickham, CB21 4RP

Drawing Title
Typical Hardstanding & Kerbing Details

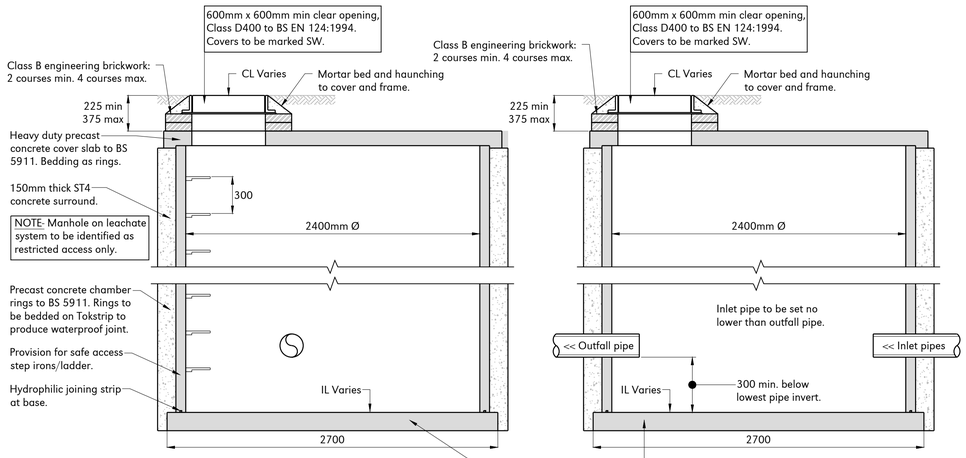
Scale U.N.O.	Date	Drawn By
As Noted (A1)	December 2022	MJP

Drawing No.	Rev
27951/121	0



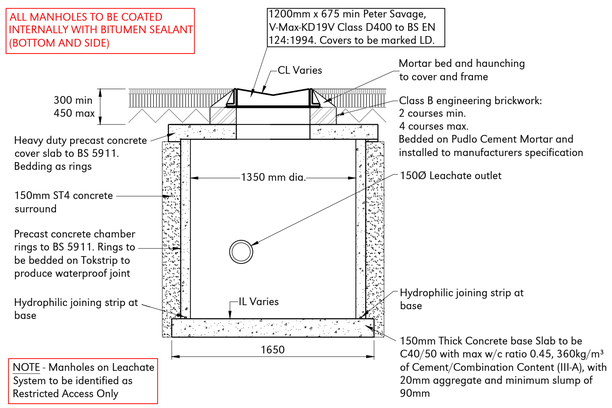
1350Ø MANHOLE DETAIL

Scale 1:25



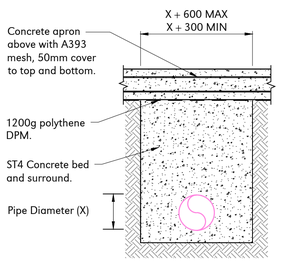
2400Ø PUMPING MANHOLE CHAMBER DETAIL

Scale 1:25



1350Ø LEACHATE DRAINAGE SUMP

Scale 1:25



PIPE BEDDING DETAIL FOR DRAINS WHERE DEPTH TO SOFFIT LESS THAN 0.5M

Scale 1:20

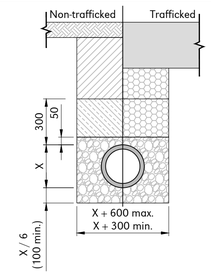
Details Key:

- Selected excavated material; free from timber, frozen material, vegetable and foreign matter and exclude any stones or hard lumps of clay retained on a 40mm sieve
- ST4 Concrete to S.H.W. Clause 503.3 (iii)
- General fill to S.H.W. Clause 505.2
- Topsoil
- Carriageway construction
- Granular material Type 1 sub-base to S.H.W. Clause 803 compacted in accordance with Clause 612, table 6/4 method 6
- Granular material to S.H.W. Clause 503.3 (i) or Table 1 below (processed granular bedding and sidefill)

S.H.W. = Specification for Highway Works
X = Pipe Diameter Ø

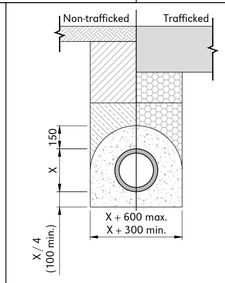
Standard Notes:

1. All dimensions are in millimeters unless stated otherwise.
2. The joint detail for pipe surround on Type Z drains is for flexible joints only.
3. For pipes with nominal diameter below 450mm, the thickness of compressible joint filler board shall be 18mm. For pipes with a nominal diameter of 450mm or greater, but not exceeding 1200mm, the thickness of joint filler board shall be 36mm. For pipes exceeding 1200mm nominal diameter, the thickness of joint filler board shall be 54mm.
4. The minimum of maximum width of the trench applies on and below a line 300mm above the outside top of the pipe. Above the 300mm line the trench backfill material shall be as described in Clause 505 of S.H.W.
5. The concrete bed or surround may extend to the sides of the trench or be a minimum width. Class 8 material is to be used to fill any voids formed.
6. Granular pipe bed and surround material, consisting of natural and/or recycled coarse aggregate or recycled concrete aggregate, should have the following specification (in accordance with clause 503.3 MCDHW).
7. For Type Z trench the concrete cover may be formed to a radius batter or horizontal surface. Minimum cover of concrete shall be 150mm.
8. Main backfill to be selected excavated material; free from timber, frozen material, vegetable and foreign matter and exclude any stones or hard lumps of clay retained on a 40mm sieve. backfill material should be well graded, readily compactable and consolidated in maximum 300mm layers. No mechanical compaction is to be applied until first 300mm of main backfill is in place. if excavated material is unsuitable, use S.H.W. class 8 recycled aggregate.



Type S

Note: Type S is the preferred granular bed and surround detail.
To be used where cover to pipe soffit is greater than 1200mm in vehicular areas andin non-trafficked areas (ie. footpaths, verges, etc)

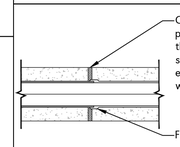


Type Z

Note: Type Z is recommended where depths of cover are less than 1.2m in Vehicular areas. Joint filler board shall be placed in contact with the end of the socket at a pipe joint and shall extend through the full thickness of the concrete in contact with the pipe, these should be placed at each pipe joint.

Table 1 Processed Granular Bedding and Sidefill

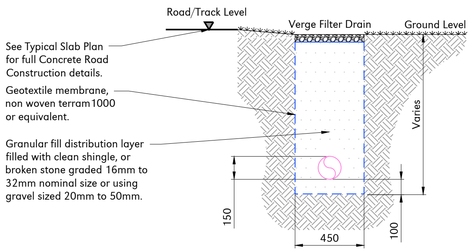
Nominal pipe bore (mm)	Nominal maximum partial size (mm)	Material specification
100	10	10mm nominal single sized
100 TO 150	15	10 or 14mm nominal single sized or 14mm to 5mm graded
150 TO 300	20	10, 14 or 20mm nominal single sized or 14mm to 5mm graded or 20mm to 5mm graded



Expansion Joint for Type Z

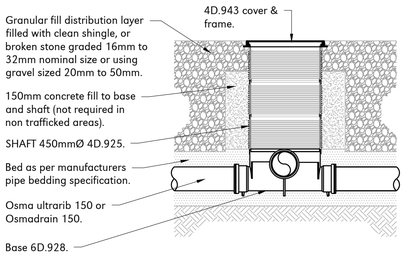
TYPICAL PIPE BEDDING DETAILS

Note: The above details provided for guidance only, refer to manufacturers technical manual for installation guidance and further details.
Scale 1:20



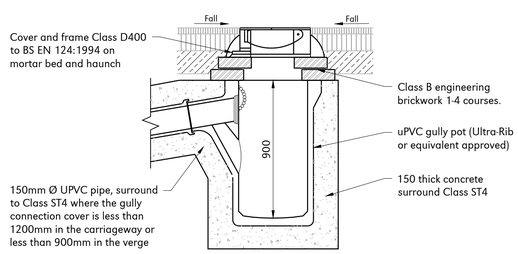
TYPICAL VERGE FILTER DRAIN CROSS SECTION

Scale 1:20



450Ø INSPECTION CHAMBER DETAIL

Not to Scale



TYPICAL LEACHATE GULLY DETAIL

Scale 1:20

NOTES:

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5. Plandescil Ltd. to be informed immediately of and alterations/deviations identified on site from the information shown on the engineering drawings.
6. This drawing is to be read in conjunction with all other relevant documents relating to the project.
7. All setting out to be coordinated by the Contractor and to be checked onsite prior to construction.
8. To be read in conjunction with the following Plandescil Drawings, schedules and documents:
   27951/007 - Proposed Site Layout

DRAINAGE NOTES:

9. All drainage pipes to be laid invert to invert.
10. All levels are indicative only.
11. All proprietary materials to be fixed strictly in accordance with manufacturer's recommendations using materials approved by the manufacturer.
12. All levels and dimensions should be checked on site by contractors and relevant sub-contractors.
13. Existing public utility services and private apparatus are not necessarily shown on the drawings. The contractor shall liaise with the utility provider to determine precise location of existing services. Existing services to be marked out on site prior to any excavation works. All utility company guidelines & health and safety procedures must be strictly followed.
14. Where surface water drains to ground, the existing ground should broken up prior to laying the subgrade to aid infiltration.
15. All Leachate manholes to be coated internally with bitumen sealant (bottom and sides).

MATERIAL NOTE:

16. Materials must NOT contain limestone, including D.f.T Type 1 and concrete aggregate.
17. All Asphalt to be made with Granite or other acid resistant aggregate (No Limestone filler allowed).
18. All pipes to be UPVC twin wall or foul water push fit orange pipe, NOT Concrete or Foul water pipe.
19. All Asphalt to be made with Granite or other acid resistant aggregate (No Limestone Filler Allowed)
20. All Leachate Manholes to be coated internally with bitumen sealant (Sides and Bottom)
21. Silage clamps and drainage design to comply with latest SSAFO and CIRIA C759 guidance.
22. Designed for Maize, Rye, and Grass only, not Beet or Beet pulp.

ALL PROPRIETARY MATERIALS TO BE FIXED STRICTLY IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS USING MATERIALS APPROVED BY THE MANUFACTURER.

NOT TO BE USED FOR CONSTRUCTION

PROVISIONAL FOR TENDER PURPOSES ONLY

Rev	Date	Rev By	Chkd	Description
0	15-12-22	-	OAJ	First Issue

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civil / structural / environmental / surveying

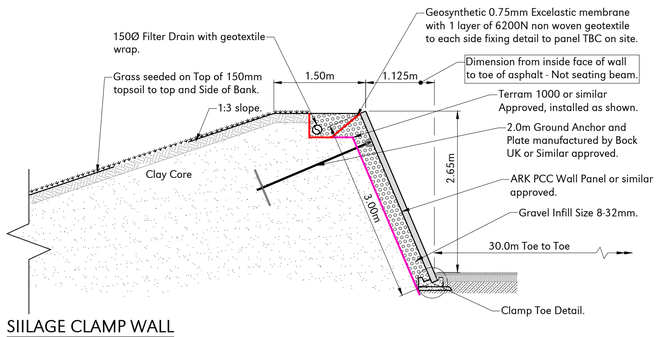
Client
Streetly Hall Estate

Project
AD Plant,
Streetly Hall Estate,
West Wickham, CB21 4RP

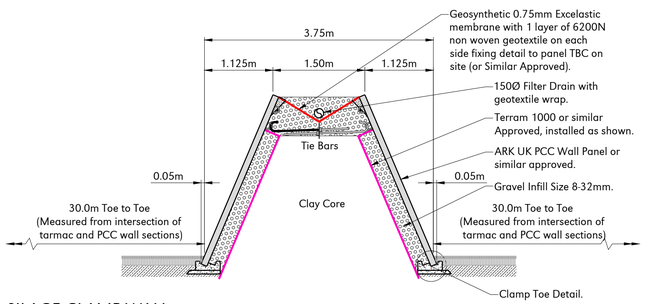
Drawing Title
Typical Drainage Details

Scale U.N.O.: As Noted (A1)
Date: December 2022
Drawn By: MJP

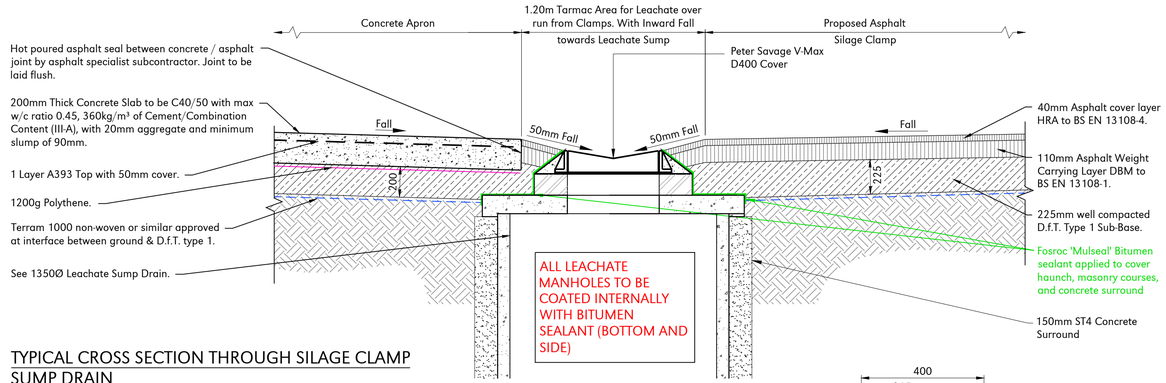
Drawing No. 27951/122
Rev 0



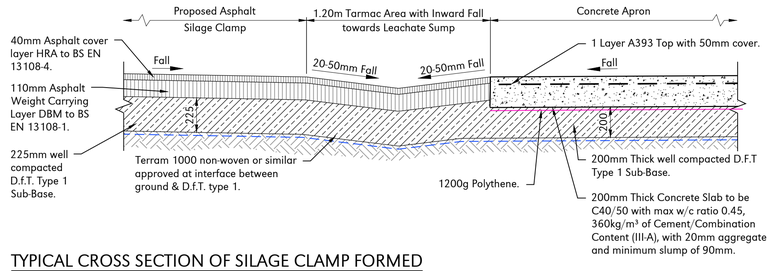
SIILAGE CLAMP WALL
Scale 1:50



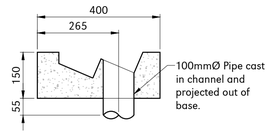
SILAGE CLAMP WALL
Scale 1:50



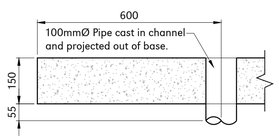
TYPICAL CROSS SECTION THROUGH SILAGE CLAMP SUMP DRAIN
Scale 1:20



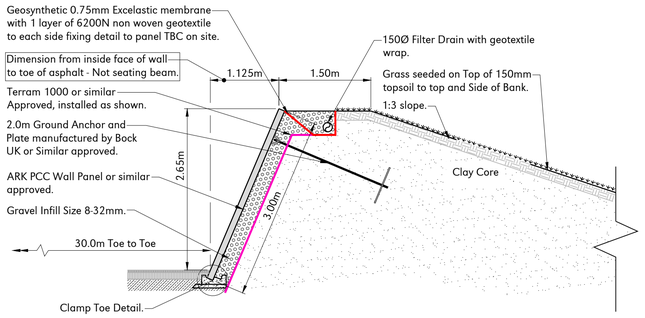
TYPICAL CROSS SECTION OF SILAGE CLAMP FORMED V-CHANNEL
Scale 1:20



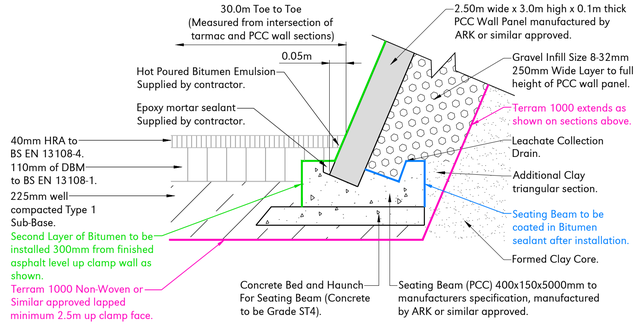
END ELEVATION ON CHANNEL OUTLET PIPE
Scale 1:10



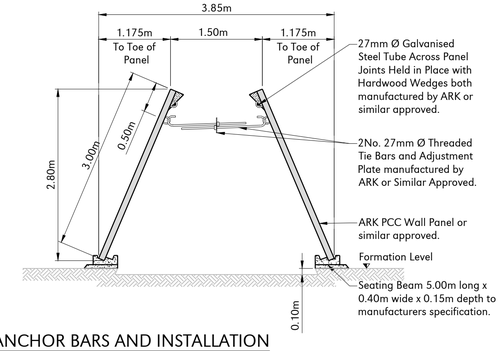
SIDE ELEVATION ON CHANNEL OUTLET PIPE
Scale 1:10



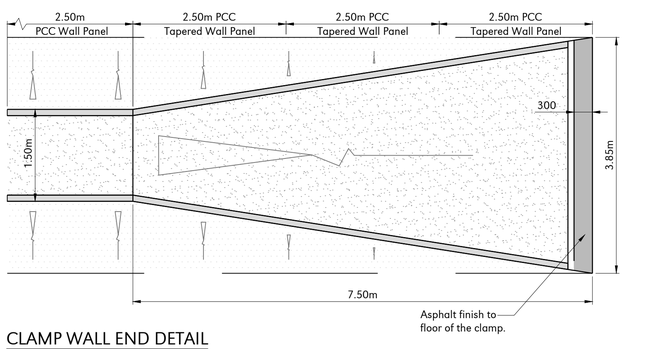
SILAGE CLAMP WALL
Scale 1:50



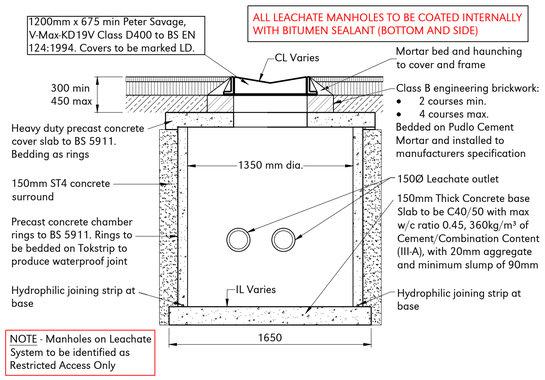
CLAMP TOE DETAIL
Scale 1:10



ANCHOR BARS AND INSTALLATION SUPPORTS FOR INTERNAL CLAMP WALLS
Scale 1:50



CLAMP WALL END DETAIL
Scale 1:50



1350Ø LEACHATE DRAINAGE SUMP
Scale 1:25

NOTE:

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4. Plandescil Ltd to be immediately notified of any suspected omissions or discrepancies.
5. This drawing is to be read in conjunction with all other relevant documents relating to the project.

SILAGE CLAMP CONSTRUCTION:

6. All D.f.T Type 1 must NOT contain Limestone.
7. Clay Core to be imported from a source certified as not contaminated.
8. All pipes to be UPVC twin wall or foul water push fit orange pipe, NOT Concrete or Foul water pipe.
9. All Asphalt to be made with Granite or other acid resistant aggregate (No Limestone Filler Allowed)
10. All joints and exposed edges in clamp floor to be sealed with hot poured bitumen emulsion.
11. All levels and dimensions should be checked on site by contractors and relevant sub-contractors.
12. All Leachate manholes to be coated internally with bitumen sealant (bottom and sides).

MATERIAL NOTE:

13. Materials must NOT contain limestone, including D.f.T Type 1 and concrete aggregate.
14. All Leachate Manholes to be coated internally with bitumen sealant (Sides and Bottom)
15. Silage clamps and drainage design to comply with latest SSAFO and CIRIA C759 guidance.
16. Designed for Maize, Rye, and Grass only, not Beet or Beet pulp.

ALL PROPRIETARY MATERIALS TO BE FIXED STRICTLY IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS USING MATERIALS APPROVED BY THE MANUFACTURER.

NOT TO BE USED FOR CONSTRUCTION

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0	15-12-22	-	OAJ	First Issue
Rev	Date	Rev By	Chkd	Description

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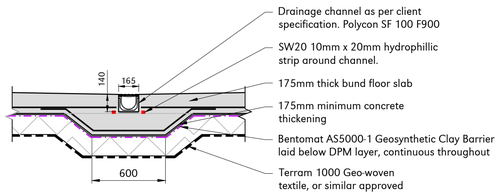
Project
AD Plant,
Streetly Hall Estate,
West Wickham, CB21 4RP

Drawing Title
Typical Silage Clamps Sections & Details

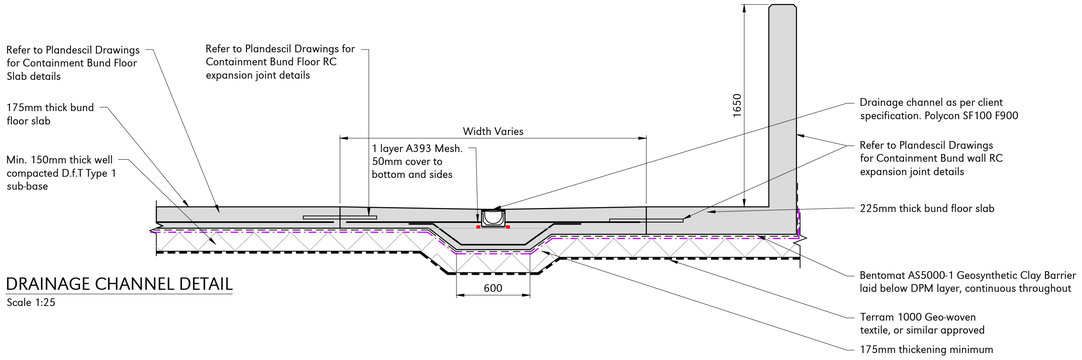
Scale U.N.O.	Date	Drawn By
As Noted (A1)	December 2022	MJP

Drawing No.	Rev
27951/123	0



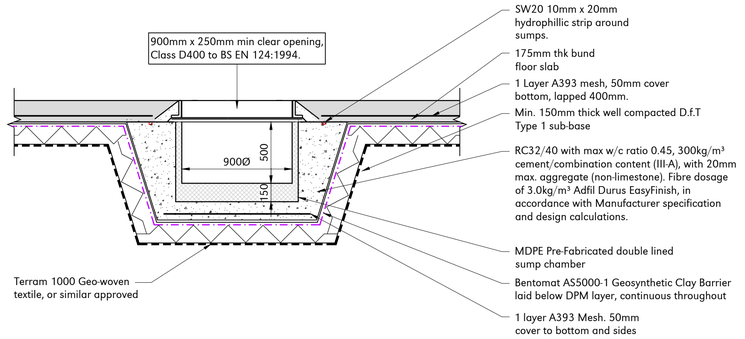
TYPICAL DRAINAGE CHANNEL DETAIL

Scale 1:25



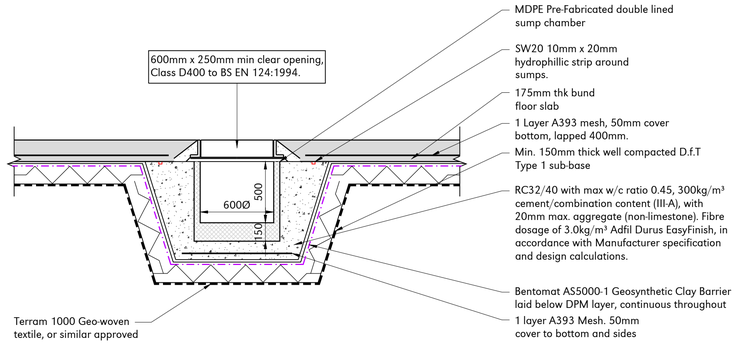
DRAINAGE CHANNEL DETAIL

Scale 1:25



CONTAINMENT BUND DRAINAGE SUMP - S2

Scale 1:25



CONTAINMENT BUND DRAINAGE SUMP - S3

Scale 1:25

NOTES:

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2. All levels to be above Ordnance Survey Datum defined levels (A.O.Dm) unless noted otherwise.
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5. Plandescil Ltd. to be immediately notified of any suspected omissions or discrepancies.
6. This drawing is to be read in conjunction with all other relevant documents relating to the project.
7. All setting out to be coordinated by the Contractor and to be checked onsite prior to construction.
8. To be read in conjunction with the following Plandescil Drawings, schedules and documents:
   27951/007 - Proposed Site Layout

REINFORCED CONCRETE:

9. 175mm Containment slab Concrete to be RC32/40 with max w/c ratio 0.45, 300kg/m³ cement/combination content (III-A), with 20mm max. aggregate (non-limestone).
   - Fibre dosage of 4.0kg/m³ Adfil Durus EasyFinish, in accordance with Manufacturer specification and design calculations.
   - Slab nominal 175mm thick, 50mm cover to bottom and sides.
   - Above mix to be used in addition to A393 mesh reinforcement in the bottom with 50mm cover to all faces.
10. Insitu Concrete to be in accordance with BS 8110 & BS 8500-1.
11. Reinforcement to be Grade H 500N/mm² High Yield, Deformed Type 2 Bar detailed in accordance with BS 4449 and BS 8666.

CONCRETE JOINT NOTES:

12. All joint dowel/reinforcement shall be set level and perpendicular to the joint face prior to casting. Damage or bent dowels are to be re-aligned or replaced prior to casting.
13. All formed joints are to be cleaned of concrete overruns to ensure accidental restraint is not created
14. All joints are to be sufficiently cured and cleaned of all contaminations prior to sealing.
15. All sealants are to be installed as per manufacturers specification and must be suitable for the joint type.
16. Joints subject to confirmation by Fibres used in mix design supplies. Fibre Supplier/Designer to check and approve joints.

FOUNDATION NOTES:

17. Assumed GBP value of 100kN/m² taken in lieu of site investigation, Contractor to confirm on site and advise Engineer, prior to construction of foundations.
18. Any soft spots or deleterious material is to be removed & taken down to virgin ground level & replaced with compact D.f.T Type 1 or suitable hogging material.
19. Overdig to be made up in compacted D.f.T. Type 1 or lean mix concrete.

ALL PROPRIETARY MATERIALS TO BE FIXED STRICTLY IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS USING MATERIALS APPROVED BY THE MANUFACTURER.

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Rev	Date	Rev By	Chkd	Description
0	15-12-22	-	OAJ	First Issue

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Client

Streetly Hall Estate

Project

AD Plant,
Streetly Hall Estate,
West Wickham, CB21 4RP

Drawing Title

Typical Containment Bund Drainage Details

Scale U.N.O.	Date	Drawn By
1:25 (A1)	December 2022	MJP

Drawing No.	Rev
27951/124	0

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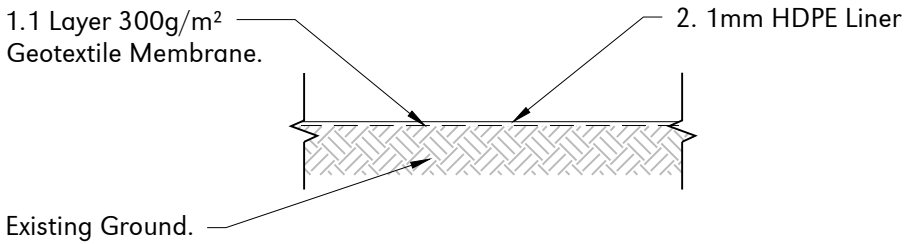

TYPICAL LINING DETAIL

Scale 1:20

Lining ordered from bottom to top.

GENERAL NOTES:

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2. All levels to be above Ordnance Survey Datum defined levels (A.O.Dm) unless noted otherwise.
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6. This drawing is to be read in conjunction with all other relevant documents relating to the project.
7. Storage capacity of lagoon designed to allow a nominal 250mm freeboard.
8. Placement of topsoil over the formed banks to be at a minimum of 300mm, residual volume to be lost in adjacent field.
9. Estmated topsoil strip volume TBC.

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Client

Streetly Hall Estate

Project

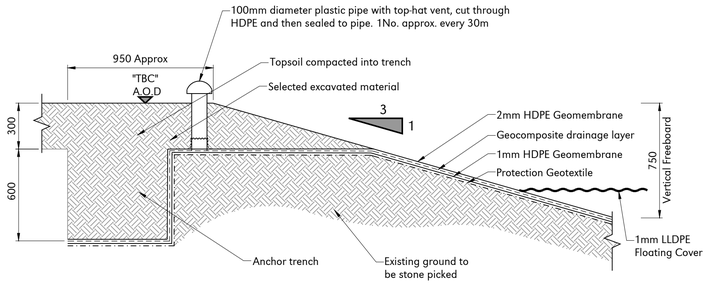
AD Plant,
Streetly Hall Estate,
West Wickham, CB21 4RP

Drawing Title

Typical Water Storage Pond Construction Details

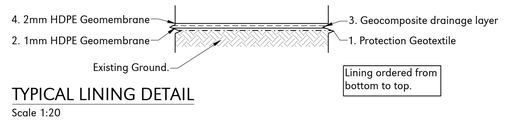
Scale U.N.O.	Date	Drawn By
1:20 (A4)	December 2022	MJP

Drawing No.	Rev
27951/125	0



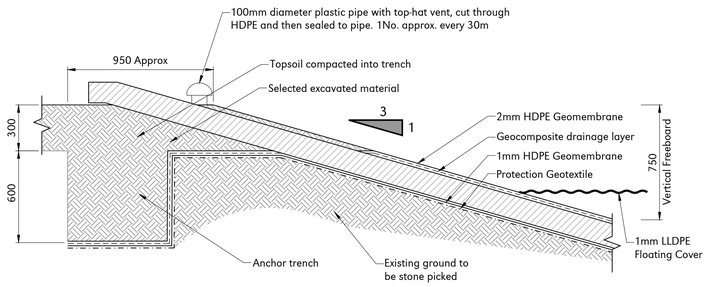
DETAIL A - TYPICAL ANCHOR TRENCH

Scale 1:20



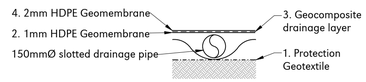
TYPICAL LINING DETAIL

Scale 1:20



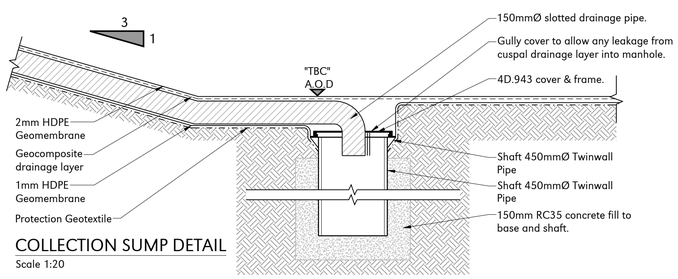
DETAIL B - TYPICAL DRAINAGE PIPE

Scale 1:20



LEAK DETECTION DETAIL

Scale 1:20



COLLECTION SUMP DETAIL

Scale 1:20

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7. All setting out to be coordinated by the Contractor and to be checked onsite prior to construction.
8. Recirculation pipework in lagoons TBC by Client and lining manufacturer prior to construction.

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West Wickham, CB21 4RP

Drawing Title

Typical Digestate Lagoon Construction Details

Scale U.N.O.	Date	Drawn By
1:20 (A1)	December 2022	MJP

Drawing No.	Rev
27951/126	0

civil engineering and building

- Industrial, Commercial, Agricultural and Domestic building design
- Foundation Design and ground improvements
- Highway Engineering including PDS/Civil 3D
- Retaining walls
- Sheet Piling
- Infrastructure planning and design
- Design of sustainable drainage system (SUDS)
- Soakaway design
- Architectural design of industrial buildings
- Planning and building regulation applications
- 3D conceptual models
- Renewable Energy Civil Engineering design and project management
- Anaerobic Digestion and Waste to Energy Project design and detail

environmental engineering

- Contaminated Land investigations (intrusive & non-intrusive)
- Land remediation verification
- Environmental impact assessments (EIA)
- Flood Risk Assessments
- Water supply, treatment, storage and distribution
- Foul and surface water & effluent/leachate drainage design
- Drainage network modelling
- 1D & 2D flood modelling
- Hydraulic river modelling
- Flood Alleviation
- Breach & overtopping analysis
- Reservoir flood inundation modelling
- Consent to discharge applications
- Landscaping design
- Tree surveys
- Environmental Permits

structural engineering

- Structural calculations for Commercial, Agricultural and Domestic building design
- Structural design using steel, stainless & carbon steel, concrete, timber, alloys and masonry
- Maritime and Hydraulic structures
- Structural surveys and structural suitability surveys
- Structural failure studies
- Subsidence claims
- Temporary works design
- 3D Finite Element Analysis
- Structural monitoring
- Structural enhancement/ remedial work
- Historic building advice
- 3D Revit & Level 2 BIM structural design & modelling

surveying land and buildings

- Geomatic / topographical site surveys
- Building, Road, and Earthworks Setting out
- Engineering Setting out
- Establish precise site survey control
- 3D digital terrain modelling
- Volumetric analysis
- Site area computations
- Flood risk surveys using GPS active network
- Measured building floor plans and elevation surveys
- Land transfer plans to Land Registry requirements
- Drainage network surveys
- Assistance/Expert witness in land boundary disputes
- Deterioration monitoring
- Preparation of asset plans
- As built record surveys

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