Flood Risk Screening and Drainage Management Plan

Stoneworthy BESS

Ref	05197-7792937

Revision History

Issue	Date	Name	Latest changes
01	09/05/2024	Mark Crabtree	First Created
02	17/05/2024	Mark Crabtree	Update to guidance requirements
03	20/05/2024	Jenna Folkard	Update following Planning Consultant review

Contents

1 Introduction

Stoneworthy Energy Storage System is a proposed battery energy storage system (BESS) comprising approximately 32no. battery enclosures, 16no. PCS (power conversion systems), 16no. MV skids (PCS transformer and switchgear), a 33kV substation building with a high voltage area containing auxiliary transformer and grid compliance equipment, a 132kV grid transformer with associated equipment and a grid connection to a National Grid Electricity Distribution (NGED) overhead line. It is located on land south of Pyworthy substation, approximately 1.3km southwest of the village of Pyworthy, centred at approximate Grid Reference E230230, N101584.

This report sets out the flood risk screening and drainage management plan for the Stoneworthy BESS.

Drawing 05197-RES-LAY-DR-PT-001 included in Appendix A, shows the proposed project layout.

The compound area within the battery storage compound fence measures 0.58 hectares, the compound area within the DNO cable compound measures 0.26 hectares, the total area enclosed by the red line boundary measures 3.6 hectares.

The Devon County Council SuDS Pro Forma for planning applications is included in Appendix F of this document.

2 Relevant Guidance and Legislation Requirements

This report uses best practice and conforms with the requirements of the relevant regulatory authorities.

The key legislation and guidance adhered to are as follows:

- Torridge District Council Flood Risk Assessment and Foul Drainage Assessment Guidance.
- North Devon and Torridge Local Plan 2011-2031
- Devon County Council, Sustainable Drainage System – Guidance for Devon (2023).
- National Planning Policy Framework.
- The EU Water Framework Directive (2000/60/EC).
- The SUDS Manual. CIRIA C753 (2015).
- The Department for Environment, Food and Rural Affairs (DEFRA) Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015).
- Building Research Establishment Digest 365 Soakaway Design (2016).
- Code of practice for surface water management for development sites BS8585 (2013).
- The Building Regulations 2010 Drainage and Waste Disposal Approved Document H, HM Government (2015).
- Engineering in the Water Environment, Good Practice Guide, Temporary Construction Methods, First Edition, March 2009.
- Control of Water Pollution on Construction Sites, CIRIA C532.

3 Existing Information

3.1 Site Location

The proposed site is located approximately 1.3km southwest of the village of Pyworthy, Devon - centred at approximate Grid Reference E230380, N101800.

Refer to Appendix A for the Site Location Plan.

Access will be taken off a local unnamed road located adjacent to the northern boundary of the site.

3.2 Existing Land Use and Topography

A walkover survey and topographical survey of the site extents have been carried out to confirm the existing land use and topography within the extents of the field required for the proposed development. A separate topographical survey includes a section of the unnamed road. The topographical survey data is included in Appendix B of this document.

The land within the site boundary comprises of gently undulating agricultural/pastureland.

The site is bounded to the north by an unnamed road (generally narrow with occasional passing places), to the east by woodland, open fields and an existing solar farm, and to the west by Derril Water watercourse, and to the south by a minor watercourse, woodland and open fields.

The site generally slopes west towards Derril Water watercourse. Ground levels vary between approximately 97m – 110mAOD.

3.3 Ground Conditions

Bedrock geology shows Bude Formation comprising intermittent mudstone, siltstone and sandstone.

Superficial deposits are limited to the area close to Derril Water and comprise alluvium and river terrace deposits of clay, silt, sand and gravel.

Records from the geotechnical investigation at the adjacent Derril Water Solar project (planning reference: 1/0249/2021/FULM) indicate relatively shallow bedrock comprising sandstone generally at between 1 and 3m depth. Residual soils above that level were generally competent firm or still clayey material. Infiltration test results showed that infiltration was not possible.

Drawing 05197-RES-DRN-DR-PT-001 showing the infiltration test locations and an extract from the adjacent solar farm Site Investigation report are included in Appendix C of this report. It is planned to perform geotechnical and infiltration testing within the proposed development site should consent be granted, and prior to detailed design.

3.4 Existing Hydrology / Drainage

The site drains into the Derrill Water, which abuts the western boundary of the site.

Environment Agency mapping classify the quality of groundwater underneath and around site as ‘medium’. The site does not fall in a protected area as defined by EA.

A site visit was conducted in February 2024. Water ponding and waterlogged ground was observed within the site boundary, indicating the ground on site has limited infiltration potential. Figure 1 below shows a photograph taken at the existing site entrance looking out over the site.

Figure 1 – Site Photo showing standing water, February 2024

In discussions during a site visit, the landowner stated there are land drains present on the site, however their location and condition is unknown. No land drains were found in the topographical survey (including buried services) undertaken in January 2024.

The site does not fall within a Critical Drainage Area as defined by the Devon County Council Environment Viewer.

4 Flood Risk Screening

4.1 Overview

The proposed development is deemed at low risk of flooding as set out in this flood screening section.

4.2 Flooding from Fluvial Sources

Figure 2 below depicts the Environment Agency fluvial flood risk mapping, with the proposed development and site red line boundary overlaid. As can be observed in Figure 2 the main compound areas and access tracks do not lie in an area at risk of flooding from fluvial sources.

Figure 2 - Excerpt from the Environment Agency fluvial flood risk map, with proposed development overlaid

4.3 Flooding from Surface Water

Figure 3 below depicts the Environment Agency surface water flood risk map, with the proposed development and site red line boundary overlaid. As can be observed in Figure 3, the main compound areas do not lie in an area at risk of flooding from fluvial sources.

The proposed access track crosses an existing ditch / watercourse shown as a linear strip of surface water flooding.

Figure 3 - Excerpt from EA surface water flood risk map, with proposed development overlaid

A review of the data provided by the Environment Agency shows the flooding is of relatively high probability (more than 3.3% chance each year), but flood depths and velocities are low. Flooding is restricted to the confines of the channel.

Where the proposed access track crosses the watercourse at the entrance to the site, it will be culverted. At detailed design stage the culvert will be designed in accordance with Devon County Council guidance.

Prior to construction, approval for the new culvert will be sought from Devon County Council's Flood and Coastal Risk Management Team.

Section 6.5.2 of this report provides further details of the watercourse crossing approval process.

4.4 Flooding from Groundwater

Environment Agency flood risk mapping shows the proposed development site lies in an area with a negligible risk of groundwater flooding.

4.5 Flooding from Tidal or Sea Flooding

The development site is located outside of any area of tidal influence based on a minimum ground elevation above ordnance datum of 97m AOD. The proposed development is therefore not considered at risk of tidal or sea flooding.

4.6 Flooding from Overland Sheet Flow

An existing watercourse along the northeastern boundary of the site, intercepts any potential sheet flow running off the fields from the higher ground to the north of the site. The proposed development is therefore not considered at risk of flooding from overland sheet flow.

4.7 Flooding from Sewers and Highway Drains

There are no surface water sewers or highway drains in the vicinity of the development. Therefore, the development is not considered at risk of flooding from sewers or highway drains.

4.8 Flooding as a Result of the Development

The development is not considered to exacerbate the flood risk of the surrounding area as runoff rates will not exceed the greenfield conditions as discussed in sections 6 & 7.

4.9 Historic Flooding

There are no known records of historic flooding to the knowledge of the Landowner.

5 Foul Drainage Strategy

5.1 Overview

Permanent welfare facilities will be required at the DNO substation, in the form of a WC and sink.

A Foul Drainage Assessment (FDA) form has been completed in conjunction with this report. The FDA documents the foul drainage decisions taken with respect to disposal in accordance with The National Planning Practice Guidance and Building Regulations Approved Document H. The FDA form also documents that the proposed foul drainage is not located in a source protection zone.

Refer to Appendix D for the FDA form.

5.1.1 Foul Drainage Hierarchy

As described in the FDA form, the National Planning Practice Guidance and Building Regulations Approved Document H give a hierarchy of drainage options that must be considered and discounted in the following order:

1. Connection to the public sewer.
2. Package sewage treatment plant (which can be offered to the Sewerage Undertaker for adoption).
3. Septic Tank.
4. If none of the above are feasible, a cesspool.

5.2 Foul Drainage Discharge Options

5.2.1 Connection to a Public Sewer

As set out in Building Regulations Approved Document H, Section 2.3 “Foul drainage should be connected to a public foul or combined sewer wherever this is reasonably practicable. For small developments connection should be made to a public sewer where this is within 30m provided that the developer has the right to construct the drainage over any intervening land”.

Based on the quantity of foul drainage facilities proposed and the infrequent use over its lifetime, the site can be classified as a small development in the context of foul drainage.

As shown in drawing 05197-RES-DRN-DR-PT-002 provided in Appendix A, no public sewers have been identified within a reasonable distance to the development, therefore, it is deemed impracticable to connect to a public sewer.

5.2.2 Packaged Treatment Plant / Septic Tank / Cesspool

A packaged treatment plant has not been deemed practicable given the infrequent use and small scale of the foul drainage facilities.

Septic tank effluent discharging directly into the existing field ditch has not been deemed an option based on the residual contamination risk posed by the foul water and such, a septic tank would only be viable should the ground conditions allow infiltration.

As discussed later in Section 6.2.1, it is expected the ground conditions offer little to no infiltration, therefore, a septic tank has not been proposed.

Given the above assessment, the foul drainage has been assumed to be discharged into a sealed cesspool.

5.3 Proposed System

As set out in Section 5.2, a cesspool has been chosen as the most practicable foul water disposal method.

Off-site disposal from the cesspool will be by a licensed waste haulier / contractor.

Permanent facilities on site will be designed by the contractor and shall be in accordance with the General Binding Rules (GBR) created through the Environmental Permitting (England and Wales) (Amendment) (England) Regulations 2014.

Prior to the installation of the foul drainage system, any necessary agreements or licensing from the relevant third parties will be gained.

The infrastructure layout provided in Appendix A has been designed to allow space for the permanent cesspool.

6 Surface Water Drainage Strategy

6.1 General

The SuDS Hierarchy as included in the Devon County Council's Sustainable Drainage System – Guidance for Devon (2023), section 5.2 will be applied and is described below:

1. Discharge into the ground (infiltration).
2. Discharge to a surface water body (with written permission from the riparian owner).
3. Discharge to a surface water sewer, highway drain, or other drainage system (with written permission from South West Water Ltd., Devon County Council Highways, or the riparian owner, respectively).
4. Discharge to a combined sewer (with written permission from South West Water Ltd.).

The surface water drainage design will ensure that the requirements of Devon County Council's Sustainable Drainage System – Guidance for Devon (2023) are met. The following list outlines the strategies and design standards that will be adopted for the surface water management system:

- Surface water drainage strategies will make use of above ground sustainable drainage systems.
- The surface water drainage strategy will make use of a series of SuDS features acting as a treatment train to treat the runoff from a development. Water quality will be assessed using the simple index approach using the pollution hazard rating and the SuDS mitigation indices.
- Runoff rates post development will not exceed greenfield runoff rates for the same return period event. Greenfield runoff rates calculated in accordance with the methodologies outlined in CIRIA's SuDS Manual (C753). Consequently, only impermeable areas draining into the proposed network should be used in the calculation of runoff rates.
- The volume of surface water runoff discharged off-site in the 1 in 100 year, 6 hour rainfall event, will not exceed the greenfield runoff volume for the same event.
- Long term storage will be provided to store the additional volume of surface water runoff generated by the increase in impermeable area, which is in addition to the attenuation storage required to address the greenfield runoff rates. The incorporation of long-term storage will ensure that each SuDS component is appropriately sized and must discharge at a rate not exceeding 2 litres/second/hectare or Qbar.
- The rates and volumes of surface water runoff will be safely managed on-site up to, and including, the 1 in 100 year plus an allowance for climate change) rainfall event.

6.2 Surface Water Drainage Options

6.2.1 Infiltration

Based on the hierarchy identified in Section 6.1, the preferred method of surface water discharge is via infiltration to the ground. However, the ground on site is not anticipated to support drainage by infiltration due to the following:

- Poor infiltration test results at the adjacent Derrill Water Solar site.
- BGS maps indicate the majority of the site's underlying material is a clay material, characterised with low permeability.
- Greenfield runoff rate estimation tool created by HR Wallingford supports this assumption as it identifies the land as soil type 4 indicating relatively impermeable ground conditions and therefore lack of suitability for infiltration methods.
- Standing water observed on ground during the site visit.
- Existing land drainage systems in place, indicating the need to convey overland flows during storm events.

Infiltration testing within the site bounds will be carried out post-consent to confirm the above assumption that an infiltration solution is not possible for this site.

6.2.2 Attenuate Rainwater in Basin for Gradual Release

Due to the low probability of infiltration capacity on site, it is assumed for design purposes that attenuation basin is the highest option on the SuDS Hierarchy that is viable for the proposed development site.

The surface water drainage will be designed in accordance with the guidance in Section 2 and Section 6.1 of this report. Flows will be restricted to Qbar, and the attenuation basin will be sized to contain the 1 in 100 rainfall event plus a 45% allowance for climate change.

The attenuation basin will discharge via an outfall pipe to the small watercourse the runs along the southern boundary of the site.

6.3 Proposed Surface Water Management System

6.3.1 Overview / Non-technical Summary

As set out in Section 6.2, an attenuation basin with gradual release strategy has been chosen as the most appropriate surface water management system.

Without the provision of attenuation features, the proposed development will result in an increase in runoff. To ensure the water quantity and volume are suitably managed back to pre-development rates, attenuation and interception will be provided.

Surface water flows from the two compounds will be collected by a series of filter drains and pipes before discharging into an above ground attenuation basin. Flows discharging out of the attenuation basin will be restricted by means of a flow control device. Restricted flows will discharge south-westwards, as per the pre-development hydrological regime.

Typically, the access tracks serving the site will be constructed from unbound granular material. Flows will be partially attenuated at source within the tracks and part shed into the adjacent soft landscaped areas. As such, the change in flow regime from the existing scenario will be minimal.

The SuDS will be constructed prior to or at the same time as the access tracks and the site compound. Interim measures such as the placement of silt fences around watercourses will be retained in place until the SuDS are established and providing sufficient silt removal.

Refer to Appendix A for the details and layout of the SuDS proposed across the site.

6.3.2 Design Criteria

A surface water drainage system has been designed in accordance with the guidance in Section 2.

Outflows will be restricted to pre-development runoff rates (Qbar) and an attenuation basin will be sized to contain the 1 in 100 (plus a 45% allowance for climate change) rainfall event. The 45% climate change allowance is based on the Environment Agency peak rainfall allowances mapping.

No allowance has been made for an increase in impermeable area due to urban creep. Unlike other development examples, such as housing estates, there is no opportunity or reason to increase the impermeable areas within the site bounds. Any potential increase in impermeable area within the site will be regulated by means of a new planning application.

6.3.3 Long Term Storage

Surface water flows discharging into the receiving watercourse will be restricted to Qbar.

The SuDS components are suitably sized to restrict flows to QBar and ensure surface water runoff volumes do not exceed greenfield flow conditions for critical rainfall events up to 1 in 100 year plus climate change.

The surface water attenuation basin combined with the flow control device will ensure flows do not exceed 2 litres/second/hectare or Qbar.

6.3.4 Exceedance Flow Design

In accordance with CIRIA Report 753 and Devon County Council, Sustainable Drainage System – Guidance for Devon (2023), an exceedance route should be considered as part of the SuDS design.

The exceedance route will remain as per the existing scenario, i.e. over vegetation down towards the Derill Water / existing watercourse to the south / southwest of the site.

The attenuation basin is located downslope of the energy storage facility. The site levels will be such that flows from any extreme events will flow over the banks of the attenuation basin and swales, away from the energy storage facility and then downslope overland away from the site. The edges of the attenuation basin will be vegetated to reduce the risk of scour during an extreme event.

6.3.5 Modification to Land Drainage

Where land drainage is encountered during the works, it will be intercepted / diverted where necessary to facilitate the construction of the development.

6.3.6 Water Quality and Treatment

In line with the requirements noted in the Devon County Council, Sustainable Drainage System – Guidance for Devon (2023), a Simple Index Approach is undertaken to ensure the proposed drainage strategy provides adequate water quality treatment, as per Section 26.7.1 of the SUDS Manual 2015 (CIRIA C753).

The proposed development is considered a medium pollution hazard level based on land use definitions provided in Table 26.2 of the SUDS Manual. The corresponding pollution hazard indices are denoted in Table 1.

Surface water within the proposed development will receive minimum three stages of treatment before being discharged overland. The three main stages are listed below:

1. Filtration of water through filter drain stone upstream of basin; mitigation indices for filter drain: TSS = 0.4, metals = 0.4, hydrocarbons = 0.4.

2. Settlement in attenuation basin; mitigation indices for detention basin: TSS = 0.5, metals = 0.5, hydrocarbons = 0.6.

3. Filtration of water through filtration check dam within basin; mitigation indices for filter drain: TSS = 0.4, metals = 0.4, hydrocarbons = 0.4.

Table 1 below demonstrates how the pollution hazard index for each contaminant is satisfied by the three stages of water treatment provided as part of the proposed drainage strategy.

Table 1 – Simple Index Calculation

Contaminant Type	Stage 1	Stage 2	Stage 3	Total SUDS Mitigation Index	Pollution Hazard Index	Utilisation
TSS	0.4	0.5(0.5)=0.25	0.4(0.5)=0.2	0.85	0.7	1.21
Metals	0.4	0.5(0.5)=0.25	0.4(0.5)=0.2	0.85	0.6	1.42
Hydrocarbons	0.4	0.5(0.6)=0.3	0.4(0.5)=0.2	0.9	0.7	1.29

During the construction phase, temporary silts fences may also be installed, providing an additional treatment stage of water filtration.

6.4 Capacity of Receiving Watercourse

In accordance with Devon County Council, Sustainable Drainage System – Guidance for Devon (2023), when discharging into an existing watercourse on site an assessment should be made on the capacity / condition of the watercourse to ensure the watercourse is in an acceptable condition to receive the water.

Flows in the watercourse have been modelled using TUFLOW software. The cross section in Figure 4 below, shows the watercourse does not run full in the peak 1 in 100 year plus climate change rainfall event, and will therefore have capacity to receive the pre-development restricted flows.

The peak level in the watercourse (97.8m AOD) is more than 1 metre lower than the preliminary design level of the attenuation basin (99m AOD), allowing for a free discharge.

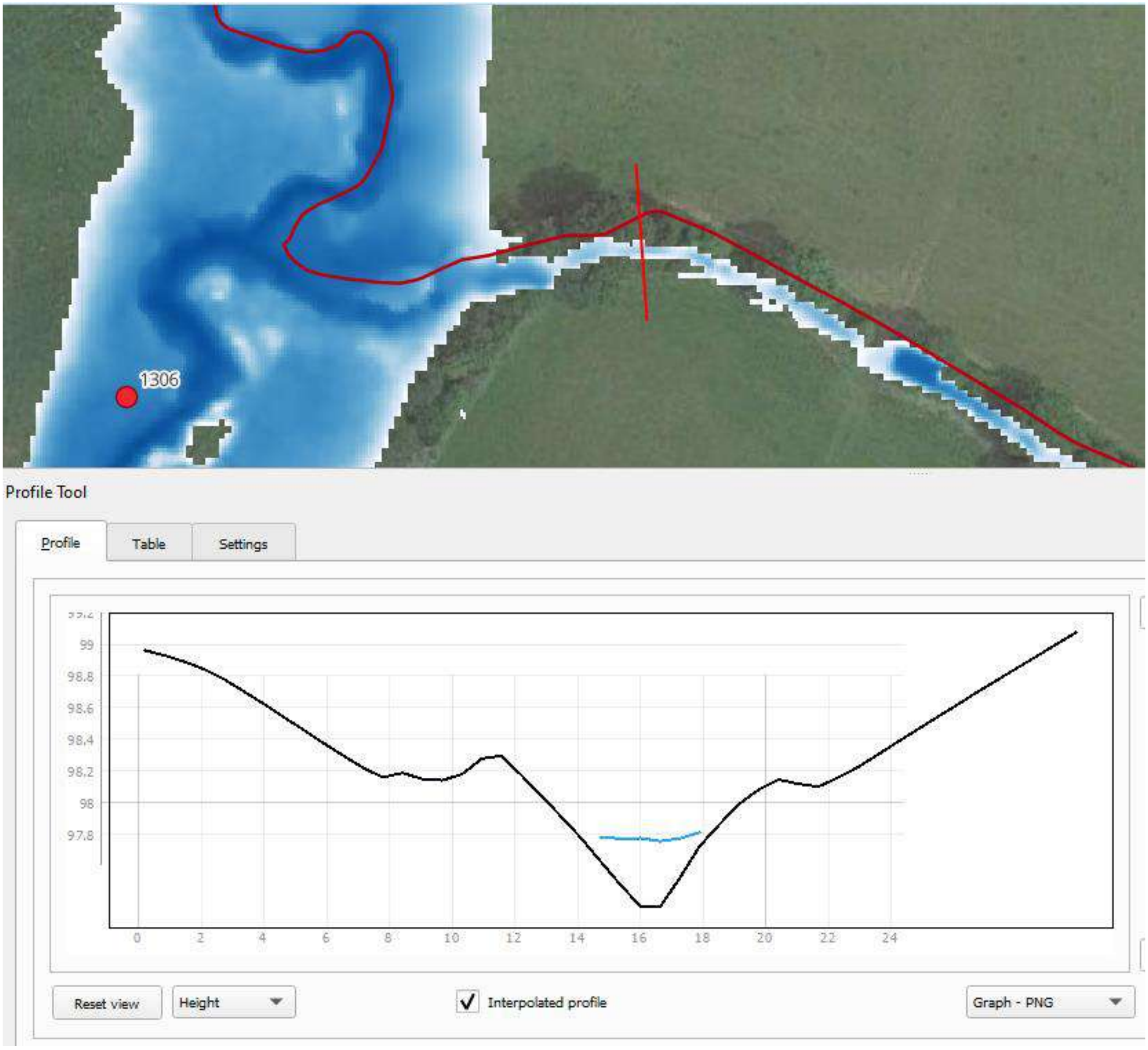


Figure 4 - Excerpt from TUFLOW modelling (1 in 100 year + CC)

6.5 Works to Ordinary Watercourses

6.5.1 General

A new outfall for the restricted discharge of surface water flows will be required on the ordinary watercourse to the south of the site.

A new culvert will be required on the ordinary watercourse to the north of the site where the site access meets the public road.

The watercourses fall within the red line boundary and is within the ownership of the landowner.

6.5.2 Approval

Prior to construction, approval for the new outfall / culvert will be sought from Devon County Council's Flood and Coastal Risk Management Team.

In accordance with the Land Drainage Act (1991), if any temporary or permanent works need to take place within an ordinary watercourse to facilitate any part of a development (e.g. an access culvert or bridge), Land Drainage Consent will be obtained from Devon County Council's Flood and Coastal Risk Management Team, prior to any works commencing.

7 Hydraulic Assessment

7.1 General

Pre-development runoff rates for the development have been estimated using the Flood Estimation Handbook (FEH) and IH124 methodology. The methodology with the lower runoff rate will be used for the design.

An attenuation storage calculation using the drainage network and analysis tool within Infodrainage (previously Microdrainage). The software has been used to simulate the worst case 1 in 100 year storm event plus a 45% allowance for climate change.

Whilst as discussed in Section 6.3.1, the unbound tracks are deemed to have a minimal impact on runoff rates, the section of track between the two compounds will be partially cut below existing levels to manage existing ground topography. Runoff along this section of track will be unable to shed into the adjacent soft landscaped areas. Therefore, this runoff from this area, whilst also constructed from unbound stone, will need to be managed back to pre-development rates.

The inputs taken have been assumed as “worst case” and as such has determined the maximum drainage component extents required for the project.

This worst-case scenario includes the following assumptions:

- The main energy storage compound has a fully impermeable asphalt surface (for earthing requirements).
- The DNO substation compound has a well graded unbound surface.
- Tracks have a well graded unbound surface.
- Infiltration through the soil is not possible.

Should planning consent be granted, a detailed drainage design will be completed following the ground investigation and compound earthing design (to determine surface finishes).

All methods and inputs are taken in accordance with the relevant guidance documents provided in Section 2.

7.2 Greenfield Peak Runoff Rates from Site

Current and future greenfield runoff rates for the development have been estimated using the lowest run off rate derived by the FEH Statistical Method and IH124 Method. Using the rainfall data from the UK Centre for Ecology & Hydrology and the mapping software within HR Wallingford Design Tool, the site-specific parameters have been established:

- Standard average annual rainfall (SAAR): 1100mm;
- Flood Attenuation by Reservoirs and Lakes (FARL) index: 1;
- Standard percentage run-off: 47%;

- BFIHost: 0.362;
- Total drained area:
    - Impermeable surface (runoff coefficient = 1): 0.58 ha;
    - Well graded unbound surface(runoff coefficient = 0.7): 0.26 ha ;

The total drained area is defined as the catchment area for the attenuation basin, which comprises the area inside the main battery storage compound and the DNO compound and access tracks adjacent to the DNO compound in cut.

Refer to Appendix E for the Qbar design tool calculation summary.

The peak runoff rate calculated for a Qbar (1 in 2.3) rainfall event is 6.88 l/s. It is proposed to match this discharge rate through use of a flow control device installed in a manhole positioned immediately downstream of the basin.

7.3 Attenuation Storage Required Post Development

Attenuation storage will be provided to accommodate the peak runoff rate calculated up to the critical 1 in 100 year event (including 45% allowance for climate change).

As per the calculation described in Section 7.2, allowable discharge from the basin is set to the calculated greenfield runoff rate of 6.88 l/s.

The attenuation volume calculated based on the above criteria is approximately 650m^3.

3D modelling has been carried out to demonstrate this volume can be accommodated within the site boundary.

The attenuation volume should be considered a maximum volume, this assumes that the battery storage compound has an asphalt surface and that drainage by infiltration methods is not possible.

Refer to Appendix E for the Infodrainage storage volume calculation summary.

8 Operation and Maintenance Requirements

All surface water drainage and pollution control features associated with the site will remain private and will be maintained by the site operator.

The following section outlines the proposed maintenance for the various aspects of the drainage system. If necessary, these outline maintenance proposals will be refined when the site is operational to suit specific conditions.

A maintenance record log will be maintained for all maintenance work carried out. Where problems persist on each six-monthly inspection, advice will be sought from the SUDS designer on an alternative drainage solution.

8.1 Pipe & Catchpits

The anticipated maintenance plan for the site pipes and site compound catchpits is outlined in Table 2.

Table 2 – Typical Pipes and Catchpits Operation and Maintenance Requirements

Pipes, culverts and Catchpits Maintenance Schedule	
Maintenance Action	**Minimum Frequency**
Inspect manhole / pipe. Where pipe has become clogged with silt, the pipe will be cleared out.	Half yearly
Remove litter and debris.	Half yearly
Inspect inlets and outlets for blockages, and clear (if required).	Half yearly
Remove settled solids, litter and debris from catchpits.	Half yearly

8.2 Filter Drain

The anticipated maintenance plan for the filter drains at the site is outlined in Table 3.

Table 3 – Typical Filter Drain Maintenance Requirements

Filter Drain Maintenance Schedule	
Maintenance Action	**Minimum Frequency**
Inspect filter drain for silt contamination.	Half yearly
Replace drainage stone where necessary.	Half yearly
Remove litter and debris	Half yearly

8.3 Attenuation Basin

The anticipated maintenance plan for the basin at the site is outlined in Table 4.

Table 4 – Typical Basin Operation and Maintenance Requirements

Basin Maintenance Schedule	
Maintenance Action	**Minimum Frequency**
Remove litter and debris	Half yearly
Inspect inlets and outlets for blockages, and clear (if required).	Half yearly
Inspect inlets and outlets for noticeable effects of erosion, suitable erosion protection measures such as reno-mattress or placement of large stones (>150mm) to dissipate water energy levels will be installed at the area affected.	Half yearly
Inspect silt accumulation rates in any forebay and in main body of the pond and establish appropriate removal frequencies	Half yearly
Reseed areas of poor vegetation growth, alter plant types to better suit conditions (if required).	As required, or if bare soil is exposed over 10% or more of the basin treatment area

9 Conclusion

A flood risk assessment has been undertaken across the site. The site has been deemed at low risk of flooding.

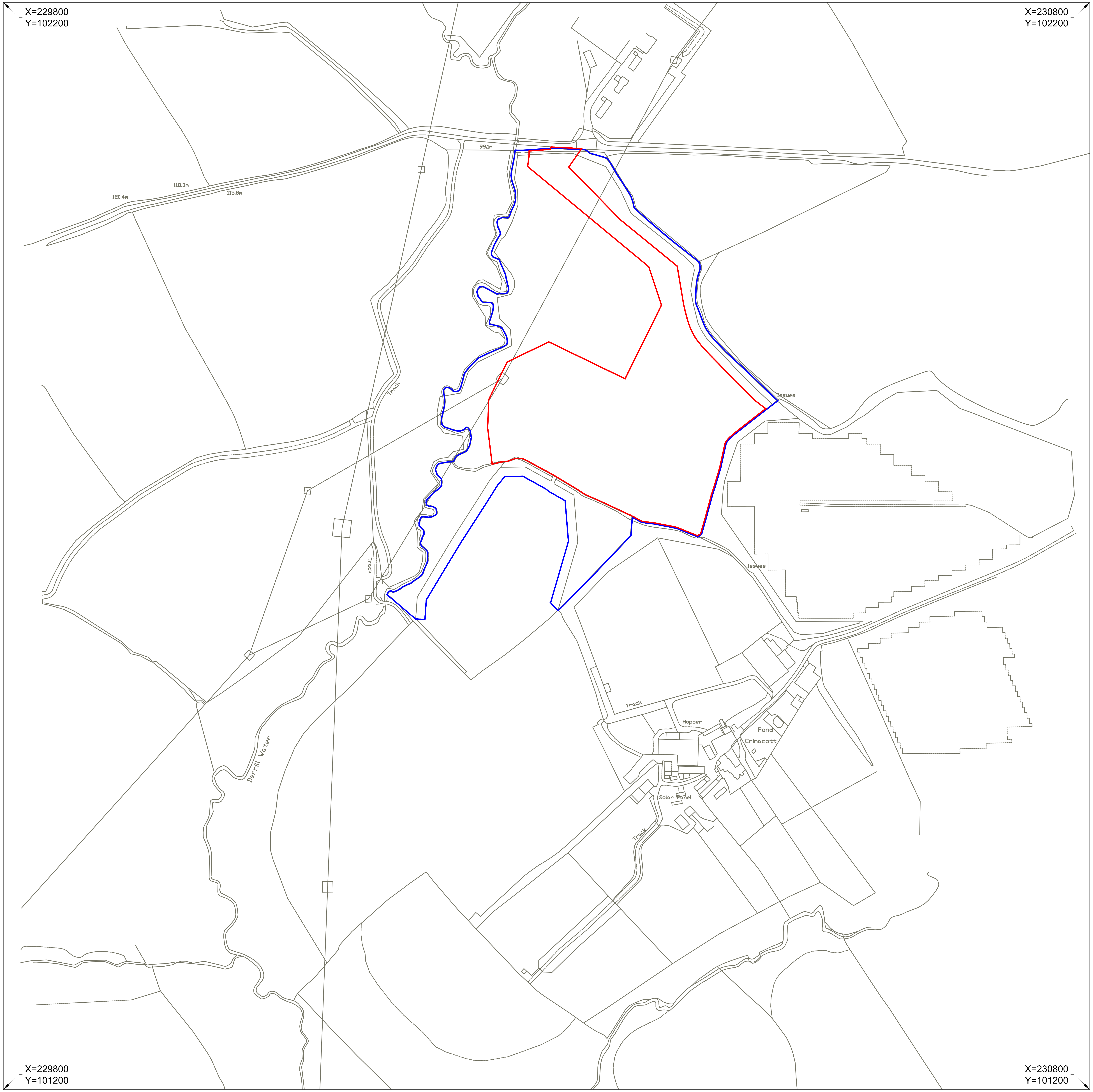
An assessment of the drainage options has also been undertaken, and it has been concluded that drainage by infiltration is unlikely to be a viable option. As such, the current proposal is to drain the site via an attenuation basin, with a restricted discharge rate, discharging overland to match its existing drainage condition. Infiltration testing will be undertaken on site prior to detail design, and should acceptable infiltration rates be found, an infiltration solution will be adopted during detail design. The location and condition of land drains will also be determined prior to detailed design to determine if an alternative discharge method can adopted.

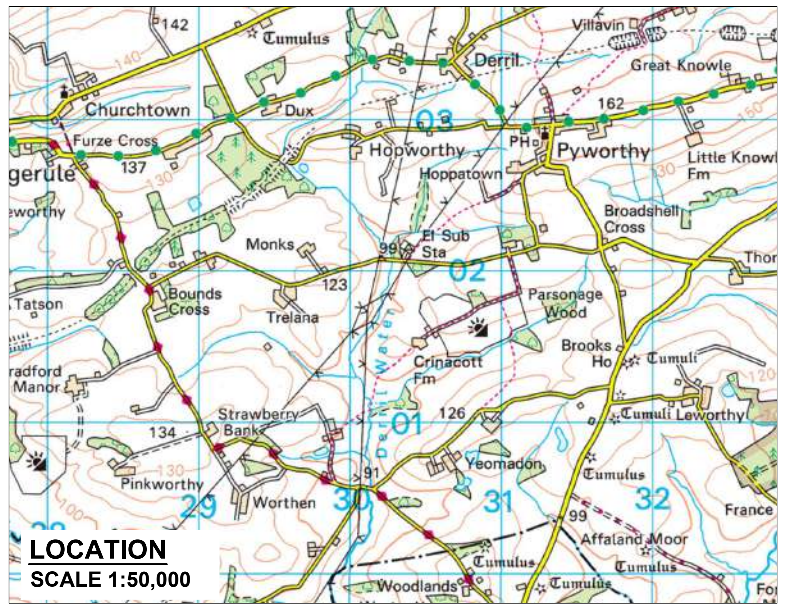
The required attenuation volume has been calculated as approximately $650m^3$. This should be considered a maximum volume, based on the assumption that all permanent infrastructure (other than the access track) has an asphalt surface and that drainage by infiltration methods is not possible.

A site investigation, 3D earthworks modelling, earthing design, and a further assessment of the proposed discharge will be undertaken to inform the detailed design of the site drainage.

The drainage strategy proposed will provide sufficient water quality treatment as demonstrated using the Simple Index Approach.

Appendix A Project Drawings





KEY:

LANDLORD'S PROPERTY (INSIDE EDGE OF LINE DENOTES BOUNDARY)

DEVELOPMENT BOUNDARY (OUTSIDE EDGE OF LINE DENOTES BOUNDARY)

KEY PLAN

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
4	BM	VM	JH	2024-05-24	UPDATED DEVELOPMENT BOUNDARY
3	BM	VM	JH	2024-05-14	UPDATED BOUNDARIES AND CHANGED PURPOSE TO PLANNING
2	BM	BY APPD	JH	2024-03-11	UPDATED DEVELOPMENT BOUNDARY
1	BM	BY APPD	JH	2024-03-11	FIRST ISSUE

PURPOSE: PLANNING	COORDINATES: OSGB 1936
SCALE: 1:2,500 @ A2	DATUM: N/A
LAYOUT DRAWING: N/A	T-LAYOUT NO: N/A

PROJECT TITLE

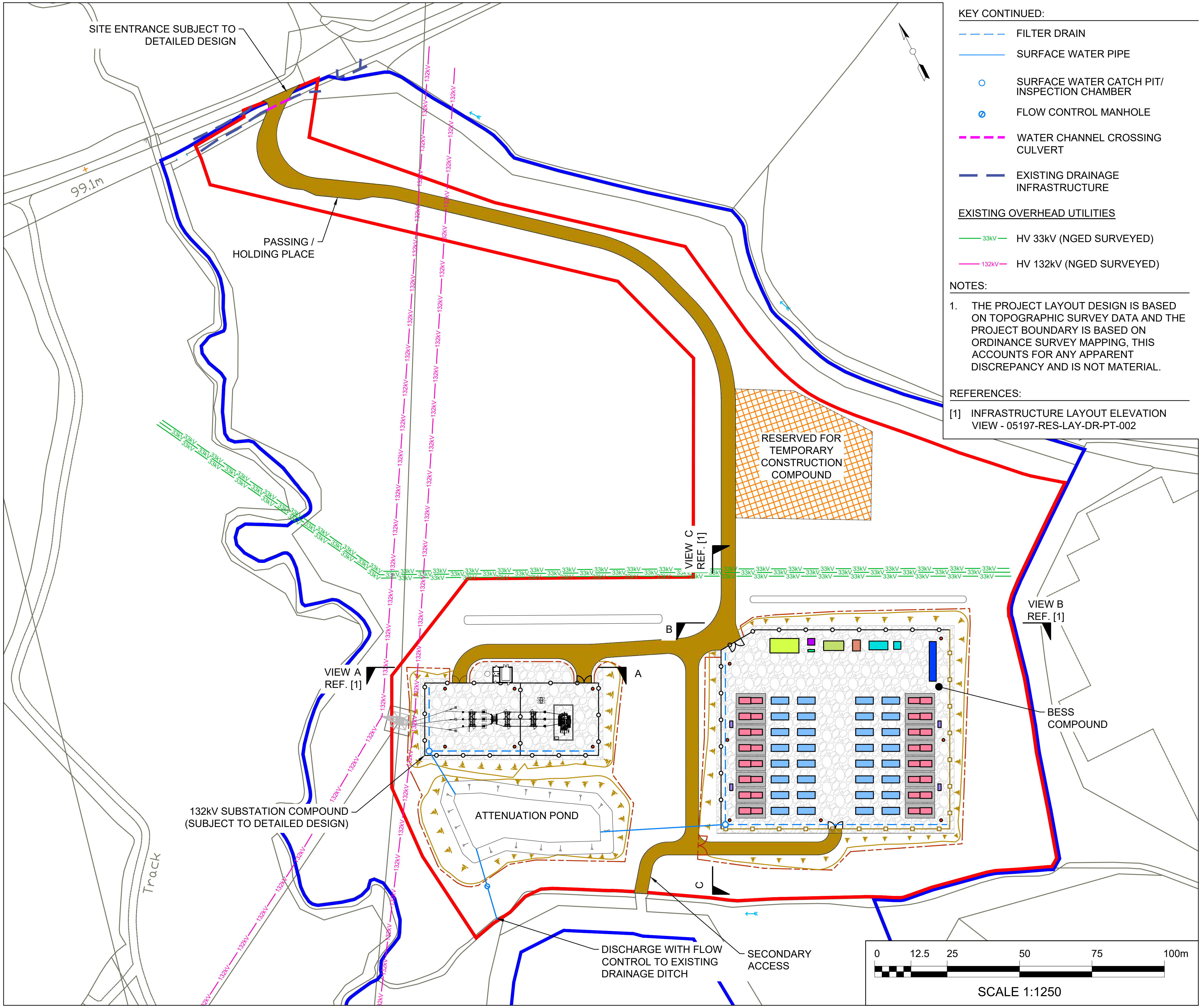
STONEWORTHY BESS

DRAWING TITLE

LOCATION PLAN

RES DRAWING NUMBER	REV
05197-RES-MAP-DR-XX-001	4

BEAFORT COURT,
EGG FARM LANE,
KINGS LANGLEY,
HERTS WD4 8LR, UK
TEL +44 (0) 1923 299200
WWW.RES-GROUP.COM



KEY CONTINUED:

- FILTER DRAIN
- SURFACE WATER PIPE
- SURFACE WATER CATCH PIT/ INSPECTION CHAMBER
- FLOW CONTROL MANHOLE
- WATER CHANNEL CROSSING CULVERT
- EXISTING DRAINAGE INFRASTRUCTURE

EXISTING OVERHEAD UTILITIES

- HV 33kV (NGED SURVEYED)
- HV 132kV (NGED SURVEYED)

NOTES:

1. THE PROJECT LAYOUT DESIGN IS BASED ON TOPOGRAPHIC SURVEY DATA AND THE PROJECT BOUNDARY IS BASED ON ORDINANCE SURVEY MAPPING, THIS ACCOUNTS FOR ANY APPARENT DISCREPANCY AND IS NOT MATERIAL.

REFERENCES:

[1] INFRASTRUCTURE LAYOUT ELEVATION VIEW - 05197-RES-LAY-DR-PT-002

KEY:

- LANDLORD'S PROPERTY (INSIDE OF LINE DENOTES BOUNDARY)
- DEVELOPMENT BOUNDARY (OUTSIDE OF LINE DENOTES BOUNDARY)
- SECURITY FENCE
- ACOUSTIC FENCE
- BATTERY STORAGE ENCLOSURE (BSE)
- POWER CONVERSION SYSTEM (PCS) WITH SINGLE MV SKID AND APRON SLAB
- BESS SUBSTATION BUILDING
- AUXILIARY TRANSFORMER
- LV DISTRIBUTION EQUIPMENT
- AGGREGATION PANEL WITH LV PILLAR
- PRE-INSERTION RESISTOR
- CAPACITOR BANK
- HARMONIC FILTER AND RESISTOR
- SPARES CONTAINER
- LIGHTING / CCTV COLUMN
- SURFACE FINISH TYPICALLY COMPRISING STONE OR ASPHALT
- ACCESS TRACK
- EARTHWORKS BATTER
- STOCK PROOF FENCE
- DEVON HEDGE

CONTINUED...

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
5	BM	VM	JH	2024-05-24	UPDATED DEVELOPMENT BOUNDARY ADDED CALL-OUTS AND REFERENCE DRAWING
4	BM	VM	JH	2024-05-14	RELOCATED MANHOLE WITH FLOW CONTROL AND ADDED CULVERT
3	BM	VM	JH	2024-05-09	DESIGN EVOLUTION
2	BM	VM	JH	2024-03-12	REMOVED COMMS TOWER

PURPOSE: PLANNING
COORDINATES: OSGB 1936
SCALE: 1:1,250 @A3
DATUM: N/A
LAYOUT DRAWING: N/A
T-LAYOUT NO: N/A

PROJECT TITLE: STONEWORTHY BESS

DRAWING TITLE: INFRASTRUCTURE LAYOUT

RES DRAWING NUMBER: 05197-RES-LAY-DR-PT-001
REV: 5

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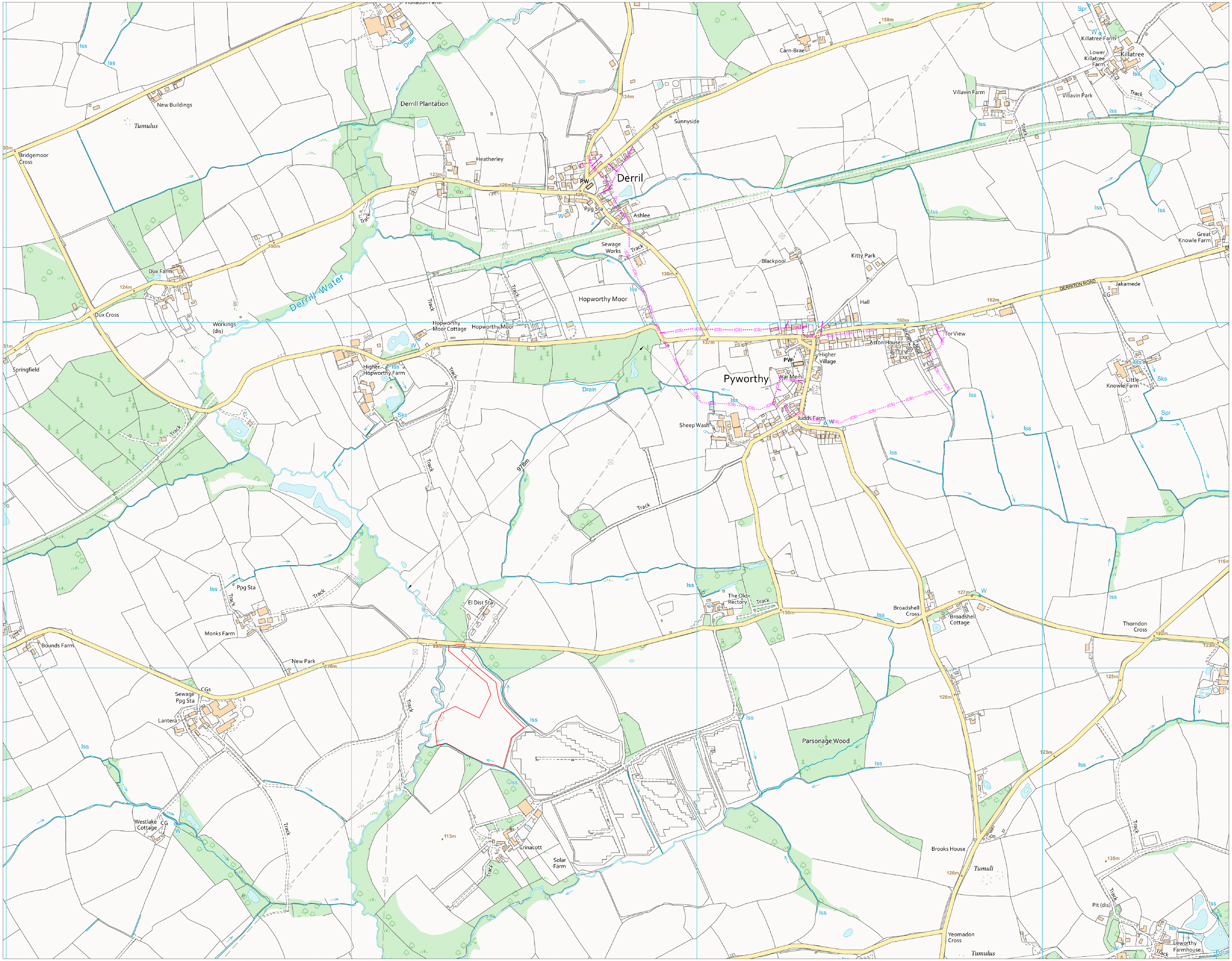

KEY:

- DEVELOPMENT BOUNDARY (OUTSIDE OF LINE DENOTES BOUNDARY)
- (CS) COMBINED SEWER (SOUTH WEST WATER RECORDS)

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
2	BM	BY APPD	MC	2024-05-24	UPDATED DEVELOPMENT BOUNDARY
1	BM	BY APPD	MC	2024-05-13	FIRST ISSUE

PURPOSE: PLANNING	COORDINATES: OSGB 1936
SCALE: 1:5,000 @ A1	DATUM: N/A
LAYOUT DWG: N/A	T-LAYOUT NO.: N/A

PROJECT TITLE

STONEWORTHY BESS

DRAWING TITLE

PUBLIC FOUL DRAINAGE LOCATION PLAN

RES DRAWING NUMBER: 05197-RES-DRN-DR-PT-002 REV: 2

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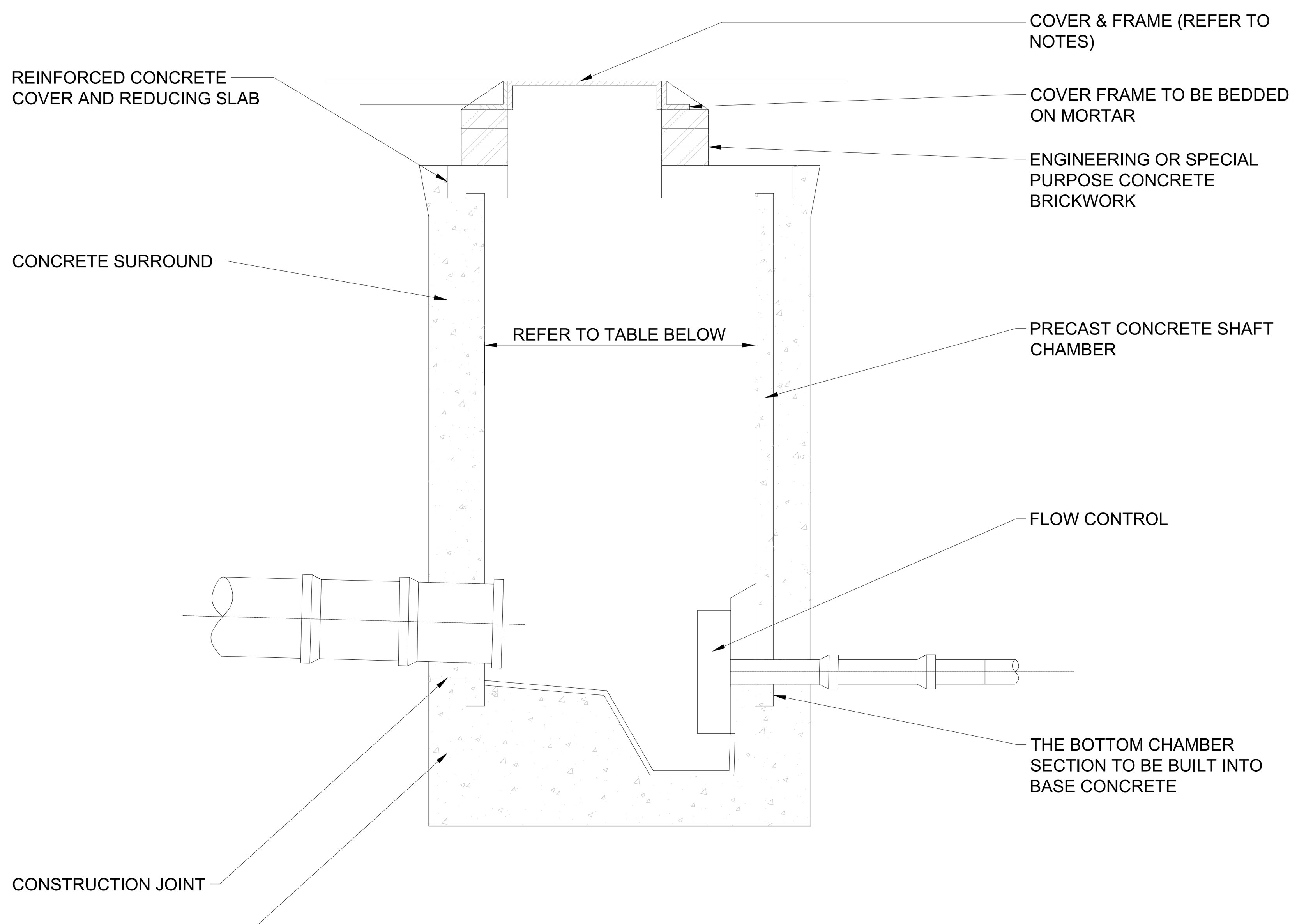
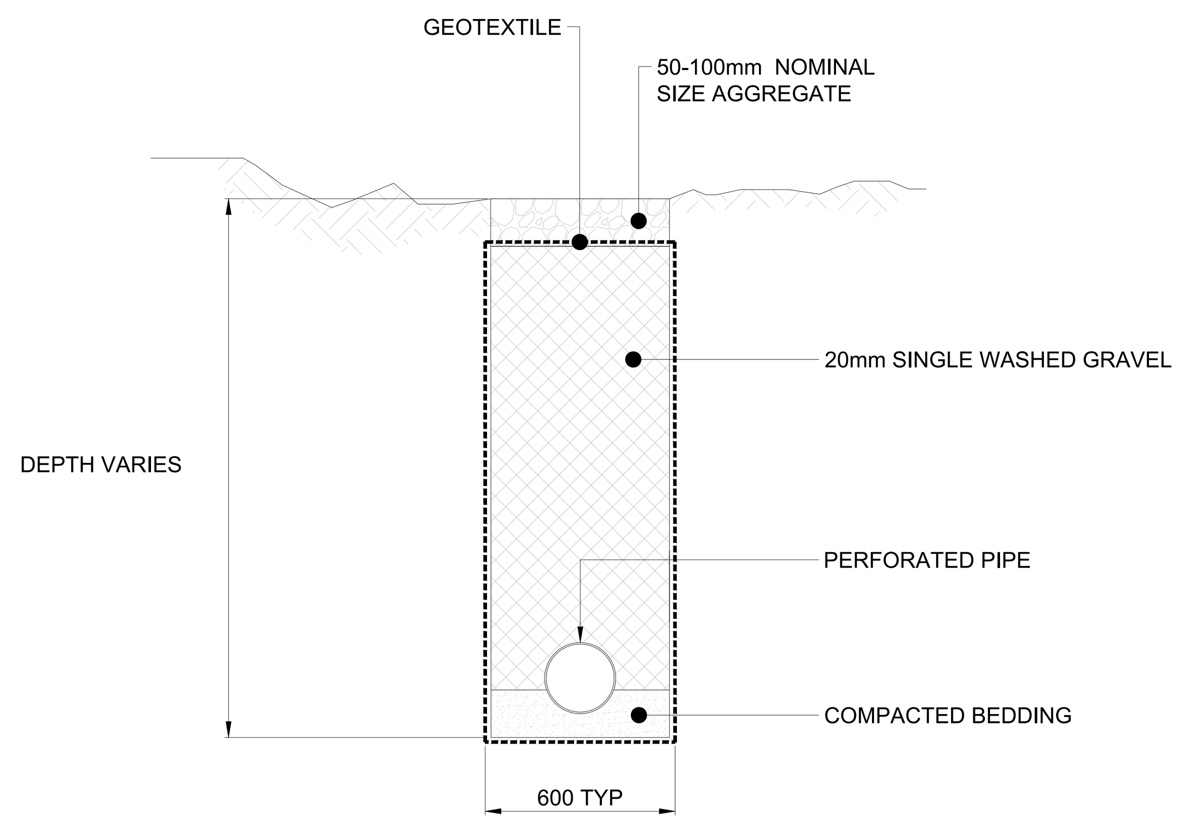
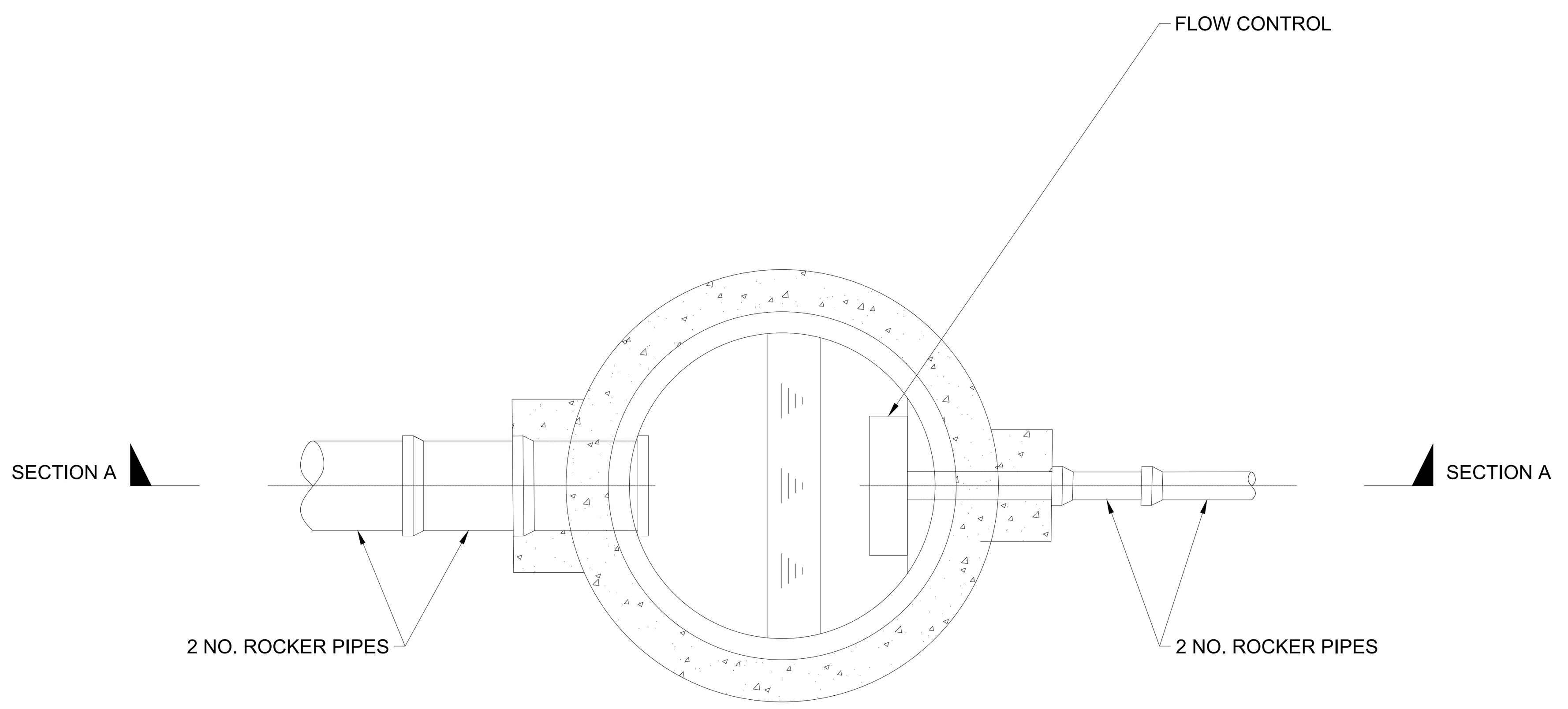


SECTION A-A
SCALE 1:20

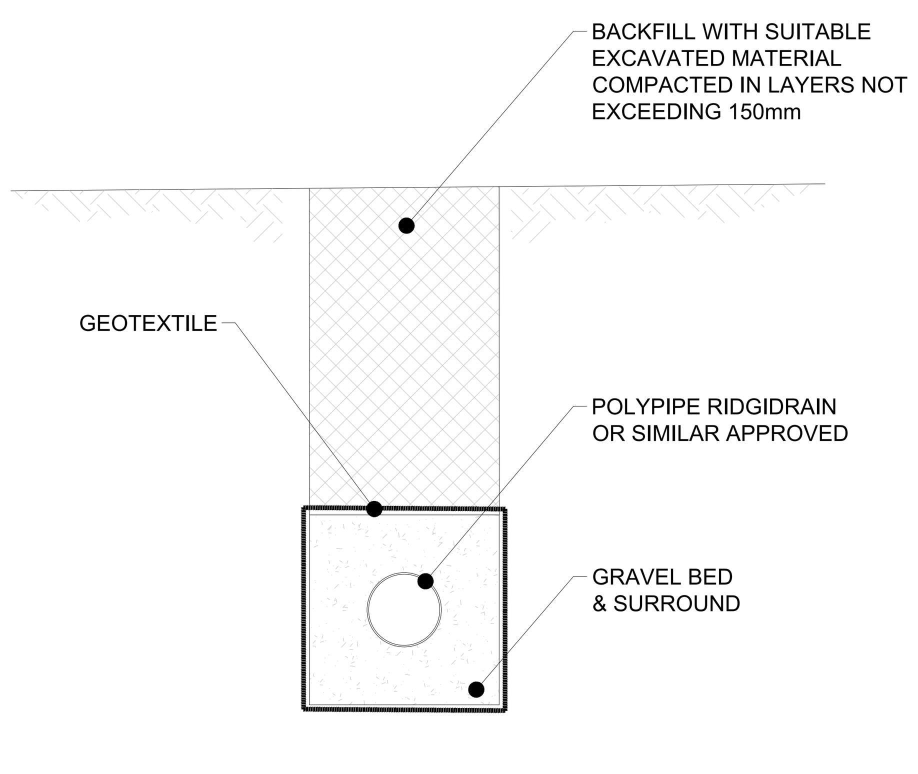
Ø OF LARGEST PIPE IN MANHOLE (mm)	INTERNAL DIAMETER OF MANHOLE (mm)
LESS THAN 375	1200
375 - 700	1500
750 - 900	1800



FILTER DRAIN DETAIL
SCALE 1:20



MANHOLE DETAIL WITH FLOW CONTROL DEVICE
SCALE 1:20



OUTFALL PIPE CROSS SECTION
SCALE 1:20

NOTES:

1. DO NOT SCALE, ANY DISCREPANCIES SHALL BE HIGHLIGHTED TO THE DESIGNER FOR CONFIRMATION.
2. SUDS SYSTEMS TO BE CONSTRUCTED PRIOR TO, OR AT THE SAME TIME AS THE ACCESS TRACK AND COMPOUND. INTERIM MEASURES SUCH AS THE PLACEMENT OF SILT FENCES TO BE USED AROUND WATERCOURSES AND RETAINED IN PLACE UNTIL SUDS ARE ESTABLISHED AND PROVIDING SUFFICIENT SILT REMOVAL.
3. WHERE RESEEDING IS REQUIRED, NATIVE SPECIES SEED MIX SHALL BE USED BASED UPON THE SURROUNDING HABITAT. THE PLANTING SHALL BE CAPABLE OF RESISTING DROUGHT CONDITIONS.
4. AREAS STRIPPED OF VEGETATION SHOULD BE KEPT TO A MINIMUM.
5. SILT LEVELS AT DETENTION BASIN TO BE VISUALLY INSPECTED AS PART OF AN ONGOING MAINTENANCE PROGRAMME DURING THE CONSTRUCTION PHASE. WHERE CHECK DAMS BECOME CLOGGED WITH SILT OR VEGETATION, STONE CHECK DAM TO BE REMOVED AND DISPOSED OF APPROPRIATELY.
6. SUDS DETAILS, DIMENSIONS AND LEVELS MAY BE MODIFIED DURING DETAILED DESIGN. CHANGES WILL ADHERE TO THE REQUIREMENTS AND PHILOSOPHY IN THE SURFACE WATER MANAGEMENT PLAN AND ADDENDUM.

SHEET 1 OF 2

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
1	BM	BY APPD	MC	2024-05-13	FIRST ISSUE

PURPOSE: PLANNING
COORDINATES: N/A
SCALE: AS SHOWN @ A1
DATUM: N/A
LAYOUT DWG: N/A
T-LAYOUT NO.: N/A

PROJECT TITLE: STONEWORTHY BESS

DRAWING TITLE: TYPICAL DRAINAGE DETAILS

RES DRAWING NUMBER: 05197-RES-DRN-DR-PT-003
REV: 1

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EGG FARM LANE,
KINGS LANGLEY,
HERTS WD4 8LR, UK
TEL +44 (0) 1923 299200
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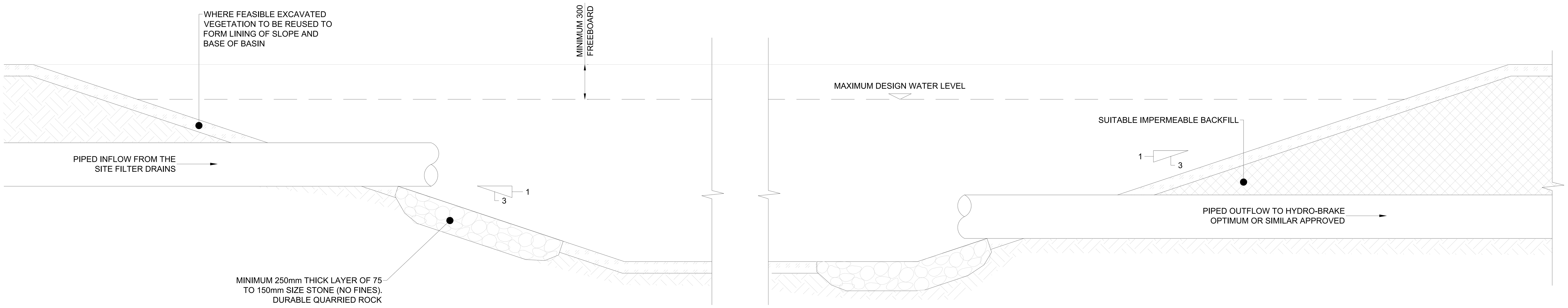
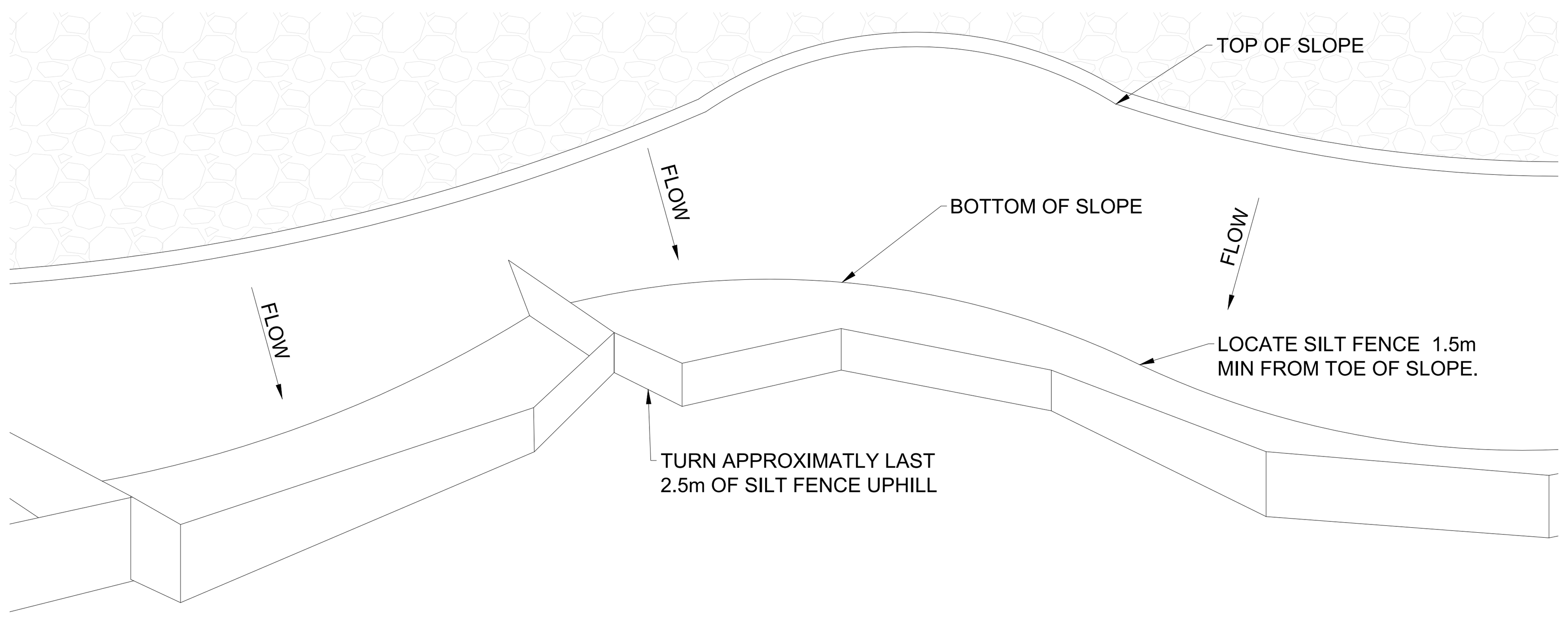
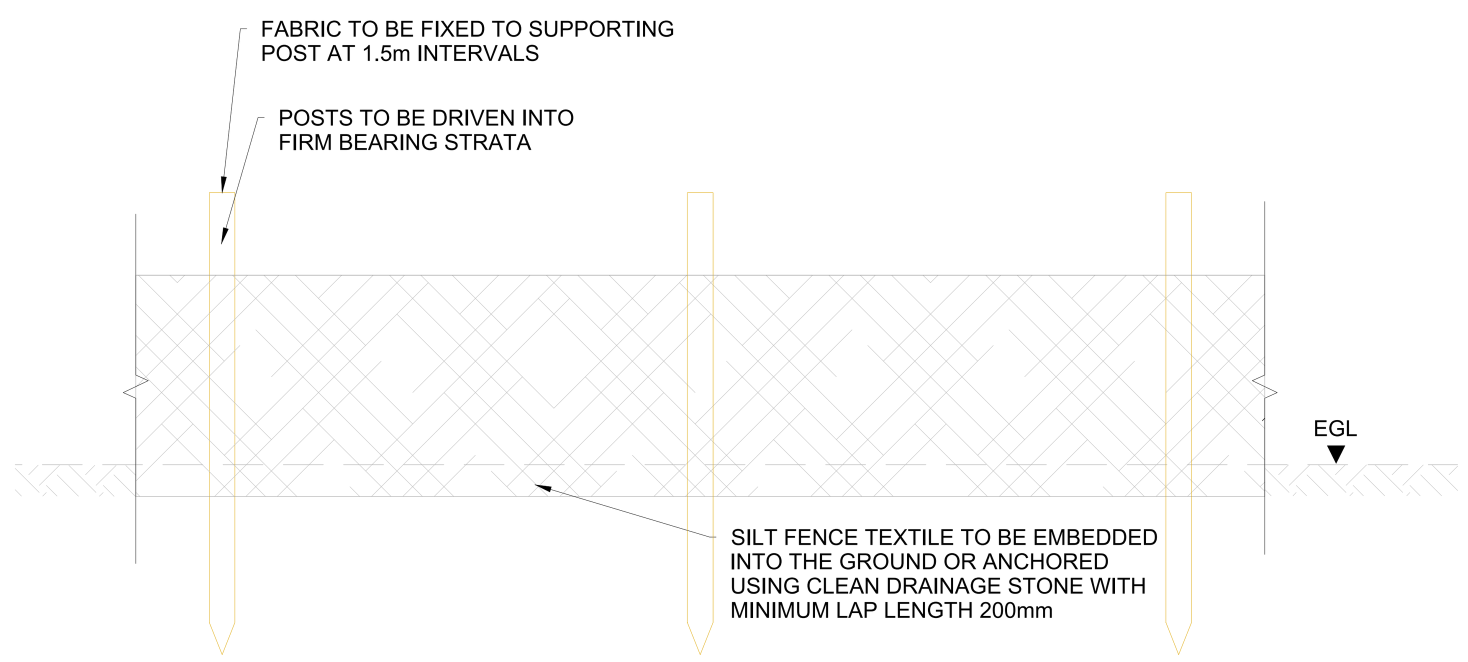


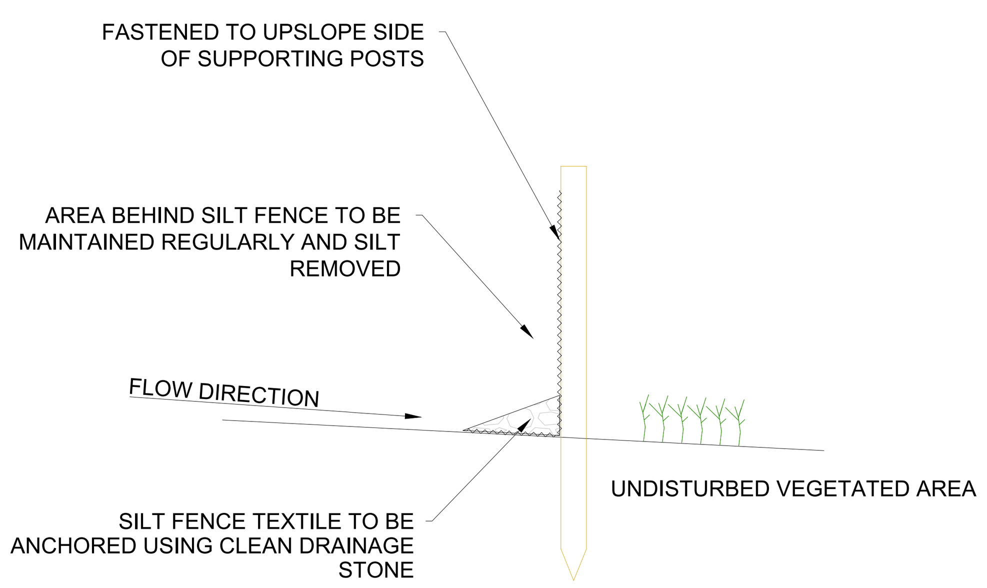
TYPICAL SECTION OF ATTENUATION BASIN
SCALE - 1:20



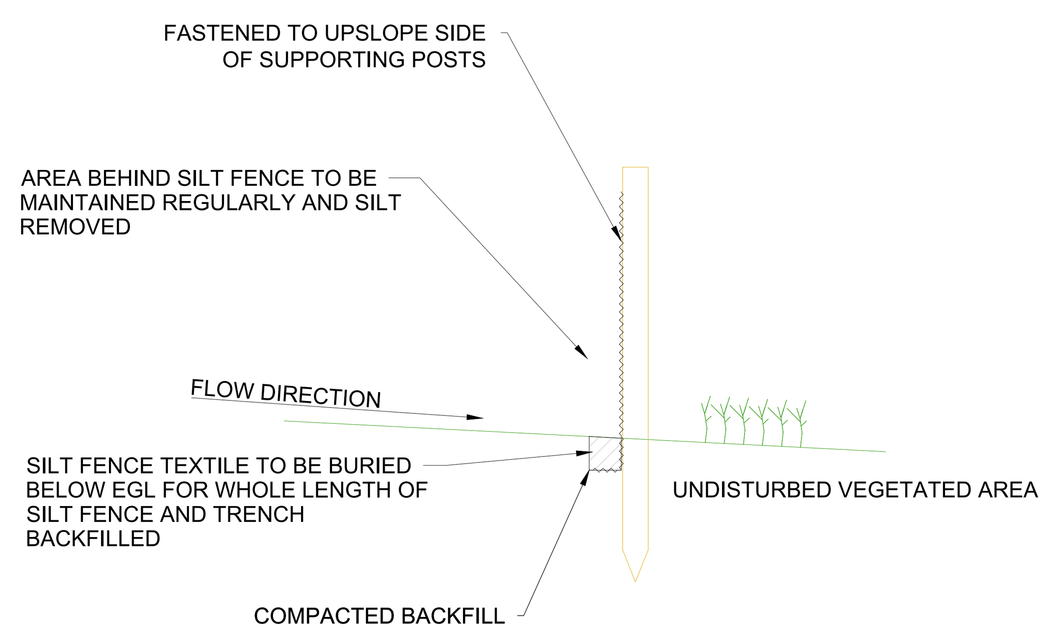
TYPICAL SILT FENCE BOTTOM OF SLOPE
SCALE - NTS



SILT FENCE TEXTILE DETAIL
SCALE 1:20



ANCHORED TYPE OPTION
SCALE 1:20



BURIED TYPE OPTION
SCALE 1:25

NOTES:

1. DO NOT SCALE, ANY DISCREPANCIES SHALL BE HIGHLIGHTED TO THE DESIGNER FOR CONFIRMATION.
2. SUDS SYSTEMS TO BE CONSTRUCTED PRIOR TO, OR AT THE SAME TIME AS THE ACCESS TRACK AND COMPOUND. INTERIM MEASURES SUCH AS THE PLACEMENT OF SILT FENCES TO BE USED AROUND WATERCOURSES AND RETAINED IN PLACE UNTIL SUDS ARE ESTABLISHED AND PROVIDING SUFFICIENT SILT REMOVAL.
3. WHERE RESEEDING IS REQUIRED, NATIVE SPECIES SEED MIX SHALL BE USED BASED UPON THE SURROUNDING HABITAT. THE PLANTING SHALL BE CAPABLE OF RESISTING DROUGHT CONDITIONS.
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6. SUDS DETAILS, DIMENSIONS AND LEVELS MAY BE MODIFIED DURING DETAILED DESIGN. CHANGES WILL ADHERE TO THE REQUIREMENTS AND PHILOSOPHY IN THE SURFACE WATER MANAGEMENT PLAN AND ADDENDUM.

SHEET 2 OF 2

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
1	BM	BY APPD	MC	2024-05-13	FIRST ISSUE

PURPOSE: PLANNING
COORDINATES: N/A
SCALE: AS SHOWN @ A1
DATUM: N/A
LAYOUT DWG: N/A
T-LAYOUT NO.: N/A

PROJECT TITLE: STONEWORTHY BESS

DRAWING TITLE: TYPICAL DRAINAGE DETAILS

RES DRAWING NUMBER: 05197-RES-DRN-DR-PT-003
REV: 1

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BEAUFORT COURT,
EGG FARM LANE,
KINGS LANGLEY,
HERTS WD4 8LR, UK
TEL +44 (0) 1923 299200
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Appendix B Topographical Survey

UTILITY SURVEY DRAWING KEY

Abbreviations and Symbols

EOT - End of trace	BD - Back drop
UTT - Unable to trace	CL - Cover level
PT - Poor trace	CRL - Crown level
(E) - Empty duct	IL - Invert level
(R) - Taken from records	SL - Silt level
(AR) - Assumed route	SuL - Surcharge level
(VI) - Verbal Information	WL - Water level
UTL - Unable to lift	BL - Base level
Ø - Diameter	UTR - Unable to rod
Wd - Depth to water	UTS - Unable to survey
Sd - Depth to surcharge	FW - Foul water sewer
d - Electronically derived depth	CW - Combined water sewer
Cd - Depth to crown	SW - Surface water sewer
Id - Depth to invert	GPR - Ground penetrating Radar
Sd - Depth to silt	NFI - No further information

TV	Cable TV
HV	High Voltage
LV	Low Voltage
	Electric Cable
CCTV	Security Cable
COM	Comms
F	Fuel Line
D	Empty Duct
TL	Traffic Light Cable
G	Gas
P	Oil Pipe
	British Telecom
U	Unknown Trace
W	Water
	Foul Water Sewer
	Combined Water Sewer
	Surface Water Sewer
	Utility Survey Extents
	Other
	Chamber Extents
	End of Trace

UTILITY SURVEY SITE NOTES

- It has not been possible to detect the water main that records show is in the field. GPR techniques were limited by the waterlogged ground.
- It is recommended that trial excavations are used before construction to confirm the results of the utility survey.

Disclaimer

General Notes

Electro-magnetic techniques and/or ground penetrating radar have been used in the location of underground services. The results are not infallible and trial excavations should be carried out to confirm service identification, positions and depths. Although all reasonable practices have been undertaken to detect buried services, the information cannot be guaranteed. The methods of the survey does not differentiate between live and dead services, and as such all services should be treated as live. Where services are non-metallic, these would be located with GPR. However services are likely to go undetected, if they are smaller than 2 inches, or below 2 meters. Where we have been unable to trace a service, we may show an assumed route. This is not to be treated as exact.

Vertical & Horizontal Position

Vertical position (depth) is approximate to the trace. Drains may have been detected using a tracing wire, and the depth indicated could be between the bottom and top of the pipe. Horizontal position is indicative to the centre of the utility/service, and should not be taken as exact.

Warranty

Paint marks may fade, no warranty is given in respect of the durability of the paint marks. Therefore this drawing should be used as the primary reference for the survey results. This drawing does not provide an absolute representation of the sub-surface. Utilities have been detected using non invasive technologies only, and the performance can be adversely affected by ground, weather and site conditions. Therefore some utilities may be undetectable. While Landmark Surveys uses reasonable procedures to detect all utilities. It does not guarantee 100% detection will be achieved. Services at depths greater than 2m, will not be detectable.

Where a utility is shown on this drawing as a single line, this may represent multiple utilities. Where service records have been provided, Landmark Surveys will endeavor to match results in the field. However some results may coincidentally match a provided service location. This could result in false information being provided. Sewer and manhole details will be critical to the project design. Landmark Surveys would recommend that entry into the chamber be undertaken using a specialist team qualified for confined space entry.

Irrespective of the information provided by a utility survey and statutory plans, excavation work should be undertaken with extreme caution and in accordance with HSE guidelines - 'HSG47 Avoiding danger from Underground services'.

Ver. 2.9

REVISIONS/UPDATES & ASSOCIATED DETAILS

Dwg No	Details	By	Date
R1	HV extended and Road added	RL	10/01/24

LANDMARK SURVEYS WALES
THE SURVEY PEOPLE

~ www.lmswalesltd.co.uk ~ enquiries@lmswales.co.uk ~ Tel: 01554 821590

JOB TITLE
Hoppaworthy,
Devon

SHEET SIZE & SCALE A0 @ 1:500

DATE SURVEYED January 2024

DRAWING NUMBER 6804

DRAWN BY RL

CLIENT RES Group

Appendix C Site Investigation

6.10 Soakaways

Large scale soakaway testing was undertaken in TPs SA01-06 to assist with surface water drainage design. Infiltration rates were very low and it was only possible to undertake one partial test in each of the trial pits during the one day testing, with minimal reductions in induced water levels over extended time periods.

In order to calculate an infiltration rate for a soakaway test, the induced water level must reduce by 75% (i.e. must reach 25% storage volume). This did not occur in any of the pits. Table 5 summarises the testing.

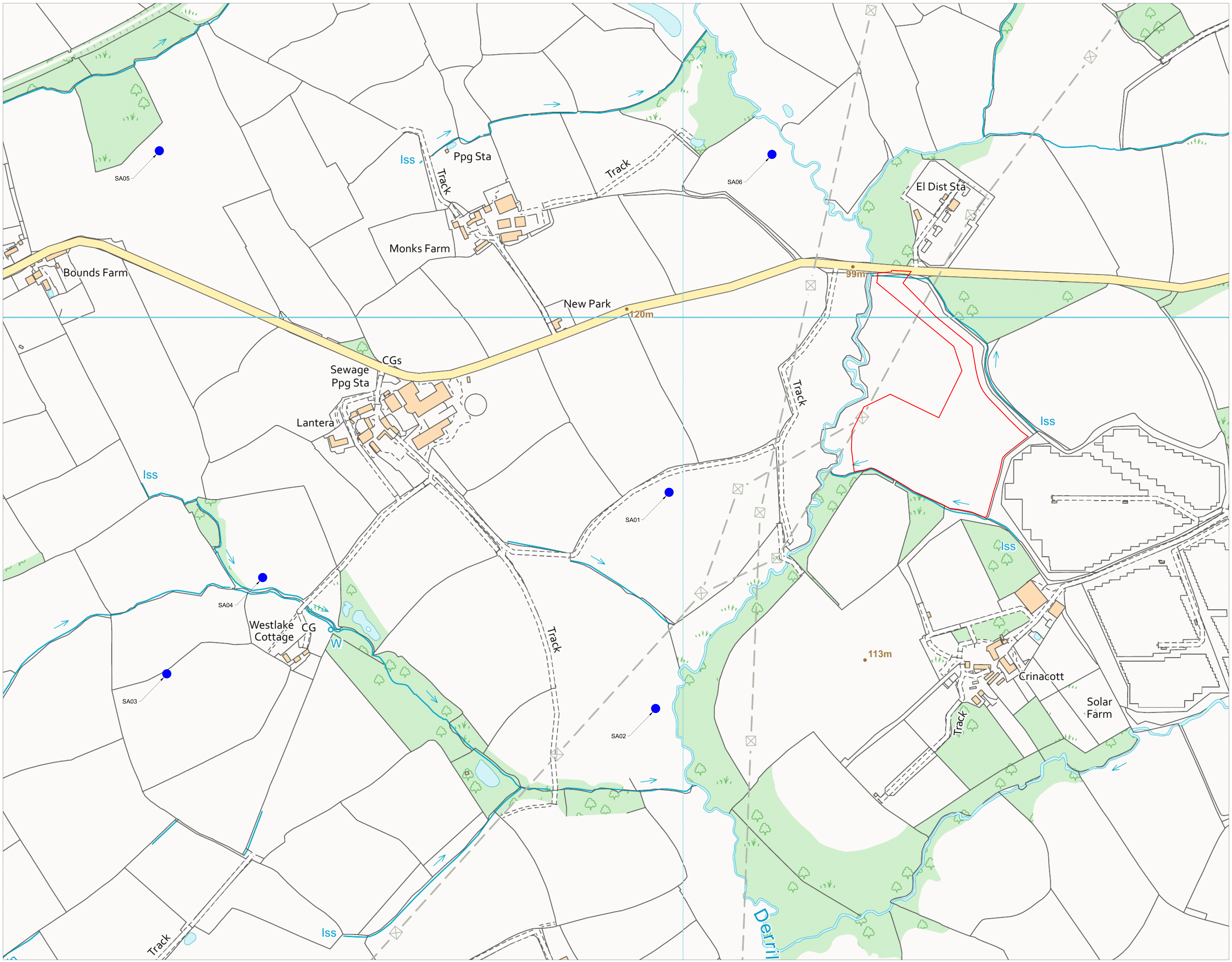
Table 5: Soakaway Test Results

TP ID	Test Results and Infiltration rate (m/s)
	1
SA01	Induced water level of 0.48m reduced to 0.89m over 258 minutes (27% reduction). Not possible to calculate infiltration rate.
SA02	Induced water level of 0.33m remained static over 172 minutes. Not possible to calculate infiltration rate.
SA03	Induced water level of 0.24m reduced to 0.43m over 285 minutes (25% reduction). Not possible to calculate infiltration rate.
SA04	Induced water level of 0.23m reduced to 0.26m over 310 minutes (2% reduction). Not possible to calculate infiltration rate.
SA05	Induced water level of 0.24m reduced to 0.27m over 232 minutes (2% reduction). Not possible to calculate infiltration rate.
SA06	Induced water level of 0.25m reduced to 0.33m over 219 minutes (5% reduction). Not possible to calculate infiltration rate.

The testing indicates that the natural soils have very low permeability as it was not possible to undertake a full test in any of the trial pits. CIRIA 156 (1996) recommends an infiltration rate of 3×10^{-06} m/s as the lower limit of acceptability for soakaway feasibility. Resulting infiltration rates on the site would be lower than this.

The cohesive soils will have a very low permeability (typical permeability for clay soils $\approx 1.0 \times 10^{-8}$ m/s, Barnes, 2000).

On this basis, an alternative surface water drainage strategy will be required.



KEY:

DEVELOPMENT BOUNDARY (OUTSIDE OF LINE DENOTES BOUNDARY)

INFILTRATION TEST LOCATION

TEST LOCATION CO-ORDINATES		
TP ID	EASTING	NORTHING
SA01	229981.90	101745.80
SA02	229962.40	101432.80
SA03	229254.70	101483.01
SA04	229393.50	101622.40
SA05	229243.90	102240.20
SA06	230130.80	102235.00

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
2	BM	BY APPD	MC	2024-05-24	UPDATED DEVELOPMENT BOUNDARY
1	BM	BY APPD	MC	2024-05-13	FIRST ISSUE

PURPOSE: PLANNING

COORDINATES: OSGB 1936

SCALE: 1:2,500 @ A1

DATUM: N/A

LAYOUT DWG: N/A

T-LAYOUT NO.: N/A

PROJECT TITLE: STONEWORTHY BESS

DRAWING TITLE: DERRILL WATER SOLAR INFILTRATION TEST LOCATIONS

RES DRAWING NUMBER: 05197-RES-DRN-DR-PT-001

REV: 2

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EGG FARM LANE,
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Appendix D FDA Form

Foul Drainage Assessment Form (FDA)

Please note: You should only use this form for planning related queries. You cannot use it to apply for an Environmental Permit but you may submit a copy of the information you have provided for planning purposes in support of your Environmental Permit application. Further information on how to apply for an environmental permit and general binding rules applicable to small discharges of domestic sewage effluent is available on the gov.uk website.

APPLICANT DETAILS
Name: Joseph McAlpine
Address: Beaufort Court, Egg Farm Lane, Kings Langley, Hertfordshire WD4 8LR
Telephone No: 07747216105
e-mail: joseph.mcalpine@res-group.com

We will use the information you provide on this form to establish whether non-mains drainage, either a new system or connection to an existing system, would be acceptable. It is important that you provide full and accurate information. Failure to do this will delay the processing of your application.

You must provide evidence that a connection to the public sewer is not feasible.

Other than in very exceptional circumstances, we will not allow the use of non-mains drainage as part of your Planning or Building Regulation application unless you can prove that a connection to the public sewer is not feasible. We do not consider non-mains drainage systems to be environmentally acceptable in locations where it is feasible to connect to a public sewer. Please note that a lack of capacity in, or other operating problems with, the public sewer are not valid reasons to use a non-mains drainage system where it is otherwise feasible to connect to a public sewer.

Where connection to the public sewer is feasible, you may need to get the agreement of either the owners of any land through which the drainage will run or, if you intend to connect via an existing private drain, the owner of that private drain.

The National Planning Practice Guidance and Building Regulations Approved Document H give a hierarchy of drainage options that must be considered and discounted in the following order:

1 Connection to the public sewer
2 Package sewage treatment plant (which can be offered to the Sewerage Undertaker for adoption)
3 Septic Tank
4 If none of the above are feasible a cesspool

You must respond to all the following questions. If you wish to submit additional information please do so, marked clearly “Additional Information”. **In some cases you will be required to provide further information in order to demonstrate that any non-mains foul drainage system proposed is acceptable.**

Feasibility of mains foul sewer connection	YES	NO
Have you provided a written explanation of why it is not feasible to connect to the public foul sewer with this form? *This must include a scaled map showing the nearest public foul sewer connection point - check with your local sewerage undertaker.*	x	
Is the distance from your site to the closest connection point to the public foul sewer less than the number of properties to be built on the site multiplied by 30m? *(see Guidance Note 2)*		x
Does your proposal form part of a phased development or planned development of a wider area? *If YES, please provide further details including references of any planning permissions already granted.*		x

Non-mains connection

Please provide a plan with dimensions that clearly shows the location of the whole system in relation to the proposed development and the position of the key elements e.g. septic tank, drainage fields and points of discharge.

1. Existing system	YES	NO
Do you intend to use an existing non-mains foul drainage system?		x
If YES, does the system already have an Environmental Permit issued by the Environment Agency? *(In the case of a cesspool write N/A)* If YES, please provide Environmental Permit reference number………………………	N/A	

2. Discharge	YES	NO
Do you propose to use a package treatment plant?		x
Do you propose to use a septic tank?		x
Do you propose to use a cesspool? *If YES go to Q4*	x	
Have you considered having your system adopted by the sewerage undertaker? *(see Guidance Note 7).*	N/A	N/A
Will all, or any part of, the discharge go to a drainage field or soakaway? *(see Guidance Note 3)* - this includes systems that combine a drainage field with a high level overflow to watercourse *If YES go to Q3.*	N/A	N/A
Do you intend to use a system that discharges solely to watercourse? *(see Guidance Note 3) If YES go to Q9.*	N/A	N/A

3. Water abstraction	YES	NO
Do you receive your water from the public mains supply?	N/A	N/A
If not, where do you get your water supply from?	N/A	

4. Cesspools *(For methods other than cesspools write N/A)*	YES	NO
Have you provided written justification for the use of a cesspool in preference to more sustainable methods of foul drainage disposal? *(see Guidance Note 4).*	x	

See section 5 of flood risk screening and drainage management plan.

5. Drainage field design *(For cesspools write N/A)*	**YES**	**NO**
Will the system discharge to a drainage field designed and constructed in accordance with British Standard BS6297:2007? If not, why not?	N/A	
Will the discharge from the system be located in a Source Protection Zone 1 (SPZ1)?		x

6. Ground Conditions *(For cesspools write N/A)*	**YES**	**NO**
6a. Have you submitted a copy of the percolation test results with this form *(see Guidance Note 6)?*	N/A	
6c. Is any part of the system in land which is marshy, water logged or subject to flooding?	N/A	
6d. Will the soakaway be located on artificially raised, made-up ground or ground likely to be contaminated? *If YES please provide details as additional information.*	N/A	
6e. Have you submitted the results of a trial hole at the site to establish that the proposed drainage field will be above any standing groundwater *(see Guidance Note 6)?*	N/A	

7. Available Land	**YES**	**NO**
Is the application site plus any available area for a soakaway less than 0.025 hectares ($250m^2$)?	N/A	

8. Siting of drainage field/soakaway discharge from a septic tank or package treatment plant or other secondary treatment. *You may need to make local enquiries to get a full answer to these questions.*	**YES**	**NO**
Will it be at least **10m** from a watercourse, permeable drain or land drain?	N/A	
Will it be at least **50m** from any point of abstraction from the ground for a drinking water supply (e.g. well, borehole or spring)? *This includes your own or a neighbour's supply.*	N/A	
Will the discharge be within a groundwater Source Protection Zone 1? *If yes, you will need to apply for an environmental permit*	N/A	
Are there any drainage fields/soakaways within **50m**? *This includes any foul drainage discharge system (other than the subject of this application) or surface water soakaway on either your own or a neighbour's property.*	N/A	
Will it be at least **15m** from any building?	N/A	
Will there be any water supply pipes or underground services within the disposal system, other than those required by the system? *(For cesspools write N/A)*	N/A	
Will there be any access roads, driveways or paved areas within the disposal area? *(For cesspools write N/A)*	N/A	

9. Siting of treatment plant, septic tank or cesspool	**YES**	**NO**
Is it at least **7m** from the habitable part of a building?	x	
Will there be vehicular access for emptying within **30m?**	x	
Can the plant, tank or cesspool be maintained or emptied without the contents being taken through a dwelling or place of work?	x	

10. Expected flow

Please estimate the total flow in litres per day *(see Guidance Note 5).*	0 l/d most days. 90l/d for routine maintenance. as per flows and loads – 4, full time day staff.

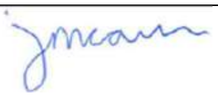
11. General Binding Rules for Small Sewage Discharges	YES	NO
Does the system meet the requirements of the General Binding Rules for small sewage discharges?	x	

12. Maintenance

6 monthly inspections to determine when maintenance actions are required. Maintenance requirements will vary subject to the extent of operation works required across the site.

13. Declaration

I declare that the above information is factually correct.

Name	Signature	Date
Joseph McApline		07/05/2024

GUIDANCE NOTES:

1) This form is for use with *the National Planning Practice Guidance, British Standard BS6297:2007 and Building Regulations Approved Document H.* It is intended to help Local Planning Authorities establish basic information about your non-mains drainage system and decide whether you need to submit a more detailed site assessment. If a detailed site assessment is requested but not submitted, your planning application might be refused.

2) Where the distance from a site to the closest point of connection to the foul sewer is less than the number of properties that are proposed to be built on that site multiplied by 30m an Environmental Permit will be required and an applicant will need to demonstrate as part of any application for such a permit why connection to the public foul sewer is not feasible.

Number of domestic properties served by the sewage treatment system [1] x 30 metres = Answer [30] metres

3) In addition to Planning Permission and Building Regulation approval **you may also require an Environmental Permit from the Environment Agency (EA). Please note that the granting of Planning Permission or Building Regulation approval does not guarantee the granting of an Environmental Permit. Upon receipt of a correctly filled in application form the EA will carry out an assessment. It can take up to 4 months before the Agency is in a position to decide whether to grant a permit or not**.

4) The use of cesspools is an option of last resort as set out in the non-mains drainage hierarchy of preference in Building Regulations Approved Document H. In principle, a properly constructed and maintained cesspool, being essentially a holding tank with no discharges, should not lead to environmental, amenity or public health problems. However, in practice, it is known that such problems occur as a result of frequent overflows due to poor maintenance, irregular emptying, lack of suitable vehicular access for emptying and even through inadequate capacity. In addition to this the requirement for frequent emptying is usually carried out by a contractor involving road transport with associated environmental costs. For these reasons, the use of cesspools will not normally be considered to be a long-term foul

sewage disposal solution. In view of the environmental risks associated with their use, any proposal to use cesspools must be fully justified to the Local Planning Authority

5) Package treatment plants and septic tanks should be designed and sized according to the advice given in the current edition of Flows and Loads, published by British Water. Volumes for larger systems should be calculated based on expected flows arising from the development.

6) You should refer to Building Regulations Approved Document H2 with regard to the general requirements for construction of non mains sewerage systems. **Sections 1.33 to 1.38** deal with the test requirements for trial holes and percolation tests and for convenience the text of these sections is repeated below:

1.33 A trial hole should be dug to determine the position of the standing groundwater table. The trial hole should be a minimum of 1m² in area and 2m deep, or a minimum of 1.5m below the invert of the proposed drainage field pipework. The ground water table should not rise to within 1m of the invert level of the proposed effluent distribution pipes. If the test is carried out in summer, the likely winter groundwater levels should be considered. A percolation test should then be carried out to assess the further suitability of the proposed area.

1.34 Percolation test method – A hole 300mm square should be excavated to a depth 300mm below the proposed invert level of the effluent distribution pipe. Where deep drains are necessary the hole should conform to this shape at the bottom, but may be enlarged above the 300mm level to enable safe excavation to be carried out. Where deep excavations are necessary a modified test procedure may be adopted using a 300mm earth auger. Bore the test hole vertically to the appropriate depth taking care to remove all loose debris.

1.35 Fill the 300mm square section of the hole to a depth of at least 300mm with water and allow it to seep away overnight.

1.36 Next day, refill the test section with water to a depth of at least 300mm and observe the time, in seconds, for the water to seep away from 75% full to 25% full level (i.e. a depth of 150mm). Divide this time by 150mm. The answer gives the average time in seconds (Vp) required for the water to drop 1mm.

1.37 The test should be carried out at least three times with at least two trial holes. The average figure from the tests should be taken. The test should not be carried out during abnormal weather conditions such as heavy rain, severe frost or drought.

1.38 Drainage field disposal should only be used when percolation tests indicate average values of V_p of between 12 and 100 and the preliminary site assessment report and trial hole tests have been favourable. This minimum value ensures that untreated effluent cannot percolate too rapidly into groundwater. Where V_p is outside these limits effective treatment is unlikely to take place in a drainage field. However, provided that an alternative form of secondary treatment is provided to treat the effluent from the septic tanks, it may still be possible to discharge the treated effluent to a soakaway.

N.B. When determining whether a discharge may be made under statutory General Binding Rules one of the requirements is that any drainage field must be designed and constructed in accordance with BS6297:2007. This specifies that the minimum percolation rate under that standard is 15s/mm and any discharge made to ground where the percolation rate is less than 15s/mm is subject to the granting of an Environmental Permit.

7) Developers may requisition a sewer from the Sewerage Undertaker to connect their development to the public sewer. Should this not be feasible on the grounds of cost and practicability, on site treatment in the form of package plants and their associated sewers (if constructed to an acceptable standard) can be offered to the sewerage undertaker for adoption. This approach is in support of advice from the Government contained in the National Planning Practice Guidance Developers are urged to discuss their requirements with the Sewerage Undertaker at the earliest possible opportunity.

8) Glossary

Package treatment plant
A package treatment plant is a system which offers varying degrees of biological sewage treatment and involves the production of an effluent which can be disposed of to ground via a drainage field or direct to a watercourse. There are many varieties of package treatment plant but all involve settling the solids before and/or after a biological treatment stage and almost all use electricity. Package treatment plants usually treat sewage to a higher standard than septic tanks but are vulnerable in the event of power failures and require more regular servicing and maintenance to ensure that they work effectively. The type of system chosen should be appropriate to the type of development proposed and take account of variations in flow and periods of inactivity, for example where the system will serve holiday accommodation where occupation and maintenance may be more irregular.

Septic tank
A septic tank is a two or three chamber system, which retains sewage from a property for sufficient time to allow the solids to form into sludge at the base of the tank, where it is partially broken down. The remaining liquid in the tank then drains from the tank by means of an outlet pipe.

Effluent from a septic tank is normally disposed of to ground via a drainage field and receives further treatment in the soils surrounding that drainage field, so that it does not generate a pollution risk to surface waters or groundwater resources (underground water). The most commonly used form of drainage field is a subsurface irrigation area, comprising a herringbone pattern of interconnecting dispersal pipes laid in shallow, shingle filled trenches. The dispersal pipes within the drainage field should be located at as shallow a depth as possible, usually within 1 metre of the ground surface. A septic tank typically needs to be desludged at least once a year in order to ensure that it continues to work effectively.

Cesspool
A cesspool is a covered watertight tank used for receiving and storing sewage and has no outlet. It relies on road transport for the removal of raw sewage and is therefore the least sustainable option for sewage disposal. It is essential that a cesspool is, and remains, impervious to the ingress of groundwater or surface water.

Appendix E Calculations

Calculation - Stoneworthy Greenfield Runoff Rates (IH124 and FEH)

PROJECT: Stoneworthy Energy Storage
PROJECT NO: 05197
REFERENCE NO: 05197-7814807

Issue	Date	Author	Nature and Location of Change
1	14/05/2024	Joe McAlpine	First issue

Note: revision history should include design stage, revision of load and other relevant information.

Peak Runoff Rates

This calculation can be used to determine the pre-development runoff rates for a project.

To determine pre development peak runoff rates, the modified rational method can be used to model the impervious areas and the IH124 and FEH statistical method can be used to calculate the pervious areas in accordance with CIRIA Guide C753.
The worst case methodology (lower rate) will be taken forward for the design.

1. INPUT PARAMETERS AND ASSUMPTIONS
1.1 First category of inputs - Hydrological Characteristics

	YES		Does this calculation include pervious area?
	NO		Does this calculation include impervious / semi-impervious area?
m5-60		mm	*Five Year - 60 Minute Rainfall Depth (see "Data" Tab)*
r			*Ratio M5-60/M5-2day (see "Data" Tab)*
Location			*E/W (England and Wales) or S/NI (Scotland and Northern Ireland)*
SAAR	1100	mm	*Standard Average Annual Rainfall from FSR Map (see "Data" Tab)*
SPR	47	%	*Standard Percentage Runoff from Wallingford maps or FSR Soil maps (see "Data" Tab)*
FARL	1		*A measurement of attenuation influence of water bodies in the catchement (typically assume FARL = 1 for a conservative value)*
BFIHOST	0.362		*A measure of the baseflow from the catchment (see "Data" tab)*
$F_{Qbar / Qmed}$	1.08		*Qbar / Qmed correlation factor (see"Data" tab)*

1.2 Second category of inputs - Catchment Area Characteristics

Ap	0.84	ha	*Pervious area*
Ai		ha	*Impervious Area (C= 1 assumed) (ha)*
S		m/km	*Catchment slope*
L		km	*Length of catchment*

2. CALCULATIONS
2.1 First calculation section - runoff from impervious areas (Modified Rational Method)

D		mins	*Time of Concentration (Bransby Williams) $D = 58 \times L(km) \times A(km^2)^{-0.1} \times S(m/km)^{-0.2}$*
z1			*See "Data" Tab*
M5-D		mm	*M5-D = M5-60min x Z1*
z2			*See "Data" Tab*
MT-D		mm	*MT-D = M5-D x Z2*
i		mm/hr	*i = MT-D / D*
Qi		l/s	*1 in # peak runoff from the impervious areas - Qi = 2.78 x C x i x A (where c = 1 for imp areas)*

2.2 Second calculation section - runoff from pervious areas (IH 124 Method)

Qbar	6.88	l/s	*Mean annual greenfield peak flow - $Qbar = 0.00108 \times AREA^{0.89} \times SAAR^{1.17} \times SPR^{2.17}$*

2.3 Third calculation section - runoff from pervious areas (FEH Statistical Method)

Qmed	9.41	l/s	*Peak rate of flow from a catchment for the median annual flood $Qmed = 8.3062 \times AREA^{0.851} \times 0.15361000 / SAAR \times FARL^{3.4451} \times 0.0460^{BFIHOST \times BFIHOST}$*
Qbar	10.12	l/s	*Mean annual greenfield peak flow - $Qbar = F_{Qbar / Qmed} \times Qmed$*

BESS Type : Catchment Area

Area (ha)	0.585

Preliminary Sizing

Volumetric Runoff Coefficient	0.750
Percentage Impervious (%)	100
Time of Concentration (mins)	5

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Substation Type : Catchment Area

Area (ha)	0.206

Preliminary Sizing

Volumetric Runoff Coefficient	0.750
Percentage Impervious (%)	70
Time of Concentration (mins)	5

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	70

Section of access track in cut Type : Catchment Area

Area (ha)	0.05

Preliminary Sizing

Volumetric Runoff Coefficient	0.750
Percentage Impervious (%)	70
Time of Concentration (mins)	5

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.750
Winter Volumetric Runoff	0.840
Time of Concentration (mins)	5
Percentage Impervious (%)	70

Attenuation Basin Type : Pond

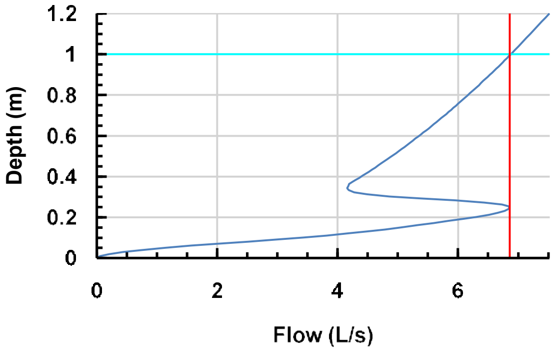
Outlets

Outlet

Outgoing Connection	(None)
Outlet Type	Hydro-Brake®

Invert Level (m)	99.000
Design Depth (m)	1.000
Design Flow (L/s)	6.88
Objective	Minimise Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☐

Unit Reference	CHE-0117-6880-1000-6880



Outfalls

Outfall	Outfall Type	Fixed Surcharged Level (m)	Level Curve
Attenuation Basin	Free Discharge		

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Rainfall

01597_Stoneworthy-FEH

Type: FEH

Site Location	GB 230200 99050 SX 30200 99050
Rainfall Version	1999
C (1km)	-0.025
D1 (1km)	0.406
D2 (1km)	0.291
D3 (1km)	0.380
E (1km)	0.280
F (1km)	2.501
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
1.0	0.000
2.0	0.000
10.0	0.000
30.0	0.000
100.0	45.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

Stoneworthy BESS: SuDS Design	Date: 03/05/2024		
	Designed by: James Mason	Checked by:	Approved By:
Report Details: Type: Stormwater Control Results Storm Phase: Phase	RES Group: Beaufort Court, Egg Farm Lane Kings Langley, Hertfordshire WD4 8LR		

Attenuation Basin
Critical Storm: 01597_Stoneworthy-FEH: 100 years: Increase Rainfall (%): +45: 720 mins: Winter

Type : Pond

Tables

Time (mins)	Total Inflow (L/s)	US Depth (m)	DS Depth (m)	Resident Volume(m³)	Flooded Volume (m³)	Total Outflow (L/s)
0	0.0	0.000	0.000	0.000	0.000	0.0
5	0.6	0.001	0.000	0.078	0.000	0.0
10	1.6	0.003	0.000	0.398	0.000	0.0
15	2.7	0.006	0.000	1.027	0.000	0.0
20	4.0	0.009	0.000	2.002	0.000	0.0
25	4.9	0.011	0.000	3.324	0.000	0.0
30	5.5	0.012	0.001	4.876	0.000	0.0
35	6.3	0.014	0.005	6.635	0.000	0.0
40	6.9	0.015	0.012	8.597	0.000	0.1
45	7.3	0.018	0.016	10.695	0.000	0.1
50	7.7	0.021	0.020	12.888	0.000	0.2
55	8.1	0.024	0.023	15.179	0.000	0.3
60	8.3	0.027	0.027	17.533	0.000	0.4
65	8.4	0.031	0.031	19.910	0.000	0.5
70	8.6	0.035	0.034	22.304	0.000	0.6
75	8.7	0.038	0.038	24.704	0.000	0.7
80	8.7	0.042	0.042	27.085	0.000	0.8
85	8.7	0.046	0.045	29.441	0.000	0.9
90	8.8	0.049	0.049	31.766	0.000	1.1
95	8.8	0.053	0.053	34.056	0.000	1.2
100	8.7	0.056	0.056	36.302	0.000	1.4
105	8.7	0.059	0.059	38.500	0.000	1.5
110	8.7	0.063	0.063	40.652	0.000	1.6
115	8.7	0.066	0.066	42.758	0.000	1.8
120	8.8	0.069	0.069	44.825	0.000	1.9
125	8.8	0.072	0.072	46.861	0.000	2.1
130	8.9	0.075	0.075	48.867	0.000	2.2
135	9.0	0.078	0.078	50.836	0.000	2.4
140	9.2	0.081	0.081	52.823	0.000	2.5
145	9.3	0.084	0.084	54.810	0.000	2.7
150	9.6	0.088	0.088	56.813	0.000	2.8
155	9.9	0.091	0.091	58.855	0.000	3.0
160	10.1	0.094	0.094	60.944	0.000	3.1
165	10.5	0.097	0.097	63.176	0.000	3.3
170	11.0	0.101	0.101	65.317	0.000	3.4
175	11.4	0.104	0.104	67.628	0.000	3.6
180	11.8	0.108	0.108	70.030	0.000	3.7
185	12.7	0.112	0.112	72.581	0.000	3.8
190	13.3	0.116	0.116	75.345	0.000	4.0
195	13.8	0.121	0.120	78.149	0.000	4.1
200	14.7	0.125	0.125	81.153	0.000	4.3
205	15.6	0.130	0.130	84.351	0.000	4.5
210	16.3	0.136	0.135	87.893	0.000	4.6
215	17.3	0.140	0.141	91.403	0.000	4.8
220	18.4	0.147	0.146	95.437	0.000	4.9
225	19.2	0.153	0.153	99.449	0.000	5.1
230	20.2	0.161	0.159	104.005	0.000	5.3
235	21.7	0.166	0.167	108.585	0.000	5.5
240	22.6	0.174	0.175	113.491	0.000	5.7

Time (mins)	Total Inflow (L/s)	US Depth (m)	DS Depth (m)	Resident Volume(m³)	Flooded Volume (m³)	Total Outflow (L/s)
245	23.6	0.183	0.182	118.731	0.000	5.8
250	25.3	0.190	0.193	124.230	0.000	6.1
255	26.4	0.200	0.201	130.308	0.000	6.3
260	27.4	0.212	0.208	136.464	0.000	6.5
265	29.1	0.222	0.218	142.960	0.000	6.6
270	30.4	0.233	0.229	149.803	0.000	6.7
275	31.5	0.242	0.242	157.067	0.000	6.8
280	32.9	0.255	0.252	164.631	0.000	6.9
285	34.6	0.267	0.265	172.873	0.000	6.7
290	35.7	0.282	0.280	181.557	0.000	6.1
295	36.8	0.293	0.293	190.601	0.000	5.4
300	38.7	0.309	0.308	200.396	0.000	4.7
305	39.7	0.324	0.323	210.863	0.000	4.3
310	40.7	0.343	0.340	221.615	0.000	4.2
315	42.3	0.359	0.357	232.887	0.000	4.2
320	43.4	0.377	0.375	244.416	0.000	4.3
325	44.3	0.395	0.394	256.213	0.000	4.4
330	45.5	0.414	0.414	268.526	0.000	4.5
335	46.5	0.433	0.432	280.816	0.000	4.6
340	47.2	0.452	0.450	293.571	0.000	4.6
345	48.0	0.472	0.470	306.402	0.000	4.8
350	48.8	0.497	0.489	319.548	0.000	4.8
355	49.2	0.513	0.510	332.775	0.000	4.9
360	49.6	0.531	0.532	346.138	0.000	5.1
365	49.6	0.554	0.553	359.526	0.000	5.1
370	49.3	0.575	0.570	372.726	0.000	5.2
375	48.9	0.594	0.593	385.774	0.000	5.3
380	48.0	0.614	0.613	398.930	0.000	5.4
385	47.2	0.634	0.633	411.419	0.000	5.5
390	46.5	0.652	0.651	423.847	0.000	5.6
395	45.5	0.673	0.672	436.005	0.000	5.7
400	44.3	0.689	0.690	447.767	0.000	5.7
405	43.4	0.707	0.707	459.125	0.000	5.8
410	42.4	0.723	0.724	470.338	0.000	5.9
415	40.8	0.741	0.739	481.056	0.000	5.9
420	39.7	0.755	0.755	491.230	0.000	6.0
425	38.7	0.769	0.770	501.266	0.000	6.0
430	36.9	0.786	0.785	510.722	0.000	6.1
435	35.7	0.799	0.800	519.766	0.000	6.2
440	34.6	0.813	0.813	528.479	0.000	6.2
445	33.0	0.827	0.825	536.773	0.000	6.3
450	31.6	0.838	0.838	544.591	0.000	6.3
455	30.5	0.850	0.849	552.026	0.000	6.4
460	29.1	0.861	0.860	558.978	0.000	6.4
465	27.6	0.872	0.870	565.658	0.000	6.4
470	26.5	0.880	0.879	571.720	0.000	6.5
475	25.4	0.888	0.889	577.612	0.000	6.5
480	23.7	0.898	0.897	583.048	0.000	6.5
485	22.7	0.905	0.905	587.972	0.000	6.5
490	21.8	0.912	0.911	592.629	0.000	6.6
495	20.2	0.919	0.918	597.010	0.000	6.6
500	19.3	0.924	0.924	600.975	0.000	6.6
505	18.5	0.930	0.930	604.692	0.000	6.6
510	17.3	0.935	0.936	607.953	0.000	6.7
515	16.3	0.941	0.939	611.064	0.000	6.7
520	15.6	0.944	0.944	613.769	0.000	6.7
525	14.8	0.951	0.945	616.249	0.000	6.7

Time (mins)	Total Inflow (L/s)	US Depth (m)	DS Depth (m)	Resident Volume(m³)	Flooded Volume (m³)	Total Outflow (L/s)
530	13.8	0.952	0.951	618.665	0.000	6.7
535	13.3	0.955	0.955	620.717	0.000	6.7
540	12.7	0.958	0.958	622.586	0.000	6.7
545	11.9	0.960	0.960	624.226	0.000	6.7
550	11.5	0.963	0.963	625.739	0.000	6.8
555	11.1	0.965	0.965	627.095	0.000	6.8
560	10.5	0.967	0.967	628.306	0.000	6.8
565	10.2	0.968	0.968	629.374	0.000	6.8
570	9.9	0.970	0.969	630.433	0.000	6.8
575	9.6	0.971	0.971	631.229	0.000	6.8
580	9.3	0.972	0.972	632.032	0.000	6.8
585	9.2	0.973	0.973	632.774	0.000	6.8
590	9.0	0.971	0.977	633.464	0.000	6.8
595	8.9	0.976	0.975	634.112	0.000	6.8
600	8.8	0.976	0.976	634.735	0.000	6.8
605	8.8	0.978	0.978	635.326	0.000	6.8
610	8.7	0.978	0.978	635.919	0.000	6.8
615	8.7	0.979	0.979	636.495	0.000	6.8
620	8.7	0.980	0.980	637.073	0.000	6.8
625	8.7	0.981	0.981	637.654	0.000	6.8
630	8.7	0.982	0.981	638.231	0.000	6.8
635	8.8	0.983	0.983	638.812	0.000	6.8
640	8.8	0.984	0.984	639.392	0.000	6.8
645	8.7	0.985	0.984	639.965	0.000	6.8
650	8.7	0.986	0.986	640.510	0.000	6.8
655	8.6	0.986	0.988	641.069	0.000	6.8
660	8.4	0.987	0.987	641.572	0.000	6.8
665	8.3	0.988	0.988	642.028	0.000	6.8
670	8.1	0.988	0.988	642.437	0.000	6.8
675	7.7	0.989	0.989	642.759	0.000	6.8
680	7.3	0.989	0.989	642.962	0.000	6.8
685	7.0	0.989	0.989	643.056	0.000	6.8
690	6.3	0.989	0.989	643.003	0.000	6.8
695	5.6	0.989	0.989	642.745	0.000	6.8
700	4.9	0.988	0.988	642.263	0.000	6.8
705	4.1	0.987	0.987	641.576	0.000	6.8
710	2.7	0.986	0.985	640.539	0.000	6.8
715	1.7	0.984	0.983	639.151	0.000	6.8
720	0.7	0.981	0.981	637.490	0.000	6.8
725	0.0	0.978	0.977	635.579	0.000	6.8
730	0.0	0.975	0.975	633.483	0.000	6.8
735	0.0	0.971	0.971	631.482	0.000	6.8
740	0.0	0.968	0.968	629.489	0.000	6.8
745	0.0	0.965	0.965	627.388	0.000	6.8
750	0.0	0.962	0.962	625.391	0.000	6.7
755	0.0	0.959	0.959	623.346	0.000	6.7
760	0.0	0.956	0.956	621.323	0.000	6.7
765	0.0	0.953	0.953	619.313	0.000	6.7
770	0.0	0.950	0.950	617.300	0.000	6.7
775	0.0	0.947	0.947	615.309	0.000	6.7
780	0.0	0.944	0.943	613.282	0.000	6.7
785	0.0	0.940	0.940	611.257	0.000	6.7
790	0.0	0.937	0.937	609.263	0.000	6.7
795	0.0	0.934	0.934	607.278	0.000	6.7
800	0.0	0.931	0.931	605.265	0.000	6.6
805	0.0	0.928	0.927	603.341	0.000	6.6
810	0.0	0.925	0.925	601.311	0.000	6.6

Time (mins)	Total Inflow (L/s)	US Depth (m)	DS Depth (m)	Resident Volume(m³)	Flooded Volume (m³)	Total Outflow (L/s)
815	0.0	0.922	0.922	599.291	0.000	6.6
820	0.0	0.919	0.919	597.379	0.000	6.6
825	0.0	0.916	0.916	595.336	0.000	6.6
830	0.0	0.913	0.913	593.366	0.000	6.6
835	0.0	0.910	0.910	591.390	0.000	6.6
840	0.0	0.907	0.907	589.437	0.000	6.6
845	0.0	0.904	0.904	587.479	0.000	6.5
850	0.0	0.901	0.901	585.492	0.000	6.5
855	0.0	0.898	0.898	583.558	0.000	6.5
860	0.0	0.895	0.895	581.580	0.000	6.5
865	0.0	0.892	0.892	579.635	0.000	6.5
870	0.0	0.889	0.889	577.679	0.000	6.5
875	0.0	0.886	0.886	575.752	0.000	6.5
880	0.0	0.883	0.883	573.849	0.000	6.5
885	0.0	0.880	0.880	571.879	0.000	6.5
890	0.0	0.877	0.877	569.924	0.000	6.5
895	0.0	0.874	0.874	568.023	0.000	6.4
900	0.0	0.871	0.871	566.091	0.000	6.4
905	0.0	0.868	0.868	564.131	0.000	6.4
910	0.0	0.865	0.865	562.215	0.000	6.4
915	0.0	0.862	0.862	560.297	0.000	6.4
920	0.0	0.859	0.859	558.374	0.000	6.4
925	0.0	0.856	0.856	556.484	0.000	6.4
930	0.0	0.853	0.853	554.574	0.000	6.4
935	0.0	0.850	0.850	552.643	0.000	6.4
940	0.0	0.847	0.847	550.734	0.000	6.3
945	0.0	0.844	0.844	548.827	0.000	6.3
950	0.0	0.841	0.841	546.931	0.000	6.3
955	0.0	0.839	0.838	545.036	0.000	6.3
960	0.0	0.836	0.835	543.151	0.000	6.3
965	0.0	0.833	0.832	541.251	0.000	6.3
970	0.0	0.830	0.830	539.389	0.000	6.3
975	0.0	0.827	0.827	537.542	0.000	6.3
980	0.0	0.824	0.824	535.622	0.000	6.3
985	0.0	0.821	0.821	533.736	0.000	6.2
990	0.0	0.818	0.818	531.887	0.000	6.2
995	0.0	0.815	0.815	530.001	0.000	6.2
1000	0.0	0.812	0.812	528.133	0.000	6.2
1005	0.0	0.810	0.810	526.290	0.000	6.2
1010	0.0	0.807	0.807	524.407	0.000	6.2
1015	0.0	0.804	0.804	522.599	0.000	6.2
1020	0.0	0.801	0.801	520.713	0.000	6.2
1025	0.0	0.798	0.798	518.869	0.000	6.2
1030	0.0	0.795	0.795	517.039	0.000	6.1
1035	0.0	0.793	0.793	515.208	0.000	6.1
1040	0.0	0.790	0.790	513.317	0.000	6.1
1045	0.0	0.787	0.787	511.485	0.000	6.1
1050	0.0	0.784	0.784	509.659	0.000	6.1
1055	0.0	0.781	0.781	507.842	0.000	6.1
1060	0.0	0.778	0.779	505.993	0.000	6.1
1065	0.0	0.776	0.776	504.185	0.000	6.1
1070	0.0	0.773	0.773	502.358	0.000	6.1
1075	0.0	0.770	0.770	500.565	0.000	6.0
1080	0.0	0.767	0.767	498.720	0.000	6.0
1085	0.0	0.764	0.764	496.936	0.000	6.0
1090	0.0	0.762	0.762	495.122	0.000	6.0
1095	0.0	0.759	0.759	493.331	0.000	6.0

Time (mins)	Total Inflow (L/s)	US Depth (m)	DS Depth (m)	Resident Volume(m³)	Flooded Volume (m³)	Total Outflow (L/s)
1100	0.0	0.756	0.756	491.515	0.000	6.0
1105	0.0	0.753	0.753	489.716	0.000	6.0
1110	0.0	0.751	0.750	487.917	0.000	6.0
1115	0.0	0.748	0.748	486.193	0.000	6.0
1120	0.0	0.745	0.745	484.341	0.000	6.0
1125	0.0	0.742	0.742	482.624	0.000	5.9
1130	0.0	0.740	0.740	480.791	0.000	5.9
1135	0.0	0.737	0.737	478.994	0.000	5.9
1140	0.0	0.734	0.734	477.291	0.000	5.9
1145	0.0	0.732	0.731	475.471	0.000	5.9
1150	0.0	0.729	0.729	473.709	0.000	5.9
1155	0.0	0.726	0.726	471.941	0.000	5.9
1160	0.0	0.723	0.723	470.167	0.000	5.9
1165	0.0	0.721	0.721	468.430	0.000	5.9
1170	0.0	0.718	0.718	466.671	0.000	5.8
1175	0.0	0.715	0.715	464.935	0.000	5.8
1180	0.0	0.713	0.713	463.174	0.000	5.8
1185	0.0	0.710	0.710	461.405	0.000	5.8
1190	0.0	0.707	0.707	459.656	0.000	5.8
1195	0.0	0.704	0.704	457.958	0.000	5.8
1200	0.0	0.702	0.702	456.181	0.000	5.8
1205	0.0	0.699	0.699	454.469	0.000	5.8
1210	0.0	0.697	0.696	452.730	0.000	5.8
1215	0.0	0.694	0.694	450.994	0.000	5.7
1220	0.0	0.691	0.691	449.286	0.000	5.7
1225	0.0	0.689	0.689	447.558	0.000	5.7
1230	0.0	0.686	0.686	445.835	0.000	5.7
1235	0.0	0.683	0.684	444.128	0.000	5.7
1240	0.0	0.681	0.681	442.429	0.000	5.7
1245	0.0	0.678	0.678	440.721	0.000	5.7
1250	0.0	0.676	0.675	439.020	0.000	5.7
1255	0.0	0.673	0.673	437.311	0.000	5.7
1260	0.0	0.670	0.670	435.612	0.000	5.7
1265	0.0	0.668	0.668	433.912	0.000	5.6
1270	0.0	0.665	0.665	432.230	0.000	5.6
1275	0.0	0.662	0.662	430.534	0.000	5.6
1280	0.0	0.660	0.660	428.854	0.000	5.6
1285	0.0	0.657	0.657	427.178	0.000	5.6
1290	0.0	0.655	0.655	425.512	0.000	5.6
1295	0.0	0.652	0.652	423.832	0.000	5.6
1300	0.0	0.650	0.649	422.146	0.000	5.6
1305	0.0	0.647	0.647	420.537	0.000	5.6
1310	0.0	0.644	0.644	418.822	0.000	5.5
1315	0.0	0.642	0.642	417.151	0.000	5.5
1320	0.0	0.639	0.639	415.490	0.000	5.5
1325	0.0	0.637	0.637	413.833	0.000	5.5
1330	0.0	0.634	0.634	412.234	0.000	5.5
1335	0.0	0.632	0.632	410.567	0.000	5.5
1340	0.0	0.629	0.629	408.895	0.000	5.5
1345	0.0	0.627	0.627	407.251	0.000	5.5
1350	0.0	0.624	0.624	405.612	0.000	5.5
1355	0.0	0.622	0.621	403.973	0.000	5.5
1360	0.0	0.619	0.619	402.334	0.000	5.4
1365	0.0	0.617	0.616	400.704	0.000	5.4
1370	0.0	0.614	0.614	399.105	0.000	5.4
1375	0.0	0.611	0.611	397.458	0.000	5.4
1380	0.0	0.609	0.609	395.828	0.000	5.4

Time (mins)	Total Inflow (L/s)	US Depth (m)	DS Depth (m)	Resident Volume(m³)	Flooded Volume (m³)	Total Outflow (L/s)
1385	0.0	0.607	0.606	394.229	0.000	5.4
1390	0.0	0.604	0.604	392.603	0.000	5.4
1395	0.0	0.602	0.601	390.996	0.000	5.4
1400	0.0	0.599	0.599	389.385	0.000	5.4
1405	0.0	0.597	0.597	387.801	0.000	5.3
1410	0.0	0.594	0.594	386.177	0.000	5.3
1415	0.0	0.592	0.592	384.617	0.000	5.3
1420	0.0	0.589	0.589	382.986	0.000	5.3
1425	0.0	0.587	0.587	381.420	0.000	5.3
1430	0.0	0.584	0.584	379.808	0.000	5.3
1435	0.0	0.582	0.582	378.238	0.000	5.3
1440	0.0	0.580	0.580	376.564	0.000	5.3

Appendix F Devon County Council SuDS Checklist

SuDS Pro Forma For Planning Applications
(To be read in conjunction with Devon County Council's Guidance for Sustainable Drainage Systems)

Applicant / Consultant:

Development Site:

Requirement	Stage of Planning	Info Provided (FRA / Calculation)	Submitted? Y/N
Existing Site Existing runoff rates should be calculated using an approved method as per Ciria SuDS Manual C753. The existing runoff rate calculation should be based on the impermeable area of the proposed development. The default soil values within hydraulic modelling software should not be tweaked. Has consideration been given to runoff from higher adjoining land which flows onto the site or existing watercourses/ditches on the site.	All Applications	Section 7.2. Calculations included in Appendix E.	Y Y Y Y
Proposed Surface Water Drainage Strategy Proposed surface water runoff rates should be stated; greenfield rates for greenfield sites and greenfield rates for brownfield sites however if this is not feasible we would expect a significant betterment to be proposed. The critical storm should be demonstrated. Is there a need for any Land Drainage Consents within the proposals? Is there an accessible drainage discharge point? Does this need to be assessed for its suitability/condition to accept the flows?	All Applications	Section 7.2. Calculations included in Appendix E. Section 6.4	Y Y N Y
Infiltration Led Design	Full		

Infiltration Testing Has BRE365 testing been carried out? • Correct depth (representative of the proposed infiltration feature) • Correct location (representative of the proposed infiltration feature) • 3 full test cycles completed • 25-75% effective depth achieved? **Groundwater Monitoring** Has the groundwater been monitored in line with our groundwater monitoring policy https://www.devon.gov.uk/floodriskmanagement/planning-and-development/suds-guidance/? Please note that soakaways should not be sited in Made Ground or in Fill material nor adjacent to or above the toe of any steep embankment. **Infiltration Design/ Calculations** Are half drain down times achieved as per Ciria SuDS Manual C753 25.7? Has an appropriate factor of safety been used as per the Ciria SuDS Manual C753. Table 25.2? Are the infiltration devices at least 5 m from buildings? Please note if the site gradient is less than 1 in 10, infiltration should not be used due to risk of water re-emerging downstream.	Reserved Matters Discharge of Conditions Infiltration testing can be conditioned at outline stage if a feasible alternative attenuated solution is proposed. Full Reserved Matters Discharge of Conditions All Applications	Refer section 6.2.1	Y (at adjacent site) N N/A
Attenuation Calculation Has FEH rainfall data set been used?	All applications	Section 7.2. Calculations included in Appendix E.	Y

Has 10% urban creep been applied for residential sites? Please note this is not applicable to roads or commercial sites Are Critical Drainage Standards required? Please note these are due to be updated winter 2021/2022. Have above ground SuDS been proposed? Has Long Term Storage been assessed?		Section 6.3.2 Section 3.4 Section 6.3 Section 6.3.3	N N Y N
Above Ground SuDS Design We are keen to ensure above ground features are designed with maximum benefit for the environment and to be sympathetic to the surrounding landscape. Side slopes should be varied with sides no steeper than 1 in 3. A 300 mm freeboard should be designed on top of the design water level. Basins should have sediment forebays and/or low flow channels. The flow paths (between the inlet and outlet) should be maximised to encourage opportunities for sedimentation. Please note that SuDS should not be situated in Flood Zones 2 or 3. **Tidal locking?** Can the network potentially be influenced by the tide? If so, the system should be designed with a tidal design level being the 1 in 200 year plus 100 years for climate change.	Full Reserved Matters Discharge of Conditions		N/A
Water Quality Assessed using SuDS indices as per Table 26.2 and Table 26.3 of Ciria SuDS Manual C753.	Full Reserved Matters Discharge of Conditions		N/A
Exceedance Flows A plan detailing how potential exceedance flows will be safely managed within the site.	Full Reserved Matters		N/A

What is the likelihood of theses flow paths being restricted in the future and what effect this would have?	Discharge of Conditions		N/A
Maintenance Details of who will maintain the proposed SuDS features. Maintenance schedules for all features should be submitted.	All applications	Section 8	Y