

SAB details:

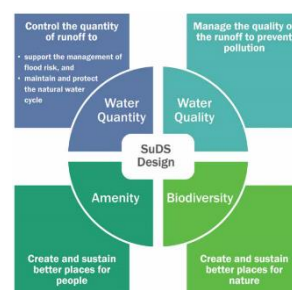


SuDS Approving Body
Flood & Water Management Team, Environment Department
Wrexham County Borough Council
Abbey Road South
Wrexham, LL13 9PW

Flood & Water Management Act 2010

Schedule 3 Sustainable Drainage

SuDS Scheme Application for SuDS Approving Body (SAB) Approval – Wales



Application Form for Full Application Approval of SuDS on new developments, in accordance with The Sustainable Drainage (Approval and Adoption Procedure) (Wales) Regulations 2018

Full Application Structure	
Full Application Form	(To complete & return)
Guidance on Completing the Full Application Form – including specific information and evidence required to support the application.	(For guidance)

(Use hyperlinks above to directly access the Form and Guidance)

Full Application Form

This form is based on the requirements provided by Welsh Government for the sole purpose of submitting information to the SuDS Approving Body (SAB) in accordance with the legislation detailed on this form and other relevant items of primary and subordinate legislation.

Please be aware that once you have downloaded this form, the SAB and Welsh Government will have no access to the form or the data you enter into it. Subsequent use of this form is solely at your discretion, including the choice to complete and submit it to the SAB in agreement with the declaration section.

Upon receipt of this form and any supporting information, it is the responsibility of the SAB to inform you of its obligations in regard to the processing of your application. Please refer to its website for further information on any legal, regulatory and commercial requirements relating to information security and data protection of the information you have provided.

Please Note:

1. **This form is for a Full SuDS Scheme Application for SAB approval ONLY;**
2. Approval of this application will be based on compliance with the [Statutory National Standards for Sustainable Drainage Systems \(SuDS\) for Wales](#), and [Statutory Instruments](#);
3. Once this application is made to SAB, it will be determined solely on the written technical and other information submitted with the full application;
4. You are strongly advised to have previously submitted a Pre-Application form to SAB, and engaged early, and directly, with the SAB, the LPA and all other relevant organisations that may have an interest in your SuDS scheme proposal, including the SAB statutory consultees listed below:
 - a. Sewerage undertaker
 - b. National Resources Wales
 - c. Highway Authority
 - d. Canal & River Trust
 - e. Internal Drainage Districts (NRW);
5. **For a valid SuDS Scheme Full Application to the SAB, all sections of this form MUST be fully completed; and**
6. **You are also required to provide technical information as indicated in the [Guidance](#) (or as otherwise directed by the SAB during Pre-Application discussions).**

We will process the information you provide so that we can deal with your application. We may also process or release the information to offer you documents or services relating to environmental matters and consult the public, public organisation and other organisations; provide information from the public register to anyone who asks or prevent anyone from breaking environmental law, investigate cases where environmental law may have been broken and take any action that is needed, and respond to requests for information under the Freedom of Information Act 2000 and the Environmental

Information Regulations 2004 (if the Data Protection Act allows).

Please ensure that the information you submit is accurate and correct and does not include personal or sensitive information. If you require any further clarification, please contact the SAB directly.

If printed, please complete using block capitals and black ink prior to submitting to the SAB.

Please read through the [Guidance](#) and complete this application form carefully ensuring all boxes are completed fully. If you fill in the application form correctly first time, the SAB can process it quicker.

Prior to the submission of this Full Application, applicants are strongly advised to make a Pre-Application submission to discuss their proposals with the SAB and ensure that an acceptable SuDS scheme is submitted. Please note that pre-application fees may apply.

Submissions made in support of this application shall be based upon current legislation and industry best practice including documents referenced in [Guidance on Making SuDS Applications for SAB Approval](#).

Proposals submitted should be developed by a competent and suitability qualified professional, experienced in drainage/ SuDs / flood risk management design.

Where applicable, the LPA planning reference or unique identifier must be included.

Applicants should complete this form and submit it, together with the necessary supporting documents, to Wrexham County Borough Council SAB. Details for the payment of the Full Application fee will be provided upon confirmation of receipt of a valid application. This confirmation will include a unique reference (SAB/FUL/20XX/XXX) that must be quoted on all future correspondence. Your valid application will not be processed until the application fee is received and cleared in full.

Payment of the Full Application fee can be made via:

Cheque: *Made payable to 'Wrexham County Borough Council'*

Cash: *At '16 Lord Street, Wrexham, LL11 1LG'*

Debit or Credit Card Payment: *Please contact us on 01639 686906 to make a payment using this method quoting the application reference number and/or address of the application site.*

*(The Authority does **NOT** accept American Express).*

BACS: *If paying by BACS please contact us on 01639 686906 so that details of Bank Name, Sort Code and Account No. can be given. When making a BACS payment a remittance advice must also be sent in Referencing 'S.A.B. Payment' to accounts@npt.gov.uk in conjunction with a notifying email to hdc@npt.gov.uk*

Your application will not be processed until the application fee is received and cleared in full.

When you have completed the application form please submit the form and associated documents to:

Electronically: SAB@wrexham.gov.uk

Postal: SuDS Approving Body

Flood & Water Management Team

Environment Department

Wrexham County Borough Council

Abbey Road South

Wrexham, LL13 9PW

If you are not sure about anything contained in the application form, please contact us.

Content

ALL sections of this form MUST be fully completed

- 1. Applicant Details**
- 2. Site Details**
- 3. Interest in Land**
- 4. Application**
- 5. Application Fee**
- 6. Environmental Impact Assessment (EiA) Statement**
- 7. Compliance with Statutory National Standards for Sustainable Drainage Systems (SuDS)**
- 8. Assessment of Flood Risk**
- 9. Surface Water Discharge Hierarchy**
- 10. Infiltration Assessment**
- 11. Non-performance Bond, Adoption, Operation & Maintenance**
- 12. SuDS Scheme Application Checklist**
- 13. Declaration**

1. Applicant Details**Applicant Name and Address**

Title and Name		
Company		
Suffix (unit/name/number)		
Address line 1		
Address line 2		
Address line 3		
Town		
County		
Postcode		
Phone number	Mobile	
	Works	
	Home	
e-mail address		

Agent Name and Address

Title and Name		Mr. Oliver Harvey
Company		Ambiental
Suffix (unit/name/number)		
Address line 1		Sussex Innovation Centre
Address line 2		Science Park Square
Address line 3		
Town		Brighton
County		East Sussex
Postcode		BN1 9SB
Phone number	Mobile	+44 (0)1273 006913
	Works	+44 (0)1273 006900
	Home	
e-mail address		Oliver.harvey@rhdhv.com

Preferred contact	Applicant	Agent x
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2. Site Details

A general description of site location supported by a plan specifying the construction area and the extent of the drainage system for which approval is sought MUST be submitted. Plans shall be at a scale of 1:2500. All plans MUST show the direction of North.

Name of proposed development	Land Adjacent to 4 Sunnyacre
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Grid Reference (E/N)	331966	352955
Suffix (unit/name/number)		
Address line 1	Land Adjacent to 4 Sunnyacre	
Address line 2		
Address line 3		
Town	Gwersyllt	
County	Wrexham	
Postcode	LL11 4RH	

Description of proposed development	Construction of a new dwelling	
Total application site area (Ha)	0.1Ha	
Is the existing site currently developed i.e. Brownfield or is it currently undeveloped i.e. Greenfield?	Undeveloped	
Existing use	Garden of No. 4	
Proposed use	1 x Residential dwelling	
Does the site cross more than one SAB area?	Yes ☐	No ☒
If "Yes", please confirm the proportionate area in each SAB below: (The main contact will be the SAB that has most of the surface water drainage system within its boundary.)		

SAB	% of Site Area

3. Interest in the Land

What interest do you have in the land?		
Owner	Yes ☐	No ☒
Prospective Owner	Yes ☐	No ☒
Other (please provide details)	Agent for owner	

4. Application

Has any prior advice been sought from the SAB about this application?		Yes ☐	No ☒
If Yes, please complete the following information about the advice you were given. This will help the SAB to deal with this application more efficiently.			
Officer Name			
Reference number		Date	DD MM YYYY
Details of pre-application advice received			

Does this application relate to any other SAB application already made?	Yes ☐	No ☒
If "Yes", please provide SAB Reference number		

Is this application part of a phased approach to development of the site, or one of multiple applications for the same site?	Yes ☐	No ☒
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If “Yes”, please provide brief details	
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Is this application one of two or more applications made at the same time, each setting out an alternative proposal for construction of a drainage system	Yes ☐	No ☒
If “Yes”, please provide details of other applications made at the same time (include SAB Reference number if available)		

5. Application Fee

It is recommended you contact the SAB directly to ensure the correct fee is paid with the application.

		Area of Land (Ha)	Fraction	Fees
Application fee		N/A	N/A	£350.00
Each 0.1ha or fraction of 0.1ha, for first 0.5ha	£70.00			
Each 0.1ha or fraction of 0.1ha, from 0.5ha up to and including 1ha	£50.00			
Each 0.1ha or fraction of 0.1ha, from 1ha up to and including 5ha	£20.00			
Each additional 0.1ha or fraction of 0.1ha above 5Ha.	£10.00			

Is the applicant a town/community council?	If yes, application fee is half the amount	
If applicable – reduction of 50% application fee due to this being an alternative proposal made at the same time.		
If applicable – application fee adjustment due to cross-SAB area approvals needed.		
		Total Fees

6. Environmental Impact Assessment (EiA) Statement

Does this application relate to a development that is the subject of an EiA application under the Town & Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017(1)?	Yes ☐	No ☒
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7. Compliance with Statutory National Standards for Sustainable Drainage Systems (SuDS)

All sustainable drainage systems **MUST** comply with the [Statutory National Standards for Sustainable Drainage Systems \(SuDS\) for Wales](#). You are advised to refer to the detailed text in the Standards that relate to the information required below. The Standards are re-produced, in the [Guidance](#) to assist in completing this application form.

Standard Principles

The Principles listed below will underpin the design of surface water management schemes to meet the Statutory National Standards. Please provide a brief summary in each of the boxes below relating to each of the bulleted Standard Principles and itemised Standards 1 to 6, showing how your proposed drainage scheme complies with this statutory requirement.

Compliance with Standard Principles
My proposed surface water drainage scheme will comply in the following way/s:
1. The full surface water runoff from the site for all events up to and including 100 +40%CC would be infiltrated in the ground via a soakaway and Type A permeable paving, keeping the surface water managed as shallow and as close to the source as possible. 2. Surface water runoff from the existing site is managed via infiltration into the surrounding areas. In order to keep water as close to the source as possible, soakaways will be used to infiltrate surface water runoff from the proposed roof areas. Type A permeable paving is to be utilised for the

hardstanding access areas. The permeable paving will not have any additional runoff directed to it and will only manage itself.

3. A soakaway is proposed to manage the runoff from the proposed roof area. This will be located at least 5m from the foundations of the proposed dwelling and at least 5m from the sloped retaining wall.
4. It is also proposed to utilise rainwater harvesting to collect roof water to provide some betterment proposed. This will be considered offline storage and have an overflow towards the proposed soakaway. The rainwater harvesting will consist of a small water butt to provide water for non-potable uses around the site.
5. Residential roof runoff is considered to be largely uncontaminated (however sediment traps are recommended) while other treatment for other hardstanding areas would be provided through permeable pavement. This would treat the runoff to an acceptable standard prior to infiltration.
6. The proposal is for full infiltration of the runoff for all events up to and including 100-year +40%CC. As such, there would be no offsite flows for all events up to and including 1:100-year +40%CC.
7. A climate change uplift to the rainfall intensity of 40% has been applied to the 100-year storm event. The proposed roof areas on site are measured to be 150m². The proposed hardstanding (patio and driveway) total 180m². The car parking area over the road is to be constructed used permeable materials (gravel). An additional 10% allowance for urban creep has also been allowed for, bringing the total impermeable surfacing to 330m² (Appendix 3, Calculations).
8. For the proposed roof areas, the runoff would be filtered through crushed stone prior to entering the soakaways. This is designed to remove sediments and boost the longevity of the soakaways.
9. The area surrounding the buildings will be of permeable construction to allow infiltration.
10. As the proposal is for infiltration and due to the topography on site, pumping would not be required for the surface water runoff. The soakaway is located on a low point of the site.
11. A maintenance plan is provided in Appendix 4.

Relevant items of supporting information (e.g. evidence, technical documents, plans and drawings etc.), as shown in [Table A](#) and [Table B](#) of this Guidance **MUST** be listed below, and all relevant material submitted.

1. Drawing "Location Plan" – Appendix 1
2. Drawing "Location & Site Plans" (Drg No: PD202/01) – Appendix 1
3. Drawing "Proposed Site Plan" (Drg No: PD202/02) – Appendix 1
4. Drawing "Proposed Floor Plans" (Drg No: PD202/03) – Appendix 1
5. Drawing "Proposed Elevations" (Drg No: PD202/04) – Appendix 1
6. Drawing "5997-DR01" – proposed drainage layout – Appendix 2

7. Drawing “5997-DR02” – proposed drainage details – Appendix 2
8. Calculations – Appendix 3
9. Maintenance plan – Appendix 4
10. Infiltration test results – Appendix 5

Standards 1 to 6

Compliance with Standard S1 - Surface water runoff destination

My proposed surface water drainage scheme will comply in the following way/s:

Priority Level 1: The proposal would utilise rainwater harvesting for parts of the roof runoff. Water could be used for watering the plants within the soft landscape areas of the proposals.

Priority Level 2: The roof runoff that has not been used on site would be directed to geocellular soakaways. Road/hardstanding runoff is infiltrated using Type A permeable pavement. The existing concrete access road is to remain as existing. The soakaways are designed to manage all runoff from roof areas up to and including 100-year +40%.

Relevant items of supporting information (e.g. evidence, technical documents, plans and drawings etc.), as shown in [Table A](#) and [Table B](#) of this Guidance **MUST** be listed below, and all relevant material submitted.

1. Drawing “Location Plan” – Appendix 1
2. Drawing “Location & Site Plans” (Drg No: PD202/01) – Appendix 1
3. Drawing “Proposed Site Plan” (Drg No: PD202/02) – Appendix 1
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5. Drawing “Proposed Elevations” (Drg No: PD202/04) – Appendix 1
6. Drawing “5997-DR01” – proposed drainage layout – Appendix 2
7. Drawing “5997-DR02” – proposed drainage details – Appendix 2
8. Calculations – Appendix 3
9. Maintenance plan – Appendix 4
10. Infiltration test results – Appendix 5

Compliance with Standard S2 - Surface water runoff hydraulic control

My proposed surface water drainage scheme will comply in the following way/s:

1,2,3,4: There would be no surface water runoff for all events up to and including 100-year +40%. The runoff for these events would be infiltrated in the ground.

5. The proposal is for the construction of a new residential dwelling. As such, the development is considered a Highly Vulnerable development under the TAN15 guidance. Therefore, the risk from events greater than 100-year +40% may be considered to have the potential for social disruption and risk to life. The site is in flood zone A. Upon investigation of the surface water flood maps, there is a low risk of flooding from surface water on site. The site slopes east to west towards

the access road that intersects the site boundary, the impact to the building could be considered minimal. Nevertheless, the building is to be raised to 93.00mAOD above external ground levels, to minimise the impact on the building (See Appendix 1 for site plans).

6. In the event of drainage system failure under extreme rainfall events (exceeding 100-year +40%) or blockage, flooding may occur within the site. In the event of the development's drainage system failure, the runoff flow will be dictated by topography on site. The topographic survey shows that the existing buildings are located on some of the highest part of the site, with levels dropping approximately 2-3m down towards the access road. As such, exceedance flow routes will naturally be directed away from the proposed dwelling. Furthermore, the building is raised above external ground levels which would mitigate against surface water flows into the building.

Relevant items of supporting information (e.g. evidence, technical documents, plans and drawings etc.), as shown in [Table A](#) and [Table B](#) of this Guidance **MUST** be listed below, and all relevant material submitted.

1. Drawing "Location Plan" – Appendix 1
2. Drawing "Location & Site Plans" (Drg No: PD202/01) – Appendix 1
3. Drawing "Proposed Site Plan" (Drg No: PD202/02) – Appendix 1
4. Drawing "Proposed Floor Plans" (Drg No: PD202/03) – Appendix 1
5. Drawing "Proposed Elevations" (Drg No: PD202/04) – Appendix 1
6. Drawing "5997-DR01" – proposed drainage layout – Appendix 2
7. Drawing "5997-DR02" – proposed drainage details – Appendix 2
8. Calculations – Appendix 3

Compliance with Standard S3 – Water Quality

My proposed surface water drainage scheme will comply in the following way/s:

Adequate treatment must be delivered to the water runoff to remove pollutants through SuDS devices, which are able to provide pollution mitigation. Pollution Hazards and the SuDS Mitigation have been indexed in the specialized literature CIRIA 753 'The SUDS Manual'. This is determined by the following restriction:

$$\text{Total SuDS Mitigation Index} \geq \text{Pollution Hazard Index}$$

The Pollution Hazard Indices are summarized in Table Amb1 below (reference: Table 26.2.CIRIA SuDS Manual 2015).

POLLUTION HAZARD INDICES FOR DIFFERENT LAND USE CLASSIFICATIONS				
LAND USE	Pollution Hazard Level	Total suspended Solids (TSS)	Metals	Hydro-carbons
Residential Roofs	Very Low	0.2	0.2	0.05
Individual property driveways	Low	0.5	0.4	0.4

Table Amb1: Summary of Pollution hazard Indices for different Land Use

INDICATIVE SuDS MITIGATION INDICES FOR DISCHARGES TO SURFACE WATER			
SuDS Component	Total suspended Solids (TSS)	Metals	Hydrocarbons
Permeable Pavement	0.7	0.6	0.7

Table Amb2: Summary of Pollution hazard Indices for different Land Use

Runoff from residential roof areas is considered to be generally uncontaminated, although sediment traps should be considered on the underground drainage to prevent impacts on the storage structure from sedimentation. Additionally, water would be treated by a layer of 2-6mm crushed stone laid under the base of the geocellular soakaway. This is designed to provide further filtration of the runoff prior to infiltrating in the ground.

The runoff from the hardstanding areas will be drained via self-draining Type A Permeable Paving. Table Amb2 shows that the permeable paving would provide adequate treatment to remove pollutants from the hardstanding/car parking areas.

Relevant items of supporting information (e.g. evidence, technical documents, plans and drawings etc.), as shown in [Table A](#) and [Table B](#) of this Guidance **MUST** be listed below, and all relevant material submitted.

1. Drawing "5997-DR01" – proposed drainage layout – Appendix 2
2. Drawing "5997-DR02" – proposed drainage details – Appendix 2
3. Calculations – Appendix 3

Compliance with Standard S4 – Amenity

My proposed surface water drainage scheme will comply in the following way/s:

Amenity benefits can be gained by enhancing the use of the site and utilising it for residential purposes. Soft landscaping in the form of garden/grassy areas will be incorporated into the design and privately maintained by the land owners. In addition, amenity benefits would be delivered through the multifunctional nature of the proposed permeable pavement. Space on site is limited to provide any substantial amenity benefits, however, amenity will be maximised as far as practicable

Relevant items of supporting information (e.g. evidence, technical documents, plans and drawings etc.), as shown in [Table A](#) and [Table B](#) of this Guidance **MUST** be listed below, and all relevant material submitted.

1. Drawing "Location & Site Plans" (Drg No: PD202/01) – Appendix 1
2. Drawing "Proposed Site Plan" (Drg No: PD202/02) – Appendix 1
3. Drawing "5997-DR01" – proposed drainage layout – Appendix 2
4. Drawing "5997-DR02" – proposed drainage details – Appendix 2

Compliance with Standard S5 – Biodiversity

My proposed surface water drainage scheme will comply in the following way/s:

Soft landscaping on the developed site in the form of garden/grassy areas are to be utilized. Biodiversity benefits can be gained by formalizing the holiday let use and ensuring that a private maintenance regime is implemented.

By ensuring that runoff is managed as close to the source as possible there should be no adverse impacts on biodiversity as a result of the development.

Relevant items of supporting information (e.g. evidence, technical documents, plans and drawings etc.), as shown in [Table A](#) and [Table B](#) of this Guidance **MUST** be listed below, and all relevant material submitted.

1. Drawing "Location Plan" – Appendix 1
2. Drawing "Location & Site Plans" (Drg No: PD202/01) – Appendix 1
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5. Drawing "Proposed Elevations" (Drg No: PD202/04) – Appendix 1
6. Drawing "5997-DR01" – proposed drainage layout – Appendix 2
7. Drawing "5997-DR02" – proposed drainage details – Appendix 2

Compliance with Standard S6 – Design of drainage for Construction and Maintenance and Structural Integrity

My proposed surface water drainage scheme will comply in the following way/s:

1. The permeable paving can be 'type A' to the majority of hardstanding areas around the site and infiltrate runoff from its own area which should provide a cost-effective and time efficient construction of the permeable pavement. Keeping excavations as shallow as practical has been a major design consideration in order to reduce risk and allow easy, safe, cost-effective and time efficient construction. Materials used for the permeable paving construction should be graded to give the right balance between achieving good structural performance and providing sufficient permeability.
2. It is proposed for the developer to consider soakaway systems made of recycled polypropylene. This would reduce the embodied carbon of the proposed drainage system. The feasibility of such a system must be confirmed with a manufacturer whilst considering the relatively confined nature of the site.
3. Maintenance of the proposed systems is provided in Appendix 4. As all elements are relatively shallow and accessible, maintenance can be conducted in an easy, safe, cost effective and timely manner.
4. Simple regular maintenance activities (weeding, litter removal) can be undertaken by the owner. If a CCTV survey is required then a specialist contractor can cost in the region of £300-£600, any additional fees for

jetting/remedial works will be additional. A breakdown of indicative costs for SuDS features has been provided in Appendix 4.

5. CBR tests are advised to be carried out for the proposed site to identify equilibrium CBR values that will achieve the appropriate structural integrity of the subgrade paving.

Relevant items of supporting information (e.g. evidence, technical documents, plans and drawings etc.), as shown [Table A](#) and [Table B](#) of this Guidance **MUST** be listed below, and all relevant material submitted.

1. Drawing "Location Plan" – Appendix 1
2. Drawing "Location & Site Plans" (Drg No: PD202/01) – Appendix 1
3. Drawing "Proposed Site Plan" (Drg No: PD202/02) – Appendix 1
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5. Drawing "Proposed Elevations" (Drg No: PD202/04) – Appendix 1
6. Drawing "5997-DR01" – proposed drainage layout – Appendix 2
7. Drawing "5997-DR02" – proposed drainage details – Appendix 2
8. Maintenance plan – Appendix 4

8. Assessment of Flood Risk

Is the site within an area at risk of flooding? Refer to Natural Resources Wales Development Advice maps. (Natural Resources Wales / Development and flood risk)	Yes ☐	No ☒
If the proposed development is within the area at risk of flooding, you will need to consider whether it is appropriate to submit a flood consequences assessment. (Refer to Technical Advice Note 15 (TAN15)).		

Is the site located within an area susceptible to surface water flooding? Refer to NRW Surface Water Flood Maps . <i>Low Surface Water Flood Risk.</i>	Yes ☐	No ☒
Is the site located within an area susceptible to groundwater flooding? <i>limited potential for groundwater flooding to occur' (BGS, 2020)</i>	Yes ☐	No ☒
Is there a watercourse (as defined under Section 72 Land Drainage Act 1991) located within 20m of the proposed development?	Yes ☐	No ☒

9. Surface Water Discharge Hierarchy

Surface water drainage arrangements shall demonstrate the proposed surface water drainage complies with National SuDS Standards. As much of the runoff as possible should be discharged to each hierarchy element before a lower hierarchy element is considered. Collection and infiltration methods of drainage are required to be considered in the first instance. With reference to the hierarchy levels below, please indicate your proposed drainage arrangements.

Level	Yes	No
1. Collect for use	☒	☐
2. Infiltration	☒	☐
3. To watercourse	☐	☒
a. Is it an Ordinary Watercourse?	☐	☒
b. Is it a Main River?	☐	☒
4. To surface water sewer	☐	☒
a. Is it a Highway drain?	☐	☒
b. Is it a public sewer?	☐	☒
c. Is it a private sewer?	☐	☒
d. Other	☐	☒
5. To combined sewer	☐	☒

Has advice been sought from the asset owners?	Yes ☐	No ☒
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Has advice been sought from the land owners?	Yes ☐	No ☒
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10. Infiltration Assessment

Where infiltration drainage is proposed, testing should be carried out to a methodology agreed with the SAB e.g. [Infiltration Drainage - Manual of Good Practice \(CIRIA R156\)](#) and [BRE Soakaway Design \(DG 365 – 2016\)](#), and be used to inform the design, construction, maintenance, testing and assessment of infiltration systems.

Has infiltration testing been carried out?		Yes ☒	No ☐
Analysis of development Geology (including both bedrock and superficial deposits where known)		Superficial deposits are Glaciofluvial Sheet Deposits, Devensian - Sand and gravel Bedrock geology is recorded as Pennine Lower Coal Measures Formation and Pennine Middle Coal Measures Formation (Source: BGS)	
		Soil described as being freely draining slightly acid loamy soils (Source: Soilscales Online).	
		BGS borehole records (BGS ID: 155593: BGS Reference: SJ35SW733, 331700, 352810) in the area describe the soils as having compact sand and gravel underlain by silty sand. See attached borehole records and infiltration testing in Appendix 5	
Depth to groundwater (metres)		Groundwater was not struck in the borehole to 1.6m depth.	
Borehole testing	Reference	See Appendix 5	

	Date		September	2021
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Has a Contaminated Land Assessment been undertaken?	Yes ☐	No ☒
Is the infiltration drainage proposed on contaminated land?	Yes ☐	No ☒

Infiltration test result	Infiltration tests show an okay infiltration rate of approx. 0.022m/hr (see appendix 5) 6.17 x 10 ⁻⁶ m/s
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11. Non-performance Bond, Adoption, Operation & Maintenance

What are your proposals regarding cost of works, adoption and maintenance of the SuDS scheme?

Non-performance Bond – Estimated cost of work	See Appendix 4
Adoption (including land agreements etc)	The proposed drainage systems would remain private.
Funded Maintenance Plan for the lifetime of the development	Maintenance plan attached in the Appendix 4

12. SuDS Scheme Application Checklist

Please complete the following checklist and make sure you have read the [Guidance on Making SuDS Applications for SAB Approval](#), the [Guidance on](#)

<u>completing the Full Application Form</u>, and provided all the necessary information in support of your application:	
Correct Full Application fee.	Yes ☒
Completed, signed and dated Full Application form.	Yes ☒
Plan/s specifying the construction area and the extent of the drainage system for which approval is sought. All plan/s shall be at a scale of 1:2500 and MUST show the direction of North.	Yes ☒
Taken account of SAB <u>Guidance</u> on technical information to be submitted to enable SAB to assess your Full Application.	Yes ☒

13. Declaration

I/ we hereby apply for SuDS Approval as described in this form and the accompanying plans/drawings and additional information. I confirm that I have read and complied with the National SuDS Standards and, to the best of my knowledge, any facts stated are true and accurate and any opinions given are the genuine opinions of the persons giving them.

This form has been completed using evidence from the Flood Consequences Assessment where applicable, surface water drainage strategy and site plans and associated documents.

This form has been completed using accurate information. It can be used as a summary of the detailed surface water drainage proposals on this site, and clearly shows that these drainage proposals conform to the National SuDS Standards for Wales.

Form completed by	Oliver Harvey
Signature	
Qualification of person responsible for signing off this application	Steven Brown - B.Eng., M.Sc., MCIWEM C.WEM, AMICE
Company	Ambiental Environmental Assessment
On behalf of (Client's details)	
Date	18/10/2020

Disclaimer

Information provided on this form and in supporting documents may be published on the SABs SuDS register and website and be made publicly available.

Guidance on completing the Full Application Form

This guidance comprises:

- [General comments](#)
- [Detailed questions to be answered to show compliance with Statutory National Standards for Sustainable Drainage Systems \(SuDS\)](#);
- [Table A - Information and evidence](#); and
- [Table B – Plans and drawings](#).

General comments

Applications for approval must be submitted using this **Full Application** form provided by the SAB. **USE OF THIS FORM IS MANDATORY** as it has been developed to ensure your application has due regard to the statutory requirements.

This form is for SAB approval ONLY, and you are also advised to engage early, and directly, with the LPA and all other relevant organisations that may have an interest in your SuDS scheme proposal, including the SAB statutory consultees listed below:

- Sewerage undertaker;
- Natural Resources Wales;
- Highway Authority;
- Canal & River Trust; and
- Internal Drainage Districts (NRW).

You are advised to commence **Pre-Planning Application discussions** with the LPA at the earliest opportunity and undertake discussions with both the SAB and the LPA simultaneously.

Development on site should not commence until formal Planning Approval AND Full SAB Approval has been given.

It is important that you keep SAB officers and planning officers informed of progress and decisions with regard to the planning application and the SAB application, as they are separate applications, with different requirements, timescales and approval bodies.

Engaging in **Pre-Application discussions** with the SAB at the outset of your SuDS concept design is strongly advised. Effective **Pre-Application discussions** and **Master Planning** can ensure a robust, cost effective and viable surface water management strategy and SuDS scheme design. SAB can help you determine the optimum SuDS solution for your site by providing an early indication of what may or may not comply with the National SuDS Standards.

Please provide as much technical information as possible to the SAB to enable a considered and reasoned response to be given at both the **Pre-Application and Full**

Application stages. i.e. the more information provided at the **Pre-Application stage**, the more detailed technical advice can be given.

The site-specific surface water drainage assessment and SuDS requirements should be integrated with the **Flood Consequences Assessment (FCA)**, and an integrated **Flood and Surface Water Drainage Report** provided to both the LPA and the SAB.

Please refer to key national and local documents prior to, and during the concept design, detailed design, SAB and LPA approvals, construction, adoption, operation & maintenance of a SuDS scheme. A list of, and links to, these documents are provided in the [Guidance on Making SuDS Applications for SAB Approval](#).

With specific regard to the **Full Application**:

- To ensure a **Valid Application**, all questions on the form MUST be answered, and ALL supporting material MUST be submitted as indicated in the [Guidance on completing the Full Application Form](#) (or as otherwise agreed with the SAB);
- Your response to questions should be comprehensive and reflect the specific requirements of the Statutory National Standards;
- Once your application form together with any supporting material has been submitted to the SAB, it will be **validated**;
- **Please be aware that if the questions have not been answered as indicated on the form and by the requirements above, your application will be automatically refused;**
- If deemed to be a **valid application**, your submission will be technically assessed by the SAB;
- Once a **Full SuDS Scheme Application** is received, the SAB will determine it solely on the written technical and other information submitted with the full application;
- Only in exceptional circumstances, will SAB contact you during its assessment of the **Full SuDS Scheme Application**, therefore it's essential that any technical uncertainties or issues are dealt with by all parties as part of the Pre-Application process, and prior to the **Full Application** being submitted;
- In accordance with the statutory requirements, SAB will notify you of the outcome of its technical assessment of your **Full Application**; and
- The **Full Application** may be **Approved** subject to **Conditions** or it may be **Refused**, in which case you will be informed of the reasons why.

Please provide three hard copies and one electronic copy sent to hdc@npt.gov.uk.

Please refer to the relevant [Ciria SuDS Manual C753](#) chapters, and additional references indicated.

Detailed questions to be answered to show compliance with Statutory National Standards for Sustainable Drainage Systems (SuDS)

For **each of the Standards**, relevant items of supporting information (e.g. evidence, technical documents, plans and drawings etc.), as shown in [Table A](#) and [Table B](#) of this Guidance, **MUST** be listed on the application form and all relevant material submitted.

Standard Principles

The Principles listed below underpin the design of surface water management schemes to meet the [Statutory National Standards for Sustainable Drainage Systems \(SuDS\) for Wales](#). Where possible, please provide a brief summary relating to each Principle, showing how your proposed surface water drainage scheme complies with this statutory requirement.

Compliance with Standard Principles

The SuDS scheme requirements are shown below:

1. How do you propose to manage water on or close to the surface and as close to the source of the runoff as possible?
(see **Standard S1** and **Standard S2**)
2. How do you propose to treat rainfall as a valuable natural resource?
(see **Standard S1** and **Standard S2**)
3. How do you propose to ensure pollution is prevented at source, rather than relying on the drainage system to treat or intercept it?
(see **Standard S3**)
4. How do you propose to manage rainfall to help protect people from increased flood risk, and the environment from morphological and associated ecological damage resulting from changes in flow rates, patterns and sediment movement caused by the development?
5. How do you propose to take account of likely future pressures on flood risk, the environment and water resources such as climate change and urban creep?
6. How do you propose to use the SuDS Management Train, using drainage components in series across a site to achieve a robust surface water

management system (rather than using a single “end of pipe” feature, such as a pond, to serve the whole development)? (see Standard S1, Standard S2 and Standard S3)
7. How do you propose to maximise the delivery of benefits for amenity and biodiversity? (see Standard S4 and Standard S5)
8. How do you propose to make the best use of available land through multifunctional usage of public spaces and the public realm?
9. How do you propose that the SuDS scheme performs safely, reliably and effectively over the design life of the development taking into account the need for reasonable levels of maintenance? (see Standard S6)
10. How do you propose to avoid the need for pumping where possible?
11. How do you propose to ensure the scheme is affordable, taking into account both construction and long-term maintenance costs and the additional environmental and social benefits afforded by the system?
12. Applications should be accompanied by proposals for a maintenance plan and the means of funding for the scheme for its design life.

Standard S1 - Surface water runoff destination

The requirements of Standard S2 listed below address the use of surface water by the development and where it should be discharged. The aim is to ensure that runoff is treated as a resource and managed in a way that minimises negative impact of the development on flood risk, the morphology and water quality of receiving waters and the associated ecology. This will ensure that early consideration is given to the use of rainwater harvesting systems to both manage runoff and deliver a source of non-potable water for the site where practical. Where it is not, prioritisation should be given to infiltration. Discharges to sewerage systems should be limited where possible.

As much of the runoff as possible (subject to technical or cost constraints) should be discharged to each destination before a lower priority destination (level) is considered.

Depending on the site characteristics, drainage from different parts of the site could have different drainage destinations.

Depending on the quantity of runoff and the potential for a particular destination to manage that runoff, small events may discharge to a higher level while larger events may need to make use of lower priority destinations.

Compliance with Standard S1 - Surface water runoff destination

Priority Level 1 is the preferred (highest priority) and 4 and 5 should only be used in exceptional circumstances.

Proposed drainage scheme runoff destinations, and the reasons for proposing these, **MUST** be indicated as shown below. If/where Priority Level 1 or Priority Level 2 run off destination/s are unable to be achieved, the reasons for this **MUST** also be provided.

Priority Level 1: Surface water runoff is collected for use.

Priority Level 2: Surface water runoff is infiltrated to ground.

Note: If any runoff is not infiltrated to ground, and a lower priority level of surface water runoff destination is proposed, "Exception Criteria" **MUST** be demonstrated and evidence provided.

Priority Level 3: Surface water runoff is discharged to a surface water body.

Priority Level 4: Surface water runoff is discharged to a surface water sewer, highway drain, or another drainage system.

Priority Level 5: Surface water runoff is discharged to a combined sewer.

Note: Strong presumption against discharge to a combined sewer.

Standard S2 - Surface water runoff hydraulic control

The aim of Standard S2 listed below is to manage the surface water runoff from, and on a site, to protect people on the site from flooding from the drainage system for events up to a suitable return period. Also, to mitigate any increased flood risk to people and property downstream of the site as a result of the development, and to protect the receiving water body from morphological damage.

Compliance with Standard S2 - Surface water runoff hydraulic control

The SuDS scheme **MUST** comply with the following:

1. Surface water should be managed to prevent, so far as possible, any discharge from the site for the majority of rainfall events of less than 5mm.

2. The surface water runoff rate for the 1 in 1-year return period event (or agreed equivalent) should be controlled to help mitigate the negative impacts of the development runoff on the morphology and associated ecology of the receiving surface water bodies.
3. The surface water runoff (rate and volume) for the 1% (1 in 100 year) return period event (or agreed equivalent) should be controlled to help mitigate negative impacts of the development on flood risk in the receiving water body.
4. The surface water runoff for events up to the 1% (1 in 100 year) return period (or agreed equivalent) should be managed to protect people and property on and adjacent to the site from flooding from the drainage system.
5. The risks (both on site and off site) associated with the surface water runoff for events greater than the 1% (1 in 100 year) return period should be considered. Where the consequences are excessive in terms of social disruption, damage or risk to life, mitigating proposals should be developed to reduce these impacts.
6. Drainage design proposals should be examined for the likelihood and consequences of any potential failure scenarios (e.g. structural failure or blockage), and the associated flood risks managed where possible.

Standard S3 – Water Quality

Standard S3 shown below addresses the drainage design requirements to minimise the potential pollution risk posed by the surface water runoff to the receiving water body.

Compliance with Standard S3 – Water Quality

The SuDS scheme **MUST** comply with the following:

1. Surface water runoff should be treated to prevent negative impacts on the receiving water quality and/or protect downstream drainage systems, including sewers.

Standard S4 – Amenity

Standard S4 shown below addresses the design of SuDS components to ensure that, where possible, they enhance the provision of high quality, attractive public space which can help provide health and wellbeing benefits, they improve liveability for local

communities and they contribute to improving the climate resilience of new developments.

Compliance with Standard S4 – Amenity

The SuDS scheme **MUST** comply with the following:

1. The design of the surface water management system should maximise amenity benefits.

Standard S5 – Biodiversity

Standard S5 shown below addresses the design of SuDS to ensure that, where possible, they create ecologically rich green and blue corridors in developments and enrich biodiversity value by linking networks of habitats and ecosystems together. Biodiversity should be considered at the early design stage of a development to ensure the potential benefits are maximised.

Compliance with Standard S5 – Biodiversity

The SuDS scheme **MUST** comply with the following:

1. The design of the surface water management system should maximise biodiversity benefits.

Standard S6 – Design of drainage for Construction and Maintenance and Structural Integrity

Standard S6 shown below deals with designing robust surface water drainage systems so that they can be easily and safely constructed, maintained and operated, taking account of the need to minimise negative impacts on the environment and natural resources.

Compliance with Standard S6 – Design of drainage for Construction and Maintenance and Structural Integrity

The SuDS scheme **MUST** comply with the following:

1. All elements of the surface water drainage system should be designed so that they can be constructed easily, safely, cost-effectively, timely manner, and with the aim of minimising the use of scarce resources and embedded carbon (energy).
2. All elements of the surface water drainage system should be designed so that maintenance and operation can be undertaken (by the relevant responsible

body) easily, safely, cost-effectively, in a timely manner, and with the aim of minimising the use of scarce resources and embedded carbon (energy).

3. The surface water drainage system should be designed to ensure structural integrity of all elements under anticipated loading conditions over the design life of the development site, taking into account the requirement for reasonable levels of maintenance.

Note:

Information provided may be published on the SABs SuDS register and website and be made publicly available.

TABLE A: Specific information and evidence required for the Full Application

Flood Consequences Assessment (FCA) – (See [Technical Advice Note 15: Development and Flood Risk \(TAN15\)](#))

REASON: To show existing and future flood risks to and from the site, and how these will be managed to ensure people and property remain safe for the lifetime of the development. The assessment will include:

- The requirements of TAN 15; and
- Frequent references and links to relevant planning conditions, reserved planning matters, and to the FCA.

Detailed Geotechnical Factual and Interpretive Report – (See also specific [Ciria SuDS Manual C753](#) Chapters 13 & 25)

REASON: To show existing on site and relevant off-site physical properties of soils, rocks and features, and demonstrating that the proposed method of surface water drainage is appropriate for the geology of the site; and will continue to perform to its design criteria for the lifetime of the development. The report will include:

- Topography, geology & site history;
- Significant constraints (incl. soluble rocks, landslides, shallow mining, shallow groundwater, made ground, contaminated land);
- Drainage potential (incl. depth to water table, permeability of superficial deposits, thickness of superficial deposits, permeability of bedrock, presence of floodplains);
- Ground stability (incl. soluble rocks, landslides, shallow mining, running sands, swelling clays, compressible ground, collapsible ground);
- British Geological Survey BGS GeoSure Maps (incl. artificial deposits, superficial deposits, bedrock);
- Borehole & trial pit locations, monitoring & any related information;
- Detailed infiltration assessment (incl. evidence of soil types, soil infiltration coefficients & Standard Percentage Run-off (SPR) calculations);
- Where pervious pavements are proposed in certain soil types, soaked CBRs are required;
- Laboratory work;
- Where possible, detailed evidence of groundwater table levels over recent 12-month period or other validated evidence; and
- Groundwater levels and location of, and impacts on:
 - Surface Water Safeguard Zones
 - Groundwater Safeguard Zones,
 - Water Protection Zones, and/or
 - Groundwater Nitrate Vulnerable Zones.

Detailed Whole Site SuDS Drainage Design Proposals – (See also all [Ciria SuDS Manual C753](#) Chapters)

REASON: To confirm that the proposed drainage solution is appropriate for the location, type, scale and nature of the site and development proposed; and to demonstrate that flood risk will be reduced, to ensure people and property remain safe for the lifetime of the development. The proposals will include:

- Drainage Strategy;
- Masterplan;
- Reference and alignment to the Local Flood Risk Management Strategy (LFRMS);
- Approved Flood Consequences Assessment (FCA) including:
 - existing hydrology,
 - greenfield & brownfield runoff rate calculations,
 - critical duration rainfall events,
 - simulation results for design storm RP, 1 in 1 RP, 1 in 2 RP, 1 in 30 RP and 1:100 RP,
 - appropriate % allowance for climate change and urban creep,
 - historical flood events and groundwater levels,
 - risks (both on site and off site) associated with surface water runoff for events greater than the 1% (1 in 100 year) return period,
 - descriptions of existing drainage assets and features,
 - current and future flood risks including:
 - surface,
 - groundwater,
 - other sources,
 - exceedance flood flow paths,
 - discharges,
- Existing and proposed impermeable and permeable areas (runoff betterment required of min 30% or equivalent to greenfield on existing brownfield areas);
- Models (as appropriate) and detailed hydraulic calculations;
- Detailed SuDS design including:
 - Interception incl. mechanisms and summer and winter interception compliance targets (e.g. summer 80% & winter 50%),
 - Treatment,
 - Conveyance,
 - peak flow and volume control (1:100y - 6 hr rainfall event for peak volume control),
 - surface storage (long-term and attenuation),
 - underground storage,
 - use of vegetation and trees,
 - exceedance routes and components (for 1:100y rainfall event or greater),
 - demonstration that the required storages and conveyance flows can be delivered on site,
 - minimum throttle outlet flow rates (i.e. 1-2 l/s/ha or 5 l/s/ha where risk of blockage and no other viable alternative),
 - risks and consequences of design failure scenarios,
- Surface water storage; calculations including time to discharge from full to half full;
- Infiltration calculations including:
 - stated safety factor,
 - stated infiltration rate at 1×10^{-5} m/s or higher,
- Outfalls & discharges (normally 2 l/s/ha is considered an appropriate rate so as not to increase flood risk downstream);

- Specifications for all materials used in the design;
- Components can be constructed, operated and maintained easily, safely and cost effectively;
- Components retain structural integrity for the lifetime of the development;
- Components demonstrated to resist all imposed design loadings with specified factors of safety;
- Evidence to enable SAB to calculate the Non-performance Bond value incl. unit rates for each SuDS component;
- Drainage related flood risk mitigation measures, stating their location, type and features (i.e. roads & access areas protected to 1:30y rainfall, internals & critical infrastructure protected to 1:100y rainfall or greater, appropriate freeboard);
- Multiple use of SuDS benefits incl. temporary flooded areas; and
- Future ownership of surface water drainage assets and adoptions.

Detailed SuDS Assets Maintenance Plan – (See also specific [Ciria SuDS Manual C753 Chapter 32 & Appendix B](#))

REASON: To confirm that the SuDS management train and individual SuDS components will be effectively maintained (including asset replacement where necessary), to perform to their design criteria for the lifetime of the development. The plan shall include:

- Information on how SuDS will be managed & maintained, & who will do it;
- Details of future vehicular & pedestrian access arrangements;
- Information on the various human, plant & materials resources needed & broad timescales as to when; and
- Sympathetic to the need to promote the biodiversity supported by the SuDS system.

Amenity and Biodiversity Plan – (See also specific [Ciria SuDS Manual C753 Chapters 5 & 6](#))

REASON: To demonstrate how the SuDS will protect and enhance amenity and biodiversity for the lifetime of the development. The plan shall include:

- How the amenity value from a SuDS scheme for the development will be maximised for the local and wider community;
- Amenity providing clean water, SuDS legibility, safe access, multiple functionality and attractive spaces, social value and adaptable to change;
- Bio-diversity providing clean water, connectivity along the management train and habitat creation;
- Details of amenity and biodiversity value, and the linkages between them; and
- Proposals to benefit priority habitats and maintain or enhance others where possible.

Unstable and Contaminated Land Reports – (See also specific [Ciria SuDS Manual C753 Chapters 4 & 26](#))

REASON: To identify the presence, location and nature of any unstable and/or contaminated land on or close to the site; and how this has been taken account of in the

SuDS scheme design, and how it will be managed and maintained for the lifetime of the development. The reports shall include any pollution remediation strategies.

Water Quality Treatment and Pollution Prevention Strategy and Plan – (See also specific [Ciria SuDS Manual C753](#) Chapters 4,26 & 27)

REASON: To show how the SuDS proposal will avoid or minimise the generation of pollutants and how it will prevent pollutants mixing with runoff before it enters the drainage system. The plan shall include:

- Supporting current or future quality objectives for the water body over the lifetime of the development;
- Evidence of pollution risk screening and that the minimum water quality management requirements have been considered & are able to be met (using SuDS Manual (Table 4.3), CIRIA 2015;
- Information on type & strength of contaminants & polluting materials;
- How have these potential contaminants been managed close to the source & on the surface;
- Details of what SuDS components have been provided in series (the SuDS train) to cleanse flow prior to point of discharge;
- Information on how sediment is trapped & retained on site (for rainfall events greater than 1:1-year return period);
- Details of accessibility to undertake sediment cleansing & other maintenance activities;
- Details of how the impacts from accidental spills been addressed; and
- Written evidence of discussion & agreement with Natural Resources Wales.

Landscape Plan – (See also specific [Ciria SuDS Manual C753](#) Chapter 29)

REASON: To show how the proposed soft landscape features work in harmony with the overall objectives of SuDS, and how the landscape supports and enhances flood risk reduction, improved water quality, amenity and biodiversity. The plan shall include:

- Detailed overall layout, ground contouring, planting, hard, soft & water features;
- Detail landscape elements to improve water quality;
- Show how the design achieves effective attenuation, flow control & exceedance;
- Improvements to ecology & biodiversity;
- Detailed consideration of effective routine & periodic maintenance activities;
- Full understanding of the sites character: slope, gradient, ground modelling, geology, soils types, natural drainage patterns;
- Show existing features to be preserved, enhanced, removed &/or replaced; and
- Details of any soils stabilization/reinforcement & erosion control.

Construction Management Plan – (See also specific [Ciria SuDS Manual C753](#) Chapter 31 & Appendix B, and [CIRIA report C768 - Guidance on the construction of SuDS](#))

REASON: To provide a structured approach to the construction activities and temporary works deployed for constructing SuDS, ensuring that key construction site issues such as drainage, flooding, sediment control, pollution prevention, compression of infiltration areas,

storage of materials & existing amenity and natural habitats etc. are sensitively and effectively managed until the site construction is complete. The plan shall include:

- Details of the nature of the work to be completed;
- Site plans & full scheme drawings, where required to support the method of approach;
- Consents & reinstatement requirements;
- Access points & details;
- Any site-specific ecological issues, or features that require protection &/or consideration;
- Pollution control arrangements & any likely water quality issues resulting from the highways & SuDS construction;
- Proposed strategy for sediment control, erosion control & site drainage during the construction of the development; where this impacts on the SuDS proposed for the site, it should identify any potential impacts on the final performance of the drainage system & any necessary protection measures or remedial works; and
- Measures to prevent the inadvertent access across the completed or partially completed SuDS.

Construction Phasing Plan – (See also specific [Ciria SuDS Manual C753](#) Chapter 31 & Appendix B, and [CIRIA report C768 - Guidance on the construction of SuDS](#))

REASON: To clearly state how the development and/or phase/s of the development will drain during the construction and occupation of the development prior to adoption. The plan shall include:

- The sequencing of phases of the development and how the drainage systems (permanent or temporary) connect to an outfall (temporary or permanent) during the construction and occupation of the development prior to adoption.

Information and communications plan (where appropriate) – (See also specific [Ciria SuDS Manual C753](#) Chapter 34)

REASON: To provide a structured approach to engagement with the local community and set out the engagement stages, how they are delivered, the resources available to deliver them, and the timescale within which an outcome needs to be delivered. The plan shall include:

- communication with and education of existing residents;
- communication with and education of new residents;
- site and SuDS component specific information boards; and
- local community education and education strategies (eg through schools).

Construction (Design and Management) CDM Regulations 2015 File – (See also specific [Ciria SuDS Manual C753](#) Chapter 36 & Appendix B)

REASON: To ensure that SuDS designs fulfil regulatory and legal requirements, and SuDS health and safety risk assessments are in line with BS EN 31010:2010. The file shall include:

- Risk assessments for the design, construction, operation and maintenance of the highway and drainage system.

Statutory consents and permissions

REASON: To provide evidence that all necessary consents, written agreements in principle, and permissions have been obtained. These shall include:

- Discharge consents & licenses to watercourses;
- Rights to lay pipes on third party land/easements;
- Easement details;
- Permission from riparian owner to discharge;
- Water Industry Act 1991 Section 104 (adoption);
- Agreement in Principle from Statutory Undertaker; and
- Land drainage consent & management company drainage agreements.

Title documents

REASON: To ensure all legal interests and ownership etc. in land and buildings associated with the SuDS are identified, and can be communicated for legal transfers, acquisitions and responsibilities. These shall include

- Up-to-date coloured Copy Entries of Title or Epitome of Title to the land in question.

TABLE B: Plans and drawings containing relevant information required for the Full Application

Drawing number issue sheet

Outline or Full Planning Permission Notice and approved layout drawing (where applicable).

Site location plan (Scale 1:2500) supported by recent photographs.

Natural and artificial drainage catchment and sub-catchment plan (Scale 1:2500) showing:

- Land contours;
- Topography;
- Watercourses; and
- Current flood risk areas, both within, above and below, impacting on the site.

Concept drawings (Scale 1:2500) of the proposed development layout (and/or layout options), appropriate and proportionate evidence showing:

- Contoured flood routing plan showing exceedance flows;
- Outline sizing of site areas and land use zones;
- Conceptual SuDS calculations and design including:
 - interception,
 - treatment,
 - conveyance,
 - peak flow and volume control,
 - storage (long-term and attenuation),
 - exceedance routes and components,
 - demonstration that the required indicative storages and conveyance flows can be delivered on site,
 - protection and enhancement of:
 - water quality,
 - amenity,
 - bio-diversity,
 - landscape.
- Location of roads, buildings and sustainable drainage features (including water quality measures);
- Potential flood risk protection features that may be required; and
- Initial thoughts on SuDS adoption & maintenance responsibilities.

General engineering layout coloured drawings (Scale 1:500 & 1:1250) showing:

- Areas of proposed SuDS submitted for SAB approval & offered for adoption – coloured

green with solid red outline;

- Site Boundaries;
- Existing buildings (on and around the site);
- Positions of all carriageways, footways, footpaths, cycleways, verges, service strips, traffic calming features;
- Existing and proposed foul and surface water drainage, highway drainage to be offered for adoption by the Highway Authority, & any highway drainage not to be adopted, need to be identified in different colours & clearly labelled;
- Where applicable, each dwelling draining private surface water to the highway SuDS, should be clearly identified on the plan and coloured differently;
- Watercourses;
- Finished building ground floor levels;
- Manholes;
- Storage/attenuation devices, chambers and systems;
- Outfalls/headwalls;
- Other ancillary systems/features;
- Existing trees and proposed locations;
- Easements to be coloured blue;
- Position of dwellings, garaging and/or parking spaces, structures; and
- Falls and cross-falls of SuDS components, footways and carriageways.

Longitudinal section coloured drawings (Scale 1:500 Horizontal & 1:100 Vertical)

showing:

- Existing and proposed road levels for the centre line, channels, gradients and vertical curves;
- Surface and foul water drainage profiles, including positions of chambers, gradients, pipe diameters, cover and invert levels and protection;
- Highway drainage should be identified in a different colour;
- Pipe material;
- Pipe strength;
- Bedding classification and details; and
- Ground water and watercourse levels.

Cross section drawings and standard detail drawings (Scale 1:100, 1:50, 1:20 & 1:10) showing items in the general engineering layout drawings, at intervals of no greater than 30 metres.

Landscaping layout drawing (Scale 1:500)

showing:

- Details of planting, trees species /size/positions;
- Any existing trees to be retained;
- Tree pit details;
- Grassed areas play grounds and equipment;
- Fencing and, walls; and
- Confirmation of land ownership.

Specialist drawings (Scale 1:1250)

showing:

- Bridges, Culverts, any pipework over 600mm diameter, headwalls, retaining walls and any other constructed features; and
- Existing Statutory Services and utility plans showing surrounding location of proposed development.

The *following note* shall be incorporated on all drawings submitted:

- 1) *“The specification in all respects shall be in accordance with the current NPTCBC Specification and Construction publication in force in the county at the time of construction.”*

It should be noted that:

- Should the developer wish to submit AutoCAD files, he should attach the relevant pen setting files (ctb).
- Plans should be folded to A4 size.
- 3 hardcopies and an electronic copy shall be submitted of all drawings and documents.

Appendix 1 – Supporting Information

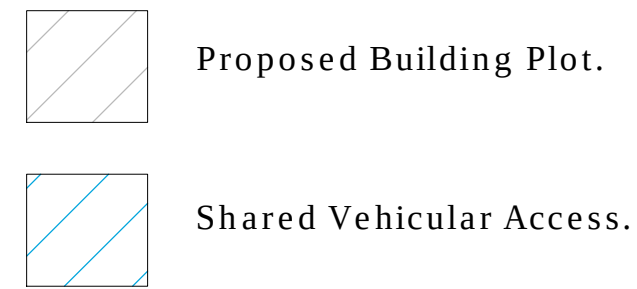
4. Sunnyacre, Gwersyllt, Wrexham, LL11 4RH



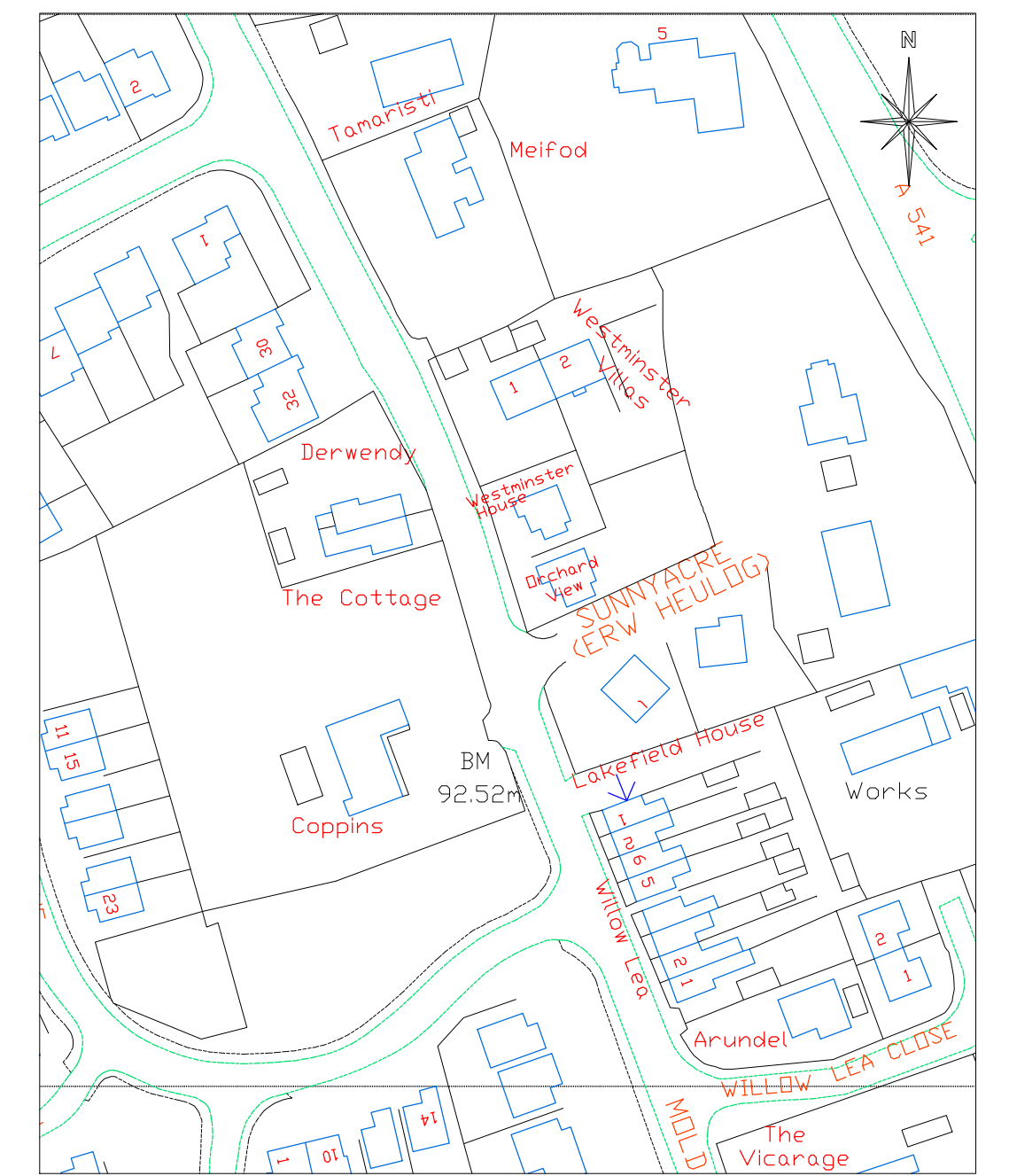
Site Plan shows area bounded by: 331902.24, 352853.97 332043.66, 352995.39 (at a scale of 1:1250), OSGridRef: SJ31975292. The representation of a road, track or path is no evidence of a right of way. The representation of features as lines is no evidence of a property boundary.

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Scale 1:100



Location Plan

Scale 1:1250

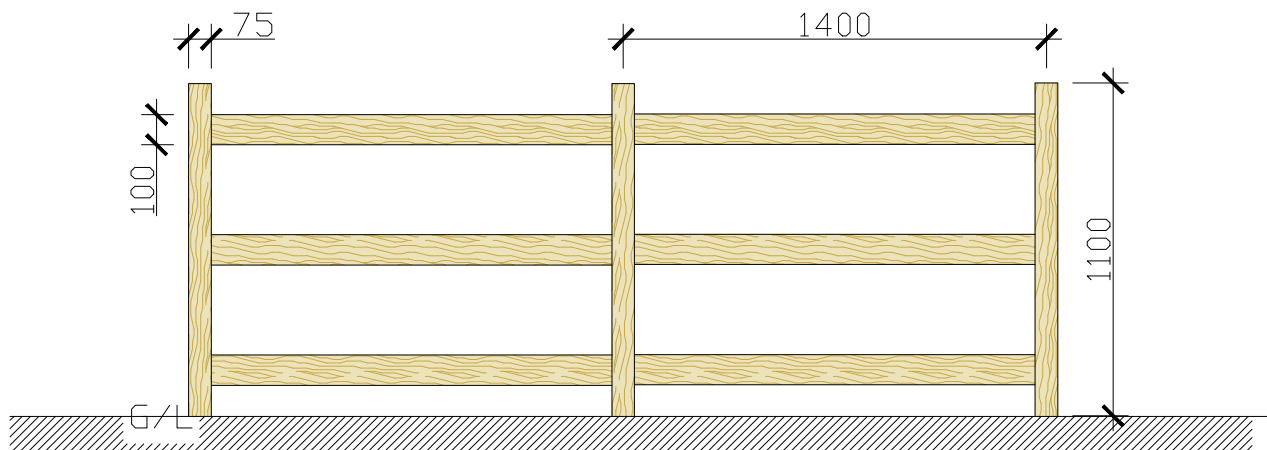


Existing Site Plan

Scale 1:500

Proposed Site Plan

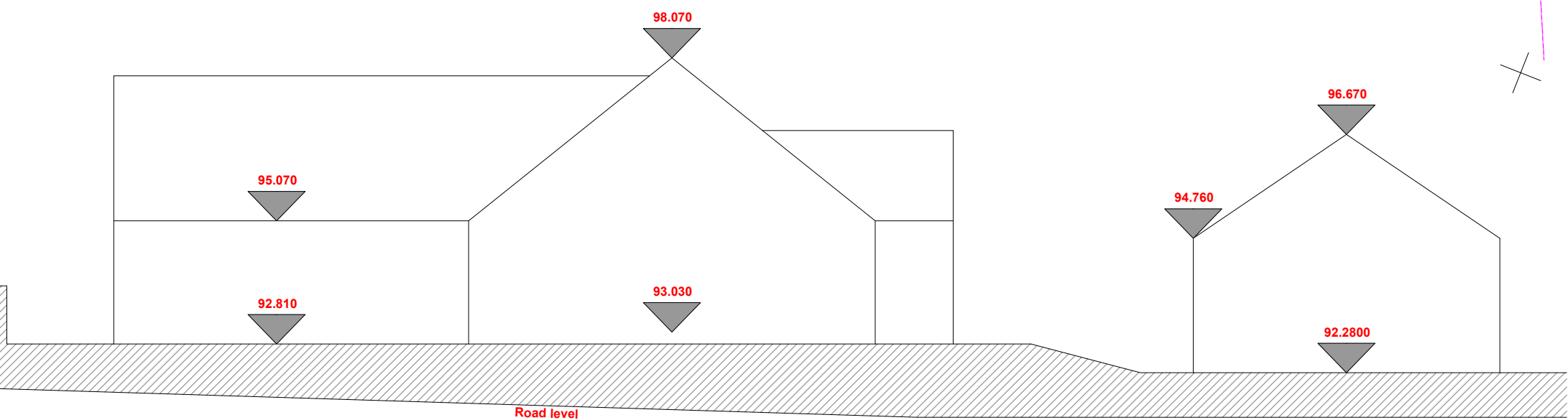
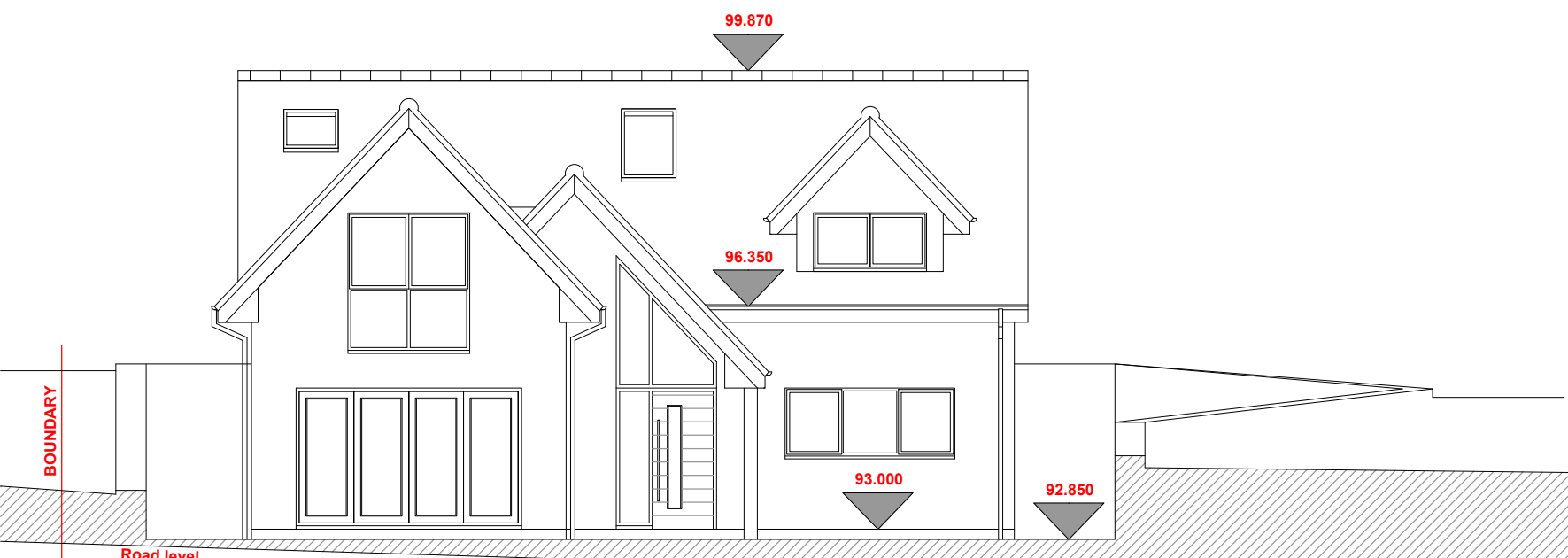
Scale 1:100



Timber boundary fence between proposed dwelling and No. 4 Sunnyacre (Existing adjacent dwelling).

Shared Vehicular Access.

Existing boundary retained.



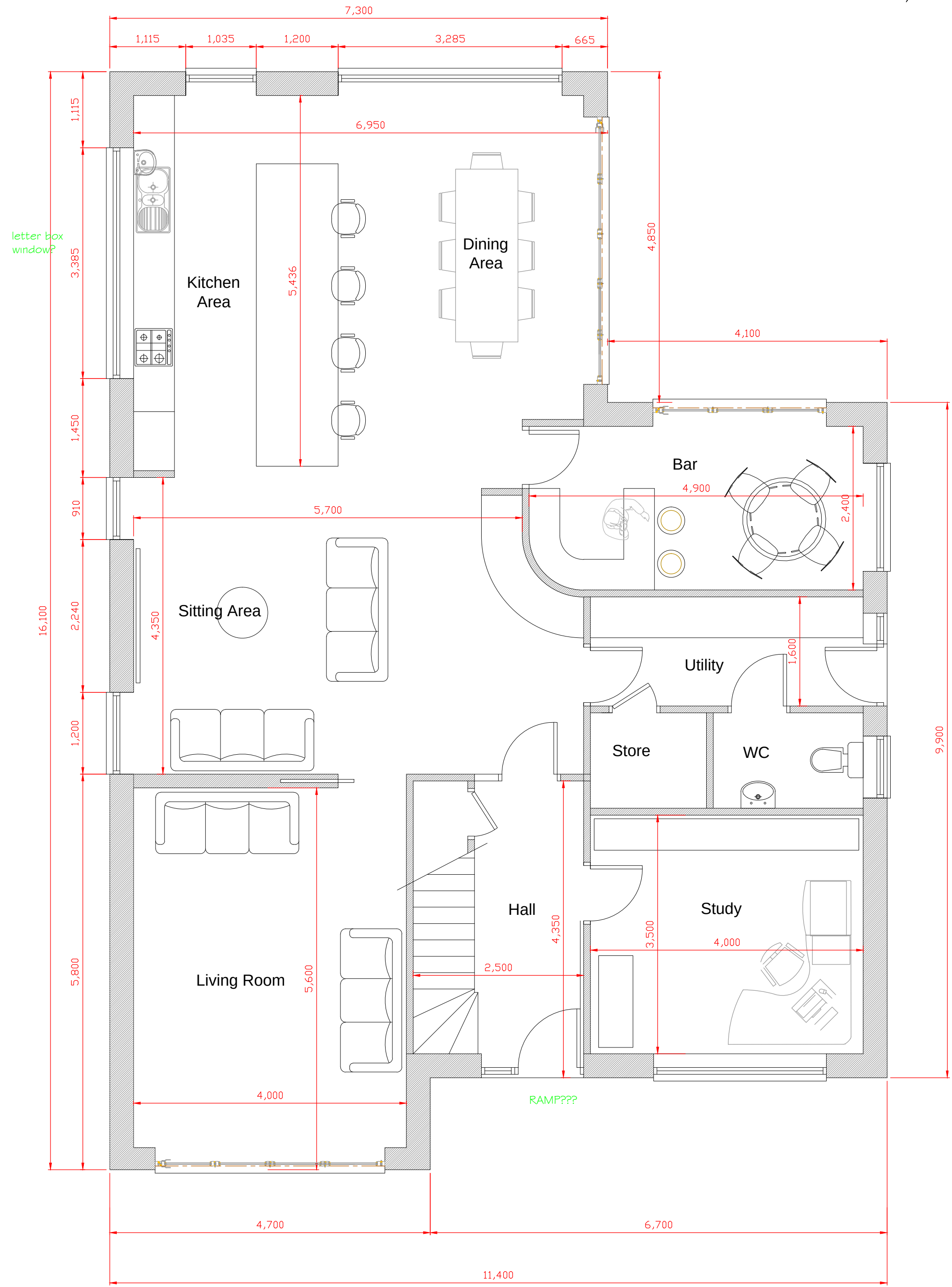
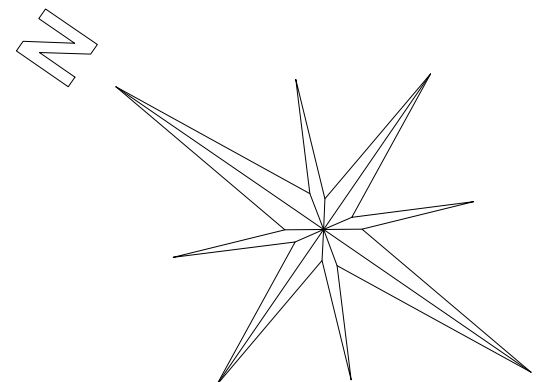
Proposed Site Section

1:100

25 Sunningdale Close
Wrexham
North Wales
LL13 9QU
T 01978 264376
M 07791 480768
E ajones540@btinternet.com

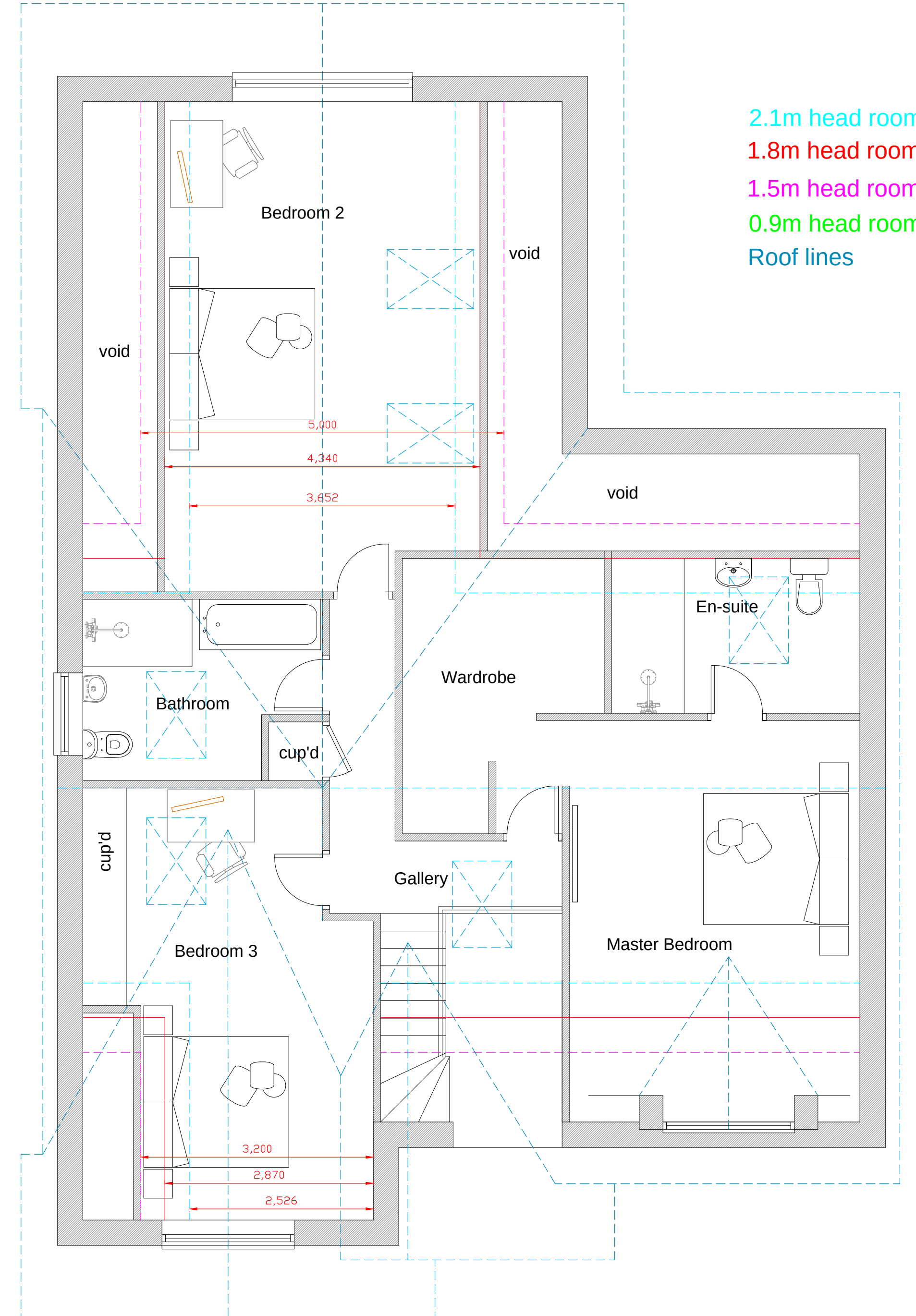
LABC

Client Mr. & Mrs. Evans.			
Drawing Title Proposed Site Plan.			
Job Title Proposed New Dwelling at Land Adjacent to 4 Sunnyacre, Wrexham.			
Date Feb 2021	Scale 1:100 at A1	Rev. PD202/02	Drawn by



Proposed Ground Floor Plan

1:50



- 2.1m head room
- 1.8m head room
- 1.5m head room
- 0.9m head room
- Roof lines

Proposed First Floor Plan

1:50

CULLIS-ARCHITECTURAL-DESIGN
25 Sunningdale Close
Wrexham
North Wales
LL13 9QU
T 01978 264376
M 07791 480768
E ajones540@btinternet.com

Client: Mr. & Mrs. Evans.			
Drawing Title: Proposed Floor Plans.			
Job Title: Proposed New Dwelling at Land Adjacent to 4 Sunnycroft, Wrexham.			
Date: Feb 2021	Scale: 1:50 at A1	Rev:	Draw No: PD202 / 03



Proposed Front Elevation

1:50



Proposed Rear Elevation

1:50



Proposed Side Elevation

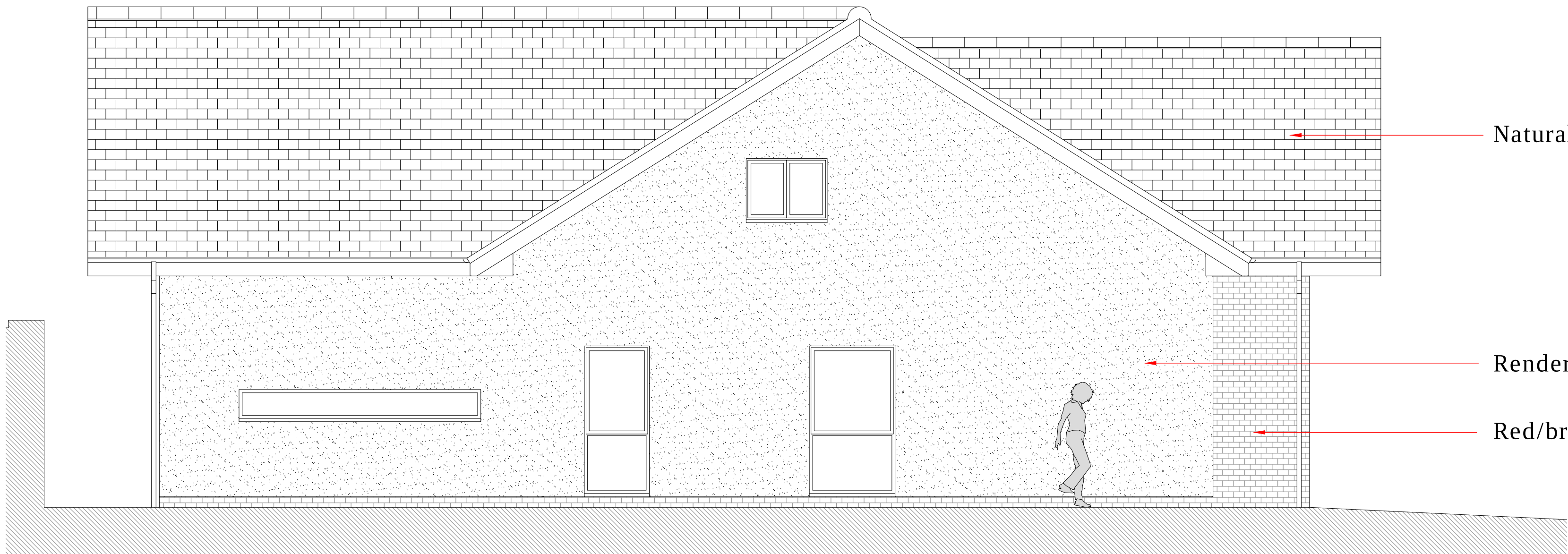
1:50

Natural slate.

Powdercoated aluminium rooflights - Dark grey.

Powdercoated aluminium sliding doors - Dark grey.

Powdercoated aluminium windows - Dark grey.



Proposed Side Elevation

1:50

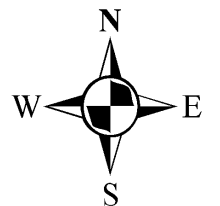
Natural slate.

Render.

Red/brown facing brick.

 CULLIS-ARCHITECTURAL-DESIGN 25 Sunningdale Close Wrexham North Wales LL13 9QU T 01978 264376 M 07791 480768 E ajones540@btinternet.com	Client: Mr. & Mrs. Evans.	
	Drawing Title: Proposed Elevations.	
	Job Title: Proposed New Dwelling at Land Adjacent to 4 Sunnycroft, Wrexham.	
	Date: Feb 2021	Scale: 1:50 at A1
Rev: 0		Drawn: PD202 / 04

Land Adjacent to 4 Sunnyacre



LEGEND(Representative of most common features)

Waste network:	Foul chamber	Outfall
Surface water chamber	LH	Lamphole
Combined chamber	Storm Overflow	Rising main
Combined sewer overflow	Gravity sewer	Private sewer
Special purpose chamber	S 104	Private sewer subject to Sect. 104 adoption agreement
Treatment works	Private Sewer Transfer	Lateral Drain
Pumping station	Inspection Chamber	

NB: Sewer symbol colour indicates the type.
RED - Combined
GREEN - Surface Water
BROWN - Foul
Purple - Former S24 sewers (for indicative purposes only)

Notes:

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be asbestos cement (AC) or Pitch Fibre (PF). It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation.

Dŵr Cymru Cyfyngedig ('the Company') gives this information as to the position of its underground apparatus by way of general guidance only and on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works made in the vicinity of the company's apparatus. The onus of locating apparatus before carrying out any excavations rests entirely on you. The information which is supplied by the Company, is done so in accordance with statutory requirements of sections 198 and 199 of the Water Industry Act 1991 which is based upon the best information available and, in particular, but without prejudice to the generality of the foregoing, it should be noted that the records that are available to the Company may not disclose the existence of a water main, service pipe, sewer, lateral drain or disposal main and any associated apparatus laid before 1 September 1989, or, if they do, the particulars thereof including their position underground may not be accurate. It must be understood that the furnishing of this information is entirely without prejudice to the provision of the New Roads and Street Works Act 1991 and the Company's right to be compensated for any damage to its apparatus.

Service pipes are not generally shown but their presence should be anticipated.

**EXACT LOCATIONS OF ALL APPARATUS
TO BE DETERMINED ON SITE.**

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Map Ref: 331974,352926
Map scale: 1:1000
Printed by: Emma John
Printed on: 09 Feb 2021

Appendix 2 – Site Layout Drainage Strategy

DESIGN PHILOSOPHY:

THESE PROPOSALS ARE TO BE READ IN CONJUNCTION WITH REPORT 5997 SWDS

FOUL WATER AND SURFACE WATER ON-SITE DRAINAGE TO REMAIN PRIVATE AND SEPERATE.

ALL STORM WATER PIPEWORK TO BE A MINIMUM OF 150mmØ AND LAID NO FLATTER THAN 1 IN 100 (UNLESS OTHERWISE SHOWN). ALL PIPEWORK AND SURFACE WATER DRAINAGE TO BE LAID IN ACCORDANCE WITH BUILDING REGULATIONS PART H.

INFILTRATION THROUGH SOAKAWAYS DRAINING AN AREA LARGER THAN THEIR PLAN AREA SHOULD NOT BE ALLOWED WITHIN 5m OF BUILDING OR PUBLIC HIGHWAY AS PER BUILDING REGULATIONS. THE PROPOSED GEOCELLULAR SOAKAWAY TO BE SITUATED IN ACCORDANCE WITH THIS.

IT IS RECOMMENDED THAT SOAKAWAYS TO BE SITED A SAFE DISTANCE (5m OR MORE) FROM THE FOUNDATIONS OF THE PROPOSED BUILT STRUCTURES

CATCHPITS WITH SEDIMENT TRAP TO BE INSTALLED TO REDUCE RISK OF BLOCKAGE OR SILTING

CALCULATIONS DEMONSTRATE NO FLOODING FOR ALL EVENTS UP TO AND INCLUDING 1:100 + 40% CC. ADDITIONALLY, CALCULATIONS DEMONSTRATE THE HALF-DRAIN TIME TO BE 1196 MINUTES (19.9 HOURS) FOR THE SOAKAWAY.

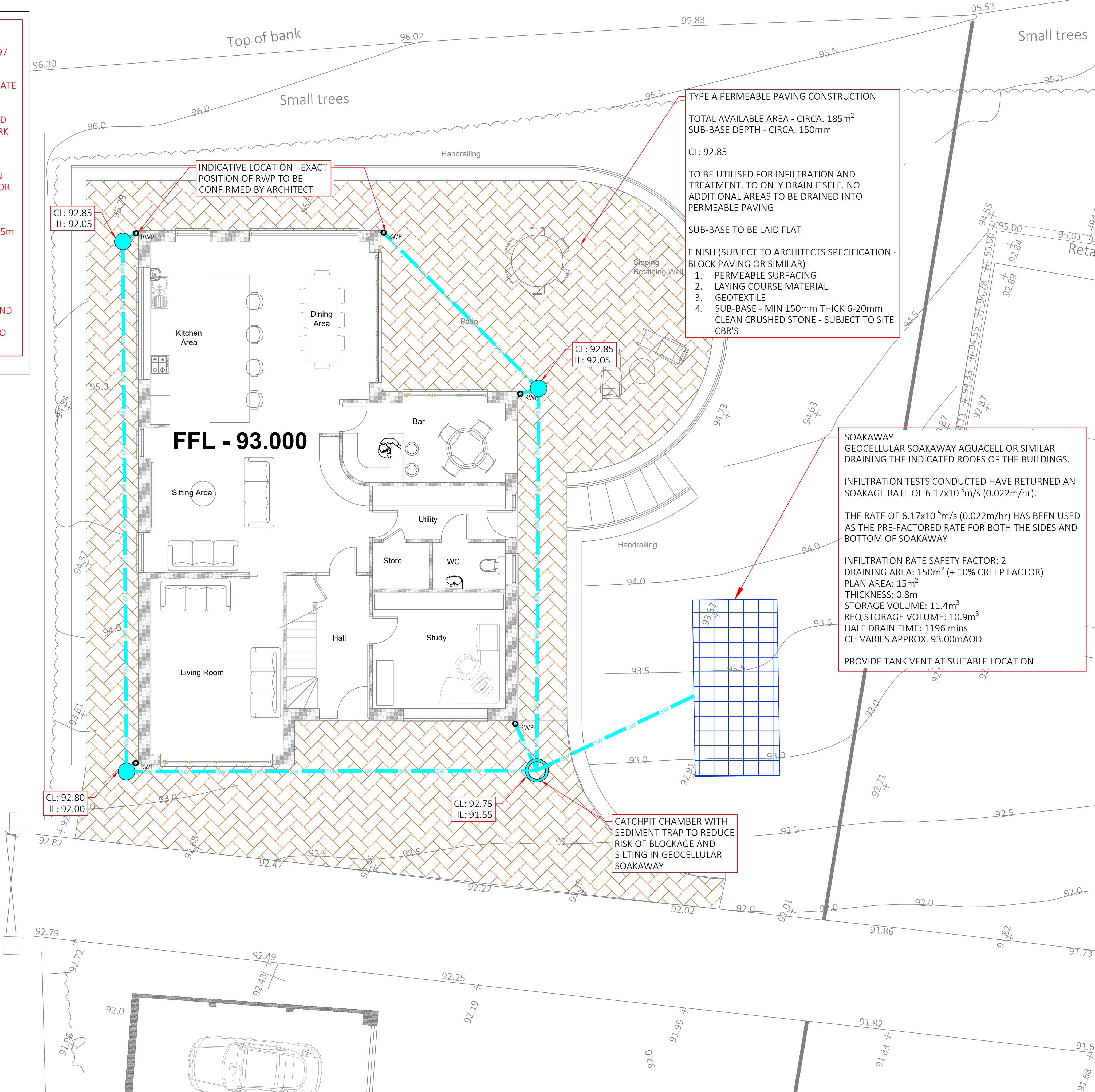
DESIGN OF ON-SITE SUDS SYSTEMS USING INFILTRATION RATE OF $6.17 \times 10^{-5} \text{m/s}$ (0.022m/hr)

LEVELS BASED ON TOPOGRAPHIC SURVEY. ALL PROPOSED LEVELS TO BE CONFIRMED BY ARCHITECT

RWP LOCATIONS, GROUND LEVELS AND FINISHED FLOOR LEVELS SHOWN INDICATIVELY; TO BE CONFIRMED BY ARCHITECT PRIOR TO CONSTRUCTION.

DRAINAGE LAYOUT SUBJECT TO CHANGE. DRAINAGE NETWORK TO BE COORDINATED WITH STRUCTURAL DETAILS AND SUBJECT TO FINAL APPROVALS BY THE LPA.

Drawing No: C:\Users\306227\Box\WAT-DWA-SEA-General\PROJECTS\5997-Cullis-Sunnyacre_Sud\Plans\AMB\5997-DR01 Rev A.dwg



TYPE A PERMEABLE PAVING CONSTRUCTION

TOTAL AVAILABLE AREA - CIRCA. 185m²
SUB-BASE DEPTH - CIRCA. 150mm

CL: 92.85

TO BE UTILISED FOR INFILTRATION AND TREATMENT. TO ONLY DRAIN ITSELF. NO ADDITIONAL AREAS TO BE DRAINED INTO PERMEABLE PAVING

SUB-BASE TO BE LAID FLAT

FINISH (SUBJECT TO ARCHITECTS SPECIFICATION - BLOCK PAVING OR SIMILAR)

1. PERMEABLE SURFACING
2. LAYING COURSE MATERIAL
3. GEOTEXTILE
4. SUB-BASE - MIN 150mm THICK 6-20mm CLEAN CRUSHED STONE - SUBJECT TO SITE CBR'S

SOAKAWAY
GEOCELLULAR SOAKAWAY AQUACELL OR SIMILAR DRAINING THE INDICATED ROOFS OF THE BUILDINGS.

INFILTRATION TESTS CONDUCTED HAVE RETURNED AN SOAKAGE RATE OF $6.17 \times 10^{-5} \text{m/s}$ (0.022m/hr).

THE RATE OF $6.17 \times 10^{-5} \text{m/s}$ (0.022m/hr) HAS BEEN USED AS THE PRE-FACTORED RATE FOR BOTH THE SIDES AND BOTTOM OF SOAKAWAY

INFILTRATION RATE SAFETY FACTOR: 2
DRAINING AREA: 150m² (+ 10% CREEP FACTOR)
PLAN AREA: 15m²
THICKNESS: 0.8m
STORAGE VOLUME: 11.4m³
REQ STORAGE VOLUME: 10.9m³
HALF DRAIN TIME: 1196 mins
CL: VARIES APPROX. 93.00mAOD

PROVIDE TANK VENT AT SUITABLE LOCATION

1. GENERAL
a. THIS DRAWING IS NOT TO BE SCALED. WORK TO FIGURED DIMENSIONS ONLY, CONFIRMED ON SITE.
b. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTURAL DRAWINGS, DETAILED SPECIFICATIONS WHERE APPLICABLE AND ALL ASSOCIATED DRAWINGS IN THIS SERIES.
c. ANY DISCREPANCY ON THIS DRAWING IS TO BE REPORTED IMMEDIATELY TO THE PARTNERSHIP FOR CLARIFICATION.
d. THE CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY WORKS AND FOR THE STABILITY OF THE WORKS IN PROGRESS.
e. CDM REGULATIONS 2015. ALL CURRENT DRAWINGS AND SPECIFICATIONS MUST BE READ IN CONJUNCTION WITH THE DESIGNER'S HAZARD RISK AND ENVIRONMENT ASSESSMENT RECORD. DESIGN HAS BEEN PRODUCED BASED ON INFORMATION PROVIDED BY THE CLIENT/PRINCIPLE DESIGNER AVAILABLE AT TIME OF ISSUE. CONTRACTOR TO REVIEW DRAWING AND SPECIFICATION IN CONTEXT WITH THE WIDER SITE AND SPECIFIC SITE INVESTIGATION, CONTAMINATION ASSESSMENT, ASBESTOS SURVEY, ENVIRONMENTAL SURVEY, UXO SURVEY AND ANY OTHER RELEVANT INFORMATION AND MANAGE RISKS RELATING TO THE WORKS OUTLINED IN THE DRAWINGS AND SPECIFICATION. PRINCIPLE CONTRACTOR TO MAKE DESIGNER AND CLIENT AWARE OF SITE SPECIFIC RISKS THAT MAY AFFECT THE DRAWING AND SPECIFICATION.
f. CDM REGULATIONS 2015. FOR GENERIC MAINTENANCE AND MANAGEMENT RISKS REFER TO CHAPTER 36 OF CIRIA 752 SUDS MANUAL FOR PROPRIETARY SYSTEMS SEE MANUFACTURERS MANAGEMENT AND MAINTENANCE DETAILS AND RISK ASSESSMENT WITH REGARDS TO MAINTENANCE OF PROPRIETARY SYSTEMS.

2. CONSTRUCTION NOTE
a. THE MAIN CONTRACTOR IS RESPONSIBLE FOR THE DESIGN OF ALL TEMPORARY WORKS, AND IS ALSO RESPONSIBLE FOR THE SAFE MAINTENANCE AND STABILITY OF EXISTING BUILDINGS AT ALL TIMES.
b. THE MAIN CONTRACTOR IS RESPONSIBLE FOR ALL OCCURRENCES OF GROUND WATER DURING THE CONSTRUCTION PERIOD.
c. ANY INFORMATION GIVEN REGARDING EXISTING UNDERGROUND SERVICES IS GIVEN IN GOOD FAITH AFTER CONSULTATION WITH THE RELEVANT AUTHORITY. HOWEVER ACCURACY IS NOT CERTAIN. THE MAIN CONTRACTOR IS RESPONSIBLE FOR CHECKING ALL INFORMATION ON SITE PRIOR TO WORK COMMENCING AND TAKING DUE CARE AND ATTENTION WHILST UNDERTAKING THE WORKS.
d. THE CONTRACTOR MUST COMPLY WITH ALL CURRENT LEGISLATION RELATING TO HEALTH & SAFETY.
e. ALL PRODUCTS SPECIFIED SHALL BE INSTALLED IN STRICT ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS AND INSTRUCTIONS. IF THERE ARE DISCREPANCIES BETWEEN THAT INFORMATION AND THE DETAILS ON ANY AMBIENTAL DRAWINGS, THE MANUFACTURERS INSTRUCTIONS MUST BE USED.
3. BELOW GROUND DRAINAGE
a. PREWORK TO BE UPGRADE PIPES TO BS 4660 : 2000 AND INSPECTION CHAMBERS TO BS 7158 : 2001.
b. ALL ADAPTABLE DRAINAGE TO BE CONSTRUCTED IN ACCORDANCE WITH SEWERS FOR ADOPTION 7TH EDITION AND THE RELEVANT COUNCIL DESIGN GUIDE.
c. ALL PRIVATE SURFACE WATER SEWERS TO BE LAID AT 1 IN 100 UNLESS OTHERWISE STATED ON THE DRAWING.
d. ALL PRIVATE FOUL WATER SEWERS TO BE LAID AT 1 IN 40 AT THE HEAD OF PIPE RUNS AND 1 IN 80 ELSEWHERE UNLESS OTHERWISE STATED.
e. ALL PRIVATE FOUL SEWER PIPES TO BE 150MM DIAMETER UNLESS OTHERWISE STATED ON THE DRAWING. ALL PRIVATE SURFACE WATER SEWER PIPES TO BE 100MM DIAMETER FROM DOWNPIPES AND 150MM DIAMETER ELSEWHERE UNLESS OTHERWISE STATED ON THE DRAWING.
f. ALLOW FOR RODDING ACCESS ABOVE GROUND WHERE RAINWATER DOWNPIPES DO NOT HAVE A DIRECT CONNECTION TO AN INSPECTION CHAMBER. EXISTING SEWER PIPE TO BE RE-USED TO BE SURVEYED AND LEVELLED PRIOR TO COMMENCEMENT OF THE DRAINAGE WORKS AND REBURIED IF NECESSARY.
g. CONNECTIONS TO AN ADOPTED SEWER ONLY TO BE MADE FOLLOWING APPROVAL FROM THE RELEVANT ADOPTING AUTHORITY.
h. ALL DRAINS, SEWER PIPES AND MANHOLES TO BE CLEANED AND TESTED FOR WATER TIGHTNESS ON COMPLETION OF CONSTRUCTION.

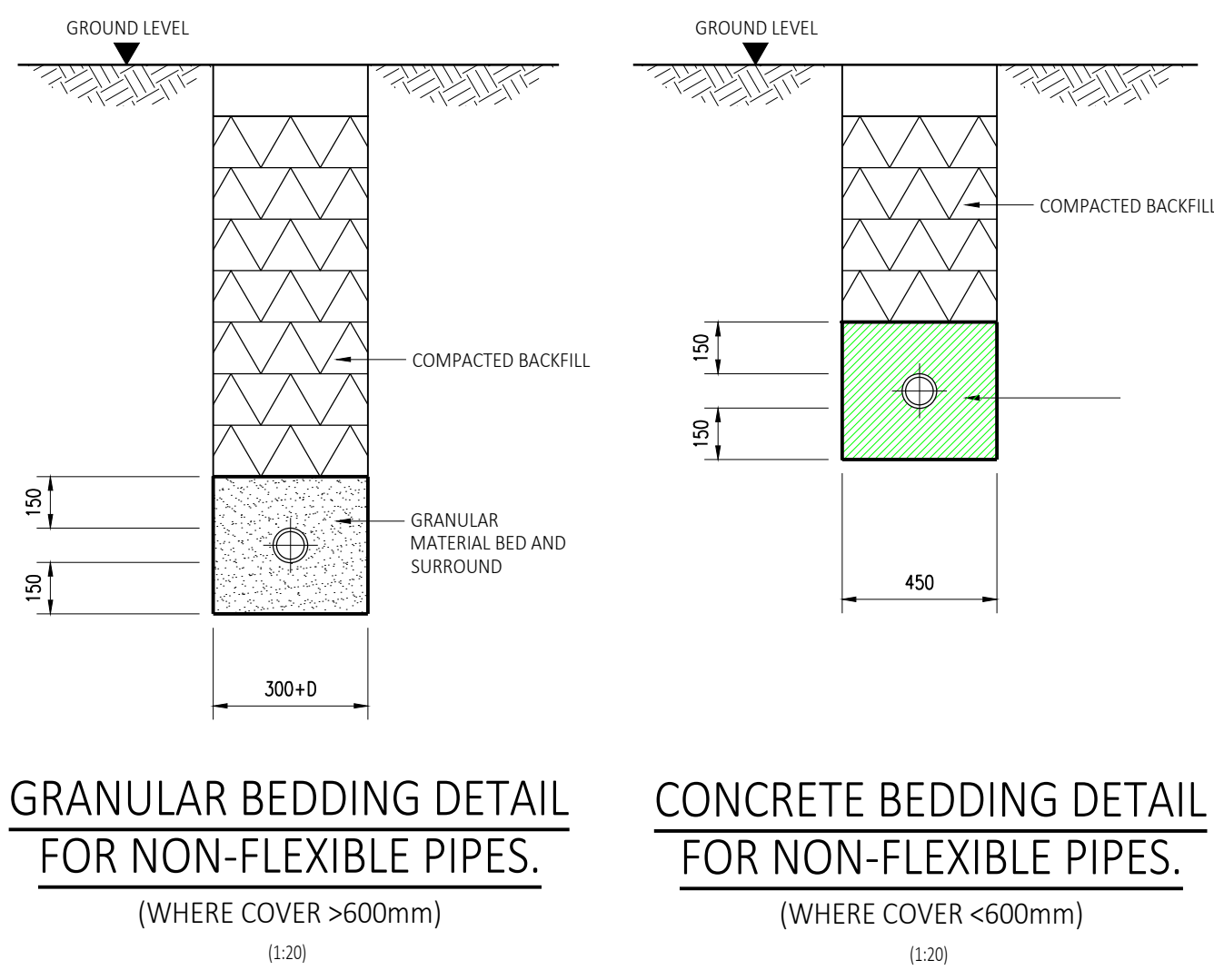
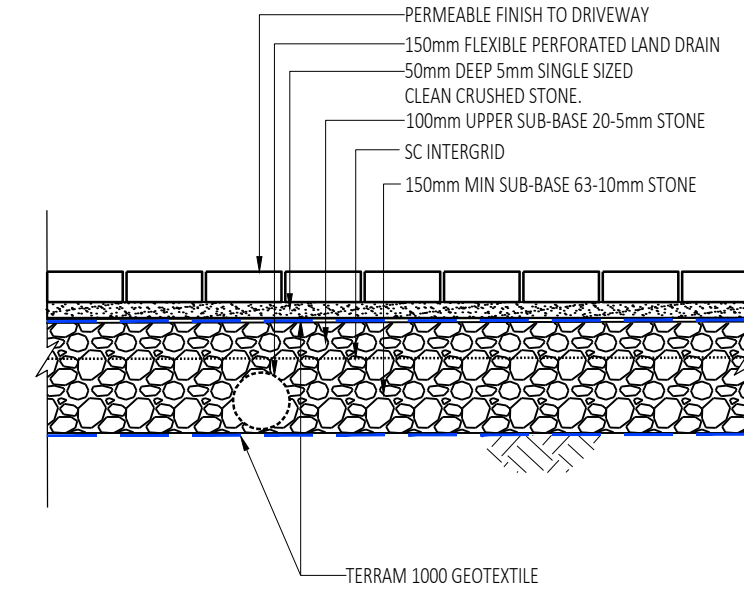
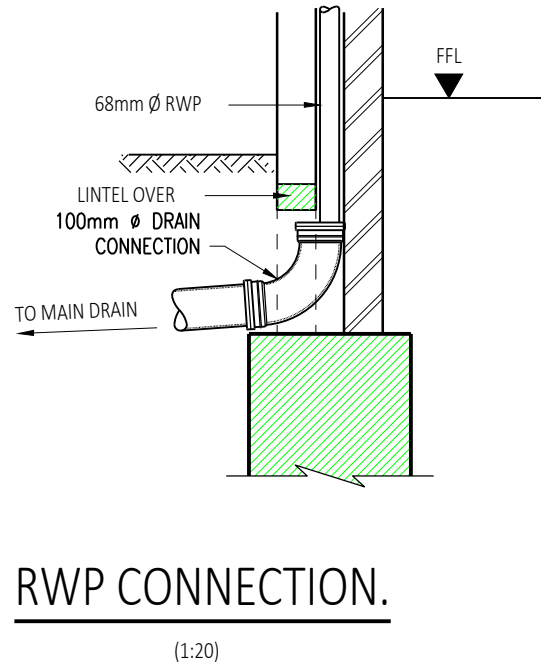
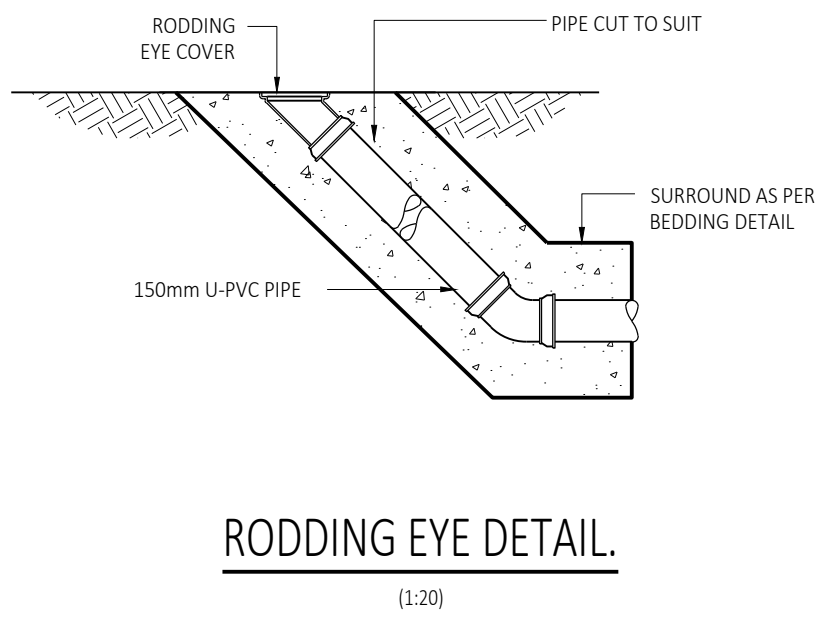
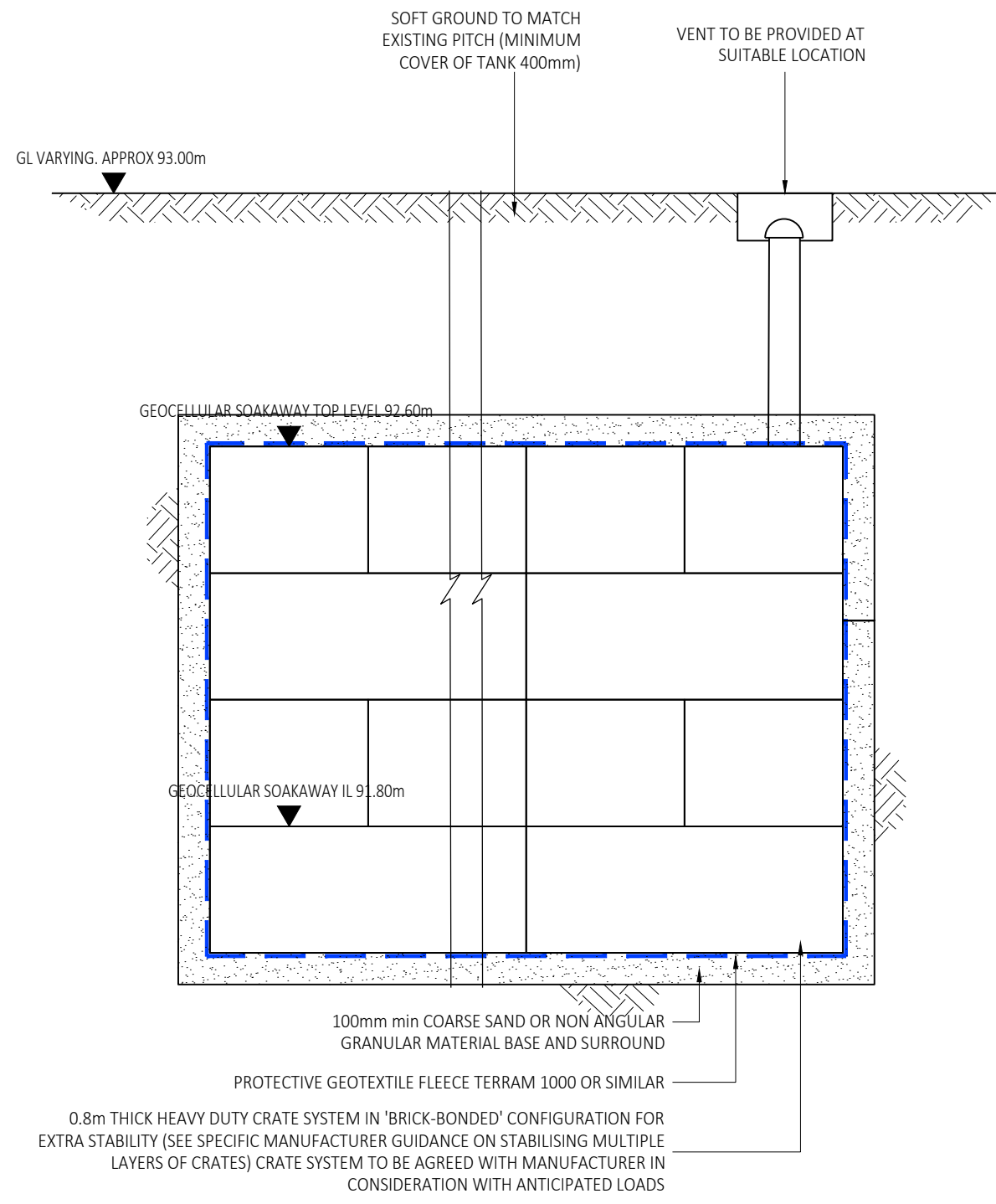
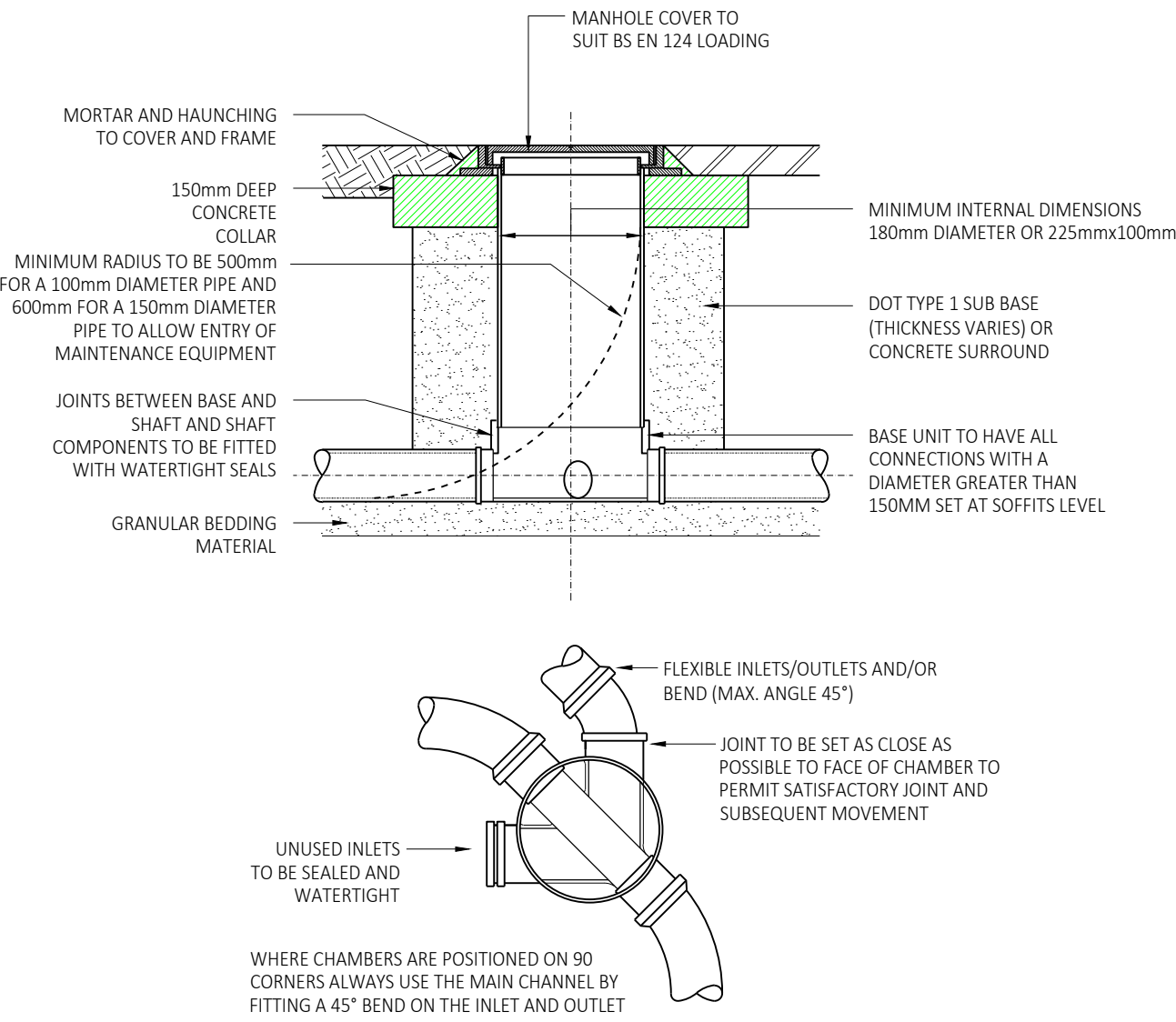
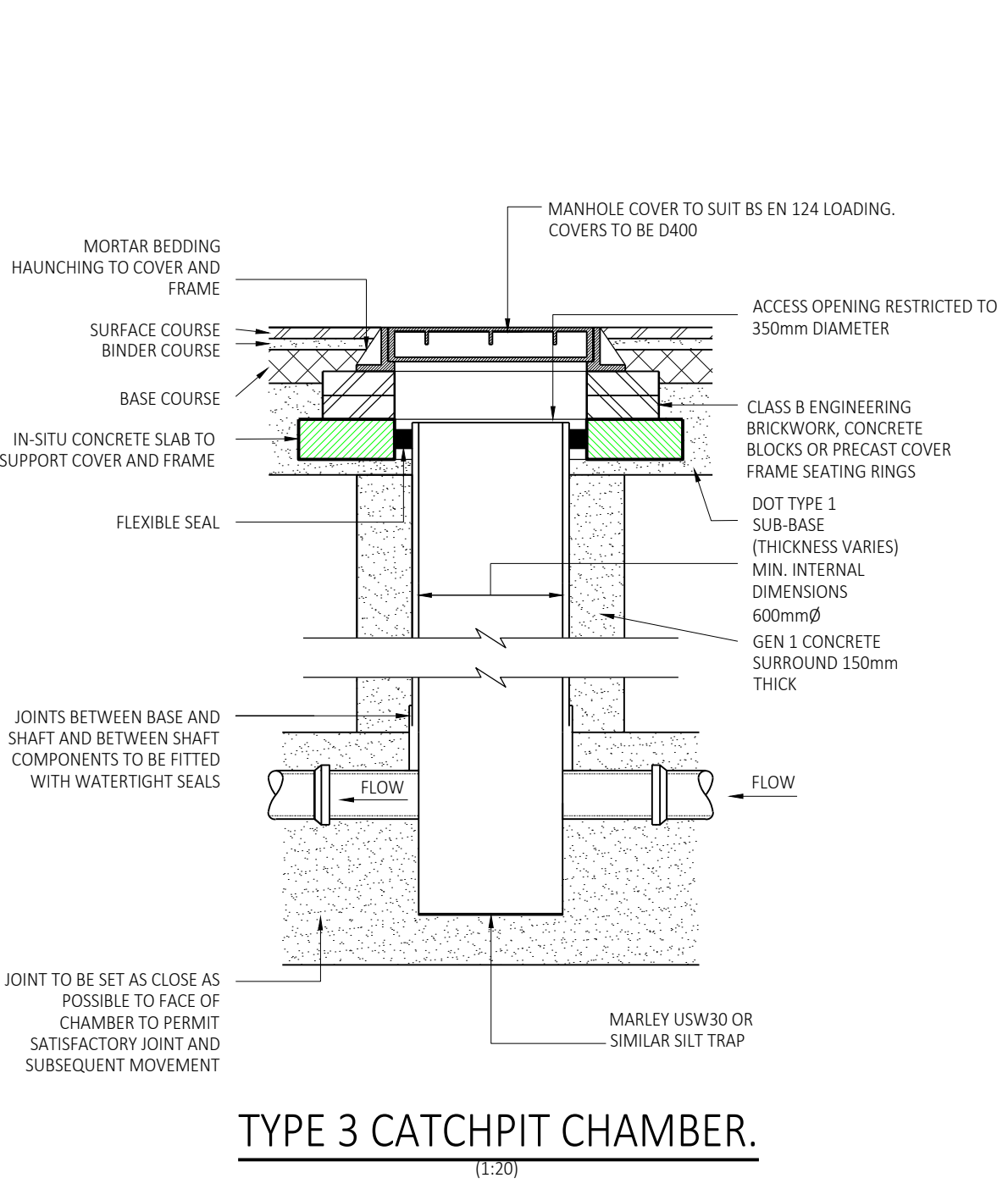
4. MANHOLE COVERS AND FRAMES
a. MANHOLE COVERS TO BE CLASS D400 IN HIGHWAYS, CLASS B125 IN FOOTWAYS AND VERGES, CLASS A15 IN NON-TRAFFICKED AREAS.
b. MANHOLE COVER AND FRAME TO BE BEDDED AND SURROUNDED IN 1:3 MORTAR.

LEGEND

- PRIVATE SURFACE WATER DRAIN
- PERFORATED SURFACE WATER DRAIN
- TYPE 3 INSPECTION CHAMBER
- TYPE 4 INSPECTION CHAMBER
- RAIN WATER PIPE
- PERMEABLE PAVING
- SOAKAWAY
- HYDROBRAKE MANHOLE
- EXCEEDANCE FLOWS
- RODDING EYE

REV	DATE	BY	APPD	DESCRIPTION
1	2021-10-01	CKD		PRELIMINARY DRAWING FOR INFORMATION ONLY. NOT FOR CONSTRUCTION.
Client				
SPENCER CULLIS				
AMBIENTAL ENVIRONMENTAL ASSESSMENT				
a company of Royal HaskoningDHV				
Project				
LAND ADJ. 4 SUNNYACRE WREXHAM LL11 4RH				
Drawing				
SURFACE WATER DRAINAGE STRATEGY DRAINAGE LAYOUT				
Drawn by: OH				Date: OCT - 2021
Drawing No. 5997 - DR01				Revision A
Drawing Scale:				

Drawing No. C:\Users\305227\Box\WAT-DWA-AEA-General\PROJECTS\5997_Cullis_Summary_Sab\Plans\AAB\5997 - DR01 Rev A.dwg



NOTE
ALL BACKFILLING AND REINSTATEMENT WITHIN ROADS AND STREETS TO BE IN ACCORDANCE WITH THE HIGHWAY AUTHORITY AND HAUC SPECIFICATION.

- GENERAL
a. THIS DRAWING IS NOT TO BE SCALED, WORK TO FIGURED DIMENSIONS ONLY, CONFIRMED ON SITE.
b. THIS DRAWING IS TO BE READ IN CONIUNCTION WITH ALL RELEVANT ARCHITECTURAL DRAWINGS, DETAILED SPECIFICATIONS WHERE APPLICABLE AND ALL ASSOCIATED DRAWINGS IN THIS SERIES.
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- BELOW GROUND DRAINAGE
a. PIPEWORK TO BE UPVC/CLP PIPES TO BS 4660 : 2000 AND INSPECTION CHAMBERS TO BS 7158 : 2001.
b. ALL ADOPTABLE DRAINAGE TO BE CONSTRUCTED IN ACCORDANCE WITH 'SEWERS FOR ADOPTION' 7TH EDITION AND THE RELEVANT COUNCIL DESIGN GUIDE.
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b. MANHOLE COVER AND FRAME TO BE BEDDED AND SURROUNDED IN 1:3 MORTAR.

REV	DATE	BY	CKD	APPDDESCRIPTION
PRELIMINARY DRAWING FOR INFORMATION ONLY. NOT FOR CONSTRUCTION.				
Client SPENCER CULLIS				
AMBIENTAL ENVIRONMENTAL ASSESSMENT a company of Royal HaskoningDHV				
Project LAND ADJ. 4 SUNNYACRE WREXHAM LL11 4RH				
Drawing SURFACE WATER DRAINAGE STRATEGY DRAINAGE DETAILS				
Drawn by: OH			Date: OCT - 2021	
Drawing No. 5997 - DR02			Revision -	
Drawing Scale: 1:20 @ A1 0 200 400 600 800 1000mm				

Appendix 3 –Calculations

Ambiental		Page 1
Science Park Square Brighton East Sussex, BN1 9SB	Land adj. 4 Sunnycroft LL11 4RH #5997	
Date 18/10/2021 File	Designed by OH Checked by SB	
Innovyze Source Control 2018.1		
<u>ICP SUDS Mean Annual Flood</u> Input Return Period (years) 100 Soil 0.300 Area (ha) 0.100 Urban 0.000 SAAR (mm) 938 Region Number Region 9 Results 1/s QBAR Rural 0.3 QBAR Urban 0.3 Q100 years 0.6 Q1 year 0.2 Q30 years 0.5 Q100 years 0.6		
©1982-2018 Innovyze		

Ambiental				Page 1																																																																																																																																																																																																																			
Science Park Square Brighton East Sussex, BN1 9SB		Land adj. 4 Sunnycroft LL11 4RH Ref: 5997																																																																																																																																																																																																																					
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Innovyze		Source Control 2018.1																																																																																																																																																																																																																					
<u>Summary of Results for 1 year Return Period (+40%)</u> Half Drain Time : 481 minutes. <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>60 min Summer</td><td>91.916</td><td>0.116</td><td>0.1</td><td>1.7</td><td>O K</td></tr><tr><td>120 min Summer</td><td>91.945</td><td>0.145</td><td>0.1</td><td>2.1</td><td>O K</td></tr><tr><td>180 min Summer</td><td>91.962</td><td>0.162</td><td>0.1</td><td>2.3</td><td>O K</td></tr><tr><td>240 min Summer</td><td>91.973</td><td>0.173</td><td>0.1</td><td>2.5</td><td>O K</td></tr><tr><td>360 min Summer</td><td>91.985</td><td>0.185</td><td>0.1</td><td>2.6</td><td>O K</td></tr><tr><td>480 min Summer</td><td>91.991</td><td>0.191</td><td>0.1</td><td>2.7</td><td>O K</td></tr><tr><td>600 min Summer</td><td>91.996</td><td>0.196</td><td>0.1</td><td>2.8</td><td>O K</td></tr><tr><td>720 min Summer</td><td>91.999</td><td>0.199</td><td>0.1</td><td>2.8</td><td>O K</td></tr><tr><td>960 min Summer</td><td>92.003</td><td>0.203</td><td>0.1</td><td>2.9</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>92.003</td><td>0.203</td><td>0.1</td><td>2.9</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>91.995</td><td>0.195</td><td>0.1</td><td>2.8</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>91.985</td><td>0.185</td><td>0.1</td><td>2.6</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>91.963</td><td>0.163</td><td>0.1</td><td>2.3</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>91.940</td><td>0.140</td><td>0.1</td><td>2.0</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>91.919</td><td>0.119</td><td>0.1</td><td>1.7</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>91.901</td><td>0.101</td><td>0.1</td><td>1.4</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>91.886</td><td>0.086</td><td>0.1</td><td>1.2</td><td>O K</td></tr><tr><td>60 min Winter</td><td>91.931</td><td>0.131</td><td>0.1</td><td>1.9</td><td>O K</td></tr><tr><td>120 min Winter</td><td>91.964</td><td>0.164</td><td>0.1</td><td>2.3</td><td>O K</td></tr><tr><td>180 min Winter</td><td>91.984</td><td>0.184</td><td>0.1</td><td>2.6</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>60 min Summer</td><td>15.926</td><td>0.0</td><td>62</td></tr><tr><td>120 min Summer</td><td>10.402</td><td>0.0</td><td>122</td></tr><tr><td>180 min Summer</td><td>8.083</td><td>0.0</td><td>182</td></tr><tr><td>240 min Summer</td><td>6.755</td><td>0.0</td><td>240</td></tr><tr><td>360 min Summer</td><td>5.208</td><td>0.0</td><td>336</td></tr><tr><td>480 min Summer</td><td>4.318</td><td>0.0</td><td>398</td></tr><tr><td>600 min Summer</td><td>3.735</td><td>0.0</td><td>464</td></tr><tr><td>720 min Summer</td><td>3.317</td><td>0.0</td><td>528</td></tr><tr><td>960 min Summer</td><td>2.753</td><td>0.0</td><td>666</td></tr><tr><td>1440 min Summer</td><td>2.118</td><td>0.0</td><td>952</td></tr><tr><td>2160 min Summer</td><td>1.627</td><td>0.0</td><td>1364</td></tr><tr><td>2880 min Summer</td><td>1.350</td><td>0.0</td><td>1764</td></tr><tr><td>4320 min Summer</td><td>1.040</td><td>0.0</td><td>2552</td></tr><tr><td>5760 min Summer</td><td>0.863</td><td>0.0</td><td>3336</td></tr><tr><td>7200 min Summer</td><td>0.744</td><td>0.0</td><td>4040</td></tr><tr><td>8640 min Summer</td><td>0.660</td><td>0.0</td><td>4760</td></tr><tr><td>10080 min Summer</td><td>0.596</td><td>0.0</td><td>5448</td></tr><tr><td>60 min Winter</td><td>15.926</td><td>0.0</td><td>62</td></tr><tr><td>120 min Winter</td><td>10.402</td><td>0.0</td><td>120</td></tr><tr><td>180 min Winter</td><td>8.083</td><td>0.0</td><td>178</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	60 min Summer	91.916	0.116	0.1	1.7	O K	120 min Summer	91.945	0.145	0.1	2.1	O K	180 min Summer	91.962	0.162	0.1	2.3	O K	240 min Summer	91.973	0.173	0.1	2.5	O K	360 min Summer	91.985	0.185	0.1	2.6	O K	480 min Summer	91.991	0.191	0.1	2.7	O K	600 min Summer	91.996	0.196	0.1	2.8	O K	720 min Summer	91.999	0.199	0.1	2.8	O K	960 min Summer	92.003	0.203	0.1	2.9	O K	1440 min Summer	92.003	0.203	0.1	2.9	O K	2160 min Summer	91.995	0.195	0.1	2.8	O K	2880 min Summer	91.985	0.185	0.1	2.6	O K	4320 min Summer	91.963	0.163	0.1	2.3	O K	5760 min Summer	91.940	0.140	0.1	2.0	O K	7200 min Summer	91.919	0.119	0.1	1.7	O K	8640 min Summer	91.901	0.101	0.1	1.4	O K	10080 min Summer	91.886	0.086	0.1	1.2	O K	60 min Winter	91.931	0.131	0.1	1.9	O K	120 min Winter	91.964	0.164	0.1	2.3	O K	180 min Winter	91.984	0.184	0.1	2.6	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	60 min Summer	15.926	0.0	62	120 min Summer	10.402	0.0	122	180 min Summer	8.083	0.0	182	240 min Summer	6.755	0.0	240	360 min Summer	5.208	0.0	336	480 min Summer	4.318	0.0	398	600 min Summer	3.735	0.0	464	720 min Summer	3.317	0.0	528	960 min Summer	2.753	0.0	666	1440 min Summer	2.118	0.0	952	2160 min Summer	1.627	0.0	1364	2880 min Summer	1.350	0.0	1764	4320 min Summer	1.040	0.0	2552	5760 min Summer	0.863	0.0	3336	7200 min Summer	0.744	0.0	4040	8640 min Summer	0.660	0.0	4760	10080 min Summer	0.596	0.0	5448	60 min Winter	15.926	0.0	62	120 min Winter	10.402	0.0	120	180 min Winter	8.083	0.0	178
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Ambiental				Page 2	
Science Park Square Brighton East Sussex, BN1 9SB		Land adj. 4 Sunnycacre LL11 4RH Ref: 5997			
Date 18/10/2021 File		Designed by OH Checked by SB			
Innovyze		Source Control 2018.1			
<u>Summary of Results for 1 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	91.997	0.197	0.1	2.8	O K
360 min Winter	92.013	0.213	0.1	3.0	O K
480 min Winter	92.020	0.220	0.1	3.1	O K
600 min Winter	92.024	0.224	0.1	3.2	O K
720 min Winter	92.028	0.228	0.1	3.2	O K
960 min Winter	92.030	0.230	0.1	3.3	O K
1440 min Winter	92.026	0.226	0.1	3.2	O K
2160 min Winter	92.011	0.211	0.1	3.0	O K
2880 min Winter	91.991	0.191	0.1	2.7	O K
4320 min Winter	91.953	0.153	0.1	2.2	O K
5760 min Winter	91.918	0.118	0.1	1.7	O K
7200 min Winter	91.887	0.087	0.1	1.2	O K
8640 min Winter	91.864	0.064	0.1	0.9	O K
10080 min Winter	91.850	0.050	0.1	0.7	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
240 min Winter	6.755	0.0	234		
360 min Winter	5.208	0.0	346		
480 min Winter	4.318	0.0	450		
600 min Winter	3.735	0.0	492		
720 min Winter	3.317	0.0	564		
960 min Winter	2.753	0.0	722		
1440 min Winter	2.118	0.0	1036		
2160 min Winter	1.627	0.0	1476		
2880 min Winter	1.350	0.0	1904		
4320 min Winter	1.040	0.0	2724		
5760 min Winter	0.863	0.0	3464		
7200 min Winter	0.744	0.0	4176		
8640 min Winter	0.660	0.0	4760		
10080 min Winter	0.596	0.0	5248		
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Science Park Square Brighton East Sussex, BN1 9SB	Land adj. 4 Sunnyacre LL11 4RH Ref: 5997	
Date 18/10/2021 File	Designed by OH Checked by SB	
Innovyze Source Control 2018.1		

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	60
Ratio R	0.305	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.015

Time (mins)	Area
From:	To: (ha)
0	4 0.015

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Science Park Square Brighton East Sussex, BN1 9SB	Land adj. 4 Sunnyside LL11 4RH Ref: 5997	
Date 18/10/2021 File	Designed by OH Checked by SB	
Innovyze Source Control 2018.1		

Model Details

Storage is Online Cover Level (m) 93.000

Cellular Storage Structure

Invert Level (m) 91.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.02200 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.02200

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	15.0	16.0	0.801	0.0	28.8
0.800	15.0	28.8			

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Ambiental				Page 1																																																																																																																																																																																																																			
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Summer</td><td>92.293</td><td>0.493</td><td>0.1</td><td>7.0</td><td>O K</td></tr><tr><td>960 min Summer</td><td>92.297</td><td>0.497</td><td>0.1</td><td>7.1</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>92.295</td><td>0.495</td><td>0.1</td><td>7.1</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>92.283</td><td>0.483</td><td>0.1</td><td>6.9</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>92.265</td><td>0.465</td><td>0.1</td><td>6.6</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>92.226</td><td>0.426</td><td>0.1</td><td>6.1</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>92.188</td><td>0.388</td><td>0.1</td><td>5.5</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>92.152</td><td>0.352</td><td>0.1</td><td>5.0</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>92.118</td><td>0.318</td><td>0.1</td><td>4.5</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>92.087</td><td>0.287</td><td>0.1</td><td>4.1</td><td>O K</td></tr><tr><td>60 min Winter</td><td>92.130</td><td>0.330</td><td>0.1</td><td>4.7</td><td>O K</td></tr><tr><td>120 min Winter</td><td>92.209</td><td>0.409</td><td>0.1</td><td>5.8</td><td>O K</td></tr><tr><td>180 min Winter</td><td>92.255</td><td>0.455</td><td>0.1</td><td>6.5</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>60 min Summer</td><td>38.715</td><td>0.0</td><td>64</td></tr><tr><td>120 min Summer</td><td>24.616</td><td>0.0</td><td>122</td></tr><tr><td>180 min Summer</td><td>18.667</td><td>0.0</td><td>182</td></tr><tr><td>240 min Summer</td><td>15.254</td><td>0.0</td><td>242</td></tr><tr><td>360 min Summer</td><td>11.439</td><td>0.0</td><td>362</td></tr><tr><td>480 min Summer</td><td>9.321</td><td>0.0</td><td>480</td></tr><tr><td>600 min Summer</td><td>7.946</td><td>0.0</td><td>600</td></tr><tr><td>720 min Summer</td><td>6.971</td><td>0.0</td><td>700</td></tr><tr><td>960 min Summer</td><td>5.666</td><td>0.0</td><td>810</td></tr><tr><td>1440 min Summer</td><td>4.224</td><td>0.0</td><td>1066</td></tr><tr><td>2160 min Summer</td><td>3.144</td><td>0.0</td><td>1472</td></tr><tr><td>2880 min Summer</td><td>2.546</td><td>0.0</td><td>1900</td></tr><tr><td>4320 min Summer</td><td>1.889</td><td>0.0</td><td>2724</td></tr><tr><td>5760 min Summer</td><td>1.528</td><td>0.0</td><td>3520</td></tr><tr><td>7200 min Summer</td><td>1.297</td><td>0.0</td><td>4320</td></tr><tr><td>8640 min Summer</td><td>1.135</td><td>0.0</td><td>5096</td></tr><tr><td>10080 min Summer</td><td>1.014</td><td>0.0</td><td>5848</td></tr><tr><td>60 min Winter</td><td>38.715</td><td>0.0</td><td>62</td></tr><tr><td>120 min Winter</td><td>24.616</td><td>0.0</td><td>122</td></tr><tr><td>180 min Winter</td><td>18.667</td><td>0.0</td><td>180</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	60 min Summer	92.093	0.293	0.1	4.2	O K	120 min Summer	92.163	0.363	0.1	5.2	O K	180 min Summer	92.203	0.403	0.1	5.7	O K	240 min Summer	92.229	0.429	0.1	6.1	O K	360 min Summer	92.260	0.460	0.1	6.6	O K	480 min Summer	92.278	0.478	0.1	6.8	O K	600 min Summer	92.288	0.488	0.1	7.0	O K	720 min Summer	92.293	0.493	0.1	7.0	O K	960 min Summer	92.297	0.497	0.1	7.1	O K	1440 min Summer	92.295	0.495	0.1	7.1	O K	2160 min Summer	92.283	0.483	0.1	6.9	O K	2880 min Summer	92.265	0.465	0.1	6.6	O K	4320 min Summer	92.226	0.426	0.1	6.1	O K	5760 min Summer	92.188	0.388	0.1	5.5	O K	7200 min Summer	92.152	0.352	0.1	5.0	O K	8640 min Summer	92.118	0.318	0.1	4.5	O K	10080 min Summer	92.087	0.287	0.1	4.1	O K	60 min Winter	92.130	0.330	0.1	4.7	O K	120 min Winter	92.209	0.409	0.1	5.8	O K	180 min Winter	92.255	0.455	0.1	6.5	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	60 min Summer	38.715	0.0	64	120 min Summer	24.616	0.0	122	180 min Summer	18.667	0.0	182	240 min Summer	15.254	0.0	242	360 min Summer	11.439	0.0	362	480 min Summer	9.321	0.0	480	600 min Summer	7.946	0.0	600	720 min Summer	6.971	0.0	700	960 min Summer	5.666	0.0	810	1440 min Summer	4.224	0.0	1066	2160 min Summer	3.144	0.0	1472	2880 min Summer	2.546	0.0	1900	4320 min Summer	1.889	0.0	2724	5760 min Summer	1.528	0.0	3520	7200 min Summer	1.297	0.0	4320	8640 min Summer	1.135	0.0	5096	10080 min Summer	1.014	0.0	5848	60 min Winter	38.715	0.0	62	120 min Winter	24.616	0.0	122	180 min Winter	18.667	0.0	180
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Ambiental			Page 2		
Science Park Square Brighton East Sussex, BN1 9SB		Land adj. 4 Sunnycroft LL11 4RH Ref: 5997			
Date 18/10/2021 File		Designed by OH Checked by SB			
Innovyze		Source Control 2018.1			
<u>Summary of Results for 30 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	92.285	0.485	0.1	6.9	O K
360 min Winter	92.324	0.524	0.1	7.5	O K
480 min Winter	92.347	0.547	0.1	7.8	O K
600 min Winter	92.361	0.561	0.1	8.0	O K
720 min Winter	92.370	0.570	0.1	8.1	O K
960 min Winter	92.375	0.575	0.1	8.2	O K
1440 min Winter	92.371	0.571	0.1	8.1	O K
2160 min Winter	92.352	0.552	0.1	7.9	O K
2880 min Winter	92.323	0.523	0.1	7.5	O K
4320 min Winter	92.262	0.462	0.1	6.6	O K
5760 min Winter	92.202	0.402	0.1	5.7	O K
7200 min Winter	92.148	0.348	0.1	5.0	O K
8640 min Winter	92.098	0.298	0.1	4.2	O K
10080 min Winter	92.053	0.253	0.1	3.6	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
240 min Winter	15.254	0.0	238		
360 min Winter	11.439	0.0	354		
480 min Winter	9.321	0.0	468		
600 min Winter	7.946	0.0	580		
720 min Winter	6.971	0.0	692		
960 min Winter	5.666	0.0	902		
1440 min Winter	4.224	0.0	1126		
2160 min Winter	3.144	0.0	1596		
2880 min Winter	2.546	0.0	2048		
4320 min Winter	1.889	0.0	2940		
5760 min Winter	1.528	0.0	3800		
7200 min Winter	1.297	0.0	4608		
8640 min Winter	1.135	0.0	5368		
10080 min Winter	1.014	0.0	6152		
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Ambiental		Page 3
Science Park Square Brighton East Sussex, BN1 9SB	Land adj. 4 Sunnyacre LL11 4RH Ref: 5997	
Date 18/10/2021 File	Designed by OH Checked by SB	
Innovyze Source Control 2018.1		

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	60
Ratio R	0.305	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.015

Time (mins)	Area
From:	To: (ha)
0	4 0.015

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Ambiental		Page 4
Science Park Square Brighton East Sussex, BN1 9SB	Land adj. 4 Sunnyside LL11 4RH Ref: 5997	
Date 18/10/2021 File	Designed by OH Checked by SB	
Innovyze Source Control 2018.1		

Model Details

Storage is Online Cover Level (m) 93.000

Cellular Storage Structure

Invert Level (m) 91.800 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.02200 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.02200

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	15.0	16.0	0.801	0.0	28.8
0.800	15.0	28.8			

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Ambiental				Page 1																																																																																																																																																																																																																			
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<u>Summary of Results for 100 year Return Period (+40%)</u> Half Drain Time : 1196 minutes. <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>60 min Summer</td><td>92.188</td><td>0.388</td><td>0.1</td><td>5.5</td><td>O K</td></tr><tr><td>120 min Summer</td><td>92.283</td><td>0.483</td><td>0.1</td><td>6.9</td><td>O K</td></tr><tr><td>180 min Summer</td><td>92.337</td><td>0.537</td><td>0.1</td><td>7.6</td><td>O K</td></tr><tr><td>240 min Summer</td><td>92.370</td><td>0.570</td><td>0.1</td><td>8.1</td><td>O K</td></tr><tr><td>360 min Summer</td><td>92.412</td><td>0.612</td><td>0.1</td><td>8.7</td><td>O K</td></tr><tr><td>480 min Summer</td><td>92.437</td><td>0.637</td><td>0.1</td><td>9.1</td><td>O K</td></tr><tr><td>600 min Summer</td><td>92.452</td><td>0.652</td><td>0.1</td><td>9.3</td><td>O K</td></tr><tr><td>720 min 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min Summer</td><td>7.198</td><td>0.0</td><td>878</td></tr><tr><td>1440 min Summer</td><td>5.315</td><td>0.0</td><td>1124</td></tr><tr><td>2160 min Summer</td><td>3.914</td><td>0.0</td><td>1516</td></tr><tr><td>2880 min Summer</td><td>3.145</td><td>0.0</td><td>1932</td></tr><tr><td>4320 min Summer</td><td>2.305</td><td>0.0</td><td>2764</td></tr><tr><td>5760 min Summer</td><td>1.849</td><td>0.0</td><td>3576</td></tr><tr><td>7200 min Summer</td><td>1.559</td><td>0.0</td><td>4392</td></tr><tr><td>8640 min Summer</td><td>1.357</td><td>0.0</td><td>5184</td></tr><tr><td>10080 min Summer</td><td>1.207</td><td>0.0</td><td>5952</td></tr><tr><td>60 min Winter</td><td>50.812</td><td>0.0</td><td>62</td></tr><tr><td>120 min Winter</td><td>32.374</td><td>0.0</td><td>122</td></tr><tr><td>180 min Winter</td><td>24.479</td><td>0.0</td><td>180</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	60 min Summer	92.188	0.388	0.1	5.5	O K	120 min 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Summer	12.010	0.0	482	600 min Summer	10.194	0.0	600	720 min Summer	8.911	0.0	720	960 min Summer	7.198	0.0	878	1440 min Summer	5.315	0.0	1124	2160 min Summer	3.914	0.0	1516	2880 min Summer	3.145	0.0	1932	4320 min Summer	2.305	0.0	2764	5760 min Summer	1.849	0.0	3576	7200 min Summer	1.559	0.0	4392	8640 min Summer	1.357	0.0	5184	10080 min Summer	1.207	0.0	5952	60 min Winter	50.812	0.0	62	120 min Winter	32.374	0.0	122	180 min Winter	24.479	0.0	180
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120 min Summer	92.283	0.483	0.1	6.9	O K																																																																																																																																																																																																																		
180 min Summer	92.337	0.537	0.1	7.6	O K																																																																																																																																																																																																																		
240 min Summer	92.370	0.570	0.1	8.1	O K																																																																																																																																																																																																																		
360 min Summer	92.412	0.612	0.1	8.7	O K																																																																																																																																																																																																																		
480 min Summer	92.437	0.637	0.1	9.1	O K																																																																																																																																																																																																																		
600 min Summer	92.452	0.652	0.1	9.3	O K																																																																																																																																																																																																																		
720 min Summer	92.459	0.659	0.1	9.4	O K																																																																																																																																																																																																																		
960 min Summer	92.463	0.663	0.1	9.4	O K																																																																																																																																																																																																																		
1440 min Summer	92.459	0.659	0.1	9.4	O K																																																																																																																																																																																																																		
2160 min Summer	92.440	0.640	0.1	9.1	O K																																																																																																																																																																																																																		
2880 min Summer	92.416	0.616	0.1	8.8	O K																																																																																																																																																																																																																		
4320 min Summer	92.367	0.567	0.1	8.1	O K																																																																																																																																																																																																																		
5760 min Summer	92.319	0.519	0.1	7.4	O K																																																																																																																																																																																																																		
7200 min Summer	92.276	0.476	0.1	6.8	O K																																																																																																																																																																																																																		
8640 min Summer	92.236	0.436	0.1	6.2	O K																																																																																																																																																																																																																		
10080 min Summer	92.199	0.399	0.1	5.7	O K																																																																																																																																																																																																																		
60 min Winter	92.236	0.436	0.1	6.2	O K																																																																																																																																																																																																																		
120 min Winter	92.344	0.544	0.1	7.8	O K																																																																																																																																																																																																																		
180 min Winter	92.406	0.606	0.1	8.6	O K																																																																																																																																																																																																																		
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)																																																																																																																																																																																																																				
60 min Summer	50.812	0.0	64																																																																																																																																																																																																																				
120 min Summer	32.374	0.0	124																																																																																																																																																																																																																				
180 min Summer	24.479	0.0	182																																																																																																																																																																																																																				
240 min Summer	19.911	0.0	242																																																																																																																																																																																																																				
360 min Summer	14.817	0.0	362																																																																																																																																																																																																																				
480 min Summer	12.010	0.0	482																																																																																																																																																																																																																				
600 min Summer	10.194	0.0	600																																																																																																																																																																																																																				
720 min Summer	8.911	0.0	720																																																																																																																																																																																																																				
960 min Summer	7.198	0.0	878																																																																																																																																																																																																																				
1440 min Summer	5.315	0.0	1124																																																																																																																																																																																																																				
2160 min Summer	3.914	0.0	1516																																																																																																																																																																																																																				
2880 min Summer	3.145	0.0	1932																																																																																																																																																																																																																				
4320 min Summer	2.305	0.0	2764																																																																																																																																																																																																																				
5760 min Summer	1.849	0.0	3576																																																																																																																																																																																																																				
7200 min Summer	1.559	0.0	4392																																																																																																																																																																																																																				
8640 min Summer	1.357	0.0	5184																																																																																																																																																																																																																				
10080 min Summer	1.207	0.0	5952																																																																																																																																																																																																																				
60 min Winter	50.812	0.0	62																																																																																																																																																																																																																				
120 min Winter	32.374	0.0	122																																																																																																																																																																																																																				
180 min Winter	24.479	0.0	180																																																																																																																																																																																																																				
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Ambiental		Page 2			
Science Park Square Brighton East Sussex, BN1 9SB	Land adj. 4 Sunnycroft LL11 4RH Ref: 5997				
Date 18/10/2021 File	Designed by OH Checked by SB				
Innovyze	Source Control 2018.1				
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	92.445	0.645	0.1	9.2	O K
360 min Winter	92.495	0.695	0.1	9.9	O K
480 min Winter	92.526	0.726	0.1	10.3	O K
600 min Winter	92.546	0.746	0.1	10.6	O K
720 min Winter	92.558	0.758	0.1	10.8	O K
960 min Winter	92.567	0.767	0.1	10.9	O K
1440 min Winter	92.559	0.759	0.1	10.8	O K
2160 min Winter	92.535	0.735	0.1	10.5	O K
2880 min Winter	92.501	0.701	0.1	10.0	O K
4320 min Winter	92.426	0.626	0.1	8.9	O K
5760 min Winter	92.355	0.555	0.1	7.9	O K
7200 min Winter	92.290	0.490	0.1	7.0	O K
8640 min Winter	92.231	0.431	0.1	6.1	O K
10080 min Winter	92.177	0.377	0.1	5.4	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
240 min Winter	19.911	0.0	238		
360 min Winter	14.817	0.0	356		
480 min Winter	12.010	0.0	470		
600 min Winter	10.194	0.0	584		
720 min Winter	8.911	0.0	696		
960 min Winter	7.198	0.0	914		
1440 min Winter	5.315	0.0	1170		
2160 min Winter	3.914	0.0	1624		
2880 min Winter	3.145	0.0	2080		
4320 min Winter	2.305	0.0	2984		
5760 min Winter	1.849	0.0	3856		
7200 min Winter	1.559	0.0	4688		
8640 min Winter	1.357	0.0	5528		
10080 min Winter	1.207	0.0	6256		
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Ambiental		Page 3
Science Park Square Brighton East Sussex, BN1 9SB	Land adj. 4 Sunnyacre LL11 4RH Ref: 5997	
Date 18/10/2021 File	Designed by OH Checked by SB	
Innovyze Source Control 2018.1		

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	60
Ratio R	0.305	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.015

Time (mins)		Area
From:	To:	(ha)
0	4	0.015

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Ambiental		Page 4
Science Park Square Brighton East Sussex, BN1 9SB	Land adj. 4 Sunnyside LL11 4RH Ref: 5997	
Date 18/10/2021 File	Designed by OH Checked by SB	
Innovyze Source Control 2018.1		

Model Details

Storage is Online Cover Level (m) 93.000

Cellular Storage Structure

Invert Level (m) 91.800 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.02200 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.02200

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	15.0	16.0	0.801	0.0	28.8
0.800	15.0	28.8			

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Appendix 4 – Drainage Maintenance Regime

GULLIES, PIPEWORK, INSPECTION CHAMBERS AND CONTROLS	
<u>Required Action</u>	<u>Frequency</u>
Regular Maintenance	
Remove cover and inspect chambers and pipework ensuring water is flowing freely and that the exit route for water is unobstructed.	Annually
Undertake inspection after leaf fall in autumn, remove leaves from gullies, chambers and pipes	Every autumn
Inspect silt traps and clear of silt	Every 6 months or as required
Inspect catchpits and clear of silt	Every 6 months or as required
Remedial work	
Remove debris, silt and leaves from inspection chambers and flow control chambers.	As required
Remove debris and silt from pipework through high pressure jet washing.	As required
Repair physical damage if necessary	As required
Monitoring	
CCTV survey to establish condition of pipe runs. Cleansing or repair of physical damage to be conducted if necessary	Every 5 years or as required
PERMEABLE AND POROUS SURFACES	
<u>Required Action</u>	<u>Frequency</u>
Regular Maintenance	
Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional Tasks	
Stabilise and mow contributing and adjacent areas	As required
Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required
Remedial Work	
Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material.	As required

Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required
If efficiency of water percolating to the sub-base drops, jet washing and suction cleaning could substantially reinstate paving to 90% efficiency (as per recent experience).	As required
Monitoring	
Initial inspection	Monthly for three months after installation
Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48h after large storms in first six months
Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
Monitor inspection chambers	Annually
GEOCELLULAR SOAKAWAY SYSTEM	
<u>Required Action</u>	<u>Frequency</u>
Regular maintenance	
Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually
Remove debris from the catchment surface (where it may cause risks to performance).	Monthly
Remove sediment from pre-treatment structures – all runoff entering the tank will need to have been routed through a catchpit with sediment filter.	Annually or as required
Remedial	
Repair/rehabilitate inlets and vents	As required
Monitoring	
Inspect/check all inlets and vents to ensure that they are in good condition and operating as designed	Annually
If product allows for internal inspection, CCTV survey inside of tank for sediment build-up and remove if necessary (this could be through the Polystorm Access product suitable for the Polystorm Xtra crate system). Manufacturer's specific recommendation to be followed.	Every 5 years or as required

TYPICAL KEY SUDS COMPONENTS OPERATION AND MAINTENANCE ACTIVITIES													
Operation and Maintenance Activity	SuDS Component												
	Pond	Wetlands	Detention Basin	Infiltration Basin	Soakaway	Infiltration Trench	Filter Drain	Modular Storage	Pervious pavement	Swale/Bioretention	Filter Strip	Green Roofs	Proprietary Treatment
Regular Maintenance													
Inspection	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Litter/debris removal	✓	✓	✓	✓	-	✓	✓	-	✓	✓	✓	x	-
Grass cutting	✓	✓	✓	✓	-	✓	✓	-	-	✓	✓	x	x
Weed/invasive plant control	-	-	-	-	X	-	-	x	-	x	-	✓	x
Shrub management	-	-	-	-	X	x	x	x	-	-	-	x	x
Shoreline vegetation management	✓	✓	-	x	X	x	x	x	x	x	x	x	x
Aquatic vegetation management	✓	✓	-	x	X	x	x	x	x	x	x	x	x
Occasional Maintenance													
Sediment management	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Vegetation replacement	-	-	-	-	X	x	x	x	x	-	-	✓	x
Vacuum sweeping and brushing	x	x	x	x	X	x	x	x	✓	x	x	x	x
Remedial Maintenance													
Structure rehabilitation/repair	-	-	-	-	-	-	-	-	-	-	-	-	x
Infiltration surface reconditioning	x	x	x	-	-	-	-	x	-	-	-	x	x
Key:													
Will be Required		✓	May be Required				-	Not Normally Required				x	

All onsite SuDS and drainage systems will be privately maintained. A long-term maintenance regime should be agreed with the site owners before adoption. In addition to a long-term maintenance regime, it is recommended that all drainage elements implemented on site should be inspected following the first rainfall event post-construction and monthly for the first quarter following construction.

Visual Inspection/ Sweep

This should include a systematic review of the drainage infrastructure. Each element should be inspected to determine if remedial actions are needed. Where access chambers are provided, these should be used to access below ground infrastructure:

- Rodding eyes / inspection chambers are provided at both ends of all perforated pipes, these should be used to determine the level of silt within the system;
- Non-man entry inspection chambers are provided for the geo-cellular structure;
- Permeable paving should be inspected for vegetation / defects (rocking blocks), it should be swept clear of debris.

System Test

The surface water drainage system should be CCTV surveyed and dye tested at least every ten years.

Replacement of elements

Should the replacement of any element be required, this should be undertaken in accordance with the manufacturer's specifications and in a planned and controlled manner. Working on live drainage systems can pose a health and safety hazard and should only be undertaken by a competent contractor.

Surface water management during construction

The surface water runoff generated during construction has the potential to have higher concentration of oils and sediments from heavy machinery and earthworks respectively. As such, it is necessary to devise appropriate surface water management plans tailored to specific construction activities and receptors of runoff. Specific considerations are:

- Provision of appropriate bunding / containment for potentially hazardous materials / chemicals;
- Re-fuelling of plant and equipment to take place only within designated areas, with suitable pollution containment;
- Good house-keeping on site to prevent accidental spillages, and spill kits to be provided as appropriate;
- Vehicle wash down areas / wheel cleaning to be located in areas with appropriate pollution control measures;
- If water/spray dust suppression is needed, the run-off should be directed to a temporary containment area, and should not be allowed to discharge to the public sewer / infiltration devices;
- The installed surface water drainage network should be routinely inspected during construction, especially the infiltration devices; and,
- Suitable protection measures should be in place during construction to protect the watercourse and groundwater resources.

Spillage – Emergency Action

Most spillages on development sites are of compounds that do not pose a serious risk to the environment if they enter the drainage in a slow and controlled manner, with time available for natural breakdown in a treatment system. Therefore, small spillages of oil, milk or other known organic substances should be removed where possible using soak mats as recommended by the Environment Agency with residual spillage allowed to bio-remediate in the drainage system.

In the event of a serious spillage, either by volume or of unknown or toxic compounds, then this should be isolated with soil, turf, or fabric and block outlet pipes from chamber(s) downstream of the spillage with a bung(s). (A bung for blocking pipes may be made by wrapping soil or turf in a plastic sheet or close woven fabric.) Contact the Environment Agency immediately.

Table 1-7: Indicative annual maintenance costs for key SUDS options

Option	Annual maintenance costs	Source
Green roofs	£2,500 per year for first 2 years for covered roof with sedum mat, £600 per year after. £1,250 per year for first 2 years for covered roof with biodiverse roof, £150 per year after.	Bamfield (2005) Bamfield (2005)
Simple rainwater harvesting (water butts)	Negligible	
Advanced rainwater harvesting	£250 per year per property for external maintenance contract	RainCycle
Permeable paving	£0.5 - £1 / m ³ of storage volume	HR Wallingford, 2004
Filter drain / perforated pipes	£0.2 - £1 / m ² of filter surface area	HR Wallingford, 2004
Swales	£0.1 / m ² of swale surface area £350 per year	HR Wallingford, 2004 Ellis, 2003
Infiltration basin	£0.1 - £0.3 / m ² of detention basin area £0.25 - £1 / m ³ of detention volume	HR Wallingford, 2004
Soakaways	£0.1 / m ² of treated area	HR Wallingford, 2004
Infiltration trench	£0.2 - £1 / m ² of filter surface area	HR Wallingford, 2004
Filter strip	£0.1 / m ² of filter surface area	HR Wallingford, 2004
Constructed wetland	£0.1 / m ² of wetland surface area Annual maintenance of £200-250/yr for first 5 years (declining to £80 -£100/yr after 3 years).	HR Wallingford, 2004 Ellis, 2003
Retention (wet) pond	£0.5 - £1.5 / m ² of retention pond surface area £0.1 - £2 / m ³ of pond volume	HR Wallingford, 2004 HR Wallingford, 2004 Ellis, 2003
Detention basin	£0.1 - £0.3 / m ² of detention basin area £0.25 - £1 / m ³ of detention volume £250-£1000 per basin	HR Wallingford, 2004 HR Wallingford, 2004 Ellis, 2003

Table 1-8: Indicative annual maintenance costs by contributing area

Option	Annual maintenance costs
Rainwater harvesting	£0.4 per m ² for detached/semi detached residential properties £0.1 per m ² for non-domestic properties
Permeable paving	£0.4 per m ²
Filter drain / perforated pipes	£0.6 per m ² for regular maintenance £3.0 per m ² for intermittent maintenance £0.2 per m ² for monitoring
Swales	£0.1 per m ² for regular maintenance £0.15 per m ² for intermittent maintenance £2.0 per m ² for remedial maintenance £0.05 per m ² for monitoring
Infiltration basin	£0.6 per m ² for regular maintenance £3.0 per m ² for intermittent maintenance £2.0 per m ² for monitoring

Table 1-9: Indicative annual maintenance activities and unit costs for various SUDS features

SUDS feature	Activity	Frequency	Unit rates
Peripheral planting	Grass cutting and collection / disposal	Monthly	£150
	Meadow grass cutting/management	6 monthly	£400
	Woodland grass cutting/management	Annual	£250
	General vegetation management	4 monthly	£60
	Litter removal during monthly site visits	10 visits a year	£30
Drainage features	Litter removal during monthly site visits	Monthly	£20 per visit
	Grass cutting April - October	Fortnightly	£25 per visit
	Swale grass cutting	Monthly	£25 per visit
	Wetland ditch vegetation management	6 monthly	£40 per visit
	Aquatic plant management	5 visits a year	£100
Inlets and outlets	Remove debris, strim, remove accumulated silt	Monthly	£50
	Rip-rap inspection	Monthly	£10
	Grass weir inspection	Monthly	£10
	Stilling area inspection. 12 visits 10 120	Monthly	£10
Visual monitoring		Monthly	£15

As the end of the design life SUDS components will require either rehabilitation or decommissioning. Components of the system that may require disposal include fill material, block paving, geomembranes and sediment.

Where ground features are used such as swales, the costs are likely to be minimal. However, the use of filter drains, ponds or pervious pavements where a volume of construction material or sediment requiring disposal is required, the costs could be significantly higher due to the need to consider landfill charges and the possible impact of pollutants in the disposal materials.

Some decommissioning assumptions for SUDS features are provided by Taylor (2005) who undertook an analysis of project costs for real examples and literature values from storm water treatment measures around Australia. Despite acknowledgements with regard to the uncertainty of this information and a high degree of variability in these measures, this information provides indicative values for the proportion of decommissioning costs associated with a number of different measures.

Typical decommissioning costs are 35 - 42% of the total construction costs.

Table 1-12: Design life estimates for SUDS measures

Option	Design life	Component life
Green roofs	Unlimited design life	N/A
Simple rainwater harvesting (water butts)	Unlimited design life	No reliable information
Advanced rainwater harvesting	Unlimited design life	No reliable information.
Permeable paving	Unlimited design life	20-25 years before replacement of filter material
Filter drain / perforated pipes	Unlimited design life	10 – 15 years before replacement of filter material
Swales	Unlimited design life	5 – 20 years before deep tilling required and replacement of infiltration surface
Infiltration basin	Unlimited design life	5 – 10 years before deep tilling required and replacement of infiltration surface
Soakaways	No available information	
Infiltration trench	Unlimited design life	10 – 15 years before replacement of filter material
Filter strip	Unlimited design life	20 – 50 years before replacement of the filter surface
Constructed wetland	20 – 50 years	sediment disposal after 10-15 years
Retention (wet) pond	20 – 50 years	
Detention basin	20 – 50 years	sediment disposal after 10-15 years

Source:

https://assets.publishing.service.gov.uk/media/6034ee6c8fa8f54334a5a6a9/Cost_estimation_for_SUDS.pdf

Appendix 5 – Infiltration Test Results



EXTRAPOLATED POINT

min	proportion
0	0.250
28.75031	0.250