

AMBIENTAL

ENVIRONMENTAL ASSESSMENT

Surface Water Drainage and SuDS Assessment

The Green House Sussex Ltd, Lake Lane, Barnham,
West Sussex, PO22 0AD

Our Ref: 5877_DowsettMayhew_Lake Lane

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Project type: SuDS/Surface Water Drainage Strategy

Prepared for: The Green House Sussex Ltd,

Reference: 5877_DowsettMayhew_Lake Lane

Site Location: The Green House Sussex Ltd, Lake Lane, Barnham, West Sussex, PO22 0AD

Proposed Development: It is understood that the application is for temporary rural workers accommodation and to secure up to 11 mobile home units and service room on land at The Green House Sussex Ltd, Pollards House, Lake Lane, Barnham, West Sussex, PO22 0AD

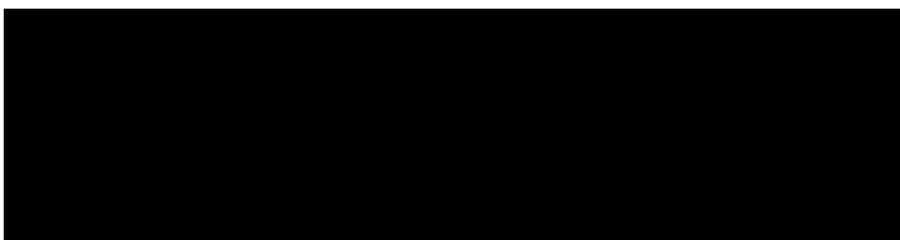
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Document Check			
Authorisation			

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1. Introduction

Site Overview

- 1.1 Ambiental have been appointed by Dowsett Mayhew to undertake a Surface Water Drainage Strategy to advise on the proposed development of up to 8 temporary rural worker accommodation mobile home units and service room on land at The Green House Sussex Ltd, Lake Lane, Barnham, West Sussex, PO22 0AD (Figure 1). In addition, 3 existing mobile home units also require planning permission and are covered by this report.

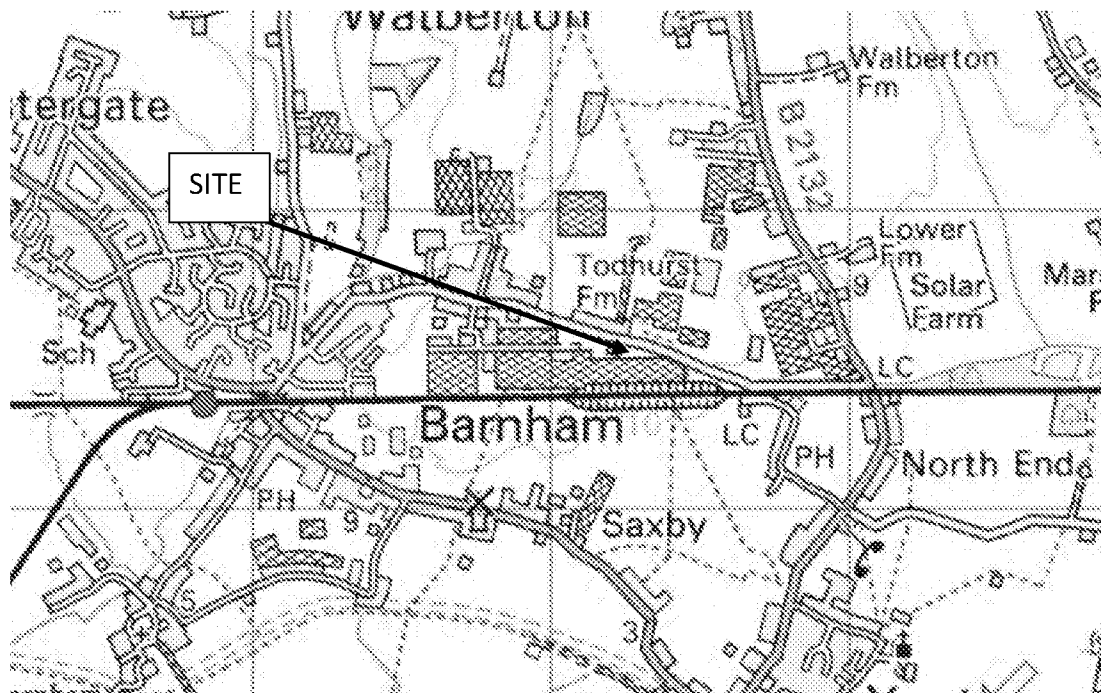


Figure 1: Site Location Plan (Sources: OS)

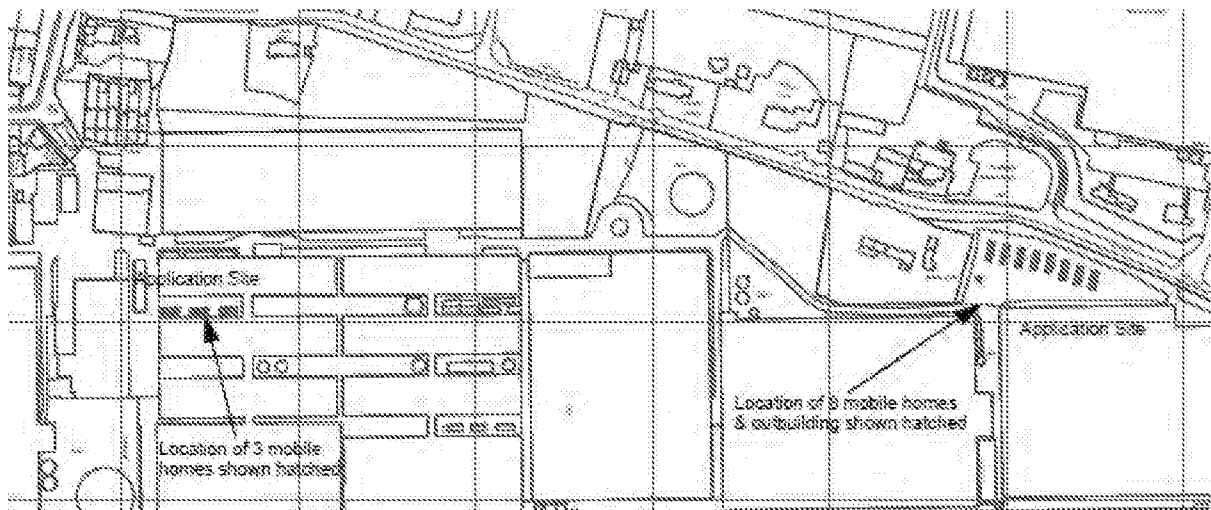


Figure 2: Site location plan extract showing location of 8 new units and 3 existing.

- 1.2 The redline boundary for the 8 unit site totals approximately 0.3 ha. The site is shown to be largely soft landscaped as can be seen in Figure 3. The site borders large nursery buildings to the south and a residential building to the east. Directly north of the site is Lake Lane. Supporting architectural plans are included in Appendix IV.

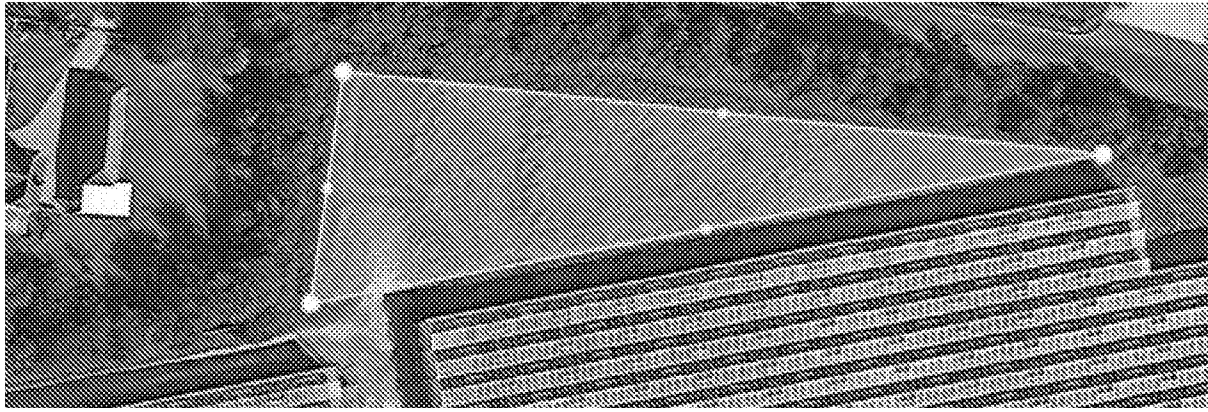


Figure 3: Aerial photograph showing approximate 8 unit site extents.

- 1.3 The redline boundary for the 3 unit site totals approximately 0.058 ha. The site is shown to be largely soft landscaped. The site is situated between large nursery buildings to the north and south. Architectural plans are included in Appendix IV.

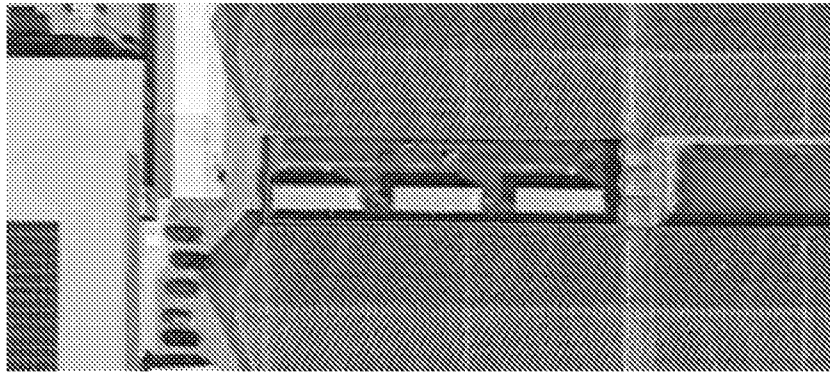


Figure 4: Aerial photograph showing approximate 3 unit site extents.

- 1.4 The purpose of this assessment is to demonstrate that the development proposal outlined above can be satisfactorily accommodated without worsening flood risk for the area and without placing the development itself at risk of flooding, as per the:

- National Planning Policy Framework
- West Sussex County Councils - West Sussex LLFA Policy for the Management of Surface Water
- Arun District Council - Supplementary Requirements for Surface Water Drainage Proposals
- NPPF and NPPG policies, LPA local plan policies and HCC SuDS Guidance and Policies
- Defra Non-Statutory Technical Standards
- Ciria SuDS Manual C753

- 1.5 In order to mitigate the potential flood risk posed by the proposed development, adequate control measures are required to be considered. This will ensure that surface water runoff can be managed at source and the flood risk off site is not increased.

- 1.6 All new on-site drainage should be designed to Building Regulations Part H and to accommodate a 1 in 100 year rainfall event. An allowance for climate change at 40% is adopted for all new impermeable areas.

Geology and Infiltration Potential

- 1.7 The British Geological Survey mapping for the area of the site shows the proposed developments to be situated over an area of London Clay bedrock but with superficial deposits of River Terrace Deposits. See Figure 5 below. Given river terrace deposits can be permeable infiltration testing was undertaken on site.

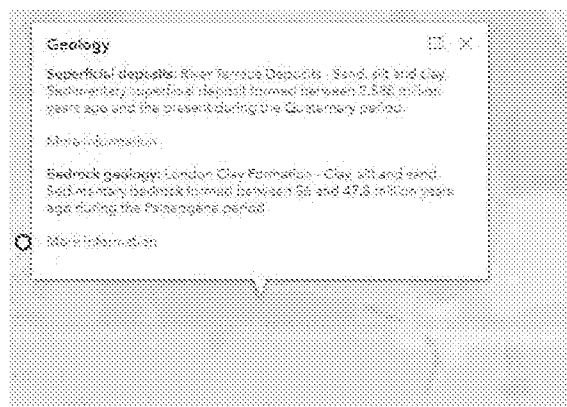


Figure 5: BGS Geology map extract

- 1.8 Soakaway tests were conducted at two locations (TP1 & TP2), in general accordance with BRE Digest 365, to give an initial indication of infiltration characteristics of the underlying soils. Soakaway testing demonstrated that the clayey nature of the underlying superficial deposits results in slow infiltration drainage conditions across the site, which are not considered suitable for the adoption of traditional soakaways or other similar methods of surface water disposal. The low infiltration rates prevented any repeat tests being conducted. See Appendix IV for a copy of the ground investigation report.
- 1.9 Based on this, full infiltration may not be feasible but water levels did drop slowly so some infiltration over a larger area may be viable.

Foul Drainage Infrastructure

- 2.4 Southern Water have provided a sewer asset plan for the areas adjacent to the site as shown in Appendix I. This shows a foul sewer and rising main is located within Lake lane. The head of the foul sewer is located west of the site to the north of the adjacent Bowley Cottage. The rising main is assumed to outfall into this manhole ref 2501.
- 2.5 Looking at the lidar levels below it looks like there should be sufficient falls to make a gravity connection for foul. Based on the topographic levels show on the proposed architectural drawings the site is approximately 10.80mAOD and the manhole cover level is shown to be 10.30mAOD. The connection manhole is only 1.2m deep but a connection would be feasible based on the 500mm fall from site to manhole plus the 1200mm manhole depth. The route of the foul water connection would need to be finalised and a pump on site may be necessary if there is a storm water ditch long the north boundary of the site. Any connection to the main sewer would need to be agreed with Southern Water prior to commencement.

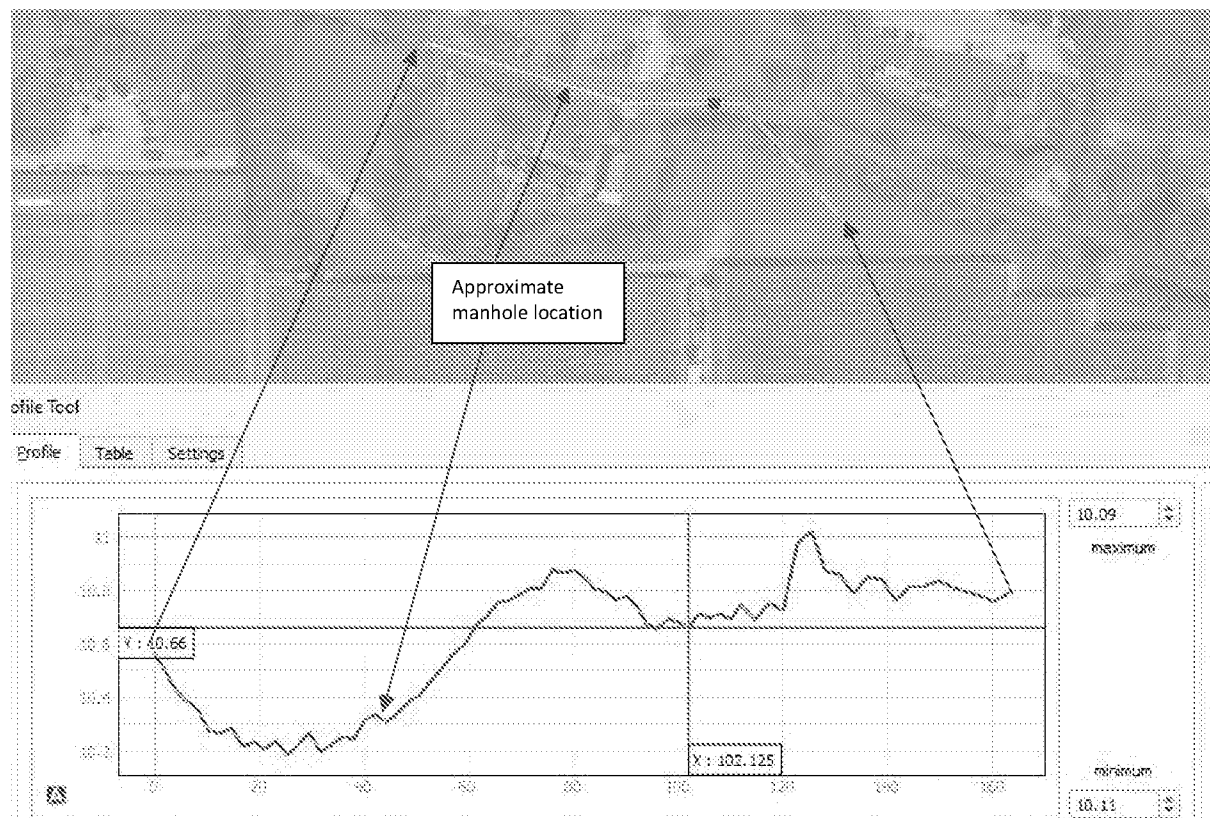


Figure 8: LiDAR level section

- 2.6 It is noted the site lies within the Lidsey Foul Water Treatment Catchment Area. Arun council state '*If it is not connecting to the mains it will need to be accompanied by an environmental assessment in accordance with circular 03/99 as was agreed at Full Council on 11 January 2012*'. As a connection to main foul drainage is proposed and is demonstrated to be feasible a Foul Environmental Assessment is not required as detailed by Arun District Council: <https://www.arun.gov.uk/lidsey-foul-water/>

3. Flood Risk

Fluvial Flood Risk

- 3.1 The EA's Flood Map for planning shows the proposed development site to be located within an area of Flood Zone 1 as per the extract in Figure 9 below:

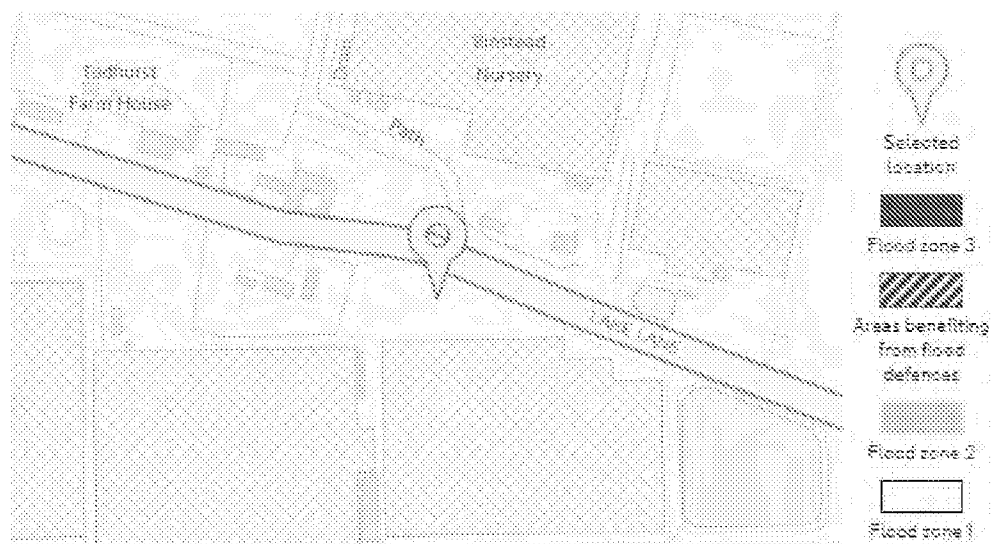


Figure 9: EA's Flood Map for Planning extract

Surface Water Flood Risk

- 3.2 The EA Online Risk of Surface Water Flooding Map (Figure 10) identifies the site to be at limited risk of flooding. A full flood risk assessment is outside the scope of this report, however it is advised that the finish floor level of the dwelling is set above the modelled flood level at this location and there is no change to external ground levels.

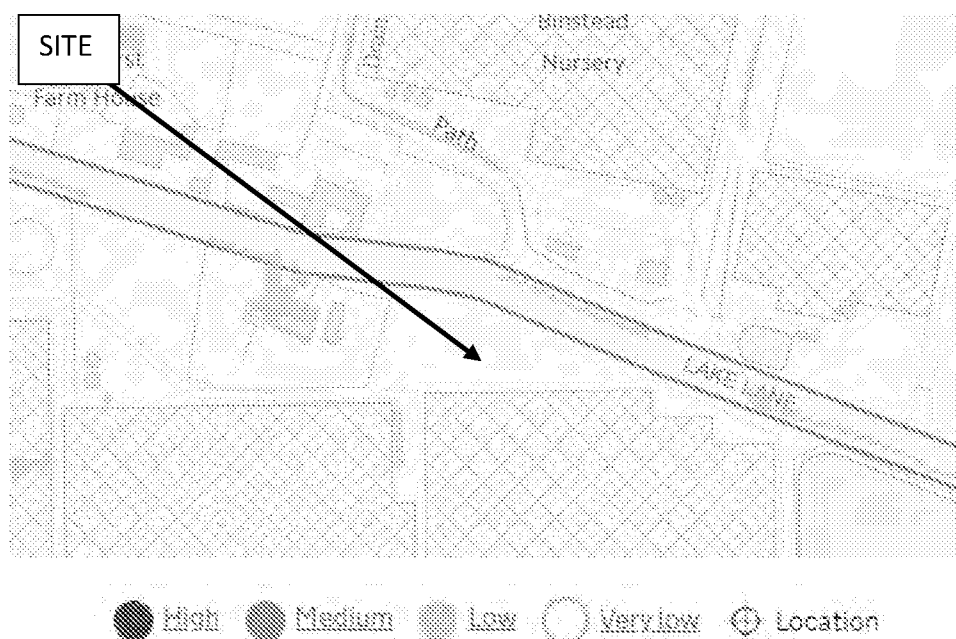


Figure 10: Surface Water Flood Risk Map (Source: EA)

4. SuDS Assessment

- 4.1 In accordance with the SuDS management train approach, the use of various SuDS measures to reduce and control surface water flows have been considered in detail for the development.
- 4.2 The management of surface water has been considered in respect to the SuDS hierarchy (below) (as detailed in the CIRIA 753 'The SUDS Manual', Section 3.2.3):

SuDS Drainage Hierarchy				
			Suitability	Comment
	1.	Store rainwater for later use	✓	Rainwater harvesting is being considered by the developer and could be used around the wider site where feasible
	2.	Use infiltration techniques, such as porous surfaces in non-clay areas	✓	Infiltration in the underlying soils is poor but partial infiltration may be viable.
	3.	Attenuate rainwater in ponds or open water features for gradual release	✗	Given the site scale open features are not viable, although permeable paving should be utilised to treat runoff from parking areas and minimise below ground tanks systems.
	4.	Attenuate rainwater by storing in tanks or sealed water features for gradual release	✓	A feasible option given the constraints, preference to permeable pavements and storage
	5.	Discharge rainwater direct to a watercourse	✓	Watercourse/ditches along northwest site boundary
	6.	Discharge rainwater to a surface water sewer/drain	✗	No existing surface water sewers in the surrounding area
	7.	Discharge rainwater to Combined Sewer	✗	No combined sewer

Table 1: SuDS Drainage Hierarchy

- 4.3 Following the SuDS drainage hierarchy, infiltration has been considered. As per the section Geology and Infiltration Potential, the site is likely to be unsuitable for full infiltration methods. There is a nearby watercourse to connect to located at the north west corner of the development site. Additionally the client has a storage reservoir on site to provide water to the greenhouses and a connection could be made to this.
- 4.4 Therefore, it can be demonstrated that compliance with West Sussex and Adur SuDS policy the available options to partially infiltrate runoff, drain into the reservoir or to the surface water ditch could be feasible. The proposals outlined in this report are to provide water butts to the caravans to collect water butts for re-use, drain partially by infiltration into the rain shadow under the caravans and any excess to be drained into the existing storm drainage provided to the existing greenhouses on the site.
- 4.5 The suitability of SuDS components has been assessed in order to provide a sustainable means of providing the required attenuation volumes. The following components have been assessed as follows in Table 2, below.

Suitability of SuDS Components		
SuDS Component	Comment	Suitability
Infiltrating SuDS	Site is located over London Clay with River terrace superficial deposits. Infiltration is shown to be low. Partial infiltration in the rain shadow of the installed caravan could be feasible.	✓
Permeable Pavement	Permeable paving is suitable on site and is recommended to utilised for all new hardstanding areas on site. Given the ground conditions, the permeable paving will be unlined to allow infiltration.	✓
Green / Blue Roofs	Considered unsuitable for use given the use of caravans.	x
Rainwater Harvesting	It is recommended that Water Butts be implemented, where feasible and where there is space to do so.	✓
Swales	Insufficient space to implement such conveyancing SuDS techniques	x
Rills and Channels	Insufficient space to implement such conveyancing SuDS techniques and would provide little benefit overall.	x
Bioretention Systems	Small scale rain gardens/bioretention systems could be retrofitted into the rear garden however space is heavily constrained on site. Furthermore, the lack of infiltration would require an overflow into additional SuDS downstream. Therefore, rain gardens would overall provide little benefit to storage volumes.	x
Retention Ponds and Wetlands	Insufficient space on site to implement large scale SuDS techniques such as ponds/wetlands. These SuDS measures are better suited to large scale developments.	x
Detention Basins	Insufficient space on site to implement large scale SuDS techniques such as detention basins. These SuDS measures are better suited to large scale developments.	x
Geocellular Systems	Geocellular systems can be configured to suit almost every site/development. Given the space constraints on site this has been deemed a suitable alternative to provide attenuation on site.	✓
Proprietary Treatment Systems	There are a wide range of manufactured treatment systems that are reliable in removing pollutants such as oil interceptors and sediment traps. Roof runoff is considered to be largely uncontaminated and there will be no trafficked hardstanding areas on site so there is no need for oil interceptors. However, sediment traps can extend the lifetime of underground attenuation tanks by preventing siltation.	✓
Filter Drains and Filter Strips	Insufficient space on site and poor infiltration would result in filter drains/strips providing little overall benefit.	x

Table 2: Suitability of SuDS Components

Rainwater Harvesting

- 4.6 Rainwater harvesting (RWH) systems should be considered for rainwater re-use. Rainwater harvesting can take various forms including simple water butts to utilise runoff for watering and irrigation, to more complex pumped RWH systems to be used in grey water uses, such as toilet flushing.
- 4.7 Water butts should be installed to harvest water where feasible.

Permeable Pavement

- 4.8 Permeable pavements are efficient in treating oils and metals but also in intercepting debris and silt. The permeable paving to external paved surfaces (i.e. external paved areas) would be Type A as these areas will be used to simply manage rainfall directly to these areas. The non-trafficked areas to the side and rear should be Type A (self-draining). The paving would be formed by the following layers:

- Permeable Concrete blocks (or similar such as permeable resin bound gravel).
- Laying Course Material.
- Geotextile filter.
- Sub-Base: 6-20mm Clean Crushed Stone (Depth: 200mm min. for attenuation storage).
- Geotextile filter.

- 4.9 Guidance about proper use, installation and maintenance of any proprietary system should be provided by the supplier and incorporated into the site proposals at detailed design stage.

Geocellular System

- 4.10 Geocellular systems can be used to control and manage rainwater surface water runoff either as a soakaway or as a storage tank. The modular/honeycomb nature of geocellular systems means that they can be tailored to suit the specific requirements of any site.
- 4.11 Guidance about proper use, installation and maintenance of any proprietary system should be provided by the supplier and incorporated into the site proposals at detailed design stage.

3. SuDS Strategy

- 4.1 In accordance with West Sussex CC and Adur SuDS policy, developments are required to use SuDS to reduce both the volume and runoff rates to the drainage system, runoff calculations have been undertaken for the site pre and post development (*Appendix 2*).
- 4.2 It is understood that the existing property's runoff is directed to existing storm drainage on site. The size, depth and condition of this connection should be confirmed by the client prior to construction.
- 4.3 The proposals outlined in this report are to provide water butts to the caravans to collect water butts for re-use, drain partially by infiltration into the rain shadow under the caravans and any excess to be drained into the existing storm drainage provided to the existing greenhouses on the site.
- 4.4 A summary of pre- and post-development drained areas are detailed below:

Existing 8 units site area: 3000m²

Proposed 8 units site hard area: 328m² (caravan roof and utility room)

Existing 3 units site area: 558m²

Proposed 3 units site hard area: 98.4m² (caravan roofs only)

(Note: the development proposals will form all external paths and hard standing areas of permeable paving and laid to fall towards the grassed/landscaped areas)

Runoff Rates

- 4.5 Table 4 below summarises the greenfield runoff targets, existing runoff rates and proposed runoff rates for the development.

Surface Water Discharge Rates Summary					
	Area (ha)	Discharge Rates (l/s) – Critical			
		1 year	2 year/Q _{BAR}	30 year	100 year
Greenfield Rates 8 unit Site	0.3	1.35	1.58	3.65	5.06
Greenfield Rates 8 unit Site (proposed drained areas)	0.0328	0.148	0.173	0.399	0.553
Greenfield Rates 3 unit Site	0.0558	0.25	0.29	0.68	0.94
Greenfield Rates 3 unit Site (proposed drained areas)	0.0098	0.044	0.052	0.12	0.17
Proposed (Max) Runoff Rates* (+40% CC)		0.0	0.0	0.0	0.0

*Table 3: Runoff rates; *- 40% climate change allowance and 10% UC allowance added*

- 4.6 Given Greenfields runoff rates are very low for the existing drained areas, it is considered not practicable to restrict runoff to such low rates given the risk of blockage to the flow controls that would be required to achieve this. Therefore, a scheme offering partial infiltration (via permeable paving and in the rain shadow under the proposed mobile homes) with rainwater harvesting (via water butt) is proposed. Should the permeable paving become surcharged runoff the client has agreed to drain to the existing storm drainage system serving the adjacent greenhouses and stored in the on-site reservoir for re-use within the wider site.

Attenuation Storage

- 4.7 Attenuation storage is needed to temporarily store water during periods when the runoff rates from the development site exceed the allowable discharge rates from the site.
- 4.8 A scheme offering partial infiltration (via permeable paving and in the rain shadow under the proposed mobile homes) with rainwater harvesting (via water butt) is proposed. Should the permeable paving become surcharged runoff the client has agreed to drain to the existing storm drainage system serving the adjacent greenhouses and stored in the on-site reservoir for re-use within the wider site.
- 4.9 As such rainwater would be retained in its entirety on site for rainfall events up to and including the 1in100yr+40% rainfall event.

Climate Change Allowances

- 4.10 Making an allowance for climate change in the design of surface water drainage systems will help to minimise vulnerability and provide resilience to flooding and coastal change in the future. Climate Change allowances vary across the UK subject to catchment conditions and are based on climate change projections and different scenarios of carbon dioxide (CO₂) emissions to the atmosphere. The atmospheric impacts as result, are predicted to have impacts on:
- ⇒ peak river flow by river basin district
 - ⇒ peak rainfall intensity
 - ⇒ sea level rise
 - ⇒ offshore wind speed and extreme wave height
- 4.11 Climate change already seen in the UK is consistent with the UKCP02 scenarios. These suggested that winters would become wetter over the whole of the UK, by as much as 20% by the 2050's and upwards of 40% for epoch to 2115. Therefore a 40% allowance for climate change has been considered for all design storm events.

Long-Term Storage (LTS)

- 4.12 Given runoff will drain via partial infiltration and excess drained to the existing storm network on site LTS is not required to be considered in determining storage calculations. Instead runoff should not exceed existing rates.

Interception storage

- 4.13 Given runoff will drain via partial infiltration and excess drained to the existing storm network on site interception storage is not required to be considered in determining storage calculations. Instead runoff should not exceed existing rates.
- 4.14 Permeable paving is proposed in the majority of the external paved areas, as such partial interception storage is possible.

Urban Creep (UC)

- 4.15 Many of our existing combined and separate sewer systems are at or beyond their originally intended capacity. Capacity issues are compounded by the effects of UC where permitted development (i.e. developments that do not require specific planning permission) such as driveways and patios add runoff

to the drainage system that has not been originally allowed for. As a result, new residential developments should take into account potential future increase in impermeable areas by making an additional 10% allowance to the hardstanding areas.

- 4.16 A factor for urban creep has not been made in the proposals as this is for temporary seasonal accommodation only.

Design Exceedance

- 4.17 In the event of drainage system failure under extreme rainfall events 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, given proposals aim to not significantly change external ground levels.
- 4.18 Nevertheless, the finished floor levels or thresholds of the buildings are raised above ground levels as these are mobile home units which would mitigate against surface water flows in an exceedance event.

Water Quality

- 4.19 The Pollution Hazard Indices are summarised in Table 5 – Summary of Pollution Hazard Indices for different Land Use below (based on Table 26.2 of The SuDS Manual):

POLLUTION HAZARD INDICES FOR DIFFERENT LAND USE CLASSIFICATIONS

LAND USE	Pollution Hazard Level	Total Suspended Solids	Metals	Hydrocarbons
Residential Roofs	Very Low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads.	Low	0.5	0.4	0.4
TOTAL POLLUTION HAZARD INDEX	Low	0.7	0.6	0.45

Table 5: Summary of Pollution hazard Indices for different Land Use

- 4.20 When designing suitable treatment trains to deliver adequate treatment prior to discharging to sewers, watercourse or groundwater, consideration of the treatment properties of each SuDS component specified should be reviewed. With the total mitigation potential of a SuDS treatment train determined by:

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

- 4.21 The Mitigation Indices of the proposed SuDS techniques are summarised in Table 6 below.

INDICATIVE SUDS MITIGATION INDICES FOR DISCHARGES TO SURFACE WATER			
SuDS Component	Total Suspended Solids	Metals	Hydrocarbons
Permeable Paving/Proprietary Treatment	0.7	0.6	0.7
TOTAL SUDS MITIGATION INDEX	0.7	0.6	0.7

*Table 6: Indicative SuDS Mitigation Indices. * Further information attached in Appendix 1*

- 4.22 The primary risk to water quality is very low. It can be seen that the water treatment provided by this SuDS train is enough to remove the pollutants.

5. Adoption and Maintenance

- 5.1 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.
- 5.2 General maintenance of key SuDS components are provided below.
- 5.3 The property owner will be responsible for the management and maintenance of SuDS devices.

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

Table 4: General Maintenance Requirements (Source: CIRIA SuDS Manual C753)

Proposed Schedule of Maintenance for Below Ground Drainage

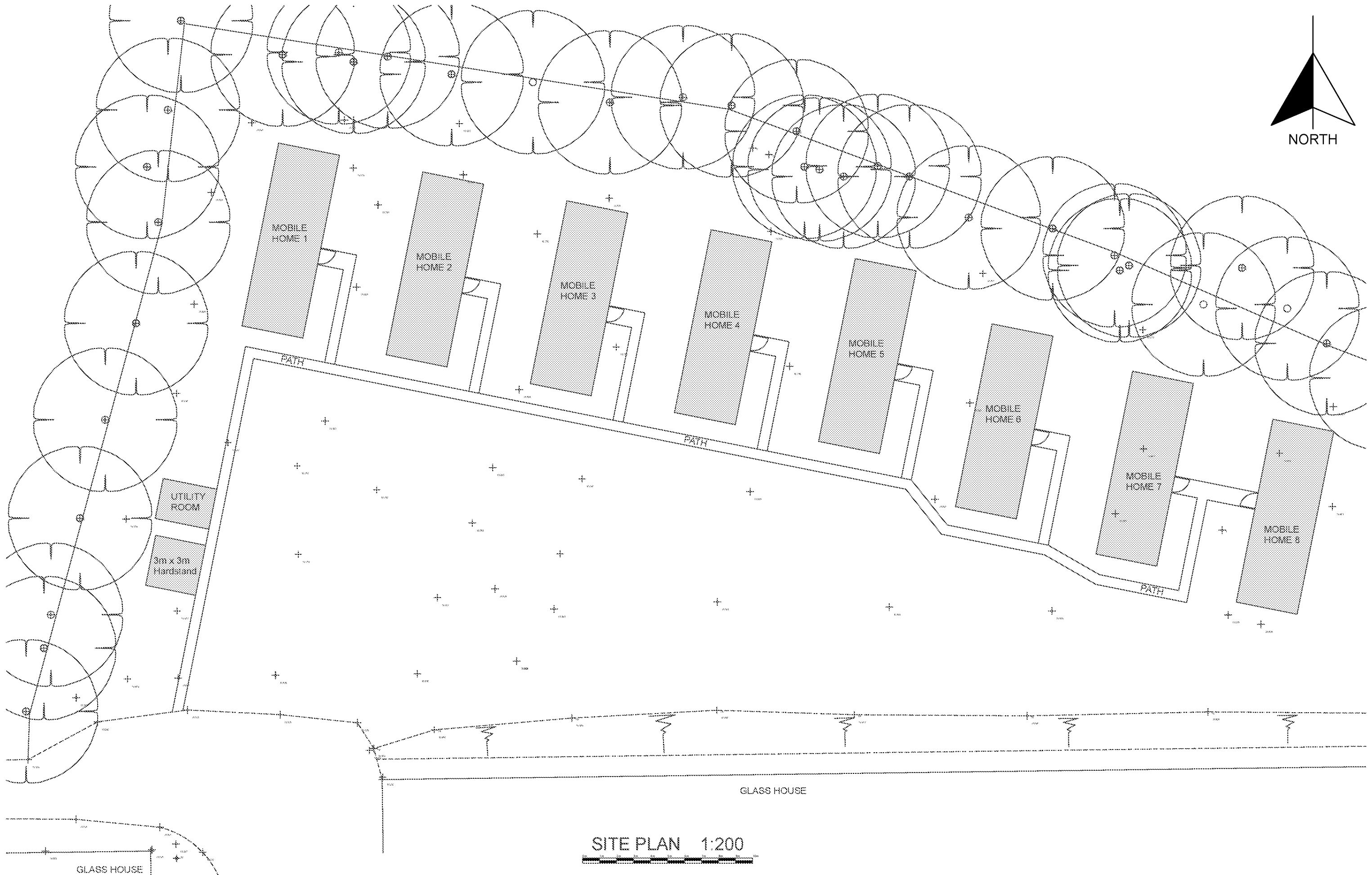
Item	Visual Inspection	Cleanse / De-sludge	CCTV Survey	Comments
Foul Drainage System (pipework, chambers etc.)	5 years	10 years	10 years	Cleansing to be carried as necessary
Surface Water Drainage System (pipework, chambers etc.)	5 years	10 years	10 years	Cleansing to be carried as necessary
Gullies/Channels	1 year	1 year	N/A	Cleansing to be carried as necessary
Soakaways and catchpits	1 year		N/A	Cleansing to be carried as necessary
Permeable Tarmac Paving	1 year	'Swept' clean of debris every 2 years.	N/A	Jetwash or suction roadsweep permeable tarmac as performance levels reduce.
Permeable Block Paving	1 year	'Swept' clean of debris every 2 years.	N/A	Lift blocks and remove sand bedding and replace and re-bed paving - currently recommended by manufacturers every 20 years.

6. Conclusions

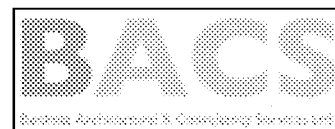
- 6.1 Ambiental have been appointed by The Green House Sussex Ltd, to undertake a Surface Water Drainage Strategy to advise on the proposed development of up to 8 temporary rural worker accommodation mobile home units and service room on land at The Green House Sussex Ltd, Lake Lane, Barnham, West Sussex, PO22 0AD (Figure 1). In addition, 3 recently installed mobile home units also require planning permission and are covered by this report.
- 6.2 The purpose of this assessment is to demonstrate that the development proposal outlined above can be satisfactorily accommodated without worsening flood risk for the area and without placing the development itself at risk of flooding, as per the:
- National Planning Policy Framework
 - West Sussex County Councils - West Sussex LLFA Policy for the Management of Surface Water
 - Arun District Council - Supplementary Requirements for Surface Water Drainage Proposals
 - NPPF and NPPG policies, LPA local plan policies and HCC SuDS Guidance and Policies
 - Defra Non-Statutory Technical Standards
 - Ciria SuDS Manual C753
- 6.3 The redline boundary for the 8 unit site totals approximately 0.3 ha. The site is shown to be largely soft landscaped. The site borders large nursery buildings to the south and a residential building to the east. Directly north of the site is Lake Lane.
- 6.4 The redline boundary for the 3 unit site totals approximately 0.058 ha. The site is shown to be largely soft landscaped. The site is situated between large nursery buildings to the north and south.
- 6.5 Soakaway tests were conducted at two locations (TP1 & TP2), in general accordance with BRE Digest 365, to give an initial indication of infiltration characteristics of the underlying soils. Soakaway testing demonstrated that the clayey nature of the underlying superficial deposits results in slow infiltration drainage conditions across the site, which are not considered suitable for the adoption of traditional soakaways or other similar methods of surface water disposal. The low infiltration rates prevented any repeat tests being conducted. Based on this, full infiltration may not be feasible but water levels did drop slowly so some infiltration over a larger area may be viable.
- 6.6 The drainage proposals aim to manage the proposed runoff to as close as practicable greenfield runoff rates. However, calculated greenfield runoff rates are very low for the existing drained areas, and therefore it is considered not practicable to restrict runoff to such low rates given the risk of blockage to the flow controls that would be required to achieve this. Therefore the proposals outlined in this report are to provide water butts to the caravans to collect water butts for re-use, drain partially by infiltration into the rain shadow under the caravans and any excess to be drained into the existing storm drainage provided to the existing greenhouses on the site and re-used within the wider site.
- 6.7 This report demonstrates that the development proposals can accommodate the necessary SuDS systems required in order to meet the WSCC and Adur surface water policy requirements.
- 6.8 The property owner will be responsible for the management and maintenance of SuDS devices.

- 6.9 Following the guidelines contained within the NPPF, the proposed development is considered to be suitable assuming appropriate mitigation (including SuDS) can be maintained for the lifetime of the development.
- 6.10 We can conclude that providing the development adheres to the conditions advised in this report, the said development proposals can be accommodated without increasing flood risk within the locality in accordance with objectives set by Central Government and the EA.

Appendix I – Supporting Information



SITE PLAN 1:200



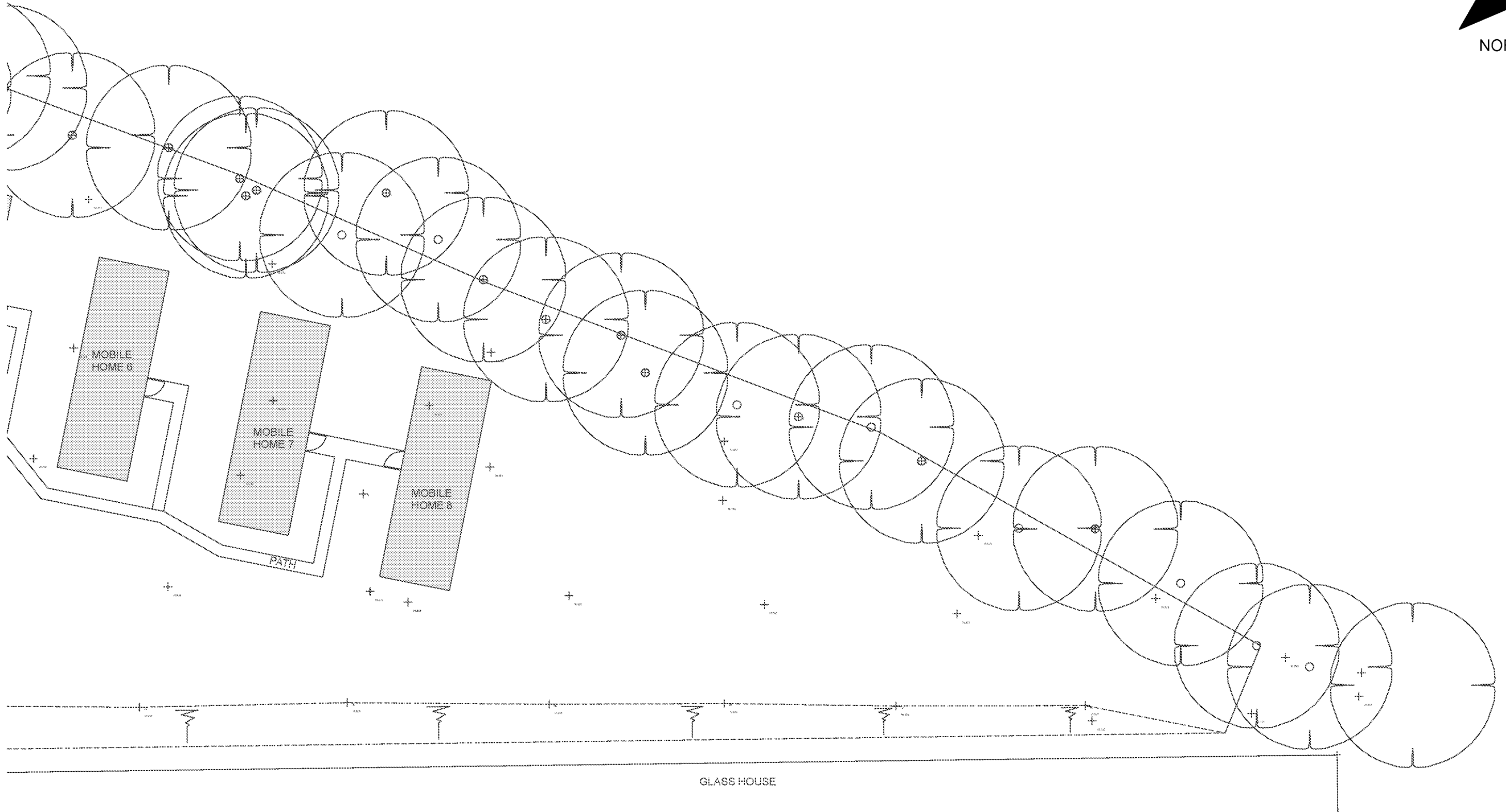
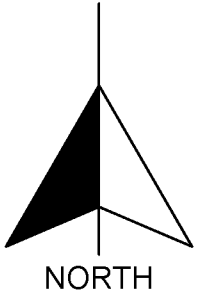
Stuart Beckett, BSc (Hons) ICIOB
Architectural Technician
t: 07879 418520
e: beckettarchitectural@hotmail.com
www.beckettarchitectural.co.uk

Revisions:

Scheme **Eric Wall Nursery, Lake Lane, Barnham, PO22 0AD**
Title **Proposed Site Plan (1 of 2)**

Drawn By **SRB**
Date **DEC 2020**
Date plotted **16/12/2020**

Scale **1:200 @ A3**
Drawing Number **2029-015**



SITE PLAN 1:200



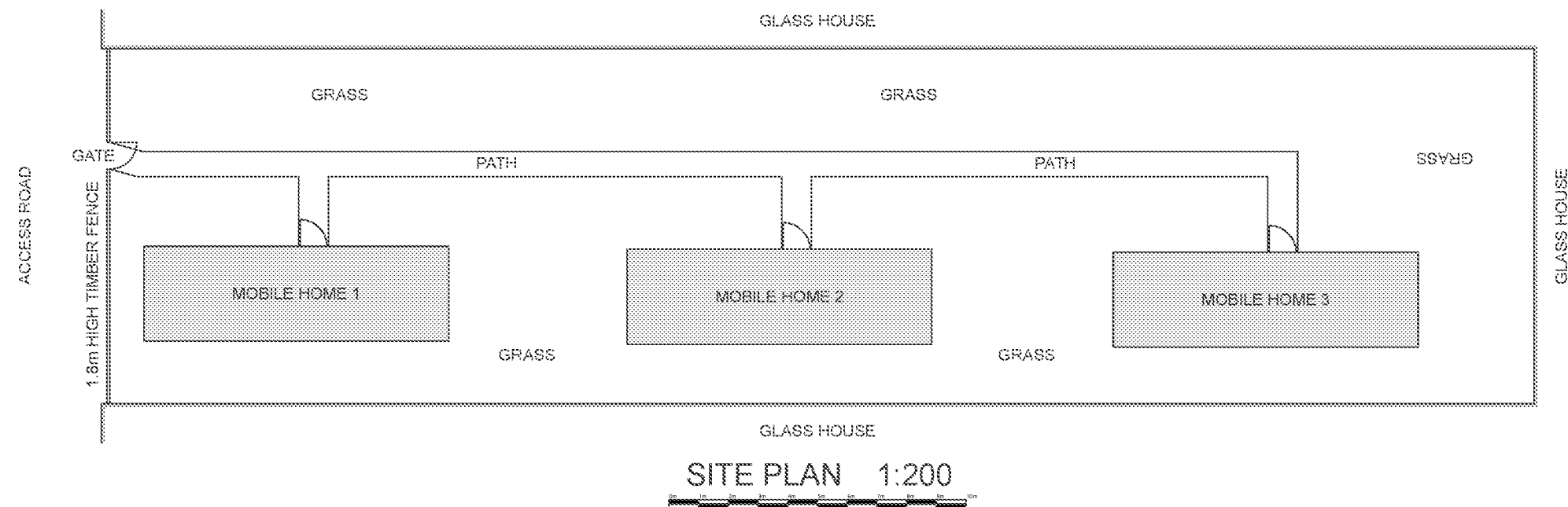
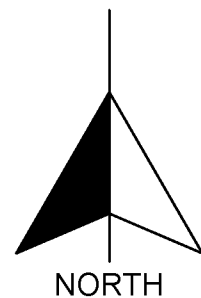
Stuart Beckett, BSc (Hons) ICIOB
Architectural Technician
t: 07879 418520
e: beckettarchitectural@hotmail.com
www.beckettarchitectural.co.uk

Revisions:

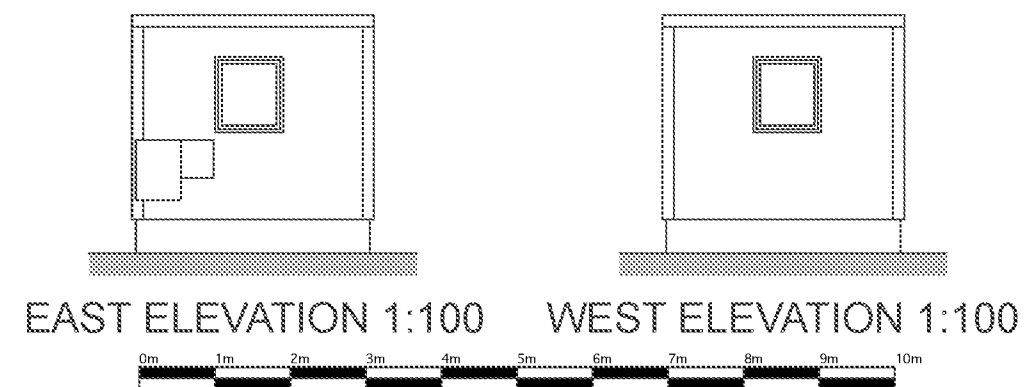
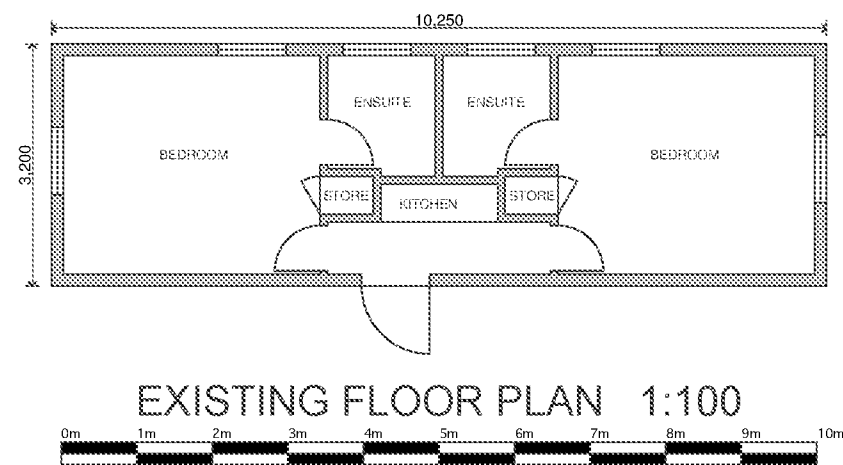
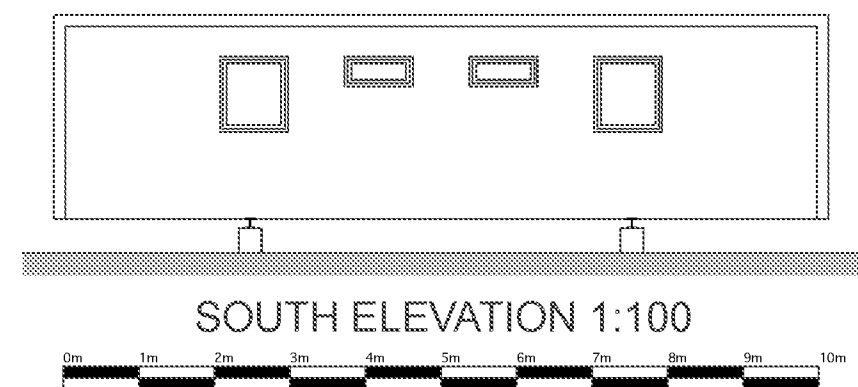
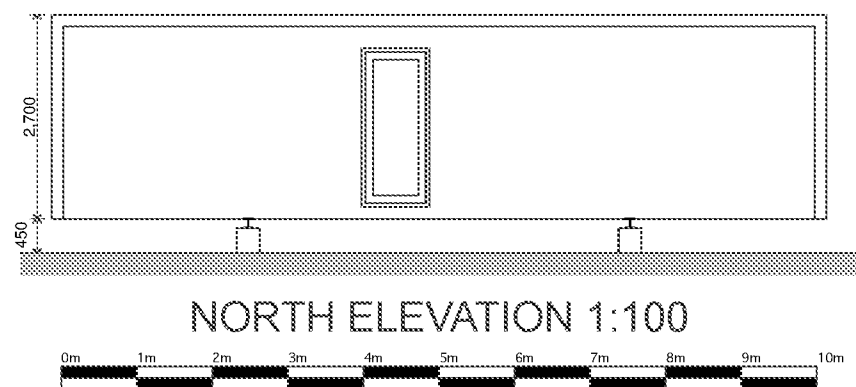
Scheme **Eric Wall Nursery, Lake Lane, Barnham, PO22 0AD**
Title **Proposed Site Plan (2 of 2)**

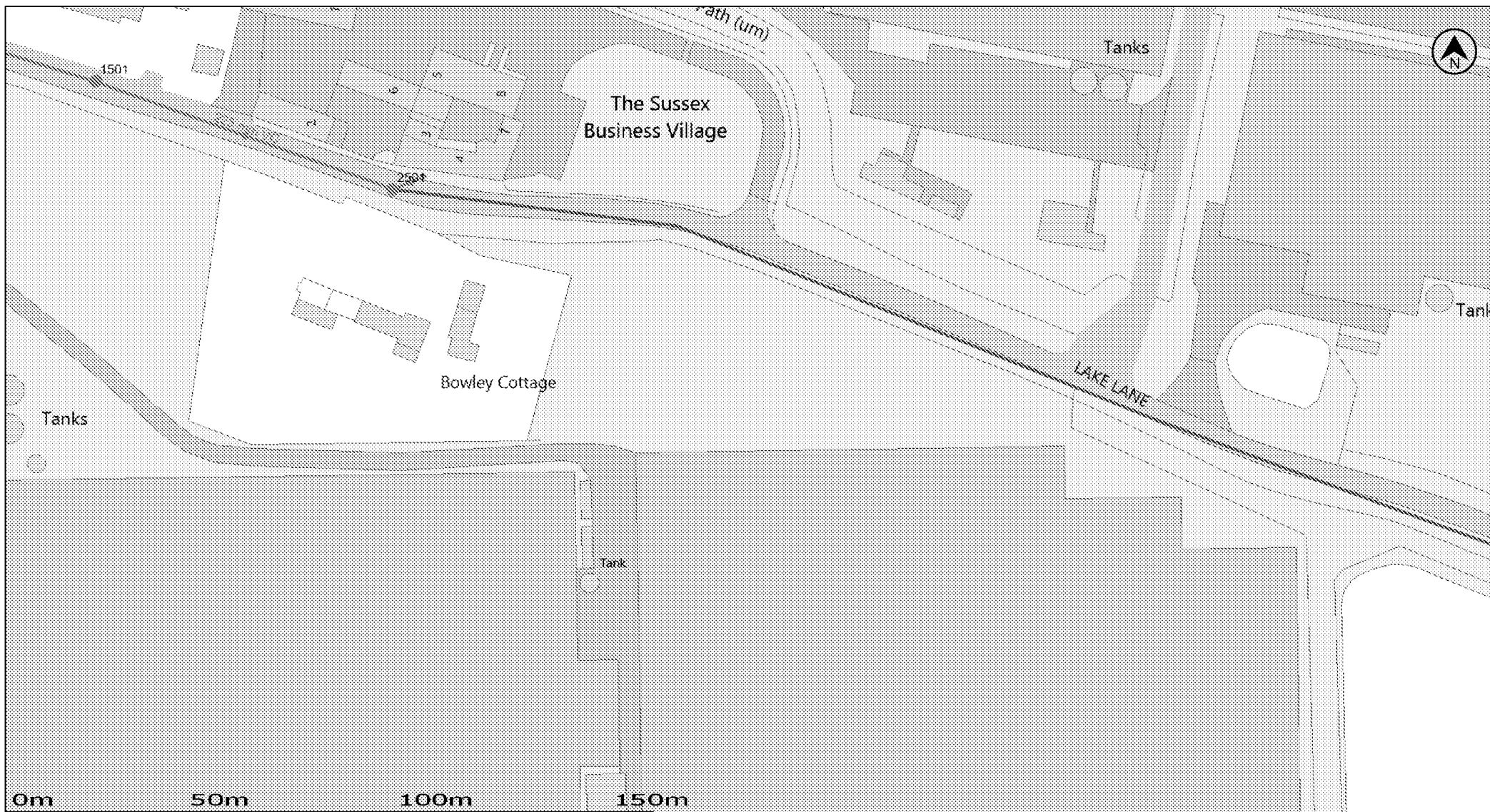
Drawn By SRB
Date DEC 2020
Date plotted 16/12/2020

Scale 1:200 @ A3
Drawing Number **2029-016**



All three mobile home units on existing site are the same (as indicated below).





(c) Crown copyright and database rights 2020 Ordnance Survey 100031673

Date: 10/11/20

Scale: 1:1250

Map Centre: 497323,104518

Data updated: 19/10/20

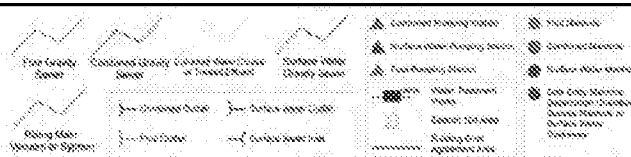
Our Ref: 457669 - 1

Wastewater Plan A4

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2020 Ordnance Survey 100031673. This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.



lloyd.joel@ericwall.com	
Pollardsd	



Appendix II – Calculations



Greenfield runoff rate estimation for sites

Greenfield runoff tool

Calculated by: mark naumann

Site name: 3 units

Site location: Eric Wall Nurseries, Lake Lane

Site Details

Latitude: 50.83203° N

Longitude: 0.62585° W

Reference: 4150525815

Date: Dec 22 2020 14:43

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 1

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR

SPR estimation method: Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	756	756
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	1.99	5.28
1 in 1 year (l/s):	1.7	4.49
1 in 30 years (l/s):	4.59	12.15
1 in 100 year (l/s):	6.36	16.85
1 in 200 years (l/s):	7.46	19.76

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.



Greenfield runoff rate estimation for sites

Greenfield runoff tool

Calculated by: mark naumann
 Site name: 8 units
 Site location: Eric Wall Nurseries, Lake Lane

Site Details

Latitude: 50.83209° N
 Longitude: 0.61943° W
 Reference: 1359599751
 Date: Dec 22 2020 14:41

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): .3

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR
 SPR estimation method: Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	756	756
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

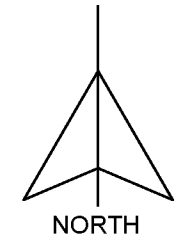
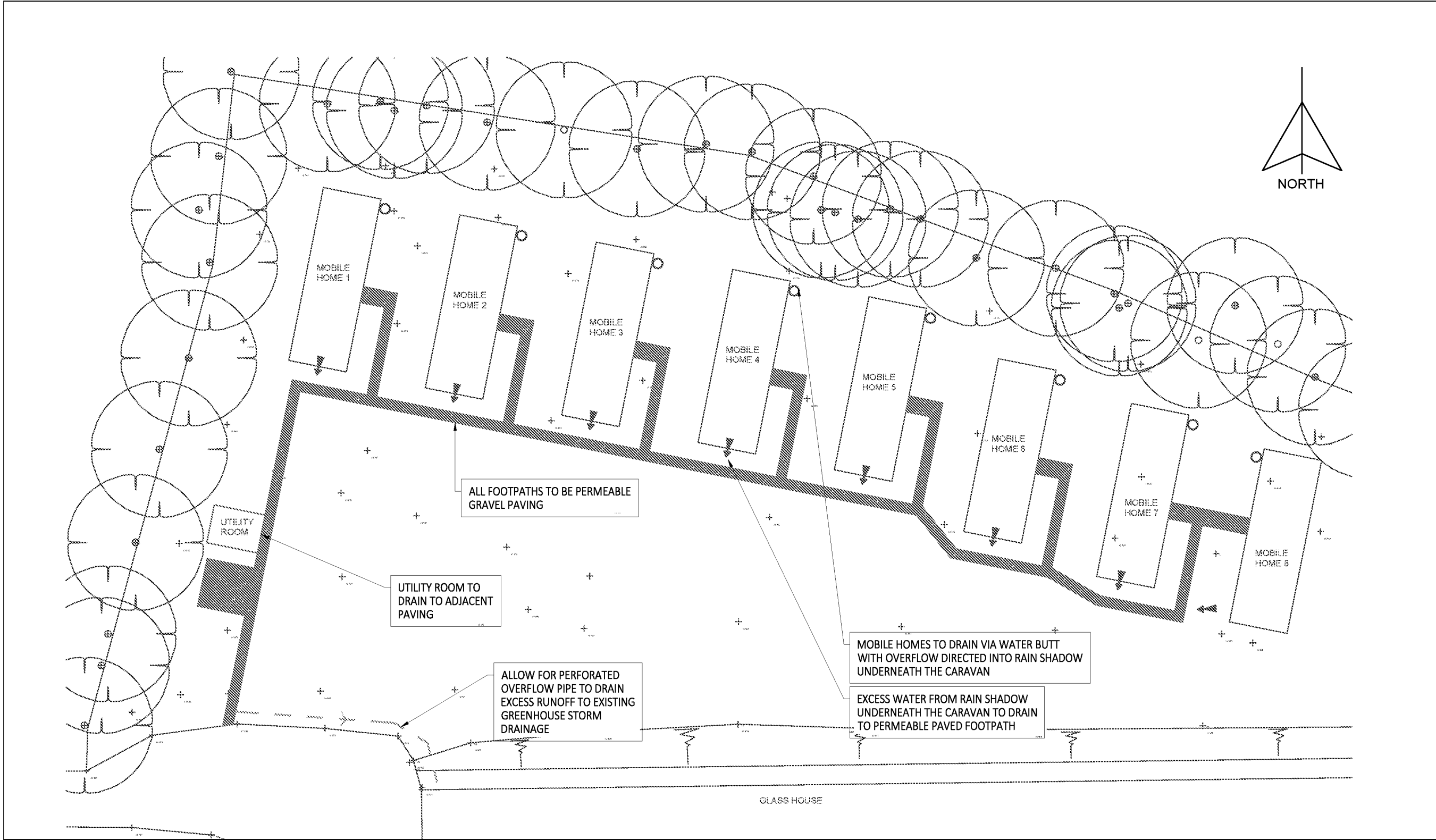
Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	0.6	1.58
1 in 1 year (l/s):	0.51	1.35
1 in 30 years (l/s):	1.38	3.65
1 in 100 year (l/s):	1.91	5.06
1 in 200 years (l/s):	2.24	5.93

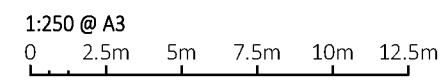
This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

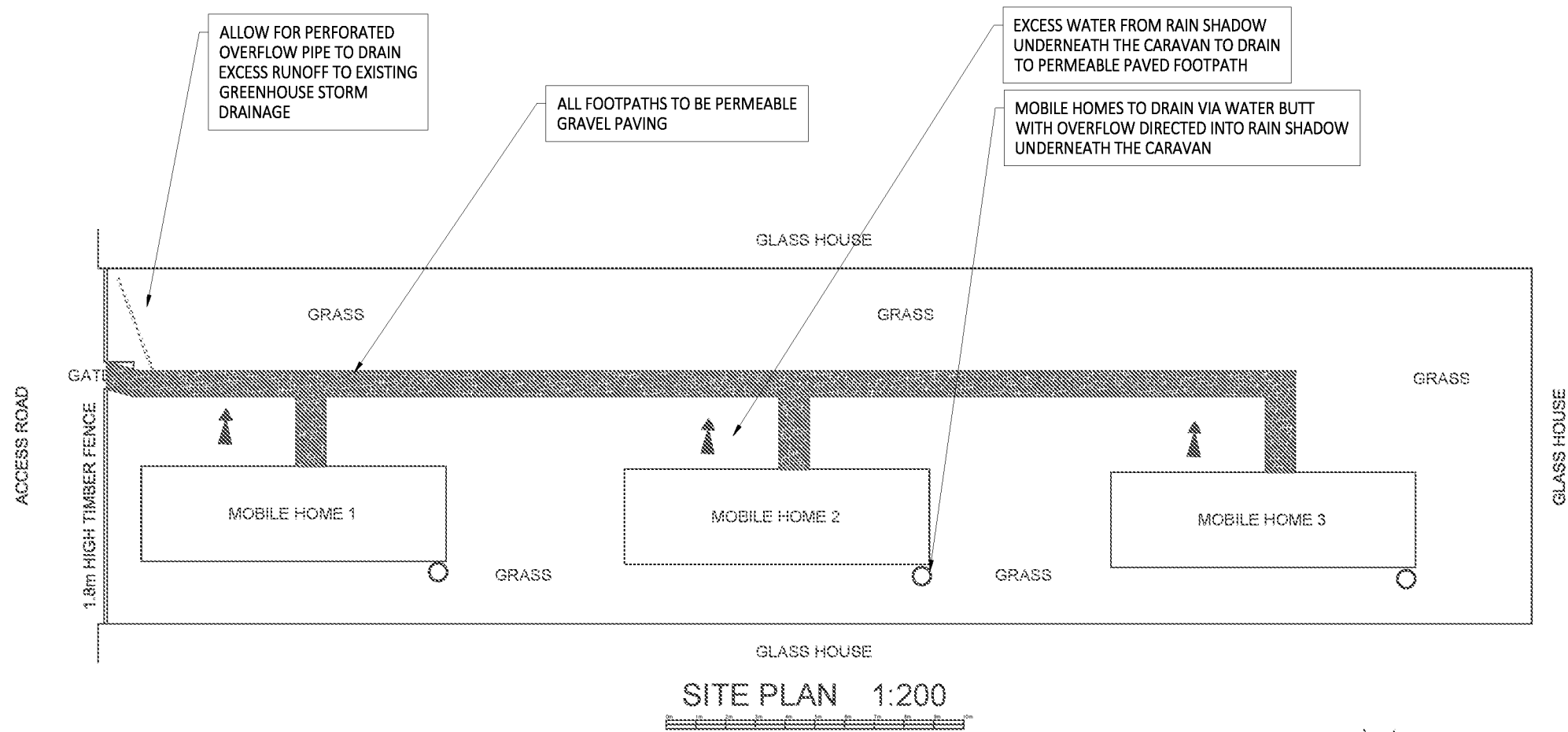
Appendix III – Drainage Plan



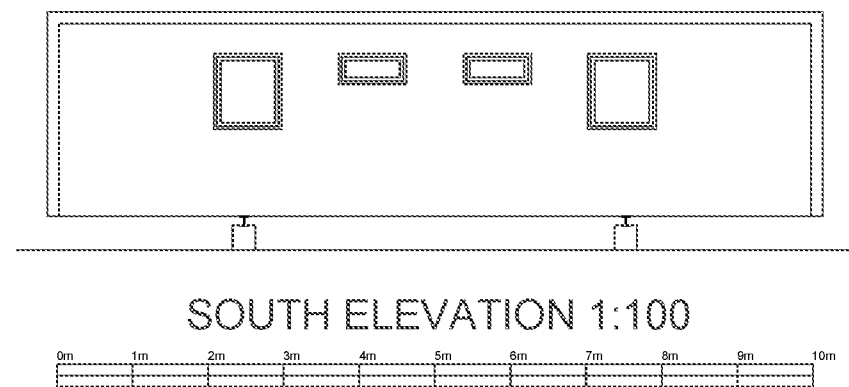
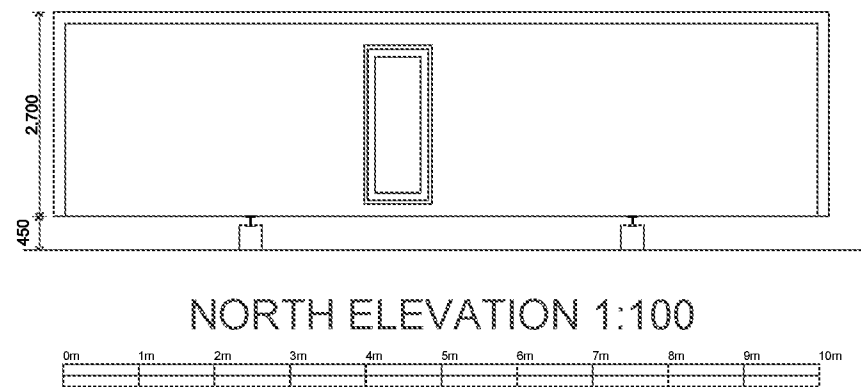
1. GENERAL
- a. THIS DRAWING IS NOT TO BE SCALED, WORK TO FIGURED DIMENSIONS ONLY, CONFIRMED ON SITE.
- b. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTURAL DRAWINGS, DETAILED SPECIFICATIONS WHERE APPLICABLE AND ALL ASSOCIATED DRAWINGS IN THIS SERIES.
- c. ANY DISCREPANCY ON THIS 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. CONM 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, LAND 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. CONM REGULATIONS 2015. FOR GENERIC MAINTENANCE AND MANAGEMENT RISKS REFER TO CHAPTER 36 OF CIRIA 752 SUDS MANUAL. FOR PROPRIETARY SYSTEMS SEE MANUFACTURER'S MANAGEMENT AND MAINTENANCE DETAILS AND RISK ASSESSMENT WITH REGARDS TO MAINTENANCE OF PROPRIETARY SYSTEMS.

REV	DATE	BY	CHKD	APP'D	DESCRIPTION
					PRELIMINARY DRAWING "FOR INFORMATION ONLY, NOT FOR CONSTRUCTION"
Client					
DOWSETT MAYHEW					
AMBIENTAL ENVIRONMENTAL ASSESSMENT a company of Royal HaskoningDHV					
Project					
Eric Wall Nurseries, Lake Lane Barnham, West Sussex, PO22 0AD					
Drawing					
8 UNIT SITE LAYOUT PROPOSED DRAINAGE STRATEGY					
Drawn by: MN Drawing No. 5877 DR01 Date: DEC20 Revision: -					
Drawing Scale: 1:250					





All three mobile home units on existing site are the same (as indicated below).



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, LAND 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 MANUFACTURER'S MANAGEMENT AND MAINTENANCE DETAILS AND RISK ASSESSMENT WITH REGARDS TO MAINTENANCE OF PROPRIETARY SYSTEMS.

REV	DATE	BY	CHK	APP	DESCRIPTION
PRELIMINARY DRAWING FOR INFORMATION ONLY NOT FOR CONSTRUCTION					
Client					
DOWSETT MAYHEW					
Project					
Eric Wall Nurseries, Lake Lane Barnham, West Sussex, PO22 0AD					
Drawing					
3 UNIT SITE LAYOUT PROPOSED DRAINAGE STRATEGY					
Drawn by: MN Date: DEC20					
Drawing No. 5877 DR02					Revision
Drawing Scale: 1:250					-

Appendix IV – Infiltration test results

Our Ref: YE9218

23rd November 2020

For the attention of Dowsett Mayhew,

Ref: Eric Wall Nurseries, Lake Lane, Barnham, West Sussex, PO22 0AD

We thank you for your request to undertake permeability testing at the above mentioned site and take pleasure in enclosing the results of this work. The investigation was undertaken on the 17th November 2020 in accordance with your instruction to proceed. This letter describes the work undertaken, presents the data obtained and discusses the results of the tests.

Geology

An examination of the available British Geological Survey data of the area for the site has been examined and indicates that the site has superficial drift deposits composed of River Terrace Deposits (sandy, silt and clay), and bedrock deposits recorded as the London Clay Formation (clay, silt and sand).

Fieldworks

The programme of this investigation included the excavation of two trial pits. The locations of the soakaway tests were selected by YourEnvironment and the client.

During this work, the soils encountered were logged in general accordance with BS 5930: 1990, as amended in 2007, and full descriptions are given on the borehole records, which are also appended to this letter.

Soakaway Tests

During the soakaway tests the water failed to achieve a fall from 75% to 25% of the effective depth of the storage volume in TP01 and TP02. The results obtained from the soakaway tests are summarised below:

Table 1: Soakaway Test Results

WS	Soakage Area Dimensions (m)	Depth (m)	Soil Description (Base of TP)	Infiltration Rate (m/sec)	Drainage Characteristics
TP01 test 1	1.30 x 0.30	1.50	Soft orangish brown and mottled orange sandy CLAY. Sand is medium – coarse.	N/ A	Practically Impermeable
TP02 test 1	1.50 x 0.30	1.30	Soft orangish brown and mottled orange sandy CLAY. Sand is medium – coarse.	N/ A	Practically Impermeable

Discussion

The soils encountered beneath the site were recorded as predominantly CLAY. During the testing groundwater was encountered. In TP01 the groundwater rose from 1.50mbgl to 1.35mbgl, in TP02 the groundwater rose from 1.30mbgl to 1.20mbgl. Given the data from the test, it is considered that the use of soakaways is not suitable for this site.

References

Building Research Establishment (BRE) Digest 365, *Soakaway Design*, September 1991.

British Standards Institution (1999) BS5930: *Code of practice for site investigations*, B.S.I., London.

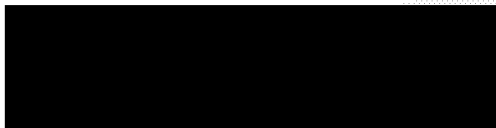
British Standards Institution (2007), Amendment No 1, BS5930: *Code of practice for site investigations*, B.S.I., London.

We trust that this information is of interest and should you have any other requirements do not hesitate to contact us.

For and on behalf of

Your Environment

Yours Faithfully,



Nick Hammond

Geo-Environmental Engineer

Enc.

Appendix A: Site Investigation Plan

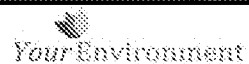
Appendix B: Trial Pit Logs

Appendix C: Soakaway Test Results

Appendix D: Photographs

APPENDIX A: Site Investigation Plan





Ground Investigation Location Plan - Not to Scale

Your Environment

Chilgrove Business Centre, Chilgrove, Nr Chichester, PO18 9HU

Tel: 01243 787150

Email: info@yourenvironment.org

Site Name:

Eric Wall Nurseries

Client:

Dowsett Mayhew

Date:

Nov-20

Job No:

YE9218

APPENDIX B: Trial Pit Logs



TP2				Trial Pit Log				TrialPit No TP2 Sheet 1 of 1	
Project Name: Lake Lane				Project No. YE9218		Co-ords: - Level:		Date 17/11/2020	
Location: Barnham						Dimensions (m): 0.30 1.30		Scale 1:25	
Client: Eric Wall Nurseries						Depth 1.30		Logged NH	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
				0.60			MADE GROUND. Firm brown sandy, gravelly CLAY. Sand is fine - medium. Gravel is medium - coarse, angular of brick fragments and mixed lithology.		
				1.30			Soft orangish brown and mottled orange sandy CLAY. Sand is medium - coarse.	1	
							End of Pit at 1.30m	2	
								3	
								4	
								5	
Remarks: Groundwater strike at 1.3mbgl, rising to 1.2mbgl.									
Stability: Poor stability									

APPENDIX B: Soakaway Test Results

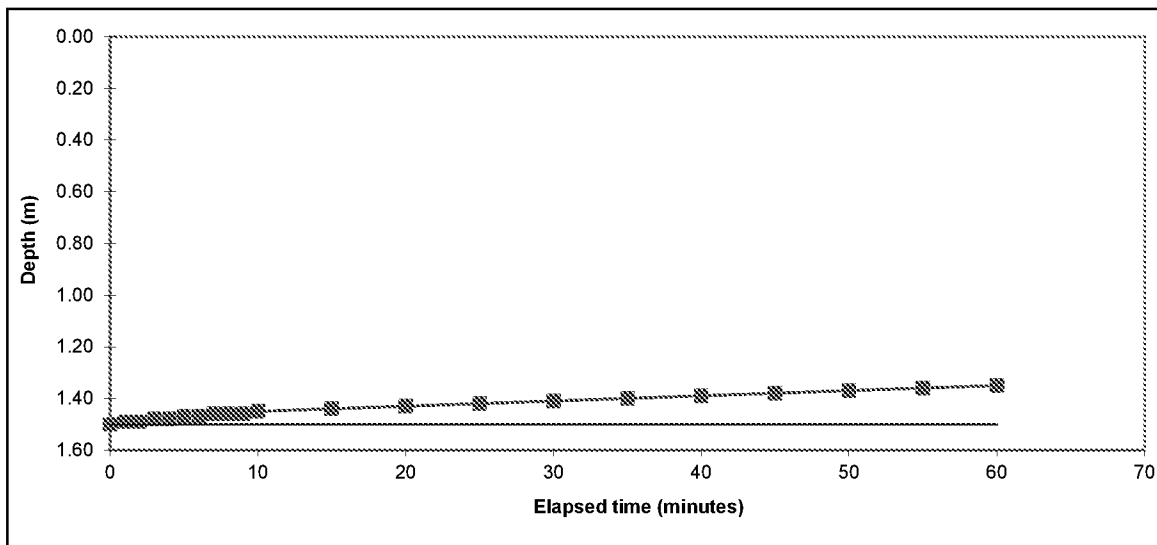


Your Environment

Soakaway Test

Trial Pit No:	TP1	Test No:	1	Date:	17/11/2020
Length (m):	1.300	Datum Height:	0.00 m agl		
Width (m):	0.30	Granular infill:	None		
Depth (m):	1.50	Porosity of infill:	1	(assumed)	

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	1.500	30	1.410
1	1.490	35	1.400
2	1.490	40	1.390
3	1.480	45	1.380
4	1.480	50	1.370
5	1.470	55	1.360
6	1.470	60	1.350
7	1.460		
8	1.460		
9	1.460		
10	1.450		
15	1.440		
20	1.430		
25	1.420		



Start water depth for analysis (mbgl):	1.50		
75%effective depth (mbgl):	1.50	Elapsed time (mins):	#N/ A
50%effective depth (mbgl):	1.50		
25%effective depth (mbgl):	1.50	Elapsed time (mins):	#N/ A
Base of soakage zone (mbgl):	1.50		
Volume outflow between 75%and 25%effective depth (m³):			
Mean surface area of outflow (m²):			0.39
(side area at 50%effective depth + base area)			
Time for outflow between 75%and 25%effective depth (mins):			

Soil infiltration rate (m/s):	Test incomplete as 25%effective depth not achieved. Unable to reliably determine soil infiltration rate.
Remarks	Results processed following BRE 365 (2007).

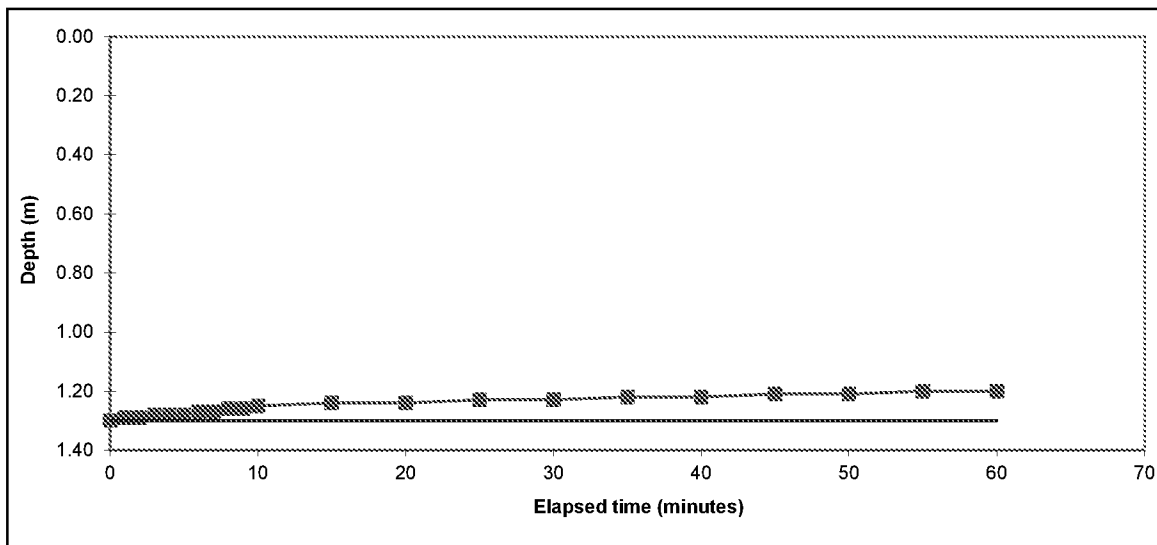
Client:	Dowsett Mayhew	TP1
Site:	Eric Wall Nurseries	

Your Environment

Soakaway Test

Trial Pit No:	TP2	Test No:	1	Date:	17/11/2020
Length (m):	1.500	Datum Height:		0.00 m agl	
Width (m):	0.30	Granular infill:	None		
Depth (m):	1.30	Porosity of infill:	1	(assumed)	

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	1.300	30	1.230
1	1.290	35	1.220
2	1.290	40	1.220
3	1.280	45	1.210
4	1.280	50	1.210
5	1.280	55	1.200
6	1.270	60	1.200
7	1.270		
8	1.260		
9	1.260		
10	1.250		
15	1.240		
20	1.240		
25	1.230		



Start water depth for analysis (mbgl):	1.30		
75%effective depth (mbgl):	1.30	Elapsed time (mins):	#N/ A
50%effective depth (mbgl):	1.30		
25%effective depth (mbgl):	1.30	Elapsed time (mins):	#N/ A
Base of soakage zone (mbgl):	1.30		
Volume outflow between 75%and 25%effective depth (m³):			
Mean surface area of outflow (m²):			0.45
(side area at 50%effective depth + base area)			
Time for outflow between 75%and 25%effective depth (mins):			

Soil infiltration rate (m/s):	Test incomplete as 25%effective depth not achieved. Unable to reliably determine soil infiltration rate.
Remarks	Results processed following BRE 365 (2007).

Client:	Dowsett Mayhew	TP2
Site:	Eric Wall Nurseries	

APPENDIX D: Photographs

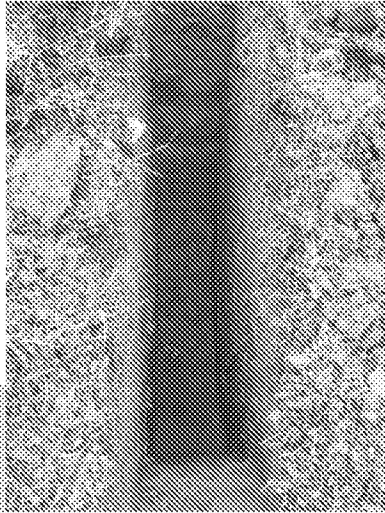


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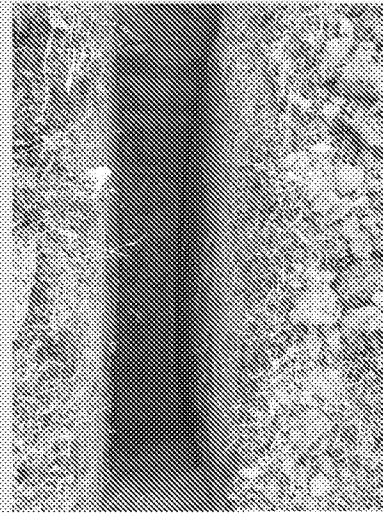
Client: Dowsett Mayhew

Job Reference: YE9218, Dated: November 2020

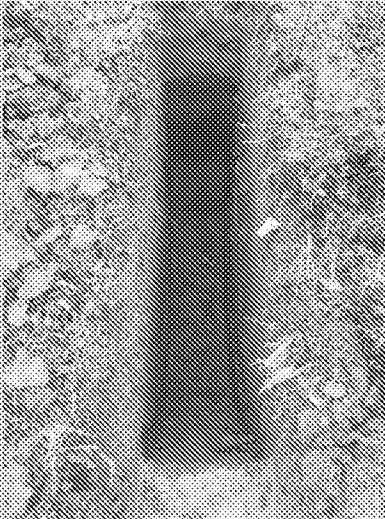
A.



B.



C.



D.



Your Environment

A. TP1

B. TP1

C. TP1

D. TP1

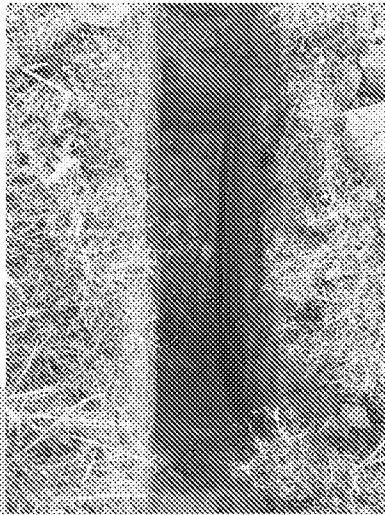


Site: Eric Wall Nurseries

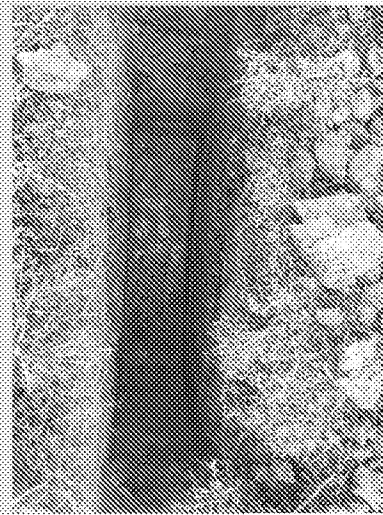
Client: Dowsett Mayhew

Job Reference: YE9218, Dated: November 2020

E.



F.



Your Environment

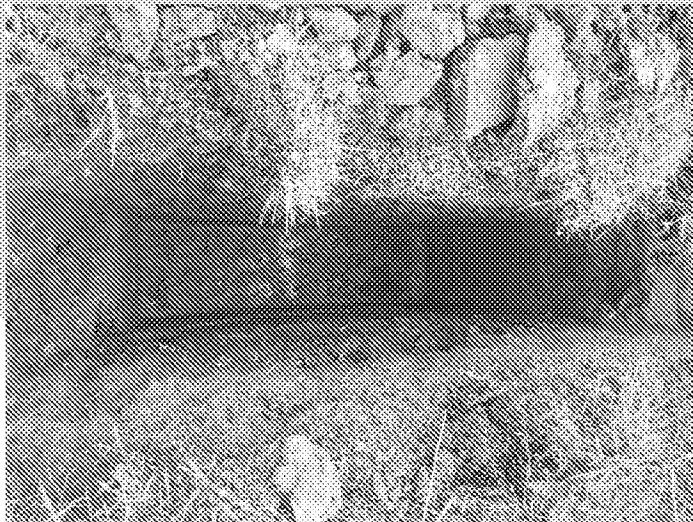
E. TP2

F. TP2

G. TP2

H. TP2

G.



H.



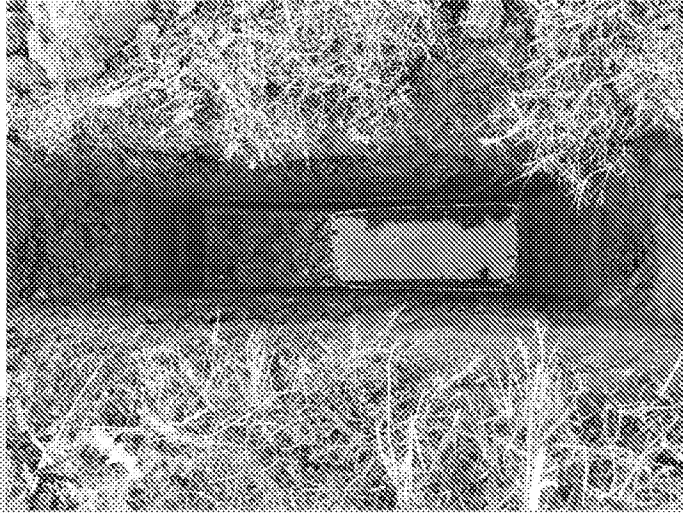
ADONIS 1361 1361 COUNCIL 1/15/2019
Your Environment

Site: Eric Wall Nurseries

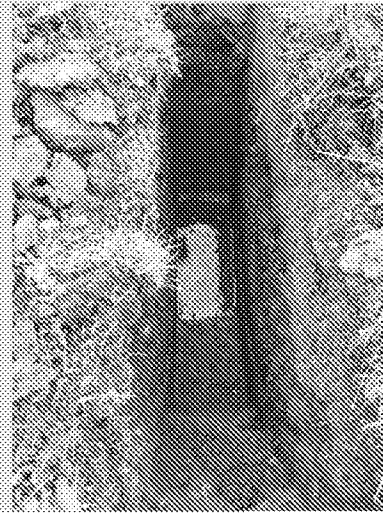
Client: Dowsett Mayhew

Job Reference: YE9218, Dated: November 2020

I.



J.



Your Environment

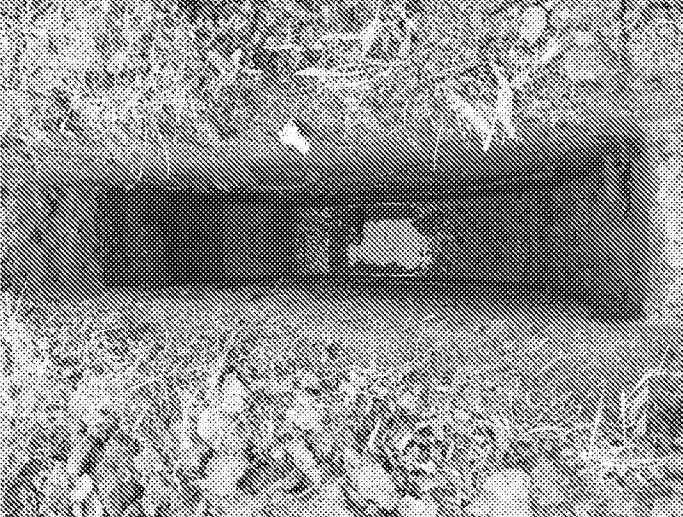
I. TP1 after 60 minutes

J. TP1 after 60 minutes

K. TP2 after 60 minutes

L. TP2 after 60 minutes

K.



L.



ADONIS 1381 1381 COUNCIL 1/15/2019
Your Environment