

Sustainable Drainage Options Appraisal & Strategy

09 February 2026

White Planning

Bluebell Farm, Commonfield Lane, Barkham, Wokingham, RG40 4PR

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1. Introduction

The following document is a Sustainable Drainage Options Appraisal & Strategy carried out by Oakshire Environmental, and includes details of the site, previous investigations, an evaluation of drainage options and an assessment of further investigations.

1.1 Project Overview

The client's proposed project involves the erection of 1no. replacement dwelling and car port, following demolition of existing dwelling at Bluebell Farm, Commonfield Lane, Barkham, Wokingham, RG40 4PR. Oakshire Environmental have carried out a Sustainable Drainage Strategy, as described below.

1.2 Purpose of Investigation

The objectives of the Sustainable Drainage Options Appraisal & Strategy were to:

- Establish the context and setting of development at the site.
- Assess the nature of existing surface water management at the site.
- Calculate surface water storage volumes and runoff rates.
- Identify suitable sustainable drainage option(s).
- Outline a strategy for the implementation of suitable sustainable drainage option(s).

1.3 Scope of Work

- Brief introductory information will be noted to provide context to the report and will include an Introduction, Project Overview, Scope of Work and Limitations.
- Desk studies will be carried out to establish the context and setting of development and the nature of existing surface water management at the site, through analysis of information obtained from sources including the Environment Agency, Local & National Authorities, Strategic Flood Risk Assessments and Digital Terrain Model (DTM) LiDAR topographical surveys.
- Quantitative surface water analysis will be conducted, to calculate runoff rates and storage volume requirements needed to meet Environment Agency, DEFRA and CIRIA guidance.
- Identify initial feasible options for sustainable drainage at the site, including assessment of potential constraints and generic objectives, based on the estimated cost, practicality and regulatory implications of their application.
- Conduct a detailed evaluation of sustainable drainage options, including development of site-specific objectives, in order to determine which option(s) are most appropriate for the site.
- Outline a strategy for the implementation of suitable sustainable drainage option(s).
- Recommended sustainable drainage option(s) will be assessed to determine the requirement or scope of further investigations at the site.
- Supporting appendix to include photographs, maps and plans of the site.

1.4 Limitations

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This report excludes consideration of potential hazards arising from any activities at the site other than normal use and occupancy for the intended land uses. Hazards associated with any other activities have not been assessed and must be subject to a specific risk assessment by the parties responsible for those activities. Oakshire Environmental does not warrant or guarantee that the site is free of hazardous or potentially hazardous materials or conditions. It should be noted that this report has been produced for environmental purposes only.

2. Site

The following section provides a description of the site, location and previous investigations, utilising information obtained from the client and publicly available sources.

2.1 Site Description and Location

The site is located at Bluebell Farm off Commonfield Lane to the south of Barkham and covers an area of 468m². The site comprises a chalet style dwelling at the south with an adjacent area of hardstanding in the centre, grass gardens at the north and south and a tarmac access road at the north west.

The site is bordered by an access track to the north, an area of woodland to the east and Bluebell Farm to the south and west which comprises mobile homes and dwellings.

There are downpipes on the existing dwelling, however, the existing drainage arrangement is not known. The site slopes gently from north east to south west, therefore, runoff from areas of hardstanding will discharge to adjacent grassed areas to the south.

National Grid Reference: SU 77876 65581

2.2 Proposed Development

The proposed development involves the demolition of the existing dwelling and the construction of a replacement dwelling with the same footprint along with a car port, cycle storage, an adjacent decking to the south and paving to the north.

The existing dwelling has a footprint of 80m² and the existing hardstanding covers an area of 200m² while the proposed dwelling will have the same footprint, the proposed car port will have a footprint of 31m², the proposed decking adjacent to the dwelling will also cover an area of 31m² and the remaining paving (including access road) will cover an area of 176m². The remainder of the site will be covered by grass or planting.

2.3 Previous Investigations

No previous investigations regarding surface water management have been carried out at the site.

3. Sustainable Drainage Options

A Sustainable Drainage Options Appraisal requires the initial identification of feasible options for sustainable drainage at a site, based on the costs involved and the practicality of their application. Some methods may not be appropriate to a particular site and some may not be cost effective. Other site specific constraints such as the available space can also determine the feasibility of a particular drainage option. The following section outlines objectives for the site, taking into account potential constraints, and includes a selection of feasible drainage options.

3.1 Feasible Drainage Options

The proposed development will slightly increase the impermeable surface cover across the site, therefore, sustainable drainage measures will be designed to ensure that the rate and volume of runoff from the site is not increased and is reduced to as close to the greenfield rate as is reasonably practicable.

In accordance with the 'National standards for sustainable drainage systems', where the volume of runoff discharged from the development for the 1% AEP, 6-hour rainfall event can be limited to less than or equivalent to the volume of greenfield runoff for the same event, the peak discharge rate from the development for the 1% AEP event shall be limited to the 1% AEP greenfield runoff rate or 3l/s/ha, whichever is the greater.

The 1% AEP greenfield runoff rate for the site is 0.5l/s while 3l/s/ha is 0.14l/s.

Provided the runoff volume from the site can be limited to the volume of greenfield runoff, the peak discharge rate for the 1% AEP event will be limited to the 1% AEP greenfield runoff rate.

BGS mapping shows that the site is situated on Bagshot Sand formation with no superficial deposits indicating that infiltration SuDS should be feasible at the site. Options that required a large land take, such as ponds and basins will not be suitable due to the limited space available outside the building footprint and green roofs will not be feasible due to lack of flat roof area.

Infiltration testing will be required to confirm the efficacy of infiltration SuDS at the site.

The following sustainable drainage options are, therefore, considered appropriate for the site and will be subject to a more detailed evaluation in the following section.

1. *Pervious Paving*
2. *Soakaway*

3.2 Detailed Evaluation of Drainage Options

Following the identification of feasible sustainable drainage options, a detailed evaluation of options, including development of site-specific objectives, is required to determine which option(s) are most appropriate for the site.

Table 1: Summary of Site-Specific Objectives

Mitigation Objective	Objective Type	Evaluation Criteria
Provide a reduction in the rate of runoff from the site	General/Technical	Peak discharge rate for the 1% AEP event will be limited to greenfield runoff rate
Ensure that the volume of runoff from the site is not increased	General/Technical	Runoff volume for the 100 year, 6 hour event to be constrained to as close as reasonably practicable to the greenfield runoff volume
Ensure that the implemented option can be maintained for the lifetime of the development	General/Technical	Allow maintenance of selected option for a minimum of 100 years
Enable development of a drainage strategy that meets regulatory requirements	Management	Drainage strategy to be agreed with Local Authority and carried out in accordance with relevant regulations
Enable development of a drainage strategy that meets the owner's requirements	Management	Drainage strategy to be agreed with site owner

3.3 Pervious Paving

Pervious paving could be implemented in all areas of proposed paving to provide a means of significantly reducing the rate of runoff from the site, while also allowing the storage of surface water close to the surface.

Pervious paving also provides treatment of surface water to improve water quality through processes including the filtration of silt and the attached pollutants, biodegradation of organic pollutants (such as petrol and diesel within the pavement construction), adsorption of pollutants and the settlement and retention of solids.

A minimum infiltration rate of 2,500mm/h (7×10^{-4} m/s) is considered reasonable for a pavement surface to be considered pervious in respect to surface water management and most permeable paving designs can achieve infiltration rates of far more than this.

The decking area to the south of the dwelling will not experience vehicular traffic and will be classified as Traffic Category 1 while vehicular traffic on the paved areas at the north will be limited to cars and light vans, therefore, this will be classified as 'Traffic Category 2'. The structural requirements of pervious paving in Traffic Categories 1 & 2 include sub base thicknesses of at least 100mm and 150mm, respectively.

Given the topography of the site (sloping to the south west) it may not be suitable to discharge runoff from the roof of the proposed dwelling and car port to the sub base of the proposed paving, therefore, this will be managed separately.

An infiltration test will be required to determine the hydraulic requirements of the pervious paving.

3.4 Soakaway

Surface water runoff from the proposed dwelling roof and car port can be managed through the installation of a soakaway.

The soakaway would need to be at least 5m from the foundations of the dwelling, at least 2.5m from the site boundary and, where possible, should also be built on land lower than, or sloping away from, the dwelling. There will be sufficient space to locate the soakaway in the garden area at the south of the site.

The soakaway should be constructed using modular plastic units to allow a porosity of 95% and minimise size requirements and downpipes from the proposed dwelling and car port should direct water to the soakaway through underground pipework.

An infiltration test will be required to determine the minimum soakaway size required to accommodate the 1% AEP runoff volume.

In conjunction with pervious paving, this will allow all surface water from the site to be discharged via infiltration.

4. Recommendations

Following a detailed evaluation of feasible sustainable drainage options, the final option is selected, taking into account site-specific factors and the constraints outlined previously. The most appropriate sustainable drainage option at the site is considered to be through the implementation of pervious paving and a soakaway. The details regarding this are outlined below.

4.1 Sustainable Drainage Strategy

Pervious paving should be implemented in all areas of proposed hardstanding and should comprise a sub-base of coarse graded aggregate (or Type 3 MOT). Modular permeable paving (e.g. brick paving/concrete block permeable paving) or porous asphalt can be implemented in the proposed driveway while the proposed decking should have gaps to allow surface water to pass through to an underlying sub base.

Above the subgrade soil, a sub base comprised of coarse graded aggregate should be placed to a minimum depth of 100mm in the proposed decking area to the south of the dwelling and 150mm in all other areas of paving (subject to infiltration testing). Sub base material should have a porosity of at least 30% in accordance with BS7533-13:2009 or DfT (1998) and should also have a minimum infiltration rate of $1 \times 10^{-2} \text{m/s}$. Sub base should be laid in 100-150mm layers and compacted to ensure the maximum density is achieved without crushing the individual particles or reducing the porosity below the design value.

Where modular permeable paving is installed in the proposed driveway, a non-woven geotextile layer should be laid on top of the sub base to ensure that aggregate from the sand bedding layer is not washed down into the sub base. This layer should be laid in accordance with manufacturers' instructions and with overlaps between adjacent strips of 300mm without any folds or creases.

A 50mm bedding layer should then be placed on top of the geotextile layer. The bedding layer should comprise aggregate material of type 2/6.3 Gc 80/20 in accordance with BS EN 13242:2007.

Paving blocks should then be laid on the bedding layer to a thickness of 60mm, however, advice should also be sought from the manufacturer on their recommendations. Manufacturer's advice should also be sought to determine the joint spacing and joint filling requirements of the block paving.

Alternatively, if porous asphalt is implemented, a bedding layer will not be required and a surface layer comprising porous asphalt should be laid directly onto the sub-base layer. The thickness of porous asphalt should be in accordance with DfT (1998) depending on the use type of the road or driveway. For the proposed driveway (Traffic Category 2) the asphalt layer should be a minimum of 70mm thick, assuming a CBR of 5%.

Treatment design should ensure that the surface layer has sufficiently small voids to trap silt within 30mm of the surface but still be permeable enough to allow water to flow into the sub base. Modular permeable paving with type 2/6.3 jointing material and suitably specified porous asphalt should meet this requirement.

In the proposed timber decking to the south of the dwelling, the decking surface should have sufficient gaps to allow the infiltration of surface water and no bedding layer will be required above the underlying sub base.

In addition to pervious paving, a soakaway should also be installed in the proposed garden area at the south of the site to discharge rainwater from the roofs of the proposed dwelling and car port and should be located at least 5m from the dwelling and 2.5m from the site boundary.

The soakaway should be constructed using geocellular crates that can be easily constructed and connected together to create the required capacity. The pits should be lined with a geotextile membrane to allow water to pass into the void of the crates while keeping soil and sediment out. The soakaway crates should then be placed into the pit and wrapped in the membrane. Following this, the outside of the crates should then be infilled to provide 100mm of clean granular material (e.g. soil or gravel).

Downpipes will direct water from the roofs of the dwelling and car port into underground pipes leading to the soakaway. Inflow pipes to the soakaway should be at least 100mm diameter and should be laid to a fall no steeper than 1 in 40. The soakaway should be provided with inspection access, so that the point of discharge of the drain to the soakaway can be seen. This access will identify the location and will allow material to be cleared from the soakaway. The inspection access should provide a clear view to the base of the soakaway.

In order to protect the proposed dwellings in the event of an exceedance of the design capacity of the soakaway, the soakaway will be situated on land sloping away from the dwelling.

Infiltration testing will be required to determine the minimum pervious paving sub base depth and the minimum soakaway size.

4.2 Maintenance

The maintenance of the soakaway will be the responsibility of the homeowner(s) and should include routine inspection of the geo-cellular crates and associated infrastructure to ensure that debris is removed and there are no blockages.

The responsibility for the maintenance of the pervious paving installed in the proposed driveway will be with the homeowner(s). The pavement should be inspected regularly, preferably during and after heavy rainfall to check effective operation and to identify any areas of ponding.

It is likely that the surface layer will become clogged to some degree over the lifetime of the development due to the build-up of silt and dirt from vehicles and off-site runoff. Despite reduction in surface infiltration due to clogging, available evidence indicates that the long-term reduced rate is more than sufficient in most cases to deal with any rainfall intensities likely to occur in the UK.

The following table provides guidance on the type of operational and maintenance requirements that are recommended and the frequency at which they should be carried out.

Table 2: Operation and maintenance requirements at the site

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber	Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)
	Trimming any roots that may be causing blockages	Annually (or as required)
	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 manufacturers' 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 maintenance	Remove sediment and debris from pre-treatment components and floor of inspection tube or chamber	As required, based on inspections
	Removal of weeds	As required
Remedial actions	Reconstruct soakaway and/or replace or clean void fill if performance deteriorates or failure occurs	As required
	Replacement of clogged geotextile (will require reconstruction of soakaway)	As required
	Remedial work to any depressions, rutting and cracked or broken areas of paving considered detrimental to the structural performance or a hazard to users	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually
	Check soakaway to ensure emptying is occurring	Annually
	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 and establish appropriate brushing frequencies	Annually

5. Calculations

5.1 Greenfield Runoff Rate

The greenfield runoff rate for the site has been calculated using the uksuds tool from HR Wallingford.

Outputs are provided in the appendix.

5.2 Pervious Paving Sub Base Depth

The minimum sub base depth required in the proposed pervious paving will be determined by calculating the maximum water depth for a range of storm durations from 5 minutes to 24 hours, following infiltration testing at the site.

5.3 Soakaway

The minimum soakaway height required will be determined by calculating the maximum water depth for a given soakaway base area for a range of storm durations from 5 minutes to 24 hours, following infiltration testing at the site.

6. References

BRE, 2016. *Soakaway design - Digest 365*. BRE Electronic Publications.

CIRIA, 2015. *The SuDS Manual*. ISBN: 978-0-86017-760-9.

Department for Communities and Local Government. *Technical Guidance to the National Planning Policy Framework*.

Environment Agency, 2025. *Flood risk and coastal change*. [online] Available at: <gov.uk/guidance/flood-risk-and-coastal-change>.

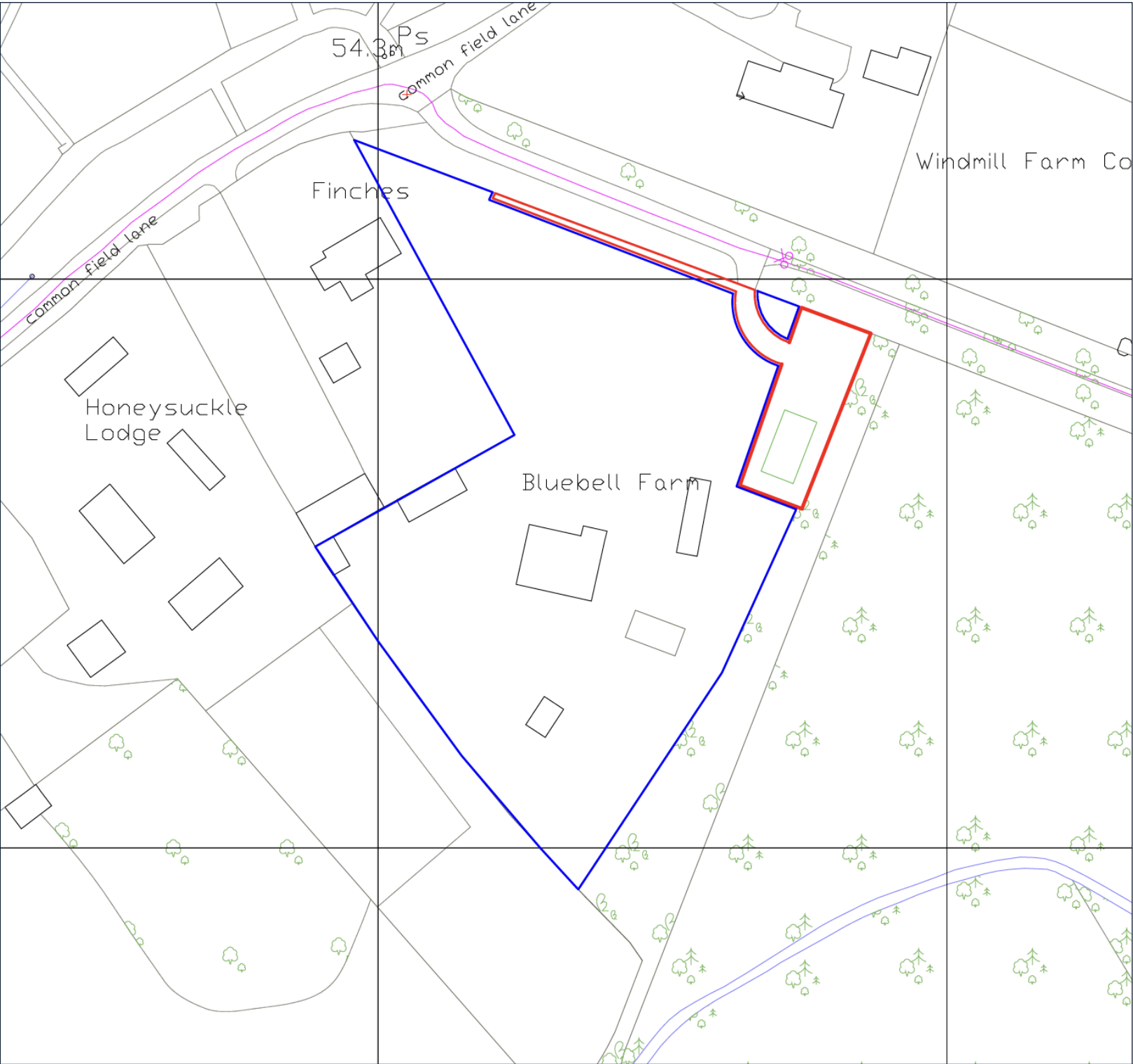
HM Government, 2015. *Approved Document H - Drainage and Waste Disposal (2015 edition)*. The Building Regulations 2010.

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Ordnance Survey. [online] Available at: <ordnancesurvey.co.uk>.

UK Centre for Ecology & Hydrology. *Flood Estimation Handbook Web Service*. [online] Available at: <fehweb.ceh.ac.uk>.

Oakshire Environmental. Available at: <oakshireenvironmental.co.uk>



Appendix - Site Maps & Plans

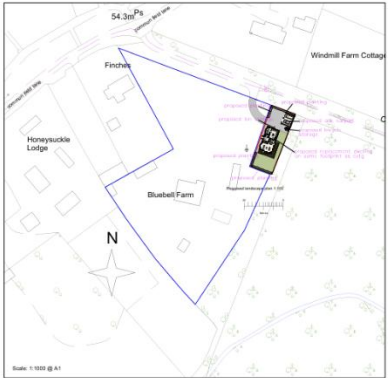
Description

Site location plan

Key

Site boundary

North



Native Hedge Schedule									
Hedge	1	1%	Species	Common Name	Height	Age	Root	Nr	Linear M
34	30		Viburnum opulus	Gelder Rose	60-80	1+1	BR	5	per m
23	20		Cornus sanguinea	Dogwood	60-80	1+1	BR	5	per m
14	12.5		Prunus spinosa	Blackthorn	40-60	1+1	BR	5	per m
14	12.5		Crataegus monogyna	Hawthorn	40-60	1+1	BR	5	per m
14	12.5		Euonymus europaea	Spindle	20-40	1+0	BR	5	per m
14	12.5		Betula pubescens	Birch	20-40	1+0	BR	5	per m

Ornamental Hedging Schedule						
Nr	Abbr	Species	Height	Root	Breaks	Nr m²
26	COR	Cornus stolonifera flaviramea	30-40	CG	3+	5
45	PRU	Prunus laurocerasus	60-80	CG	3+	5

Existing Landscape

Application/Site Boundary

Boundary within the ownership of the client

Planting & Soft Landscaping

Native hedge - See planting schedule and planning notes

Ornamental hedging - See planting schedule and planning notes

Amenity mown grass areas:
Typical sown seed mixture for turf:
25% Dwarf Perennial Ryegrass
30% Slender Creeping Red Fescue
45% Strong Creeping Red Fescue

Hard Landscaping & Surfaces

Tarmac driveway - see architects drawing for details

Timber decking - see architects drawing for details

Refuse bin store

Cycle store

Boundary Treatments

1.8m high close board fence and gates

0m 5m 10m

N

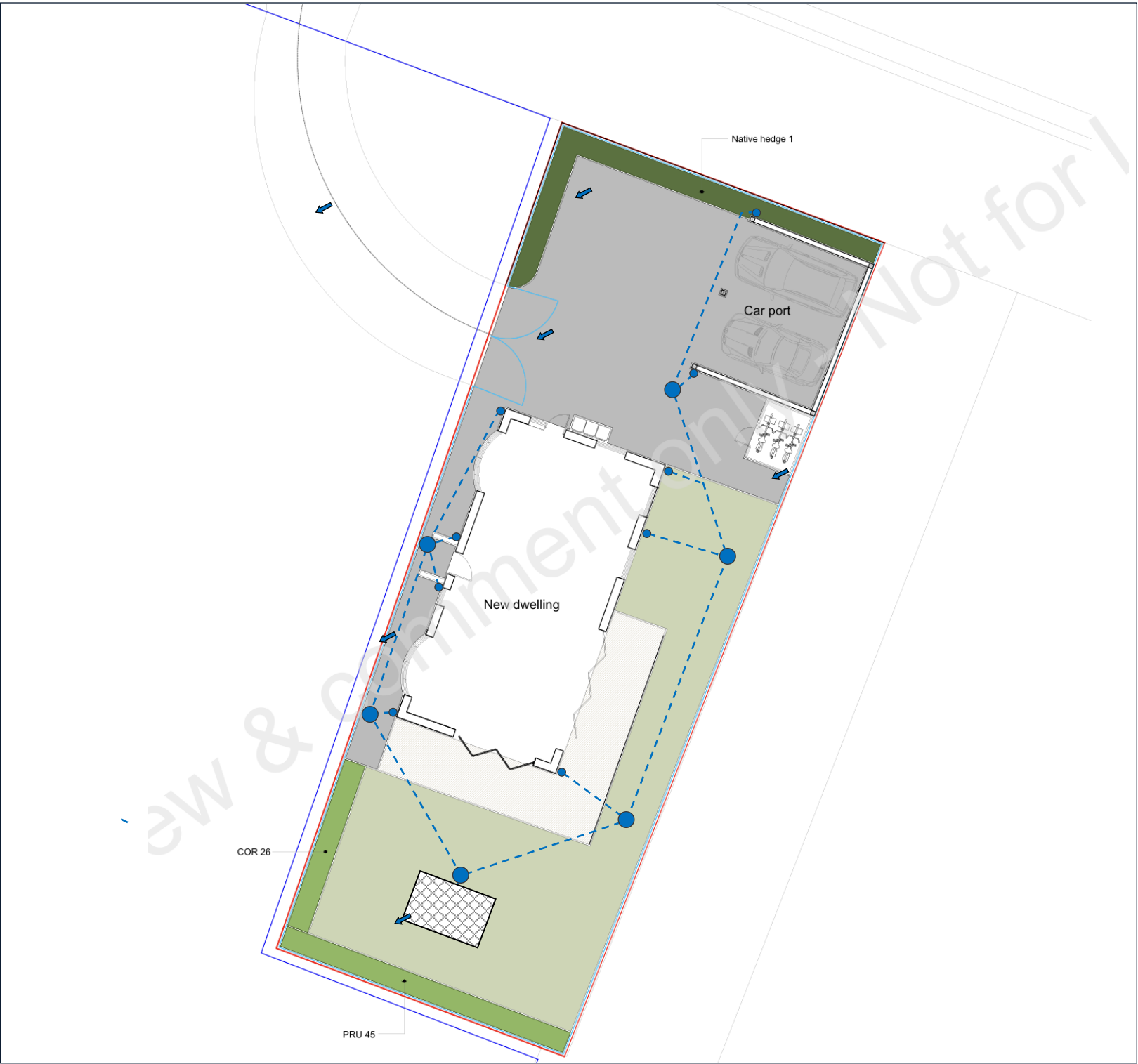
Appendix - Site Maps & Plans

Description

Proposed landscaping plan

Key

- Site boundary
- North



Appendix - Indicative Drainage Layout

Description

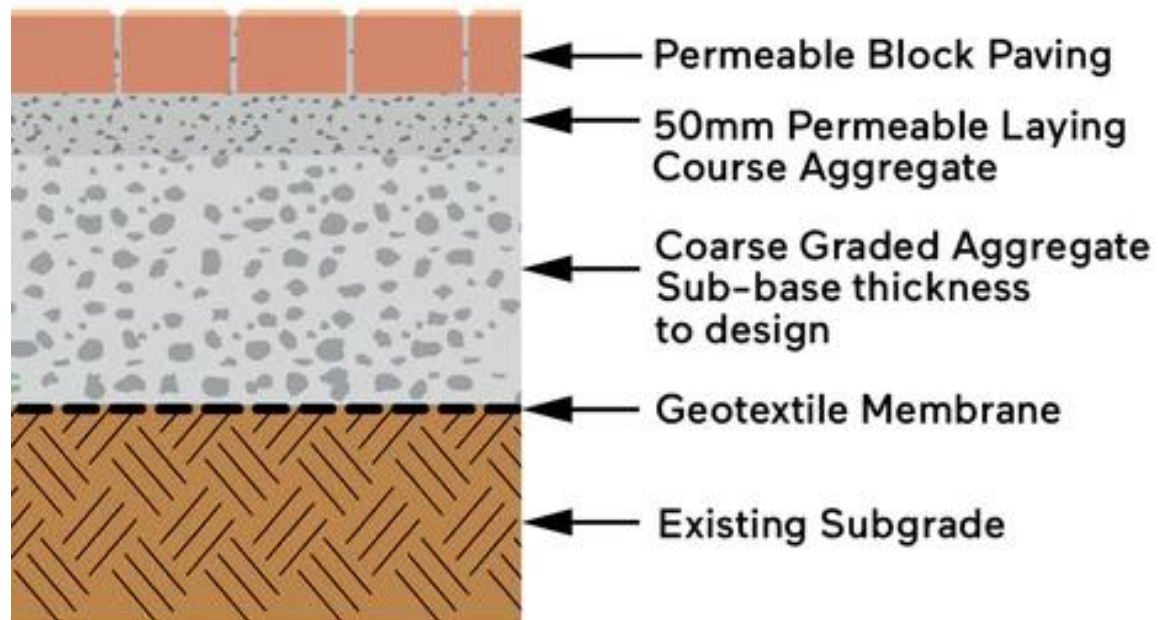
Indicative drainage layout (for illustrative purposes only – to be confirmed by engineer)

Sources

Oakshire Environmental

Key

	Site boundary
	Pervious paving (min. 100mm subbase)
	Pervious paving (min. 150mm subbase)
	Soakaway
	Surface water pipe
	Downpipe
	Inspection chamber
	Exceedance flow



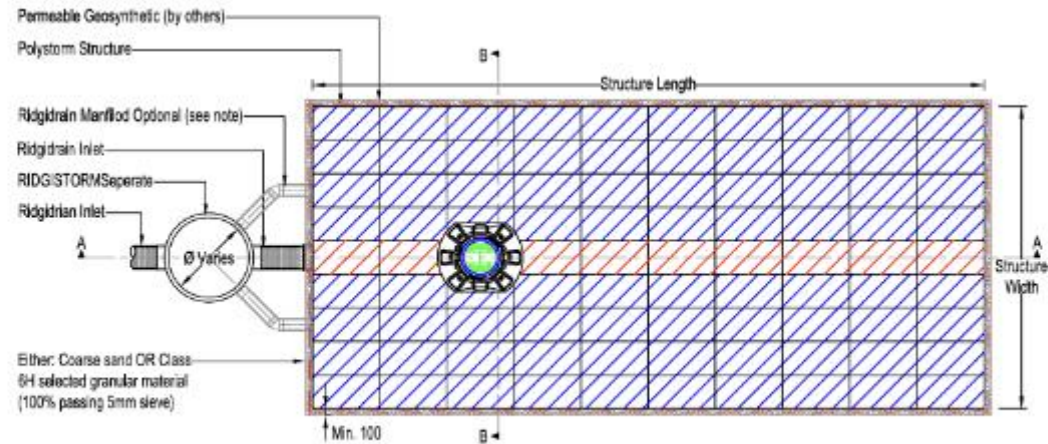
Appendix - Example Construction Drawings

Description

Soakaway design drawings

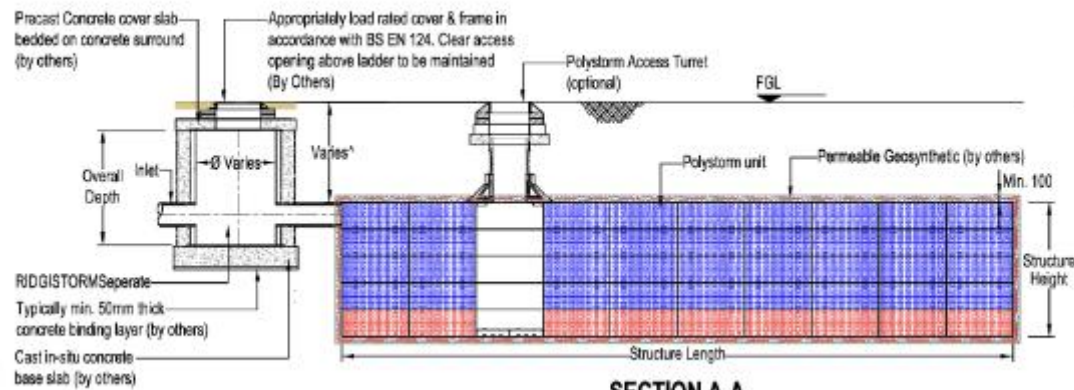
Sources

Polypipe



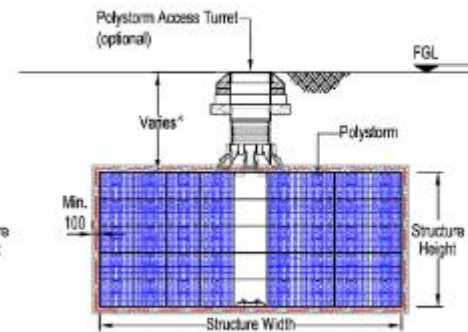
TYPICAL SOAKAWAY TANK PLAN

(Scale 1:75)



SECTION A-A

Scale (1:75)



SECTION B-B

Scale (1:75)

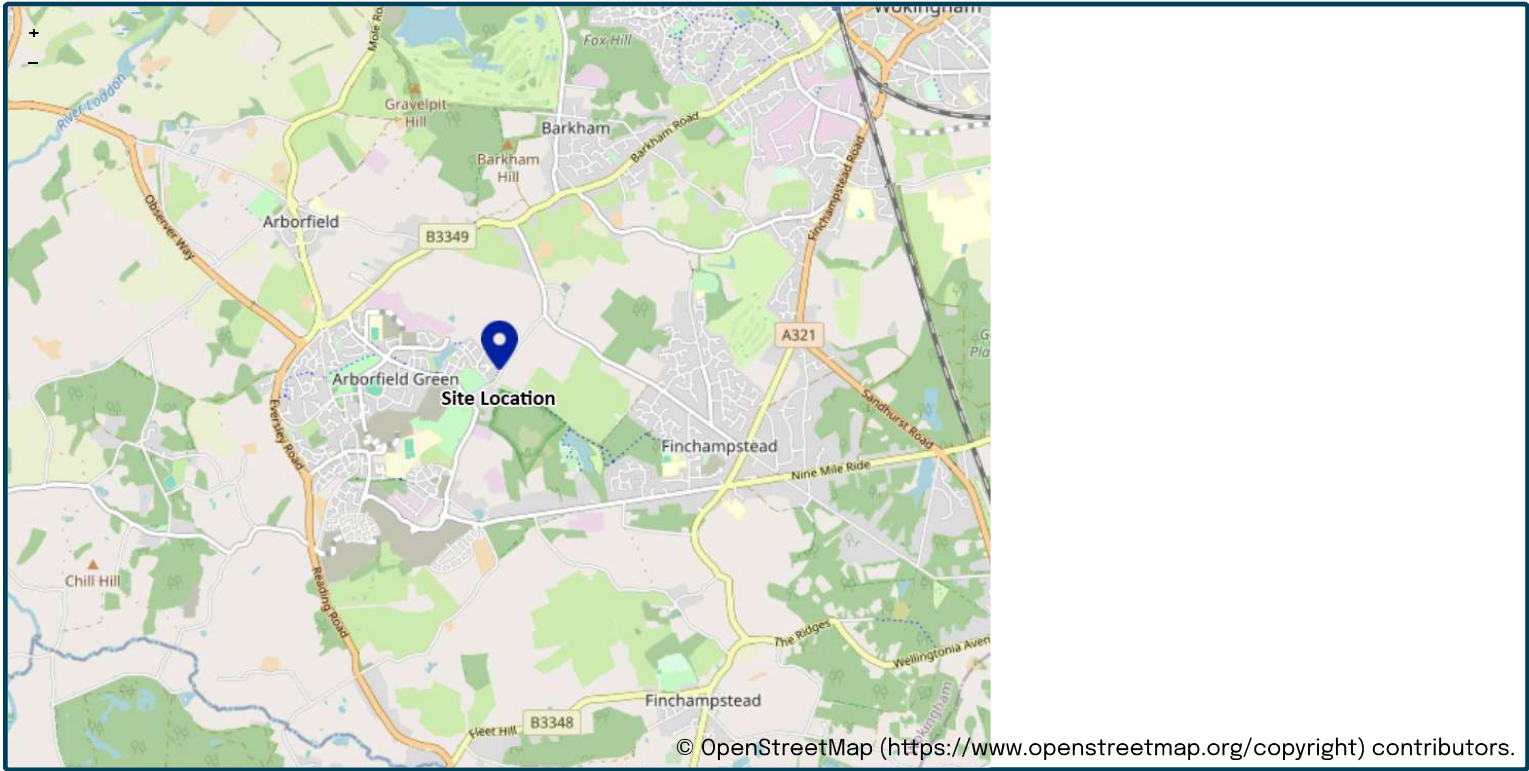
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015).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

Project details

Date	05/02/2026
Calculated by	Oakshire Environmental
Reference	White Planning
Model version	2.2.2

Location

Site name	Bluebell Farm
Site location	Barkham



Site easting (British National Grid)	477872
Site northing (British National Grid)	165580

Site details

Total site area (ha)	0.0468	ha
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Greenfield runoff

Method

Method	FEH statistical (2025)
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FEH statistical (2025)

	My value		Map value
SAAR9120 (mm)	681		mm
BFIHOST19scaled	0.472		
QMed-QBar conversion	1.136	☐	1.136
QMed (l/s)	0.1		l/s
QBar (FEH statistical 2025) (l/s)	0.1		l/s

Growth curve factors

	My value		Map value
Hydrological region	6	☐	6
1 year growth factor	0.85		
2 year growth factor	0.88		
10 year growth factor	1.62		
30 year growth factor	2.3		
100 year growth factor	3.19		
200 year growth factor	3.74		

Results

Method	FEH statistical (2025)	
Flow rate 1 year (l/s)	0.1	l/s
Flow rate 2 year (l/s)	0.1	l/s
Flow rate 10 years (l/s)	0.2	l/s
Flow rate 30 years (l/s)	0.3	l/s
Flow rate 100 years (l/s)	0.5	l/s
Flow rate 200 years (l/s)	0.6	l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent ‘zero’ figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.2) developed by HR Wallingford and available at uksuds.com (<https://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 uksuds.com/terms-conditions (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate 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, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.