Foul and Surface Water Management Strategy

Bluebell Meadow

East Langdon Road

Martin

CT15 5JJ

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CONTENTS

1. Background and Introduction

This Foul and Surface Water Management Strategy accompanies a planning application submitted to Dover District Council. The planning application is for development at Bluebell Meadow, East Langdon Road, Martin, CT15 5JJ.

2. Development Location and Description

Development Location

The site is at Bluebell Meadow, East Langdon Road, Martin, CT15 5JJ, Figure 1. The site currently forms a paddock.

Figure 1. Site location plan.

Proposed Site Use

The proposed development is for a single dwelling, Figure 2. The development will use the existing access onto East Langdon Road.

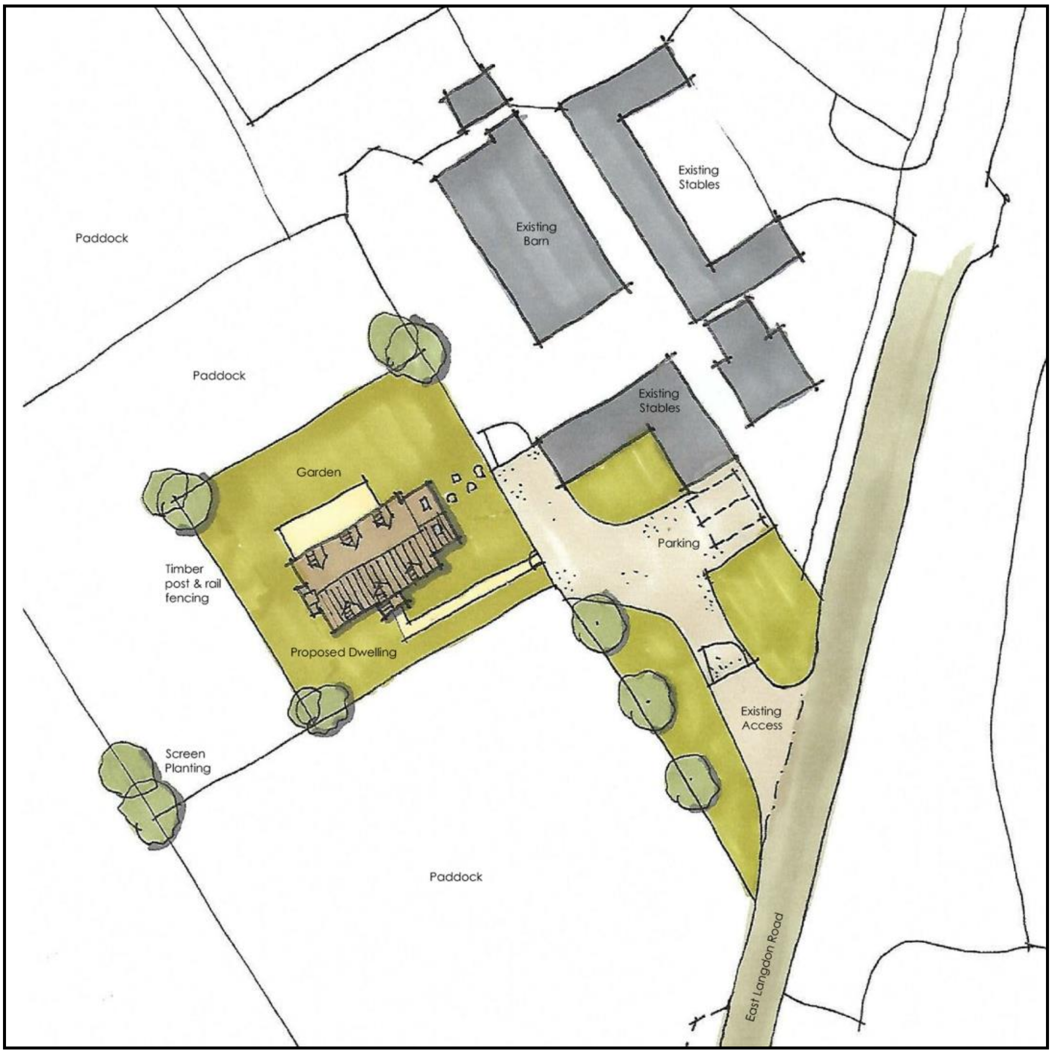


Figure 2. Proposed development.

3. Policy Background

National Planning Policy Framework

The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally-prepared plans for housing and other development can be produced.

Chapter 14 Meeting the challenge of climate change, flooding and coastal change states:

165. Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

- *a) take account of advice from the lead local flood authority;*
- *b) have appropriate proposed minimum operational standards;*
- *c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and*
- *d) where possible, provide multifunctional benefits.*

Chapter 15 Conserving and enhancing the natural environment states:

170. Planning policies and decisions should contribute to and enhance the natural and local environment by:

- *a) protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);*
- *b) recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland;*
- *c) maintaining the character of the undeveloped coast, while improving public access to it where appropriate;*
- *d) minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;*
- *e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and*

f) remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.

Dover District Council Core Strategy 2010

Dover District Council's Local Development Framework Core Strategy was adopted in February 2010. The following policies are relevant to the site.

Policy DM 17

Groundwater Source Protection

Within Groundwater Source Protection Zones, shown on the Proposals Map, the following will not be permitted in Zones 1 and 2 unless adequate safeguards against possible contamination are provided:

i. Septic tanks, storage tanks containing hydrocarbons or any chemicals, or underground storage tanks;
ii. Proposals for development which may include activities which would pose a high risk of contamination unless surface water, foul or treated sewage effluent, or trade effluent can be directed out of the source protection zone;
iii. Proposals for the manufacture and use of organic chemicals, particularly chlorinated solvents;
iv. Oil pipelines;
v. Storm water overflows;
vi. Activities which involve the disposal of liquid waste to land; and
vii. Sustainable urban drainage systems.

New graveyards will not be permitted in Zone 1. Farm waste, storage areas, new foul or combined sewerage systems will also not be permitted in Zone 1 unless adequate safeguards are provided.

4. Site Characteristics

Topography - Contours have been derived from Lidar data. The site slopes from northwest to southeast from 70.0mAOD (Above Ordnance Datum) to 67.0mAOD, Figure 3, at gradient of approximately 1 in 16. A dry valley runs from southwest to northeast, south of East Langdon Road.

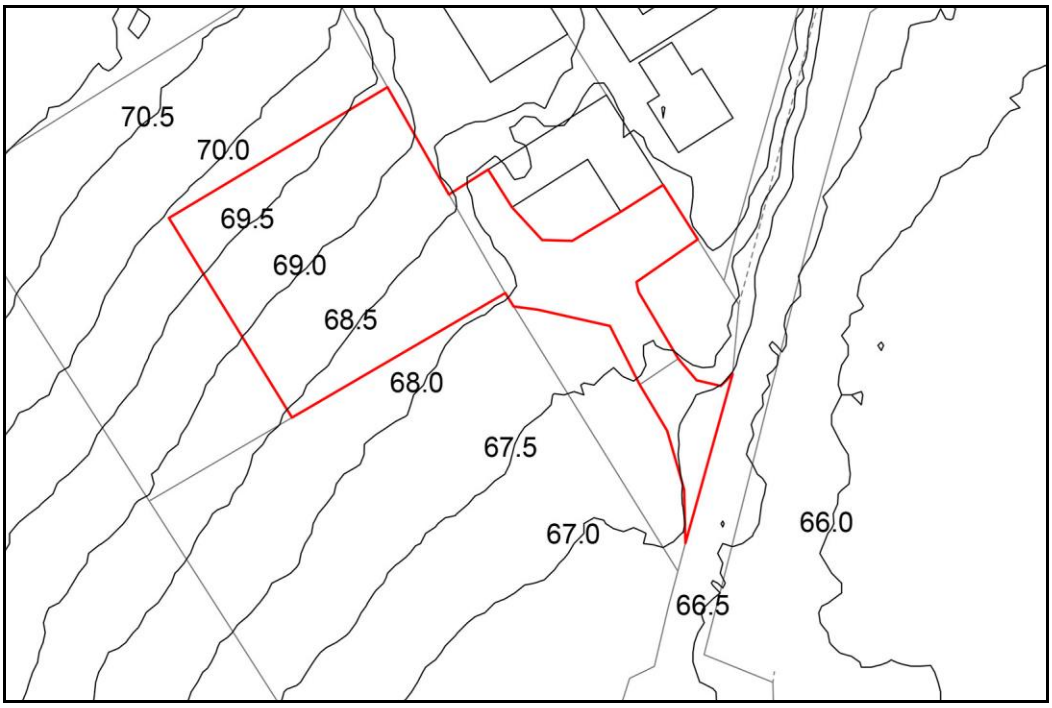


Figure 3. Local topography.

Geology and Soils - The bedrock geology consists of the Seaford Chalk Formation, chalk. Superficial deposits consist of Head Deposits, clay, silt, sand and gravel. The soils are classified as freely draining loamy soils draining to chalk groundwater.

Groundwater - The site lies across groundwater source protection zones 2 (outer) and 3 (total), Figure 4.

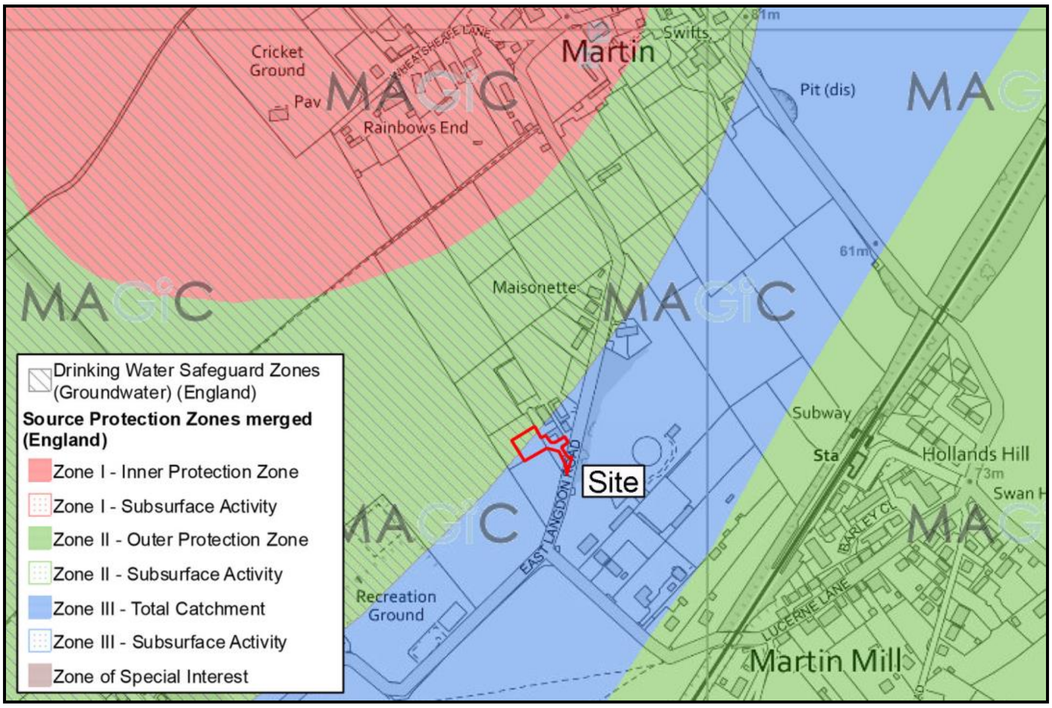


Figure 4. Groundwater source protection zones.

Records from a borehole sunk in Martin Mill indicate that groundwater level was at approximately 18mAOD, 49m below the lowest site level.

Infiltration Rates - Soakage testing has not been carried out at the site. Infiltration rates for common types of soil are shown in Table 1.

Soil Type	Infiltration Rate *f*
gravel	2.8×10^{-3} to 0.28 m/s
sand	2.8×10^{-5} to 0.028 m/s
loamy sand	2.8×10^{-6} to 2.8×10^{-4} m/s
sandy loam	1.4×10^{-5} to 1.4×10^{-4} m/s
loam	2.8×10^{-7} to 2.8×10^{-5} m/s
silt loam	1.4×10^{-7} to 2.8×10^{-5} m/s
chalk	2.8×10^{-7} to 0.028 m/s
sandy clay loam	2.8×10^{-7} to 2.8×10^{-5} m/s
clayey gravels	1.0×10^{-8} to 1.0×10^{-6} m/s
clayey sands	1.0×10^{-9} to 1.0×10^{-6} m/s

Table 1. Infiltration rates for typical soils.

An infiltration rate of 1.0 x 10^{-5} m/s has been assumed for infiltration into the chalk. This assumed rate is considered to be conservative and therefore leads to a robust surface water management strategy. The assumed rate will need to be verified through site specific percolation tests before the design and construction of any infiltration devices.

Rainfall Data - FEH 2013 XML point rainfall data has been used in developing this strategy. This provides rainfall data for return periods greater than 2 years.

Existing Site - The site includes an existing access which is laid as permeable paving. The site covers 890m^2. 290m^2 of the site is covered with the existing driveway, Figure 5.

Figure 5. Existing paved area.

Greenfield Runoff Rate - The peak greenfield runoff for the critical storm duration for the site has been calculated using the IH124 method from the greenfield runoff rate estimation tool published online by HR Wallingford at uksuds.com. The peak runoff is shown in Table 2.

Return Period	Runoff Rate Q l/s	
	per ha.	Site (0.09ha)
QBar	0.20	0.02
1	0.17	0.02
30	0.45	0.04
100	0.62	0.06

Table 2. Greenfield runoff rate for the site.

Sewer Record - A public foul sewer runs southwest to northeast along East Langdon Road, Figure 6. The public sewer crosses the corner of the paddock to the south of the proposed dwelling. This paddock is within the applicant's ownership.

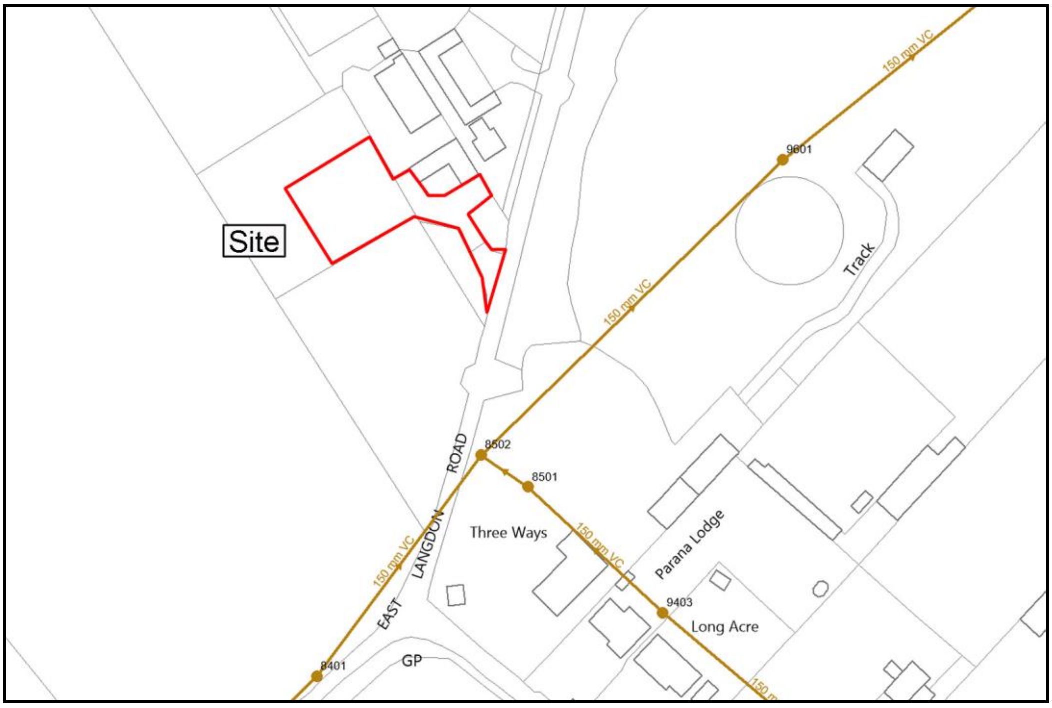


Figure 6. Sewer record. (© Southern Water)

5. Flood Risk Assessment

The NPPF states that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk. Local Plans should apply a sequential, risk-based approach to the location of development to avoid where possible flood risk to people and property and manage any residual risk, taking account of the impacts of climate change by applying the Sequential Test.

Flood zones are the starting point for the Sequential Test. These zones are a broad assessment of flood risk as given below.

Zone 1 Low Probability - land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).

Zone 2 Medium Probability - land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year.

Zone 3a High Probability - land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

Zone 3b The Functional Floodplain - land where water has to flow or be stored in times of flood, land which would flood with an annual probability of 1 in 20 (5%) of greater in any year or designed to flood in an extreme flood.

The site lies within flood zone 1 and therefore residential development is appropriate.

Surface Water - The Government has published surface water flooding maps.

The site is at very low risk of surface water flooding, Figure 7. The definition of each category is given below:

Very Low (white) a chance of flooding of less than 1 in 1000 (0.1%)
Low (pale blue) a chance of flooding of between 1 in 1000 (0.1%) and 1 in 100 (1%)
Medium (mid blue) a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%)
High (dark blue) a chance of flooding of greater than 1 in 30 (3.3%)

The depth of water associated with the low, medium and high risk flood events is shown in Figures 8-10. The definition of each colour is given below:

Below 300mm (light blue)
300-900mm (medium blue)
Over 900mm (dark blue)

The surface water flood maps also give an indication of velocity and direction of flow, Figure 11. The definition of each colour is given below:

Over 0.25 m/s (dark blue)
Less than 0.25 m/s (light blue)

The arrows indicate the direction of flow.

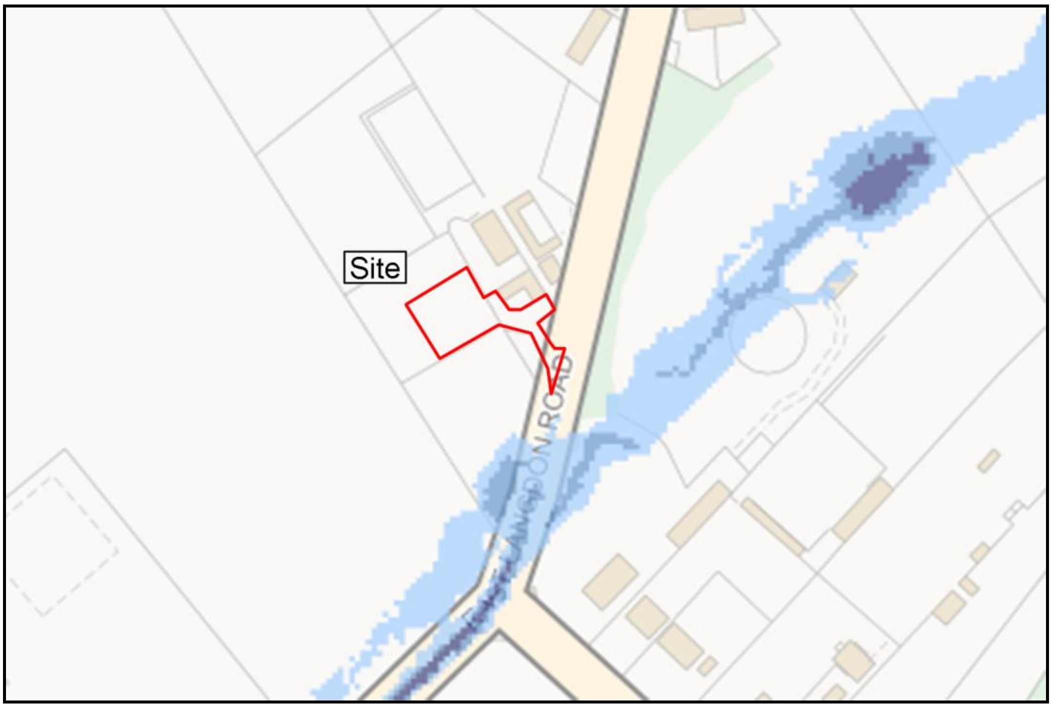


Figure 7. Surface water flood map with the site edged red.

Figure 8. Surface water flood depth map for the low risk flood event with the site edged red.

Figure 9. Surface water flood depth map for the medium risk flood event with the site edged red.

Figure 10. Surface water flood depth map for the high risk flood event with the site edged red.

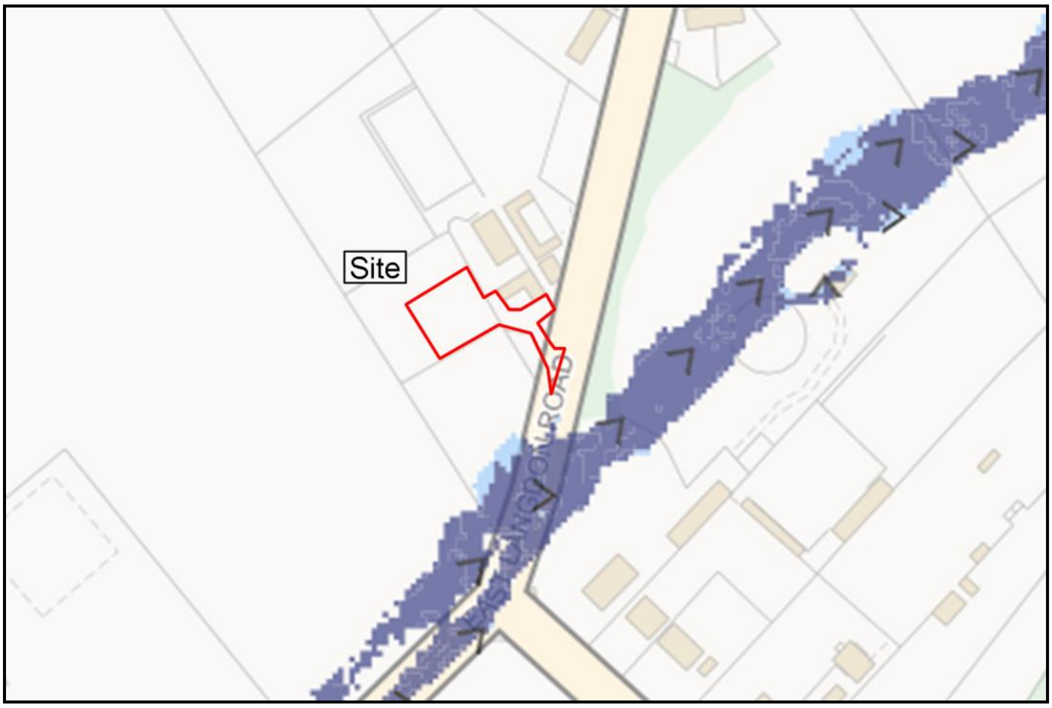


Figure 11. Surface water flood velocity map for the low risk flood event with the site edged red.

The surface water flood maps pick up a drainage flow path to the south of the of the site within the dry valley.

Groundwater - Water levels below the ground rise during wet winter months, and fall again in the summer as water flows out into rivers. In very wet winters, rising water levels may lead to the flooding of normally dry land, as well as reactivating flow in 'bournes' (streams that only flow for part of the year). Where land that is prone to groundwater flooding has been built on, the effect of a flood can be very costly, and because groundwater responds slowly compared with rivers, floods can last for weeks or months.

Records from a borehole sunk in Martin Mill indicate that groundwater level was at approximately 18mAOD, 49m below the lowest site level. The risk of groundwater flooding at the site is therefore considered to be very low.

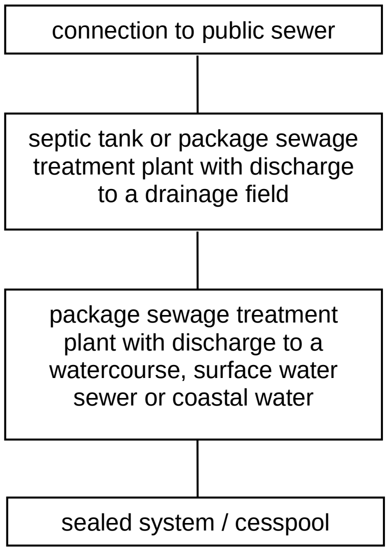
Infrastructure - The site is served by public sewers. The site is elevated above the line of the foul sewer. Any water breaking the surface would flow northeast following the flow path identified by the surface water flood mapping. The risk of infrastructure flooding at the site is considered to be very low.

The site lies within flood zone 1 and is at very low risk of flooding from all other sources.

6. Foul Water Management Strategy

Choosing the right sewage treatment and disposal method is essential for the protection of public health and the environment and ensures effective long term performance of the system. Sewage treatment and disposal can be provided by a sewerage undertaker or by a private treatment system.

There is a hierarchy of methods for disposing of foul sewage.



Connection to Public Sewer

A public foul sewer runs southwest to northeast along East Langdon Road.

Network reinforcement charges are now recovered through the infrastructure charge. This is currently £790 per property with an income offset of £225, a net cost of £565.

Network reinforcement is work that needs to be carried out to the existing network to support development-related growth. This work is needed to ensure there is enough capacity in wastewater network to serve the new homes that are built without impacting on the service to existing customers.

Network Reinforcement may include the following activities:

- Enlarging existing pipes or installing larger new pipes to increase capacity for a specific development, or further expected growth in the future.
- Upsizing existing or proposed pumping stations.

- Providing new cross-connections to improve network capacity under differing network conditions.
- Other infrastructure required to provide network capacity for growth resulting from new development.

The capacity of the existing sewerage network is not a constraint on development, as any necessary upgrades will be carried out by Southern Water and paid for through the infrastructure charge. The developer will still be responsible for delivering on-site sewers and providing the connection to the existing public sewer.

Foul Sewage Flows

Sewers for Adoption 7th Edition states that design flow rates for dwellings should be 4,000 litres per dwelling per day. This equates to a design flow of 0.05 l/s.

Foul Drainage Strategy

The paddock to the south of the proposed dwelling is within the applicant’s ownership. The foul sewer is shown crossing the corner of this paddock providing a connection point within the applicant’s ownership. For a single dwelling the connection can be made via a junction.

The sewer record does not have an invert level for manhole 8502. Assuming a maximum invert level of 65.29mAOD, the invert level at the upstream manhole 8501, the maximum invert level at the proposed connection point is 65.6mAOD. This is sufficiently deep to allow the proposed dwelling to connect to the foul sewer by gravity. A draft foul drainage design is shown in Figure 12. The draft design shows that the development can connect to the public foul sewerage network.

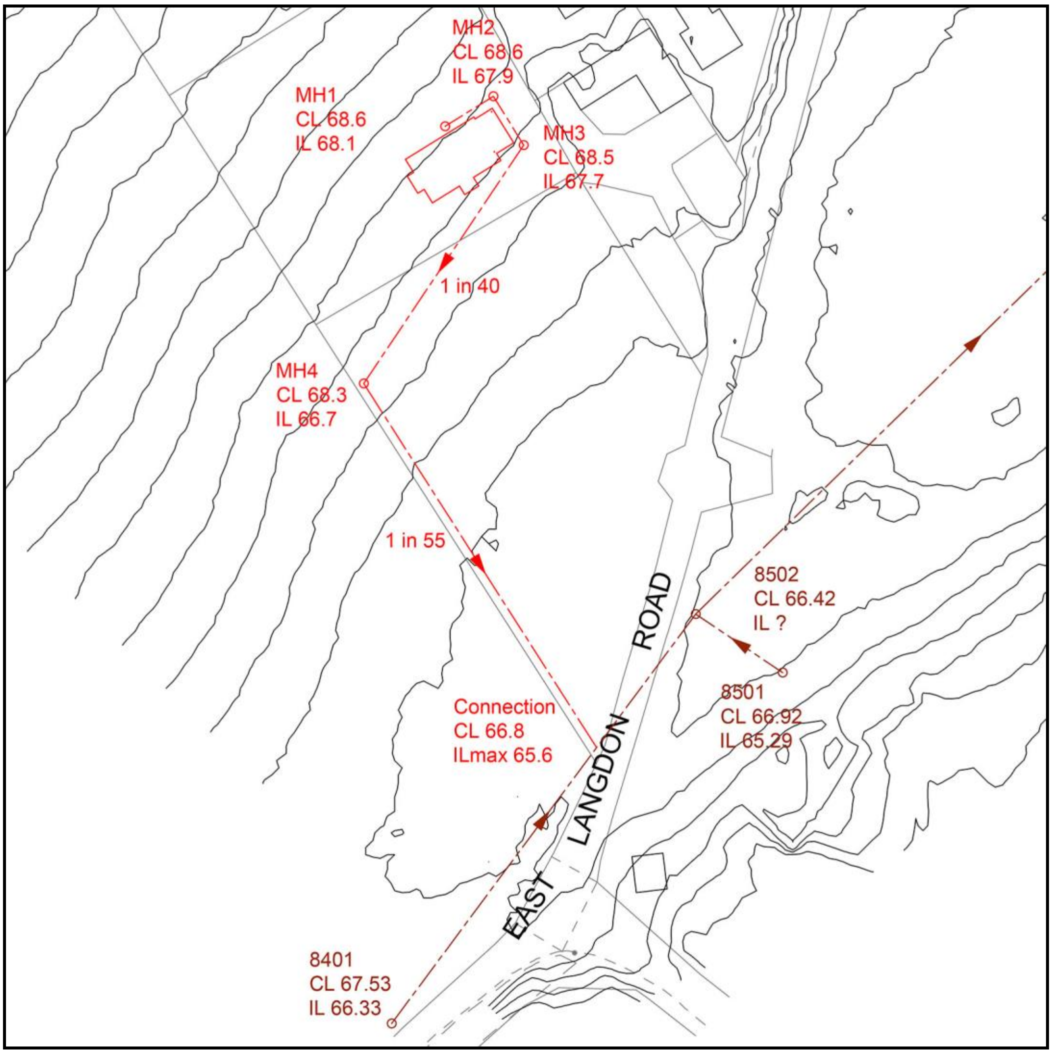


Figure 12. Schematic foul drainage layout.

7. Climate Change

The global climate is constantly changing, but it is widely recognised that we are now entering a period of accelerating change. Climate change will result in an increase in sea levels, rainfall intensity and river flows.

The impact of climate change will be to reduce the standard of protection provided by current defences with time and increase the risk of flooding in undefended areas. The Planning Practice Guidance to the National Planning Policy Framework (NPPF) recommends using the following range of increases in peak rainfall intensity due to climate change to 2115 in any assessment:

Upper End	+40%
Central	+20%

The range is based on percentiles. The 50th percentile is the point at which half of the possible scenarios for peak rainfall intensity fall below it and half fall above it. The Central allowance is based on the 50th percentile whilst the Upper End is based on the 90th percentile.

The Central allowance is 20% and scientific evidence suggests that it is just as likely that the increase in rainfall intensity will be more than 20% as less than 20%. The Upper End allowance is 40% and current scientific evidence suggests that there is a 90% chance that peak rainfall intensity will increase by less than this value, but there remains a 10% chance that peak rainfall intensity will increase by more.

The Planning Practice Guidance suggests that flood risk assessments and strategic flood risk assessments should assess both the Central and Upper End allowances to understand the range of impact.

The surface water calculations include an increase of 20% in peak rainfall intensity for the sizing of structures. The structures are then tested with a 40% increase in peak rainfall intensity. If this results in any flooding, the extent of this flooding and its impact on the development is then considered.

8. Detailed Development Proposals

The development creates 100m^2 of impermeable roof area. The existing access remains unaltered, Figure 13. The development leads to an increase in impermeable area of 100m^2.

Figure 13. Proposed roof and existing paved areas.

9. Surface Water Management Strategy

Objectives

The broad strategy is to use suitable SuDS elements to attenuate and dispose of surface water via infiltration. The geology and greenfield runoff rate indicate that this is an appropriate strategy.

Drainage Elements

The appropriateness of different SuDS is considered in Table 3.

SuDS Type	Appropriate to site	Comment
Permeable paving (Infiltration)	Yes	Infiltration is feasible into the Chalk
Permeable paving (Attenuation)	No	Infiltration is feasible into the Chalk
Green roof	No	Traditional pitched roofs are proposed
Filter strips	No	Infiltration is feasible into the Chalk
Swales	No	Infiltration is feasible into the Chalk
Infiltration devices	Yes	Infiltration is feasible into the Chalk
Filter drains	Possible	Other infiltration devices are likely to be more appropriate
Infiltration basin	Possible	Other infiltration devices are likely to be more appropriate
Detention pond	No	Infiltration is feasible into the Chalk
Wet pond	No	Infiltration is feasible into the Chalk
On/offline storage	Yes	Appropriate if additional attenuation required

Table 3. SuDS suitability for development.

The following drainage elements are identified as being the most appropriate to the site:

- permeable paving
- soakaways
- on/offline storage

Permeable Paving - Permeable paving allows water to infiltrate through the surface into a coarse graded sub-base which can store runoff. The base of the pavement can be open to allow infiltration. Permeable paving acts as interception storage and runoff typically does not occur from permeable paving for rainfall events up to 5mm even without infiltration, due to evaporation.

Soakaways - Soakaways can be provided for the proposed dwelling. Soakaways allow water to infiltrate into the ground and provide storage to accommodate more extreme rainfall events.

On/offline Storage - Additional storage can be provided using cellular storage crate systems if required.

Surface Water Management Strategy

The surface water management strategy is to discharge all runoff from the proposed dwelling to ground via a soakaway. The existing access is formed from permeable paving. The final design will need to be based on site specific percolation tests.

Soakaways should not normally be constructed closer than 5m to building foundations. In chalk, the advice of a specialist geotechnical engineer should be sought concerning the risk of solution features and the interaction of any soakaways with foundations. This should be carried out as part of the detailed design.

The parameters used for the assessment of the soakaway are shown in Table 4. The assessment is presented in Appendix A.

Parameter	Soakaway Design				
Rainfall return period	2 year	30 year	100 year	100 year + 20%	100 year + 40%
Infiltration rate (m/s)	1×10^{-5}	1×10^{-5}	1×10^{-5}	1×10^{-5}	1×10^{-5}
Factor of safety	2	2	2	2	2
Soakaway type	crate	crate	crate	crate	crate
Soakaway size (m)	3.0 x 3.5	3.0 x 3.5	3.0 x 3.5	3.0 x 3.5	3.0 x 3.5
Soakaway depth (m)	0.8	0.8	0.8	0.8	0.8
Contributing area (m^2)	100	100	100	100	100
Maximum water depth (m)	0.166	0.361	0.558	0.708	1.203
Half drain time (minutes)	231	434	587	682	782
Flood volume (m^3)	0	0	0	0	0

Table 4. Design parameters for the roof soakaways.

The soakaway has been designed to accommodate runoff from the proposed dwelling for all rainfall events up to and including the 1 in 100 year event plus an increase of 20% to allow for climate change. There is no flooding under the 1 in 100 year rainfall event with an allowance of 40% for climate change.

There is ample space within the site for the soakaway as shown in Figure 14.

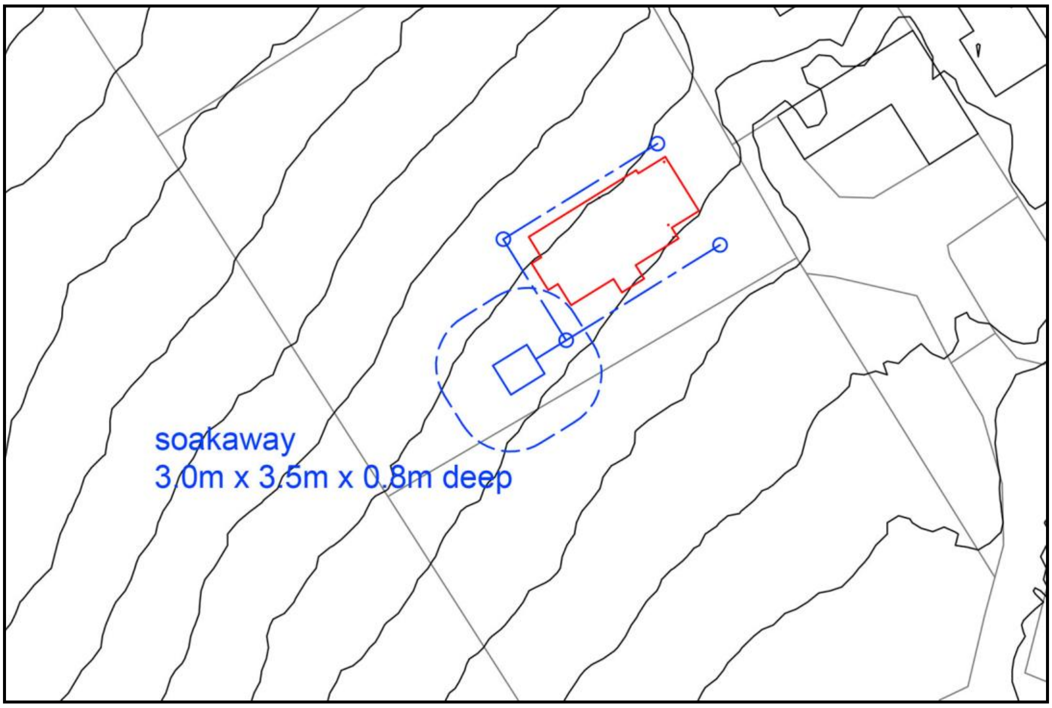


Figure 14. Proposed soakaway location.

Exceedance flows from rainfall events greater than the 1 in 100 year rainfall event with an allowance of 40% for climate change are shown in Figure 15. These flows are to the southeast away from the proposed dwelling.

The final drainage design will need to be based on site specific infiltration rates.

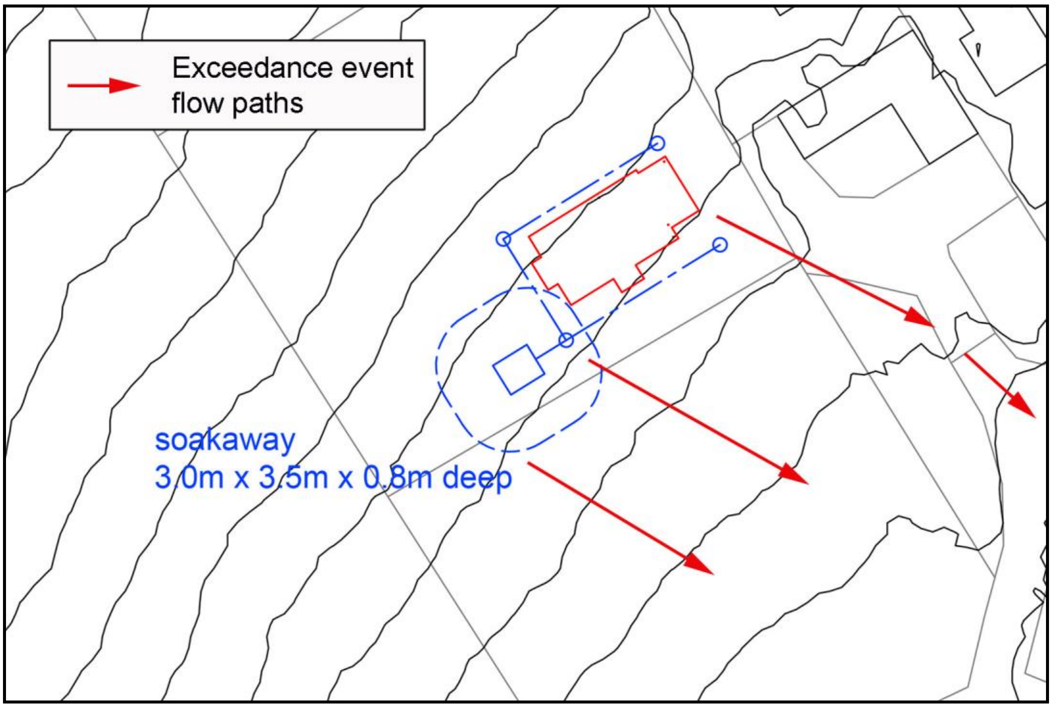


Figure 14. Exceedance event flow paths.

10. Water Quality

The SuDS Manual gives the following as standards of good practice for water quality:

Water quality standard 1: Prevent runoff from the site to receiving surface waters for the majority of small rainfall events.

No runoff should be discharged from the site to receiving surface waters or sewers for the majority of small (eg < 5 mm) rainfall events. This is termed Interception.

Water quality standard 2: Treat runoff to prevent negative impacts on the receiving water quality.

Runoff should be adequately treated to protect the receiving water body from:

1. Short-term acute pollution that may result from accidental spills or temporary high pollution loadings within the catchment area.
2. Long-term chronic pollution from the spectrum of runoff pollutant sources within the urban environment.

Water Quality Standard 1 - Interception

Disposal of surface water via a soakaway will prevent water discharging from the site for rainfall events of less than 5mm. The proposed strategy therefore meets the interception standard.

Water Quality Standard 2 - Treatment

The extent of treatment required depends on the land use, the level of pollution prevention in the catchment and for groundwater the natural protection afforded by underlying soil layers. High hazard sites will have a higher potential pollution load and higher potential maximum pollution concentrations. They therefore tend to require more treatment than low hazard sites in order to deliver discharges of an acceptable quality.

The SuDS Manual sets out minimum water quality management requirements for discharges to receiving surface waters and groundwater for various land use types, Table 5. The site consists of one land use type:

1. Roofs to houses classed as *residential roofs*, very low pollution hazard.

Land use	Pollution hazard level	Requirements for discharge to:	
		surface waters	groundwater
Residential roofs	Very low	Removal of gross solids and sediments only	
Individual property driveways, roofs (excluding residential), residential car parks, low traffic roads (eg cul de sacs, home zones, general access roads), non-residential car parking with infrequent change (eg schools, offices)	Low	Simple index approach Note: extra measures may be required for discharges to protected resources	
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	Simple index approach Note: extra measures may be required for discharges to protected resources	In England and Wales, Risk Screening must be undertaken first to determine whether consultation with the environmental regulator is required.
Trunk roads and motorways	High	Follow the guidance and risk assessment process set out in HA (2009)	
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels are to be delivered, handled, stored, used or manufactured, industrial sites	High	Discharges may require an environmental licence or permit. Obtain pre-permitting advice from the environmental regulator. Risk assessment is likely to be required.	
Note 1. Filter drains can remove coarse sediments, but their use for this purpose will have significant implications with respect to maintenance requirements, and this should be taken into account in the design and Maintenance Plan. Note 2. Ponds and wetlands can remove coarse sediments, but their use for this purpose will have significant implications with respect to the maintenance requirements and amenity value of the system. Sediment should normally be removed upstream, unless they are specifically designed to retain sediment in a separate part of the component, where it cannot easily migrate to the main body of water. Note 3. Where a wetland is not specifically designed to provide significantly enhanced treatment, it should be considered as having the same mitigation indices as a pond.			

Table 5. Pollution hazard levels for different land uses.

A simple index approach is appropriate which involves the following steps:

1. Allocate suitable pollution hazard indices for the proposed land use, Table 6.
2. Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index, Table 7.
3. Where the discharge is to protected surface waters or groundwater, consider the need for a more precautionary approach.

Land Use	Pollution hazard level	Total suspended solids	Metals	Hydro-carbons
Residential Roofs	Very low	0.2	0.2	0.05
Other roofs (commercial/industrial)	Low	0.3	0.2[1]	0.05
Individual property driveways, residential car parks, low traffic roads and non-residential car parking with infrequent change (eg schools, offices) <300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites, sites where chemicals and fuels are to be delivered, handled, stored, used or manufactured, industrial sites, trunk roads and motorways[2]	High	0.8[3]	0.8[3]	0.9[3]
Note 1. Up to 0.8 where there is potential for metals to leach from the roof. Note 2. Motorways and trunk roads should follow the guidance and risk assessment process set out in Highways Agency (2009) Note 3. These should only be used if considered appropriate as part of a detailed risk assessment.				

Table 6. Pollution hazard indices for different land use classifications.

To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index, for each contaminant type, that equals or exceeds the pollution hazard index, for each contaminant type. Where the mitigation index of an individual component is insufficient, two components, or more, in series will be required. A factor of 0.5 is used to account for the reduced performance of secondary or tertiary components.

Characteristics of the material overlying the proposed infiltration surface through which the runoff percolates	Total suspended solids	Metals	Hydro-carbons
A layer of dense vegetation underlain by a soil with good contaminant attenuation potential of at least 300mm in depth	0.6	0.5	0.6
A soil with good contaminant attenuation potential of at least 300mm in depth	0.4	0.3	0.3
Infiltration trench (where a suitable depth of filtration material is included that provides treatment, ie graded gravel with sufficient smaller particles but not single size coarse aggregate such as 20mm gravel) underlain by a soil with good contaminant attenuation potential of at least 300mm in depth	0.4	0.4	0.4
Constructed permeable pavement (where a suitable filtration layer is included that provides treatment, and including a geotextile at the base separating the foundation from the subgrade) underlain by a soil with good contaminant attenuation potential of at least 300mm in depth	0.7	0.6	0.7
Bioretention underlain by a soil with good contaminant attenuation potential of at least 300mm in depth	0.8	0.8	0.8
Proprietary treatment system	These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area.		
Note 1. All designs must include a minimum of 1m unsaturated depth of aquifer material between the infiltration surface and the maximum likely groundwater level.			

Table 7. Indicative SuDS mitigation indices for discharge to groundwater.

For residential roofs infiltration within a soakaway has a total pollution mitigation index that is greater than the pollution hazard index for all pollutants, Table 8. All runoff from the site will therefore receive an appropriate level of water quality treatment.

Indices	Total suspended solids	Metals	Hydro-carbons
Residential roofs			
Maximum hazard index	0.2	0.2	0.05
Minimum SuDS mitigation index (300mm soil)	0.4	0.3	0.3
Appropriate treatment	✓	✓	✓

Table 8. Pollution hazard indices and SuDS mitigation indices for the development.

The site lies across groundwater source protection zones 2 and 3. The development only involves the discharge of clean roof runoff. The publication *The Environment Agency's approach to groundwater protection February 2018 Version 1.2* contains position statements which provide information about the Environment Agency's approach to managing and protecting groundwater. Position Statement G12 states:

G12 - Discharge of clean roof water to ground

The discharge of clean roof water to ground is acceptable both within and outside SPZ1, provided that all roof water down-pipes are sealed against pollutants entering the system from surface run-off, effluent disposal or other forms of discharge. The method of discharge must not create new pathways for pollutants to groundwater or mobilise contaminants already in the ground. No permit is required, if the above criteria can be met.

The discharge of clean runoff from roofs in groundwater source protection zones 2 and 3 is therefore acceptable. Groundwater levels are approximately 49m below the invert level of the proposed soakaway providing further water quality treatment. The risk of pollution to groundwater is therefore very low.

11. Conclusion

This Foul and Surface Water Management Strategy accompanies a planning application submitted to Dover District Council. The planning application is for development at Bluebell Meadow, East Langdon Road, Martin, CT15 5JJ.

The site currently forms a paddock.

The proposed development is for a single dwelling. The development will use the existing access onto East Langdon Road.

The site lies within flood zone 1 and therefore residential development is appropriate. The site is at very low risk from surface water flooding.

Foul Water Drainage

A public foul sewer runs southwest to northeast along East Langdon Road.

The paddock to the south of the proposed dwelling is within the applicant's ownership. The foul sewer is shown crossing the corner of this paddock providing a connection point within the applicant's ownership. For a single dwelling the connection can be made via a junction.

The sewer record does not have an invert level for manhole 8502. Assuming a maximum invert level of 65.29mAOD, the invert level at the upstream manhole 8501, the maximum invert level at the proposed connection point is 65.6mAOD. This is sufficiently deep to allow the proposed dwelling to connect to the foul sewer by gravity. A draft foul drainage design shows that the development can connect to the public foul sewerage network.

Surface Water Drainage

The development creates 100m^2 of impermeable roof area. The existing access remains unaltered.

The surface water management strategy is to discharge all runoff from the proposed dwelling to ground via a soakaway.

Soakaways should not normally be constructed closer than 5m to building foundations. In chalk, the advice of a specialist geotechnical engineer should be sought concerning the risk of solution features and the interaction of any soakaways with foundations. This should be carried out as part of the detailed design.

The soakaway has been designed to accommodate runoff from the proposed dwelling for all rainfall events up to and including the 1 in 100 year event plus an increase of 20% to allow for climate change. There is no flooding under the 1 in 100 year rainfall event with an allowance of 40% for climate change.

The final drainage design will need to be based on site specific infiltration rates.

Disposal of surface water via a soakaway will prevent water discharging from the site for rainfall events of less than 5mm. The proposed strategy therefore meets the water quality interception standard.

For residential roofs infiltration within a soakaway has a total pollution mitigation index that is greater than the pollution hazard index for all pollutants. All runoff from the site will therefore receive an appropriate level of water quality treatment as recommended within the SuDS Manual.

The site lies across groundwater source protection zones 2 and 3. The development only involves the discharge of clean roof runoff. The discharge of clean runoff from roofs in groundwater source protection zones 2 and 3 is acceptable under the Environment Agency's groundwater Position Statement G12. Groundwater levels are approximately 49m below the invert level of the proposed soakaway providing further water quality treatment. The risk of pollution to groundwater is therefore very low.

The proposed development is considered acceptable from a foul and surface water drainage perspective.

Appendix A - Draft Soakaway Design

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 682 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	67.319	0.219	0.1	2.2	O K
30 min Summer	67.386	0.286	0.1	2.9	O K
60 min Summer	67.451	0.351	0.1	3.5	O K
120 min Summer	67.512	0.412	0.1	4.1	O K
180 min Summer	67.549	0.449	0.1	4.5	O K
240 min Summer	67.576	0.476	0.1	4.7	O K
360 min Summer	67.616	0.516	0.1	5.2	O K
480 min Summer	67.644	0.544	0.1	5.4	O K
600 min Summer	67.665	0.565	0.1	5.6	O K
720 min Summer	67.682	0.582	0.1	5.8	O K
960 min Summer	67.704	0.604	0.1	6.0	O K
1440 min Summer	67.719	0.619	0.1	6.2	O K
2160 min Summer	67.702	0.602	0.1	6.0	O K
2880 min Summer	67.669	0.569	0.1	5.7	O K
4320 min Summer	67.595	0.495	0.1	4.9	O K
5760 min Summer	67.525	0.425	0.1	4.2	O K
7200 min Summer	67.463	0.363	0.1	3.6	O K
8640 min Summer	67.409	0.309	0.1	3.1	O K
10080 min Summer	67.363	0.263	0.1	2.6	O K
15 min Winter	67.346	0.246	0.1	2.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	119.600	0.0	22
30 min Summer	79.000	0.0	37
60 min Summer	49.555	0.0	66
120 min Summer	30.238	0.0	124
180 min Summer	22.815	0.0	184
240 min Summer	18.796	0.0	242
360 min Summer	14.506	0.0	360
480 min Summer	12.158	0.0	458
600 min Summer	10.620	0.0	516
720 min Summer	9.514	0.0	580
960 min Summer	7.984	0.0	714
1440 min Summer	6.163	0.0	988
2160 min Summer	4.650	0.0	1408
2880 min Summer	3.762	0.0	1820
4320 min Summer	2.749	0.0	2636
5760 min Summer	2.188	0.0	3408
7200 min Summer	1.828	0.0	4176
8640 min Summer	1.578	0.0	4928
10080 min Summer	1.394	0.0	5648
15 min Winter	119.600	0.0	22

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	67.421	0.321	0.1	3.2	O K
60 min Winter	67.496	0.396	0.1	3.9	O K
120 min Winter	67.565	0.465	0.1	4.6	O K
180 min Winter	67.609	0.509	0.1	5.1	O K
240 min Winter	67.642	0.542	0.1	5.4	O K
360 min Winter	67.692	0.592	0.1	5.9	O K
480 min Winter	67.728	0.628	0.1	6.3	O K
600 min Winter	67.752	0.652	0.1	6.5	O K
720 min Winter	67.769	0.669	0.1	6.7	O K
960 min Winter	67.795	0.695	0.1	6.9	O K
1440 min Winter	67.808	0.708	0.1	7.1	O K
2160 min Winter	67.775	0.675	0.1	6.7	O K
2880 min Winter	67.723	0.623	0.1	6.2	O K
4320 min Winter	67.612	0.512	0.1	5.1	O K
5760 min Winter	67.513	0.413	0.1	4.1	O K
7200 min Winter	67.429	0.329	0.1	3.3	O K
8640 min Winter	67.357	0.257	0.1	2.6	O K
10080 min Winter	67.297	0.197	0.1	2.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	79.000	0.0	36
60 min Winter	49.555	0.0	66
120 min Winter	30.238	0.0	122
180 min Winter	22.815	0.0	180
240 min Winter	18.796	0.0	238
360 min Winter	14.506	0.0	352
480 min Winter	12.158	0.0	462
600 min Winter	10.620	0.0	566
720 min Winter	9.514	0.0	660
960 min Winter	7.984	0.0	752
1440 min Winter	6.163	0.0	1068
2160 min Winter	4.650	0.0	1520
2880 min Winter	3.762	0.0	1964
4320 min Winter	2.749	0.0	2812
5760 min Winter	2.188	0.0	3632
7200 min Winter	1.828	0.0	4392
8640 min Winter	1.578	0.0	5112
10080 min Winter	1.394	0.0	5856

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 633830 146605 TR 33830 46605
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.010

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.005	4	8	0.005

Model Details

Storage is Online Cover Level (m) 68.500

Cellular Storage Structure

Invert Level (m) 67.100 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.03600 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.03600

Depth (m)	**Area (m²)**	**Inf. Area (m²)**	**Depth (m)**	**Area (m²)**	**Inf. Area (m²)**
0.000	10.5	10.5	0.900	0.0	20.9
0.800	10.5	20.9			