herrington CONSULTING LIMITED




Client: Tim Odlin

Sustainable Drainage Assessment for the Proposed Development at Capel Street, Capel-Le-Ferne,
Kent

June 2019

Canterbury Office
Unit 6 & 7
Barham Business Park
Elham Valley Road
Barham
Canterbury
Kent
CT4 6DQ

Tel 01227 833855

London Office
6-8 Bonhill Street
London
EC2A 4BX

www.herringtonconsulting.co.uk

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1 Scope of Appraisal

Herrington Consulting has been commissioned by **Tim Odlin** to prepare a drainage strategy for the the proposed development at: **Caple Street, Capel-Le-Ferne, Kent, CT18 7EY.**

The objective of this Sustainable Drainage Assessment is to outline the proposals for the disposal of surface water runoff and foul sewerage from site.

This report has been prepared to supplement an outline planning application and has been prepared in accordance with the requirements of both national and local planning policy. To ensure that due account is taken of industry best practice, reference has also been made to, CIRIA Report C753 'The SuDS Manual' and any relevant local planning policy guidance. Both the foul water and surface water management strategies included within this report are not intended to constitute a detailed drainage design.

2 Background Information

2.1 Site Location and Existing Use

The site is located at OS coordinates 624938, 139242 off Capel Street, in Capel-Le-Ferne, Kent and covers an area of approximately 1.6 hectares. The location of the site in relation to the surrounding area is shown in Figure 2.1 (below).

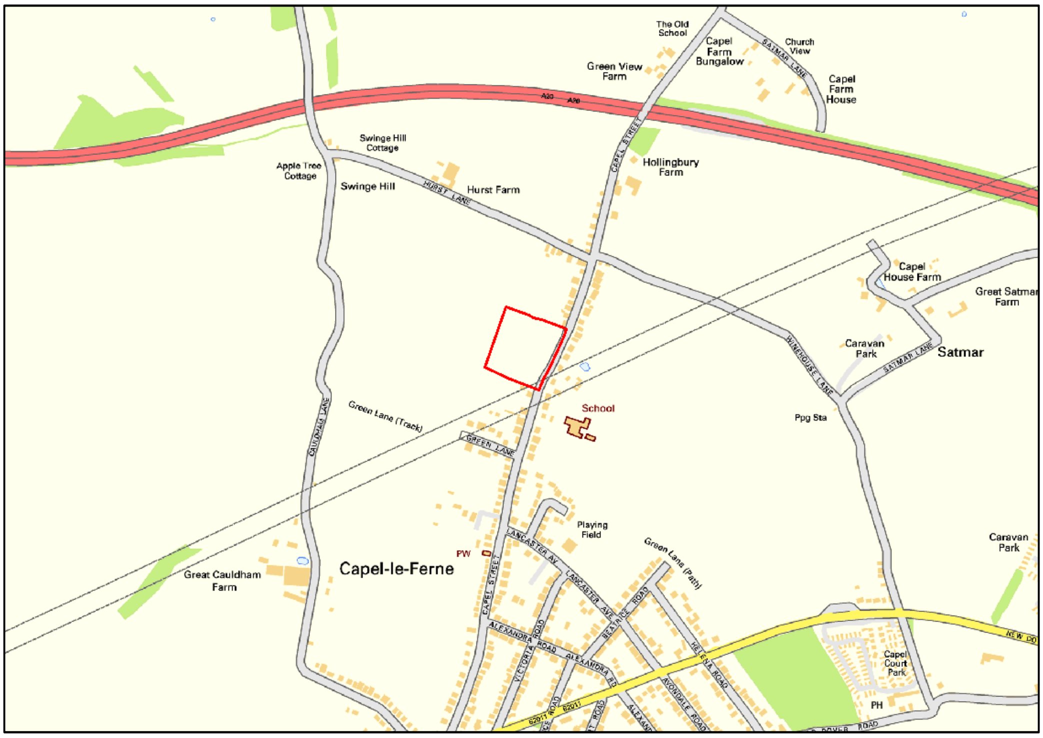

Figure 2.1 – Location map (Contains Ordnance Survey data © Crown copyright and database right 2019).

The site currently comprises open fields, with an informal access track.

2.2 Site Geology and Topography

Reference to the British Geological Survey (BGS) data identifies that the geology at the site comprises Chalk, Overlain by clay silt sand and gravel superficial deposits. This is largely supported by site investigations, which have been undertaken by others, and are discussed in more detail within this report.

Reference to a site specific topographic survey indicates that land levels at the site vary between approximately 150m AODN and 154m AODN, with a gradual fall towards the east.

2.3 Proposed Development

The development proposals comprise the erection of 34 dwellings (8x2 bed, 16x3 bed and 10x4 bed) at a maximum height of two storeys, with associated landscaping, access and parking. Figure 2.2 (below), shows the proposed development and further drawings of the proposed scheme are included in Appendix A.1 of this report.

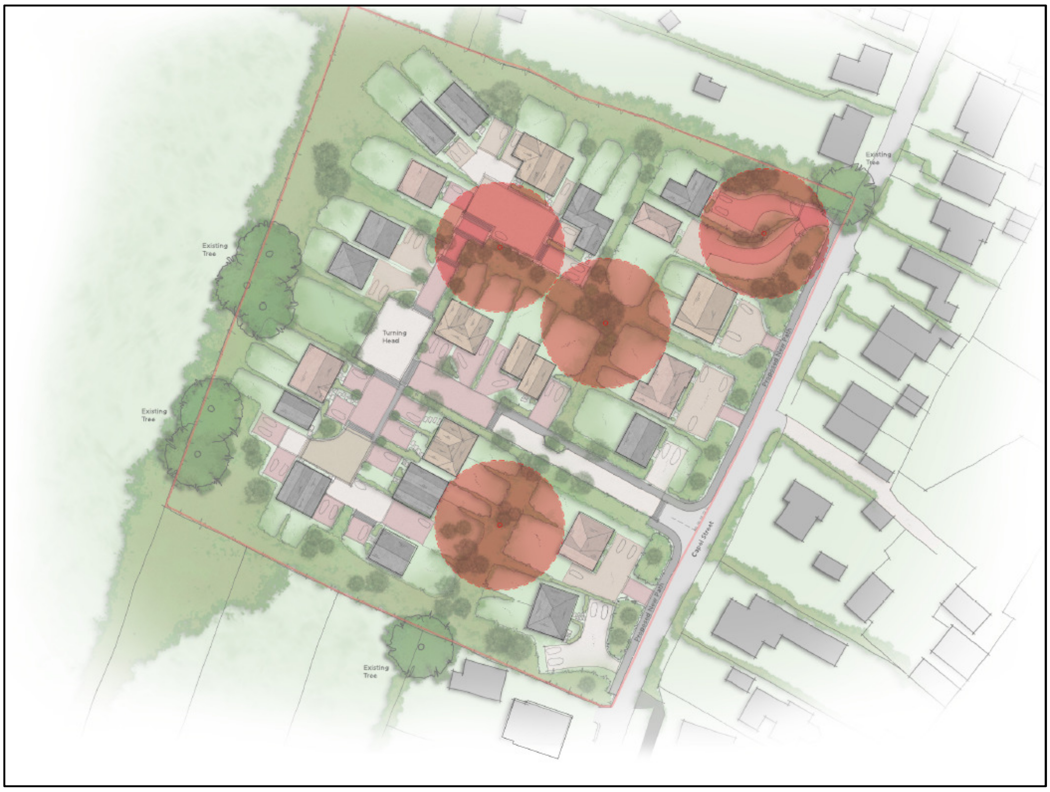

Figure 2.2 – Proposed Development Plan.

The important characteristics of the site that have the potential to influence the drainage strategy are summarised in Table 2.1 below.

Site characteristic	**Value**	
Total area of site	~1.6 ha	
Number of proposed units	34	
Current site condition	Undeveloped (Greenfield)	
Infiltration	Variable although good at depth, based on the results of onsite investigations undertaken by others.	
Current method of surface water discharge	Assumed to drain informally, with surface water running off the existing site onto the existing highway.	
Is there a watercourse within close proximity to site?	No	
Impermeable area	**Existing Site** **~ 0 m²**	**Proposed Site** Roof area = 1960 m² Hardstanding = 3470 m² **Total = 5430 m²**

Table 2.1 – Site characteristics affecting rainfall runoff.

Based on the table above, it is evident that the development proposals will increase the total impermeable area across the site. As a result, the rate at which the surface water runoff is discharged from the site is likely to increase. Consequently, measures will need to be put in place to ensure that the impact of this additional surface water runoff is appropriately managed.

2.4 Planning Policy and Context

The general requirement for all new development is to ensure that the runoff from the development is managed sustainably and that the drainage solution does not increase the risk of flooding at the site, or within the surrounding area.

For undeveloped greenfield sites, the impact of the proposed development will therefore require mitigation to ensure that the runoff from the site replicates the natural drainage characteristics of the pre-developed site.

Changes relating to The Flood and Water Management Act 2010 National Standards (Schedule 3 – paragraph 5) for design, construction, maintenance and operation of Sustainable Drainage Systems (SuDS), came into effect from 6 April 2015. These changes provide additional detail and requirements not initially covered by the NPPF and are Non-statutory Technical Standards for SuDS (NTSS).

The NTSS specify criteria to ensure sustainable drainage is included within developments of 10 dwellings or more; or equivalent non-residential, or mixed development (as set out in Article 2(1) of the Town and Country Planning (Development Management Procedure) (England) Order 2010). It is, however, recognised that SuDS should be designed to ensure that the maintenance and operation requirements are economically proportionate.

In this instance, the proposed development is for the construction of 34 residential units on land totalling an area greater than 1ha. As a result, the proposals are classified as 'major' development and therefore, the NTSS will apply. Reference to the NTSS has therefore been made throughout the following sections of this report to ensure the principles of sustainable drainage are considered.

In addition to the NTSS, Kent County Council's (KCC) Drainage and Planning Policy Statement (June 2017) also applies. Most notably this document states that in the absence of FEH rainfall data, a rainfall depth of 26.25mm for M5-60 event should be applied.

2.5 Climate Change

The global climate is constantly changing, but it is widely recognised that we are now entering a period of accelerating change. Over the last few decades there have been numerous studies into the impact of potential futures changes in the climate and there is now an increasing body of scientific evidence which supports the fact that the global climate is changing as a result of human activity. Past, present, and future emissions of greenhouse gases are expected to cause significant global climate change during this century.

The nature of climate change at a regional level will vary: for the UK, projections of future climate change indicate that more frequent short-duration, high-intensity rainfall, and more frequent periods of long-duration rainfall (of the type responsible for the recent UK flooding) could be expected.

These effects will tend to increase the size of flood zones associated with rivers, and the amount of flooding experienced from other inland sources. Consequently, the following section of this report takes into consideration the impacts of climate change and references the most contemporary guidance which is applicable to the development site.

To ensure that any recommended mitigation measures are sustainable and effective throughout the lifetime of the development, it is necessary to base the appraisal on climate change predictions which are commensurate with the planning horizon for the proposed development. The NPPF and supporting Planning Practice Guidance Suite state that residential development should be considered for a minimum of 100 years, but that the lifetime of a non-residential development depends on the characteristics of the development. The development that is the subject of this SWMS is classified as residential, and therefore a design life of 100 years has been assumed.

Potential Changes in Climate

The recommended allowances for increases in peak rainfall intensity were updated by the Environment Agency in February 2016 and are applicable nationally. These allowances, shown in Table 2.2 below, provides a range of values which correspond with the Central and Upper End percentiles (i.e. the 50th and 90th percentile respectively) over three-time epochs.

Allowance Category (applicable nationwide)	Total potential change anticipated for each epoch		
	2015 to 2039	2040 to 2069	2070 to 2115
Upper End	+10%	+20%	+40%
Central	+5%	+10%	+20%

Table 2.2 – Recommended peak rainfall intensity allowance for small and urban catchments (1961 to 1990 baseline).

Impacts of Climate Change on the Development Site

Potential increases in future rainfall need to be considered when designing surface water drainage systems. For this development, a design life of 100 years is assumed and therefore, an increase of 20% in peak rainfall intensity has been applied to the calculations used for the design rainfall event. Where this allowance has been applied the abbreviation *"+20%cc"* has been used.

To test the sensitivity of the proposed surface water drainage strategy to changes in peak rainfall intensity the Environment Agency recommend testing the drainage system under a higher climate change allowance of 40%. This has been considered further within the following sections of this report.

3 Existing Drainage

3.1 Existing Surface Water Drainage

The existing site comprises fields and has no known existing drainage infrastructure. Rain landing on the existing fields is likely to run across the site to the east, draining into the existing public highway. There is a small topographic depression within the highway, and it is likely that water will currently pond in this location. The greenfield runoff rates for the site have been estimated using the FEH Statistical methodology and are shown in Table 3.1 (below).

Return period (years)	Peak runoff from the existing site (l/s/ha)
Q1	2.2
Qbar	2.6
Q30	5.9
Q100	8.2

Table 3.1 - Summary of Greenfield Runoff Rates.

3.2 Existing Foul Water Drainage

The undeveloped site is not served by existing sewers; however, Southern Water has provided sewer mapping for the surrounding area which shows an existing foul sewer located beneath the adjacent public highway (Capel Street). An extract of this mapping is provided in Figure 3.1 below and shows the location of public sewers near to the site.

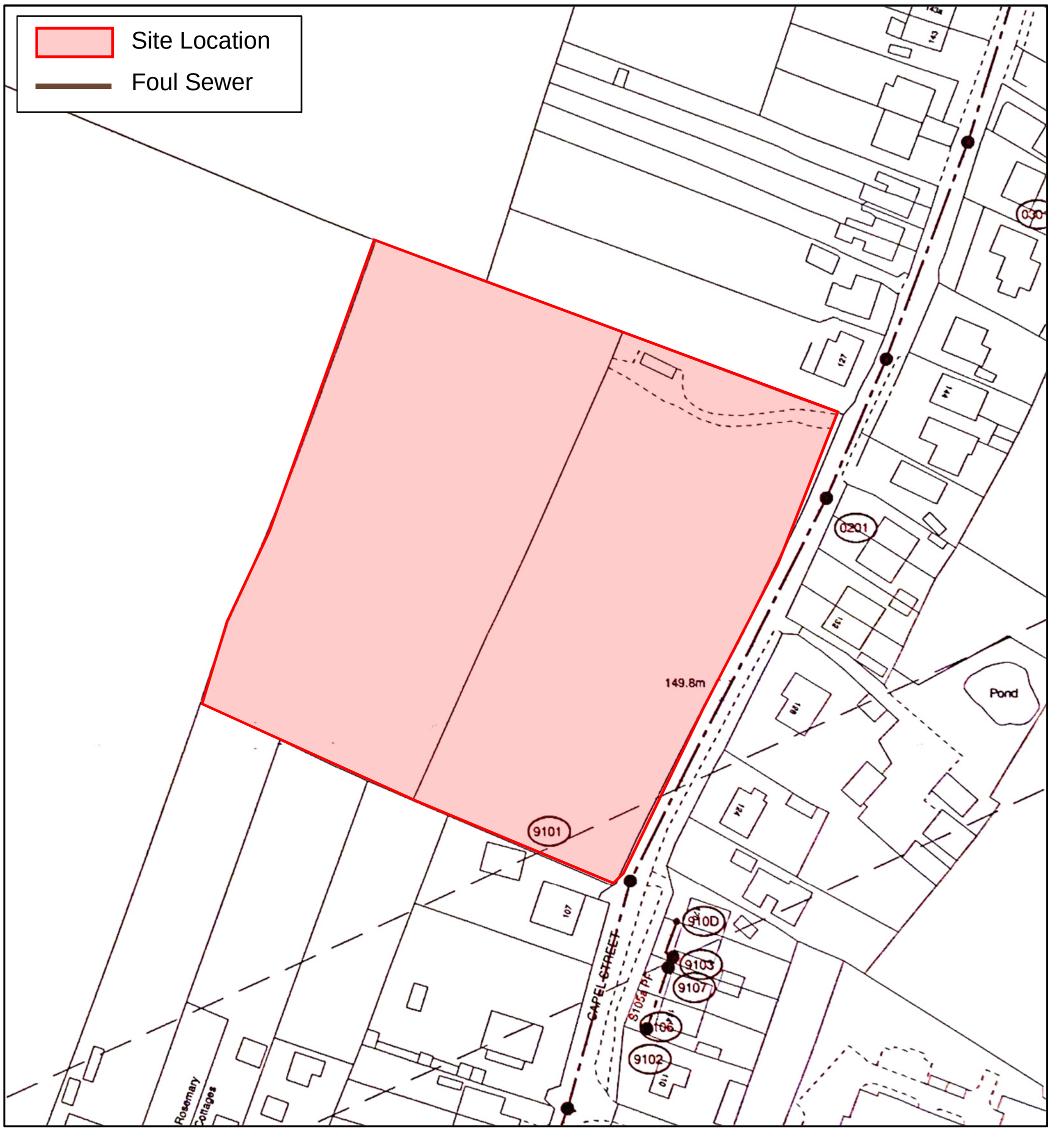

Figure 3.1 – Extract from Sewer Mapping for Capel Street.

From Figure 3.1 (above) it is evident that the sewer nearest to the site is designated as a foul sewer, which appears to drain the properties along Capel Street.

4 Sustainable Drainage Assessment

4.1 Opportunities to Discharge Surface Water Runoff

Part H of the Building Regulations summarises a hierarchy of options for discharging surface water runoff from developments. The most preferential option is to **infiltrate** water into the ground, as this deals with the water at source and serves to replenish groundwater. If this option is not viable, the next option of preference is for the runoff to be discharged into a **watercourse**. Only if neither of these options are possible, the water should be conducted into the **public sewer** system.

The following opportunities for managing the surface water runoff discharged from the development site are listed in order of preference:

Infiltration – Ground investigations have been undertaken at the site to determine the infiltration potential of the soils and geology at this location. The results from shallow infiltration tests carried out into the upper 1m of material indicate impermeable soils. Low infiltration rates of around 0.01m/hr were also observed in deeper investigations, and on this basis it was concluded that infiltration rates into the soils and sandy clay are insufficient to support the use of infiltration SuDS. These superficial deposits are shown to range from 2m to 9m thick.

Borehole soakage testing has also been carried out at the site to a depth of 18m. This borehole intercepted the un-weathered chalk bedrock, which yielded significantly higher infiltration rates than the superficial strata. Unfortunately, following completion of the borehole soakage test the rig operator confirmed that a collapse had occurred within the borehole. Inspection of the borehole log data shows a sudden reduction in discharge rate occurring approximately 150 seconds into the testing. It is assumed this reduction in rate was the direct result of the boreholes partial collapse and therefore, results after this time are not considered to provide a reliable indication of infiltration rates at this location.

Based on the assumption that the collapse impacted the discharge rates after 150s, calculations have been undertaken to estimate the infiltration rate from the first 150s of data. These calculations suggest an infiltration rate of ~0.75m/hr into the un-weathered bedrock chalk.

Based on the information available it is therefore concluded that infiltrating runoff into the ground via deep borehole soakaways will be the most sustainable solution for managing surface water runoff at this site. It is, however, strongly recommended that additional borehole infiltration tests are carried out at the full planning or detailed design stage, to confirm infiltration rates across the site.

Discharge to Watercourses – There are no watercourses located within close proximity to the site which show an onward connectivity to a main river, the sea, or any other large surface water body. As a result, there is no opportunity to discharge surface water runoff from the development to an existing watercourse.

Discharge to Public Sewer System – As there is a public foul sewer close to the site and as such, there is an opportunity to drain surface water runoff from the development into this sewer. Nonetheless, as an alternative solution (infiltration) is likely to be available, a surface water connection to the public sewer system is unlikely to be required. Consequently, this option has been discounted.

4.2 Constraints and Further Considerations

There are several potential constraints that should be considered as part of the drainage strategy. The key constraints that are relevant to this development are listed below:

- Due to the sloping topography across the site, it may be necessary to incorporate check dams within the sub-base of any permeable paving, or swales.
- Infiltration SuDS should not be constructed through contaminated material. It is therefore recommended that a contamination study is carried out at the detailed design stage.
- A minimum 15m easement will be required between buildings and any borehole soakaways. Geotechnical investigations should be carried out to confirm the stability of the bedrock in this location, and the easement adjusted based on the observed ground conditions.
- A minimum of a 1.0 metre unsaturated zone shall be maintained between the base of any infiltration SuDS and the maximum seasonal water table. For borehole soakaways this can be extended to several metres and would need to be agreed with the Environment Agency.
- The channel tunnel passes under the southern part of the site and as a result, the use of borehole soakaways near to the tunnel may need to be agreed with the owners / operators. Notwithstanding this, it is recognised that the tunnel is at a significant depth beneath the site.
- The use of borehole soakaways is always subject to written agreement from the EA.

4.3 Proposed Surface Water Management Strategy

The drainage strategy set out below discusses each of the different elements of the proposed scheme, along with calculations that have been undertaken to demonstrate how the overall objectives can be achieved. This does not represent a detailed surface water drainage design; it is simply an assessment to demonstrate that the objectives and requirements of the NPPF can be met at the planning stage.

Water Butts

To reduce the developments reliance on potable water supplies for external use there is the potential to incorporate water butts within the communal garden area. Typical sizes and dimensions of water butts are outlined below.

Typical house water butt options	Dimensions of a typical house water butt	Volume of storage provided (litres)
Type 1 (wall mounted – Small)	1.22m high x 0.46m x 0.23m	100
Type 2 (Standard house water butt)	0.9m high x 0.68m diameter	210
Type 3 (Large house water butt)	1.26m high x 1.24m x 0.8m	510
Type 4 (Column tank – Very large)	2.23m high x 1.28m diameter	2000

Table 4.1 – Estimated storage capacity of available water butts.

In this case the demand for potable water from each of the gardens is likely to be moderate and as a result, typical 200 - 210 litre units are likely to be the most appropriate size for inclusion within the scheme.

It is recognised that each of the water butts will need to overflow into the main drainage system for the site, to ensure that in the event the water butt is full prior to the onset of the design rainfall event, water can be discharged away from the properties without increasing the risk of flooding.

Permeable Surfacing

The private highways and parking areas across the site can be made permeable. These permeable surfaces will intercept runoff and will allow water to be discharged as close to source as possible, through infiltration and evaporation. This in turn will help to; reduce the volume and improve the quality of water draining to other SuDS. The permeable surfacing will need to be laid on top of a layer of porous open graded material, designed to store water and allow it to slowly infiltrate into the ground wherever possible. As shallow infiltration rates in this area are poor, it is considered unlikely that runoff from high return period rainfall events can be managed by the permeable surfacing systems alone. Consequently, these systems will need to overflow into other SuDS, which can be used to ensure that the runoff from the remainder of the site can be managed under the design rainfall event.

Borehole Soakaways

Runoff from the roof of the properties, adoptable highway, and any water overflowing the water butts or permeable surfacing, can be directed via pipes to borehole soakaways located throughout the site. Based on an infiltration rate of 0.75m/hr it has been estimated that 4 borehole soakaways will be required. Each soakaway will need to be connected to a storage tank designed to store runoff before it is discharged to the ground. Calculations to size the borehole soakaways and the required storage tanks have been undertaken and are summarised in Tables 4.2 and 4.3 (below).

Based on the current masterplan layout, soakaways B and C are assumed to share a single large storage tank.

Parameter	**Value (1:100yr+20%cc event)**
SuDS	Borehole soakaway
Number of borehole soakaways	4
Infiltration	0.75m/hr

Table 4.2 – Summary of proposed borehole soakaways.

Return Period	**Area draining to soakaway(s), including 10% allowance for urban creep**	**Required volume of storage in tank**	**Maximum filtration**
Soakaway A	1100 m^2	100 m^3	1.0 l/s
Soakaway B & Soakaway C	2820 m^2	2540 m^3	2.0 l/s (1.0l/s per borehole).
Soakaway D	1220 m^2	100 m^3	1.0 l/s

Table 4.3 – Summary of storage tanks and filtration rates.

From the calculations above it is evident that a solution for draining surface water runoff from the proposed development via borehole soakaways is likely to be available.

4.4 Indicative Drainage Layout Plan

Figure 4.1 below is an indicative drainage layout plan delineating how the proposed SuDS can be incorporated into the scheme proposals.

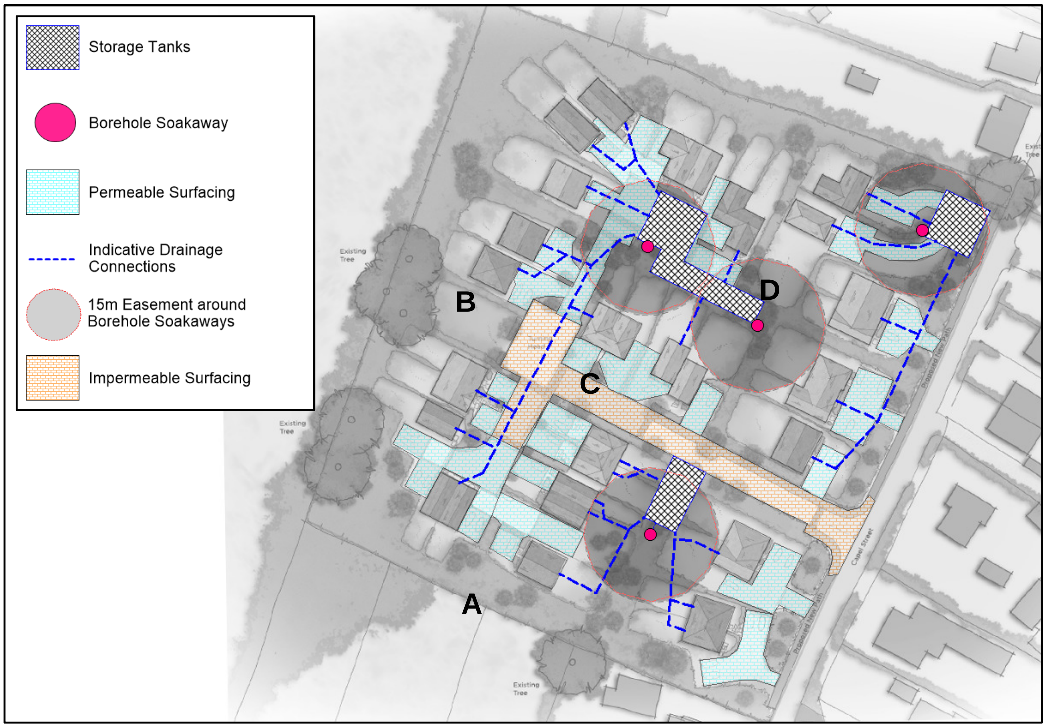

Figure 4.1 - Indicative drainage layout plan showing the proposed location of SuDS.

A full copy of this layout is included within Appendix A.3 of this report.

4.5 Management and Maintenance

For any surface water drainage system to operate as originally designed, it is necessary to ensure that it is adequately maintained throughout its lifetime. Therefore, over the lifetime of a development there is a possibility that the performance of the system could be reduced or could fail if it is not correctly maintained. This is even more important when SuDS form a part of the surface water management system, as these require a more onerous maintenance regime than a typical piped network.

The key requirements of any management regime are routine inspection and maintenance, when the development is taken forward to the detailed design stage an 'owner's manual' will need to be prepared. This should include:

- A description of the drainage scheme,
- A location plan showing all of the SuDS features and equipment such as flow control devices etc.
- Maintenance requirements for each element, including any manufacturer specific requirements
- An explanation of the consequences of not carrying out the specified maintenance

- Details of who will be responsible for the ongoing maintenance of the drainage system.

For the SuDS recommended by this assessment, the most obvious maintenance tasks will be the regular brushing and cleaning of the permeable surfacing and the inspection and desilting of the storage tanks and borehole soakaways.

For developments such as this that rely to some extent on the ongoing inspection and maintenance of SuDS, it will be necessary to ensure that measures are in place to maintain the system for the lifetime of the development. For the SuDS located within the private garden areas (i.e. driveways and water butts), it is likely that maintenance will be the responsibility of the individual property owners / occupants. For the communal storage tanks and borehole soakaways it is recommended that the management company responsible for maintaining the rest of the development site are tasked with the inspection and maintenance of these features.

Further details of the maintenance and management strategy should be confirmed following the completion of a detailed drainage design for the development.

4.6 Sensitivity Testing and Residual Risk

When considering residual risk it is necessary to consider the impact of a flood event that exceeds the design event, or the implications if the proposed drainage system becomes blocked.

The proposed drainage system has been designed for an extreme rainfall event with a return period of 1 in 100 years, including a 20% increase in peak rainfall intensity (to account for the impacts of climate change). Nonetheless, based on the EA's most contemporary climate change guidance an Upper End climate change allowance of 40% has been used to test the proposed drainage system to reflect further increases in peak rainfall intensity.

Calculations have therefore been undertaken to assess the performance of the borehole soakaways during an exceedance rainfall event including a 40% increase in peak rainfall intensity, due to climate change. The results of this analysis are summarised in Table 4.4 (below).

Parameter	Freeboard within storage tank	Volume of water overflowing drainage system
Borehole Soakaway A	N/A (surcharged)	~ 4 m^3
Borehole Soakaways B & C	N/A (surcharged)	~ 58 m^3
Borehole Soakaway D	N/A (surcharged)	~ 20 m^3

Table 4.4 – Summary of Micro Drainage analysis for the proposed SuDS (100 yr+40%cc).

From Table 4.4 it is evident that the borehole soakaways and storage tanks are potentially sensitive to changes in peak rainfall intensity due to climate change.

Inspection of the topography across the site suggests that if the soakaways were to become overwhelmed following an extreme rainfall event, water would back up within the storage tanks and would subsequently exit the drainage system, flowing overland. In this case, it is considered likely that most of the water overflowing the storage tanks would be intercepted by the permeable surfacing located across the access roads and private parking areas.

The small volume of runoff which would not be intercepted by the permeable surfacing would drain towards the east of the site, before ponding within and small topographic depression located to the east of the site before running towards the public highway and being intercepted by the existing highway drainage system.

Providing the permeable surfacing is included within the detailed design for the drainage system, it is considered likely that there will be minimal risk to the proposed properties and the area surrounding the site. It is therefore concluded that with the inclusion of the proposed SuDS discussed within this strategy, the risk of flooding will not be increased by the new development.

5 Foul Water Management Strategy

5.1 Background

The objective of this foul water drainage strategy is to ensure a viable solution for managing foul waste from the proposed development at Capel Street, Capel-Le-Ferne, is available.

In general, there are two methods for draining effluent from proposed developments. The preferred solution is a connection to the public sewer network, which is controlled by the sewerage undertaker. Nonetheless, if there are no sewers near to the development site, as is commonly the case in rural locations, then the use of package treatment systems or cesspits is permitted.

The Environment Agency's "Binding Rules" control the use of package treatment systems by requiring all developments to connect to the public sewer system if the site boundary is within 30m (plus an additional 30 meters for every proposed unit), from an existing sewer. In this case there is a public foul sewer located within the road adjacent to the development and consequently, the use of package treatment systems is unlikely to be considered appropriate.

5.2 Existing sewers and connections

As the existing site is undeveloped there are assumed to be no existing drainage connections between the site and public sewer system.

5.3 Proposed Discharge Rate

Based on the proposed 34 residential units the foul discharge rate from the development has been estimated using the 4000l/day methodology outlined in Sewers for Adoption Volume 7. The estimated peak discharge rate is 1.6l/s.

5.4 Capacity Checks

A pre-planning investigation has been undertaken by the sewerage undertaker (Southern Water) and the results confirm that the public foul sewer adjacent to the site will have sufficient capacity to accommodate foul effluent discharged from at least 40 units at the development site. The assumed location of the new sewer connection would be at Manhole TR24399101.

5.5 The Water Industry Act

The Water Industry Act 1991 provides developers with a mechanism for connecting to the public sewerage infrastructure. In this case it is likely a connection to the public foul sewer at Manhole TR24399101 can be facilitated under Section 106 of the Water Industry Act.

5.6 Foul Water Drainage Strategy

It is envisaged that foul effluent will be discharged via pipes to the public foul sewer system, via a new connection at Manhole TR24399101. An indicative layout plan showing the potential foul drainage connections across the site is shown in Figure 5.1 (below).

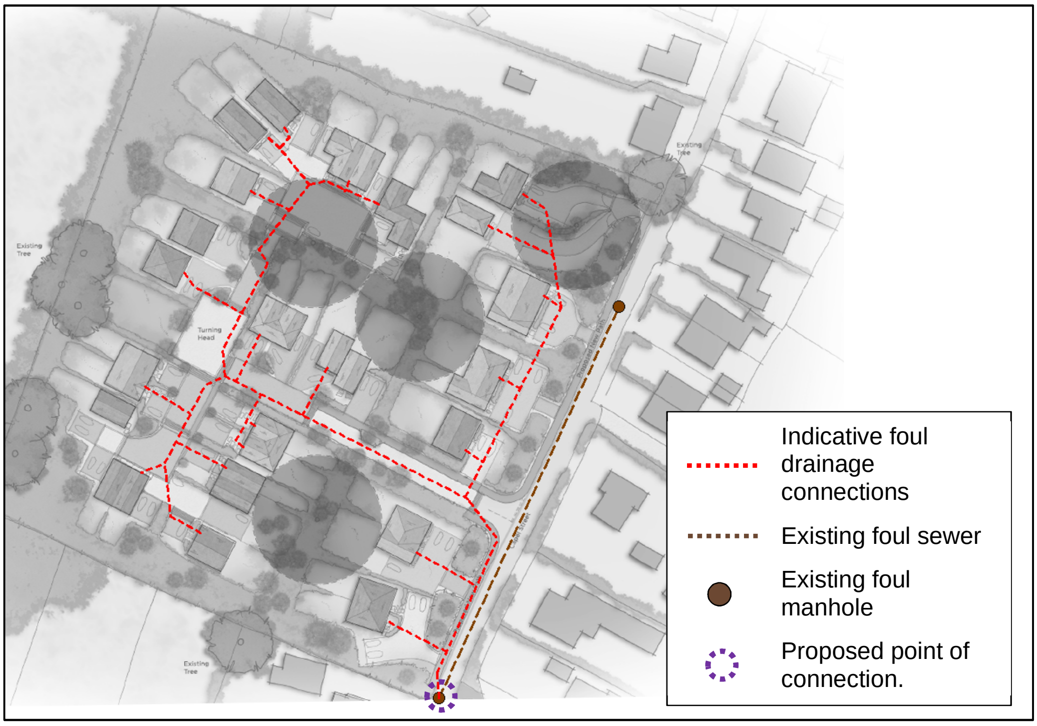

Figure 5.1 – Indicative foul drainage layout plan.

Based on Figure 5.1 (above) and the correspondence from Southern Water it is evident that a solution is available for managing foul effluent discharged from the development.

6 Conclusions and Recommendations

The overarching objective of this report is to appraise the proposals for the development at Capel Street, Capel-Le-Ferne, Kent to ensure that a sustainable solution for managing surface water runoff and foul effluent can be achieved in accordance with the NPPF and local planning policy.

As part of this assessment, the potential opportunities for managing surface water runoff at the site have been analysed and it has been concluded that draining runoff to the bedrock chalk located beneath the site will present the most sustainable and viable solution.

It is envisaged that the drainage of surface water runoff from the development will be facilitated by various Sustainable Drainage Systems, including permeable surfacing, water butts, and borehole soakaways. Calculations have been undertaken for the proposed drainage system and have confirmed that runoff from the entire development can be discharged to the ground.

At the detailed design stage, it is recommended that additional site investigations are carried to confirm the infiltration potential in the exact location of each borehole soakaway.

Details of the typical maintenance and management requirements for each element of the drainage system have been provided to ensure that the proposed drainage solution can be maintained and will continue to operate in perpetuity. It is, however, recommended that an “owner’s manual” containing additional product specific maintenance requirements is produced as part of the detailed design for the site.

The potential options for draining foul waste from the site have also been explored and it is concluded that a new connection to the public sewer system will present the most suitable solution for draining foul effluent from the development.

In conclusion, it is evident that a sustainable solution for managing the surface water runoff and the foul effluent discharged from the proposed development at Capel Le Ferne is available. Consequently, the proposals will meet the requirements of the NPPF, NTSS and local planning policy.

7 Appendices

Appendix A.1 – Drawings

Appendix A.2 – Southern Water Correspondence

Appendix A.3 – Indicative Drainage Layout Plan

Appendix A.4 – Surface Water Management Calculations

Appendix A.1 – Drawings

RIBA Chartered Practice

Proposed Residential Development
At: Land between 107-127 Capel Street, CT18 7HB
Project Name;

Proposed
Illustrative Masterplan With Drainage Strategy
Drawing Name;

A2

Drawing No;A1382-130
Revision; SK1
Date; Dec 2018
Scale; 1:500@A2

Revision;
date note

Urban & Rural Ltd
Specialists in Bespoke Development
5 Castle Street, Canterbury, Kent, CT1 2FG 01227 272 585
info@urbanandruralltd.co.uk www.urbanandruralltd.co.uk

NOTE;

Do Not Scale.
Report all discrepancies, errors and omissions.
Verify all dimensions on site before commencing any work on site or preparing shop drawings.
All materials, components and workmanship are to comply with the relevant British & European Standards, Codes of Practice, and appropriate manufacturers recommendations that from time to time shall apply.

Appendix A.2 – Southern Water Correspondence