

Proposed Residential Development
Bonhams Field, Yapton, West Sussex

Flood Risk Assessment

Prepared for
Seaward Properties Ltd

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Registered in England No: 5433708
Registered Office: One West Smithfield, London, EC1A 9BB

116 High Street, The French Quarter
Southampton SO14 2AA

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1.0 INTRODUCTION

Seaward Properties Ltd appointed AKS Ward to undertake a Flood Risk Assessment (FRA) and drainage strategy to support a planning application for a proposed residential development in Yapton, West Sussex. A site location plan can be found in Appendix A.

The 3.2 ha site is located south west of Stakers Farm and is currently greenfield. The proposed works are to construct a residential development for up to 60 dwellings including vehicular access from the B2233, open space, ancillary works and associated infrastructure. All matters are reserved except for access. The proposed masterplan can be found in Appendix B: Proposed Master Plan.

This report comprises the following elements:

- Review of existing legislation (national and local), policy and documentation in relation to the risk of flooding and design of foul and surface water drainage;
- Assessment of potential impact on the risk of flooding to the development from sources of flooding including fluvial, pluvial, groundwater, sewers and manmade infrastructure. The assessment also identifies and proposes mitigation of the residual flood risk to the proposed development and neighboring property from these sources;
- Proposes the use of Sustainable Drainage Systems (SUDS) to mitigate any potential flooding due to the development;
- Presentation of surface and foul water drainage strategies illustrating how the site can be drained effectively and in accordance with the requirements of Arun District Council (ADC), West Sussex County Council (WSCC), the Environment Agency (EA) and Southern Water Services Ltd (SWSL).

This report takes the form of a formal Flood Risk Assessment (FRA) in accordance with National Planning Policy Framework (NPPF, March 2012) along with reference to Environment Agency Guidance and correspondence with Southern Water.

2.0 DEVELOPMENT PROPOSALS

Seaward Properties Ltd proposes to promote the land for the development described above on land currently occupied by farmland.

Access to the development is proposed to be taken from the B2233 Main Road, and located approximately 20m west of the junction with Drove Lane.

3.0 BASELINE CONDITIONS

3.1 Sources of Information

The baseline conditions for this site have been established using the following sources and references:

- Environment Agency Online mapping;
- Environment Agency Correspondence;
- Southern Water Asset location plans;
- British Geological Survey (BGS) mapping;
- Existing Topographical Survey undertaken by Stuart Bailey Land Surveyor (July 2016);
- Arun District Council's Strategic Flood Risk Assessment (SFRA) (February 2008);
- West Sussex County Council's Preliminary Flood Risk Assessment (PFRA) (May 2011);
- Arun District Council Core Strategy;
- Arun District Council Pre-Application Advice.

3.2 Site Location

Bonhams field is located in Yapton, approximately 4km north east of Bognor Regis in West Sussex. The Ordnance Survey (OS) grid reference for the site is SU 97544 03456 and the nearest post code is BN18 ODX. A site location plan can be found in Appendix A.

The site is greenfield and is currently being used as farm land.

The surrounding land is predominantly used for agriculture with buildings associated with Stakers Farm located to the north west. There is also a residential development to the west of the site with a road and residence located on the southern boundary of the site.

3.3 Topographical Survey

In July 2016 Stuart Bailey Land Surveyors undertook a topographical survey on behalf of the client Seaward Properties Ltd. The results show that the site is relatively flat with the highest recorded elevation of 6.75 m AOD and a low point of 4.52 m AOD. The survey shows a general fall towards the road on the south western boundary of the site. The site can be taken to constitute a single catchment and the survey can be found in Appendix C.

3.4 Geology and Hydrogeology

British Geology Survey (BGS) online maps (accessed July 2016) indicate that the bedrock beneath the site is Chalk which could comprise Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newford Chalk Formation. The superficial deposits at the site are River Terrace Deposits consisting of Sand, Silt and Clay.

Historical borehole logs from the BGS (SU90SE29 ~95m south-west of the site) record soil to 0.5m overlying Brickearth described as "clay, brown, silty" to a depth of 1.9m. This is underlain by Raised Beach Deposits which include material described as "silt, chalky, with chalk pebbles" to 2.9m and a "very clayey sandy gravel" to 3.9m. This is reported to overlie the upper chalk which is described as "chalky, rubbly, soft silty and sandy" to a maximum observed depth of 6.2m. Water was struck 4.7 m below ground level.

A detailed Site Investigation was completed in September 2016 by Tweedie Evans Consulting (TEC). This recorded encountering shallow made ground overlaying river terrace deposits between 2.4 and more than 5m depth. Underlying this is Upper Chalk with flint deposits in some locations. The results of this ground investigation were consistent with anticipated results from BGS information.

Borehole locations are available in Appendix F of this document with detailed results of the ground investigation available in TECs ground investigation report.

The results of 2 No. soakage tests were undertaken at TP1 & TP2 to a depth of 2.5m & 3.02m respectively. Soil encountered in TP1 was predominantly slightly gravelly sandy clay with a low infiltration rate that would not be suitable for direct infiltration on site. Results of TP2, which was observed to be carried out within sandy gravelly clay with gravel chalk, achieved acceptable design infiltration rates.

Table 3.1 Soil Infiltration Rates

Location	Test 1	Test 2	Test 3
TP01/SA1	9.16×10^{-6} m/s		
TP02/SA2	3.08×10^{-5} m/s	2.92×10^{-5} m/s	2.97×10^{-5}

It should be noted that soil descriptions within trial pits and boreholes across the north west quadrant of the site presented similar results to those noted for TP02.

Ground water was encountered within one borehole (WS5) as part of site works at a depth of 5m.

Groundwater monitoring is currently being undertaken for a period finishing in March 2017.

Shallowest recorded groundwater depths between September & November 2016 are presented within table 3.2.

Table 3.2 Ground Water Monitoring – Shallowest Recorded Water Depth

Locations	Date	Depth (meters below ground level)
WS1	20.09.16	3.99
WS4	All	Dry
WS6	24.11.16	4.39

No drainage features were observed during the site reconnaissance.

The site is not reported to be within an Environment Agency Source Protection Zone.

4.0 EXISTING SURFACE WATER DRAINAGE REGIME

Surface water runoff from the existing site currently infiltrates into the underlying strata with any excess runoff ponding on site or crossing site boundaries to adjoining land.

There are no public surface water sewers in close proximity to the site. Extracts from the Southern Water sewer records are presented as Appendix E.

As the developable area is less than 50 ha, the Institute of Hydrology (IoH) Report 124 Flood Estimation for Small Catchments (1994) method has been used to estimate the greenfield site peak flow rate. This is an approved methodology specified within the Environment Agency's 'Rainfall Runoff Management for Developments Report', using the parameters detailed in Table 4.1 below.

Table 4.1 ICP SuDS Parameters

Parameter	Value	Unit
Area	3.20	Ha
SAAR	741	Mm
Soil Class	0.4	-
Region	7.0	-
Urban	0.0	-

Table 4.2 Summarises the estimated current greenfield discharge rates for the site. Calculations are provided in Appendix G.

Table 4.2 Existing Surface Water Discharge Rates

Return Period	Site Greenfield Discharge Rate (l/s)
QBAR	6.23
Q1	5.3
Q30	14.34
Q100	19.88

The existing runoff volume calculation for a 1 in 100 year, 6 hour rainfall event has been calculated using the parameters in Table 4.3 and the estimated volume is in Table 4.4 below.

Table 4.3 Greenfield Volume Calculation Parameters

Parameter	Value	Unit
SAAR	738	mm
Soil	0.4	-
SPRHOST	35.21	-
Urban	0.0	-

Table 4.4 Greenfield Runoff Volume

Return Period	Greenfield Runoff Volume (m3)
Q100	732.469

4.1 Existing Foul Water Drainage Regime

There are also no existing foul water sewers present within the site, the nearest public foul sewers are on Main Road, immediately to the south of the site. Initial consultation with Southern Water indicates that capacity is not available within the downstream treatment works to utilize this drainage for the proposed development site. A copy of the letter from Southern Water confirming this is included in Appendix H.

5.0 FLOOD RISK LEGISLATION AND POLICY REVIEW

5.1 Legislation

Flood and Water Management Act 2010

The Flood and Water Management Act 2010 (FWMA) received Royal Assent on 8th April 2010. The Act was introduced to enforce some of the key proposals set out within the Government's flood and water strategies along with the Government's response to Sir Michael Pitt's Review of the summer 2007 floods.

Relevant to the development site, the FWMA is intended to encourage the uptake of SuDS by removing the automatic right to connect to sewers and providing for unitary and county councils to adopt SuDS for new developments.

The development proposals will adhere to the FWMA through the provision of SuDS as a fundamental element of the surface water drainage system. Furthermore, the developer is committed to working with the relevant stakeholders, such as the Environment Agency, ADC and WSCC in implementing the requirements of the FWMA.

National Policy

National Planning Policy Framework 2012

The National Planning Policy Framework 2012 (NPPF) replaced all planning policy statements (including Planning Policy Statement 25: Development and Flood Risk) upon publication in March 2012.

The NPPF sets out the Government's planning policies for England and how these policies should be applied. The technical guidance to the NPPF, the Planning Practice Guidance, March 2014 (PPG) was published to accompany the NPPF. The PPG is an online document and provides additional guidance and links to relevant current detailed documents.

The NPPF states that "inappropriate development in areas at risk of flooding should be avoided by directing development away from areas of highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere."

All land in England and Wales is classified into three main Flood Zones which refer to the probability of river or sea flooding (ignoring the existence of defences). The PPG identifies and describes the Environment Agency Flood Zones as:

- Flood Zone 1: Low Probability defined as land assessed as having less than 1 in 1,000 annual probability of river or sea flooding (<0.1%);
- Flood Zone 2: Medium Probability defined as land assessed as having between 1 in 100 and 1 in 1,000 annual probability of river flooding (1% - 0.1%) or between 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% - 0.1%);

- Flood Zone 3a: High Probability defined as 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 sea flooding (0.5%);
- Flood Zone 3b: The Functional Floodplain defined as land where water has to flow or be stored in times of flood (as identified by local planning authorities in their SFRA's).

In accordance with the NPPF, a site specific FRA is required for:

- Proposals of 1 hectare or greater in Flood Zone 1;
- All proposals for development in Flood Zones 2 and 3;
- An area within Flood Zone 1 which has critical drainage problems;
- Development or change of use to a more vulnerable class that may be subject to other sources of flooding.

Given the above, the site requires a site-specific FRA on the basis that the site is over 1 hectare located in Flood Zone 1.

According to Table 2 (Flood Risk Vulnerability Classification) of the NPPF Flood Risk and Coastal Change Planning Practice Guidance, the development proposals (residential) are classified as 'More Vulnerable'.

Table 3 (Flood Risk vulnerability and Flood Zone Compatibility) of the NPPF Flood Risk and Coastal Change Planning Practice Guidance, states that 'More Vulnerable' development is appropriate within Flood Zone 1.

As all built development is located within Flood Zone 1 the site does not require an Exception Test.

Non-Statutory Technical Standards for Sustainable Drainage Systems 2015

The Non-Statutory Technical Standards for Sustainable Drainage System were published by DEFRA in March 2015.

The standards are to be used in order to manage surface run-off in accordance with Schedule 3 of the FWMA.

The standards state that the run-off destination should be considered in the following order of preference:

- Discharge into the ground (infiltration);
- Discharge to a surface water body;
- Discharge to a surface water sewer;
- Discharge to a combined sewer.

The standards also state that for greenfield developments the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the assumed event.

Where it is reasonably practicable for greenfield developments the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the greenfield runoff volume for the same event. If this is not practicable the runoff volume must be discharged at a rate that does not adversely affect flood risk.

The drainage system must be designed so that unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 year rainfall event, and flooding does not occur during a 1 in 100 year rainfall event in any part of a building or utility plant susceptible to water. The

design of the site must ensure that where reasonably practicable flows resulting from a rainfall in excess of a 1 in 100 year rainfall event are managed in exceedance routes that minimise risks to people and property.

Components must be designed to ensure structural integrity of the drainage system, and any adjacent structures for the design lifetime of the development, and the materials which are specified by the designer must be of a suitable nature for their intended use. Pumping (of surface water) should only be used to facilitate drainage for those parts of the site where it is not reasonably practicable to drain water by gravity.

Local Policy

Arun District Council — Local Plan (2003 - 2011)

The aim of the Local Plan was to apply the principles of sustainable development in assessing development proposals by finding the balance between the need for development and the utilisation of scarce resources.

The following policies are considered relevant to this Flood Risk Assessment.

Policy GEN9 — Foul and Surface Water Drainage

Planning permission for development which will materially increase foul and/or surface water discharges will be refused unless the Local Planning Authority is satisfied that either adequate drainage capacity exists or appropriate drainage capacity can be provided as part of the development. Consideration should also be given to the use of Sustainable Urban Drainage Systems (SUDS) as alternatives to conventional drainage where appropriate.

Policy GEN11 — Inland Flooding

Permission for development which would be at risk from flooding and/or materially decrease the capacity of a floodplain to store or pass flows of floodwater, will be refused unless the Local Planning Authority is satisfied that compensatory flood storage/waterway areas can be provided as part of the development and the function and effectiveness of existing watercourses, or their replacements, are not adversely affected.

Arun District Council — Emerging Local Plan (2011 — 2031)

The emerging Local Plan for Arun District Council sets out the vision for the future by setting a spatial planning framework until 2031 and ensuring that that investment and development decisions are not made in isolation, but are properly coordinated, with a focus on promoting the principles of sustainable development.

In terms of the Development Plan process these policies within the Local Plan are at the Regulation 19 stage of the Town and Country Planning (Local Planning) (England) Regulation 2012. The policies in the plan will be subject to public consultation on behalf of the Government when the remaining policies have also been agreed, this will depend on when Full Council agrees the remaining elements of the plan; including the residual housing allocations and related infrastructure.

The following policies are relevant to this Flood Risk Assessment.

Policy W DM2 — Flood Risk

Development in areas at risk from flooding, identified on the latest Environment Agency flood risk maps and the Council's Strategic Flood Risk Assessment (SFRA), will only be permitted where all of the following criteria have been satisfied:

- a) The sequential test in accordance with the National Planning Policy Framework Technical Guidance has been met;

- b) A site specific Flood Risk Assessment demonstrates that the development will be safe, including access and egress, without increasing flood risk elsewhere and reduce flood risk overall;
- c) The scheme identifies adaptation and mitigation measures;
- d) Appropriate flood warning and evacuation plans are in place;
- e) New site drainage systems are designed to take account of events which exceed the normal design standard i.e. consideration of flood flow routing and utilising temporary storage areas.

The reports prepared as part of the criteria above must take into account contingency allowances, taking climate change into account as set out in the NPPF Technical Guidance.

In locations where strategic flood defence or resilient and resistant construction measures are necessary within the site itself, proposals will be required to demonstrate how measures have been incorporated as an intrinsic part of the scheme in a manner which is compatible with the Strategic Flood Risk Assessment.

All development proposals must take account of relevant Surface Water Management Plans, Catchment Flood Management Plans and related Flood Defence Plans and strategies such as the Lower Tidal River Arun Strategy. The Council may require financial contributions from development on sites where measures to address flood risk or to improve the environmental quality of watercourses have been identified by these Plans and Strategies.

Developments shall also be consistent with all other Local Plan policies.

4.28 The National Planning Policy Framework (NPPF) (March 2012) emphasises the active role Local Planning Authorities (LPAs) should have in ensuring flood risk is managed effectively and sustainably as an integral part of the planning process. The NPPF outlines that Local Plans should be supported by a Strategic Flood Risk Assessment and use their findings to inform strategic land use planning.

Policy W DM3 — Sustainable Drainage

To increase the levels of water capture and storage and improve water quality, all development must identify opportunities to incorporate a range of Sustainable Urban Drainage Systems (SUDS), appropriate to the size of development, at an early stage of the design process.

Proposals for both major and minor developments must incorporate SUDS within the private areas of the development in order to provide source control features as part of the overall SUDS design. These features can include:

- Green roofs;
- Permeable driveways and parking;
- Soakaways;
- Water harvesting and storage features including water butts.

Proposals for major development must also integrate SUDS within public open spaces and roads, in liaison with West Sussex County Council, (the SuDS Approval Body) or its agent. SuDS must therefore be integrated into the overall design of a development and must:

- a) Contribute positively to the appearance of the area;
- b) Effectively manage water (including its quality);

- c) Accommodate and enhance biodiversity by making connections to existing Green Infrastructure assets;
- d) Provide amenity for local residents (ensuring a safe environment);
- e) Retain existing open drainage ditches in their current form.

In order to ensure that SuDS discharge water from the development at the same or lesser rate, as prior to construction, developers must:

- a) Follow the hierarchy of preference for different types of surface water drainage disposal systems as set out in Approved Document H of the Building Regulations and the SUDS manual produced by CIRIA;
- b) Undertake up to six months groundwater monitoring within the winter period;
- c) Undertake winter percolation testing in accordance with BRE365;
- d) The proposed drainage system must be designed to ensure that there is no flooding on a 1 in 30 year storm event;
- e) The design must also take account of the 1 in 100 year storm event plus 30% allowance for climate change, on stored volumes, to ensure that there is no flooding of properties or the public highway or inundation of the foul sewerage system. Any excess flows must be contained within the site boundary, and within designated storage areas;
- f) Flow routes through the development must be demonstrated as a first stage in the design process, demonstrating how water will travel at or near the surface for three types of flow:
 - Low flow routes: Once surface water run-off has been collected, cleaned and controlled in source control features it will either be stored where it fell as rain in permeable pavement, or flow onward to local storage structures. The day-to-day flows from these features should travel in low flow channels through the development in a controlled way contributing to landscape quality.
 - Overflows: In the event of local blockages or surcharge a simple overflow arrangement should allow water to bypass the obstruction and return to the management train sequence until conditions return to normal.
 - Exceedance routes: When SuDS are overwhelmed by exceptional rainfall then exceedance routes protect people and property by providing unobstructed overland flow routes from the development and should be considered for all drainage schemes. The SUDS design must demonstrate that flow routes have been considered at each design stage to take into account the effect of proposed development on the natural flow pattern for the site. Exceedance routes should also be protected from future changes in land use.

Developments shall also be consistent with all other Local Plan policies.

In terms of the Development Plan process these policies within the Local Plan are at the Regulation 19 stage of the Town and Country Planning (Local Planning) (England) Regulation 2012. The policies in the plan will be subject to public consultation on behalf of the Government when the remaining policies have also been agreed, this will depend on when Full Council agrees the remaining elements of the plan; including the residual housing allocations and related infrastructure. However, the above saved policies are now considered a material consideration by Arun in assessing planning applications.

Arun District Council Strategic Flood Risk Assessment (SFRA)

The National Planning Policy Framework (NPPF) (March 2012) emphasises the active role Local Planning Authorities (LPAs) should have in ensuring flood risk is managed effectively and sustainably as an integral part of the planning process. The NPPF outlines that Local Plans should be supported by a Strategic Flood Risk Assessment (SFRA) and use their findings to inform strategic land use planning.

In February 2008, a Level 1 Strategic Flood Risk Assessment completed for Arun District Council by CAPITA with information gathered from a variety of stakeholders including the Environment Agency, Southern Water, WSCC Highways and the Internal Drainage Board. The site is not shown to be at risk of flooding from any other sources.

4.33 Map extracts from the SFRA relating to recommended development site can be found in Appendix F.

Lidsey Surface Water Management Plan - 2014

The Lidsey Surface Water Management Plan was prepared in partnership with Southern Water, Arun District Council, West Sussex County Council and Environment Agency. This includes all of the Lidsey Sewage Treatment Works catchment and also the areas of Middleton, Elmer and Slindon as well as Westergate.

As West Sussex County Council is responsible for the management of local flood risk which includes both surface water and ground water sources. The Lidsey SWMP study area has been identified by West Sussex as an area susceptible to surface water flooding based on Defra's National Rank Order of Settlements to surface water flooding (Defra 2009) and from persistent history of reported and confirmed flooding.

West Sussex Preliminary Flood Risk Assessment (PFRA)

The West Sussex PFRA was completed in May 2011 as a requirement for the EU Floods Directive, transposed to Law in 2009 by the Flood Risk Regulations (2009). It provides a high level overview of flood risk from local flood sources such as surface water, groundwater, ordinary watercourses and canals.

It is stated in the PFRA that parts of Yapton and Barnham are known areas at risk from surface water flooding.

West Sussex SFRA (2010)

The West Sussex Strategic Flood Risk Assessment was prepared in 2010. This report was a county wide strategic flood risk assessment in support of their Minerals and Waste Development Framework rather than to support development of the housing allocation aspects of the Local Plan.

West Sussex Local Flood Risk Management Strategy 2013 – 2018 (LFRM/IS)

WSCC prepared a local flood risk strategy which sets out how WSCC intends to carry out its statutory responsibilities required by the Flood and Water Management Act 2010. The strategy is directly informed by the EA's National Strategy and the guiding principles of the Local Government Association Framework 'Living Document' (2nd Edition November 2011).

The report identifies a series of "Wet Spots" throughout the county based on the areas at risk of flooding and the number properties in the area. The nearest 'Wet Spot' to the site is Littlehampton with close to 2640 properties at risk of flooding from all sources.

Arun and Western Stream Catchment Flood Management Plan (CFMP) 2009

The Arun and Western Stream CFMP is a formal planning document which sets out the Environment Agency's preferred plan for sustainable flood risk management for the next 50 to 100 years.

The Arun and Western Streams CFMP recommended Policy 4 be applied to the Coastal Plains (Sub-area 6) within which the site lies. This policy states:

Areas of low, moderate or high risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change.

This Policy will tend to be applied where the risks are currently deemed to be appropriately-managed, but where the risk of flooding is expected to significantly rise in the future. In this case we would need to do more in the future to contain what would otherwise be increased risk. Taking further action to reduce risk will require further appraisal to assess whether there are socially and environmentally sustainable, technically viable and economically justified options.

The Water Industry Act 1991

The Water Industry Act 1991 (WIA) (HMSO, 1991) was introduced to consolidate previous water supply and wastewater services enactments in the UK. Section 94 sets out the principal duties and standards of performance to sewerage undertakers which include the duty 'to provide, improve and extend such a system of public sewers (whether inside its area or elsewhere) and so to cleanse and maintain those sewers as to ensure that that area is and continues to be effectively drained'.

Relevant to new development, Section 104 and Section 106 of the WIA provides the framework for the adoption of sewers, subject to an agreement with the sewerage undertaker, who in this case is Southern Water Services Ltd.

Section 98 of the WIA provides the legal mechanism through which the appropriate infrastructure can be requested (by the developer) and provided to drain a specific location off-site through third party land.

Section 106 allows the sewerage undertaker a 21 day notice period prior to the connection works being undertaken. During this time the application may be refused if the undertaker considers that the connection mode or condition of the connecting sewer does not satisfy the required standards. The undertaker cannot refuse the connection based on inadequate capacity.

Transfer of Private Sewers

It should be noted that the Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011 have transferred private sewers into the ownership of statutory sewerage companies in England since October 2011. The Government is also taking steps to stem the proliferation of newly built sewers in order to prevent the recurrence of existing ownership/maintenance problems in the future.

Sewers for Adoption 7th Edition

Sewers for Adoption (SFA) 7th Edition provides guidance for developers for the design and construction of both surface and foul water sewers to be offered for adoption. The guidance is provided in consultation with Water undertakers.

The SFA places responsibility (in England and Wales) for existing and future private sewers and lateral drains that connect to the public sewer system to the water and sewerage companies.

The SFA will provide detailed guidance to support the Mandatory Build Standard whereby; it will be mandatory for new sewers and lateral drains (between the sewer and the serviced property boundary) to be adopted to public status by the sewerage undertaker.

The guidance for foul sewer design in Sewers for Adoption states that 'The design flow rates for gravity sewers for dwellings should be 4,000 litres/dwelling/per 24 hours.'

Building Regulations

4.51 Where drainage within a development is not to be adopted by the sewerage undertakers, the so called private sewers will require to meet the standards as set out in Building Regulations 2002, Part H 'Drainage and Waste Disposal' guidance on the design of private sewers.

Specific guidance can be found within the following sections of the Building Regulations 2002 Part H:

- H1 — Foul water drainage;
- H2 — Wastewater treatment systems and cesspools;
- H3 — Rainwater drainage;
- H4 — Building over sewers;
- H5 — Separate systems of drainage;
- H6 — Solid waste storage.

Pollution Prevention Guidance

For sewers not connected to a public adopted system, the Environment Agency's Pollution Prevention Guidance 4 (PPG4) 'Treatment and Disposal of Sewage where no foul sewer is available' should be considered. However this guidance states that "discharge to a foul sewer is the preferred option as the sewage is conveyed to a purpose built and closely monitored sewage treatment plant, so development proposals in sewered areas should connect to public sewers".

6.0 THE SEQUENTIAL TEST AND THE EXCEPTION TEST

The Sequential Test

The Environment Agency's flood zones are the starting point for the Sequential approach promoted by the NPPF, and are shown on the EA flood mapping. The NPPF's Planning Practice Guidance (PPG) identifies that the overall aim of the Sequential Test is to steer new developments to Flood Zone 1 (NPPF, 2012).

Table 3 of Technical Guide to NPPF (March 2012) sets out the flood risk vulnerability classification of developments. The site is to be considered for the 'worst' flood risk vulnerability classification - Residential development is classed as 'More Vulnerable'.

Table 6.1: Flood Risk Vulnerability and Flood Zone 'Compatibility'
(from Technical Guide to NPPF, March 2012)

Flood Risk Vulnerability Classification		Essential infrastructure	Water compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception test required	✓	✓
	Zone 3a	Exception test required	✓	×	Exception test required	✓
	Zone 3b Functional floodplain	Exception test required	✓	×	×	×

Key: ✓ Development is appropriate, × Development should not be permitted  Proposed Development

As shown in Table 6.1 the development proposal is suitable for the location of the site.

In accordance with Table 3 of Technical Guide to NPPF (March 2012) 'more vulnerable' developments are appropriate in Flood Zone 1, hence, the Sequential Test and Exception Test are not required.

APPRAISE KEY SOURCES OF FLOOD RISK

In accordance with the NPPF requirement, all forms of flooding must be considered within a site specific FRA. The following is a review of the various types of flooding and an overview of the potential risk to the site, if any.

Flooding from Rivers (Fluvial) and Sea (Tidal)

Tidal flood sources include the sea and estuaries, and tidal flooding is often caused by high tides with meteorological and storm events. Tidal flooding can be extremely rapid and its effects severe; deep fast-flowing water can create an extreme hazard. The site is located within tidal Flood Zone 1 which represents risk of flooding less than 1 in 1000 year event.

The nearest main river to the site is the Lidsey Rife, approximately 250m to the south west of the site. Flood Mapping obtained from the EA indicates the site lies within Flood Zone 1, low probability of flooding. A copy of the Environment Agency's river flood risk map is presented in figure 6.1.

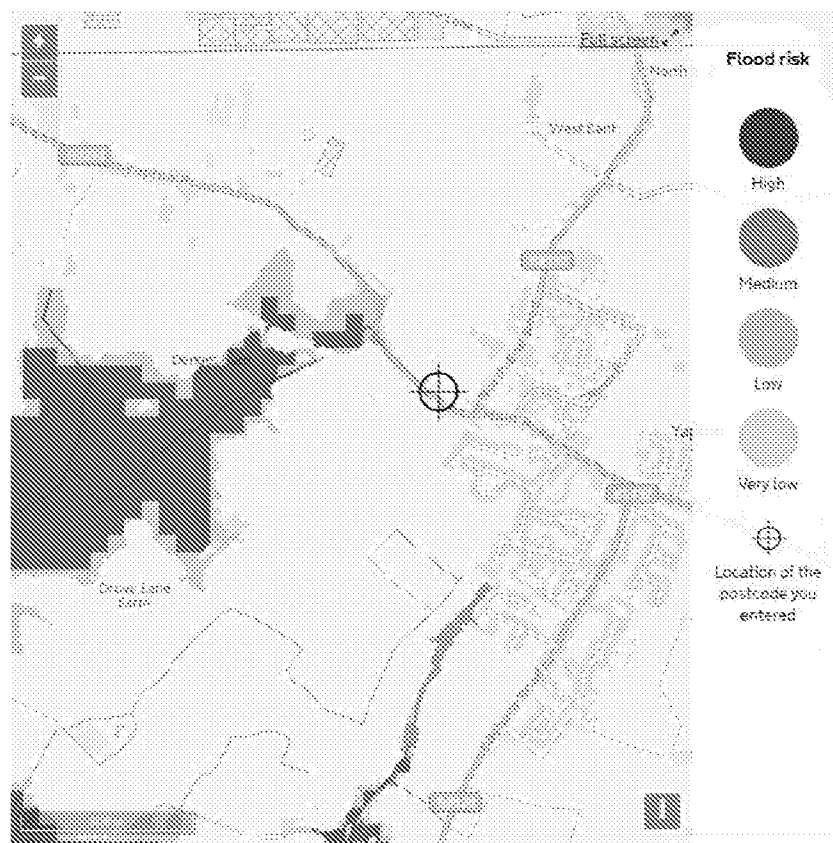


Figure 6.1 – EA river flood risk

Groundwater Flooding

Groundwater flooding is caused by the emergence of water originating from sub-surface permeable strata. A groundwater flood event results from a rise in the groundwater level sufficient for the water table to intersect the ground surface and inundate low lying land.

Ground investigations have been undertaken at the site and monitoring is ongoing. Results to date indicate the highest groundwater levels were 3.99m below existing ground levels. At the date of writing there are no recorded incidences of groundwater flooding at the site.

Reservoir Flooding

The Environment Agency's reservoir flood mapping indicates that the site is not at risk from reservoir flooding. A copy of the Environment Agency's reservoir flood risk map is presented in figure 6.2.



Figure 6.2 – EA reservoir flood risk

Surface Water Flooding/Overland Flows (Fluvial)

Surface water flooding is caused by rainfall levels exceeding the natural infiltration properties of the surrounding soils. It occurs where there is a lack of a formalised drainage system, as a result of poorly designed or maintained sewer systems or due to no natural method of drainage such as watercourses, ditches, or where soil infiltration rates are low. It often results in ponding of water at low points or backing up behind obstructions.

Environment Agency's mapping indicates that the site is not susceptible to surface water flooding.

A SuDS system designed to accommodate the surface water run-off generated from a 1 in 100 year storm event plus 30% climate change will help mitigate any risk from overland flood flows within the proposed development.

A copy of the Environment Agency's river surface water flood risk map is presented in figure 6.3.



Figure 6.3 – EA surface water flood risk

Sewer Infrastructure Flooding

Flooding can occur due to the failure of existing foul or surface water drainage infrastructure. If flows within the drainage system exceed the designed capacity or foreign matter causes blockages, overflow to the surface can occur leading to flooding.

FLOOD RISK MITIGATION MEASURES

To mitigate against the risk from localised overland flooding from and within the proposed development, it is proposed that a SuDS management train will provide surface water source control, treatment and attenuation. Permeable paving will provide flow control and pollution prevention to low risk highway surface water run off whilst roof drainage will be accommodated within onsite cellular storage and trench infiltration on site. Surface water attenuation will be designed to accommodate a 1 in 100 year return period storm with 30% allowance for climate change within the below ground surface network or at surface level within designated flood alleviation green space subject to detailed design.

Contamination from Construction

The construction works must be undertaken in a manner to prevent pollution of the nearby watercourses and any groundwater which may lie beneath the site. Contractors are to make reference to current legislation and EA guidelines in respect of construction pollution prevention.

The contractor will be advised on the removal of any hotspots of contaminated ground established through an intrusive soil investigation or during excavation works.

All stocks of materials, oils and fuels are to be stored in a manner preventing spillage and seepage to ground. Wastewater will not be freely discharged to the ground or watercourses. All hydrocarbons and chemical spillages will be thoroughly cleaned by excavation of the polluted ground and disposed of to a licensed waste depot.

The Environment Agency produces Pollution Prevention Guides (PPGs) giving advice on the law and good environmental practice. The following guidance notes are considered relevant for this development:

- PPG 1 — Basic Good Environment Practices (EA, July 2013);
- PPG 2 — Choosing and Using Oil Storage Tanks (EA, April 2014);
- PPG 3 — Choosing and Using Oil Separators (EA, April 2006);
- PPG 6 - Construction and Demolition Sites (EA, April 2014);
- PPG 13 - Vehicle Washing and Cleaning (EA, July 2007).

7.0 RESIDUAL FLOOD RISK

The FRA has shown that the site generally offers low risk to users of risk of flood from the recognized sources and as such the site presents a low residual risk of flooding. The proposed residential development will mitigate against increasing flood risk based on the following:

- The proposed development will utilise infiltration techniques and filtration to accommodate surface water run-off, up to and including run-off arising from the 1 in 100 year plus climate change storm;
- Environment Agency has no record of historical flooding within the development site which does not fall within an identified area of flood risk;
- The foul drainage system will be designed in accordance with best practice and connect to the public sewer system when agreement that sufficient capacity is available within Southern Water's network is reached;
- Evidence collected to date indicates the site is unlikely to be at risk from groundwater flooding.

All flood advice given is based on literature, mapping and historic records produced by the Environment Agency and Southern Water.

8.0 SURFACE WATER DRAINAGE STRATEGY

Surface Water Management Strategy Requirements

Any surface water drainage strategy must demonstrate that the proposed development can be drained in a sustainable manner, commensurate with local and national policy. The NPPF requires that flood risk to land and property is not increased as a result of new development.

A fundamental principle of sustainable development in terms of flood defence is the reduction of surface water runoff from new developments. The Non-Statutory sustainable drainage technical standards state that peak runoff rates should be limited to the Greenfield runoff rates, and long term storage should be provided. Exceedance routes should be shown not to impact the safety of property.

Part H of the Building Regulations: Drainage and Waste Disposal establishes a hierarchy for surface water disposal, which also encourages a SuDS approach. This hierarchy stipulates that surface water runoff not collected for reuse must be discharged to one or more of the following in order of priority:

1. Discharge into ground (infiltration); or, where not reasonably practicable;

2. Discharge to a surface water body; or, where not reasonably practicable;
3. Discharge to a surface water sewer, highway drain, or another drainage system; or, where not reasonably practicable;
4. Discharge to a combined sewer.

The peak runoff rates and volumes leaving the site must not be greater than those currently discharged during the following events;

- 1:1 year rainfall event;
- 1:30 year rainfall event;
- 1:100 year rainfall event;
- 1 :100 year plus climate change

Onsite infiltration testing has been undertaken in accordance with BRE 365. Initial results of groundwater monitoring and infiltration rates indicated infiltration of surface water runoff within the site is feasible subject to completion of groundwater monitoring and further infiltration testing at the detailed design stage.

Proposed Surface Water Drainage Strategy

Surface water drainage will be subject to further design following completion of the master planning exercise and detailed design following grant of planning permission. Sustainable drainage systems using infiltration techniques are proposed to control surface water at source on-site and to limit any surface water discharge off the site to Greenfield runoff rates.

As infiltration methods are proposed for the site, the potential contamination risk to underlying groundwater will need to be assessed following completion of groundwater monitoring. Existing groundwater levels are indicated to be at least 4m depth below ground level; it is not considered that infiltration of flows from the development will create a groundwater flooding risk due to the depth observed to date.

The Greenfield runoff rate for the 1-in-100-year rainfall event has been calculated as 20 l/s using IH 124 Method Soakaways will be designed for the 1 in 10 year event in accordance to BRE Digest 365, supplemented by above or below ground storage up to the 1 in 100 year event plus climate change allowance of +30%. The onsite surface water drainage system will be designed to surcharge but not flood in the 1 in 30 year event with climate change. In the event that the 1-in-100-year storm intensity is exceeded, building openings and floor levels will be designed such that excess water is directed away from buildings via overland flood flow paths to temporary storage in public open space areas entirely contained within site.

There is significant open space as part of the proposals which will be utilised for infiltration and temporary storage of excess overland flows.

As part of the drainage strategy consideration will be given to using Parking Bays and roads with permeable block paving. Where traditional macadam surfacing is used these will maintain a porous sub-base providing additional attenuation storage.

Pollution control will occur through silt collection in catchpits in the below ground piped drainage network, oil interceptors will be used where highway drainage does not pass through the porous sub-base.

Following the completion of groundwater monitoring more extensive targeted infiltration testing will be carried out as part of the detailed drainage design work to establish appropriate infiltration rates across the site for both permeable paving and trench infiltration rates.

The proposed surface water management strategy described above is outlined on Drawing YAP-AKSW-XX-GF-DR-C-92002, Appendix E.

Maintenance of SuDS Features

The onsite drainage system maintenance will be carried out by a private recognised management company through the implementation of an approved maintenance management plan to minimise the residual flood risk of drainage system blockage.

9.0 FOUL WATER DRAINAGE STRATEGY

Southern Water is the governing water authority for the area. Any proposed connections or changes to the existing discharge rates must be approved by Southern Water prior to commencement of any construction works.

It is proposed to collect and discharge all the foul flows from the site by gravity to the southwestern corner of the site.

The hydraulic design for the discharge rate for the foul wastewater design has been calculated in accordance with Sewers for Adoption 7th Edition which states design flow rates for dwellings should be 4000l/day. The total foul discharge volume for the proposed development of up to 60 residential units, in accordance with SfA, equates to 240 cubic m per day with an anticipated peak flow, in accordance with Approved doc H of the building regulations, of circa 12 l/s subject to detailed specification of household appliances.

Preliminary discussion held with Southern Water indicates that there is insufficient capacity neither in the local sewer network nor at the local treatment works. Discussions are on-going with Southern Water and at present it is proposed to await the anticipated release of information in March 2017 of infrastructure improvement works in order to propose a strategy.

An alternative to the release of capacity within the Southern Water drainage network has been examined in the form of a package treatment works on site. Following in depth ground investigation it has been recognised that that infiltration of treated effluent could not be safely achieved on the site.

10.0 CONCLUSIONS

AKS Ward has been commissioned by Seaward Properties Ltd to undertake a Flood Risk Assessment (FRA) to support a planning application for a proposed residential development on land to the north of Main Road in Yapton, West Sussex.

The Environment Agency advises that this development lies within Flood Zone 1 which is an area with a low probability of flooding. Residential (More Vulnerable) development is appropriate within Flood Zone 1.

The underlying geological conditions indicate that infiltrating SUDS features are possible on the site. Storm water will therefore need to be attenuated on site and released gradually into the ground. The attenuation storage for the site will be achieved by using tanked permeable paving and underground cellular storage tanks, located underneath the public open spaces. This will be discharged into trench soakaways where infiltration rates are sufficient, subject to confirmation of ground water monitoring results.

It is proposed to collect and discharge all the foul flows from the site by gravity to the southwestern corner of the site. At present the outfall for foul drainage remains in abeyance in anticipation of an updated upgrade from Southern Water.

This Flood Risk Assessment has demonstrated that the proposed development is fully compliant with the requirements of NPPF. Issues relating to flood risk and drainage do not represent an obstruction to the development and therefore should not hinder an approval for planning permission of the proposed development.

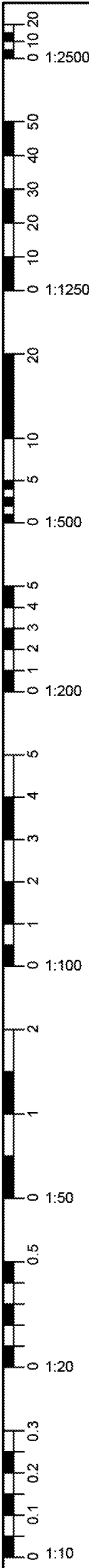
Appendix A: Site Location Plan

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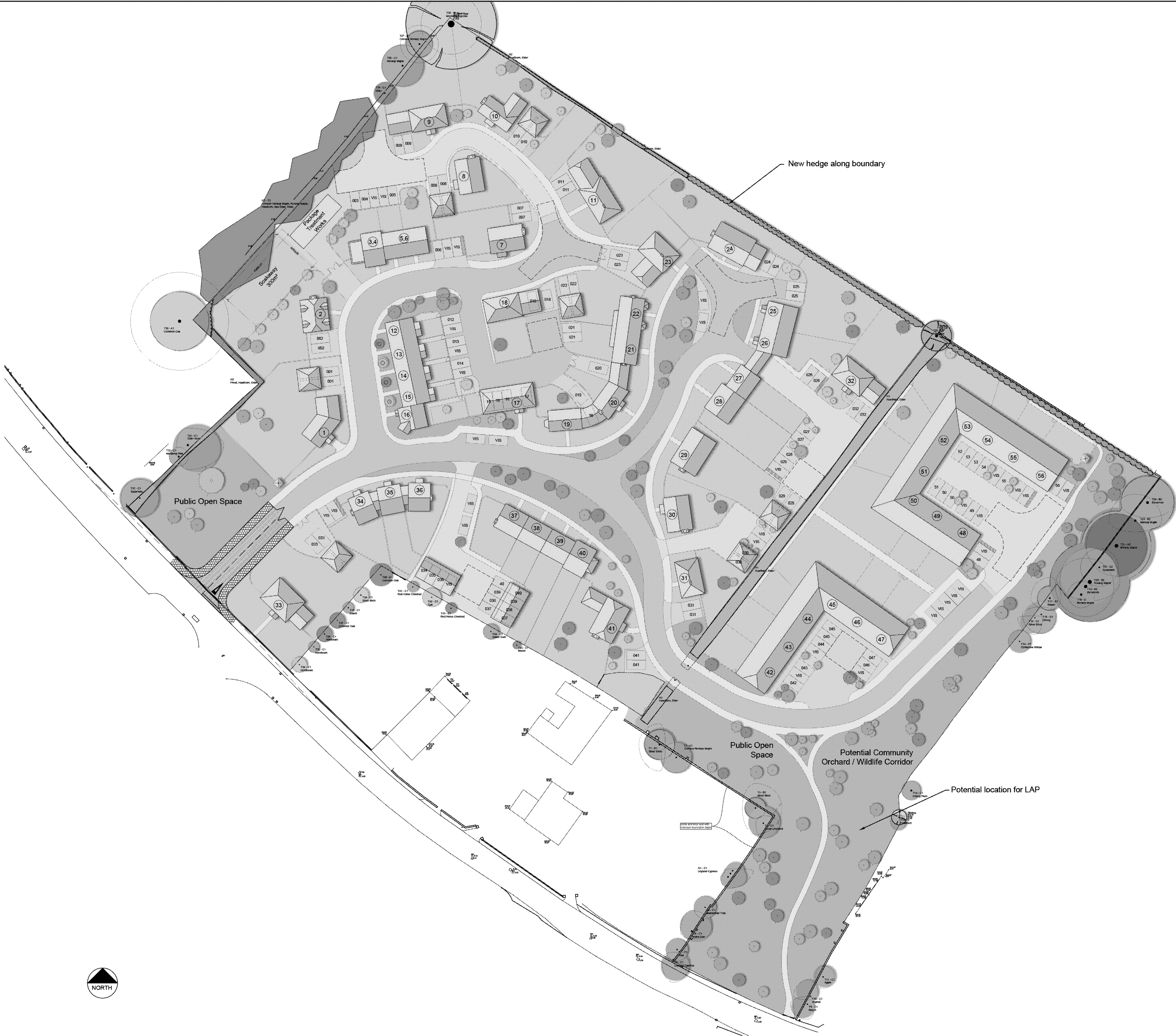
20 July 2016
11:28



Appendix B: Proposed Master Plan



REPRODUCING THESE DRAWINGS BY PRINTING OR COPYING MAY LEAD TO ERRORS. PLEASE REFER TO SCALE BAR. DO NOT SCALE OFF THESE DRAWINGS FOR CONSTRUCTION PURPOSES. IF ANY DISCREPANCIES ARE FOUND, PLEASE CONTACT WESTERN DESIGN ARCHITECTS IMMEDIATELY.



DESIGNERS RISK ASSESSMENT-
HEALTH AND SAFETY
THE CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATIONS 2015
For significant hazards specific to the project please refer to
Drawing CDM01 where appropriate

NOTES:-

I	Amended Label	PR	MW	08.11.16
H	Removal of housing schedule	PR	MW	08.11.16
G	New hedge to North Boundary	PR	MW	01.11.16
F	Alterations to schedule	PR	MW	17.10.16
E	Alterations to schedule	PR	MW	13.10.16
D	Alterations to scheme	PR	MW	13.10.16
C	Additional public open space	PR	MW	02.09.16
B	Amended Sketch Scheme	PR	MW	16.08.16
A	Sketch Scheme	PR	MW	12.08.16

REV.	REVISION DETAILS	BY	CHKD	DATE
------	------------------	----	------	------

WDA

westerndesignarchitects.com

Western Design Architects
12 The Granary, Hinton Business Park, Tarensay Winton, Dorset, DT11 8JF
T:01258 830675 E:info@westerndesign.co.uk

CLIENT		Seaward Properties Ltd	
PROJECT		Bonhams Field	
DRAWING TITLE		Sketch Layout	
DRAWN BY	CHECKED BY	DATE	
PR	MW	09.08.16	
SCALE	1:500@A1	JOB NO.	1617002
DRAWING NO	SK02	REVISION	I
SKETCH SCHEME			
THIS DRAWING IS COPYRIGHT © Western Design Ltd 2016			

Appendix C: Topographical Survey



SITE SURVEY LEGEND

Survey Station		Embankment	
Fence		Power Line	
Hedge		Telecom Line	
FWS		Elec. Main	
SWS		Gas Main	
Water			

[illegible]

FENCE TYPES

BW	Barbed Wire	CW	Chicken Wire
CB	Close Board	IW	Interwoven
CI	Corrugated Iron	IR	Iron Railing
CL	Chain Link	OB	Openboard
CP	Conc Panel	PR	Post and rail
CP	Chestnut Paling	PW	Post and Wire

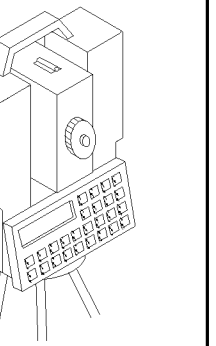
BUILDING SURVEY LEGEND

AHL	Arch Head Level
ASL	Arch Spring Level
BSL	Beam Soffit Level
CL	Cover Level
DL	Door
DHL	Door Head Level
DF	Down Pipe
FL	Floor Level
H	Height
IC	Inspection Chamber
IL	Invert Level
	Level
O/H	Overhead
RSL	Roller Steel Joist
RWP	Rain Water Pipe
SVP	Soil Vent Pipe
TL	Threshold Level
W	Window
WC	Window Cill
WH	Window Head

Floor To Ceiling Height (2.60)

Notes
All information contained in this drawing
(including digital data) should be checked and
verified prior to any fabrication or construction.

Stuart Bailey
Land Surveyor
8 Kings Road
New Haw
Surrey
KT15 3BG
Tel/Fax:
01932 345887

[illegible]

Rev. Affix	Date	Initial	Revision Details		
and operator		Approved By		Date	

Perforator	By			
Swelling		Datum		
SBM. Main Road	Value	5.07		

ient

SEAWARD PROPERTIES

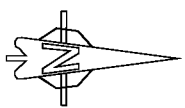
location
BONHAMS FIELD
MAIN ROAD
YAPTON

Drawing Title
SITE SURVEY

Job No. 1651	Old Job No.
Drawing Number 1651/01	

Scale <i>1:200m</i>	Date <i>July 2016</i>
------------------------	--------------------------

Appendix D: Drainage Strategy

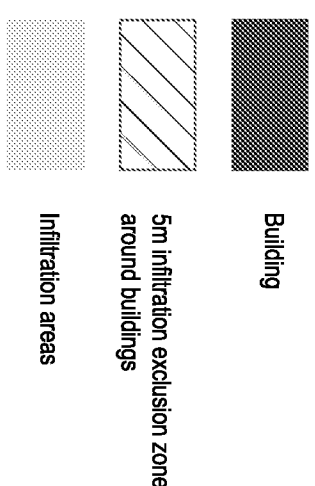


1. The drawings to be read in conjunction with all Engineers' App, Architects' or relevant drawings and specifications.
2. All dimensions and levels are to be picked on site by the contractor prior to preparing any working drawings or commencing on site.
3. The contractor must ensure and will be held responsible for the overall stability of the building structure/excavation at all stages of the work.
4. All work by the contractor must be carried out in such a way that all requirements under the Health and Safety Work Act are satisfied.
5. All work is to be carried out in compliance with the requirements of the relevant statutory authorities and regulations.

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Key:

Rev.	Amendment	Dm	Chld	Date
P01	Masterplan updated	SOM	CR	21.12.16
P00	Drawn	TR	PB	16.12.16

PRELIMINARY **\$0**



CONSTRUCTION CONSULTANTS

116 High Street
 The French Quarter
 Southampton
 SO14 2AA

Tel: 02380 235340
 Fax: 02380 634294
 e-mail: southampton@skeward.com
 web: www.skeward.com

☐ London
☐ Hitchin
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Client **Seaward**

Seaward Properties

Project

Bonhams Field

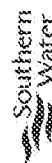
Title									
Housing Development Surface Water Drainage Proposed Strategy									
Reviewed Scheme					Date				
Reviewed Final					Date				
Scales at A1			1:500		Project No.		S168053		
Proposed		Original		Zone		Issued		Type	
Rate		Drainage		Rate		Drainage		Rev.	
YAP AKSW_XX_GF-DR-C_92002_P01									

Appendix E: Extract from Southern Water Sewer Record

SEWER RECORDS PAGE 1 OF 2



497993



The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy.

The actual positions should be determined on site.

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Page 66 of 72

O.S. REF.

SU9703SE

Drawn by: yadavsa

Scale: 1:2500

Date: 30/03/2016

Title: 212480_Bonhams Field, Main Roa

103662

497051

Appendix F: Borehole Locations

TRIAL PIT RECORD:		 TWEEDIE EVANS CONSULTING www.tecon.co.uk info@tecon.co.uk
Project Title: Bonhams Field, Yapton	Trial Pit: TP1	
Project No: 1608013.001	Dates: 6th September 2016	
Client: Seaward Properties Ltd		

Depth (m)	Description	Legend Side B	Depth (m)	Sample Details	Remarks
0.0	Ground Surface		0.00		
0.1	MADE GROUND Brown sandy silt with many rootlets.				
0.4	MADE GROUND Light brown slightly sandy silt with a friable texture and occasional gravel of flint and rare gravel of porcelain and red brick.				
0.8	Stiff light brown slightly sandy slightly clayey SILT with a friable texture and occasional gravel of flint.				PP @ 0.6m = 2.5, 2.5, 2.0, 2.5, 2.75 kg/cm2
1.3	Stiff high strength orangish brown slightly sandy silty CLAY with rare fine to medium gravel of angular to sub-rounded flint.		1.00		HSV @ 1.1m = 80, 90, 85 kPa
2.1	Firm to stiff medium to high strength slightly orangish brown slightly gravelly sandy CLAY. Gravel of fine to coarse angular to rounded flint.				HSV @ 1.4m = 70, 80, 80 kPa
2.4	Soft orangish brown slightly gravelly very sandy CLAY. Gravel of fine sub-angular chalk.		2.00		HSV @ 2.0m = 80, 75, 80 kPa
	Trial Pit Terminated				PP @ 2.3m = 0.75, 0.75, 0.5, 0.5, 0.5 kg/cm2
			3.00		
			4.00		

Excavation Details:		Dimensions:	Notes and Remarks: Soakage test conducted within trial pit.	
Date excavated: 06/09/2016 Date backfilled: 06/09/2016 Plant: JCB 3CX Shoring: N/A Stability: Stable		B: 1.7m A: 0.5m	Water observations: No groundwater was encountered.	
			Logged by: MB	Checked by: CH
			Approved by: RE	

TRIAL PIT RECORD:		 TEC TWEEDIE EVANS CONSULTING www.tecon.co.uk info@tecon.co.uk
Project Title: Bonhams Field, Yapton	Trial Pit: TP2	
Project No: 1608013.001	Dates: 6th September 2016	
Client: Seaward Properties Ltd		

Depth (m)	Description	Legend Side B	Depth (m)	Sample Details	Remarks
0.0	Ground Surface		0.00		
0.1	MADE GROUND Brown sandy silt with many rootlets.				
0.3	MADE GROUND Light orangish brown brown slightly sandy slightly clayey silt with rare gravel of flint and red brick. With a friable texture.				
	Stiff light orangish brown slightly sandy slightly clayey SILT with rare fine gravel of sub-rounded to sub-angular flint. With a friable texture.				PP @ 0.6m = >5, >5, >5, 4.75, >5 kg/cm2
0.8	Firm to stiff medium to high strength orangish brown slightly sandy silty CLAY with occasional fine gravel of sub-angular to sub-rounded chert, and rare flint cobbles.		1.00		HSV @ 1.1m = 70, 90, 90 kPa
1.7					
1.8	Firm to stiff medium to high strength grey and orange mottled slightly sandy CLAY with rare gravel of fine to coarse sub-angular to rounded flint. Occasional black organic remains.				HSV @ 1.75m = 70, 80, 90 kPa
	Soft to firm light orangish brown and white sandy very gravelly CLAY. Gravel of sub-angular chalk and rare angular to rounded flint.		2.00		
			3.00		
3.1	Trial Pit Terminated		4.00		
Excavation Details:		Dimensions:	Notes and Remarks: Soakage test conducted within trial pit.		
Date excavated: 06/09/2016		B: 1.85m			
Date backfilled: 06/09/2016			Water observations: No groundwater was encountered.		
Plant: JCB 3CX					
Shoring: N/A					
Stability: Stable					
			Logged by: MB	Checked by: CH	Approved by: RE

Trial Pit Soakage Test Summary Sheet

BRE Digest 365 (2007) Soakaway Design

Site:	Bonhams Field, Yapton
Test Pit Reference:	TP2/SA2
Site Reference:	1608013.001
Client:	Seaward Properties Ltd
Operator:	ML
Test Date:	6th September 2016

Test 1

Time (min)	Depth (mm bgl)
0	1915
1	1990
2	2056
3	2120
4	2179
5	2223
6	2264
7	2302
8	2346
9	2374
10	2406
12	2460
16	2552
18	2580
22	2611
23	2645
25	2652
28	2661
30	2683
34	2703
36	2723
42	2749
45	2769
50	2774
56	2791
61	2803
66	2820

Test 2

Time (min)	Depth (mm bgl)
0	1755
1	1837
2	1891
3	1958
4	2001
5	2052
7	2174
8	2205
9	2239
10	2278
12	2350
15	2417
22	2554
25	2591
30	2628
36	2660
40	2675
46	2700
53	2721
58	2750
66	2742
72	2750
75	2755
80	2758
85	2762
93	2770

Test 3

Time (min)	Depth (mm bgl)
0	1860
2	1942
3	2010
4	2067
5	2121
6	2150
7	2207
8	2230
9	2263
10	2298
13	2385
15	2431
20	2524
25	2563
31	2621
42	2664
47	2680
64	2700
79	2720
92	2740

Ground Conditions / Comments
Dry. Conducted within sandy gravelly clay with gravel of chalk.

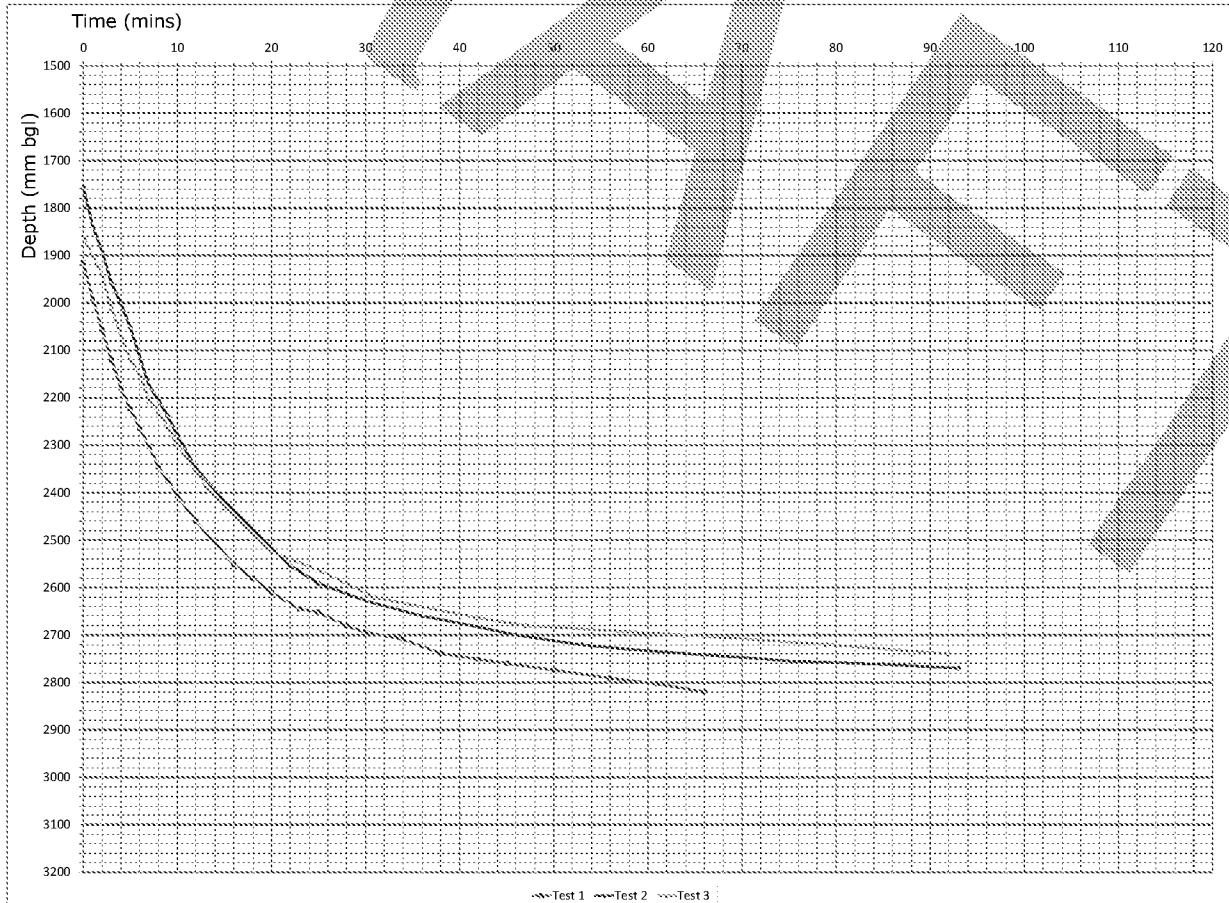
Pit reference	TP2 / SA2
Pit depth (m)	3.015
Pit width (m)	0.50
Pit length (m)	1.85
Depth to standing water (m)	-

	Test 1	Test 2	Test 3
Max. depth (mm)	3015	3015	3015
Effective depth (mm bgl)	1915	1755	1860
Effective drop (mm)	1100	1260	1155
25% effective depth (mm bgl)	2190	2070	2149
50% effective depth (mm bgl)	2465	2385	2438
75% effective depth (mm bgl)	2740	2700	2726

t ₉₅ (min)	4.2	5.5	6
t ₉₀ (min)	40	46	87

V _{avg-25} (m ³)	0.51	0.58	0.53
Q _{avg} (m ³)	3.51	3.89	3.64
t _{avg-25} (min)	36	41	81

Soil Infiltration Rate (m/sec)	6.75E-05	6.17E-05	3.02E-05
Soil Infiltration Rate (mm/hr)	2.43E+02	2.22E+02	1.09E+02



Infiltration calculated to method in BRE Digest 365 (2007) Soakaway Design

BRE Digest 365 (2007) Soakaway Design

[illegible][illegible]

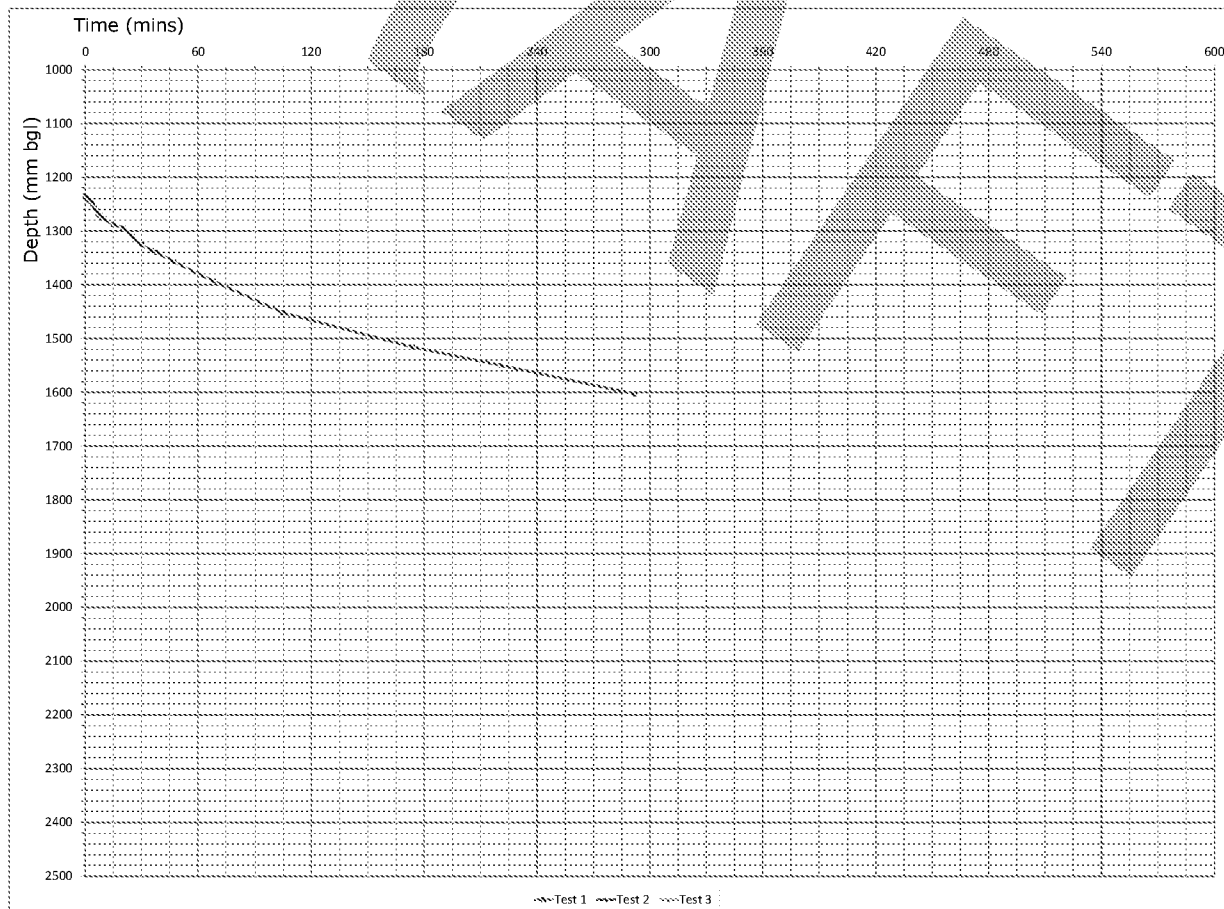
Pit reference	TP175A1
Pit depth (m)	2.50
Pit width (m)	0.50
Pit length (m)	1.70
Depth to standing water (m)	-

	Test 1	Test 2	Test 3
Max. depth (mm)	2500		
Effective depth (mm bgl)	1235		
Effective drop (mm)	1265		
25% effective depth (mm bgl)	1551		
50% effective depth (mm bgl)	1868		
75% effective depth (mm bgl)	2184		

t_{25} (min)	224		
t_{25} (min)			

$V_{075-25} \text{ (m}^3\text{)}$			
$a_{050} \text{ (m}^2\text{)}$			
$t_{075-25} \text{ (min)}$			

Soil Infiltration Rate (m/sec)			
Soil Infiltration Rate (mm/hr)			



Infiltration calculated to method in BRE Digest 365 (2007) Soakaway Design

Appendix G: Surface Water Calculations

Greenfield runoff estimation for sites

Site name: Bonhamms Field
Site location: Yapton

Site coordinates
Latitude: 50.82160° N
Longitude: 0.6157° W

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the CIRIA SUDS Manual (2007). It is not to be used for detailed design of drainage systems. It is recommended that every drainage scheme uses hydraulic modelling software to finalise volume requirements and design details before drawings are produced.

Reference: gcp91gz9m0uu / 3.2
Date: 14 Dec 2016

Site characteristics

Total site area	3.2	ha
Significant public open space	0	ha
Area positively drained	3.2	ha

Methodology

Greenfield runoff method	IH124
Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type
SOIL type	2
HOST class	20
SPR	0.30

Hydrological characteristics

	Default	Edited	
SAAR	741	741	mm
M5-60 Rainfall Depth	20	20	mm
'r' Ratio M5-60/M5-2 day	0.4	0.4	
FEH/FSR conversion factor	0.85	0.85	
Hydrological region	7	7	
Growth curve factor: 1 year	0.85	0.85	
Growth curve factor: 10 year	1.62	1.62	
Growth curve factor: 30 year	2.3	2.3	
Growth curve factor: 100 year	3.19	3.19	

Greenfield runoff rates

	Default	Edited	
Qbar	6.23	6.23	l/s
1 in 1 year	5.30	5.30	l/s
1 in 30 years	14.34	14.34	l/s
1 in 100 years	19.86	19.86	l/s

Please note that a minimum flow of 5 l/s applies to any site

Qbar

26 July 2016
09:06

26/07/2016 09:09 - Screen Clipping

Rural Runoff Calculator

Greenfield Volume

Greenfield Runoff Volume Input

Rainfall Model Return Period (years) 100

Storm Duration (mins) 360

Region England and Wales Area (ha) 3.200

Map M5-60 (mm) 19.200 SAAR (mm) 738

Ratio R 0.341 CWI 109.903

Urban 0.000

Areal Reduction Factor 1.00 SPR 35.210

Calculate

Results

PR% 35.63

Greenfield Runoff Volume (m³) 732.469

OK Cancel Help

Select required Rainfall Model from the list

26/07/2016 09:10 - Screen Clipping

Appendix H: Southern Water Correspondence

Contact info

20 July 2016
14:03

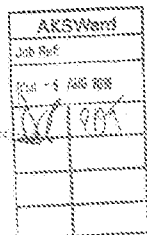
West Sussex CC -	Kevin Brook	Kevin.brook@westsussex.gov.uk
Arun DC	Tom Callaway	Thomas.callaway@arun.gov.uk
LLFA	West Sussex CC & Arun DC	See Kevin Brook
Water Authority	Southern Water	Thomas Clark T. 0330 303 0119 Clark, Thomas <Thomas.Clark@southernwater.co.uk>
Environment Agency	Jonathan Denham	02030 257133 Jonathan.denman@environment-agency.gov.uk
	Tom Baker	
	Adrian Davis	adrian.davies@environment-agency.gov.uk



Southern Water
ter01



Philip O Toole
AKS Ward Ltd
116 High Street
The French Quarter
Southampton
Hampshire
SO14 2AA



Developer Services
Southern Water
Sparrowgrove House
Sparrowgrove
Otterbourne
Hampshire
SO21 2SW

Tel: 0330 303 0119

Email: developerservices@southernwater.co.uk

Your Reference:

Our Reference:
SWS-SUSXW-CC-003045

Date:
8 August 2016

Level 1: Capacity check application for: Bonhams Field, Yapton, West Sussex, BN18 0UX.

Dear Mr. Toole,

We have completed the capacity check for the above development site and the results are as follows:-

Foul capacity check:

There is currently inadequate capacity within the foul sewerage network to accommodate a foul flow of 2.3 l/s at manhole reference SUS7034401. The proposed development would increase flows to the public sewerage system, and existing properties and land may be subject to a greater risk of flooding as a result. Additional off-site sewers, or improvements to existing sewers, will be required to provide sufficient capacity to service the development.

The nearest point where capacity is currently available is at Lidsay WTW which is located approximately 2900 from proposed development site. Rights are not issued for a direct connection to Wastewater Treatment Works. Please note that connection to the WTW will have to be agreed by Southern Water Services before being carried out.

Section 98 of the Water Industry Act 1991 provides a legal mechanism through which the appropriate infrastructure can be requested (by the developer) and provided to drain a specific location. Alternatively, carry out off site reinforcement works in order to provide capacity for the proposed foul flow to be accommodated within the local sewerage system. The extent of the works required to provide capacity for the

Southern Water Sparrowgrove House Otterbourne Winchester Hampshire SO21 2SW www.southernwater.co.uk

Southern Water Services Ltd The French Quarter Southern Water, Vernon Road, Basingstoke, Hampshire, RG24 0PR Registered in England No. 2306000

Please note:

A recent review of Design Standards has been completed and adopted by Southern Water, for all future modelling works.

Modelling procedures have also been reviewed and updated and agreed changes will be used for all future modelling works.

Models continue to be updated and verified on a regular basis.

Southern Water now seeks to simplify its procedures, improve the transparency of such procedures and to make the service it offers to its Customers more in line with their expectations and needs.

This will require some time to implement and will require consultation and liaison with its Customer base.

Pending such review Southern Water is temporarily withdrawing the Level 2 Sewerage Capacity Check offering as from:

22nd August 2016

The capacity check can assist developers in understanding the potential costs and timescales involved in servicing a site prior to land acquisition or the submission of a planning application

The results of the capacity checks are for information only and should not be regarded as an approval or rejection of your proposals.

Further details are contained in our guidance notes. Capacity checks are also available for water.capacity@sw.co.uk

Please complete an application form, then print it out and send your complete submission to:

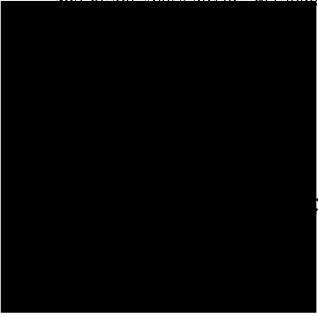
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Otterbourne
Hampshire, SO21 2SW

development site could be obtained via a level 2 Capacity Assessment (Application forms enclosed).

Unfortunately, it may be several years before adequate infrastructure is provided via a prioritised capital expenditure programme. Therefore, this proposed development would be considered premature until such time adequate sewerage infrastructure could be provided.

Before any connections are made to foul and surface sewerage network, an application form needs to be completed and approved by Southern Water Services.

Should you require any further information, please contact us at the above mentioned



local for any design/drawings submitted for the capacity analysis.
ns from the date of issue of this letter.