PROPOSED RESIDENTIAL DEVELOPMENT
SINAH LANE, HAYLING ISLAND
HAVANT

FLOOD RISK ASSESSMENT

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1.0 Executive Summary

Rogers Cory Partnership Limited has prepared this Flood Risk Assessment (FRA) in accordance with the guidance set out in the Department for Communities and Local Government National Planning Policy Framework (NPPF).

This report summarises the methodology and results of the FRA in relation to the planning application for the residential proposal for the erection of 195 dwellings, associated open space, pumping station, sub-station with vehicular access via Sinah Lane and change of use of land from agricultural to a Wader and Brent Geese refuge.

According to data supplied by the Environment Agency (EA), the site lies wholly within Flood Zone 1 considered the lowest risk of flooding from fluvial or tidal sources. This report therefore focuses on the site-specific flood risk assessment and surface water management in line with the requirements of the Environment Agency and Hampshire County Council.

The study will also examine the effects of the development on adjacent parcels of land.

A surface water drainage strategy has been developed and hydraulically modelled incorporating sustainable urban drainage systems (SuDS) in line with the NPPF and EA standing advice. The strategy is based on a reduction in the surface water run-off rates thus ensuring that the development does not increase the risk of flooding from the site during peak storm events.

This report has therefore been prepared in support of a planning application for the residential proposal for the erection of 195 dwellings, associated open space, pumping station, sub-station with vehicular access via Sinah Lane and change of use of land from agricultural to a Wader and Brent Geese refuge

The report also aims to assess potential flood risk sources to and from the site and detail the drainage strategy for implementation on the scheme.

2.0 Introduction

Rogers Cory Partnership Limited have been instructed on behalf of Barratt David Wilson to prepare a Flood Risk Assessment (FRA) and surface water drainage strategy in support of a planning application for the proposed residential development in Hayling Island.

The development site seeks planning permission from the Havant Borough Council for the residential proposal for the erection of 195 dwellings, associated open space, pumping station, sub-station with vehicular access via Sinah Lane and change of use of land from agricultural to a Wader and Brent Geese refuge.

The National Planning Policy Framework (NPPF) was published in March 2012 by the Department of Communities and Local Government and replaced all planning policy statements including Planning Policy Statement 25 (PPS 25): Development and Flood Risk. The NPPF set out the Government's planning policy for England and how these are expected to be applied. The Planning Practice Guidance (PPG), published in March 2014, provides additional guidance and retains key elements of the now superseded PPS 25.

Initial searches into the Environment Agency's (EA) website has identified the development site to lie wholly within flood zone 1, considered to be the lowest risk of flooding from rivers or sea. In this respect requirements in the NPPF (foot note 20) states the following:

'"site-specific flood risk assessment is required for proposals of 1 hectare or greater in Flood Zone 1; all proposals for new development (including minor development and change of use) in Flood Zones 2 and 3, or in an area within Flood Zone 1 which has critical drainage problems (as notified to the local planning authority by the Environment Agency); and where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding."

The EA Guidance Note 3 (April 2012) highlights that a FRA is required to ensure flood risk to the proposed development is considered as well as the impact the development will have elsewhere on people and property. In addition the FRA should consider the risk of flooding from other sources (groundwater, overland flow, sewers).

The PPG sets out the objectives of a site specific FRA as to establish the following:

- *"Whether the proposed development is likely to be affected by current or future flooding from any source;*
- *Whether it will increase flood risk elsewhere;*
- *Whether the measures proposed to deal with these effects and risks are appropriate;*
- *The evidence for the local planning authority to apply (if necessary) the Sequential Test, and;*

- *Whether the development will be safe and pass the Exception Test, if applicable."*

As such this report has been prepared in accordance with the requirements of the NPPF, PPG and EA Guidance.

3.0 Proposed Development Site

3.1 Site Location

The site is located off Sinah Lane within the south western part of Hayling Island. The site is bounded by residential properties to the west and south, open fields and a nature reserve to the north, Hayling Billy Trail and open fields to the east with National Grid reference 470733, 99841 (See **Appendix A**).

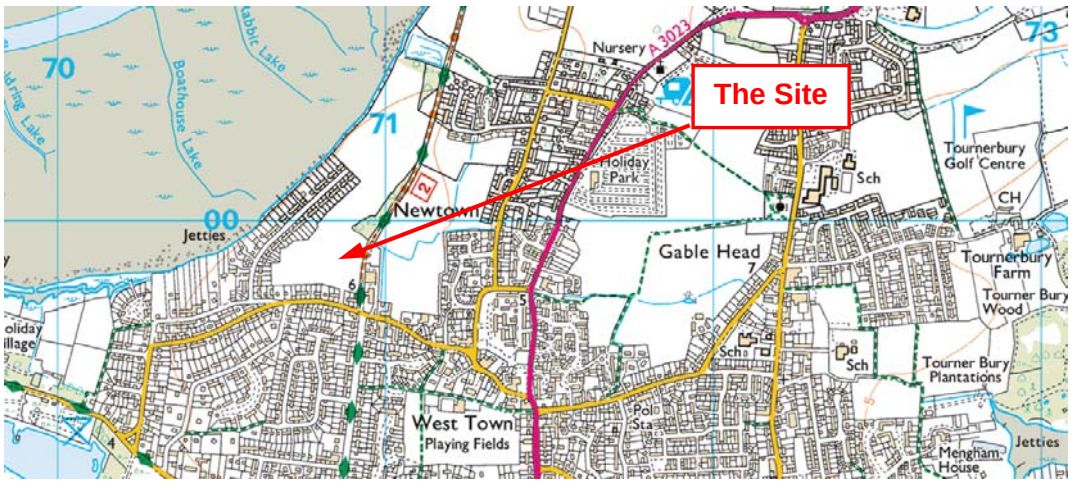


Figure 1- Site Location and Extent

3.2 Existing Topography

A topographical survey was carried out by Siteline in June 2016 and subsequently in April 2017 and May 2018 and is related to Ordinance Survey Datum.

The survey generally shows the site to be relatively flat levels ranging from approximately 5.90mAOD in the south, falling gently northwards to 5.10mAOD (See **Appendix B**).

3.3 Development Proposals

The proposed development comprises of the erection of 195 dwellings, associated open space, pumping station, sub-station with vehicular access via Sinah Lane and change of use of land from agricultural to a Wader and Brent Geese refuge.

3.4 Existing Geological Information

According to existing British Geological Survey (BGS) maps the site is located over the London Clay Formation with a superficial Head deposit consisting of River Terrace Deposits of Sand, Silt and Clay

Intrusive ground investigations carried out by Wilson Bailey in 2015 indicate the in-situ ground as comprising of Topsoil to 0.4-0.65mbgl over a soft brickearth type silty CLAY beneath which a generally medium to coarse sand with variable gravel content to depths of less than 4mbgl and onto stiff grey clay soils of the

London Clay was encountered. Groundwater was encountered at depths of approximately 1.5mbgl and found that the groundwater rest level was at 1.0mbgl with further tidal monitoring indicating that the groundwater is tidally influenced with a variation of between 0.05m to 0.12m. Due to the depth of the groundwater and extent of soft silty Clay, infiltration drainage is deemed inappropriate for this site.

3.5 National Policy Context

National policy regarding flood risk is contained within the National Planning Policy Framework and Technical guidance which was issued by the Department of Communities and Local Government in March 2012.

The Environment Agency's latest revision of their Flood Risk Standing Advised (FRSA) (version 3.1) was released in April 2012.

The Department for Environment, Food and Rural Affairs (DEFRA) released the Non-statutory technical standards for sustainable drainage systems in March 2015. The document sets out non-statutory technical standards for SuDS to be read in conjunction with the NPPF and PPG.

As of the 15th April 2015 the Lead Local Flood Authority (LLFA) has now become a statutory consultee on all major planning applications and as such will assess planning applications in respect of surface water drainage and sustainable drainage systems which was previously the responsibility of the Environment Agency. The LLFA's primary duties will be to ensure that flood risks from surface water run-off, groundwater and ordinary watercourses are identified and managed properly. The use of SuDS will be a material consideration in planning conditions and as such the proposed use of SuDS will need to be demonstrated on all major developments unless it can be demonstrated otherwise.

3.6 Local Planning Policies

As the site is located within Havant any future development would need to accord with the policies set out in the Havant Borough Council Core Strategy (adopted in 2011). The policies most relevant to flooding are CS15

CS15 Flood and Coastal Erosion Risk
Development in areas at risk of flooding now and in the future as identified on the latest Environment Agency flood risk maps and Strategic Flood Risk Assessment climate change maps will only be permitted where:

1. It meets the sequential and exception test (where required) in relation to PPS25.
2. The site is located in a low hazard area as defined in the Strategic Flood Risk Assessment.
3. A site-specific flood risk assessment demonstrates that the development will be safe, including the access, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.
4. The scheme incorporates flood protection, flood resilience and resistance measures appropriate to the character and biodiversity of the area and the specific requirements of the site.

5. Appropriate flood warning and evacuation plans are in place.
6. New site drainage systems are designed taking account of events which exceed the normal design standard.

All development will be required to ensure that there is no net increase in surface water run off. Priority should be given to incorporating Sustainable Drainage Systems (SuDS) to manage surface water drainage, unless it is proven that SuDS are not appropriate. Where SuDs are provided arrangements must be put in place for their whole life management and maintenance.

The council will work with partners to implement the Coastal Policy Zones in the North Solent Shoreline Management Plan to ensure that development avoids areas at risk from coastal erosion and coastal flooding and that areas required to offset coastal squeeze and prevent habitat fragmentation, to allow species to adapt to climate change, are identified and protected from development.

3.7 Existing Flood Defences

The site does not benefit from any existing flood defences.

3.8 NPPF Flood Zone and Vulnerability

The National Planning Policy Framework Table 1 confirms the flood zone Classification based upon the probability of flooding. The site is shown to lie wholly within Flood Zone 1 (low risk of tidal flooding).

Table 2 of the National Planning Policy Framework confirms the 'Flood Risk Vulnerability Classification' of a site, depending on its proposed use. The classification is then applied to Table 3 to determine whether:

- The proposed development is suitable for the flood zone in which it is located
- An Exception Test is required for the proposed development.

The proposed development is classified as 'More Vulnerable' according to the NPPF and suited for the flood zone in which it is located.

4 Flood Risk to the Site

The degree of detail appropriate to an FRA depends upon the scale and potential impact of the proposed development to and from the surrounding boundaries. In this case, the applicant has the intention of re-developing an area of land which is located wholly within Flood Zone 1, considered the lowest risk of flooding from tidal sources.



Figure 2- Extract from EA Website- Flood Map for Planning (Rivers and Sea)

4.1 Strategic Flood Risk Assessment

The National Planning Policy Framework confirms that Regional Planning Bodies (RPBs) or local planning authorities (LPAs) should prepare strategic Flood Risk Assessments (SFRAs) in consultation with the EA. The SFRA is then used to refine information on areas liable to flooding by taking into account other sources of flooding and the impacts associated with climate change in addition to the EA flood map data.

The document informs the Council's policies in the emerging Local Development framework and a strategic approach to the allocation of sites for development and the future management of flood risk, in line with the National Planning Policy Framework.

The Partnership for Urban South Hampshire (PUSH) is made up of 10 local planning authorities within Hampshire. Atkins were commissioned in 2006 to undertake a Strategic Flood Risk Assessment (SFRA), which was divided into two stages.

The first stage of the SFRA included for the collation of data and production of scoping appraisal. This stage also provided a high-level analysis of flood risk within each sub-region. This stage was developed to assist in assessing the feasibility of the PUSH housing allocation.

The second stage of the SFRA involved the production of detailed mapping outputs to assist the Planners and Flood Risk Managers.

4.2 Existing Information on Flooding

Tidal Flood Risk

According to the EA Flood Map, see figure 2, the site appears to be located wholly within Flood Zone 1. As such the site is considered to be at low risk from tidal flooding.

Whist the site lies wholly within Flood Zone 1, it is recognised that vehicular access on and off Hayling Island is only via Langstone Road, located further north of the site (see figure 3). Part of Langstone Road lies within Flood Zone 3 considered a high risk of Tidal Flooding. As a result, early consultation has been carried out with the Environment Agency, East Solent Coastal Partnership, Hampshire County Council and Havant Borough Council regarding flood risk and drainage matters relating to the development. As a result, a Flood Emergency Plan, describing early flood warning and procedures for the development in the event of a peak tidal surge event has been included as part of **Appendix K** which is proposed to be implement to inform and assist future residents in the event of a peak tidal flood event.

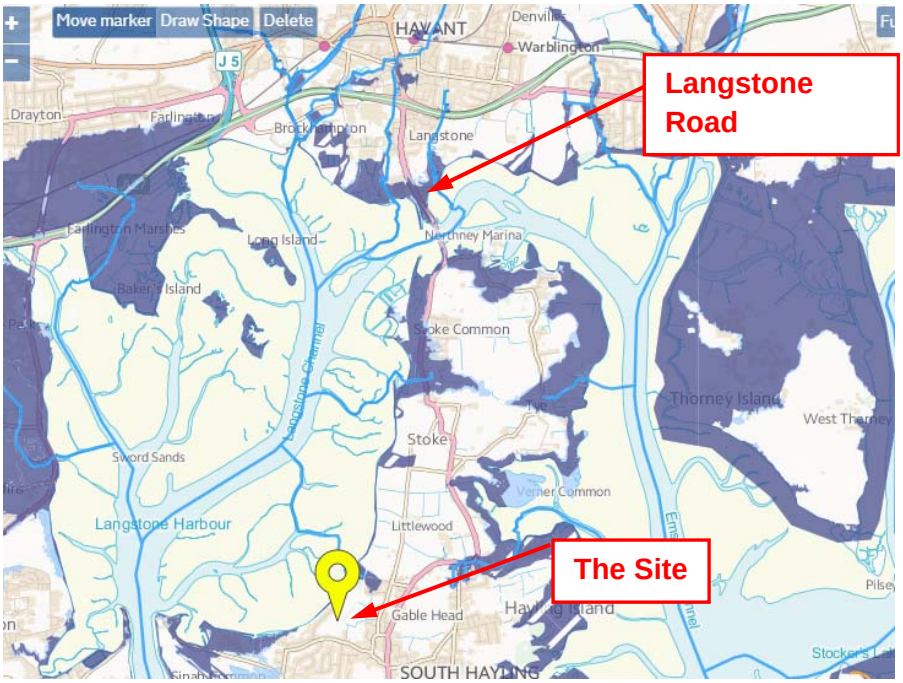


Figure 3- Extract from EA Website- Flood Map for Planning (Rivers and Sea)

Fluvial Flood Risk

The site is located within Flood Zone 1, considered lowest risk of flooding from fluvial sources.

Sewer Flood Risk

There are no recorded incidences of sewer flooding within the vicinity of the site. Any potential future risk to the proposed development from sewer flooding events is considered low in the context that the finished levels on the site will be designed to ensure that any overland flow is directed away from the buildings and not pose a risk to people or property.

Surface Water Flood Risk

Searches of the EA Risk of Flooding from Surface Water flood map confirm that the site lies mainly outside the of any risk of flooding from surface water with exception of areas within the south eastern part which indicate to be a low risk of flooding from surface water (between 0.1% to 1% probability). The areas are reflective of localised low points within the site and the risk to the future development can be mitigated thorough the detailed design of the finished ground levels of the development.

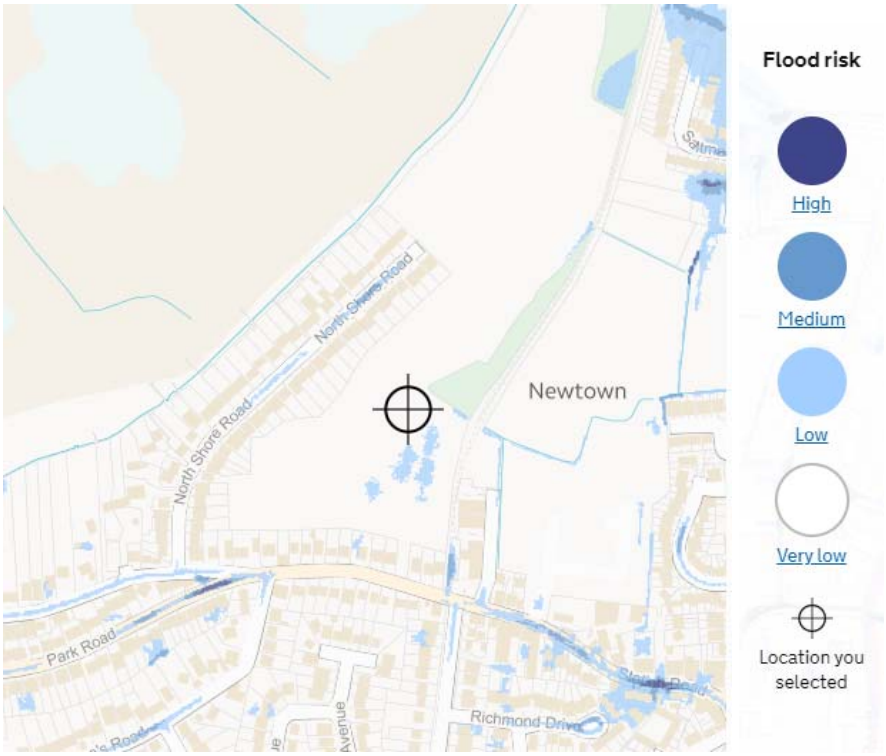


Figure 4 Extract: – Extract from Environment Agency Risk of Surface Water Flood Risk Maps

Groundwater Flood Risk

A review of the groundwater levels indicates that the risk of groundwater flooding to the development is low.

Any potential residual risk to the new development will be mitigated through the detailed design of the finished ground levels which will seek to have building floor levels above the existing ground levels and ensure adequate falls away from the building to protect both building and people.

Flood Warning

The EA's Flood Warning service is aimed to mitigate the impact of flooding for people who live in areas subject to flooding and is available for the areas within the floodplain of the main rivers in England and Wales.

4.3 Climate Change

As of the 19th February 2016, the EA has updated guidance on the application of climate changes allowances for the following:

- peak river flow by river basin district
- peak rainfall intensity
- sea level rise
- offshore wind speed and extreme wave height

Peak river flow allowances are now to be based on River Basin areas thus making them more geographically relevant, based on the range of predicted allowances.

Rainfall – increases in peak rainfall over time is to be assessed on two scenarios to assess the sensitivity of the areas as per table 1 below

Applies across all of England	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Upper end	+10%	+20%	+40%
Central	+5%	+10%	+20%

Table 1: Extract from www.gov.uk website- Table 2 – peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline)

As a conservative approach, a lifetime of the development should be considered of up to 100 years (i.e. up to 2118) when assessing flood risk for residential developments. According to Table 1 above, an increase of 20% to 40% on the peak rainfall intensity should be expected. To mitigate any residual risk at the site as a result of climate change, an appropriate climate change allowance (i.e. 40% increase in rainfall intensity) will therefore be considered and accommodated within the design strategy for managing surface water run-off.

4.4 The Sequential Test

The sequential test approach is aimed to steer new development to areas of lowest probability of flooding. In this regard to determine the suitability and classification of the development, as a check of the proposed scheme, consultation has been made to tables 2 and 3 of the NPPF.

Table 2 of the NPPF technical guidance determines that the proposed development is considered to be a 'more vulnerable' land class usage, in terms of flood risk, as illustrated in Figure 4.

More vulnerable

- Hospitals.
- Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
- Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.
- Non–residential uses for health services, nurseries and educational establishments.
- Landfill and sites used for waste management facilities for hazardous waste[6].
- Sites used for holiday or short-let caravans and camping, *subject to a specific warning and evacuation plan.*[7]

Figure 5: Extract of Table 2: Flood Risk Vulnerability Classification

Table 3 of the NPPF considers sites providing a 'more vulnerable' land-class usage in a Flood Risk Zone 3 area to require the application of the Exception Test, (see Figure 4):

Table 3: Flood risk vulnerability and flood zone 'compatibility'

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	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.

Figure 6: Table 3 - Flood Risk Vulnerability and Flood Zone 'Compatibility'

As the site lies wholly within Flood Zone 1, it is deemed suitable for residential development in terms of flood risk vulnerability.

5 Surface Water Management

Hampshire County Council (HCC) are the Lead local flood Authority for Havant Borough Council and statutory consultee on surface water management on all planning applications within the County.

The surface water management section should ensure that there is no adverse impact on flood risk elsewhere as a result of a change in the surface water runoff regime from the re-development.

A meeting was held with the LLFA on the 7th June 2017 as part of their pre-application process. Details of the key elements of the constraints and opportunities discussed at the meeting are noted below:

- HCC are not averse to the strategy using pumping provided we can demonstrate that this is the only alternative and content that pumping was being proposed, efforts have been made to bring in SuDS to manage the water quality and quantity;
- HCC would expect to see the site discharge to the greenfield run-off rates.

A site meeting and walkover was also carried out with the Havant Borough Council Drainage Engineer on the 14th June 2017, where the route of the existing ditch and outfall was reviewed and recommendations for CCTV drainage surveys to be undertaken on the sections of ordinary watercourse once it entered culverted sections. A copy of the meeting note summarising the key items of the meeting is provided in **Appendix F**. It should be noted that since this meeting, the scheme proposals have developed and the proposed point of discharge from the SuDS scheme is now being taken to another ditch system further north, which drains into a pond and ultimately to a watercourse which discharges into the Sinah Lake.

The drainage strategy has been developed with the above key items in consideration. Infiltration has not been deemed suitable based on the intrusive investigations carried out onsite which indicate a highly silty CLAY geology in conjunction with the high groundwater table.

5.1 Existing Surface Water Drainage Regime

A base line hydrology plan has been produced to review the current surface water run-off from this Greenfield site and into the existing ordinary watercourses along its eastern and northern boundary. This plan is presented as **Appendix G.**

5.2 Pre-Development Run Off

The historic Greenfield run-off rate is based on the IH Report 124 ‘Flood estimation for small catchments’ (Marshall and Bayliss, 1994).

Using the Micro drainage source control suite ICP SuDS methodology the following baseline parameters where used to determine the sites historic Greenfield run off rates:

SAAR (mm): 700

Soil: 0.40

Region 7

Area: 2.913ha (impermeable area of proposed site)

Return Period: 100 Year

The historic Greenfield run-off rates have been summarised in Table 2 below:

Area (Ha)	QBar Urban (L/sec)	Q1 Year (L/Sec)	Q30 Year (L/Sec)	Q100 Year (L/Sec)	Greenfield Run-off Volume (m3)
2.913	**9.9**	8.4	22.5	31.6	661.756

Table 2: Summary of Greenfield runoff rates and volumes

5.3 Design Principles

Key design principles in the following guidance documents steer the approach to managing surface water runoff at sites:

- Building Regulations hierarchy of drainage (H3);
- Interim Code of Practice for SuDS; and
- CIRIA best practice guidance, including the use of the 'SUDS management train'

Building Regulations hierarchy of drainage outlines the preferred methods for the disposal of surface water with infiltration methods being the preferred option. If this is not possible the next favoured option is to drain to an existing watercourse. If neither of these options are feasible, the regulations state that rainwater discharge should be directed to a sewer.

The Interim Code of Practice for SUDS provides guidance about the hydraulic design criteria for Sustainable drainage systems. This in general refers to both peak rate of runoff and the volume of runoff, post development. Prior to mitigation measures such as the use of SuDS attenuation features, both the volume and peak rate of runoff may increase post development.

The design principles for surface water management extend beyond simple hydraulic criteria. CIRIA guidance promotes the use of the SUDS management train, a concept where SUDS techniques are used to treat, convey and store surface water runoff. This approach is considered as part of the SUDS selection methodology.

Sustainable Drainage Systems

To drain the development in a sustainable manner whilst complying with the requirements of the NPPF, the scheme should seek to adopt an appropriate form(s) of sustainable urban drainage systems (SuDS).

SuDS techniques comprise of implementation of infiltration drainage devices to discharge surface water to the underlying soil stratum (where ground conditions permit). These may be in the form of conventional soakaways, infiltration basins and ponds, filter strips, bio-retention areas, swales, permeable surfaces, green roofs, over-sized pipes/tanks or geo-cellular attenuation units.

An additional 40% storage provision should be provided as an allowance for any potential climate change impact (as stated in Table 1: Peak rainfall intensity allowance in small and urban catchment associated with a residential scheme).

The SuDS philosophy is steered to maximize the benefits and minimise the negative impacts of surface water runoff from developed areas. CIRIA C753 The SuDS Manual determines the design criteria for SuDS to be based upon water quantity, water quality, amenity and biodiversity. Table 7.1 of The SuDS Manual assesses each SuDS component to the delivery of the design criteria. Where broadly ranking the SuDS, components depicted in Table 7.2 by applying a score for the deliverance of the design criteria, a theoretical SuDS hierarchy can be determined for the selection of SuDS against the design criteria as represented in Table 3 below.

SuDS in the form of an attenuation ponds, basins and bio-retention areas have been incorporated within the scheme. It has therefore been concluded that the SuDS design criteria as described in the SuDS Manual has been met and accords with current best practice.

SuDS Component	Potential of delivering SuDS Design Criteria
Infiltration Systems	High
Swales	
Bioretention systems	
Pervious Pavements	
Detention Basins	
Trees	
Green Roofs	
Ponds and Wetlands	
Filter Drains	
Filter Strips	
Rainwater Harvesting Systems	
Proprietary Treatment Systems	
Attenuation Storage Tanks	Low

Table 3: Theoretical SuDS Hierarchy

Infiltration Drainage

Intrusive ground investigations carried out indicate that the underlying strata consists of firm clay and silt with low permeability in conjunction with relatively shallow groundwater. As such full infiltration drainage has not been deemed suitable for this site.

Existing Watercourses

There is an existing ditch system located on the eastern boundary of the site, which in turn flows northwards into an existing ordinary watercourse and a final outfall into Sinah Lake.

5.4 Surface Water Drainage Strategy

In view of the requirements of the NPPF, PPG, HCC the design parameters and constraints associated with redeveloping this site, a surface water drainage strategy design has been devised and hydraulically modeled to demonstrate that the scheme can be suitably implemented without increasing the level of flood risk, when the

surface water drainage system experiences a 1:100 year rainfall event (including climate change).

The surface water drainage scheme has been designed to ensure:

- A reduction in the pre-development site discharge for peak storm events.
- Sustainable Urban Drainage systems are wholly incorporated within the scheme.
- Consideration is given for the improvement of water quality within the design.
- The designed drainage scheme can satisfactorily retain a critical 1 in 100 Year storm event with climate change.

Having taken into consideration the above points, a scheme has been devised and hydraulically modelled based on attenuation techniques with a restricted discharge to the existing watercourse at the predevelopment Greenfield run-off rates. A copy of the proposed surface water strategy can be found in **Appendix I**.

5.4.1 Access Roads, Shared Surfaces, Private Drives and Roof Drainage

The proposed run-off from the access roads, drives and parking bays will be conveyed to the new below ground surface water network via trapped gullies. Rainfall run-off from the roofs of the new properties will discharge directly into the below ground surface water network

The surface water network will convey the flows, under gravity, north eastwards towards a new attenuation basin and SuDS swales which will provide attenuation of the restricted flow prior to discharging to an existing ditch system located on the eastern boundary of the site, which in turn flows northwards into an existing ordinary watercourse and a final outfall into Sinah Lake.

Due to the very limited fall available on the site, (approximately 800mm over the entire site) and depth of the proposed outfall ditch, consideration of how to achieve a gravity connection to the existing watercourse system was undertaken whilst still ensuring a sufficient depth of attenuation could be achieved. The following options were considered:

- Raising ground levels to achieve a gravity connection to the ditch in the north- This option was discounted due to the need to raise the ground levels across the site and most significantly along the southern and western boundaries of the site, which was not permitted due to the sensitivities of the ground levels interface with the neighboring properties;
- The use of shallow SuDS drainage techniques, such as swales and lined permeable paving. This option was considered but discounted as the use of shallow SuDS alone would not mitigate the need for a surface water pumping solution, without land raising as well. Furthermore, the proposed roads and

sewers are to be put forward for adoption by HCC and a Local Sewerage Authority, who would not permit the use of a line permeable paving for the conveyance of surface water drainage within the main access roads.

As a result, a surface water pumping solution has been proposed to overcome the limited fall available on the site and a positive gravity connection from the main attenuation basin to the existing watercourse system.

The proposed onsite surface water pumping station is to be offered for adoption as part of an adoptable surface water drainage scheme and thus will become the responsibility of a Local Sewerage Authority.

In addition to the provision of emergency storage, the pumping station has been located in the north eastern part of the site adjacent to the proposed swales and attenuation basin and includes for a provision for exceedance overflow into the basin in the event of a pump failure, thus ensuring flows would continue into the SuDS attenuation systems.

5.4.3 Flow Control

A maximum overall development discharge is proposed to be limited to the greenfield equivalent run-off rates.

The hydraulic calculations have been simulated under various scenarios up to and included the critical 1 in 100 Year storm event with additional 40% allowance for climate change. The simulations confirm that the storm can be managed and maintained within the site without flooding.

The hydraulic model of the proposed surface water network, incorporating the SuDS attenuation systems can be found in **Appendix I**.

Impermeable Development Area (Ha)	**Q1 Year (L/sec)**	**Q30 Year (L/Sec)**	**Q100 Year Plus Climate (L/Sec)**	**Discharge Volume (m3)** (360min Winter)
2.913	9.7	9.9	9.9	359.554

Table 5: Summary of Post Development Runoff with mitigation measures

5.4.4 Water Quality

It is important to address issues with regards to quality when considering surface water management. As the surface water is proposed to be discharge to the existing downstream watercourses, treatment is proposed as part of a SuDS Management Train in accordance with the recommendations of the SuDS Manual (CIRIA 753) and as required by the LLFA.

Chapter 26 of the CIRIA SuDS Manual (2015) provides guidance on methods that should be used to design SuDS to meet the water quality design criteria and good

practice design standards. Diffuse urban pollution is a significant factor in compromising groundwater and receiving water standards that are required under the EA Water Framework Directive. Chapter 4 of the SuDs Manual summarises factors, which influence pollution levels in urban run-off. This summary is presented in **Table 6 below:**

Factors influencing pollution levels in urban run-off
The amount and type of pollution washed off a surface will depend on many things including: • Planning activities on, above and adjacent to the surface that affect the deposition of pollutants, their retention on the surface and the extent to which they are mixed with runoff (including pollution prevention strategies) • Unplanned activities (accidents and spillages) that can cause temporary unexpected high pollution concentrations • The surface location and type, affecting wash-off rates and contaminant movement mechanisms • The drainage path • The length of the dry weather period before the rainfall event • The intensity and the duration of the rainfall, and the associated flow velocities Any further pollutant transformations occurring during residence and conveyance within gullies, chambers, pipe or channel networks, gravels, soils and vegetation and quiescent bodies of water.

Table 6: Extract of Box 4.1 of the SuDS Manual (CIRIA 753)

Table 4.3 of the SuDS Manual classifies the pollution hazard level for residential sites, including residential car parks, low traffic roads as being “low” and thus only requiring a “Simple index approach” in terms of the requirements for the discharge to surface waters, including coasts and estuaries.

The SuDS Manual summarises the steps for the simple index approach:

Step 1 – *Allocated suitable pollution hazard indices for the proposed land use*

Step 2 – *Select SuDS with a total pollution mitigation index that equals or exceeds the pollution index*

Step 3 – *Where the discharge to a protected surface waters or groundwater, consider the need for a more precautionary approach*

The SuDS Manual describes “protected surface waters” as protected surface water resources, which include those designated for drinking water abstraction or for other environmental protection reasons

Table 26.2 of the SuDS manual notes the following pollution hazard indices for residential land use development:

Land Use	Pollution Hazard Level	Total suspended solids (TSS)	Metals	Hydrocarbons
Individual property driveways, residential car parks, low traffic roads (eg. cul-de sacs, home zones and general access roads) and non-residential car parking with infrequent change (eg schools, offices)ie. Less than 300 vehicle movements/day	Low	0.5	0.4	0.4

Figure 7: Extract of Table 26.2 of SuDS Manual (2015)

Table 26.3 of the SuDS Manual provides details of the SuDS pollution mitigation indices for various types of SuDS components

	Mitigation indices		
Type of SuDS component	TSS	Metals	Hydrocarbons
Filter Strip	0.4	0.4	0.5
Filter Drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable Paving	0.7	0.6	0.7
Detention Basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8

Figure 8: Extract of Table 26.3 of SuDS Manual (2015)

As such the total SuDS mitigation index (figure 8) must be greater than the pollution hazard index (figure 6), furthermore when used in combination of two or more SuDS components, a factor of 0.5 is used to account for the reduced performance of the secondary or tertiary components associated with the already reduced inflow of concentration, therefore:

Total SuDS mitigation index = mitigation index$_1$ + 0.5(mitigation index$_2$)

As such all the run-off from the development site is proposed to be conveyed through attenuation basins, bioretention areas and swales thus providing a far greater SuDS mitigation index than what is required to meet the minimum standards.

5.4.5 Long Term Maintenance

Consideration has been given to the long-term maintenance of the proposed drainage structures. SuDS attenuation basins, bio retention areas, granular filter drainage and all associated external pipework, chambers and manholes will be the responsibility of a management company.

A detailed maintenance schedule will be provided by the designers during the detailed design stage of the surface water proposals.

5.4.6 Exceedance

Whilst the drainage system has been designed to a very high standard (1 in 100 Year storm event including climate change), it is possible that a more extreme event will occur and that the design standard for the system will be exceeded. It is best practice to design the drainage system to shed water, primarily into landscaped and other areas, therefore reducing the risk of flooding areas of built development during extreme events.

A strategy for directing overland flows for the site will be confirmed using overland flow modeling as part of the detailed design once key ground levels or development levels across the site have been finalized. Based on the strategic finished floor levels and topographical survey it has however been possible to demonstrate the anticipated exceedance flow routes which can be found in **Appendix J**.

5.4.7 Safe means of access and egress.

A safe means of emergency dry access and egress is proposed from the development site through the proposed access roads to Sinah Lane. A Flood Plan is provided in **Appendix K** which outlines options and procedures for future occupants to consider in the event of a peak tidal surge event should they wish to leave Hayling Island during such occurrence.

6 Foul Water Drainage Strategy

Southern Water Services Limited (SWSL) are the Local Sewerage Authority in this area. The development proposals will seek to discharge to the existing Southern Water public sewer network.

The proposed foul water discharge generated by the site has been calculated at 9.02l/s (based on 195 dwellings at 4000l/dwelling/day) in accordance with Sewers for Adoption 7th Edition.

It should be noted that as of April 2018, under the new Charging Rules for New Connection Services (English Undertakers) published by Ofwat, SWSL has introduced a new Charging Arrangement which includes methods for calculating charges and any Income Offsets and Asset Payments that will apply in relation to the provision of new mains and sewers; provisions of service connections, lateral drawings and waste connections, adoption agreements and diversions.

Under the new Charging Arrangements that SWSL will limit the charge for a New Sewer to the cost of connecting to the nearest reasonably practicable point on the network where the existing sewer is at least the same diameter as the New Sewer that is required to provide the capacity of the development.

The new development parcel will seek to connect to nearest existing Southern Water foul sewer via an onsite adoptable pumping station to the existing 200mm diameter sewer located just north west of the development site, subject to agreement with Southern Water.

Connections to the existing foul sewer can be made under Section 106 of the Water Industry Act 1991. Therefore, an application will need to be made to SWSL to connect to the public sewers. Should any of the onsite foul water networks be offered for adoption, then this will be carried out under Section 104 of the Water Industry Act 1991.

All domestic foul drainage will be designed in accordance with Part H of the Building Regulations.

7 Conclusion

This site-specific flood risk assessment has demonstrated that the development proposals is appropriate in terms of flood risk and the provision of flood mitigation measures.

A preliminary design surface water drainage strategy has been prepared and hydraulically modelled which demonstrates that the redevelopment proposals can be successfully implemented and designed to withstand the impact of a 1:100 year rainfall event (including climate change), in accordance with the NPPF. PPG and HCC requirements

The development's surface water discharge is proposed to be attenuated to the pre-development Greenfield run-off rates through the use of SuDS techniques and re-use of existing resources.

In view of this assessment, the report concludes that:

i. The site is located wholly within Flood Zones 1 considered lowest risk of flooding from Rivers or Sea;

ii. The Development and its occupants are not at an increased risk of flooding;

iii. The Development does not increase the risk of flooding elsewhere;

iv. The Development can be drained in a sustainable manner utilizing SuDS techniques;

v. The Development will satisfactorily manage and maintain a 1 in 100 Year storm event with allowance for climate change

The findings of this report identify the opportunity to promote the sustainable re-use of existing resources and potential to implement an appropriate SUDS strategy.

Appendix (A)

Site Location Plan

NOTES



Rev.	Date	Details	By	Chkd	Appd

Client:-

BARRATT HOMES

Site:-
Sinah Lane
Hayling Island

Drawing Title:-
Site Location Plan

Date: June 2018 | Scales: NTS
Drawn: TRS | Checked: TRS | Approved: TRS

Drawing No.
BSO/E4513/006

FOR INFORMATION ONLY

RCP ARCHITECTURE & CIVIL ENGINEERING
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Architectural and Civil Consultants
The Old School Old School Road
Hook Hampshire RG27 9NJ
T: 01256 769269 E: mail@rcpconsultants.co.uk W: rcpconsultants.co.uk

Appendix (B)

Topographical Survey

TREES

A	Ash
AL	Alder
AP	Apple
B	Beech
C	Cedar
CB	Copper Beech
CH	Cherry
CY	Cypress
E	Elm
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F	Fir
FM	Field Maple
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e.g. OK / 0.6 / 8 / 15

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S□R□EY ST□TIO□S				
□a□e	Easting	□orthing	Height	Ty□e
S1	4□0□6□43□	□□□3□□4□	6.150	□ail
S□	4□0□66.5□□	□□□63□□5	6.04□	□ail
S3	4□0□6□□□□	□□□1□□□□	6.0□□	□ail
S4	4□0□□4□5□	□□□4□□□5	5□41	Peg
S5	4□0□□□5□□	□□□4 830	5□15□	Peg
S6	4□0□□15□0	□□□□□5□□	5.4□□	Peg
S□	4□06□1.840	□□□64.643	5□5□	Peg
S10	4□10□4□4□	1001□□9□□	5.01□	Peg
S11	4□0□61.□□	100□□5□.40	4□□□9	Peg
S13	4□1103.00□	1001□□40□	4□□□9	Peg
EP1	4□0□□4.06□	□□□□4 8□□□	□505	□ail
EP□	4□0□65.□□□	□□□□5□36□	□□□4	□ail
EP3	4□065.□□01	□□□13□340	□□□□	□ail

Revision B - May 2018
Survey extended to north outfall

Revision A - April 2017
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SITE SURVEY	Title
36HX001B - Sheet 1 of 7	Drawing No.
JUNE 2016	Date
1:250 (A0)	Scale
MJR/ST/MJU	Surveyor

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A	Ash
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e.g. OK / 0.6 / 8 / 15

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NORTH SHORE ROAD

S:::R::EY ST::TIO::S

::a::e	Easting	::orthing	Height	Ty::e
S1	4::0::6::43::	::::3::::4::	6:150	::ail
S::	4::0::66.5::	::::63::::5	6:04::	::ail
S3	4::0::6::::::	::::1::::0::	6:0::	::ail
S4	4::0::4::6::	::::4::::5	5::41	Peg
S5	4::0::::::5::	::::4:630	5::5::	Peg
S6	4::0::1:5::0	::::::5:::	5:4::	Peg
S::	4::06::1:440	:::64:643	5::5::	Peg
S10	4::10::4::4::	1001::::0::	5:01::	Peg
S1::	4::0::61::0::	100::::5::40	4::::3	Peg
S13	4::1103:00::	1001::::40::	4::::5	Peg
EP1	4::0::::4:06::	::::::4:6::	::505	::ail
EP::	4::0::65::::::	::::::1:36::	:::::4	::ail
EP3	4::065::::01	::::13:340	:::::1	::ail

Revision B - May 2018
Survey extended to north outfall

Revision A - April 2017
Survey extended to the north

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EP::	4::0::65::::::	::::::3:36:::	::::4	::ail
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Draft

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□a□e	Easting	□orthing	Height	Ty□e
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UTL	Unable to Lift
VP	Vent pipe
WM	Water Meter
WSV	Water Stop Valve

FENCES

BWF	Barbed Wire Fence
CBF	Closed Board Fence
CF	Concrete Post
CPF	Chestnut Paling Fence
CWF	Chicken Wire Fence
IRF	Iron Railing Fence
PKF	Picket Fence
PRF	Post & Rail Fence
PWF	Post & Wire Fence
SCF	Security Fence
SP	Steel Post
WMF	Wire Mesh Fence
WPF	Wood Panel Fence

S::R::EY ST::TIO::S

□a□e	Easting	□orthing	Height	Ty□e
S1	4□0□8□43□	□□□3□□4□	6□150	□ail
S□	4□0□66 5□□	□□□63□□5	6 04□	□ail
S3	4□0□8□	□□□1□□0□	6 0□	□ail
S4	4□0□□4□6□	□□□□4□□5	5□141	Peg
S5	4□0□□□□5□	□□□□4 630	5□25□	Peg
S6	4□0□□1 5□0	□□□□□5□□	5 4□□	Peg
S□	4□06□1 440	□□64 843	5□25□	Peg
S10	4□10□4□4□	1001□□0□□	5 01□	Peg
S1□	4□0□81□0□	100□□5□40	4□□3	Peg
S13	4□1103 00□	1001□□40□	4□□5	Peg
EP1	4□0□□4 06□	□□□□4 6□□	□505	□ail
EP□	4□0□55□□□	□□□□136□	□□□4	□ail
EP3	4□065□□01	□□□1□340	□□□□	□ail

Revision B - May 2018
Survey extended to north outfall
Revision A - April 2017
Survey extended to the north

NOTES:

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BARRATT DAVID WILSON	Client
LAND AT SINAH LANE HAYLING ISLAND HAMPSHIRE	Contract
SITE SURVEY	Title
36HX001B - Sheet 5 of 7	Drawing No.
JUNE 2016	Date
1:250 (A0)	Scale
MJR/ST/MU	Surveyor

TREES

A	Ash
AL	Alder
AP	Apple
B	Beech
C	Cedar
CB	Copper Beech
CH	Cherry
CY	Cypress
E	Elm
EL	Elder
EU	Eucalyptus
F	Fir
FM	Field Maple
FR	Fruit
HZ	Hazel
HC	Horse Chestnut
HO	Holm Oak
HW	Hawthorn
HY	Holly
JM	Japanese Maple
LB	Laburnum
LM	Lime
LO	Locust Tree
LR	Laurel
M	Maple
MG	Magnolia
OK	Oak
P	Pine
PA	Palm
PL	Plane
PM	Plum
PO	Poplar
PP	Pisandii Plum
PR	Pear
R	Redwood
RD	Red Oak
RH	Rhododendron
RO	Rowan
SB	Silver Birch
SC	Sweet Chestnut
SP	Scots Pine
SU	Spruce
SY	Sycamore
U	Unidentified
W	Willow
WN	Walnut
Y	Yew

Species / Dia / Spread (max) / Ht
e.g. OK / 0.6 / 8 / 15

KEY

BT	British Telecom
BOL	Bollard
CB	Control Box
CL	Cover Level
CTV	Cable Television
EL	Electric
EP	Electricity Pole
FH	Fire Hydrant
GSV	Gas Stop Valve
HT	Height
HVC	High Voltage Cable
IC	Inspection Cover
IL	Invert Level
LP	Lamp Post
MH	Man-Hole
MKR	Marker
MW	Monitoring Well
O/H	Overhead
G	Road Gully
PB	Post Box
PC	Pram Crossing
RNP	Road Name Plate
RS	Road Sign
S/A	Soakaway
ST	Stay / Strut
SV	Stop Valve (Unidentified)
TB	Telephone Box
TC	Telecom
TH	Trial Hole
TL	Traffic Light
TP	Telegraph Pole
UTL	Unable to Lift
VP	Vent pipe
WM	Water Meter
WSV	Water Stop Valve

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IRF	Iron Railing Fence
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PRF	Post & Rail Fence
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SCF	Security Fence
SP	Steel Post
WMF	Wire Mesh Fence
WPF	Wood Panel Fence

Revision B - May 2018
Survey extended to north outfall

Revision A - April 2017
Survey extended to the north

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JUNE 2016	Date
1:250 (A0)	Scale
MJR/ST/MU	Surveyor

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E	Elm
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EU	Eucalyptus
F	Fir
FM	Field Maple
FR	Fruit
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HO	Holm Oak
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LR	Laurel
M	Maple
MG	Magnolia
OK	Oak
P	Pine
PA	Palm
PL	Plane
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PP	Pissardii Plum
PR	Pear
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RD	Red Oak
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RO	Rowan
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SY	Sycamore
U	Unidentified
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Y	Yew

Species / Dia / Spread (max) / Ht
e.g. OK / 0.6 / 8 / 15

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Revision B - May 2018
Survey extended to north outfall

Revision A - April 2017
Survey extended to the north

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SITE SURVEY	Title
36HX001B - Sheet 7 of 7	Drawing No.
JUNE 2016	Date
1:250 (A0)	Scale
MJR/ST/MU	Surveyor

Appendix (C)

Feasibility Study – Site Layout Plan

N

Sinah Lane, Hayling Island

idPARTNERSHIP NORTHERN

BDW SOUTHAMPTON

	ha	acres	
GROSS SITE AREA	12.64	31.23	
NETT SITE AREA	4.78	11.85	20-Jun-2018

HOUSE TYPE	BEDROOM/PERSON	DESCRIPTION	STOREYS	NO	MIX	SQ FT	SQ M	TOTAL SQ FT	TOTAL SQ M
Private Mix									
Kersley	2B/4P	Terr/semi	2	31	23	614	57.1	19034	1770.1
Maidstone	3B/5P	Terr / Semi	2	44	32	830	77.1	36520	3392.4
Moresby	3B/5P	Semi / Detached	2	31	23	854	79.4	26474	2461.4
Norbury	3B/6P	Terr / Semi	2.5	11	8	1107	102.9	12177	1131.9
Chester	4B/6P	Detached	2	11	8	1032	95.9	11352	1054.90
Kingsley	4B/6P	Detached	2	9	7	1079	100.3	9711	902.70
			TOTAL	**137**	**100**			**115268**	**10713.40**
Affordable Mix									
HT1	2B/3P	Maisonette	2	6	10	722	67.1	4332	402.6
HT2	2B/3P	Maisonette	2	6	10	825	76.6	4950	459.6
T51	2B/4P	Terr/semi	2	26	45	842	78.3	21892	2035.8
T52	3B/5P	Terr/semi	2	18	31	926	86	16668	1548
T55	3B/5P	Semi	2	2	3	958	89	1916	178
			TOTAL	**58**	**100**			**49758**	**4624**
		OVERALL TOTALS		**195**				**165026**	**15337.40**

OVERALL DENSITY	
UNITS / ha	40.79
UNITS / ACRE	16.46
SQ M / ha	3209
SQ FT / ACRE	13926

PRIVATE MIX	TOTAL	%
2 BED HOUSE/APT	31	23
3 BED HOUSE	86	63
4 BED HOUSE	20	15
	137	100

OVERALL / SHARED OWNERSHIP AFFORDABLE		
BEDS		SOCIAL (%)
1/2 BED	38	66
3 BED	20	34
	58	**100**

NOTE: Nett area and gross area excludes all public open space and associated structural landscaping / buffer planting

SUDS ATTENUATION

NORTH SHORE ROAD

Path

THE ORCHARD

SINAH LANE

Hayling Billy Coastal Path

Drain

Car Park

Theatre

FURNISS WAY

TCB

5.8m

mber 100022432

0 5 10 20 50 metres

Scale 1:500 @ A0

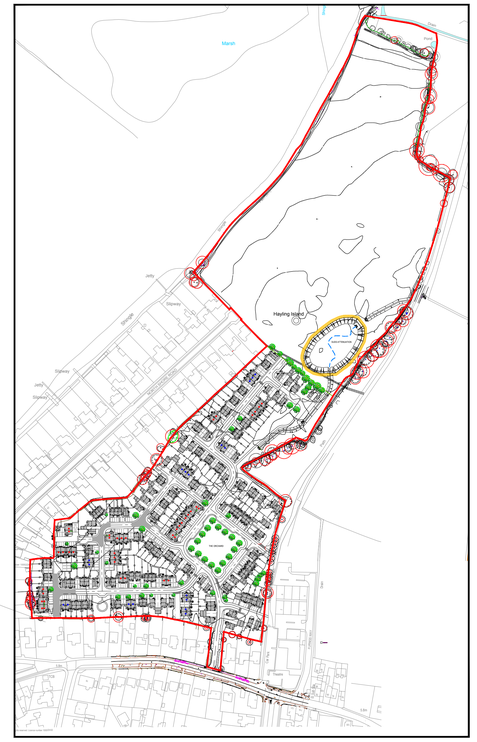
DO NOT SCALE
All dimensions to be checked on site and Architect to be notified of any discrepancies prior to commencement

DESIGNER'S RISK ASSESSMENT
Construction (Design and Management) Regulations 2015
RESIDUAL RISKS:

REF:	DESCRIPTION	DATE:

KEY

- SITE BOUNDARY (The boundary is subject to confirmation by Client.)
- SALES AREA
- AFFORDABLE RENT
- SHARED OWNERSHIP
- PROPOSED TREES
- REMOVED TREES
- EXISTING TREES



OVERALL SITE LAYOUT - n.t.s

BARRATT HOMES

REVISION	DATE	DESCRIPTION	CHECKED

idPARTNERSHIP NORTHERN

ARCHITECTURE | MASTERPLANNING | URBAN DESIGN

IDPartnership Northern, St Jude's, Barker Street, Shieldfield, Newcastle upon Tyne, NE2 1AS
T: +44 (0)191 261 4442 | W: idpartnership.com | E: info@idpartnership-northern.com

JOB / CLIENT: SINAH LANE, HAYLING ISLAND for BARRATT SOUTHAMPTON

DRAWING TITLE: PROPOSED SITE LAYOUT

PROJECT ARCHITECT	DRAWN BY	CHECKED
KD	PH	

SCALE	PROJECT NO.	DRAWING NO.
1: 500 @ A0	N81:2517	SL-02C

DATE: May 2018

DRWG. STATUS: DRAFT | CONSULTATION | TENDER | CONSTRUCTION | RECORD

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Appendix (D)

Geotechnical Information

WILSON BAILEY
GEOTECHNICAL & ENVIRONMENTAL

Borehole No
BH1
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
Sinah Lane Development Site	J16123		WLS
Location: Hayling Island, Hampshire		Level: -	Scale 1:50
Client: BDW Southampton		Dates: 22/09/2014	Logged By DPB

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.30			TOPSOIL
		0.50	D					Firm pale yellowish brown and brown very silty CLAY
		1.00	D					
		1.50	D		1.55			
					1.70			Pale yellowish brown silty very sandy fine to medium flint GRAVEL
					1.85			
		2.00	D					Pale yellowish brown and orange-brown silty SAND
		2.50	D					Yellowish orange-brown and yellowish brown silty SAND with scattered fine to medium flint gravel
	▽	3.00	D					
		3.50	D		3.50			Stiff bluish grey silty sandy CLAY
		4.00	D		4.00			End of Borehole at 4.00 m
			Type	Results				

Remarks: Groundwater encountered at 2.90m.

AGS

WILSON BAILEY
GEOTECHNICAL & ENVIRONMENTAL

Borehole No
BH2
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
Sinah Lane Development Site	J16123		WLS
Location: Hayling Island, Hampshire		Level: -	Scale 1:50
Client: BDW Southampton		Dates: 22/09/2014	Logged By DPB

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.50	D		0.50			TOPSOIL
		1.00	D					Pale yellowish grey brown silty sandy fine to medium flint GRAVEL
	▽	1.50	D		1.40			Pale orange-brown and yellowish brown sandy locally silty clayey SILT
		2.00	D					
		2.50	D		2.60			Stiff dark bluish grey fissured CLAY
		3.00	D					
		3.50	D					
		4.00	D		4.00			End of Borehole at 4.00 m
			Type	Results				

Remarks: Groundwater encountered at 1.80m. Standpipe installed with a response zone from 1.00m to 4.00m.

AGS

WILSON BAILEY
GEOTECHNICAL & ENVIRONMENTAL

Borehole No
BH3
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
Sinah Lane Development Site	J16123		WLS
Location: Hayling Island, Hampshire		Level: -	Scale 1:50
Client: BDW Southampton		Dates: 22/09/2014	Logged By DPB

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		0.25	D		0.30			TOPSOIL
		0.50	D					Firm pale yellowish brown silty sandy CLAY with scattered fine flint gravel
		0.75	D					
		1.00	SPT	N=39				
		1.00	D	(4,10/ 12,11,8,8)	1.10			Pale grey silty sandy fine to medium flint GRAVEL
					1.40			
	▽	1.50	D					Pale grey becoming orange-brown silty SAND with occasional fine flint gravel
		2.00	SPT	N=21				
		2.00	D	(3,6/ 5,6,5,5)				
		2.50	D					
					2.80			Stiff dark bluish grey silty CLAY with claystone at 3.20m.
		3.00	SPT	N=45				
		3.00	D	(1,2/ 2,1,13,29)				
		3.50	D					
		4.00	D		4.00			End of Borehole at 4.00 m
			Type	Results				

Remarks: Groundwater encountered at 1.70m.

AGS

WILSON BAILEY
GEOTECHNICAL & ENVIRONMENTAL

Borehole No
BH4
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
Sinah Lane Development Site	J16123		WLS
Location: Hayling Island, Hampshire		Level: -	Scale 1:50
Client: BDW Southampton		Dates: 22/09/2014	Logged By DPB

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.40			TOPSOIL
		0.50	D					Firm pale brow silty sandy CLAY
		1.00	D					
		1.50	D		1.60			
	▽				1.70			Firm pale grey mottled pale brown silty CLAY
		2.00	D					Pale orange-brown silty sandy fine to medium flint GRAVEL
					2.10			Pale orange-brown silty SAND with abundant fine flint gravel
		2.50	D					
		3.00	D					
		3.50	D		3.60			Stiff dark bluish grey locally silty CLAY
		4.00	D		4.00			End of Borehole at 4.00 m
				Type	Results			

Remarks: Groundwater encountered at 1.80m.

AGS

WILSON BAILEY
GEOTECHNICAL & ENVIRONMENTAL

Borehole No
BH5
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
Sinah Lane Development Site	J16123		WLS
Location: Hayling Island, Hampshire		Level: -	Scale 1:50
Client: BDW Southampton		Dates: 22/09/2014	Logged By DPB

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.25			TOPSOIL
		0.50	D					Firm orange-brown silty sandy CLAY with occasional fine flint gravel
		1.00	D					
					1.30			Orange-brown silty sandy fine to medium flint GRAVEL
	▽	1.50	D					
					1.90			Pale yellowish brown silty SAND
		2.00	D					
		2.50	D					
		3.00	D					
		3.50	D		3.50			Firm pale brown and brown silty sandy CLAY
					3.90			
		4.00	D		4.00			Stiff dark bluish grey silty CLAY
								End of Borehole at 4.00 m
			Type	Results				

Remarks: Groundwater encountered at 1.70m.

AGS

WILSON BAILEY
GEOTECHNICAL & ENVIRONMENTAL

Borehole No
BH6
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
Sinah Lane Development Site	J16123		WLS
Location: Hayling Island, Hampshire		Level: -	Scale 1:50
Client: BDW Southampton		Dates: 22/09/2014	Logged By DPB

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.50	D		0.50			TOPSOIL with abundant fine to medium flint gravel
		1.00	D					"Stiff" pale grey and orange-brown silty sandy CLAY - desiccated
		1.50	D		1.50			Pale grey and brown silty sandy locally clayey fine to medium flint GRAVEL
	▽	2.00	D		2.10			Orange-brown and brown silty locally clayey SAND
		2.50	D					
		3.00	D		3.00			End of Borehole at 3.00 m
			Type	Results				

Remarks: Groundwate encountered at 1.90m.

AGS

WILSON BAILEY
GEOTECHNICAL & ENVIRONMENTAL

Borehole No
BH7
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
Sinah Lane Development Site	J16123		WLS
Location: Hayling Island, Hampshire		Level: -	Scale 1:50
Client: BDW Southampton		Dates: 22/09/2014	Logged By DPB

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		0.25	D		0.25			TOPSOIL
		0.50	D					Firm pale yellowish brown and brown silty sandy CLAY
		0.75	D					
		1.00	SPT	N=28	0.95			Pale brown and pale grey silty sandy fine to medium flint GRAVEL
		1.00	D	(5,9/ 7,7,7,7)				
	▽	1.50	D		1.40			Pale grey locally clayey fine silty SAND with occasional fine rounded flint gravel
		2.00	SPT	N=7				
		2.00	D	(4,4/ 4,2,1,0)				
		2.50	D					
		3.00	SPT	N=7	2.85 3.00			Stiff dark bluish grey silty CLAY
		3.00	D	(1,1/ 1,2,2,2)				End of Borehole at 3.00 m
			Type	Results				

Remarks: Groundwater encountered at 1.70m.

AGS

WILSON BAILEY
GEOTECHNICAL & ENVIRONMENTAL

Borehole No
BH8
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
Sinah Lane Development Site	J16123		WLS
Location: Hayling Island, Hampshire		Level: -	Scale 1:50
Client: BDW Southampton		Dates: 22/09/2014	Logged By DPB

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20			TOPSOIL
		0.50	D					Firm brown silty sandy CLAY
		0.75	D					
		1.00	SPT	N=22	0.90			Pale grey silty sandy fine to medium flint GRAVEL
	▽	1.00	D	(6,9/ 5,5,5,7)	1.20			Orange-brown silty fine SAND with occasional fine flint gravel
		1.50	D					
		2.00	SPT	N=0				
		2.00	D	(2,1/ -,-,-,-)				
		2.50	D		2.60			Stiff dark bluish grey silty CLAY
		3.00	SPT	N=8	3.00			End of Borehole at 3.00 m
		3.00	D	(1,1/ 2,2,2,2)				
			Type	Results				

1 2 3 4 5 6 7 8 9

Remarks: Groundwater encounterd at 1.30m.

AGS

WILSON BAILEY
GEOTECHNICAL & ENVIRONMENTAL

Borehole No
BH9
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
Sinah Lane Development Site	J16123		WLS
Location: Hayling Island, Hampshire		Level: -	Scale 1:50
Client: BDW Southampton		Dates: 22/09/2014	Logged By DPB

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.30			MADE GROUND (reworked topsoil)
		0.50	D					Firm orange-brown and brown silty sandy CLAY
		1.00	D					
					1.20			Orange-brown, pale grey and brown silty sandy fine to medium flint GRAVEL
	▽	1.50	D					
					1.80			Pale orange-brown silty fine SAND with scattered fine flint gravel
		2.00	D					
		2.50	D					
		3.00	D					
					3.40			Stiff dark bluish grey fissured CLAY
		3.50	D					
		4.00	D		4.00			End of Borehole at 4.00 m
				Type / Results				

1 2 3 4 5 6 7 8 9

Remarks: Groundwater encountered at 1.70m. Standpipe installed with a response ezone from 0.50m to 2.5m. Borehole backfilled on completion.

AGS

WILSON BAILEY
GEOTECHNICAL & ENVIRONMENTAL

Borehole No
BH10
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
Sinah Lane Development Site	J16123		WLS
Location: Hayling Island, Hampshire		Level: -	Scale 1:50
Client: BDW Southampton		Dates: 23/09/2016	Logged By DPB

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20			TOPSOIL
		0.50	D					"Stiff" brown silty sandy CLAY - desiccated with roothairs
					0.60			Firm brown becoming pale brown silty locally sandy CLAY
		1.00	D					
	▽	1.50	D					
					1.70			Yellowish bronw silty sandy fine to medium flint GRAVEL
		2.00	D		1.90			Brown and pale brown silty fine SAND with soft clay layers
		2.50	D					
		3.00	D					
		3.50	D					
					3.70			Stiff dark grey very silty CLAY
		4.00	D		4.00			End of Borehole at 4.00 m
				Type	Results			

Remarks: Groundwater encountered at 1.70m.

AGS

WILSON BAILEY
GEOTECHNICAL & ENVIRONMENTAL

Borehole No
BH11
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
Sinah Lane Development Site	J16123		WLS
Location: Hayling Island, Hampshire		Level: -	Scale 1:50
Client: BDW Southampton		Dates: 23/09/2016	Logged By DPB

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.30			TOPSOIL
		0.50	D		0.60			"Stiff" brown silty sandy CLAY with rootlets - desiccated
		1.00	D					Pale brown and yellowish brown silty sandy fine to medium flint GRAVEL
	▽	1.50	D					
		2.00	D		1.85			Pale brown silty SAND with abundant fine flint gravel
		2.50	D					
		3.00	D					
		3.50	D					
		4.00	D		3.85 4.00			Stiff dark bluish grey CLAY End of Borehole at 4.00 m
			Type	Results				

Remarks: Gorundwater encounterd at 1.30m. Standpipe installed with a response zone from 0.50m to 3.00m.

AGS

WILSON BAILEY
GEOTECHNICAL & ENVIRONMENTAL

Borehole No
BH12
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
Sinah Lane Development Site	J16123		WLS
Location: Hayling Island, Hampshire		Level: -	Scale 1:50
Client: BDW Southampton		Dates: 23/09/2016	Logged By DPB

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.25	D		0.25			TOPSOIL
		0.50	D					Soft pale grey and brown mottled sandy CLAY
		1.00	D					
					1.30			
	▽	1.50	D		1.40			Pale grey silty fine SAND
					1.70			Pale grey very silty very sandy scattered fine to medium flint GRAVEL
		2.00	D					Orange-brown and yellowish brown silty fine SAND with scattered fine flint gravel
		2.50	D					
		3.00	D					
		3.50	D					
					3.90			
		4.00	D		4.00			Stiff dark grey very silty CLAY
								End of Borehole at 4.00 m
			Type	Results				

1 2 3 4 5 6 7 8 9

Remarks: Groundwater encountered at 1.70m.

AGS

WILSON BAILEY
GEOTECHNICAL & ENVIRONMENTAL

Borehole No
BH13
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
Sinah Lane Development Site	J16123		WLS
Location: Hayling Island, Hampshire		Level: -	Scale 1:50
Client: BDW Southampton		Dates: 23/09/2016	Logged By DPB

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20			TOPSOIL
		0.50	D					Firm pale brown silty sandy CLAY
		1.00	D		0.90			Pale brown and grey silty sandy clayey fine tto medium flint GRAVEL
	▽	1.50	D		1.50			Pale brown and greyish brown silty fine SAND with scatterd fine flint gravel and occasional pockets of clayey sand
		2.00	D					
		2.50	D					
		3.00	D					
		3.50	D					
					3.70			Dark orange-brown very sandy CLAY
					3.80			
		4.00	D		3.90			Dark orange-brown very sandy CLAY
					4.00			Stiff dark grey CLAY
								End of Borehole at 4.00 m
			Type	Results				

1 2 3 4 5 6 7 8 9

Remarks: Groundwater encountered at 1.60m.

AGS

WILSON BAILEY
GEOTECHNICAL & ENVIRONMENTAL

Borehole No
BH14
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
Sinah Lane Development Site	J16123		WLS
Location: Hayling Island, Hampshire		Level: -	Scale 1:50
Client: BDW Southampton		Dates: 23/09/2016	Logged By DPB

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.30			TOPSOIL
		0.50	D					Firm pale brown silty sandy CLAY
					0.80			
		1.00	SPT	N=60 (10,15/ 13,15,15,17)				Dense brown silty sandy locally clayey fine to medium flint GRAVEL
		1.80	SPT	50 (17,18/ 21,29)	1.80			End of Borehole at 1.80 m
			Type	Results				

Remarks: Sampler terminated in dense gravel at 1.80m.

AGS

WILSON BAILEY
GEOTECHNICAL & ENVIRONMENTAL

Borehole No
BH15
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
Sinah Lane Development Site	J16123		WLS
Location: Hayling Island, Hampshire		Level: -	Scale 1:50
Client: BDW Southampton		Dates: 23/09/2016	Logged By DPB

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.30			TOPSOIL
		0.50	D					Firm brown silty sandy CLAY
		1.00	D					
	▽	1.50	D		1.40			Pale grey and brown mottled silty sandy fine to medium flint GRAVEL
		2.00	D		2.10			Orange-brown silty fine SAND withscattered fine flint gravel and layers of soft very sandy clay
		2.50	D					
		3.00	D					
		3.50	D					
		4.00	D		3.90			Stiff dark grey sandy silty CLAY
					4.00			End of Borehole at 4.00 m
			Type	Results				

Remarks: Groundwater encountered at 1.50m.

AGS

WILSON BAILEY
GEOTECHNICAL & ENVIRONMENTAL

Borehole No
BH16
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
Sinah Lane Development Site	J16123		WLS
Location: Hayling Island, Hampshire		Level: -	Scale 1:50
Client: BDW Southampton		Dates: 23/09/2016	Logged By DPB

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
					0.30			TOPSOIL
		0.50	D					Firm orange-brown and brown silty sandy CLAY
		1.00	D					
	▽	1.50	D		1.60			Orange-brown silty SAND with fine flint gravel
		2.00	D					
		2.50	D					
		3.00	D					
		3.50	D					
		4.00	D		4.00			End of Borehole at 4.00 m
			Type	Results				

1 2 3 4 5 6 7 8 9

Remarks: Groundwater encounterd at 1.60m. Standpipe installed with a response zone from 1.00m to 3.00m. Borehole collapsed to 3.00m.

AGS

WILSON BAILEY
GEOTECHNICAL & ENVIRONMENTAL

Carters Barn
Sherrington
Wiltshire
BA12 0SN

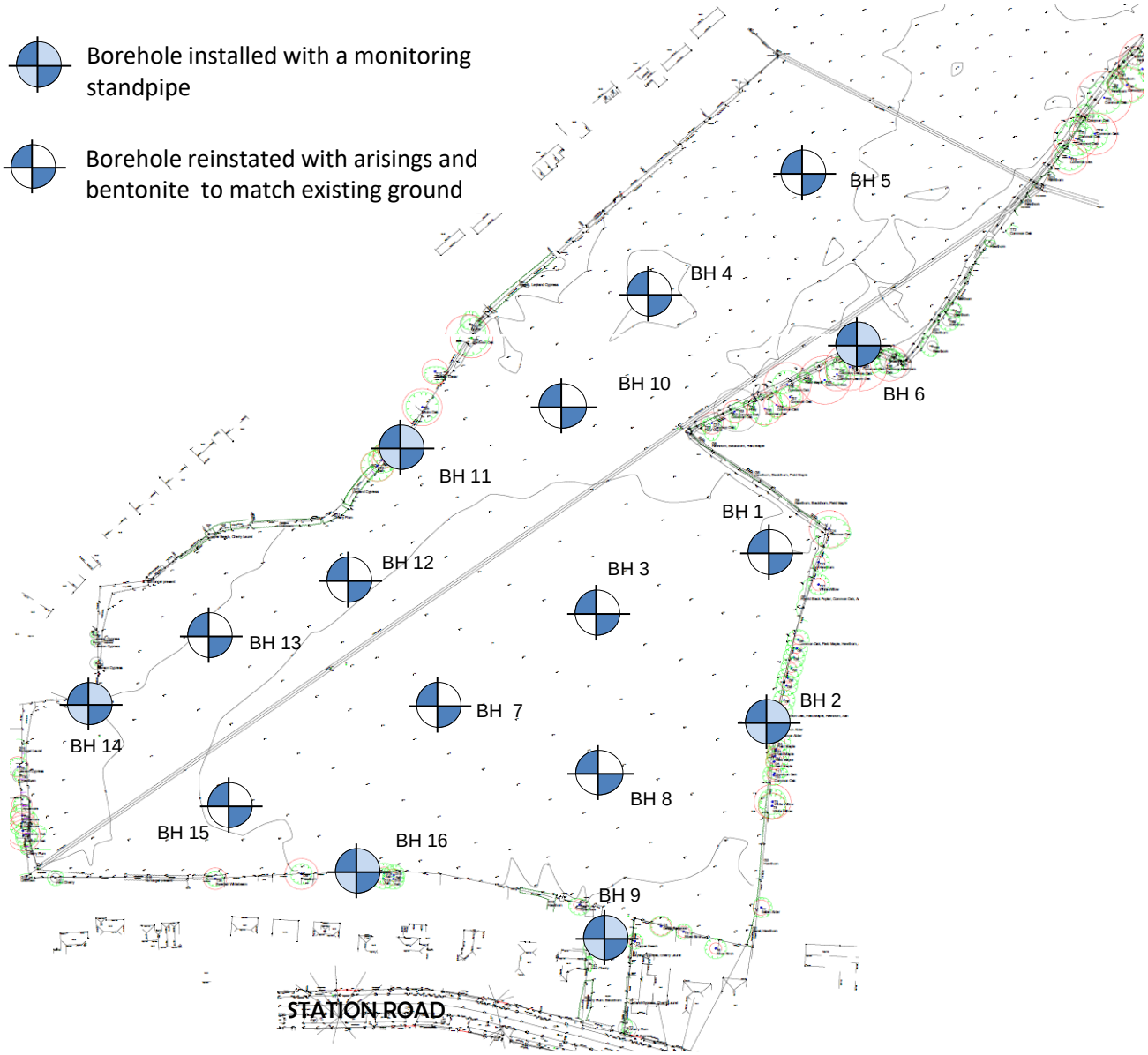
Site Plan

Site Sinah Lane Site, Hayling Island, Hampshire

Client BDW Southampton

Borehole installed with a monitoring standpipe

Borehole reinstated with arisings and bentonite to match existing ground



Winter Water Level Monitoring Records 2017/2018

	BH 2	BH 6	BH 9	BH 11	BH 14	BH 16
09/10/2017	1.79	2.52	1.62	1.66	1.35	0.89
03/11/2017	1.62	2.41	1.62	1.66	1.21	0.92
07/12/2017	1.59	2.23	1.62	1.67	1.11	1.10
10/01/2018	0.48	1.13	1.16	1.00	0.82	0.40
06/02/2018	0.52	1.13	1.22	1.00	0.89	0.52
05/03/2018	0.45	1.13	1.18	1.09	0.91	0.43



Approximate Scale in metres

Sinah Lane Site Plan

Appendix (E)

Environment Agency Correspondence

From:	Karren Johnston
To:	"Maskell, Jon"
Subject:	RE: Sinah Lane, Hayling Island, PO11 0EY - Flooding
Date:	11 May 2017 19:55:38
Attachments:	image001.jpg image002.png image003.jpg

Jon

Thank you for your response.

I have been in touch with the LLFA, but I just wanted to check that there were no special issues relating to Hayling Island that the EA were interested parties to. From your response I note that I should continue to liaise with the LLFA.

Thank you again for your time.

Kind regards,

Karren

Karren Johnston BEng (Hons) CEng MICE
Engineering Associate

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m 07484060847 **w** rcpconsultants.co.uk

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From: Maskell, Jon [mailto:jon.maskell@environment-agency.gov.uk]
Sent: 09 May 2017 16:34
To: Karren Johnston <Karren@rcpconsultants.co.uk>
Subject: RE: Sinah Lane, Hayling Island, PO11 0EY - Flooding

Hello Karren,

Thanks for your email regarding the above site in Havant.

As you have pointed out, the site you are proposing to develop falls within Flood Zone 1 (areas with a low probability of river or sea flooding). In line with Development Management Procedure Order the Environment Agency is not a statutory consultee for development in flood zone 1 and therefore we would not be consulted at the planning stage and therefore not provide any comment to the Local Planning Authority (LPA).

Legally we are only allowed to recover costs for work that we would be statutory on at the planning

stage and therefore I am afraid that we will not be able to provide you with any detailed advice with regards to the site in this instance.

I have however, provided some generic advice that may be of help below:

Access & Egress

Whilst the site itself is not in a high flood risk area (flood zone 2 or 3) it is pertinent to highlight the potentially significant flood risk facing the primary access and egress routes from Hayling Island. This is especially important given the lack of services, such as a hospital available on Hayling. It is for the council to assess the sustainability of development (now and in the future) in this location and ensure that flood risk is a significant part of this. This should include consideration of the flood risk management hierarchy including your preference for either safe access and egress, flood warning and evacuation and / or safe refuge in an extreme flood event. We would recommend that you liaise with Havant Borough Council and their Emergency Planners on this issue.

It is a requirement of the NPPF that any planning application submitted for development that is over 1 hectare in size in Flood Zone 1 is accompanied by a Flood Risk Assessment (FRA). Guidance on the requirements for undertaking a FRA can be found online at:

https://www.gov.uk/guidance/flood-risk-assessment-in-flood-zone-1-and-critical-drainage-areas; and

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/311502/LIT_9193.pdf

Surface Water:

-

Amendments to the Development Management Procedure Order (DMPO) came into effect on 15 April 2015. As a result we are no longer a statutory consultee on 'development of land over 1 hectare' (Para zf of DMPO 2010, Schedule 5) and will therefore no long provide comment on the surface water aspects of these proposals. Please be aware that we are still statutory consultee on any development (other than minor development) in Flood Zones 2 and 3.

Hampshire County Council, as the Lead Local Flood Authority is now statutory consultee for 'Major development with Surface Water Drainage', we therefore recommend that you consult them on this issue.

Kind Regards

Jon

Jon Maskell | Sustainable Places Advisor | Solent and South Downs Area | Environment Planning and Engagement
Environment Agency | Romsey District Office | Canal Walk | Romsey | Hampshire | SO51 7LP

Tel: 020 8474 5888

jon.maskell@environment-agency.gov.uk

We offer a cost recovery service for bespoke pre-application advice. For more information go to: gov.uk or email us

Flood Risk Standing Advice was updated on 15 April 2015. For more information please follow the links below:

For developers: FRSA developers page
For councils: FRSA council's page

Our **climate change allowances** for planning were updated on 19 February 2016. The guidance is accessible here: Flood risk assessment: Climate change allowances

---

From: Karren Johnston [mailto:Karren@rcpconsultants.co.uk]
Sent: 08 May 2017 16:39
To: Maskell, Jon <jon.maskell@environment-agency.gov.uk>
Subject: Sinah Lane, Hayling Island, PO11 0EY - Flooding

Jon,

I've been given your contact details by Terry Seymour.

Our Client is looking to develop the above site with circa 150 residential houses. I have attached a location plan to show where the site is. We are currently undertaking to support the planning application and would like to meet with you to discuss the site and any issues that we may need to deal with from the Environment Agencies point of view. In particular with respect to flood risk and coastal flood risk especially as we are on Hayling Island. The site is shown as being in Flood Zone 1 by the EA flood maps. EA maps also currently show no issue with coastal flooding, although there do seem to be some pockets of surface water flooding on the maps within the site.

Are there any particular issues with regard to the main road access to the island that we need to be aware of?

Is it possible to give me some dates when you are available in the coming weeks so that we can meet with you to discuss the site. Any information that you feel relevant in the meantime regarding the site would be gratefully received. If you need any further information regarding the site then please let me know.

Kind regards,

Karren

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Engineering Associate

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Appendix (F)

Local Authority Correspondence

Sinah Lane, Hayling Island
Meeting / Site Visit Notes

Location: Site off Sinah Lane, Hayling Island

Date: 14th June

Time: 10am

Present: Steve Mountain - Havant Borough council (SM)

Karren Johnston – RCP (KJ)

Purpose: To walk the downstream ditches to establish condition given that this site will discharge at greenfield rate to the existing ditch network.

Notes of Meeting / Walkround:

1. We discussed the lay of the land. RCP to clarify topographical survey levels and include in submission reasons why part of the site cannot fall to the existing sewer in Sinah Lane.

2. Steve Mountain queried the lack of SuDS features amongst the residential units. RCP to include in submission technical note explaining how strategy is arrived at and why on site SuDS features cannot be utilised. Steve also confirmed given his locally knowledge that the ground water was high and had tidal fluctuations.

3. The surface water drainage strategy was discussed. RCP will put together a comprehensive technical note on how the strategy has been arrived at given the lack of SuDS on the development site, but with the use of a pond adjacent the site.

4. SM had a plan from Southern Water showing the wider area from that obtained for the site specific asset search. This has the ditch network, which eventually outfalls to the Southern Water Network.

5. SM suggested that we contact Southern Water to discuss capacity in their piped system to the north of the island. KJ agreed noting item 6 below.

6. It was noted that the greenfield runoff had been calculated and that the site discharge from the pond would be restricted at this rate. This would mean that the runoff from the site would mimic the existing situation. Therefore the discharge in the ditches would not increase and therefore no more capacity required in the Southern Water network.

7. The ditch runs first in a westerly direction under the Hayling Billy Coastal Path before turning North. SM pointed out areas where the existing ditch network floods. These were areas of open common land and did not affect any local residents.

8. SM asked that the developer assess the condition of any piped sections for the downstream ditch system especially that as it leaves the site to cross the Hayling Billy Coastal Path.

9. The ditch runs mainly through open farmed fields, but in the north runs under a property not shown on the plan. The owner of the property confronted us as we were standing in the field looking at the headwall to the rear of his property as he knew the owner of the field. The owner was able to give interesting local knowledge and was comforted when SM told him we were walking the ditches to check they were clear before winter.

10. The owner said that he had recently cleared the ditch at the rear of his property (we could see the matt of grass cutting that he had cleared on the bank) as it was backing up and was in danger of flooding his property which was at a lower level than the field at the rear. SM was encouraged to see that the resident had taken responsibility to clear the ditch. The owner had no objection to a cctv survey of the pipe under his house being carried out with notice being given.

11. The ditch in the front garden was well maintained with gabion walling as it was quite deep. The incoming pipe (under the house) was about 600mm diameter. The outgoing pipe running under the road was also about 600mm diameter.

12. Generally the ditches were 900mm to 1200mm deep, well defined and in good condition. They were overgrown as expected at this time of year, but not overly impeding volume or flow.

Southern Water Asset Plan – Showing Ditch Locations



Appendix (G)

Existing Drainage Regime

ICP SUDS Mean Annual Flood

Input

Return Period (years) 1 SAAR (mm) 700 Urban 0.000
Area (ha) 2.913 Soil 0.400 Region Number Region 7

Results l/s

QBAR Rural 9.9
QBAR Urban 9.9

Q1 year 8.4

Q1 year 8.4
Q30 years 22.5
Q100 years 31.6

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Greenfield Runoff Volume

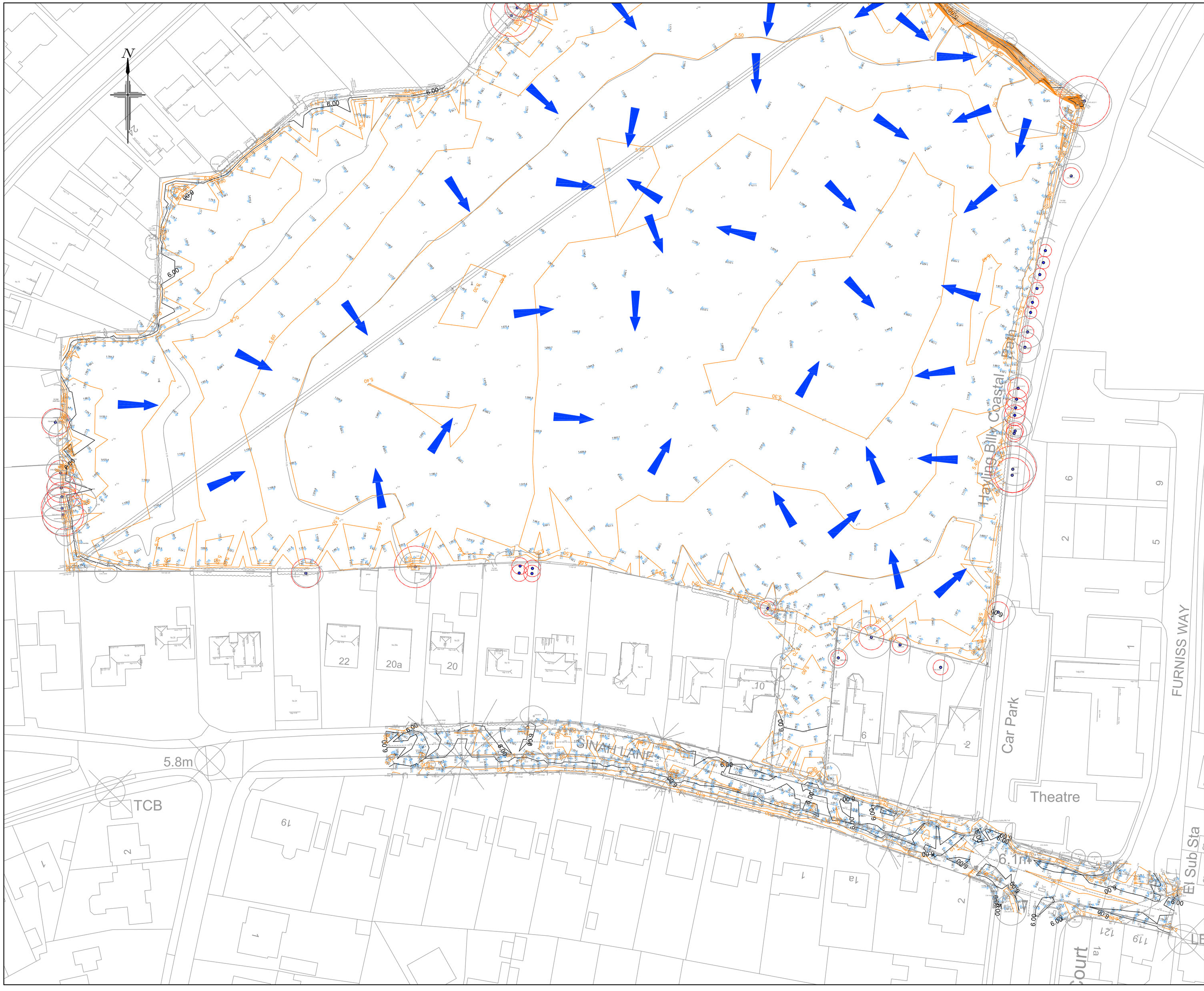
FSR Data

Return Period (years)	100
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	19.000
Ratio R	0.350
Areal Reduction Factor	1.00
Area (ha)	2.913
SAAR (mm)	700
CWI	105.000
Urban	0.000
SPR	37.000

Results

Percentage Runoff (%)	36.04
Greenfield Runoff Volume (m^3)	661.756

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NOTES

1. All dimensions are in metres unless stated otherwise.
2. Do not scale from this drawing. Only written dimensions are to be used.
3. Site layout based on ID Partnership Proposed Site Layout, project number N81:2517, drawing number PL-02 Rev.D17 dated dated 26/06/2019.
4. Topographic Survey as per Siteline Ltd. Site Survey drawing number 36HX001B dated May 2018.
5. Layout review is subject to receipt of finalised layout proposal and the final highway layout design will be subject to the outcome of consultation with Hampshire County Council.
6. Red indicates vehicle moving forward, blue indicates vehicle reversing.

KEY:

Existing flow routes

Existing Ground Level

Existing Ground Fall Arrow and gradient 181.6

Primary Ground Contour 6.000

Secondary Ground Contour 5.850

Root Protection Area (RPA) for Retained Trees
(Refer to ACD Tree Reference Plan drawing number BDWS20660 Revision A dated 25/04/17 for Details)

0m 5m 10m 20m 30m 40m 50m

SCALE BAR 1:500 at A1

Rev.	Date	Details	By	Chkd	Appd
A	28.06.19	Note 2 updated in accordance with rev. D17 of IDP Site Layout.	SRV	TRS	TRS

Client:-

BARRATT HOMES

Site:-
Sinah Lane
Hayling Island

Drawing Title:-
BASELINE HYDROLOGY

SHEET 1 OF 2

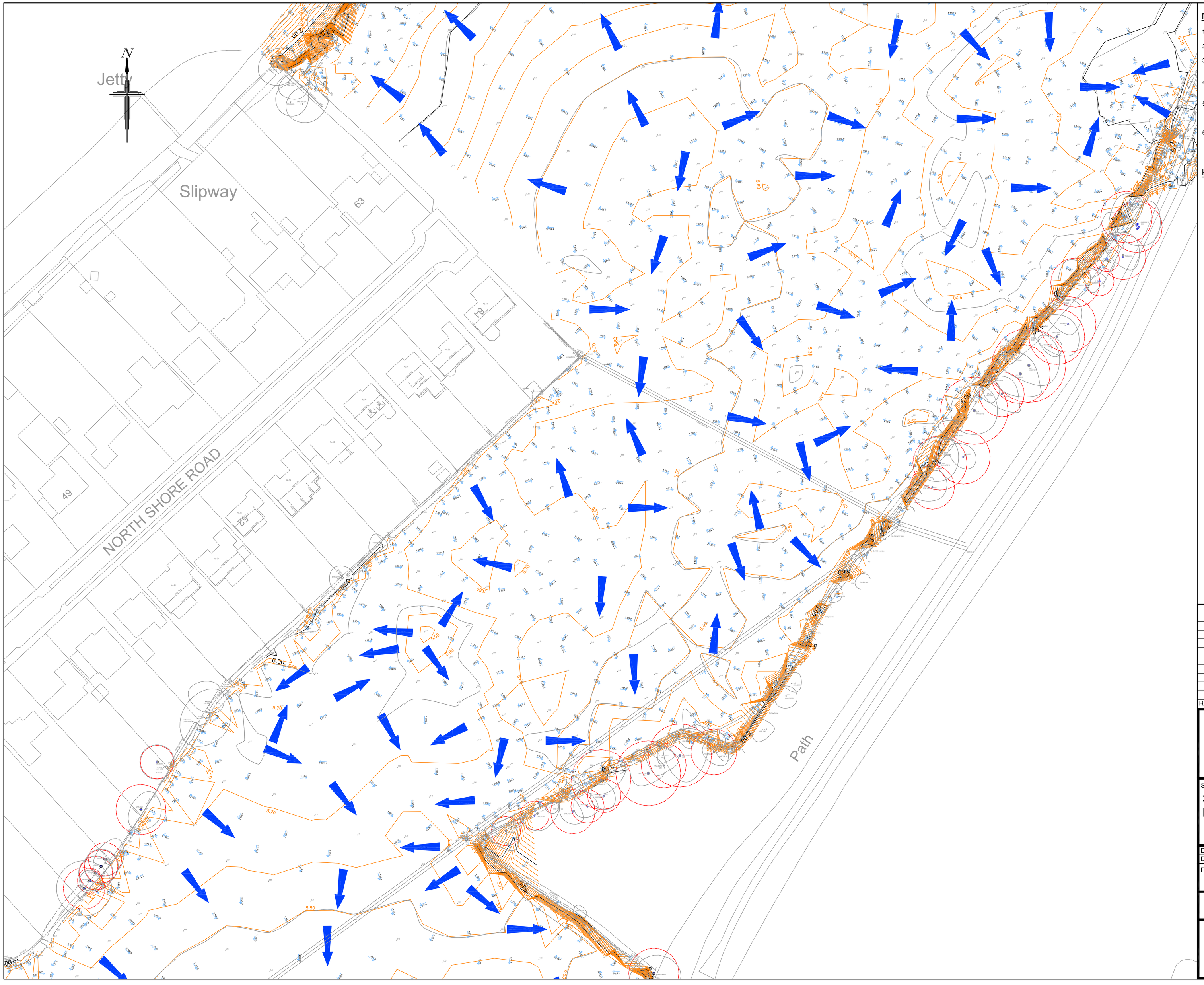
Date: June 2018 | Scales: 1:500 at A1

Drawn: SRV | Checked: TRS | Approved: TRS

Drawing No.
BSO/E4513/024 A

FOR INFORMATION ONLY

RCP ARCHITECTURE & CIVIL ENGINEERING
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Hook Hampshire RG27 9NJ
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NOTES

1. All dimensions are in metres unless stated otherwise.
2. Do not scale from this drawing. Only written dimensions are to be used.
3. Site layout based on ID Partnership Proposed Site Layout, project number N81:2517, drawing number PL-02 Rev.D17 dated dated 26/06/2019.
4. Topographic Survey as per Siteline Ltd. Site Survey drawing number 36HX001B dated May 2018.
5. Layout review is subject to receipt of finalised layout proposal and the final highway layout design will be subject to the outcome of consultation with Hampshire County Council.
6. Red indicates vehicle moving forward, blue indicates vehicle reversing.

KEY:

Existing flow routes

Existing Ground Level

Existing Ground Fall Arrow and gradient

Primary Ground Contour — 6.000

Secondary Ground Contour — 5.850

Root Protection Area (RPA) for Retained Trees
(Refer to ACD Tree Reference Plan drawing number BDWS20660 Revision A dated 25/04/17 for Details)

0m 5m 10m 20m 30m 40m 50m

SCALE BAR 1:500 at A1

Rev.	Date	Details	By	Chkd	Appd
A	28.06.19	Note 2 updated in accordance with rev. D17 of IDP Site Layout.	SRV	TRS	TRS

Client:-

BARRATT HOMES

Site:-
Sinah Lane
Hayling Island

Drawing Title:-
BASELINE HYDROLOGY

SHEET 2 OF 2

Date: June 2018 | Scales: 1:500 at A1

Drawn: SRV | Checked: TRS | Approved: TRS

Drawing No.
BSO/E4513/025 A

FOR INFORMATION ONLY

RCP ARCHITECTURE & CIVIL ENGINEERING
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Appendix (H)

Proposed Surface Water Strategy



NOTES

1. All dimensions are in metres unless stated otherwise.
2. Do not scale from this drawing. Only written dimensions are to be used.
3. Site layout based on ID Partnership Proposed Site Layout, project number N81:2517, drawing number PL-02 Rev.D17 dated dated 26/06/2019.
4. Topographic Survey as per Siteline Ltd. Site Survey drawing number 36HX001B dated May 2018.
5. Level strategy is subject to further design development. Extent of any retaining shown is indicative only and subject to a further detailed review.
6. ***ANY VARIANCE OR DISCREPANCY MUST BE REPORTED BACK TO RCP ENGINEERING BEFORE WORK BEGINS.***

KEY

- Site Boundary
- Proposed Surface Water Sewer (S5)
- Proposed Foul Water Sewer (F5)
- Existing Southern Water Foul Sewer (S5)
- Proposed Foul Water Rising Main
- Area of Public Open Space to be used as localised storage in peak storm events
- Cellular storage tank
- Wehobite (or similar) large diameter storage pipes
- Proposed Headwall
- Proposed Surface Water Swale
- 3.0m Maintenance Easement
- Root Protection Area (RPA) for Retained Trees ***(Refer to ACD Tree Reference Plan drawing number BDWS20660 Revision A dated 25/04/17 for Details)***

Any proposed works within Root Protection Areas are subject to supervision and approval by the Arboriculturist.

CDM NOTES

1. EXISTING SERVICES. Depth of existing services must be determined prior to works commencing. The contractor is responsible for establishing underground services in accordance with HSE Guidance note HS (G) 47. Any services which would be within the proposed construction layers must be lowered to below the sub-base.

0m 5m 10m 20m 30m 40m 50m

SCALE BAR 1:500 at A1

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Rev.	Date	Details	By	Chkd	Appd
B	27.06.19	Updated in accordance with rev. D17 of IDP Site Layout.	SRV	TRS	TRS
A	04.07.18	Updated in accordance with latest IDP Site Layout PL-02A	SRV	VPI	TRS

Client:-

BARRATT HOMES

Site:-
Sinah Lane
Hayling Island

Drawing Title:-
DRAINAGE STRATEGY

SHEET 1 OF 2

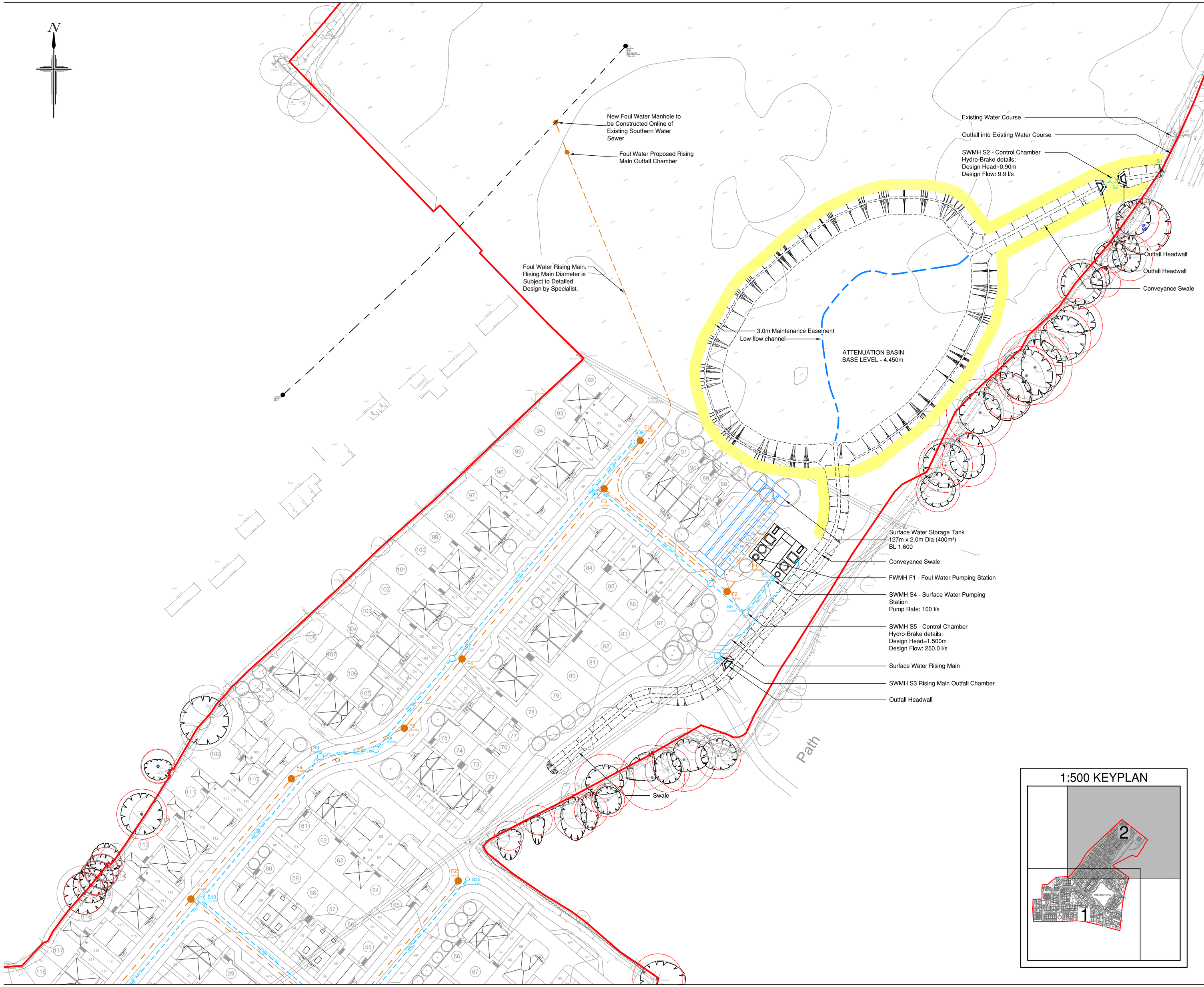
Date:	June 2018	Scales:	1:500 at A1
Drawn:	SRV	Checked: TRS	Approved: TRS

Drawing No.
BSO/E4513/012 B

FOR INFORMATION ONLY

RCP ARCHITECTURE & CIVIL ENGINEERING
Rogers Cory Partnership
Architectural and Civil Consultants
The Old School Old School Road
Hook Hampshire RG27 9NJ
T: 01256 769269 E: mail@rcpconsultants.co.uk W: rcpconsultants.co.uk

1:500 KEYPLAN



NOTES

1. All dimensions are in metres unless stated otherwise.
2. Do not scale from this drawing. Only written dimensions are to be used.
3. Site layout based on ID Partnership Proposed Site Layout, project number N81:2517, drawing number PL-02 Rev.D17 dated dated 26/06/2019.
4. Topographic Survey as per Siteline Ltd. Site Survey drawing number 36HX001B dated May 2018.
5. Level strategy is subject to further design development. Extent of any retaining shown is indicative only and subject to a further detailed review.
6. ***ANY VARIANCE OR DISCREPANCY MUST BE REPORTED BACK TO RCP ENGINEERING BEFORE WORK BEGINS.***

KEY

- Site Boundary
- Proposed Surface Water Sewer
- Proposed Foul Water Sewer
- Existing Southern Water Foul Sewer
- Proposed Foul Water Rising Main
- Area of Public Open Space to be used as localised storage in peak storm events
- Cellular storage tank
- Weholite (or similar) large diameter storage pipes
- Proposed Headwall
- Proposed Surface Water Swale
- 3.0m Maintenance Easement
- Root Protection Area (RPA) for Retained Trees ***(Refer to ACD Tree Reference Plan drawing number BDWS20660 Revision A dated 25/04/17 for Details)***

Any proposed works within Root Protection Areas are subject to supervision and approval by the Arboriculturist.

CDM NOTES

1. EXISTING SERVICES. Depth of existing services must be determined prior to works commencing. The contractor is responsible for establishing underground services in accordance with HSE Guidance note HS (G) 47. Any services which would be within the proposed construction layers must be lowered to below the sub-base.

SCALE BAR 1:500 at A1

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Rev.	Date	Details	By	Chkd	Appd
C	27.06.19	Updated in accordance with rev. D17 of IDP Site Layout.	SRV	TRS	TRS
B	27.07.18	Foul water RM and Outfall added	KK	SV	TRS
A	04.07.18	Updated in accordance with latest IDP Site Layout PL-02A	SRV	VPI	TRS

Client:- BARRATT HOMES

Site:- Sinah Lane Hayling Island

Drawing Title:- DRAINAGE STRATEGY

SHEET 2 OF 2

Date: June 2018 | Scales: 1:500 at A1

Drawn: SRV | Checked: TRS | Approved: TRS

Drawing No. BSO/E4513/013 C

FOR INFORMATION ONLY

1:500 KEYPLAN

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Appendix (I)

MicroDrainage Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for SW1.SWS

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	1.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.350
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for SW1.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	57.895	0.236	245.0	0.067	5.00	0.0	0.600	o	300	Pipe/Conduit	
S1.001	11.519	0.490	23.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.000	16.094	0.198	81.3	0.092	5.00	0.0	0.600	o	300	Pipe/Conduit	
S2.001	11.568	0.082	141.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.002	16.825	0.105	160.2	0.047	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.000	22.770	0.255	89.3	0.050	5.00	0.0	0.600	o	300	Pipe/Conduit	
S3.001	18.026	0.192	93.9	0.064	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.002	13.827	0.056	245.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	13.761	0.056	245.7	0.051	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.004	42.555	0.174	244.6	0.104	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.005	49.813	0.203	245.4	0.053	0.00	0.0	0.600	o	600	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.96	4.089	0.067	0.0	0.0	0.0	1.00	70.7	9.1
S1.001	50.00	6.02	3.853	0.067	0.0	0.0	0.0	3.26	230.1	9.1
S2.000	50.00	5.15	3.643	0.092	0.0	0.0	0.0	1.75	123.4	12.5
S2.001	50.00	5.30	3.445	0.092	0.0	0.0	0.0	1.32	93.4	12.5
S1.002	50.00	6.25	3.363	0.206	0.0	0.0	0.0	1.24	87.6	27.9
S3.000	50.00	5.23	3.761	0.050	0.0	0.0	0.0	1.66	117.7	6.8
S3.001	50.00	5.41	3.506	0.114	0.0	0.0	0.0	1.62	114.7	15.4
S3.002	50.00	5.64	3.314	0.114	0.0	0.0	0.0	1.00	70.7	15.4
S1.003	50.00	6.40	2.958	0.371	0.0	0.0	0.0	1.55	438.0	50.2
S1.004	50.00	6.85	2.902	0.475	0.0	0.0	0.0	1.55	439.0	64.3
S1.005	50.00	7.39	2.728	0.528	0.0	0.0	0.0	1.55	438.3	71.5

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Network Design Table for SW1.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.006	10.976	0.045	243.9	0.035	0.00	0.0	0.600	o	900	Pipe/Conduit	
S4.000	47.472	0.279	170.2	0.233	5.00	0.0	0.600	o	300	Pipe/Conduit	
S4.001	8.018	0.891	9.0	0.063	0.00	0.0	0.600	o	300	Pipe/Conduit	
S5.000	55.875	0.821	68.1	0.194	5.00	0.0	0.600	o	300	Pipe/Conduit	
S1.007	50.146	0.205	244.6	0.057	0.00	0.0	0.600	o	900	Pipe/Conduit	
S6.000	54.542	0.585	93.2	0.165	5.00	0.0	0.600	o	300	Pipe/Conduit	
S7.000	34.712	0.142	245.0	0.072	5.00	0.0	0.600	o	300	Pipe/Conduit	
S7.001	26.954	0.110	245.0	0.095	0.00	0.0	0.600	o	300	Pipe/Conduit	
S6.001	29.602	0.121	244.6	0.118	0.00	0.0	0.600	o	450	Pipe/Conduit	
S6.002	27.626	0.113	244.5	0.133	0.00	0.0	0.600	o	450	Pipe/Conduit	
S8.000	19.293	0.615	31.4	0.082	5.00	0.0	0.600	o	375	Pipe/Conduit	
S6.003	12.339	0.050	246.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S6.004	10.335	0.042	246.1	0.099	0.00	0.0	0.600	o	450	Pipe/Conduit	
S6.005	21.806	0.089	245.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S6.006	12.753	0.052	245.3	0.088	0.00	0.0	0.600	o	450	Pipe/Conduit	
S9.000	48.325	0.197	245.3	0.092	5.00	0.0	0.600	o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.006	50.00	7.48	2.224	0.563	0.0	0.0	0.0	2.00	1273.5	76.2
S4.000	50.00	5.66	3.949	0.233	0.0	0.0	0.0	1.20	85.0	31.6
S4.001	50.00	5.68	3.670	0.296	0.0	0.0	0.0	5.27	372.6	40.1
S5.000	50.00	5.49	3.600	0.194	0.0	0.0	0.0	1.91	134.9	26.3
S1.007	50.00	7.90	2.179	1.110	0.0	0.0	0.0	2.00	1271.7	150.3
S6.000	50.00	5.56	4.260	0.165	0.0	0.0	0.0	1.63	115.1	22.3
S7.000	50.00	5.58	3.927	0.072	0.0	0.0	0.0	1.00	70.7	9.7
S7.001	50.00	6.03	3.785	0.167	0.0	0.0	0.0	1.00	70.7	22.6
S6.001	50.00	6.41	3.525	0.450	0.0	0.0	0.0	1.30	206.0	60.9
S6.002	50.00	6.76	3.404	0.583	0.0	0.0	0.0	1.30	206.1	78.9
S8.000	50.00	5.10	3.981	0.082	0.0	0.0	0.0	3.25	358.4	11.1
S6.003	50.00	6.92	3.291	0.665	0.0	0.0	0.0	1.29	205.1	90.0
S6.004	50.00	7.06	3.241	0.764	0.0	0.0	0.0	1.29	205.4	103.5
S6.005	50.00	7.34	3.199	0.764	0.0	0.0	0.0	1.29	205.9	103.5
S6.006	50.00	7.50	3.110	0.852	0.0	0.0	0.0	1.29	205.8	115.4
S9.000	50.00	5.62	3.255	0.092	0.0	0.0	0.0	1.29	205.7	12.5

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Network Design Table for SW1.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S6.007	58.994	0.633	93.2	0.089	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.008	53.706	0.134	400.0	0.214	0.00	0.0	0.600	o	900	Pipe/Conduit	
S1.009	16.147	0.040	400.0	0.065	0.00	0.0	0.600	o	900	Pipe/Conduit	
S1.010	34.243	0.086	400.0	0.070	0.00	0.0	0.600	o	900	Pipe/Conduit	
S1.011	64.235	0.161	399.0	0.110	0.00	0.0	0.600	o	900	Pipe/Conduit	
S10.000	16.970	1.697	10.0	0.045	5.00	0.0	0.600	o	300	Pipe/Conduit	
S1.012	56.443	0.141	400.0	0.168	0.00	0.0	0.600	o	900	Pipe/Conduit	
S1.013	14.441	0.036	400.0	0.098	0.00	0.0	0.600	o	900	Pipe/Conduit	
S1.014	9.961	0.026	383.1	0.000	0.00	0.0	0.600	o	900	Pipe/Conduit	
S1.015	9.999	0.020	495.0	0.000	0.00	0.0	0.600	o	900	Pipe/Conduit	
S1.016	10.001	0.020	495.0	0.000	0.00	0.0	0.600	o	900	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S6.007	50.00	7.97	3.058	1.033	0.0	0.0	0.0	2.11	335.0	139.9
S1.008	50.00	8.54	1.974	2.357	0.0	0.0	0.0	1.56	992.7	319.2
S1.009	50.00	8.71	1.840	2.422	0.0	0.0	0.0	1.56	992.7	328.0
S1.010	50.00	9.08	1.799	2.492	0.0	0.0	0.0	1.56	992.7	337.4
S1.011	50.00	9.77	1.714	2.602	0.0	0.0	0.0	1.56	994.0	352.3
S10.000	50.00	5.06	3.931	0.045	0.0	0.0	0.0	5.00	353.4	6.1
S1.012	50.00	10.37	1.553	2.815	0.0	0.0	0.0	1.56	992.7	381.2
S1.013	50.00	10.52	1.412	2.913	0.0	0.0	0.0	1.56	992.7	394.5
S1.014	50.00	10.63	1.376	2.913	0.0	0.0	0.0	1.59	1014.5	394.5
S1.015	50.00	10.75	1.350	2.913	0.0	0.0	0.0	1.40	891.6	394.5
S1.016	50.00	10.86	1.330	2.913	0.0	0.0	0.0	1.40	891.6	394.5

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PIPELINE SCHEDULES for SW1.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	300	S18	5.739	4.089	1.350	Open Manhole	1200
S1.001	o	300	S17	5.132	3.853	0.979	Open Manhole	1200
S2.000	o	300	S20	5.293	3.643	1.350	Open Manhole	1200
S2.001	o	300	S19	5.095	3.445	1.350	Open Manhole	1200
S1.002	o	300	S16	5.013	3.363	1.350	Open Manhole	1200
S3.000	o	300	S23	5.411	3.761	1.350	Open Manhole	1200
S3.001	o	300	S22	5.156	3.506	1.350	Open Manhole	1200
S3.002	o	300	S21	4.967	3.314	1.353	Open Manhole	1200
S1.003	o	600	S15	4.843	2.958	1.285	Open Manhole	1500
S1.004	o	600	S14	4.818	2.902	1.316	Open Manhole	1500
S1.005	o	600	S13	5.409	2.728	2.081	Open Manhole	1500
S1.006	o	900	S12	5.600	2.224	2.476	Open Manhole	1800
S4.000	o	300	S25	5.599	3.949	1.350	Open Manhole	1200
S4.001	o	300	S24	5.325	3.670	1.355	Open Manhole	1200
S5.000	o	300	S26	5.250	3.600	1.350	Open Manhole	1200
S1.007	o	900	S11	5.271	2.179	2.192	Open Manhole	1800

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	57.895	245.0	S17	5.132	3.853	0.979	Open Manhole	1200
S1.001	11.519	23.5	S16	5.013	3.363	1.350	Open Manhole	1200
S2.000	16.094	81.3	S19	5.095	3.445	1.350	Open Manhole	1200
S2.001	11.568	141.1	S16	5.013	3.363	1.350	Open Manhole	1200
S1.002	16.825	160.2	S15	4.843	3.258	1.285	Open Manhole	1500
S3.000	22.770	89.3	S22	5.156	3.506	1.350	Open Manhole	1200
S3.001	18.026	93.9	S21	4.967	3.314	1.353	Open Manhole	1200
S3.002	13.827	245.0	S15	4.843	3.258	1.285	Open Manhole	1500
S1.003	13.761	245.7	S14	4.818	2.902	1.316	Open Manhole	1500
S1.004	42.555	244.6	S13	5.409	2.728	2.081	Open Manhole	1500
S1.005	49.813	245.4	S12	5.600	2.525	2.475	Open Manhole	1800
S1.006	10.976	243.9	S11	5.271	2.179	2.192	Open Manhole	1800
S4.000	47.472	170.2	S24	5.325	3.670	1.355	Open Manhole	1200
S4.001	8.018	9.0	S11	5.271	2.779	2.192	Open Manhole	1800
S5.000	55.875	68.1	S11	5.271	2.779	2.192	Open Manhole	1800
S1.007	50.146	244.6	S10	5.393	1.974	2.519	Open Manhole	1800

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PIPELINE SCHEDULES for SW1.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S6.000	o	300	S34	5.910	4.260	1.350	Open Manhole	1200
S7.000	o	300	S36	5.577	3.927	1.350	Open Manhole	1200
S7.001	o	300	S35	5.439	3.785	1.354	Open Manhole	1200
S6.001	o	450	S33	5.324	3.525	1.349	Open Manhole	1350
S6.002	o	450	S32	5.558	3.404	1.704	Open Manhole	1350
S8.000	o	375	S37	5.706	3.981	1.350	Open Manhole	1350
S6.003	o	450	S31	5.584	3.291	1.843	Open Manhole	1350
S6.004	o	450	S30	5.451	3.241	1.760	Open Manhole	1350
S6.005	o	450	S29	5.344	3.199	1.695	Open Manhole	1350
S6.006	o	450	S28	5.117	3.110	1.557	Open Manhole	1350
S9.000	o	450	S38	5.294	3.255	1.589	Open Manhole	1350
S6.007	o	450	S27	5.012	3.058	1.504	Open Manhole	1350
S1.008	o	900	S10	5.393	1.974	2.519	Open Manhole	1800
S1.009	o	900	S9	5.958	1.840	3.218	Open Manhole	1800
S1.010	o	900	S8	6.122	1.799	3.423	Open Manhole	1800
S1.011	o	900	S7	6.390	1.714	3.776	Open Manhole	1800

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S6.000	54.542	93.2	S33	5.324	3.675	1.349	Open Manhole	1350
S7.000	34.712	245.0	S35	5.439	3.785	1.354	Open Manhole	1200
S7.001	26.954	245.0	S33	5.324	3.675	1.349	Open Manhole	1350
S6.001	29.602	244.6	S32	5.558	3.404	1.704	Open Manhole	1350
S6.002	27.626	244.5	S31	5.584	3.291	1.843	Open Manhole	1350
S8.000	19.293	31.4	S31	5.584	3.366	1.843	Open Manhole	1350
S6.003	12.339	246.8	S30	5.451	3.241	1.760	Open Manhole	1350
S6.004	10.335	246.1	S29	5.344	3.199	1.695	Open Manhole	1350
S6.005	21.806	245.0	S28	5.117	3.110	1.557	Open Manhole	1350
S6.006	12.753	245.3	S27	5.012	3.058	1.504	Open Manhole	1350
S9.000	48.325	245.3	S27	5.012	3.058	1.504	Open Manhole	1350
S6.007	58.994	93.2	S10	5.393	2.425	2.518	Open Manhole	1800
S1.008	53.706	400.0	S9	5.958	1.840	3.218	Open Manhole	1800
S1.009	16.147	400.0	S8	6.122	1.799	3.423	Open Manhole	1800
S1.010	34.243	400.0	S7	6.390	1.714	3.776	Open Manhole	1800
S1.011	64.235	399.0	S6	5.961	1.553	3.508	Open Manhole	1800

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PIPELINE SCHEDULES for SW1.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S10.000	o	300	S39	5.783	3.931	1.552	Open Manhole	1200
S1.012	o	900	S6	5.961	1.553	3.508	Open Manhole	1800
S1.013	o	900	S5	6.000	1.412	3.688	Open Manhole	1800
S1.014	o	900	S4	6.000	1.376	3.724	Open Manhole	1800
S1.015	o	900	S3	6.000	1.350	3.750	Open Manhole	1800
S1.016	o	900	S2	6.000	1.330	3.770	Open Manhole	1800

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S10.000	16.970	10.0	S6	5.961	2.234	3.427	Open Manhole	1800
S1.012	56.443	400.0	S5	6.000	1.412	3.688	Open Manhole	1800
S1.013	14.441	400.0	S4	6.000	1.376	3.724	Open Manhole	1800
S1.014	9.961	383.1	S3	6.000	1.350	3.750	Open Manhole	1800
S1.015	9.999	495.0	S2	6.000	1.330	3.770	Open Manhole	1800
S1.016	10.001	495.0	S1	6.000	1.309	3.791	Open Manhole	0

Free Flowing Outfall Details for SW1.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.016	S1	6.000	1.309	0.000	0	0

Simulation Criteria for SW1.SWS

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 5 Number of Storage Structures 4 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.350		

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Online Controls for SW1.SWS

Non Return Valve Manhole: S27, DS/PN: S6.007, Volume (m³): 12.1

Non Return Valve Manhole: S10, DS/PN: S1.008, Volume (m³): 48.6

Hydro-Brake® Optimum Manhole: S5, DS/PN: S1.013, Volume (m³): 46.4

Unit Reference	MD-SHE-0571-2500-1500-2500
Design Head (m)	1.500
Design Flow (l/s)	250.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	571
Invert Level (m)	1.412
Minimum Outlet Pipe Diameter (mm)	Site Specific Design (Contact Hydro International)
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	249.9	Kick-Flo®	1.255	229.0
Flush-Flo™	0.801	249.9	Mean Flow over Head Range	-	192.0

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	13.6	1.200	234.1	3.000	351.0	7.000	532.4
0.200	50.7	1.400	241.6	3.500	378.6	7.500	550.8
0.300	104.9	1.600	257.9	4.000	404.2	8.000	568.6
0.400	167.9	1.800	273.2	4.500	428.3	8.500	585.9
0.500	228.4	2.000	287.7	5.000	451.1	9.000	602.6
0.600	244.7	2.200	301.4	5.500	472.8	9.500	618.9
0.800	249.9	2.400	314.6	6.000	493.5		
1.000	245.9	2.600	327.2	6.500	513.3		

Pump Manhole: S4, DS/PN: S1.014, Volume (m³): 19.8

Invert Level (m) 1.376

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	100.0000	0.900	100.0000	1.700	100.0000	2.500	100.0000
0.200	100.0000	1.000	100.0000	1.800	100.0000	2.600	100.0000
0.300	100.0000	1.100	100.0000	1.900	100.0000	2.700	100.0000
0.400	100.0000	1.200	100.0000	2.000	100.0000	2.800	100.0000
0.500	100.0000	1.300	100.0000	2.100	100.0000	2.900	100.0000
0.600	100.0000	1.400	100.0000	2.200	100.0000	3.000	100.0000
0.700	100.0000	1.500	100.0000	2.300	100.0000		
0.800	100.0000	1.600	100.0000	2.400	100.0000		

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Complex Manhole: S3, DS/PN: S1.015, Volume (m³): 17.0

Depth/Flow Relationship

Invert Level (m) 1.350

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.0000	0.900	0.0000	1.700	0.0000	2.500	0.0000
0.200	0.0000	1.000	0.0000	1.800	0.0000	2.600	0.0000
0.300	0.0000	1.100	0.0000	1.900	0.0000	2.700	0.0000
0.400	0.0000	1.200	0.0000	2.000	0.0000	2.800	0.0000
0.500	0.0000	1.300	0.0000	2.100	0.0000	2.900	0.0000
0.600	0.0000	1.400	0.0000	2.200	0.0000	3.000	0.0000
0.700	0.0000	1.500	0.0000	2.300	0.0000		
0.800	0.0000	1.600	0.0000	2.400	0.0000		

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0145-9900-1000-9900
Design Head (m)	1.000
Design Flow (l/s)	9.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	145
Invert Level (m)	4.350
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	9.9	Kick-Flo®	0.675	8.2
Flush-Flo™	0.305	9.9	Mean Flow over Head Range	-	8.5

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.2	1.200	10.8	3.000	16.7	7.000	25.0
0.200	9.6	1.400	11.6	3.500	17.9	7.500	25.9
0.300	9.9	1.600	12.4	4.000	19.1	8.000	26.7
0.400	9.8	1.800	13.1	4.500	20.2	8.500	27.5
0.500	9.5	2.000	13.7	5.000	21.3	9.000	28.2
0.600	9.1	2.200	14.4	5.500	22.3	9.500	29.0
0.800	8.9	2.400	15.0	6.000	23.2		
1.000	9.9	2.600	15.6	6.500	24.1		

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Storage Structures for SW1.SWS

Tank or Pond Manhole: S14, DS/PN: S1.004

Invert Level (m) 4.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	200.0	0.300	225.0

Tank or Pond Manhole: S38, DS/PN: S9.000

Invert Level (m) 3.300

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	150.0	0.800	150.0	0.801	0.0

Complex Manhole: S5, DS/PN: S1.013

Tank or Pond

Invert Level (m) 1.600

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	400.0	1.000	400.0	1.001	0.0

Tank or Pond

Invert Level (m) 5.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	175.0	0.300	200.0

Tank or Pond Manhole: S3, DS/PN: S1.015

Invert Level (m) 4.450

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2121.0	1.000	3782.0

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW1.SWS

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 5 Number of Storage Structures 4 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	19.000
Region	England and Wales	Ratio R	0.350
Cv (Summer)	0.750		
Cv (Winter)	0.840		

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S18	15 Winter	1	+0%	100/60 Summer				4.160
S1.001	S17	15 Winter	1	+0%	100/30 Winter				3.894
S2.000	S20	15 Winter	1	+0%	100/30 Winter				3.710
S2.001	S19	15 Winter	1	+0%	100/15 Summer				3.526
S1.002	S16	15 Winter	1	+0%	100/15 Summer				3.481
S3.000	S23	15 Winter	1	+0%	100/30 Winter				3.809
S3.001	S22	15 Winter	1	+0%	100/30 Winter				3.579
S3.002	S21	15 Winter	1	+0%	100/15 Winter				3.411
S1.003	S15	15 Winter	1	+0%	100/30 Summer	100/120 Winter			3.108
S1.004	S14	15 Winter	1	+0%	100/30 Summer	100/60 Winter			3.052
S1.005	S13	15 Winter	1	+0%	100/30 Summer				2.883
S1.006	S12	15 Winter	1	+0%	100/30 Summer				2.434
S4.000	S25	15 Winter	1	+0%	100/15 Summer				4.076
S4.001	S24	15 Winter	1	+0%	100/30 Winter				3.747
S5.000	S26	15 Winter	1	+0%	100/30 Winter	100/120 Winter			3.689
S1.007	S11	15 Winter	1	+0%	100/30 Summer	100/120 Winter			2.415
S6.000	S34	15 Winter	1	+0%	100/15 Summer				4.349
S7.000	S36	15 Winter	1	+0%	100/15 Summer				4.002
S7.001	S35	15 Winter	1	+0%	100/15 Summer				3.897
S6.001	S33	15 Winter	1	+0%	30/15 Winter				3.691
S6.002	S32	15 Winter	1	+0%	30/15 Summer				3.599
S8.000	S37	15 Winter	1	+0%	100/15 Summer				4.026
S6.003	S31	15 Winter	1	+0%	30/15 Summer				3.519
S6.004	S30	15 Winter	1	+0%	30/15 Summer				3.483
S6.005	S29	15 Winter	1	+0%	30/15 Summer				3.424
S6.006	S28	15 Winter	1	+0%	30/15 Summer				3.356
S9.000	S38	15 Winter	1	+0%	100/30 Winter				3.311

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW1.SWS

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S18	-0.229	0.000	0.12		8.1	OK	
S1.001	S17	-0.259	0.000	0.05		8.1	OK	
S2.000	S20	-0.233	0.000	0.11		11.6	OK	
S2.001	S19	-0.219	0.000	0.16		11.5	OK	
S1.002	S16	-0.182	0.000	0.33		24.5	OK	
S3.000	S23	-0.252	0.000	0.06		6.3	OK	
S3.001	S22	-0.227	0.000	0.13		13.0	OK	
S3.002	S21	-0.203	0.000	0.23		13.2	OK	
S1.003	S15	-0.450	0.000	0.14		43.0	OK	
S1.004	S14	-0.450	0.000	0.14		53.0	OK	2
S1.005	S13	-0.445	0.000	0.15		57.7	OK	
S1.006	S12	-0.690	0.000	0.09		61.0	OK	
S4.000	S25	-0.173	0.000	0.36		28.7	OK	
S4.001	S24	-0.223	0.000	0.15		35.4	OK	
S5.000	S26	-0.211	0.000	0.19		24.3	OK	
S1.007	S11	-0.664	0.000	0.12		119.2	OK	
S6.000	S34	-0.211	0.000	0.19		20.7	OK	
S7.000	S36	-0.225	0.000	0.14		8.9	OK	
S7.001	S35	-0.189	0.000	0.30		18.8	OK	
S6.001	S33	-0.284	0.000	0.29		51.2	OK	
S6.002	S32	-0.255	0.000	0.36		63.8	OK	
S8.000	S37	-0.330	0.000	0.03		10.3	OK	
S6.003	S31	-0.222	0.000	0.48		71.9	OK	
S6.004	S30	-0.208	0.000	0.56		80.7	OK	
S6.005	S29	-0.225	0.000	0.48		80.7	OK	
S6.006	S28	-0.204	0.000	0.58		88.0	OK	
S9.000	S38	-0.394	0.000	0.03		6.1	OK	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW1.SWS

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S6.007	S27	15 Winter	1	+0%	100/15 Summer				3.235
S1.008	S10	15 Winter	1	+0%	100/15 Summer	100/120 Winter			2.339
S1.009	S9	15 Winter	1	+0%	100/15 Summer				2.235
S1.010	S8	15 Winter	1	+0%	100/15 Winter				2.145
S1.011	S7	15 Winter	1	+0%	100/15 Winter				2.043
S10.000	S39	15 Winter	1	+0%	100/30 Summer				3.958
S1.012	S6	30 Winter	1	+0%	100/15 Summer				1.885
S1.013	S5	30 Winter	1	+0%	30/60 Winter				1.808
S1.014	S4	30 Winter	1	+0%	100/15 Winter				1.517
S1.015	S3	960 Winter	1	+0%	1/15 Summer				4.637
S1.016	S2	960 Winter	1	+0%					1.429

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S6.007	S27	-0.273	0.000	0.33		101.2	OK	
S1.008	S10	-0.535	0.000	0.27		222.0	OK	
S1.009	S9	-0.505	0.000	0.40		222.7	OK	
S1.010	S8	-0.555	0.000	0.30		223.0	OK	
S1.011	S7	-0.571	0.000	0.26		222.9	OK	
S10.000	S39	-0.273	0.000	0.02		5.7	OK	
S1.012	S6	-0.568	0.000	0.26		212.6	OK	
S1.013	S5	-0.504	0.000	0.20		101.4	OK	
S1.014	S4	-0.759	0.000	0.21		100.0	OK	
S1.015	S3	2.387	0.000	0.03		9.7	SURCHARGED	
S1.016	S2	-0.801	0.000	0.03		9.6	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW1.SWS

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 5 Number of Storage Structures 4 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	19.000
Region	England and Wales	Ratio R	0.350
Cv (Summer)	0.750		
Cv (Winter)	0.840		

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S18	15 Winter	30	+0%	100/60 Summer				4.204
S1.001	S17	15 Winter	30	+0%	100/30 Winter				3.919
S2.000	S20	15 Winter	30	+0%	100/30 Winter				3.750
S2.001	S19	15 Winter	30	+0%	100/15 Summer				3.598
S1.002	S16	15 Winter	30	+0%	100/15 Summer				3.575
S3.000	S23	15 Winter	30	+0%	100/30 Winter				3.838
S3.001	S22	15 Winter	30	+0%	100/30 Winter				3.633
S3.002	S21	15 Winter	30	+0%	100/15 Winter				3.487
S1.003	S15	15 Winter	30	+0%	100/30 Summer	100/120 Winter			3.215
S1.004	S14	15 Winter	30	+0%	100/30 Summer	100/60 Winter			3.162
S1.005	S13	15 Winter	30	+0%	100/30 Summer				2.996
S1.006	S12	15 Winter	30	+0%	100/30 Summer				2.668
S4.000	S25	15 Winter	30	+0%	100/15 Summer				4.173
S4.001	S24	15 Winter	30	+0%	100/30 Winter				3.799
S5.000	S26	15 Winter	30	+0%	100/30 Winter	100/120 Winter			3.745
S1.007	S11	15 Winter	30	+0%	100/30 Summer	100/120 Winter			2.659
S6.000	S34	15 Winter	30	+0%	100/15 Summer				4.405
S7.000	S36	15 Winter	30	+0%	100/15 Summer				4.073
S7.001	S35	15 Winter	30	+0%	100/15 Summer				4.046
S6.001	S33	15 Winter	30	+0%	30/15 Winter				4.004
S6.002	S32	15 Winter	30	+0%	30/15 Summer				3.957
S8.000	S37	15 Winter	30	+0%	100/15 Summer				4.055
S6.003	S31	15 Winter	30	+0%	30/15 Summer				3.882
S6.004	S30	15 Winter	30	+0%	30/15 Summer				3.825
S6.005	S29	15 Winter	30	+0%	30/15 Summer				3.717
S6.006	S28	15 Winter	30	+0%	30/15 Summer				3.613
S9.000	S38	15 Winter	30	+0%	100/30 Winter				3.353

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW1.SWS

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S18	-0.185	0.000	0.30		19.8	OK	
S1.001	S17	-0.233	0.000	0.11		19.8	OK	
S2.000	S20	-0.193	0.000	0.27		28.4	OK	
S2.001	S19	-0.147	0.000	0.39		28.0	OK	
S1.002	S16	-0.088	0.000	0.83		61.9	OK	
S3.000	S23	-0.223	0.000	0.15		15.4	OK	
S3.001	S22	-0.173	0.000	0.37		36.4	OK	
S3.002	S21	-0.127	0.000	0.62		36.0	OK	
S1.003	S15	-0.343	0.000	0.37		113.1	OK	
S1.004	S14	-0.340	0.000	0.38		143.8	OK	2
S1.005	S13	-0.332	0.000	0.40		154.9	OK	
S1.006	S12	-0.456	0.000	0.22		156.4	OK	
S4.000	S25	-0.076	0.000	0.88		70.4	OK	
S4.001	S24	-0.171	0.000	0.38		89.1	OK	
S5.000	S26	-0.155	0.000	0.46		59.3	OK	
S1.007	S11	-0.420	0.000	0.30		304.5	OK	
S6.000	S34	-0.155	0.000	0.46		50.0	OK	
S7.000	S36	-0.154	0.000	0.33		21.4	OK	
S7.001	S35	-0.039	0.000	0.76		48.6	OK	
S6.001	S33	0.029	0.000	0.64		114.0	SURCHARGED	
S6.002	S32	0.103	0.000	0.80		139.6	SURCHARGED	
S8.000	S37	-0.301	0.000	0.08		25.3	OK	
S6.003	S31	0.141	0.000	1.07		161.4	SURCHARGED	
S6.004	S30	0.134	0.000	1.27		182.6	SURCHARGED	
S6.005	S29	0.068	0.000	1.07		181.3	SURCHARGED	
S6.006	S28	0.053	0.000	1.31		199.0	SURCHARGED	
S9.000	S38	-0.352	0.000	0.07		13.8	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW1.SWS

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S6.007	S27	15 Winter	30	+0%	100/15 Summer				3.341
S1.008	S10	15 Winter	30	+0%	100/15 Summer	100/120 Winter			2.624
S1.009	S9	15 Winter	30	+0%	100/15 Summer				2.531
S1.010	S8	60 Winter	30	+0%	100/15 Winter				2.386
S1.011	S7	60 Winter	30	+0%	100/15 Winter				2.379
S10.000	S39	15 Winter	30	+0%	100/30 Summer				3.972
S1.012	S6	60 Winter	30	+0%	100/15 Summer				2.370
S1.013	S5	60 Winter	30	+0%	30/60 Winter				2.355
S1.014	S4	60 Winter	30	+0%	100/15 Winter				2.064
S1.015	S3	720 Winter	30	+0%	1/15 Summer				4.895
S1.016	S2	240 Summer	30	+0%					1.429

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S6.007	S27	-0.167	0.000	0.71		218.5	OK	
S1.008	S10	-0.250	0.000	0.64		526.5	OK	
S1.009	S9	-0.208	0.000	0.94		526.3	OK	
S1.010	S8	-0.313	0.000	0.51		381.0	OK	
S1.011	S7	-0.235	0.000	0.46		387.6	OK	
S10.000	S39	-0.259	0.000	0.05		13.9	OK	
S1.012	S6	-0.083	0.000	0.47		388.4	OK	
S1.013	S5	0.043	0.000	0.21		108.4	SURCHARGED	
S1.014	S4	-0.212	0.000	0.21		100.0	OK	
S1.015	S3	2.645	0.000	0.03		9.9	SURCHARGED	
S1.016	S2	-0.800	0.000	0.03		9.9	OK	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW1.SWS

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 5 Number of Storage Structures 4 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	19.000
Region	England and Wales	Ratio R	0.350
Cv (Summer)	0.750		
Cv (Winter)	0.840		

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S18	60 Winter	100	+40%	100/60 Summer				4.845
S1.001	S17	60 Winter	100	+40%	100/30 Winter				4.841
S2.000	S20	60 Winter	100	+40%	100/30 Winter				4.845
S2.001	S19	60 Winter	100	+40%	100/15 Summer				4.841
S1.002	S16	60 Winter	100	+40%	100/15 Summer				4.839
S3.000	S23	60 Winter	100	+40%	100/30 Winter				4.843
S3.001	S22	60 Winter	100	+40%	100/30 Winter				4.841
S3.002	S21	60 Winter	100	+40%	100/15 Winter				4.837
S1.003	S15	60 Winter	100	+40%	100/30 Summer	100/120 Winter			4.834
S1.004	S14	60 Winter	100	+40%	100/30 Summer	100/60 Winter			4.833
S1.005	S13	120 Winter	100	+40%	100/30 Summer				4.972
S1.006	S12	120 Winter	100	+40%	100/30 Summer				5.126
S4.000	S25	60 Winter	100	+40%	100/15 Summer				5.075
S4.001	S24	120 Winter	100	+40%	100/30 Winter				5.096
S5.000	S26	120 Winter	100	+40%	100/30 Winter	100/120 Winter			5.070
S1.007	S11	120 Winter	100	+40%	100/30 Summer	100/120 Winter			5.141
S6.000	S34	15 Winter	100	+40%	100/15 Summer				5.384
S7.000	S36	15 Winter	100	+40%	100/15 Summer				5.281
S7.001	S35	15 Winter	100	+40%	100/15 Summer				5.241
S6.001	S33	15 Winter	100	+40%	30/15 Winter				5.124
S6.002	S32	15 Winter	100	+40%	30/15 Summer				4.996
S8.000	S37	120 Winter	100	+40%	100/15 Summer				4.933
S6.003	S31	120 Winter	100	+40%	30/15 Summer				4.931
S6.004	S30	120 Winter	100	+40%	30/15 Summer				4.940
S6.005	S29	120 Winter	100	+40%	30/15 Summer				4.937
S6.006	S28	120 Winter	100	+40%	30/15 Summer				4.943
S9.000	S38	120 Winter	100	+40%	100/30 Winter				4.947

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW1.SWS

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S18	0.456	0.000	0.30		20.3	SURCHARGED	
S1.001	S17	0.688	0.000	0.13		22.8	FLOOD RISK	
S2.000	S20	0.902	0.000	0.27		28.0	SURCHARGED	
S2.001	S19	1.096	0.000	0.39		27.9	FLOOD RISK	
S1.002	S16	1.176	0.000	0.84		62.4	FLOOD RISK	
S3.000	S23	0.782	0.000	0.15		15.2	SURCHARGED	
S3.001	S22	1.035	0.000	0.35		34.8	SURCHARGED	
S3.002	S21	1.223	0.000	0.59		34.6	FLOOD RISK	
S1.003	S15	1.276	0.000	0.37		112.4	FLOOD RISK	
S1.004	S14	1.331	3.435	0.52		195.8	FLOOD	2
S1.005	S13	1.644	0.000	0.35		132.6	SURCHARGED	
S1.006	S12	2.002	0.000	0.18		129.6	SURCHARGED	
S4.000	S25	0.826	0.000	0.88		70.6	SURCHARGED	
S4.001	S24	1.126	0.000	0.24		57.0	FLOOD RISK	
S5.000	S26	1.170	0.408	0.29		37.3	FLOOD	
S1.007	S11	2.062	8.550	0.20		205.8	FLOOD	
S6.000	S34	0.824	0.000	0.67		73.4	SURCHARGED	
S7.000	S36	1.054	0.000	0.48		31.2	FLOOD RISK	
S7.001	S35	1.156	0.000	1.04		66.4	FLOOD RISK	
S6.001	S33	1.149	0.000	1.04		184.5	FLOOD RISK	
S6.002	S32	1.142	0.000	1.35		236.0	SURCHARGED	
S8.000	S37	0.577	0.000	0.05		15.8	SURCHARGED	
S6.003	S31	1.190	0.000	0.81		122.1	SURCHARGED	
S6.004	S30	1.249	0.000	0.97		140.0	SURCHARGED	
S6.005	S29	1.288	0.000	0.83		140.3	SURCHARGED	
S6.006	S28	1.383	0.000	1.03		156.0	FLOOD RISK	
S9.000	S38	1.242	0.000	0.63		117.9	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW1.SWS

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S6.007	S27	120 Winter	100	+40%	100/15 Summer				4.943
S1.008	S10	120 Winter	100	+40%	100/15 Summer	100/120 Winter			5.165
S1.009	S9	60 Winter	100	+40%	100/15 Summer				5.674
S1.010	S8	60 Winter	100	+40%	100/15 Winter				5.673
S1.011	S7	60 Winter	100	+40%	100/15 Winter				5.671
S10.000	S39	60 Winter	100	+40%	100/30 Summer				5.674
S1.012	S6	60 Winter	100	+40%	100/15 Summer				5.667
S1.013	S5	60 Winter	100	+40%	30/60 Winter				5.658
S1.014	S4	60 Winter	100	+40%	100/15 Winter				5.390
S1.015	S3	1440 Winter	100	+40%	1/15 Summer				5.282
S1.016	S2	240 Winter	100	+40%					1.429

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S6.007	S27	1.435	0.000	0.59		181.6	FLOOD RISK	
S1.008	S10	2.291	1.443	0.50		408.1	FLOOD	
S1.009	S9	2.934	0.000	1.10		610.6	FLOOD RISK	
S1.010	S8	2.974	0.000	0.83		626.8	SURCHARGED	
S1.011	S7	3.057	0.000	0.75		630.2	SURCHARGED	
S10.000	S39	1.443	0.000	0.05		13.7	FLOOD RISK	
S1.012	S6	3.214	0.000	0.78		643.9	FLOOD RISK	
S1.013	S5	3.346	0.000	0.32		164.6	SURCHARGED	
S1.014	S4	3.114	0.000	0.21		100.0	SURCHARGED	
S1.015	S3	3.032	0.000	0.03		9.9	SURCHARGED	
S1.016	S2	-0.800	0.000	0.03		9.9	OK	

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Appendix (J)

Exceedance Flow Paths

Cellular storage stank
150m² x 0.80m deep
BL 3.300

Provision of overflow arrangement

PLAY LAP

Area of Public Open Space to be used as localised storage at surface level in peak storm events
(Volume circa. 64m³)

Land to be conveyed to plots 22 & 24 North Shore Road

SINAH LANE

FURNISS WAY

Hayling Billy Coastal Path

Car Park

Theatre

TCB

5.8m

6.1m

El Sub Sta

NOTES

1. All dimensions are in metres unless stated otherwise.
2. Do not scale from this drawing. Only written dimensions are to be used.
3. Site layout based on ID Partnership Proposed Site Layout, project number N81:2517, drawing number PL-02 Rev.D17 dated dated 26/06/2019.
4. Topographic Survey as per Siteline Ltd. Site Survey drawing number 36HX001B dated May 2018.
5. Layout review is subject to receipt of finalised layout proposal and the final highway layout design will be subject to the outcome of consultation with Hampshire County Council.
6. Red indicates vehicle moving forward, blue indicates vehicle reversing.

KEY

- Site Boundary
- Existing flow routes
- Existing Ground Level
- Primary Road Contour — 6.000
- Secondary Road Contour — 5.850
- Area of Public Open Space to be used as localised storage in peak storm events
- Cellular storage tank
- Weholite (or similar) large diameter storage pipes
- Root Protection Area (RPA) for Retained Trees ***(Refer to ACD Tree Reference Plan drawing number BDWS20660 Revision A dated 25/04/17 for Details)***

SCALE BAR 1:500 at A1

Rev.	Date	Details	By	Chkd	Appd
B	27.06.19	Updated in accordance with rev. D17 of IDP Site Layout.	SRV	TRS	TRS
A	04.07.18	Updated in accordance with latest IDP Site Layout PL-02A	SRV	VPI	TRS

Client:- BARRATT HOMES

Site:-
Sinah Lane
Hayling Island

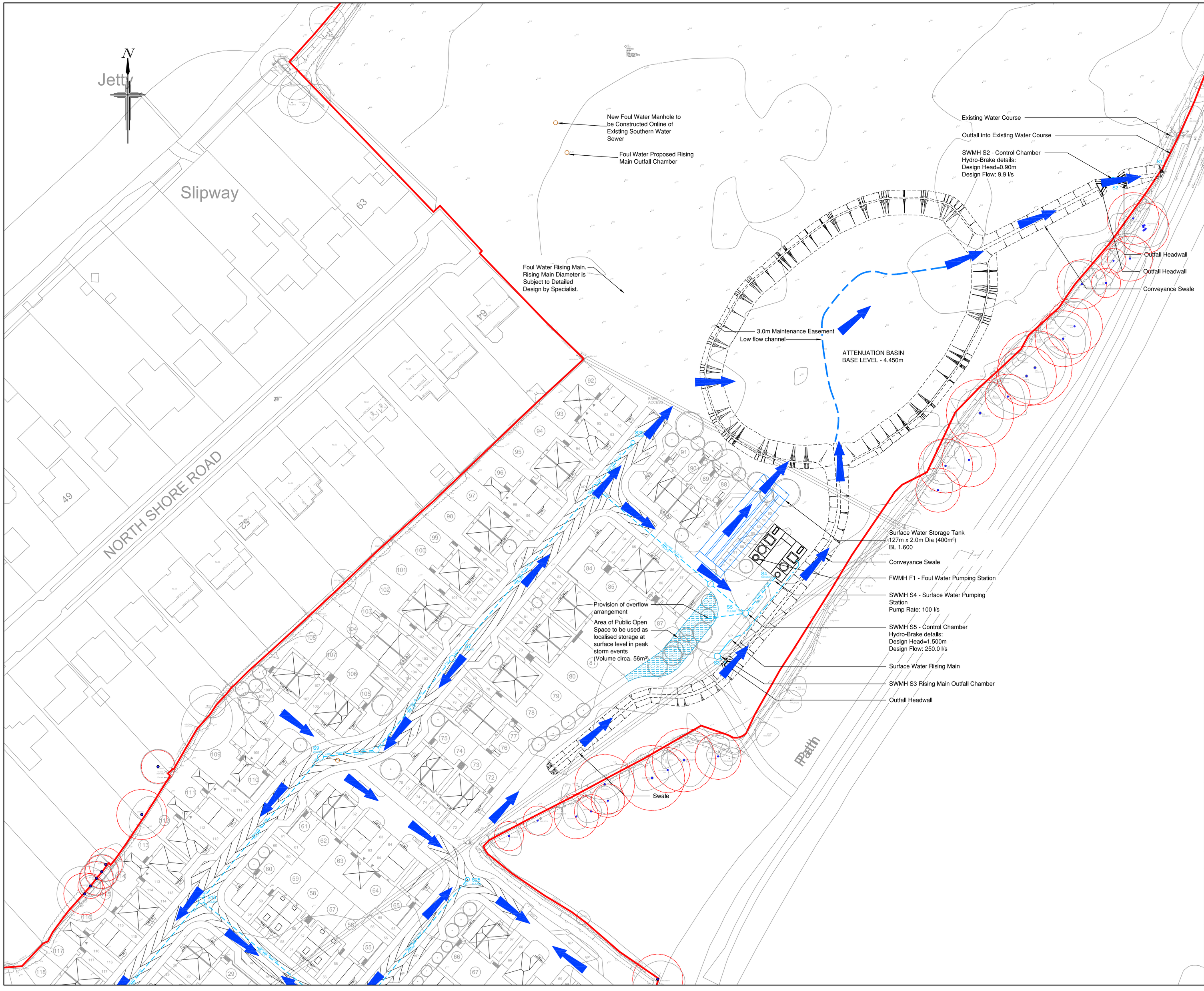
Drawing Title:-
FLOOD EXCEEDANCE PLAN
SHEET 1 OF 2

Date: June 2018 | Scales: 1:500 at A1
Drawn: SRV | Checked: TRS | Approved: TRS

Drawing No. BSO/E4513/026 B

FOR INFORMATION ONLY

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NOTES

1. All dimensions are in metres unless stated otherwise.
2. Do not scale from this drawing. Only written dimensions are to be used.
3. Site layout based on ID Partnership Proposed Site Layout, project number N81:2517, drawing number PL-02 Rev.D17 dated dated 26/06/2019.
4. Topographic Survey as per Siteline Ltd. Site Survey drawing number 36HX001B dated May 2018.
5. Layout review is subject to receipt of finalised layout proposal and the final highway layout design will be subject to the outcome of consultation with Hampshire County Council.
6. Red indicates vehicle moving forward, blue indicates vehicle reversing.

KEY

- Site Boundary
- Existing flow routes
- Existing Ground Level
- Primary Road Contour — 6.000
- Secondary Road Contour — 5.850
- Area of Public Open Space to be used as localised storage in peak storm events
- Cellular storage tank
- Wehollite (or similar) large diameter storage pipes
- Root Protection Area (RPA) for Retained Trees ***(Refer to ACD Tree Reference Plan drawing number BDWS20660 Revision A dated 25/04/17 for Details)***

0m 5m 10m 20m 30m 40m 50m

SCALE BAR 1:500 at A1

Rev.	Date	Details	By	Chkd	Appd
B	27.06.19	Updated in accordance with rev. D17 of IDP Site Layout.	SRV	TRS	TRS
A	04.07.18	Updated in accordance with latest IDP Site Layout PL-02A	SRV	VPI	TRS

Client:-

BARRATT HOMES

Site:-
Sinah Lane
Hayling Island

Drawing Title:-
FLOOD EXCEEDANCE PLAN
SHEET 2 OF 2

Date: June 2018 | Scales: 1:500 at A1
Drawn: SRV | Checked: TRS | Approved: TRS

Drawing No.
BSO/E4513/027 B

FOR INFORMATION ONLY

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Appendix (K)

Flood Plan

PROPOSED RESIDENTIAL DEVELOPMENT
SINAH LANE, HAYLING ISLAND
HAVANT

FLOOD PLAN

JUNE 2018

Document Control Sheet

Project name:	Chapel Riverside, Southampton
Project ref:	BSO/E4513
Report Title	Flood Plan
Doc. ref:	TRS/INL/E4513/17138
Date:	22nd June 2018

	Name	Position	Signature	Date
Prepared by:	Terry Seymour	Director		22.06.2018
Reviewed by:	Steve Vine	Associate Designate		22.06.2018
Approved by:	Terry Seymour	Director		22.06.2018

Revision	Date	Description	Prepared	Approved

1.0 Introduction and Objectives

Rogers Cory Partnership Limited have been instructed on behalf of Barratt David Wilson to prepare a Flood Plan in support of the planning application for the proposed residential development at the Sinah Lane, Hayling Island.

The development site seeks planning permission from Havant Borough Council for the erection of 195 dwellings, associated open space, pumping station, sub-station with vehicular access via Sinah Lane and change of use of land from agricultural to a Wader and Brent Geese refuge.

The intention of this flood plan is to provide an initial proposal to highlight the potential flood hazards and provide outline procedures to enable future occupants and users of the site to avoid being directly exposed to the hazard in any future flood events that may affect the site. This flood plan should be regularly reviewed and updated during the life of the development, by the appointed Management Company to ensure it takes into consideration any changes to legislation and the flood hazard to the site,

Site Location

The site is located off Sinah Lane within the south western part of Hayling Island. The site is bounded by residential properties to the west and south, open fields and a nature reserve to the north, Hayling Billy Trail and open fields to the east with National Grid reference 470733, 99841 (See **Figure 1**).

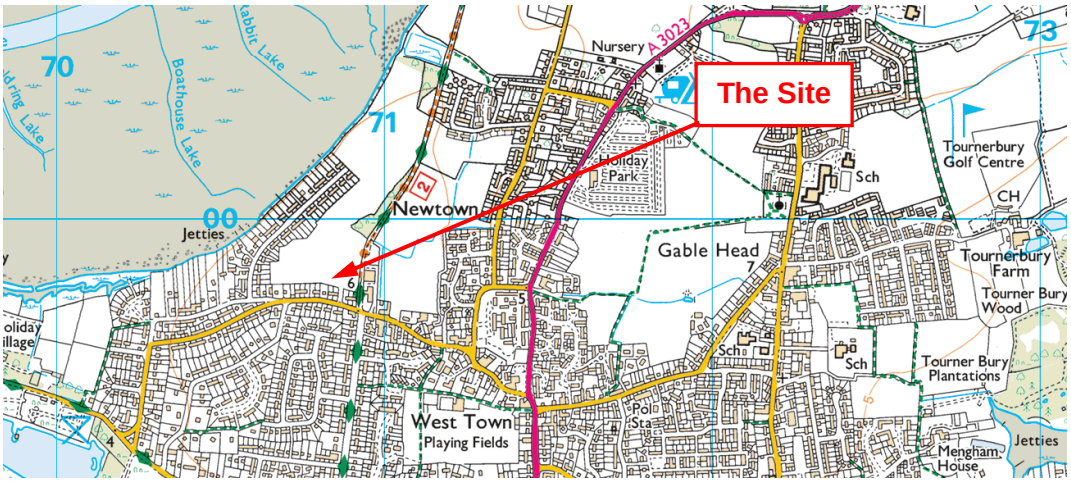


Figure 1- Site Location and Extent

Objectives

Whilst the development site itself is not at risk, Hayling Island could be subject to restricted highway access (on and off the island) in the event of a peak tidal flood event. The objective of the site flood plan is to raise awareness of the risk of flooding from tidal surge events and the potential impact this has on Langstone Road which

could restrict access on and off Hayling Island, thus allowing future occupants to consider options available in such an event.

The site falls within an area where the Environment Agency issue flood warnings. As the risk of flooding is tidal from storm surge events there is an opportunity for an early warning of the potential risk of flooding from the Environment Agency ranging between 6 to 48 hours addition to this the approximate time of arrival of the storm surge can be predicted within an allowance of time.

The flood plan will highlight what mitigation measures should be implemented by the future users of the site.

2.0 Flood Risk to the Site

Tidal Flood Risk

Whist the site lies wholly within Flood Zone 1, it is recognised that vehicular access on and off Hayling Island is only via Langstone Road, located further north of the site (**see figure 2**).



Figure 2: Extract from EA Flood Map

Table 1 below outlines the proposed residual flood mitigation measures which will be implemented in the construction of the development:

Land use	Min Finished Floor Level	Further mitigation requirements
Residential	4.70mAOD	None

Table 1 – Proposed site wide minimum finished floor levels and further mitigation requirements

Table 2 provides residual mitigation measures proposed for the future users and occupants of the site.

Land use	Further mitigation requirements
Residential	Register with the EA flood warning services. In the event of a tidal flood event, propose occupant to remain at property until the tidal surge has passed

Table 2 – Proposed site wide residual mitigation measures

Safe means of access and egress.

In the event of a peak tidal flood event (1 in 200-year event), there is no risk to the development site itself, thus occupants could choose to stay on site. Should occupants wish to leave Hayling Island ahead of a tidal flood event then sufficient warning will be provided through the EA early warning notification system to allow residents to leave the island temporarily should they so wish to.