structa

FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

HOODLANDS FARM, HARRY STOKE

FOR BOKLOK HOUSING UK LIMITED

REPORT REF: HST-STR-XX-XX-RP-C-XX-1000

REVISION P4

15 JULY 2021

- Structural
- Civil
- Geo-environmental

DOCUMENT RECORD

Document Ref:	**HST-STR-XX-XX-RP-C-XX-1000**				
Revision	Date	Remarks	Originator	Checked	Approved
P1	21/06/21	Issued for approval	TL	TS	MI
P2	02/07/21	Site area corrected	TL	TS	MI
P3	13/07/21	Report number and revision notation updated	TL	TS	MI
P4	15/07/21	Drawings in Appendices updated	TL	TS	MI

For any queries please contact:
Structa LLP, Apple Walk 1, Kembrey Park, Swindon SN2 8BL | 01793 209 130

CONTENTS

FIGURES

APPENDICES

1. INTRODUCTION

1.1. Structa LLP have been commissioned by BoKlok Housing UK Limited to undertake a Flood Risk Assessment and Drainage Strategy for a proposed residential development on a parcel of agricultural land at Hoodlands Farm, Harry Stoke. Refer to Figure 1 for the site location plan.

1.2. The proposals comprise the construction of new residential dwellings, as well as the provision of site access, roads, drainage and other necessary infrastructure.

1.3. Based on the requirements of the National Planning Policy Framework (NPPF, February 2019) and associated Planning Practice Guidance (PPG, amended November 2016), developments should include an appropriate Flood Risk Assessment if the following criteria are met:

- the development will be located in Flood Zone 2 or 3; or
- the development will be located in Flood Zone 1; **and**
  - *the site occupies an area of 1 hectare or more; or*
  - *the site is on land identified by the Environment Agency as having critical drainage problems; or*
  - *the site is on land identified in a Strategic Flood Risk Assessment as being at increased flood risk in the future; or*
  - *the site is on land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use; or*
  - *the site is considered a major planning application (as defined by local planning authority).*

1.4. The objective of a Flood Risk Assessment is to establish:

- whether the proposed development is likely to be affected by current or future flooding from any source;
- whether the proposals would increase flood risk elsewhere; and
- whether the measures proposed to mitigate any flood risk effects associated with the proposed development are appropriate.

1.5. This Flood Risk Assessment demonstrates that:

- within the site, the most vulnerable development is located in areas of lowest flood risk;
- the development is appropriately flood resistant and resilient; and
- the development incorporates sustainable drainage systems where appropriate.

1.6. This report has been prepared in accordance with current national and local flood risk policy.

2. POLICY CONTEXT

NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

2.1. The NPPF was adopted in March 2012, revised in July 2018 and last updated in June 2019. One of the overarching objectives of the NPPF is the encouragement of growth and acknowledgement that decision-makers should adopt a presumption in favour of sustainable development. Paragraphs 10-11 of the document state:

> *'So that sustainable development is pursued in a positive way, at the heart of the Framework is a **presumption in favour of sustainable development**.*
>
> *...*
>
> *For **decision-taking** this means:*
>
> - *approving development proposals that accord with an up-to-date development plan without delay; or*
> - *where there are no relevant development plan policies, or the policies which are most important for determining the application are out-of-date, granting permission unless:*
>   - *the application of policies in this Framework that protect areas or assets of particular importance provides a clear reason for refusing the development proposed*; or*
>   - *any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole.'*
>
> * This includes policies within the Framework relating to areas at risk of flooding or coastal change.

2.2. Section 14 of the NPPF seeks to address the issues of climate change, flooding and coastal change. In paragraph 155 it states: "*Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.*"

PLANNING PRACTICE GUIDANCE TO THE NATIONAL PLANNING POLICY FRAMEWORK

2.3. The Planning Practice Guidance (PPG) was first published in March 2014 and at the same time the Technical Guidance to the NPPF was withdrawn. The key difference with the new PPG is that it is a web-based resource, and each section is updated as needed.

2.4. Guidance on Flood Risk and Coastal Change was last updated in November 2016.

2.5. The assessment of flood risk is based on the definitions in Table 1 of the PPG. This information is replicated below for ease of reference.

TABLE 1: FLOOD ZONE DEFINITIONS

Flood Zone	**Annual probability of river or sea flooding**
Zone 1 *Low Probability*	■ Land having less than 1 in 1000 annual probability of river or sea flooding (<0.1%)
Zone 2 *Medium Probability*	■ Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or ■ Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.
Zone 3a *High Probability*	■ Land having a 1 in 100 or greater annual probability of river flooding; or ■ Land having a 1 in 200 or greater annual probability of sea flooding.
Zone 3b *The Functional Floodplain*	■ This zone comprises land where water has to flow or be stored in times of flood. ■ Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.

2.6. The NPPF classifies the Flood Risk Vulnerability of various land uses in Table 2 (reproduced below). The More Vulnerable Classification encompasses usages such as hospitals and buildings used for dwellings.

TABLE 2: LAND USE CLASSIFICATION

Classification	**Land Use**
Essential Infrastructure	■ Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. ■ Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. ■ Wind turbines.

Classification	Land Use
Highly Vulnerable	■ Police stations, ambulance stations and fire stations and command centres and telecommunications installations required to be operational during flooding. ■ Emergency dispersal points. ■ Basement dwellings. ■ Caravans, mobile homes and park homes intended for permanent residential use. ■ Installations requiring hazardous substances consent (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as "essential infrastructure").
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. ■ Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less Vulnerable	■ Police, ambulance and fire stations which are not required to be operational during flooding. ■ Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'more vulnerable' class; and assembly and leisure. ■ Land and buildings used for agriculture and forestry. ■ Waste treatment (except landfill and hazardous waste facilities). ■ Minerals working and processing (except for sand and gravel working). ■ Water treatment works which do not need to remain operational during times of flood. ■ Sewer treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.

2.7. The overall aim is to steer new development to Flood Zone 1. Where there are no reasonably available sites within Flood Zone 1, local planning authorities allocating land in local plans or determining planning applications for development at any particular location should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2, applying the Exception Test if required. The table below, replicated from Table 3 of the PPG, indicates which Flood Zones are considered to be appropriate for different land uses based upon the Sequential Test.

TABLE 3: FLOOD RISK VULNERABILITY CLASSIFICATION

Flood Zone	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception Test Required	✓	✓
Zone 3a	Exception Test Required	✓	×	Exception Test Required	✓
Zone 3b Functional Floodplain	Exception Test Required	✓	×	×	×

✓ Development is appropriate

× Development should not be permitted

2.8. The sequential approach requires the application of the Sequential Test whereby, in addition to the requirements of Table 3, development should first be directed to Flood Zone 1, then Flood Zone 2 and lastly Flood Zone 3.

2.9. Where the Exception Test is required it is necessary to demonstrate, partly through a site-specific flood risk assessment, that:

- The development will provide extensive sustainability benefits to the community
- And that these benefits outweigh the flood risk
- When considering the vulnerability of its users, the development will be safe for its lifetime
- Flood risk is not increased elsewhere, and reduced overall where possible

2.10. Further detail on the lifetime of development is also given in the PPG, which advises for residential development that a period of 100 years should be considered whilst for non-residential this is dependent upon the development characteristics.

2.11. The use of sustainable drainage systems is considered by the PPG to offer the following benefits:

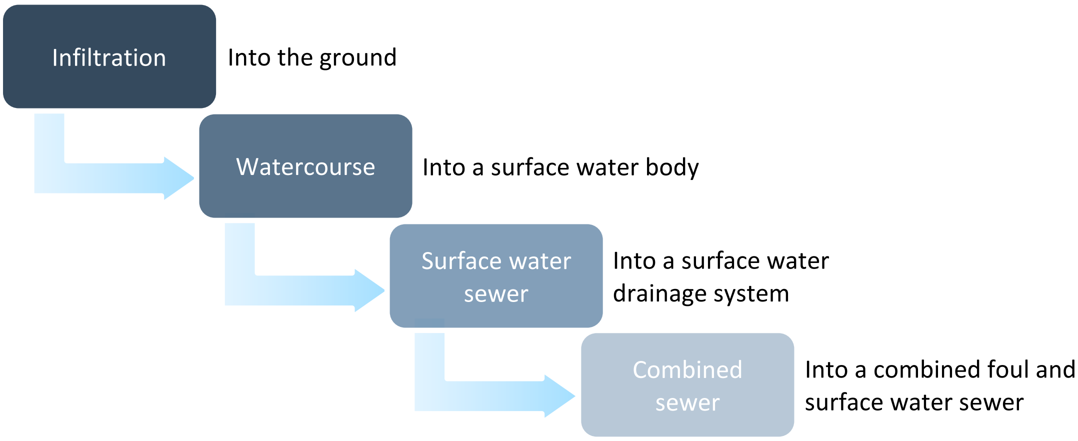
- Reduce the causes and impacts of flooding
- Remove pollutants from urban run-off at source
- Combine water management with green space with benefits for amenity, recreation and wildlife

2.12. In the consideration of major developments, sustainable drainage should be provided unless it can be demonstrated that this would be inappropriate. Major developments are defined in the Town and Country Planning Order 2015; some of these definitions encompass the following:

- Development site area of 1 hectare or more
- Provision of 10 or more residential dwellings
- Development of residential dwellings on a site having an area of 0.5 hectares or more and where the proposed no. of dwellings is not known to fall into the above criterion or not
- Provision of buildings where the floor space to be created by the development is 1,000m² or greater

2.13. The aim of sustainable drainage systems is to dispose of surface water using the following hierarchy where reasonably practicable.

TABLE 4: SURFACE WATER DISPOSAL HIERARCHY



2.14. The assessment of what is considered to be reasonably practicable in terms of sustainable drainage system provision should consider the costs associated with the design, construction, operation and maintenance of the system, and whether these are economically proportionate in relation to the consumer costs for an effective drainage system that instead connects directly to a public sewer.

FLOOD RISK ASSESSMENTS: CLIMATE CHANGE ALLOWANCES

2.15. The Environment Agency have published guidance on the use of climate change allowances in Flood Risk Assessments and this was last updated in July 2020.

2.16. These detail the anticipated future change for:

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

2.17. For the anticipated changes in peak rainfall intensity in small catchments (less than $5km^2$), or urbanised drainage catchments, refer to the following table:

TABLE 5: PEAK RAINFALL INTENSITY ALLOWANCE (BASED ON A 1961 TO 1990 BASELINE)

Applies across all of England	**Total potential change anticipated for the '2020s' (2015 to 2039)**	**Total potential change anticipated for the '2050s' (2040 to 2069)**	**Total potential change anticipated for the '2080s' (2070 to 2115)**
Upper end	10%	20%	40%
Central	5%	10%	20%

2.18. For drainage design in flood risk assessments, typically both the central and upper end allowances should be considered in order that the range of impacts is understood.

SOUTH GLOUCESTERSHIRE COUNCIL CORE STRATEGY 2006-2027

2.19. The South Gloucestershire Council Core Strategy was adopted in December 2013 and sets out a vision for future development in South Gloucestershire between 2006 and 2027.

2.20. The Core Strategy sets out various policies that will guide development in the administrative area. Details of elements of policies relevant to flood risk and drainage are provided below.

2.21. Policy CS1 entitled '*High Quality Design*' includes:

- requirement to mitigate flood risk and prepare surface water management plans.

2.22. Policy PSP20 entitled *'Flood Risk, Surface Water and Watercourse Management'* sets out requirements:

- to reduce surface water discharge from greenfield sites to the estimated mean Greenfield runoff rate (QBAR);
- that the drainage system should be designed so that flooding does not occur on any part of the development for the 3.33% (1 in 30 year) rainfall event other than in those areas/systems designated to store/convey water;
- that flooding should not occur in any part of a building during a 1% (1 in 100 year) event, with an allowance for climate change;
- that Sustainable Drainage Systems (SuDS) should be incorporated following the Surface Water Discharge Hierarchy wherever practicable; and
- that development should not increase off-site flood risk.

2.23. Policy PSP21 entitled *'Environmental Pollution and Impacts'* requires:

- New development to be sensitive to existing pollution sources, including fumes, dust, noise, vibration, odour, light or other forms of air, land or water pollution.

SOUTH GLOUCESTERSHIRE COUNCIL STRATEGIC FLOOD RISK ASSESSMENT (SFRA) - LEVEL 2

2.24. The main purpose of the SFRA is to provide sufficient flood risk information to enable an update of any flooding policies within the Council area. In achieving this, the SFRA will achieve the objectives of:

- influencing Council policy regarding decisions that are made;
- aiding the Council's response to proposed developments;
- recognising means of reducing flood risk; and
- informing the emergency flood plans.

2.25. SFRA was prepared by JBA Consulting and was last updated in December 2011.

SOUTH GLOUCESTERSHIRE COUNCIL SUSTAINABLE DRAINAGE SYSTEMS (SUDS) SPD

2.26. The SuDS SPD was prepared by South Gloucestershire Council and adopted in April 2021.

2.27. The purpose of the guide is to inform the design of development drainage proposals in South Gloucestershire. This builds upon the NPPF and NSTS SuDS, and generally accords with The SuDS Manual (Ciria Report C753) but also sets out area-specific parameters for use in detailed design.

3. DEVELOPMENT DESCRIPTION

3.1. The application site lies to the north of Hambrook Lane, east of the village of Stoke Gifford. The site can be located approximately by National Grid Reference ST 63550 79450.

3.2. The application site is roughly square in shape with access road extending to the south, and occupies an area of 1.81ha.

3.3. The site falls from around 56.7mAOD in the northwest to around 46.8mAOD in the east at an average gradient of 1 in 13.

3.4. The topographical survey identifies a pond in the northeast , adjacent to grading down from the site to a shallow ditch along the northern boundary, which falls east.

3.5. The site is bordered on all sides by agricultural land, which is subject to future residential development.

3.6. The site is currently agricultural with a dwelling and some hardstanding but for the purposes of run-off modelling it is considered to be entirely greenfield.

3.7. Refer to Figure 1 for the site location plan and Appendix A for the topographical survey.

3.8. Refer to Application drawings for details of the proposed site layout.

4. GEOLOGY & HYDROLOGY

4.1. The published geology provided by the BGS does not identify any superficial deposits across this site.

4.2. The BGS maps indicate that the site is underlain by a sedimentary mudstone bedrock of the Mercia Mudstone Group.

4.3. Ground investigation work was undertaken by Card Geotechnics Limited (CGL) at the development site in July 2020, which identified topsoil and made ground at shallow depth overlying the solid geology of the Mercia Mudstone Group comprising slightly sandy slightly gravelly Clay to completion.

4.4. Groundwater was not encountered during the investigation works.

4.5. Soakage testing was undertaken in a single exploratory hole to 3m depth and there was negligible drop in water level, which indicates that the permeability of the underlying soil is very low, precluding the use of infiltration techniques as the primary means of surface water disposal.

4.6. The site is not identified as being within a Groundwater Source Protection Zone.

5. FLOOD RISK

5.1. The NPPF and the SFRA identify several potential sources of flooding that must be considered when assessing flood risk, these are considered below in the following order:

- Flooding from rivers (fluvial flooding)
- Flooding from the sea (tidal flooding)
- Flooding from land
- Flooding from sewers
- Flooding from groundwater
- Flooding from reservoirs, canals, and other artificial sources

FLOODING FROM RIVERS (FLUVIAL FLOODING) & SEA (TIDAL FLOODING)

5.2. The indicative flood maps published by the Environment Agency (EA) identify that the entirety of the site is outside an area at risk of fluvial/tidal flooding i.e. located in Flood Zone 1.

5.3. Refer to Appendix B for the EA Flood Map for Planning.

5.4. The risk of flooding at the site from rivers and the sea is considered to be low.

FLOODING FROM LAND & SEWERS

5.5. Refer to Figure 2 for the EA Flood Risk from Surface Water map.

5.6. The map indicates an area at risk of surface water flooding to the east of the development site, which follows the route of the downstream drainage ditch.

5.7. Within the site, the pond is the only area highlighted as at risk of flooding.

5.8. Surface water flooding is indicated along Hambrook Lane, contained within the carriageway, flowing east.

5.9. The application site is surrounded by agricultural land and only a few buildings lie within 100m of the site. Wessex Water records identify that there are currently no sewers in the immediate vicinity of the site.

5.10. The risk of flooding from land & sewers is considered to be low.

FLOODING FROM GROUNDWATER

5.11. Through a combination of the Environment Agency's '*Areas Susceptible to Groundwater Flooding*' and historic flooding data provided by South Gloucestershire, the SFRA provides an assessment of groundwater flood risk across the district.

5.12. Historic flooding data confirms that there is no record of groundwater flooding in the vicinity of the application site.

5.13. The site investigation undertaken revealed that the area is underlain by low permeability clays and mudstones. These strata have limited potential to store and convey water.

5.14. The risk of groundwater flooding is therefore considered to be negligible.

FLOODING FROM RESERVOIRS, CANALS & OTHER ARTIFICIAL SOURCES

5.15. Environment Agency Reservoir Flood Mapping shows that flooding from reservoir failure in this area would be remote from the development site.

5.16. Also, with reference to the OS Map of the area, there are no canals or other artificial sources likely to cause flooding at the site.

6. DRAINAGE DESIGN

EXISTING

6.1. The existing site is largely occupied by agricultural land and is therefore considered to be entirely greenfield for the purposes of run-off modelling.

6.2. Greenfield run-off estimates for the area have been calculated using the online tool provided by HR Wallingford, using the FEH methodology. The calculations have been undertaken for an area of 1ha to return run-off rates in l/s/ha. The output from the HR Wallingford '*Greenfield runoff estimation for sites*' tool is included at Appendix C.

6.3. The table below sets out the estimated greenfield run-off rates at the site. The table includes rates in l/s/ha as well as equivalent greenfield run-off rates for the site, which have been calculated by multiplying the rates per ha by the proposed designed positively drained area for the development (0.797ha).

TABLE 6: GREENFIELD RUN-OFF RATES

Rainfall Event	Greenfield run-off rate (l/s/ha)	Equivalent greenfield run-off rate (l/s)
Qbar	5.48	4.4
1 in 1 year	4.27	3.4
1 in 30 year	10.69	8.5
1 in 100 year	13.32	10.6

6.4. In accordance with the requirements of the LLFA, discharge from the site will be controlled to the Qbar Greenfield run-off rate for all rainfall events up to and including the 1 in 100 year event.

PROPOSED SURFACE WATER

6.5. The following general principles shall be applied to the drainage design for the proposed development:

- The run-off generated by the proposed development should be minimised by the use of Sustainable Drainage Systems (SuDS) techniques.
- The surface water drainage system should be designed to convey the design storm event of a 1 in 100 year storm plus 40% climate change allowance.
- An additional 2% impermeable area will be modelled to allow for urban creep.
- Discharge rates will be limited to the Qbar greenfield run-off rates for the site.

6.6. The surface water drainage strategy for the development will ensure that:

- The surface water drainage network will be sufficiently robust to withstand the impacts of climate change over the lifetime of the development.
- The risk of flooding to surrounding areas will not be increased as a result of the development.
- Surface water run-off will be controlled on-site and the development will not increase flood risk.

6.7. The proposed drainage strategy is shown on drawing 5978-1905 (included at Appendix D).

6.8. As noted above, the clay and mudstone strata underlying the site have a very low permeability, precluding the use of infiltration techniques as the primary means of surface water disposal at the proposed development.

6.9. In accordance with the surface water disposal hierarchy set out at Table 4 above, discharging to a watercourse is the second preference after infiltration.

6.10. The proposed development will therefore discharge surface water run-off to the north-eastern drainage ditch via a new headwall in the side of the bank. This replicates the existing situation, in which greenfield run-off from the site flows downhill to the east and into the ditch.

6.11. In line with current flood risk policy requirements, the proposed development will discharge surface water run-off at an attenuated rate.

6.12. For development on greenfield sites, discharge rates must not exceed the Qbar greenfield run-off rate for the proposed positively drained area on-site, which is equivalent to a return period storm event of approximately 1 in 2.3 years.

6.13. The development will utilise a combination of offline geocellular storage and an online attenuation basin to provide the necessary attenuation storage volume to accommodate the design 1 in 100 year + 40% climate change storm event without flooding of the site.

6.14. The attenuation basin will be 0.6m deep and will have a 300mm deep low-flow channel to convey run-off during smaller rainfall events.

6.15. The basin has been designed to maintain 300mm freeboard (0.3m depth of water) during storm events up to and including the critical 1 in 100 year storm.

6.16. During the critical 1 in 100 year storm with a 40% allowance for climate change, the basin will contain the storm run-off with minimal freeboard. This corresponds to the upper end projection for climate change, for developments with a design life of up to 100 years.

6.17. The surface water drainage network has been modelled in Causeway Flow. Refer to the output reports included at Appendix E for details of the model. The impermeable areas used in the model are shown on drawing 5978-1906, included at Appendix F.

6.18. Detailed levels design should ensure that exceedance flow routes are maintained to convey overland flows away from property in the event of a storm with a return period greater than the design storm event, or during a blockage scenario. Indicative exceedance flow routes are shown on the drainage strategy drawing included at Appendix D.

PROPOSED FOUL

6.19. Wessex Water have been consulted on the available capacity within their local sewer network and have advised that their preference would be for the development to connect into the future infrastructure to be provided immediately adjacent to the site (Appendix G).

6.20. Given that this development is likely to progress in advance of the surrounding infrastructure it will be necessary, at least in the short term, to provide a temporary solution in the form of foul water pumping station with outfall to the Wessex Water foul sewer 400m to the west in Hambrook Lane.

6.21. Refer to the proposed drainage strategy shown on drawing 5978-1905 (included at Appendix D) for details of the initial foul drainage strategy, utilising foul pumping station and rising main and noting likely provision for chemical dosing in order to address potential concerns in respect of septicity.

WATER QUALITY

6.22. In addition to the water quantity control measures set out above, the proposed surface water drainage network will provide treatment to run-off prior to discharge.

6.23. CIRIA publication C753 (The SuDS Manual) sets out the simple index approach to the assessment of surface water treatment.

6.24. This approach requires suitable pollution hazard indices to be allocated to the development run-off. The pollution hazard indices for the two land use classifications applicable to the proposed development are summarised in the table below.

TABLE 7: POLLUTION HAZARD INDICES

Land Use	Pollution hazard level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential parking with frequent change, all roads except low traffic and trunk roads/motorways	Medium	0.7	0.6	0.7

6.25. To deliver adequate treatment, selected SuDS components should have a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index (for each contaminant type).

6.26. For components in series, the total SuDS mitigation index is determined according to Equation (1) below:

$$\text{Total SuDS mitigation index} = \text{mitigation index}_1 + 0.5\left(\text{mitigation index}_2\right) \quad (1)$$

where:

$\text{mitigation index}_n$ = mitigation index for component n

6.27. The proposed basin will be located upstream of the flow control manhole and will convey run-off from all impermeable areas on-site. Water passing through the basin will receive treatment through:

- gravitational settling of particulate pollutants;
- filtration through vegetation and the underlying soils; and
- biodegradation and photolytic breakdown of hydrocarbons.

6.28. The proposed hydrodynamic separator will be located downstream of the flow control manhole and provide a second stage of treatment to all runoff from the development site.

6.29. The SuDS manual indicates that the following mitigation indices can be achieved by the proposed SuDS components.

TABLE 8: POLLUTION MITIGATION INDICES: DISCHARGES TO SURFACE WATERS

SuDS Component	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Detention basin	0.5	0.5	0.6
Hydrodynamic separator, e.g. SDS AquaSwirl™*	0.8*	0.5	0.7

*TSS 0.5 on trunk roads and motorways and not suitable for removal of soluble metals

6.30. This confirms that the proposed surface water drainage network can provide suitable treatment to run-off prior to discharge.

6.31. It is important to note that the mitigation indices set out above apply to SuDS components that follow the design guidance with respect to hydraulics and treatment set out in the corresponding technical chapter of the SuDS Manual (chapter 22). During the detailed design stage the SuDS components shall be designed in accordance with the relevant guidance to ensure adequate treatment of surface water run-off.

7. MAINTENANCE AND MANAGEMENT

7.1. This section provides guidance on the maintenance of specific Sustainable Drainage Systems (SuDS) components, the management for which will be the responsibility of either:

- Wessex Water, as the sewer authority;
- South Gloucestershire Council, as the local highway authority;
- an appointed management company; or
- homeowners.

7.2. The relevant party or parties responsible for the maintenance of the SuDS components listed are identified in the corresponding sub-sections below. These sub-sections outline the maintenance requirements for the SuDS components within the proposed drainage network, however they do not set out all of the drainage that is to be maintained.

7.3. It is possible in the future that parts of the drainage network will automatically be transferred to the sewer authority under the Flood and Water Management Act, however this legislation is still under scrutiny and not yet fully implemented.

ATTENUATION BASINS

7.4. Attenuation basins are large surface SuDS features that provide attenuation storage volume during large storms.

7.5. During short return period storms water will typically pass through a low flow channel constructed in the bottom of the basin.

7.6. The operation and maintenance requirements are given in the table below.

TABLE 9: ATTENUATION BASIN MAINTENANCE

Maintenance Schedule	Required Action	Recommended Frequency
Regular maintenance	Remove litter, debris and trash.	Monthly.
	Cut grass - for landscaped areas and access routes.	Monthly (during growing season) or as required.
	Cut grass - meadow grass in and around basin.	Half yearly (spring - before nesting season, and autumn).
	Manage other vegetation and remove nuisance plants.	Monthly (at start, then as required).
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly.
	Inspect banksides, structures, pipework etc for evidence of physical damage.	Monthly.
	Tidy all dead growth before start of growing season.	Annually.
Occasional maintenance	Reseed areas of poor vegetation growth.	Annually, or as required.
	Prune and trim trees and remove cuttings.	As required.
Remedial Actions	Repair erosion or other damage by reseeding or re-turfing.	As required.

Maintenance Schedule	Required Action	Recommended Frequency
	Realignment of rip-rap.	As required.
	Repair/rehabilitation of inlet.	As required.
	Relevel uneven surfaces and reinstate design levels.	As required.
Monitoring	Inspect inlet for blockages and clear if required.	Monthly.
	Inspect banksides, structures, pipework etc for evidence of physical damage.	Monthly.
	Inspect inlets for silt accumulation; establish appropriate silt removal frequencies.	Half yearly.

7.7. Refer to Drainage Strategy drawing for the location and details of the attenuation basin.

7.8. Maintenance of the attenuation basin will be the responsibility of an appointed management company.

GEOCELLULAR ATTENUATION STORAGE

7.9. These features can provide a large volume of below ground attenuation storage in a relatively small area due to the high void ratio of the modular geocellular units. Each unit is typically 1.0m x 0.5m x 0.4m high and units can be connected to create an attenuation tank.

7.10. Each tank is wrapped in an impermeable liner to prevent the transfer of water between the tank and the surrounding ground.

7.11. Tanks can be located under soft landscaping or under paved surfaces such as roads and parking areas.

7.12. The operation and maintenance requirements are set out in the table below.

TABLE 10: GEOCELLULAR ATTENUATION STORAGE MAINTENANCE

Maintenance Schedule	Required Action	Recommended Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually.
	Remove sediment from pre-treatment structures and/or internal forebays.	Annually, or as required.
Remedial actions	Repair/rehabilitate inlets, outlets, overflows and vents.	As required.
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually.
	Survey inside of tank for sediment build-up and remove if necessary.	Every 5 years or as required.

7.13. Refer to Drainage Strategy drawing for the locations of the geocellular attenuation tanks.

7.14. Maintenance of the attenuation tanks will be the responsibility of an appointed management company.

HYDRODYNAMIC SEPARATORS

7.15. Proprietary treatment systems provide a degree of pollution control in preventing silt and debris passing into the downstream network.

7.16. The operation and maintenance requirements are given in the table below.

TABLE 11: HYDRODYNAMIC SEPARATOR MAINTENANCE

Maintenance Schedule	Required Action	Recommended Frequency
Regular maintenance	Empty the separator as soon as a significant quantity of silt has built up.	Quarterly.

7.17. Refer to Drainage Strategy drawing for the location of the proposed hydrodynamic separator.

7.18. Maintenance of these components will be the responsibility of appointed management company.

FLOW CONTROL MANHOLES

7.19. Flow control manholes limit the downstream discharge rate, allowing the drainage network to be designed to mimic the hydrological regime of the existing site.

7.20. The operation and maintenance requirements are given in the table below.

TABLE 12: FLOW CONTROL MAINTENANCE

Maintenance Schedule	Required Action	Recommended Frequency
Regular maintenance	Inspect flow control for any damage/defects. Remove any debris/blockages.	Monthly for first three months then every six months.
	Clean/replace filters.	At intervals recommended by the manufacturer and as required following inspections.

7.21. Refer to Drainage Strategy drawing for details of the flow controls.

7.22. Maintenance of the flow controls will be the responsibility of appointed management company.

DESIGN LIFE

7.23. The design life of the development is likely to exceed the design life of each of the SuDS components listed above.

7.24. During the routine inspections of any SuDS components it may become apparent that they have reached the end of their functional lifetime. In the interest of sustainability repairs should be the first choice solution where practicable. If this is not the case then it will be necessary for the responsible party to undertake complete replacement of the component in question.

7.25. The design life of modular geocellular storage systems is unproven, but BBA certification states that for the majority of geocellular units a design life in excess of 50years should be expected when installed as per the certification. Therefore the routine assessment and maintenance should take into account an assessment of creep deflection and visual monitoring of the surface above any underground geocellular units.

7.26. Notwithstanding the remedial actions noted in the above maintenance schedules, the management company will be required to repair and or replace any defective parts of any of the SuDS to ensure continuous performance.

8. RECOMMENDATIONS AND CONCLUSIONS

8.1. The risk of flooding from rivers, seas, groundwater, sewers and reservoirs is considered to be low.

8.2. The application site is located within Flood Zone 1.

8.3. The proposed surface water drainage network has been designed according to South Gloucestershire Council SuDS guidance.

8.4. This Flood Risk Assessment has been prepared in accordance with current national and local flood risk policy. The report demonstrates that the proposed development can be implemented with no material adverse flood risk impact on- or off-site.

8.5. The assessment concludes that there is no reason to refuse planning permission on the grounds of flood risk.

FIGURES

FIGURE 1

SITE LOCATION PLAN

STREET MAP

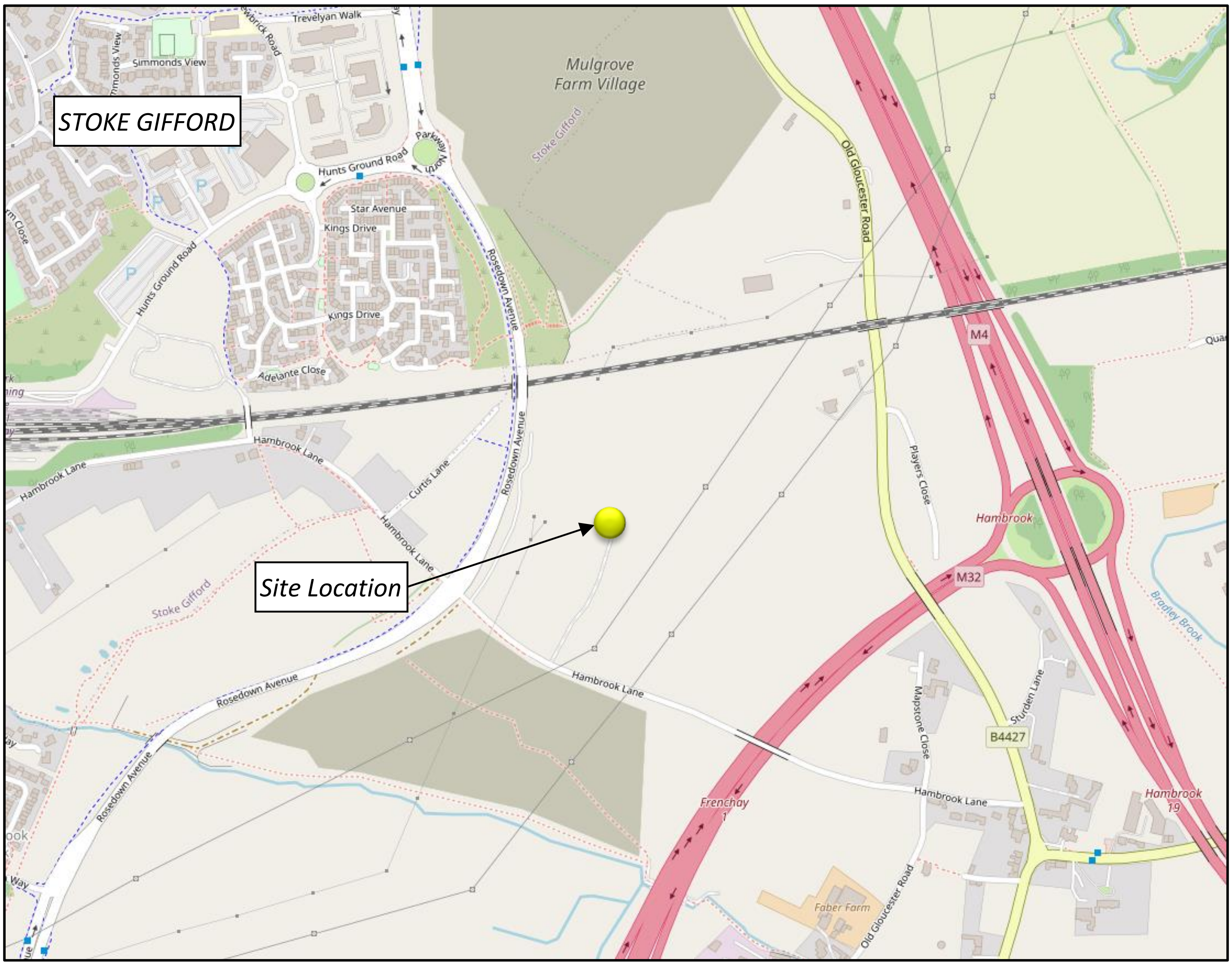


FIGURE 2

ENVIRONMENT AGENCY `FLOOD RISK FROM SURFACE WATER' MAP

APPENDICES

APPENDIX A

TOPOGRAPHICAL SURVEY

Station Schedule:

Notes:

GPS (OSGB36) Co-Ordinates & Levels Used.

GNSS Scale Factor Used :1.000

LEGEND:

Kerb		BT	British Telecom
Hedge		BT	British Telecom
Surface Edge		CAT	Cable TV
Fence		CAT	Cable TV
Building		ER	Earth Rod
Wall		TP	Telegraph Pole
Embankment		LP	Lamppost
Gate		EP	Electricity Pole
Crash Barrier		B.	Bollard
Foliage Extents		vp	Vent Pipe
Tree Canopy		MHCL	Manhole
Footpath		MHCL	Manhole
Ditch		MHCL	Manhole
TP Stay	Stay Wire	ICCL	Inspection Chamber
Overhead Lines		LH	Lamp Hole
Rock Outcrop		RE	Rodding Eye
Bus Shelter		G.	Road Gully
RS	Road Sign	E.	Electricity Cables
RS	Road Sign	W.	Water IC
NP	Road Name Plate	W	Stop Tap
Post	Fence Post	SV	Stop Valve
TL	Traffic Lights	FH	Fire Hydrant
Bin	Rubbish Bin	WM	Water Meter
TH	Trial Hole / Pit	Gas	Gas Valve
BH	Bore Hole	Mkr	Service Marker
LB	Letter Box	TCB	Telephone Box

50.0 — 1m. Contour & Height Label

Half Metre Contour

S6.0 G0.7 — Tree (Spread & Girth)

bush — Bush

S1 — Survey Station & Ref.

+ 50.25 — Spot Level & Position

Revisions:

A	Update survey of access lane. JAE 18/12/2019
B	
C	
D	
E	

healer surveys
Land Surveyors
8 Oldfield Road, Bocam Park, Pencoed, Bridgend, CF35 5LJ
tel. 01656 865566
web. www.healersurveys.co.uk

Client: Crossman Homes

Project: Land at North Harry, Bristol

Drawing: Site Survey

Scale: 1:500

Date: December 2019

Surveyed / Drawn: D.T.

Checked: R.E.

Dwg. No: P2880A

Sheet No: 1 of 1

Sheet Size: A1

APPENDIX B

ENVIRONMENT AGENCY FLOOD MAP FOR PLANNING

Environment Agency

Flood map for planning

Your reference	Location (easting/northing)	Created
5978	**363565/179450**	**18 Jun 2021 10:50**

Your selected location is in flood zone 1, an area with a low probability of flooding.

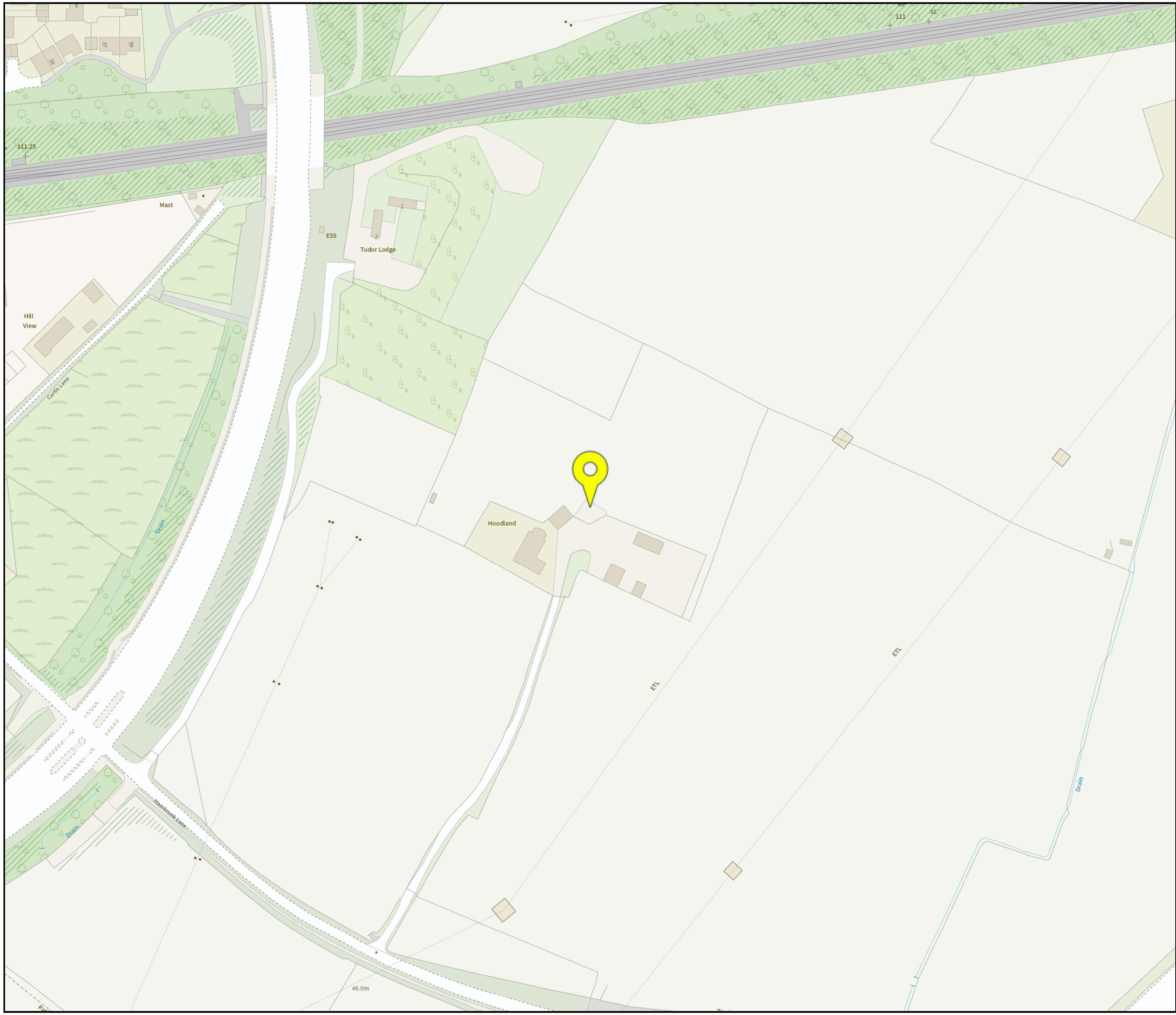
This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn’t include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.



Environment Agency

Flood map for planning

Your reference
5978

Location (easting/northing)
363565/179450

Scale
1:2500

Created
18 Jun 2021 10:50

Selected point

Flood zone 3

Flood zone 3: areas benefitting from flood defences

Flood zone 2

Flood zone 1

Flood defence

Main river

Flood storage area

0 20 40 60m

APPENDIX C

GREENFIELD RUN-OFF ESTIMATE

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Tom Lafford
Site name:	5978
Site location:	Hoodlands Farm, Harry Stoke

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

Site Details

Latitude:	51.51285° N
Longitude:	2.52648° W
Reference:	1826152905
Date:	Apr 26 2021 13:58

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	1

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	780	780
Hydrological region:	8	8
Growth curve factor 1 year:	0.78	0.78
Growth curve factor 30 years:	1.95	1.95
Growth curve factor 100 years:	2.43	2.43
Growth curve factor 200 years:	2.78	2.78

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

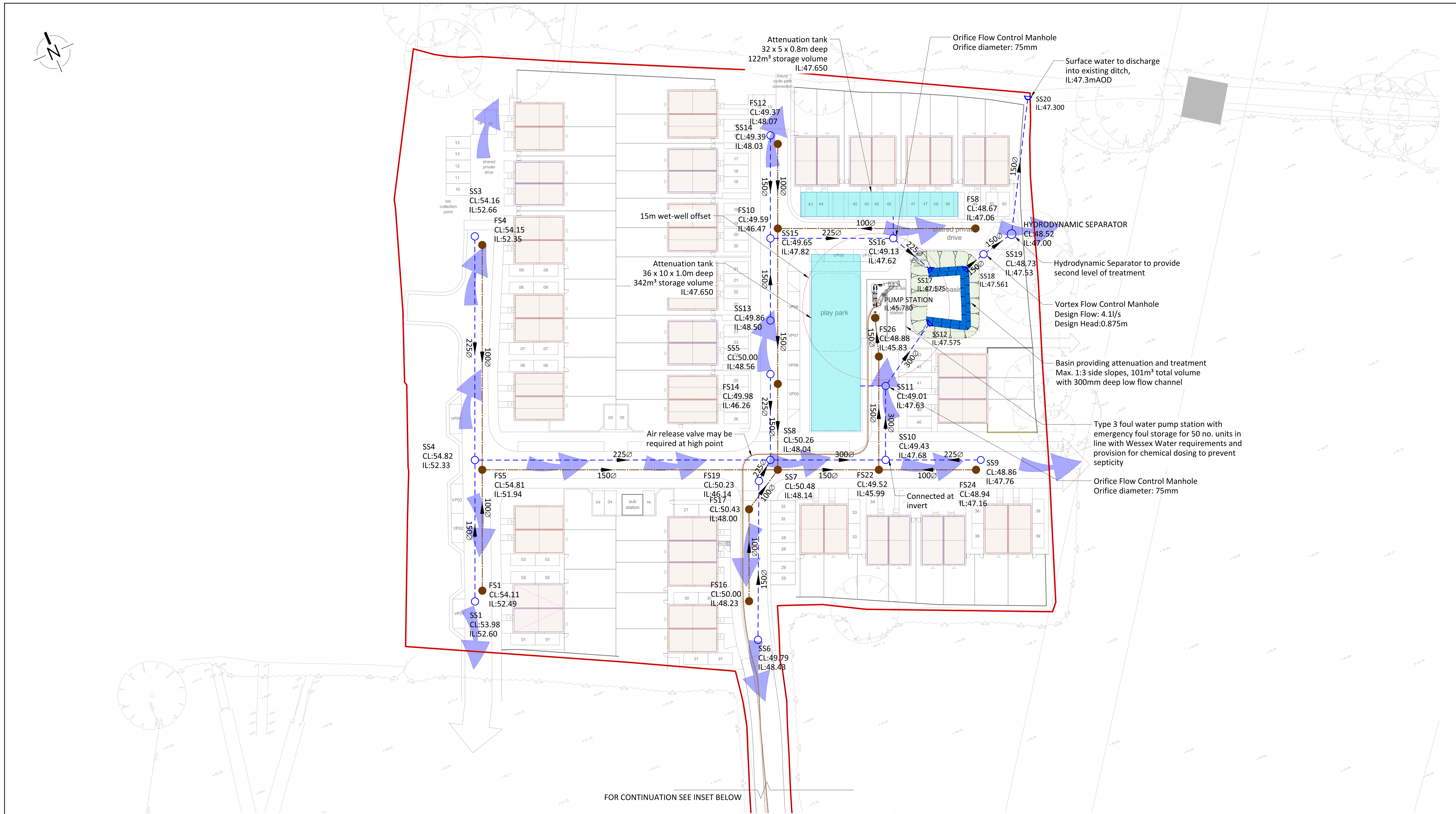
Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	5.48	5.48
1 in 1 year (l/s):	4.27	4.27
1 in 30 years (l/s):	10.69	10.69
1 in 100 year (l/s):	13.32	13.32
1 in 200 years (l/s):	15.23	15.23

APPENDIX D

PROPOSED DRAINAGE STRATEGY



Legend

Surface Water	Description
	New surface water sewer
	New surface water concrete ring manhole
	New headwall
	New cellular storage
	Attenuation basin
	Existing surface water sewer
	Existing surface water sewer manhole
Foul	**Description**
	New foul sewer
	New foul concrete ring manhole
	Existing foul sewer
	Existing foul sewer manhole
	Foul Pump Chamber
Other	
	Site boundary
	Overland exceedance route

HEALTH, SAFETY & ENVIRONMENT

It is the responsibility of the client to ensure that those undertaking the works are competent and experienced in the type of work to be undertaken.

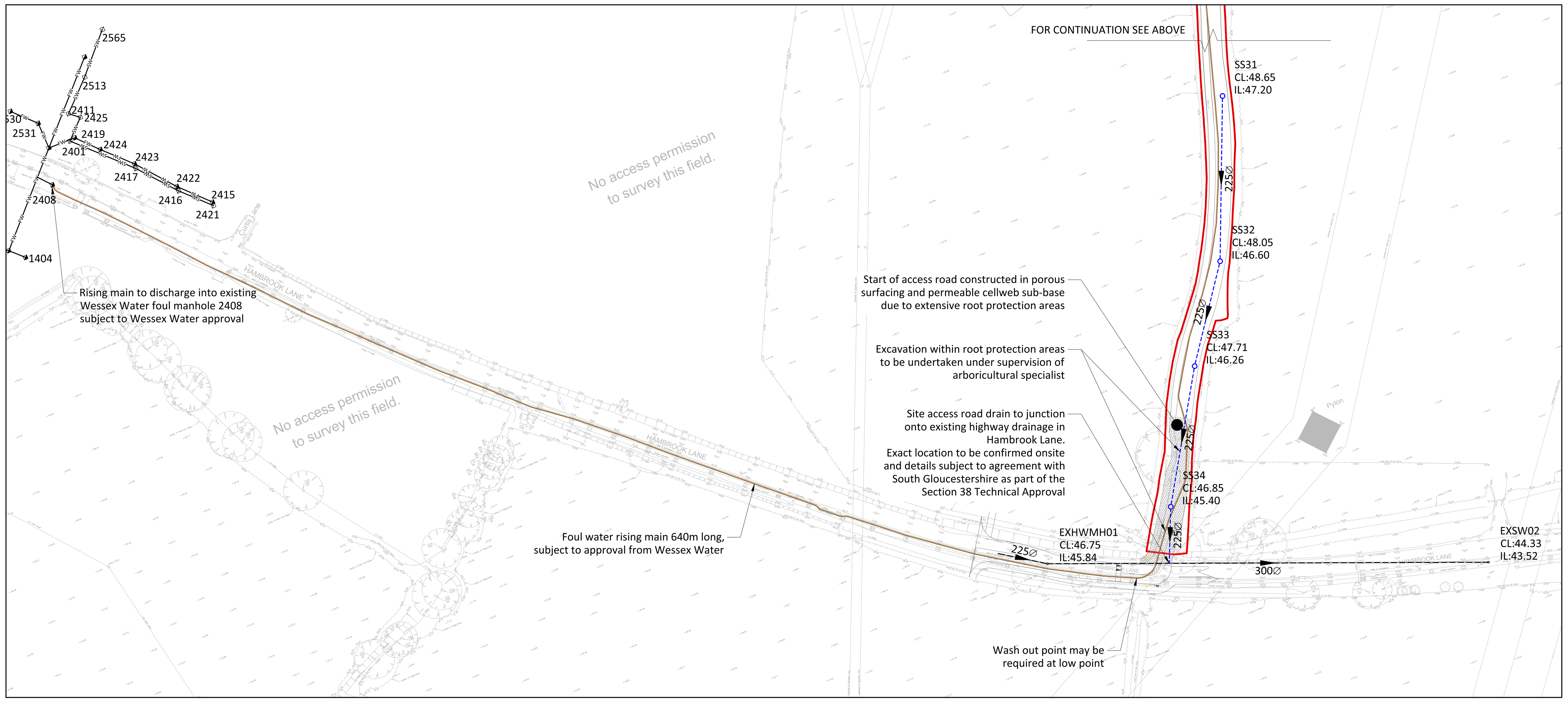
In addition to the hazards usually associated with the types of work detailed on this drawing, the following specific hazards have been identified through design risk assessment. The planning and execution of the works should take into account all usual and specific hazards.

Hazards should also be taken into account in the maintenance, operation, decommissioning and demolition of the works.

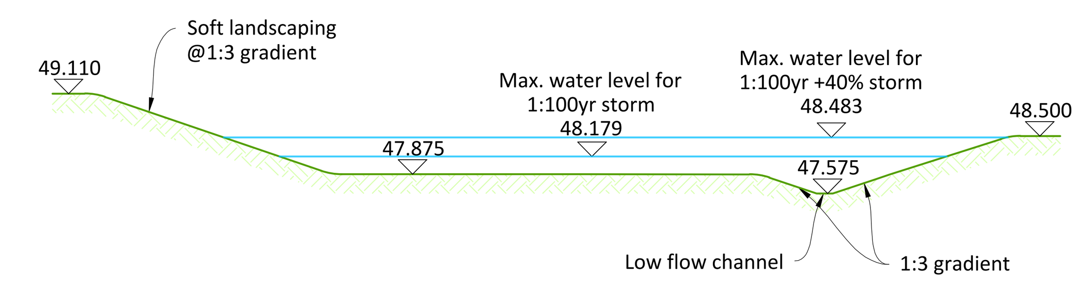
None identified

NOTES

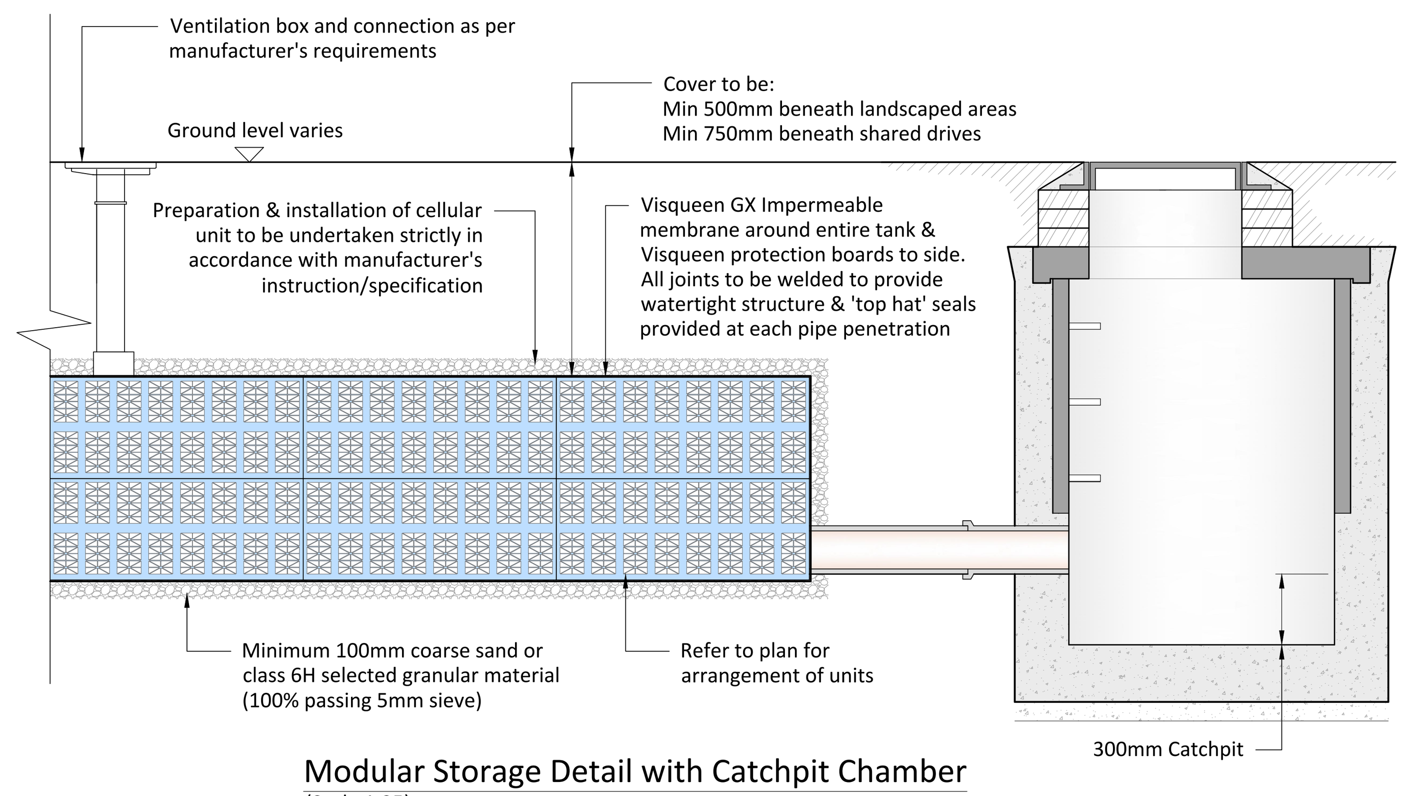
1. All dimensions are in millimetres (mm) and levels in metres Above Ordnance Datum (mAOD) unless noted otherwise.
2. Do not scale from this drawing.
3. The copyright in this drawing belongs to Structa LLP; the designs and details may not be used on any project other than that indicated in the titleblock.
4. Where CAD or BIM files of the drawing are issued, they are provided for the convenience of others, and shall not be used for construction purposes or relied upon for accuracy or completeness.



Rising main outfall
(Scale 1:1000)



Attenuation basin section
(Scale 1:100)



Modular Storage Detail with Catchpit Chamber
(Scale 1:25)

SCALE 1 : 500 @ A1 — 0m 10 20 30 40 50

Rev.	Date	Description	Drawn	Checked	Approved
P4	14.07.21	ACCESS ROAD SURFACE WATER ARRANGEMENTS UPDATED TO DISCHARGE INTO HAMBROOK LANE	TL	TS	MDI
P3	13.07.21	ACCESS ROAD PERMEABLE CONSTRUCTION NOTED. DRAWING RENUMBERED	SIH	TL	MDI
P2	18.06.21	UPDATED TO LATEST LAYOUT	SIH	TL	MDI
P1	14.06.21	FIRST ISSUE	SIH	TL	MDI

FOR APPROVAL

HOODLANDS FARM, HARRY STOKE

DRAINAGE STRATEGY

- Structural
- Civil
- Geo-environmental

structa

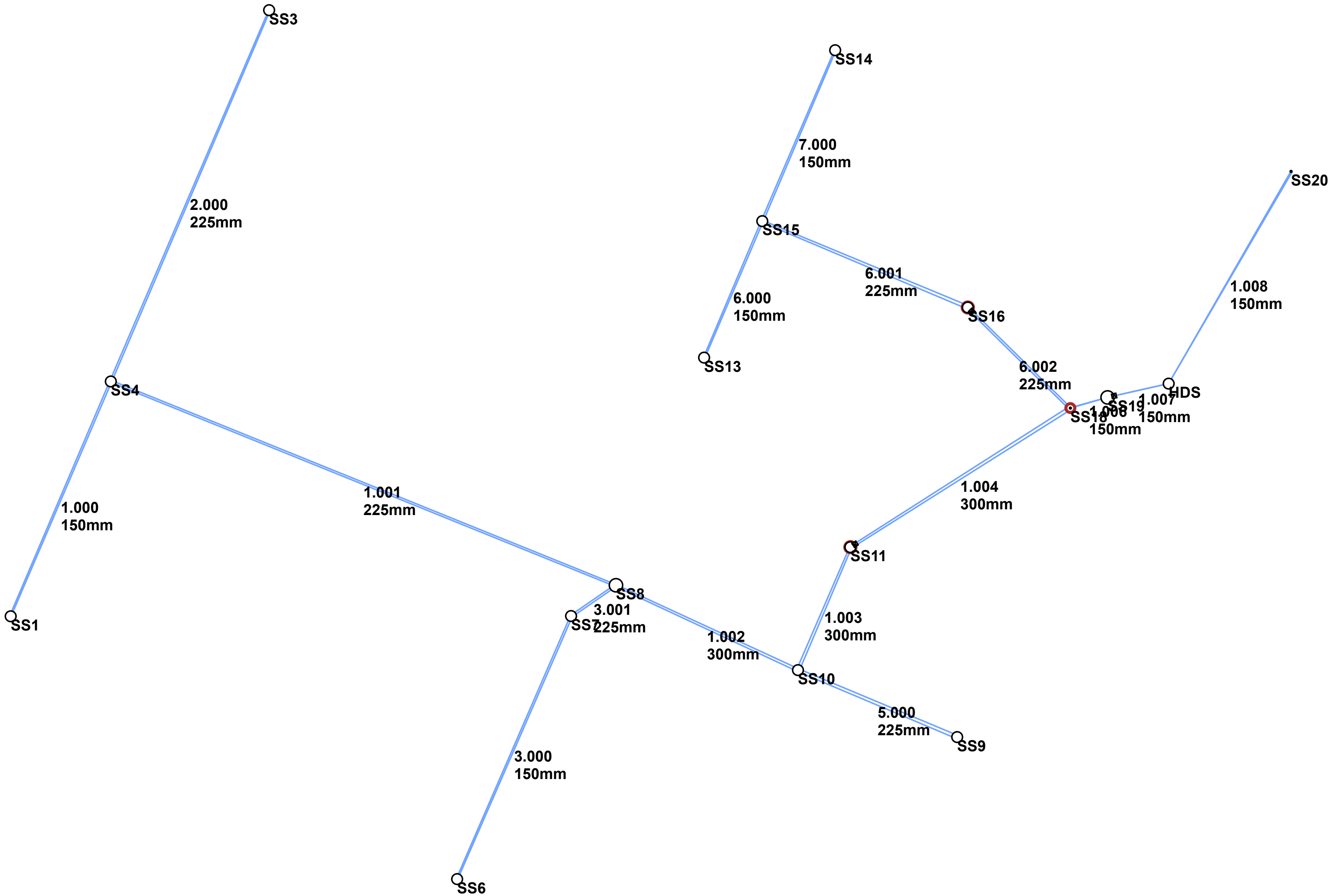
London | Hemel Hempstead | Swindon | Warwick | www.structa.co.uk

Drawing No: HST-STR-SW-GL-DR-C-SL-1905
Revision: P4

APPENDIX E

FLOW MODEL OUTPUTS

structa	Structa LLP Apple Walk 1 Kembrey Park Swindon SN2 8BL	File: 5978 SW CALCULATIONS.pfd Network: SS Tom Lafford 18/06/2021	Page 1 5978 Hoodlands Farm, Harry Stoke SW strategy



Design Settings

Rainfall Methodology	FSR
Return Period (years)	100
Additional Flow (%)	0
FSR Region	England and Wales
M5-60 (mm)	20.000
Ratio-R	0.350
CV	0.750
Time of Entry (mins)	5.00
Maximum Time of Concentration (mins)	30.00
Maximum Rainfall (mm/hr)	50.0
Minimum Velocity (m/s)	1.00
Connection Type	Level Soffits
Minimum Backdrop Height (m)	9.999
Preferred Cover Depth (m)	1.200
Include Intermediate Ground	✓
Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SS1	0.073	5.00	53.980	1200	363501.667	179444.166	1.380
SS3	0.136	5.00	54.160	1200	363530.709	179512.789	1.497
SS4	0.056	5.00	54.820	1200	363512.918	179470.752	2.487
SS6	0.059	5.00	49.790	1200	363551.836	179414.411	1.357
SS7	0.024	5.00	50.480	1200	363564.640	179444.196	2.338
SS8			50.331	1500	363569.686	179447.678	2.286
SS9	0.063	5.00	48.860	1200	363608.030	179430.490	1.097
SS10	0.061	5.00	49.430	1200	363590.137	179438.072	1.754
SS11	0.035	5.00	49.010	1200	363596.028	179451.993	1.384
SS13	0.085	5.00	49.860	1200	363579.589	179473.452	1.356
SS14	0.036	5.00	49.390	1200	363594.318	179508.253	1.358
SS15	0.038	5.00	49.650	1200	363586.128	179488.902	1.833
SS16	0.048	5.00	49.130	1200	363609.223	179479.128	1.512
SS18	0.067	5.00	48.500		363620.747	179467.740	0.939
SS19			48.730	1500	363624.934	179468.945	1.199
HDS			48.520	1200	363631.796	179470.506	1.035
SS20			48.000		363645.550	179494.532	0.700

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	SS1	SS4	28.869	0.600	52.600	52.408	0.192	150.4	150	5.59	50.0
2.000	SS3	SS4	45.647	0.600	52.663	52.333	0.330	138.3	225	5.69	50.0
1.001	SS4	SS8	61.278	0.600	52.333	48.120	4.213	14.5	225	5.98	50.0
3.000	SS6	SS7	32.420	0.600	48.433	48.217	0.216	150.1	150	5.66	50.0
3.001	SS7	SS8	6.131	0.600	48.142	48.120	0.022	278.7	225	5.79	50.0
1.002	SS8	SS10	22.595	0.600	48.045	47.676	0.369	61.2	300	6.17	50.0
5.000	SS9	SS10	19.433	0.600	47.763	47.676	0.087	223.4	225	5.37	50.0
1.003	SS10	SS11	15.116	0.600	47.676	47.626	0.050	302.3	300	6.45	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.000	0.817	14.4	9.9	1.230	2.262	0.073	0.0
2.000	1.110	44.1	18.4	1.272	2.262	0.136	0.0
1.001	3.448	137.1	35.9	2.262	1.986	0.265	0.0
3.000	0.818	14.5	8.0	1.207	2.113	0.059	0.0
3.001	0.778	30.9	11.2	2.113	1.986	0.083	0.0
1.002	2.012	142.2	47.2	1.986	1.454	0.348	0.0
5.000	0.871	34.6	8.5	0.872	1.529	0.063	0.0
1.003	0.899	63.5	64.0	1.454	1.084	0.472	0.0

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.004	SS11	SS18	15.199	0.600	47.626	47.575	0.051	298.0	300	6.73	50.0
6.000	SS13	SS15	16.777	0.600	48.504	47.892	0.612	27.4	150	5.14	50.0
7.000	SS14	SS15	21.013	0.600	48.032	47.892	0.140	150.1	150	5.43	50.0
6.001	SS15	SS16	25.078	0.600	47.817	47.618	0.199	126.0	225	5.79	50.0
6.002	SS16	SS18	9.527	0.600	47.618	47.575	0.043	221.6	225	5.97	50.0
1.006	SS18	SS19	4.357	0.600	47.561	47.531	0.030	145.2	150	6.82	50.0
1.007	SS19	HDS	7.037	0.600	47.531	47.485	0.046	153.0	150	6.96	50.0
1.008	HDS	SS20	27.684	0.600	47.485	47.300	0.185	149.6	150	7.52	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.004	0.905	64.0	68.7	1.084	0.625	0.507	0.0
6.000	1.930	34.1	11.5	1.206	1.608	0.085	0.0
7.000	0.818	14.5	4.9	1.208	1.608	0.036	0.0
6.001	1.163	46.2	21.5	1.608	1.287	0.159	0.0
6.002	0.874	34.8	28.1	1.287	0.700	0.207	0.0
1.006	0.832	14.7	105.8	0.789	1.049	0.781	0.0
1.007	0.810	14.3	105.8	1.049	0.885	0.781	0.0
1.008	0.819	14.5	105.8	0.885	0.550	0.781	0.0

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	28.869	150.4	150	1	53.980	52.600	1.230	54.820	52.408	2.262
2.000	45.647	138.3	225	1	54.160	52.663	1.272	54.820	52.333	2.262
1.001	61.278	14.5	225	1	54.820	52.333	2.262	50.331	48.120	1.986
3.000	32.420	150.1	150	1	49.790	48.433	1.207	50.480	48.217	2.113
3.001	6.131	278.7	225	1	50.480	48.142	2.113	50.331	48.120	1.986
1.002	22.595	61.2	300	1	50.331	48.045	1.986	49.430	47.676	1.454
5.000	19.433	223.4	225	1	48.860	47.763	0.872	49.430	47.676	1.529
1.003	15.116	302.3	300	1	49.430	47.676	1.454	49.010	47.626	1.084
1.004	15.199	298.0	300	1	49.010	47.626	1.084	48.500	47.575	0.625
6.000	16.777	27.4	150	1	49.860	48.504	1.206	49.650	47.892	1.608
7.000	21.013	150.1	150	1	49.390	48.032	1.208	49.650	47.892	1.608
6.001	25.078	126.0	225	1	49.650	47.817	1.608	49.130	47.618	1.287
6.002	9.527	221.6	225	1	49.130	47.618	1.287	48.500	47.575	0.700

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	SS1	1200	Manhole	1	SS4	1200	Manhole	1
2.000	SS3	1200	Manhole	1	SS4	1200	Manhole	1
1.001	SS4	1200	Manhole	1	SS8	1500	Manhole	1
3.000	SS6	1200	Manhole	1	SS7	1200	Manhole	1
3.001	SS7	1200	Manhole	1	SS8	1500	Manhole	1
1.002	SS8	1500	Manhole	1	SS10	1200	Manhole	1
5.000	SS9	1200	Manhole	1	SS10	1200	Manhole	1
1.003	SS10	1200	Manhole	1	SS11	1200	Manhole	1
1.004	SS11	1200	Manhole	1	SS18		Manhole	1
6.000	SS13	1200	Manhole	1	SS15	1200	Manhole	1
7.000	SS14	1200	Manhole	1	SS15	1200	Manhole	1
6.001	SS15	1200	Manhole	1	SS16	1200	Manhole	1
6.002	SS16	1200	Manhole	1	SS18		Manhole	1

Pipeline Schedule

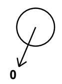
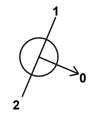
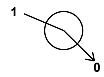
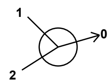
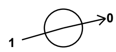
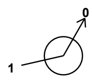
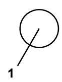
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.006	4.357	145.2	150	1	48.500	47.561	0.789	48.730	47.531	1.049
1.007	7.037	153.0	150	1	48.730	47.531	1.049	48.520	47.485	0.885
1.008	27.684	149.6	150	1	48.520	47.485	0.885	48.000	47.300	0.550

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.006	SS18		Manhole	1	SS19	1500	Manhole	1
1.007	SS19	1500	Manhole	1	HDS	1200	Manhole	1
1.008	HDS	1200	Manhole	1	SS20		Manhole	1

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SS1	363501.667	179444.166	53.980	1.380	1200	0	1.000	52.600	150
SS3	363530.709	179512.789	54.160	1.497	1200	0	2.000	52.663	225
SS4	363512.918	179470.752	54.820	2.487	1200	1	2.000	52.333	225
						2	1.000	52.408	150
						0	1.001	52.333	225
SS6	363551.836	179414.411	49.790	1.357	1200	0	3.000	48.433	150
SS7	363564.640	179444.196	50.480	2.338	1200	1	3.000	48.217	150
						0	3.001	48.142	225
SS8	363569.686	179447.678	50.331	2.286	1500	1	3.001	48.120	225
						2	1.001	48.120	225
						0	1.002	48.045	300
SS9	363608.030	179430.490	48.860	1.097	1200	0	5.000	47.763	225
SS10	363590.137	179438.072	49.430	1.754	1200	1	5.000	47.676	225
						2	1.002	47.676	300
						0	1.003	47.676	300
SS11	363596.028	179451.993	49.010	1.384	1200	1	1.003	47.626	300
						0	1.004	47.626	300
SS13	363579.589	179473.452	49.860	1.356	1200	0	6.000	48.504	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
SS14	363594.318	179508.253	49.390	1.358	1200		0	7.000	48.032	150
SS15	363586.128	179488.902	49.650	1.833	1200		1	7.000	47.892	150
							2	6.000	47.892	150
							0	6.001	47.817	225
SS16	363609.223	179479.128	49.130	1.512	1200		1	6.001	47.618	225
							0	6.002	47.618	225
SS18	363620.747	179467.740	48.500	0.939			1	6.002	47.575	225
							2	1.004	47.575	300
							0	1.006	47.561	150
SS19	363624.934	179468.945	48.730	1.199	1500		1	1.006	47.531	150
							0	1.007	47.531	150
HDS	363631.796	179470.506	48.520	1.035	1200		1	1.007	47.485	150
							0	1.008	47.485	150
SS20	363645.550	179494.532	48.000	0.700			1	1.008	47.300	150

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	✓
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.350	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	2	0
30	0	2	0
100	0	2	0
100	40	2	0

Node SS19 Online Hydroslide Control

Flap Valve	x	Design Depth (m)	0.875	Diameter (m)	0.100
Replaces Downstream Link	✓	Design Flow (l/s)	4.4	Max Head (m)	1.350
Invert Level (m)	47.531	Model	CTL VS	Min Node Dia (mm)	1200

Node SS11 Online Orifice Control

Flap Valve	x	Design Depth (m)	1.400	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	20.0		
Invert Level (m)	47.626	Diameter (m)	0.075		

Node SS16 Online Orifice Control

Flap Valve	x	Invert Level (m)	47.618	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Diameter (m)	0.075		

Node SS18 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	47.561
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	0.0	0.0	0.225	35.0	0.0	0.325	109.9	0.0	0.625	149.1	0.0
0.025	4.0	0.0	0.300	47.4	0.0	0.425	122.4	0.0	0.725	163.3	0.0
0.125	19.0	0.0	0.301	107.0	0.0	0.525	135.5	0.0	0.825	177.6	0.0

Node SS11 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	47.626
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	360.0	0.0	1.000	360.0	0.0	1.001	0.0	0.0

Node SS16 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	47.618
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	160.0	0.0	0.800	160.0	0.0	0.801	0.0	0.0

Results for 1 year +2% A Critical Storm Duration. Lowest mass balance: 99.65%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SS1	11	52.689	0.089	10.0	0.1976	0.0000	OK
15 minute winter	SS3	10	52.766	0.103	18.7	0.3087	0.0000	OK
15 minute winter	SS4	11	52.411	0.078	35.5	0.1236	0.0000	OK
15 minute winter	SS6	11	48.511	0.078	8.1	0.1574	0.0000	OK
15 minute winter	SS7	11	48.231	0.089	10.9	0.1192	0.0000	OK
15 minute winter	SS8	11	48.162	0.117	46.5	0.2066	0.0000	OK
15 minute winter	SS9	11	47.889	0.126	8.7	0.2910	0.0000	OK
15 minute winter	SS10	11	47.887	0.211	62.4	0.3878	0.0000	OK
360 minute winter	SS11	280	47.819	0.193	11.8	66.2182	0.0000	OK
15 minute winter	SS13	10	48.564	0.060	11.7	0.1452	0.0000	OK
15 minute winter	SS14	10	48.092	0.060	5.0	0.0997	0.0000	OK
15 minute winter	SS15	10	47.931	0.114	21.5	0.1774	0.0000	OK
360 minute winter	SS16	272	47.777	0.159	4.8	24.4429	0.0000	OK
360 minute winter	SS18	272	47.765	0.204	5.3	3.5074	0.0000	SURCHARGED
360 minute winter	SS19	272	47.762	0.231	4.5	0.4089	0.0000	SURCHARGED
15 minute summer	HDS	10	47.542	0.057	4.4	0.0639	0.0000	OK
15 minute winter	SS20	10	47.357	0.057	4.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SS1	1.000	SS4	9.7	0.887	0.673	0.3164	
15 minute winter	SS3	2.000	SS4	18.3	1.232	0.414	0.6785	
15 minute winter	SS4	1.001	SS8	35.5	2.919	0.259	0.7446	
15 minute winter	SS6	3.000	SS7	7.8	0.843	0.541	0.3004	
15 minute winter	SS7	3.001	SS8	11.0	0.773	0.355	0.0873	
15 minute winter	SS8	1.002	SS10	46.6	1.190	0.327	0.8844	
15 minute winter	SS9	5.000	SS10	8.0	0.322	0.231	0.5988	
15 minute winter	SS10	1.003	SS11	63.8	2.516	1.004	0.4510	
360 minute winter	SS11	Orifice	SS18	3.0				
15 minute winter	SS13	6.000	SS15	11.5	1.747	0.338	0.1108	
15 minute winter	SS14	7.000	SS15	4.8	0.745	0.334	0.1366	
15 minute winter	SS15	6.001	SS16	21.4	1.896	0.463	0.3208	
360 minute winter	SS16	Orifice	SS18	1.5				
360 minute winter	SS18	1.006	SS19	4.5	0.541	0.304	0.0767	
360 minute winter	SS19	Hydroslide	HDS	4.4				
15 minute summer	HDS	1.008	SS20	4.4	0.726	0.304	0.1679	31.6

Results for 30 year +2% A Critical Storm Duration. Lowest mass balance: 99.65%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SS1	11	52.968	0.368	24.6	0.8131	0.0000	SURCHARGED
15 minute winter	SS3	10	52.849	0.186	45.9	0.5555	0.0000	OK
15 minute winter	SS4	11	52.460	0.127	84.3	0.2021	0.0000	OK
15 minute winter	SS6	11	48.657	0.224	19.9	0.4523	0.0000	SURCHARGED
15 minute winter	SS7	11	48.289	0.147	25.7	0.1969	0.0000	OK
15 minute winter	SS8	11	48.262	0.217	110.3	0.3841	0.0000	OK
15 minute winter	SS9	11	48.113	0.350	21.3	0.8064	0.0000	SURCHARGED
480 minute winter	SS10	456	48.109	0.433	19.2	0.7964	0.0000	SURCHARGED
480 minute winter	SS11	456	48.109	0.483	20.2	165.8957	0.0000	SURCHARGED
15 minute winter	SS13	10	48.609	0.105	28.7	0.2523	0.0000	OK
15 minute winter	SS14	10	48.135	0.103	12.1	0.1720	0.0000	OK
480 minute winter	SS15	464	48.040	0.223	6.6	0.3472	0.0000	OK
480 minute winter	SS16	464	48.040	0.422	8.6	64.9456	0.0000	SURCHARGED
480 minute winter	SS18	472	48.033	0.472	7.8	27.8990	0.0000	SURCHARGED
480 minute winter	SS19	472	48.030	0.499	4.5	0.8824	0.0000	SURCHARGED
15 minute summer	HDS	8	47.542	0.057	4.4	0.0639	0.0000	OK
15 minute summer	SS20	8	47.357	0.056	4.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SS1	1.000	SS4	22.0	1.252	1.525	0.4934	
15 minute winter	SS3	2.000	SS4	44.7	1.528	1.012	1.3197	
15 minute winter	SS4	1.001	SS8	84.7	3.628	0.618	1.5191	
15 minute winter	SS6	3.000	SS7	18.1	1.042	1.255	0.5377	
15 minute winter	SS7	3.001	SS8	25.6	0.998	0.826	0.1654	
15 minute winter	SS8	1.002	SS10	108.4	1.609	0.762	1.4133	
15 minute winter	SS9	5.000	SS10	19.4	0.489	0.562	0.7729	
480 minute winter	SS10	1.003	SS11	18.8	0.956	0.296	1.0645	
480 minute winter	SS11	Orifice	SS18	3.7				
15 minute winter	SS13	6.000	SS15	28.4	2.029	0.833	0.2394	
15 minute winter	SS14	7.000	SS15	11.9	0.860	0.821	0.2972	
480 minute winter	SS15	6.001	SS16	6.6	0.778	0.143	0.9967	
480 minute winter	SS16	Orifice	SS18	2.0				
480 minute winter	SS18	1.006	SS19	4.5	0.545	0.305	0.0767	
480 minute winter	SS19	Hydroslide	HDS	4.4				
15 minute summer	HDS	1.008	SS20	4.4	0.726	0.304	0.1679	66.0

Results for 100 year +2% A Critical Storm Duration. Lowest mass balance: 99.65%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SS1	11	53.274	0.674	31.9	1.4894	0.0000	SURCHARGED
15 minute winter	SS3	11	53.043	0.380	59.4	1.1324	0.0000	SURCHARGED
15 minute winter	SS4	11	52.480	0.147	105.5	0.2333	0.0000	OK
15 minute winter	SS6	12	49.051	0.618	25.8	1.2463	0.0000	SURCHARGED
15 minute winter	SS7	12	48.593	0.451	29.5	0.6048	0.0000	SURCHARGED
15 minute winter	SS8	12	48.573	0.528	132.8	0.9330	0.0000	SURCHARGED
15 minute winter	SS9	12	48.276	0.513	27.5	1.1813	0.0000	SURCHARGED
480 minute winter	SS10	464	48.267	0.591	24.8	1.0882	0.0000	SURCHARGED
480 minute winter	SS11	464	48.267	0.641	26.4	220.3892	0.0000	SURCHARGED
15 minute winter	SS13	11	48.798	0.294	37.2	0.7084	0.0000	SURCHARGED
15 minute winter	SS14	11	48.315	0.283	15.7	0.4731	0.0000	SURCHARGED
600 minute winter	SS15	585	48.184	0.367	7.1	0.5711	0.0000	SURCHARGED
600 minute winter	SS16	585	48.185	0.567	9.0	87.1235	0.0000	SURCHARGED
600 minute winter	SS18	600	48.179	0.618	8.9	48.2114	0.0000	SURCHARGED
600 minute winter	SS19	600	48.176	0.645	4.5	1.1393	0.0000	SURCHARGED
15 minute winter	HDS	7	47.542	0.057	4.4	0.0639	0.0000	OK
15 minute winter	SS20	7	47.357	0.057	4.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SS1	1.000	SS4	27.8	1.581	1.928	0.5028	
15 minute winter	SS3	2.000	SS4	54.7	1.500	1.240	1.5333	
15 minute winter	SS4	1.001	SS8	105.2	3.577	0.768	2.0584	
15 minute winter	SS6	3.000	SS7	20.3	1.154	1.406	0.5707	
15 minute winter	SS7	3.001	SS8	29.2	1.000	0.942	0.2438	
15 minute winter	SS8	1.002	SS10	132.1	1.875	0.928	1.5911	
15 minute winter	SS9	5.000	SS10	26.7	0.670	0.770	0.7729	
480 minute winter	SS10	1.003	SS11	24.6	1.026	0.388	1.0645	
480 minute winter	SS11	Orifice	SS18	4.3				
15 minute winter	SS13	6.000	SS15	33.8	2.036	0.991	0.2954	
15 minute winter	SS14	7.000	SS15	14.2	0.871	0.981	0.3699	
600 minute winter	SS15	6.001	SS16	6.9	0.778	0.149	0.9974	
600 minute winter	SS16	Orifice	SS18	2.3				
600 minute winter	SS18	1.006	SS19	4.5	0.544	0.306	0.0767	
600 minute winter	SS19	Hydroslide	HDS	4.4				
15 minute winter	HDS	1.008	SS20	4.4	0.726	0.304	0.1679	66.1

Results for 100 year +40% CC +2% A Critical Storm Duration. Lowest mass balance: 99.65%

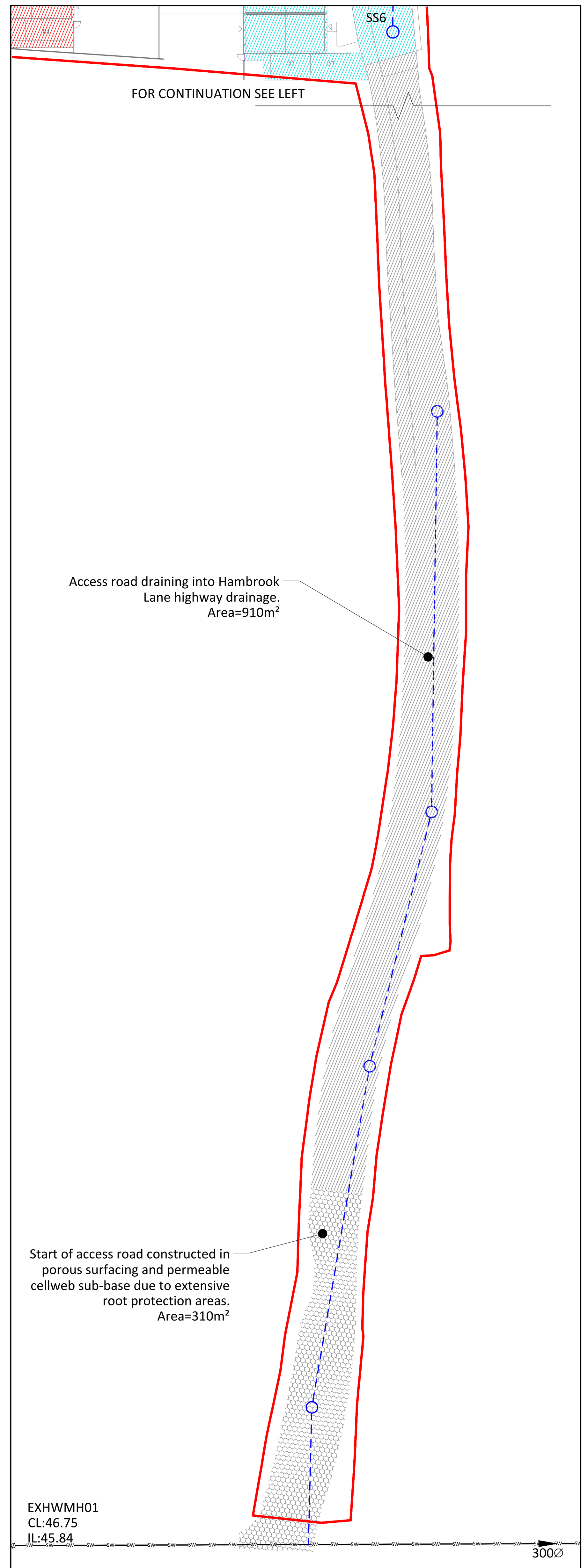
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SS1	12	53.980	1.380	44.7	3.0498	0.0841	FLOOD
15 minute winter	SS3	12	53.652	0.989	83.1	2.9508	0.0000	SURCHARGED
15 minute winter	SS4	12	52.880	0.547	139.1	0.8697	0.0000	SURCHARGED
15 minute winter	SS6	11	49.790	1.357	36.1	2.7384	0.7131	FLOOD
15 minute winter	SS7	12	49.093	0.951	39.0	1.2742	0.0000	SURCHARGED
15 minute winter	SS8	12	49.060	1.015	164.6	1.7934	0.0000	SURCHARGED
15 minute winter	SS9	11	48.648	0.885	38.6	2.0382	0.0000	FLOOD RISK
600 minute winter	SS10	585	48.559	0.883	29.0	1.6242	0.0000	SURCHARGED
600 minute winter	SS11	585	48.559	0.933	30.9	320.4906	0.0000	SURCHARGED
15 minute winter	SS13	12	49.539	1.035	52.0	2.4950	0.0000	SURCHARGED
15 minute winter	SS14	12	48.707	0.675	22.0	1.1288	0.0000	SURCHARGED
960 minute winter	SS15	900	48.494	0.677	6.9	1.0519	0.0000	SURCHARGED
960 minute winter	SS16	900	48.494	0.876	8.9	123.2340	0.0000	SURCHARGED
960 minute winter	SS18	930	48.483	0.922	9.7	99.5619	0.0000	FLOOD RISK
960 minute winter	SS19	930	48.480	0.949	6.2	1.6763	0.0000	FLOOD RISK
15 minute winter	HDS	6	47.542	0.057	4.4	0.0639	0.0000	OK
15 minute winter	SS20	6	47.357	0.056	4.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SS1	1.000	SS4	34.5	1.962	2.393	0.5082	
15 minute winter	SS3	2.000	SS4	70.3	1.798	1.593	1.8154	
15 minute winter	SS4	1.001	SS8	134.7	3.493	0.982	2.4371	
15 minute winter	SS6	3.000	SS7	25.6	1.452	1.768	0.5707	
15 minute winter	SS7	3.001	SS8	37.3	0.968	1.206	0.2438	
15 minute winter	SS8	1.002	SS10	165.0	2.344	1.160	1.5911	
15 minute winter	SS9	5.000	SS10	34.7	0.874	1.004	0.7729	
600 minute winter	SS10	1.003	SS11	28.7	1.028	0.451	1.0645	
600 minute winter	SS11	Orifice	SS18	5.2				
15 minute winter	SS13	6.000	SS15	43.3	2.462	1.270	0.2954	
15 minute winter	SS14	7.000	SS15	18.7	1.064	1.296	0.3699	
960 minute winter	SS15	6.001	SS16	6.8	0.700	0.146	0.9974	
960 minute winter	SS16	Orifice	SS18	2.5				
960 minute winter	SS18	1.006	SS19	6.2	0.543	0.419	0.0767	
960 minute winter	SS19	Hydroslide	HDS	4.4				
15 minute winter	HDS	1.008	SS20	4.4	0.726	0.304	0.1679	66.3

APPENDIX F

IMPERMEABLE AREAS

Pipe No.	Upstream MH	Hardstanding (m²)	Roof Area (m²)	Pond Area(m²)	Total Area	Key	Area (ha)
Network 1							
1.000	SS1	520	210		730		0.073
2.000	SS3	850	510		1360		0.136
1.001	SS4	560			560		0.056
3.000	SS6	340	250		590		0.059
3.001	SS7	240			240		0.024
1.002	SS8						#####
5.000	SS9	430	200		630		0.063
1.003	SS10	410	200		610		0.061
1.004	SS11	200	150		350		0.035
1.005	SS12						#####
6.000	SS13	550	300		850		0.085
7.000	SS14	160	200		360		0.036
6.001	SS15	280	100		380		0.038
6.002	SS16	290	190		480		0.048
6.003	SS17						#####
1.006	SS18	230	200	240	670		0.067
1.007	HS						#####
1.008	SS20						#####
	Totals:	5060 m²	2510 m²	240 m²	7810 m²	(0.781 ha)	0.781



Access Road Plan
Scale 1:500

SCALE 1 : 250 @ A1

0m 5 10 15 20 25

HEALTH, SAFETY & ENVIRONMENT

It is the responsibility of the client to ensure that those undertaking the works are competent and experienced in the type of work to be undertaken.

In addition to the hazards usually associated with the types of work detailed on this drawing, the following specific hazards have been identified through design risk assessment. The planning and execution of the works should take into account all usual and specific hazards.

Hazards should also be taken into account in the maintenance, operation, decommissioning and demolition of the works.

None identified

NOTES

1. All dimensions are in millimetres (mm) and levels in metres Above Ordnance Datum (mAOD) unless noted otherwise.
2. Do not scale from this drawing.
3. The copyright in this drawing belongs to Structa LLP; the designs and details may not be used on any project other than that indicated in the titleblock.
4. Where CAD or BIM files of the drawing are issued, they are provided for the convenience of others, and shall not be used for construction purposes or relied upon for accuracy or completeness.

Rev.	Date	Description	Drawn	Checked	Approved
P3	14.07.21	ACCESS ROAD SURFACE WATER ARRANGEMENTS UPDATED TO DISCHARGE INTO HAMBROOK LANE	TL	TS	MDI
P2	13.07.21	ACCESS ROAD PERMEABLE CONSTRUCTION NOTED. DRAWING RENUMBERED	SIH	TL	MDI
P1	18.06.21	FIRST ISSUE	SIH	TL	MDI

FOR APPROVAL

HOODLANDS FARM, HARRY STOKE

IMPERMEABLE AREAS

- Structural
- Civil
- Geo-environmental

structa

London | Hemel Hempstead | Swindon | Warwick | www.structa.co.uk

Drawing No: HST-STR-SW-GL-DR-C-SL-1906

Revision: P3

APPENDIX G

WESSEX WATER CORRESPONDENCE

From: Teddy Takyi-Amuah <Teddy.Takyi-Amuah@wessexwater.co.uk>
Sent: 14 May 2021 14:22
To: Tom Lafford <tom.lafford@structa.co.uk>
Subject: WW RESP : ST67NW/ 375: Hoodlands, Harry Stoke

Good afternoon Tom,

WWRESP: ST67NW/ 375 - Land At The Hoodlands Hambrook Lane Hambrook Bristol

Many thanks for your email and continued engagement. Please note the comments below as discussed

> Proposed foul drainage strategy
>
> The comprehensive approach toward the development of the site and the adjoining larger allocations are considered necessary by Wessex Water. Additionally, Wessex Water believes the proposed drainage approach would be piecemeal and would not consider capacity constraints initially identified during the Local plan revisions and to promote the distribution of land within this allocation.
>
> Considering the lapse of time between the original response and now, along with the progression of sites warranting the need for a cumulative drainage approach. We will not conduct a disjointed approval process for any upcoming sites looking to progress outside of the parameters initially set out between Wessex Water and the relevant parties. The need to progress albeit not in line with arrangements is noted. However, Wessex Water's interest is in protecting our assets and existing customers while managing our infrastructure in line with identified improvements and phasing of all upcoming sites likely to utilize the system.
>
> Despite concerns about septicity (long rising main) still needing to be addressed, the connection point requested will likely increase flood risks downstream. You can understand why Wessex Water is not encouraging this approach in the interest of protecting our assets and existing customers. Piecemeal changes to the overall drainage strategy will not be supported at this stage.

I hope the above is sufficient for now. A review of the contents of this email will be required where 18 months or more have elapsed. In the light of significant changes, any changes that are likely to impact the response (e.g. changes in drainage strategy, development numbers, or phasing) will need to be discussed with Wessex Water.

Kind regards,

Teddy Takyi-Amuah

Planning Liaison
Wessex Water
Claverton Down Bath BA2 7WW
wessexwater.co.uk

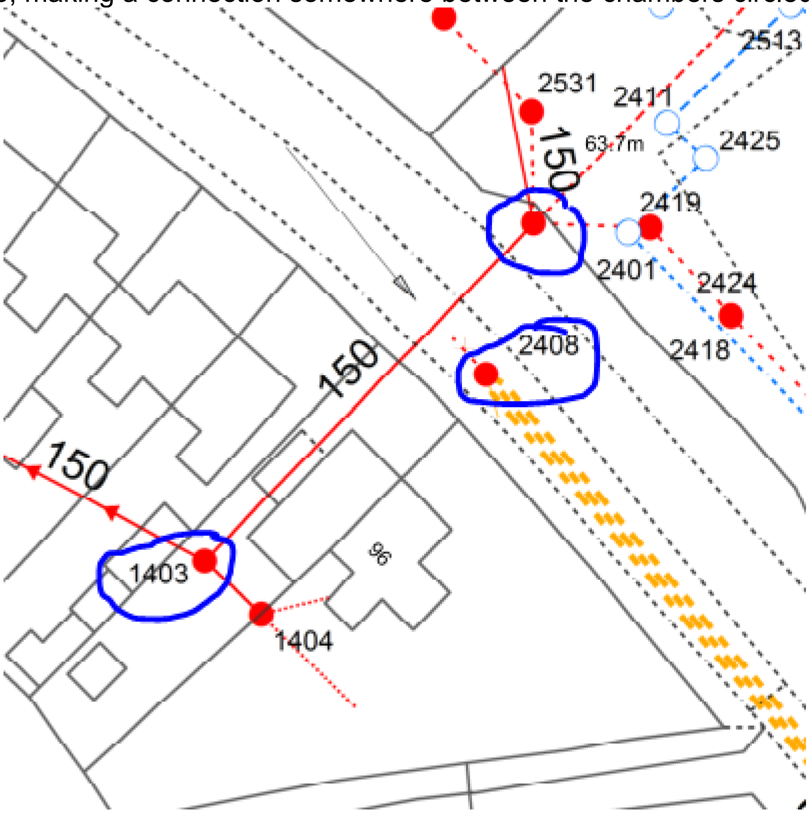
From: Tom Lafford <tom.lafford@structa.co.uk>
Sent: 23 April 2021 09:44
To: Teddy Takyi-Amuah <Teddy.Takyi-Amuah@wessexwater.co.uk>
Cc: Michael Ibbeson <michael.ibbeson@structa.co.uk>
Subject: Hoodlands, Harry Stoke

Good morning Teddy

We are consulting engineers involved in a residential scheme at the above, which is currently going through a further design iteration that utilises rapid construction methods. I attach a site location plan, which may look familiar…

I understand that you confirmed (to Vectos) in January last year that there would be capacity for the foul discharge from 49 residential units, ref. SG/ST67NW/375. It would appear that this relies upon the delivery of surrounding sewerage infrastructure (by Crest) however we understand that this is not likely to be available for 5 years or so, which would be a few years later than will be needed. Please could you confirm that we are understanding this correctly?

We have identified a 150mm foul sewer around 400m to the west in Hambrook Lane, which we could pump to, making a connection somewhere between the chambers circled-



Please can you advise whether there would be capacity for us to connect here?

Let me know if you require any further information.

Kind regards
Tom

Tom Lafford
MEng (Hons), Principal Infrastructure Engineer

Direct 01793 209 135 | Mobile 07870 891 786 | tom.lafford@structa.co.uk
Structa LLP, Apple Walk 1, Kembrey Park, Swindon, Wiltshire SN2 8BL

structa ■ Structural ■ Civil ■ Geo-environmental

London | Hemel Hempstead | Swindon | Warwick | www.structa.co.uk