



Consulting Engineers Ltd

'optimising development potential'

**LAND SOUTH OF BARTONS ROAD
HAVANT, HAMPSHIRE**

**Flood Risk Assessment &
Preliminary Surface Water Drainage Strategy**

**Project No. 14-018
December 2015**



Consulting Engineers Ltd

'optimising development potential'

**LAND SOUTH OF BARTONS ROAD
HAVANT, HAMPSHIRE**

**Flood Risk Assessment &
Preliminary Surface Water Drainage Strategy**

**C&A Consulting Engineers
Office 9 – Aldershot Enterprise Centre
Mandora House
Louise Margaret Road
Aldershot, Hampshire
GU11 2PW
Tel: 01252 939000
enquiries@c-a.uk.com**

**Project No. 14-018
December 2015**

DOCUMENT CONTROL SHEET

REV	ISSUE PURPOSE	AUTHOR	CHECKED	REVIEWED	APPROVED	DATE
-	Final	GAC	GG	GAC	GAC	Dec 2015

CONTENTS	Page
1.0 Introduction	1
2.0 Site Location & Details	3
3.0 Definition of the Flood Hazard	9
4.0 Probability of Flooding	13
5.0 Effect of Climate Change	15
6.0 Preliminary Development Proposals	16
7.0 Management Measures	18
8.0 Offsite Impact	19
9.0 Residual Risks	20
10.0 Conclusions & Recommendations	20
References	23

FIGURES

- Figure 1 - Site Location Plan
- Figure 2 - Site Boundary
- Figure 3 - Topographic Information and Existing Drainage
- Figure 4 - Flood Zones derived from EA Mapping
- Figure 5 - Surface Flooding derived from EA Mapping
- Figure 6 - British Geological Society Data Bedrock
- Figure 7 - British Geological Society Data Superficial
- Figure 8 - Ground Water Source Protection from EA Mapping
- Figure 9 - Aquifer Maps – Superficial
- Figure 10 - Aquifer Maps – Bedrock
- Figure 11 - Post Development Exceedance Overland Flow Paths

APPENDICES

- Appendix A – Correspondence with the EA
- Appendix B – Outline Illustrative Preliminary Master plan
- Appendix C – Outline Development Surface Water Drainage Drawings
- Appendix D – Outline Development Surface Water Drainage Calculations
- Appendix E – Existing Drainage Correspondence & Public Sewer Records
- Appendix F – Council SFRA extracts
- Appendix G – Extract Geotechnical Report

1.0 INTRODUCTION

- 1.1 Charles & Associates Consulting Engineers Ltd (C&A) have been appointed by Chidden Farms (CF) to prepare a Flood Risk Assessment (FRA) for the proposed development of land South of Bartons Road, Havant, within the Borough of Havant and County of Hampshire, hereafter referred to as 'the site'. The location is shown diagrammatically on **Figure 1**.

Purpose

- 1.2 The site was promoted for residential development through the Havant Council Local Plan (Allocations), dated October 2014, and is currently allocated within it.
- 1.3 CF now wish to submit a planning application in line with the original strategic promotion. This application is to be outline in nature and include a scheme to satisfy policies HB1 and UE3b which provides for an allocation of up to 203 residential dwellings.
- 1.4 With this in mind this FRA has been prepared as a means of demonstrating that flooding and drainage issues would not constrain the development of the site. It also confirms that the site will conform to the recently published national standards for sustainable drainage (SuDS) and the local requirements set out by Hampshire County Council as the SuDs approval body (SAB).
- 1.5 It is noted that the application is outline in nature as such it is expected that a planning condition will be imposed on any approval that requires the principles of this FRA to be adhered to and proven at the more detailed design stage of the site evolution.
- 1.6 In terms of surface water drainage and potential for flooding, it examines the sites suitability in planning policy terms and physical characteristics to allow suggested solutions to deal with drainage in the

developed state, thus ensuring the site is drained in a sustainable manner while not affecting the surrounding area.

- 1.7 The provisions of the National Planning Policy Framework (NPPF) have been considered in preparing the Flood Risk Assessment, together with The Flood & Water Management Act 2010 (TFWMA). In addition attention has also been paid to the Technical Guidance of the National Planning Practise Guidance (NPPG) In addition policies within the Core Strategy and LP(Allocations) have also been addressed.
- 1.8 Flood maps published by the Environment Agency and further information provided by the Agency and the Councils SFRA indicate that the site lies fully within Flood Zone 1, 'Low probability flood risk area', from for fluvial sources, as defined by Table 1 of NPPF. Correspondence from the EA is provided within **Appendix A** and shown diagrammatically on **Figure 4**.

Report Limitations

- 1.9 The findings, recommendations and conclusions of this report are based on information obtained from a variety of external sources which are understood to be reputable. However, C&A Consulting Engineers cannot guarantee the authenticity or reliability of any data and/or records provided by third parties.

2.0 SITE LOCATION & DETAILS

- 2.1 The site is located to the south east of the existing residential area of Denvilles, Bartons Road to the north and agricultural land to the east, as shown in **Figure 1**. The existing site is an open undeveloped field. The whole site within the red line boundary covers 6.8 hectares in area. Again this is shown diagrammatically in **Figure 2**.

Topography & Existing Drainage

- 2.2 Topographic information has been obtained for the site. The land survey indicates a moderate to steep slope falling from north to the south east across the site. The approximate levels fall from 35m AOD to 18m AOD. Refer **Figure 3**.
- 2.3 A 375 mm diameter Southern Water surface water sewer crosses the site from north to south at the proposed access road before continuing south changing direction to the east ultimately discharging to a culvert within Eastleigh Road. This has been confirmed via Southern Water public sewer records, refer **Appendix E and Figure 3**. In addition a number of agricultural land drains cross the site to the east and west which discharge to the north/south sewer. These drains are believed to be between 600 and 1000mm deep.
- 2.4 A small pond exists halfway down the eastern boundary which is heavily silted and overgrown with vegetation.
- 2.5 A full topographic survey has been undertaken which has confirmed the records accordingly. The presence of the public surface water suggests that the site can be drained via traditional piped networks, if necessary. However it is intended that the site follow SuDS methods of surface water control, as such the use of the existing public network will only come in to play should infiltration techniques not prove viable for geotechnical reasons.

- 2.6 Localised surface water flooding has been noted both visually on the site and within the EA's current mapping, refer **Figure 5**. This flooding follows the line of the public sewer in the main however small pockets of surface flooding occur to the south/south west as indicated on **Figure 5**.
- 2.7 It is thought that the combination of the land drainage entering the surface water sewer and the geology of the site creates this minor flooding phenomenon.

Geology

- 2.8 A review of the British Geological Society's records and intrusive borehole testing has confirmed that the superficial geology is River Terrace Deposits of Sand Silt & Clay of varying depths followed by head deposits of gravelly clay and finally a bedrock of clay silt and sand. Clearly the clay/silt has a low potential for infiltration. As such an intrusive investigation was carried out which confirmed that the site has gravelly topsoil to 250mm followed by a layer of silty clay to gravelly clay. Infiltration potential was reviewed and is supported by the infiltration test results within the geotechnical report. Infiltration rates were found to be good to poor as such selective infiltration is achievable. Refer **Appendix F** for extracts of Geotechnical Report and **Figures 6 & 7** for British Geological Society mapping.
- 2.9 As such there is potential to utilise some forms of infiltration techniques on the site at shallow levels below ground. The form of these SuDs techniques is explained later within this report. In summary they include a combination of traditional pipes and infiltration.

Vulnerability classification

- 2.10 With reference to Table 2 of NPPF, the proposed residential dwellings would be considered as a 'More Vulnerable' use. By virtue of the site having a Flood Zone 1 classification and already allocated within the LP.

The site is suitable for residential development and deemed to have passed the Sequential Test as set out in the NPPG guidance. This is supported by the Planning Authority's SFRA and LP.

Groundwater

- 2.11 Review of the Environment Agency's (EA) records has confirmed that the site is underlain by a Secondary 'A' Aquifer within the superficial gravel/clay, however, it is also designated unproductive due to the London Clay. Secondary Aquifers are designated by the EA as:

"Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers"

- 2.12 Importantly EA records confirm that the site does not fall within a ground water protection zone area. Refer **Appendix A** for EA records on Ground Water and **Figures 8 to 10**. In addition no recorded groundwater flooding has been noted by the EA or Hampshire County Council (HCC), beyond that identified as surface water flooding as suggested within the EA mapping. Reproduced as **Figure 5** within this report.
- 2.13 In addition the intrusive geotechnical survey did not encounter ground water at the time of the testing in November 2013.
- 2.14 Historic observations by the land owner have however suggested that in times of extreme rainfall events such as those experienced in 2007, the ground became water logged by a mixture of waters backing up in the public sewer and land drains, together with ground waters becoming trapped between the London Clay and Gravel/Clay layers eventually dissipating away.

Local Policy Documents

- 2.15 This FRA has been prepared with due regard to the '*Strategic Flood Risk Assessment*' (SFRA) prepared by Atkins in 2007 for the Urban South Hampshire Partnership which formed part of Havant Borough Council's evidence base for their Core Strategy which was adopted in March 2011. The Adopted 'Core Strategy', sets out the policies and aims for the Borough until 2026.
- 2.16 This SFRA has been further supplemented by the '*Strategic Flood Risk Assessment Supplement - Incorporating Sequential and Exception Tests*' for the emerging Local Plan (Allocations) which also support the Borough's, then, emerging Local Plan (Allocations). This document also confirms the site is suitable for development.
- 2.17 It is intended to provide up to 175 dwellings and associated infrastructure on the site. The site is conducive to utilising a number of Sustainable Urban Drainage techniques.
- 2.18 As such it is envisaged that all hardstanding surface water flow will be stored and infiltrated back to the ground.
- 2.19 This ensures that policy and guidance, such as that required under the Local Plan (Allocations) Policy UE3b, Adopted Core Strategy Policies CS11, 15 and 21, National Planning Policies, the Flood & Surface Water Management Act 2010 and the recently released national SuDS Guidance, are all met and satisfied.
- 2.20 The site has been recognised by both the EA and the Local Planning Authority, through their evidence base, as being suitable for development and confirm that the site can be developed in terms of planning policy.

Sequential Test and Exception Test

- 2.21 NPPF & TFWMA requires that at all stages of planning a Sequential Test is completed with the aim of steering new development to areas at the lowest probability of flooding. The Sequential Test would normally be completed by the Local Planning Authority (LPA) to inform the preparation of the Local Development Framework (LDF).
- 2.22 NPPF indicates that where a Sequential Test has not been applied by the Local Authority, evidence will need to be gathered. The onus for provision of evidence demonstrating the successful application of the Sequential Test for the site falls to the developer or promoter of the site. It is noted that a Strategic Flood Risk Assessment has been prepared for the Core Strategy and has informed the evidence base, however this is not site specific. That said further evidence has been provided in the form of the Strategic Flood Risk Assessment Supplement - Incorporating Sequential and Exception Tests.
- 2.23 This evidence confirms the sites credentials for development via a positive result in the Sequential Test which assures its continued progress through the planning system in terms of flood risk.
- 2.24 With respect to the Exception Test. This test should only be applied as set out in NPPF Table 3 following application of the Sequential Test. In this case the Sequential Test Has been deemed to be passed by virtue of sections 2.22 & 2.23 above. It is therefore now necessary to show that both elements of the test, as set out in paragraph 102 of NPPF can be satisfied. That being:
- *it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared; and*

- *a site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall. Both elements of the test will have to be passed for development to be allocated or permitted.*

2.25 As residential development has already been identified within the Council's evidence base as having passed the Sequential Test and is to be located within Flood Zone 1, the site is deemed to have also passed the required Exception Test

2.26 While a positive outcome, it must not be forgotten that in the development of the site it must be demonstrated that the development will be safe and will not increase the risk of flooding to other areas. This is dealt with in **Section 8** of this report.

3.0 DEFINITION OF THE FLOOD HAZARD

Sources of flooding:

3.1 NPPF identifies six potential sources of flooding that require investigation:

- Flooding from rivers or fluvial flooding;
- Flooding from the sea or tidal flooding;
- Flooding from land;
- Flooding from groundwater;
- Flooding from sewers; and
- Flooding from reservoirs, canals, and other artificial sources.

Flooding from rivers or fluvial flooding

3.2 There are no water courses or riparian ditches on, or adjacent to the site. A small pond exists to the eastern boundary half way down its north/south length, however this appears to be feed via the existing land drains.

3.3 There are historic records of flooding to water courses east and west of the site. However, these are some distance away. This is confirmed by the Environment Agency's flood maps, enclosed at **Appendix A** and **Figure 4**. It is also reinforced by a number of Planning Authority commissioned studies for the area. The most up to date of these being:

- The Strategic Flood Risk Assessment' (SFRA) prepared by Atkins in 2007 for the Urban South Hampshire Partnership;
- Strategic Flood Risk Assessment Supplement - Incorporating Sequential and Exception Tests for the, then, emerging Local Plan (Allocations) October 2013;

- 3.4 All of the documents identified above also confirm that the site falls within Flood Zone 1, therefore suitable for development.

Flooding from the Sea or tidal flooding

- 3.5 The site is remote from the coast and at an elevation of between 35 m AOD and 18 m AOD. As such no flooding from the sea or tidal flooding can occur.

Flooding from Land (Local Surface Water Flooding)

- 3.6 With reference to **Figure 3**, the site contours confirms that the catchment falls to the south/south east.
- 3.7 Land drains currently exist on the site and agricultural fields to the east which discharge to public sewer adjacent to the site to the east.
- 3.8 It is of note, from the EAs localised surface water flooding mapping that some low level localised flooding occurs on a similar line to that of the land drains and the public sewer.
- 3.9 Anecdotal evidence of flooding on the site has been raised, which would concur with the information shown on the EA mapping. The drainage strategy to be introduced as part of the development will intercept much of the existing localised flows within the site, directing them at controlled rates to appropriate points of discharge directly in to the ground via infiltration techniques.
- 3.10 The new SuDs regime from the development will also ensure this type of localised flooding will not occur due to the type of SuDs scheme proposed that will change the existing drainage patterns.

Flooding from sewers

- 3.11 There are surface water sewers on site, but it is not intended to connect into this existing public system. There are also foul sewers that cross the site, all new foul pipe networks will be independent to any surface water drainage and will be offered for adoption to Southern Water.
- 3.12 The details of the Foul drainage strategy are covered under a separate report.

Flooding from groundwater

- 3.13 The site is underlain by a Secondary 'A' Aquifer. Secondary Aquifers are designated by the EA as:
"Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers"
- 3.14 Importantly EA records confirm that the site does fall within a ground water protection zone area. That being inner zone 1c (subsurface activity only). Refer **Appendix A** for EA records on Ground Water. As the SuDs scheme will provide tertiary and secondary pollution control the risk of ground water contamination is minimal. In addition no recorded groundwater flooding has been noted by Hampshire County Council (HCC).
- 3.15 In addition the EA has confirmed that there has been no record of historic ground water flooding on the site. Refer **Appendix A & F**. It is our opinion therefore that ground water flooding is not a problem on the site.
- 3.16 As such, the risk of groundwater flooding is not considered significant and has not been considered further.

Flooding from reservoirs, canals and other artificial sources

- 3.17 Reference to the Streetmap website indicates there are no notable artificial sources in the vicinity of the site that could give rise to a flood risk. Flooding from reservoirs, canals and other artificial sources has therefore not been considered further.

4.0 PROBABILITY OF FLOODING

Flood Zone

- 4.1 Flood maps published by the EA and further information provided by the Agency/Planning Authority indicate that the site lies within 'Flood Zones 1, low probability flood risk area', for fluvial sources, as defined by Table 1 of NPPF. Correspondence from the Environment Agency is provided within **Appendix A** and shown diagrammatically on **Figure 4 & 5**.

Strategic Flood Risk Assessment

- 4.2 A 'Strategic Flood Risk Assessment' (SFRA) was been prepared by Atkins in 2007 for the Urban South Hampshire Partnership which formed part of Havant Borough Council's evidence.
- 4.3 This SFRA has been further supplemented by the 'Strategic Flood Risk Assessment Supplement - Incorporating Sequential and Exception Tests' for the emerging Local Plan (Allocations) which also support the Boroughs, then, emerging Local Plan (Allocations). This document also confirms the site is suitable for development.

Run-off

- 4.4 Were appropriate the existing rate of run-off from the site has been estimated using The SuDS Manual, CIRIA C697 (2007) in accordance with IH Report 124, flood estimation for small catchments (Marshall and Bayliss, 1994). The pro-rata method on the size of catchment detailed in Table 4.2 in The SuDS Manual, CIRIA C697 (2007) has been used for the 6.8 ha part of the overall site that is to be developed. The analysis has been completed using the Source Control module of WinDes using the following parameters:

AREA (AREA DRAINED)	6.8 ha	Recommended the SuDs Manual . Pro-rate flows by area of the site
SAAR (STANDARD AVERAGE ANNUAL RAINFALL)	771 mm	Obtained from WINDES
SOIL (PARAMETER REPRESENTING THE PERMEABILITY OF THE SUB SOLIDS)	0.4	This has been taken as a value to reflect the Impermeable London Clay underlying the site.
REGION (FSR REGION REPRESENTING REGIONAL GROWTH CURVE)	7	The site lies within region

4.5 The analysis provides an estimate for QBAR (the mean annual flood) of 25.9 ls^{-1} for a 6.8 ha site. The Q100 flow, the 1 in 100 year run-off from a 6.8 ha site, is 82.6ls.

4.6 As it is intended to infiltrate all development flows directly into the ground Qbar has only been provided for information purposes. This is provided in more detail within **Section 6.0**.

4.7 It should also be noted that by providing the proposed SuDS system existing runoff toward the urban area to the south west will be reduced.

5 EFFECT OF CLIMATE CHANGE

Climate Change

- 5.5 Based on the most recent advice on climate change reported in NPPG, peak rainfall intensity, sea level, peak river flow, offshore wind speed and extreme wave heights are all expected to increase in the future. It is recommended that considerations for future climate change are included in Flood Risk Assessments for proposed developments.
- 5.6 Mapping within the SFRA and the EA data confirms that all dwellings will remain located in Flood Zone 1, after allowing for climate change and therefore will not be affected by the impact of climate change.
- 5.7 The site is likely to be subject to increases in rainfall intensity of 30% over the lifetime of the development that will place additional pressure on surface water drainage infrastructure. Therefore, the sustainable drainage system that will serve the proposed development has been designed to cater for the 1 in 100 year plus 30% rainfall event.

6 PRELIMINARY DEVELOPMENT PROPOSALS

Preliminary Development Layout

- 6.1 The development of the site will provide up to 175 residential dwellings and associated infrastructure as shown by the preliminary master plan at **Appendix B**.
- 6.2 The preliminary SuDs system for the development has been designed to HCC's '*Surface Water and Sustainable Drainage Guidance for Developer, Designers and Planners*'. It is expected that this guidance will be followed should the site gain outline planning permission, when full final details of the development are provided to release conditions.
- 6.3 It is intended to utilise infiltration techniques in the form of shallow porous paving, swales and infiltration trenches to recharge the ground water. With no offsite flows for up to 1 in 100 yr plus climate change storm events.
- 6.4 Storm events above the 1 in 100 yr plus climate change events will be provided for via overland flow paths to the agricultural field to the south east. These overland flow paths will be via the proposed roads and open space areas and are shown diagrammatically on **Figure 11**.
- 6.5 Drawings and calculations are provided in **Appendix C & D** respectively these confirm the following:
- All flows will be cleansed either, via the use of the porous paving and swales. In addition pipe networks will utilize trapped gullies and oil/petrol interceptors, if appropriate before discharging to infiltration structures;
 - All development flows will be controlled at or near source via infiltration techniques;
 - Where infiltration results from testing have proven to be poor tanked attenuation will be utilised beneath porous paving that

will discharge to a pipe network which will in turn discharge to a infiltration structure;

- 1 in 100 year plus climate change of 30% will be controlled via further attenuation either in porous paving within private car parking/driveway areas or within suitably landscaped swales and local grassed depressions within the open space areas of between 200 and 300 mm deep;
- While the swales will act as surface water conveyance conduits, as well as storage, for all storm events the infiltration structures below these will only hold water at the 1 in 100 year plus climate change storm event;
- Housing finished Floor Levels will be set 150mm above existing ground to provide an additional factor of safety;
- It is not intended to utilise these existing Southern Water pipes crossing the site for development flow.

7 MANAGEMENT MEASURES

Flood Risk Management Measures

- 7.1 NPPG & the Practice Guide require that the safety of people and the proposed development be considered against each source of flooding identified in Section 3.
- 7.2 The residential development is to be located within Flood Zone 1 and therefore, even with the potential for climate change, properties will not be at risk of fluvial flooding.
- 7.3 A preliminary drainage strategy incorporating sustainable urban drainage (SuDs) has been provided to manage the increase in run-off from the site over the lifetime of the development such that it will not place properties at risk of surface water flooding.
- 7.4 The SuDs system will also be maintained by a suitably qualified Management Company for the lifetime of the development. such that it will not place properties either on the site or elsewhere at an increased risk of surface water flooding. This complies with NPPF guidance and HCC's SuDS guidance/policies.
- 7.5 The flood risk to the proposed development and surrounding area, as a consequence of the development is therefore considered to be low and no specific flood risk management measures will be required.

8 OFF SITE IMPACTS

Flood Risk elsewhere

- 8.1 As the proposed development is located entirely within a Flood Zone 1 designation, it will not have any adverse impact on the flood risk to others by virtue of obstruction to flood flows or the reduction of flood plain storage.

Surface Water Management

- 8.2 NPPG, Paragraph F6 states:-

“Surface water arising from a developed site should, as far as is practicable, be managed in a sustainable manner to mimic the surface water flows arising from the site prior to the proposed development, while reducing the flood risk to the site itself and elsewhere, taking climate change into account.”

- 8.3 The development plans, with the indicative surface water drainage solutions provided, confirms that the site can be drained in a sustainable manner. The drainage proposals are presented within **Section 6** above.

- 8.4 To reduce the run-off from the developed site to that of the undeveloped site or better, infiltration techniques using sustainable drainage measures have been fully utilised.

9.0 RESIDUAL RISKS

Residual flood risk

- 9.1 As the site's residential properties will be built in Flood Zone 1 they will not be at significant risk of flooding, even with allowance for climate change.
- 9.2 Extreme rainfall events are generally predictable, but by their nature predictions are based on probability and thus subject to uncertainty. Therefore an unquantifiable residual risk remains that events exceeding those predicted may occur, notably surcharging or blockage of sewers or gullies.
- 9.3 If the drainage system is overwhelmed, either by a storm event with a magnitude greater than that designed for or due to a blockage, the finished site levels will be designed to ensure that there is no risk of floodwaters ponding to a significant depth. In addition the overland flow path for any such exceedance storm event will be designed to take overland flow to open space areas such as the village green.

Management

- 9.4 The public drainage systems serving the proposed development will be managed either by the highways adopting authorities such as Hampshire County Council or Southern Water Ltd. For any additional SuDs element of the scheme, Hampshire County Council, as required under the FWMA as the lead Local Flood Authority, will approve the scheme in detail however a management Company will be employed to maintain the SuDs element of the system. As discussed above.

10.0 CONCLUSIONS & RECOMMENDATIONS

Background

- 10.1 This report has been commissioned to assess the risk to, and the impact of, a proposed development of the land south of Bartons Road. It is proposed to provide up to 175 residential dwellings on the site. The proposed residential development is considered as a 'More Vulnerable' when utilising Table 2 of NPPG.
- 10.2 The entire site lies Zone 1 'Low Probability' flood area as defined by Table 1 of NPPG. In assessing the flood risk, the impacts of climate change have been considered for the lifetime of the proposed development and considered acceptable.

Sequential and Exception tests

- 10.3 The Sequential and Exception tests have been applied and deemed to have been passed.

Ground Water Protection

- 10.4 The site is underlain by London Clay and is over a secondary non-productive aquifer but not within a ground water protection zone. As such the risk of ground water flooding is negligible.

Flood Risk Management

- 10.5 As the proposed residential development will lie within Flood Zone 1, the risk of flooding from all sources is assessed to be low and the safety of people is considered acceptable in all foreseeable flooding events. No specific flood management measures beyond that of maintenance are considered to be necessary.

Offsite Impacts

- 10.6 The Outline Drainage Strategy set out in this assessment identifies an option for the management of surface water run-off using sustainable drainage techniques. The proposed development will not increase the flood risk elsewhere. In fact, due to the implementation of the SuDs scheme proposed, downstream existing flooding, if any, will be minimised.

Residual Risks

- 10.7 A residual risk remains that an event exceeding the design parameters used for the drainage system may occur, or part of the drainage system may fail due to a blockage. However, in these circumstances, the general topography of the site would convey floodwaters away from the development. Toward open fields to the south east.
- 10.8 In addition the employment of a management company for the life of the development to maintain the surface water management train will ensure the scheme will operate at its maximum efficiency at all times.

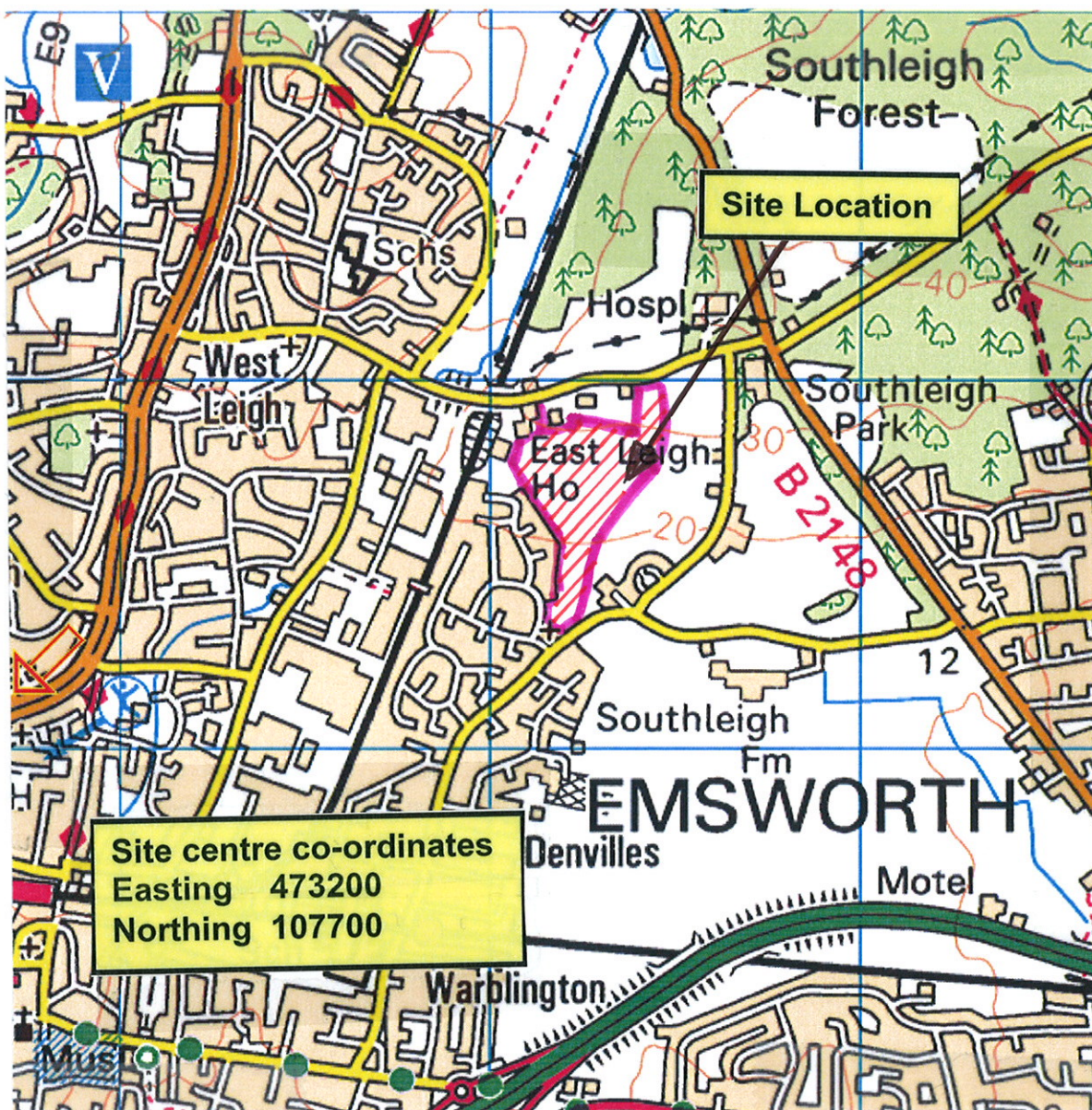
Recommendations

- 10.9 Due to the positive outcome of this Flood Risk Assessment we see no reason why the site should not continue through the planning process and be approved for residential development in terms of flood risk.

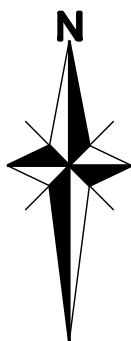
REFERENCES

- Department for Communities and Local Government, 2012 National Planning Policy Framework.
- Department for Communities and Local Government, 2014 National Planning Practise Guidance.
- Environment Agency, Nov 2012 ver 1. Ground Water Protection : Principles and Practice (GP3)
- The SuDS Manual, CIRIA C697 (2007)
- IH Report 124, Flood estimation for small catchments (Marshall and Bayliss, 1994).
- Urban South Hampshire Partnership Strategic Flood Risk Assessment 2007.
- Strategic Flood Risk Assessment Supplement - Incorporating Sequential and Exception Tests for the emerging Local Plan (Allocations) October 2013;
- Havant Borough Council Core Strategy
- Havant Borough Councils Local Plan (Allocations)
- HCC Surface Water and Sustainable Drainage Guidance for Developers, Designers and Planners
- British Geological Survey, Geology of Britain viewer:
http://maps.bgs.ac.uk/geologyviewer_google/googleviewer.html
- Streetmap <http://www.streetmap.co.uk>

FIGURES



Rev	Amendments	Drn	Chk	App	Date



- Existing Land Drain
- Existing Southern Water Surface Water Sewer
- Existing Southern Water Foul Water Sewer

Site centre co-ordinates
Easting 470050
Northing 115020

A	Site Boundary Removed	BL	SA	SA	12/2015
Rev	Amendments	Dm	Chk	App	Date



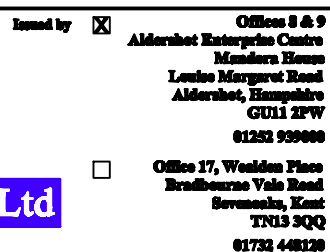
Consulting Engineers Ltd

Issued by ☒ **Offices 8 & 9**
Aldershot Enterprise Centre
Mandara House
Louise Margaret Road
Aldershot, Hampshire
GU11 2PW
01252 939000
☐ **Office 17, Wexham Place**
Bradbourne Vale Road
Sevenoaks, Kent
TN13 3QQ
01732 448120

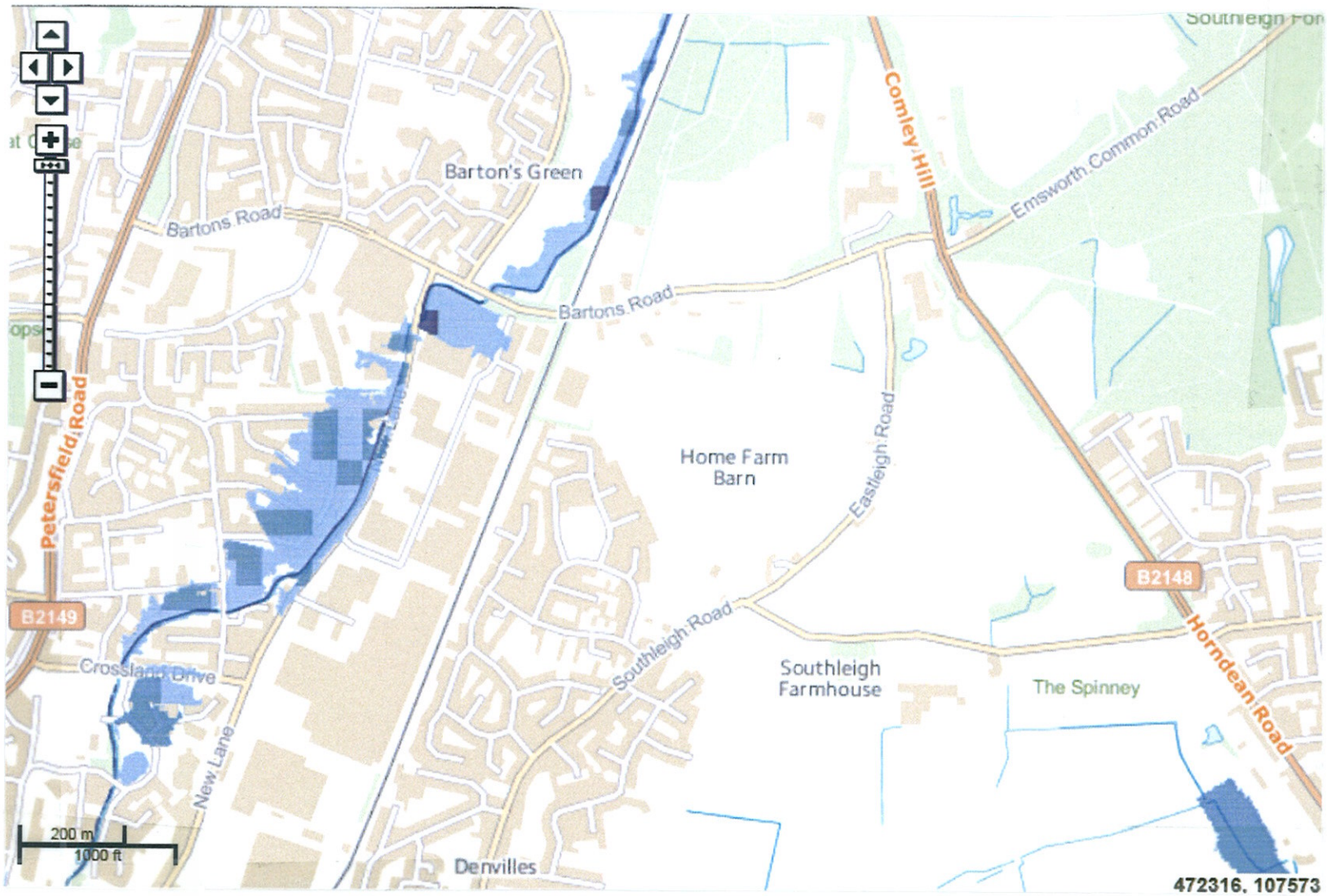
Job Title Land South of Bartons Road, Havant	Scale 1:2500@A3	Date Nov 15	Designed n/a
Drawing Title Site Boundary Plan and Existing Drainage	Drawn EV	Checked GG	Approved GC
Client Chidden Farms	Job No 14-018	Figure No FIGURE 2	Rev A



A	Site Boundary Removed	BL	SA	SA	12/2015
Rev	Amendments	Drn	Chk	App	Date



Job Title	Land South of Bartons Road, Havant	Scale	1:2500@A3	Date	Nov 15	Designed	N/A
Drawing Title	Topographical Information	Drawn	EV	Checked	GG	Approved	GC
Client	Chidden Farms	Job No	14-018	Figure No	FIGURE 3	Rev	A



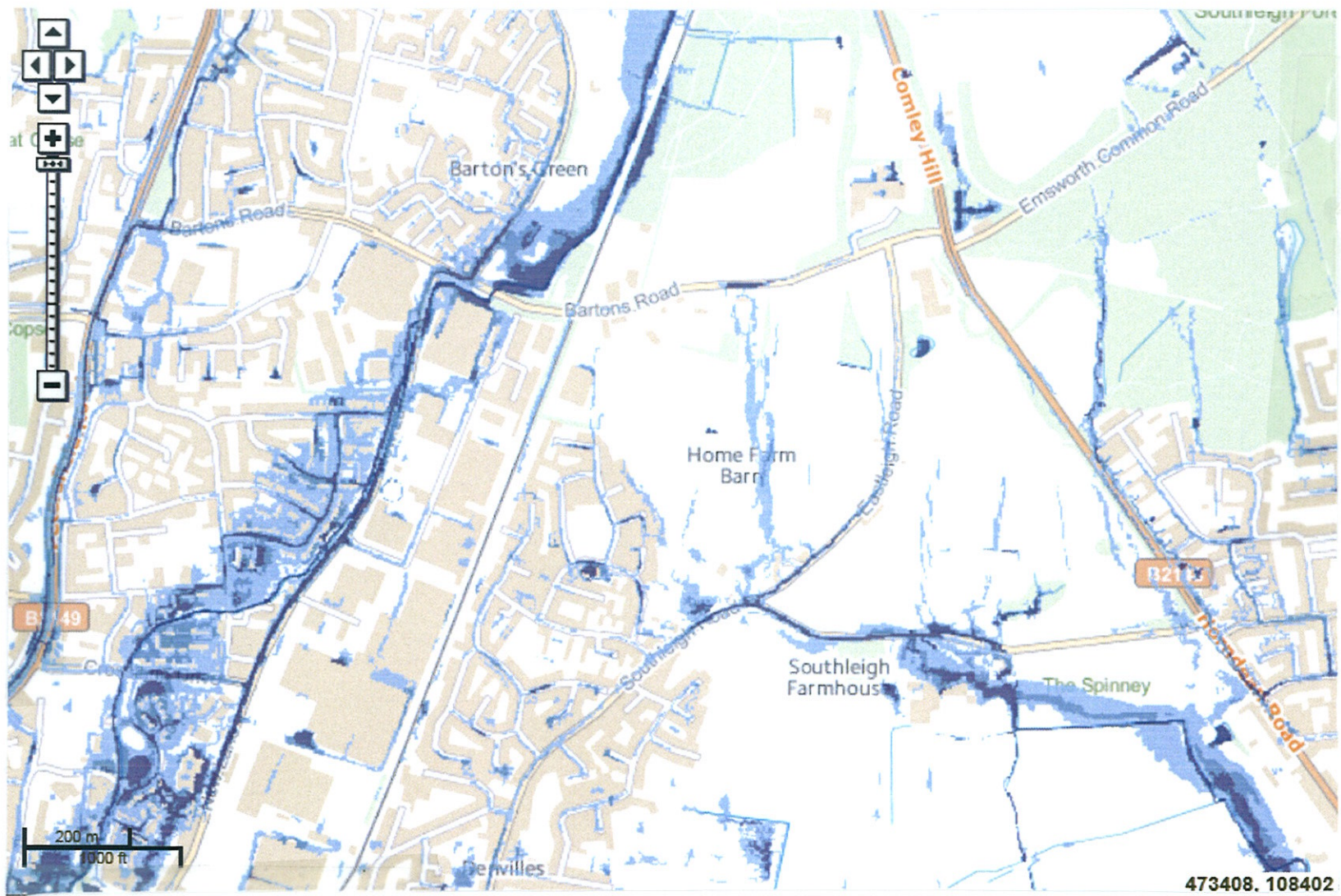
Map legend	
☒	Risk of Flooding from Rivers and Sea
	High
	Medium
	Low
	Very Low

Rev	Amendments	Drn	Chk	App	Date



Issued by ☒ Aldershot Enterprise Centre
Mandora House
Louise Margaret Road
Aldershot, Hampshire
GU11 2PW
01252 939000
☐ Office 17, Wealden Place
Bradbourne Vale Road
Sevenoaks, Kent
TN13 3QQ
01732 448120

Job Title	Land South of Bartons Road, Havant		Scale	NTS @ A3	Date	Nov 15	Designed	n/a
Drawing Title	Flood Zones derived from EA		Drawn	EV	Checked	GG	Approved	GC
Client	Chidden Farms		Job No	14-018	Figure No	FIGURE 4		Rev



Map legend	
☒	Risk of Flooding from Surface Water
	High
	Medium
	Low
	Very Low

Rev	Amendments		Drn	Chk	App
					Date



Issued by ☒ Aldershot Enterprise Centre
Mandora House
Louise Margaret Road
Aldershot, Hampshire
GU11 2PW
01252 939000
☐ Office 17, Wealden Place
Bradbourne Vale Road
Sevenoaks, Kent
TN13 3QQ
01732 448120

Job Title	Land South of Bartons Road, Havant	Scale	NTS @ A3	Date	Nov 15	Designed	n/a
Drawing Title	Surface Flood Zones derived from EA	Drawn	EV	Checked	GG	Approved	GC
Client	Chidden Farms	Job No	14-018	Figure No	FIGURE 5	Rev	



1:50 000 scale geology

Bedrock geology

- BOGNOR SAND MEMBER - SAND
- LONDON CLAY FORMATION - CLAY, SILT AND SAND
- LONDON CLAY FORMATION - SAND
- LAMBETH GROUP - CLAY, SILT AND SAND
- LAMBETH GROUP - SAND
- PORTSDOWN CHALK FORMATION - CHALK
- SPETISBURY CHALK MEMBER - CHALK
- TARRANT CHALK MEMBER - CHALK
- LEWES NODULAR CHALK FORMATION, SEAFORD
- CHALK FORMATION, NEWHAVEN CHALK FORMATION, CULVER CHALK FORMATION

Rev	Amendments	Drn	Chk	App	Date

Issued by ☒ **Offices 8 & 9**
Aldershot Enterprise Centre
Mandora House
Louise Margaret Road
Aldershot, Hampshire
GU11 2PW
01252 939000

☐ **Office 17, Wealden Place**
Bradbourne Vale Road
Sevenoaks, Kent
TN13 3QQ
01732 448120

Job Title
Land South of Barton's Road, Havant

Drawing Title
BGS data - Bedrock

Client
Chidden Farms

Scale NTS @ A3	Date Nov 15	Designed n/a
Drawn EV	Checked GG	Approved GC
Job No 14-018	Figure No FIGURE 6	Rev