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Flood Risk Assessment and Drainage Strategy

Proposed Residential Development at

Land East of Newgate Lane East, Fareham

On behalf of

Miller Homes and Bargate Homes Ltd

January 2022

Document History and Status

Project Number 23586

Date	Version	Prepared By	Reviewed By	Approved By
21 Dec 2021	DRAFT 1.0	Steve Burgess Project Manager	Stuart Magowan IEng MICE	Stuart Magowan IEng MICE
11 Jan 2022	1.1	Steve Burgess Project Manager	Stuart Magowan IEng MICE	Stuart Magowan IEng MICE
26 Jan 2022	1.2	Steve Burgess Project Manager	Stuart Magowan IEng MICE	Stuart Magowan IEng MICE

CONTENTS

1 Non Technical Summary

1.1 This Flood Risk Assessment has been undertaken in accordance with the National Planning Policy Framework on behalf of Miller Homes and Bargate Homes Ltd in support of an Outline Planning Application with all matters reserved, excluding access, for the construction of up to 375 residential dwellings, landscaping, open space and associated works, with access from Newgate Lane East on land east of the B3385 Newgate Lane East, Fareham.

1.2 This Assessment is to be read in conjunction with all planning, architectural and other reports that accompany the Outline Planning Application for the proposed development.

1.3 The site is located in Flood Zone 1.

1.4 The proposed development will incorporate a sustainable drainage system that will discharge surface water at a suitably restricted rate into the existing watercourses on site and provide storage for all storm return periods up to and including the 1:100 year rainfall event with an allowance for climate change.

1.5 The exact nature of the storage will be confirmed at detailed design stage but can be accommodated using a variety of SuDS methods such as permeable paving, swales and attenuation basins.

1.6 Foul water from the site will be drained into the public foul sewer beneath Brookers Lane via the approved proposed development, with Planning Reference 1900516/OUT and P/19/1260/OA, immediately south of the application site. Where possible this will be via gravity, however, due to the very shallow gradients of the site it is likely that some areas of the proposed development will need to be pumped to allow this connection.

1.7 This report concludes that the site is not at risk of flooding from tidal or fluvial sources, overland flows or groundwater.

1.8 In terms of flood risk the proposed development is suitable at this location.

2 Planning Policy Context

2.1 National Planning Policy Framework

2.1.1 The National Planning Policy Framework was updated in July 2021.

2.1.2 With regard to planning and flood risk the policy framework states that *'when determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment.*

Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;

b) the development is appropriately flood resistant and resilient, such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;

c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;

d) any residual risk can be safely managed; and

e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.'

2.1.3 With regard to major developments the NPPF states that *'major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:*

a) take account of advice from the lead local flood authority;

b) have appropriate proposed minimum operational standards;

c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and

d) where possible, provide multifunctional benefits'

2.1.4 Major development is defined as follows:

'For housing, development where 10 or more homes will be provided, or the site has an area of 0.5 hectares or more. For non-residential development it means additional floorspace of 1,000m^2 or more, or a site of 1 hectare or more, or as

otherwise provided in the Town and Country Planning (Development Management Procedure) (England) Order 2015.'

2.1 Lead Local Flood Authority

2.1.1 Hampshire County Council became a Lead Local Flood Authority under the Flood and Water Management Act 2010 and was given a series of new responsibilities to coordinate the management of local flood risk.

2.1.2 As part of their role Hampshire County Council has produced the following documents:

- Local Flood Risk Management Strategy dated July 2013
- Preliminary Flood Risk Assessment dated April 2011

2.1.3 The above documents have been reviewed in the preparation of this report.

2.2 Fareham Borough Council

2.2.1 Fareham Borough Council issued a Strategic Flood Risk Assessment (SFRA) as part of the Partnership for Urban South Hampshire dated February 2016 which has been reviewed in the preparation of this report.

2.3 Local Planning Policy

2.3.1 Fareham Borough Council adopted the Local Plan Core Strategy in August 2011 and the Local Plan 2015-2026 on 8 June 2015.

2.3.2 The following policies are of specific relevance to this Flood Risk Assessment:

2.3.3 **Policy CS15** Sustainable Development and Climate Change states that *'the Borough Council will promote and secure sustainable development by directing development to locations with sustainable transport options, access to local services, where there is a minimum negative impact on the environment or opportunities for environmental enhancement. Development must not prejudice the development of a larger site.*

This will be achieved by:

- *Ensuring that the scale and density of the proposal makes an efficient use of land. With a minimum of 60dph within areas with high multi-modal transport accessibility and good access to a range of social, environmental and economic infrastructure, taking account of the character of the location.*
- *Ensuring that there is sufficient capacity available, or will be made available, in existing infrastructure to meet the needs of the new development including adequate land and funding for waste management. Avoiding unacceptable*

levels of flood risk and proactively managing surface water through the promotion of sustainable drainage techniques.'

2.3.4 **Policy DSP2** Environmental Impact states that *'development proposals should not, individually, or cumulatively, have a significant adverse impact, either on neighbouring development, adjoining land, or the wider environment, by reason of noise, heat, liquids, vibration, light or air pollution (including dust, smoke, fumes or odour).*

Development should provide for the satisfactory disposal of surface and wastewater and should not be detrimental to the management and protection of water resources.'

3 Existing Site

3.1 Site Location

3.1.1 The development site is located on land east of the B3385 Newgate Lane East, Fareham at Ordnance Survey reference SU 574 035. The nearest postcode is PO14 1AZ.

Image 1: Site Location

3.1.2 The site forms the central and northern parts of HA2 'Newgate Lane South' which was previously proposed to be allocated for up to 475 dwellings in the Regulation 18 version of the Draft Fareham Local Plan.

3.1.3 Planning permission has recently been granted at appeal for up to 99 dwellings on land to the south of the proposed development immediately adjacent to the application site with Planning Reference 19/00516/OUT and P/19/1260/OA.

3.1.4 The site is bound to the north by the HMS Collingwood playing fields, Speedfields Retail Park and Tukes Avenue public open space, to the east by residential dwellings, to the south by a recently permitted residential development with Planning Reference 19/00516/OUT and P/19/1260/OA and to the west by B3385 Newgate Lane East.

3.1.5 A copy of the site location plan is located in Appendix 1 at the rear of this report.

3.2 Site Description

3.2.1 The site is approximately 20.04ha in area and currently comprises of 4 field parcels defined by mature hedgerows and trees.

3.2.2 Existing ground levels are highest at the northern end of the site at approximately 10.8m AOD. The site falls towards its south eastern boundary to a level of approximately 9.5m AOD.

3.2.3 A copy of the existing site layout plan is located in Appendix 2 at the rear of this report.

3.3 Existing Drainage

3.3.1 The site currently has no positive surface water or foul water drainage infrastructure.

3.3.2 Rainfall currently discharges in part to ground and in part overland as a greenfield runoff to the onsite watercourses which surround and cross the site.

3.3.3 There is a proposed foul sewer to be constructed as part of the infrastructure to serve the approved proposed development, with Planning Reference 1900516/OUT and P/19/1260/OA, immediately south of the application site.

3.3.4 There are 150mm and 225mm diameter public foul sewers and 225mm diameter public surface water sewers located beneath Teal Walk and Tukes Avenue to the east of the site.

3.3.5 There is a 150mm diameter public foul sewer and a 300mm diameter public surface water sewer located beneath Brookers Lane southeast of the site.

3.3.6 Pre-developed greenfield runoff rates have been established using the HR Wallingford tool for Greenfield runoff estimation.

HR Wallingford

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Steven Burgess
Site name:	Hammond Lane
Site location:	Fareham

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:	50.82878° N
Longitude:	1.18637° W
Reference:	3372845443
Date:	Dec 08 2021 12:59

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:	3	3
HOST class:	N/A	N/A
SPR/SPRHOST:	0.37	0.37

Hydrological characteristics	Default	Edited
SAAR (mm):	731	731
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

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):	3.02	3.02
1 in 1 year (l/s):	2.57	2.57
1 in 30 years (l/s):	6.95	6.95
1 in 100 year (l/s):	9.64	9.64
1 in 200 years (l/s):	11.3	11.3

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Image 2: Greenfield Runoff Calculation

3.3.7 The pre-developed greenfield runoff rates are as follows:

- Q_{bar} 3.02 l/s/ha
- 1:100 year 9.64 l/s/ha

3.3.8 A copy of the sewer records is located in Appendix 3 at the rear of this report.

3.4 Geology and Groundwater

3.4.1 The British Geological Survey borehole log data confirms clay substrata to a depth of between 2.1 and 4.5m below ground level.

3.4.2 Water strikes were recorded at between 2.5m and 4.5m below ground level typically at the interface between the clay substrata and underlying sands.

3.4.3 The “Magic Map” available from DEFRA confirms that the site is located above a minor aquifer classified as having high vulnerability.

3.4.4 A copy of the geological borehole data is located in Appendix 4 at the rear of this report.

4 Flood Zone, and Flood History

4.1 Tidal Flood Zone

4.1.1 The Environment Agency's online mapping confirms that the site is located in Tidal Flood Zone 1 and is not at risk of tidal flooding from anything less extreme than a 1:200 year flood event.

4.2 Fluvial Flood Zone

4.2.1 The Environment Agency's online mapping confirms that the site is located in Fluvial Flood Zone 1 and is not at risk of fluvial flooding from anything less extreme than a 1:1,000 year flood event.

4.3 Flood History

4.3.1 Environment Agency

4.3.1.1 The Environment Agency map of historic flood incidents does not identify any historic flooding recorded at or in the wider vicinity of the proposed development site.

4.3.2 Hampshire County Council

4.3.2.1 Neither the Preliminary Flood Risk Assessment (PFRA) dated June 2011 nor the Local Flood Risk Management Strategy dated July 2013 identify any specific flood incidents in the immediate vicinity of the site.

4.3.3 Fareham Borough Council

4.3.3.1 The Strategic Flood Risk Assessment (SFRA) as part of the Partnership for Urban South Hampshire dated February 2016 does not identify any specific flood incidents within the vicinity of the site.

4.3.4 Copies of the available flood maps and correspondence are located in Appendix 5 at the rear of this report.

5 Flooding Potential

5.1 Tidal Flooding

5.1.1 The site is located 2.8km from the coast and is not at risk of tidal flooding.

5.2 Fluvial Flooding

5.2.1 The area of the proposed site is within Flood Zone 1 and is not at risk of fluvial flooding from anything less extreme than a 1:1,000 year flood event.

5.3 Groundwater Flooding

5.3.1 The British Geological Survey borehole logs hosted on the British Geological Survey website confirm that groundwater has been recorded between 2.5m and 4.5m below ground level.

5.3.2 Figure 7 in the Hampshire Groundwater Management Plan shows the site to be within a 1km square grid having between 25-50% probability of being affected by groundwater flooding.

5.3.3 There is no indication in the Preliminary Flood Risk Assessment or other available flood maps of groundwater flooding affecting the site.

5.4 Overland Flow

5.4.1 The Environment Agency maps identify an isolated area on the eastern boundary of the site which is predicted to have a low to high risk of surface water flooding with a maximum depth of 300mm and low velocity this area however has no apparent flow route from upstream.

5.4.2 It is proposed that finished floor levels of dwellings within this area are raised a minimum of 300mm above the existing ground level.

5.4.3 There are no records of any overland surface water flow affecting the site.

5.5 Flood Routing

5.5.1 The natural route for floodwaters to dissipate, should any event occur on the site, is towards the watercourse located on the south eastern boundary of the site which ultimately discharges into the River Alver located approximately 350m southwest of the site.

5.5.2 There is no associated flood risk to the downstream catchment area.

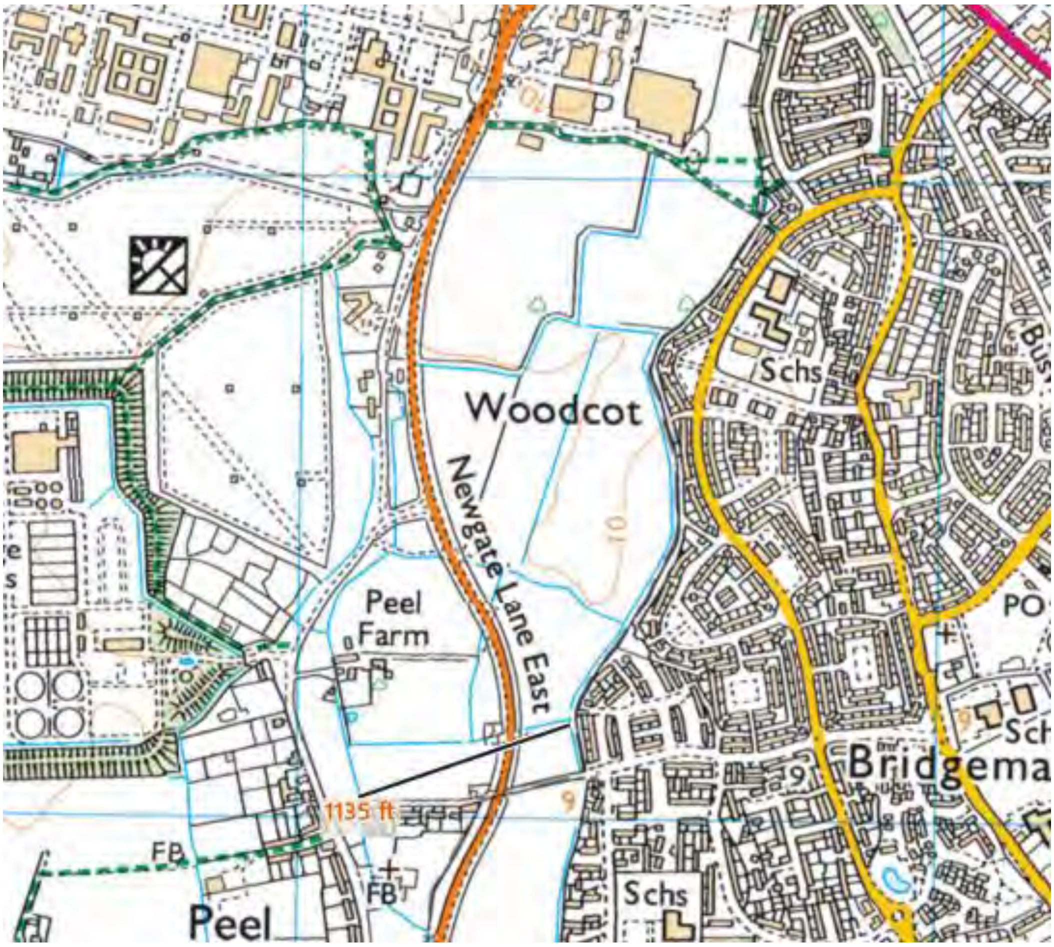


Image 3: Local Topography

6 Development Proposals

6.1 Description

6.1.1 The development proposals are for the construction of up to 375 residential dwellings, landscaping, open space and associated works, with access from Newgate Lane East on land east of the B3385 Newgate Lane East, Fareham.

6.2 Impermeable areas

6.2.1 The predicted impermeable area of the site has been based on 75% of the developable area of the site which has been measured as 10.17ha equating to an anticipated impermeable area of approximately 7.63ha.

6.2.2 A copy of the proposed site layout plan together with an impermeable areas plan is located in Appendix 6 at the rear of this report.

6.3 Surface Water Drainage

6.3.1 CIRIA report C753 The SuDS Manual-v6 provides guidance on surface water drainage. The aim for surface water runoff is to match greenfield runoff rates and volumes where reasonably achievable.

6.3.2 For surface water discharge, the drainage hierarchy notes the following list of drainage options in order of preference:

1 Infiltration to ground

2 Discharge to a watercourse

3 Discharge to a surface water sewer

4 Discharge to a foul water sewer

6.3.3 The preferred surface water drainage strategy should where possible be based on infiltration to ground, however, the site is underlain by clay and infiltration is not a practical method of discharging surface water runoff from this site.

6.3.4 The proposed surface water drainage strategy will be based on a system that will discharge surface water at a suitably restricted rate into the existing watercourses onsite and provide storage for all storm return periods up to and including the 1:100 year rainfall event with an allowance for climate change.

6.3.5 The total impermeable area of the site will be approximately 8ha and the equivalent Q_{bar} greenfield runoff at 3.02l/s/ha is 24.16 l/s.

6.3.6 Preliminary calculations have been prepared in order to demonstrate that surface water drainage can be adequately accommodated within the site without any increased flood risk elsewhere.

6.3.7 Attenuation basins / ponds, voided subbase, swales and if necessary cellular storage crates will provide sufficient storage to accommodate a 1:100 year storm event including an additional 40% to account for the predicted effects of future climate change.

6.3.8 An approximate total storage volume of 6,200m^3 will be required to accommodate a 1:100 year storm event including an additional 40% to account for the predicted effects of future climate change to serve the whole site.

6.3.9 The current master plan design for the site splits the site into 3 separate catchments. The storage requirements for each catchment have been calculated and are tabulated as follows:

Catchment	Catchment Impermeable Area (m^2)	Restriction (l/s)	1:100+40% Storage Required (m^2)
A	18,125	5.4	1,445
B	35,215	10.6	2,820
C	22,955	6.9	1,830

Table 3: Catchment Storage Requirements and Restrictions

6.3.1 The drainage strategy plan indicates the areas in which storage basins, which are sized to accommodate the runoff from each corresponding catchment, can be located. The basins have preliminarily been designed at 0.8m deep and have 1:3 banks and which confirms that the required volume of storage can clearly be accommodated within the site boundary.

6.3.2 Due to the very shallow gradients of the site a network of interlinked swales, filter trenches and permeable paving will be required to convey surface water from each catchment into the storage structures.

6.3.3 The drainage proposals will be confirmed at the detailed design stage subject to further site investigations and testing and if infiltration is found to be viable the storage requirement will be reduced.

6.4 Foul Water Drainage

6.4.1 Foul water from the site will be drained into the proposed foul sewer to be constructed as part of the infrastructure to serve the approved proposed development, with Planning Reference 1900516/OUT and P/19/1260/OA, immediately south of the application site. Where possible this will be via gravity, however, due to the very shallow gradient of the site it is likely that some areas of the development will need to be drained via a pumping station to lift the foul water to allow a connection to the public foul sewer.

6.4.2 A copy of the preliminary drainage strategy plan together with copies of the preliminary storage calculations is located in Appendix 7 at the rear of this report.

6.5 Water Quality

6.5.1 The proposed development is for residential use. In accordance with CIRIA SuDS Manual 2015 (Report C753), the pollution hazard level for this type of development is between very low and medium depending on the use / area of the site.

6.5.2 The surface water scheme will include mitigation to ensure that surface water is suitably treated and any pollution risk adequately managed prior to discharge.

6.5.3 Table 26.2 in Chapter 26 of CIRIA report C753 The SuDS Manual provides Pollution Hazard Indices for varying land types. Those of relevance to the development proposals are as follows:

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 park, low-traffic roads	Low	0.5	0.4	0.4
Non-residential car parking with frequent change (e.g. hospitals, retail), all roads except low traffic roads, trunk roads and motorways	Medium	0.7	0.6	0.7

Table 2: Pollution Hazard Indices

6.5.4 Where multiple drainage components are used in series the individual mitigation index of secondary and tertiary components is lowered by 50% due to reduced performance associated with primary treatment.

SuDS Type	Total suspended solids (TSS)	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8
A layer of dense vegetation underlain by a soil with good contaminant attenuation potential of at least 300mm in depth	0.6	0.5	0.6
A soil with good contaminant attenuation potential of at least 300mm in depth	0.4	0.3	0.3
Soakaway with 300mm minimum depth underlying soil drainage media	0.4	0.4	0.4
Propriety Treatment Systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area		

Table 3: Pollution Mitigation Indices

6.5.5 The detailed drainage design will be undertaken such that its combined elements meet the target treatment level required for runoff with a very low to medium risk of pollution.

6.5.6 An outline drainage maintenance schedule is located in Appendix 8 at the rear of this report.

7 Safe Development

7.1 Flood Zone Compatibility

7.1.1 The site and its wider area are in Flood Zone 1 and will remain so for the foreseeable future.

7.1.2 With reference to the Government Guidance on Flood Risk and Coastal Change at https://www.gov.uk/guidance/flood-risk-and-coastal-change:

- Table 2: Flood Risk Vulnerability Classification

  The type of development proposed is residential and therefore classified as More Vulnerable

- Table 3: Flood Risk Vulnerability and Flood Zone Compatibility

  More Vulnerable development is appropriate in Flood Zones 1 and 2

7.2 Risk to Others

7.2.1 The proposed surface water drainage system will be designed to current standards incorporating SuDS elements providing treatment, attenuation and storage which will minimise runoff leaving the site during times of heavy rain.

7.2.2 Allowance has been made for a 40% increase in rainfall intensities which accords with the latest figures published by the Environment Agency and in accordance with the requirements under the National Planning Policy Framework.

7.2.3 The proposed drainage system will incorporate sufficient treatment prior to final discharge thus mitigating the risk of pollution from the site.

7.2.4 The risk of surface water flooding to others due to the development proposals is reduced and the resultant risk is negligible.

7.2.5 Sewerage undertakers have an obligation to upgrade the existing networks if a connection to an equivalent or larger sized public sewer is technically achievable.

7.2.6 The residual risk of sewer flooding from this development for the foreseeable future is therefore negligible.

8 Conclusions

8.1 The site is located within Flood Zone 1 and is not at risk from any source of flooding.

8.2 There are no historic records of flooding from any source affecting the site or its immediate area.

8.3 The geology of the area is predominantly clay and is unlikely to provide suitable infiltration to accommodate an infiltration drainage system.

8.4 A suitable SuDS drainage system is proposed which accords with the requirements of National and Local Policy.

8.5 Preliminary calculations indicate that surface water runoff generated by the proposed development can be attenuated on site for all rainfall events up to the 1:100 year event including an allowance for climate change.

8.6 Water quality improvement will be provided to mitigate against any risk to any receiving waterbody.

8.7 Foul water from the site will be drained into the public foul sewer beneath Brookers Lane via the approved proposed development, with Planning Reference 1900516/OUT and P/19/1260/OA, immediately south of the application site. Where possible this will be via gravity, however, due to the very shallow gradients of the site it is likely that some areas of the proposed development will need to be pumped to allow this connection.

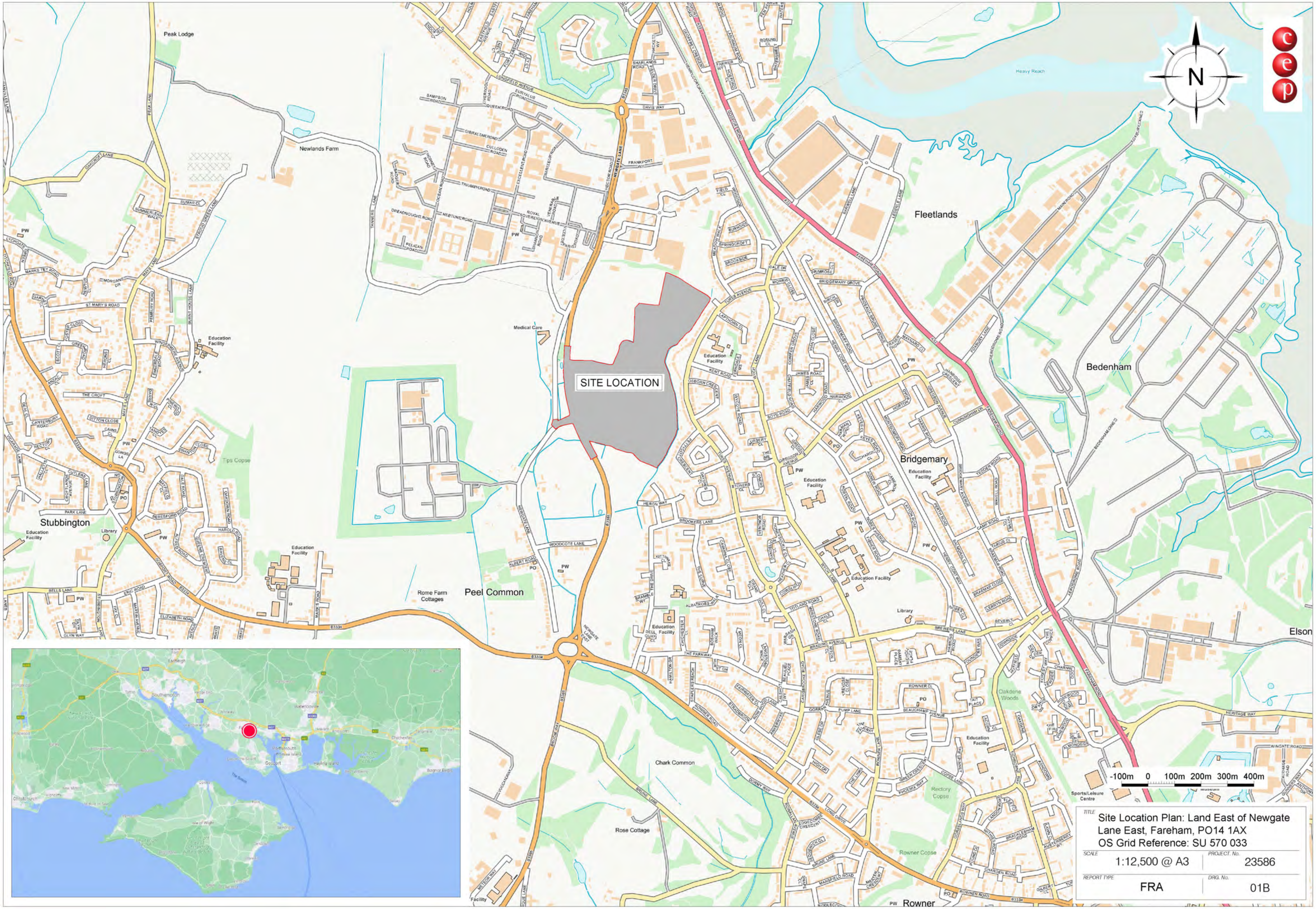
8.8 In terms of flood risk planning the proposed development is safe, will not increase flood risk elsewhere and will provide improvement to immediately adjacent sites by managing surface water from all rainfall events up to the 100 year plus climate change event.

8.9 The development proposals are suitable at this location.

9 List of Appendices, Images and Tables

Appendix 1

Site Location Plan



SITE LOCATION
Peak Lodge
Newlands Farm
Fleetlands
Heavy Reach
Bedenham
Bridgemary
Stubbington
Peel Common
Rome Farm Cottages
Tips Copse
Chark Common
Rose Cottage
Rowner
Elson
Oakdene Woods
Rectory Copse
Rowner Copse
Medical Care
Education Facility
Library
Sports/Leisure Centre
N
-100m 0 100m 200m 300m 400m
TITLE
Site Location Plan: Land East of Newgate Lane East, Fareham, PO14 1AX
OS Grid Reference: SU 570 033
SCALE
1:12,500 @ A3
PROJECT. No.
23586
REPORT TYPE
FRA
DRG. No.
01B

Appendix 2

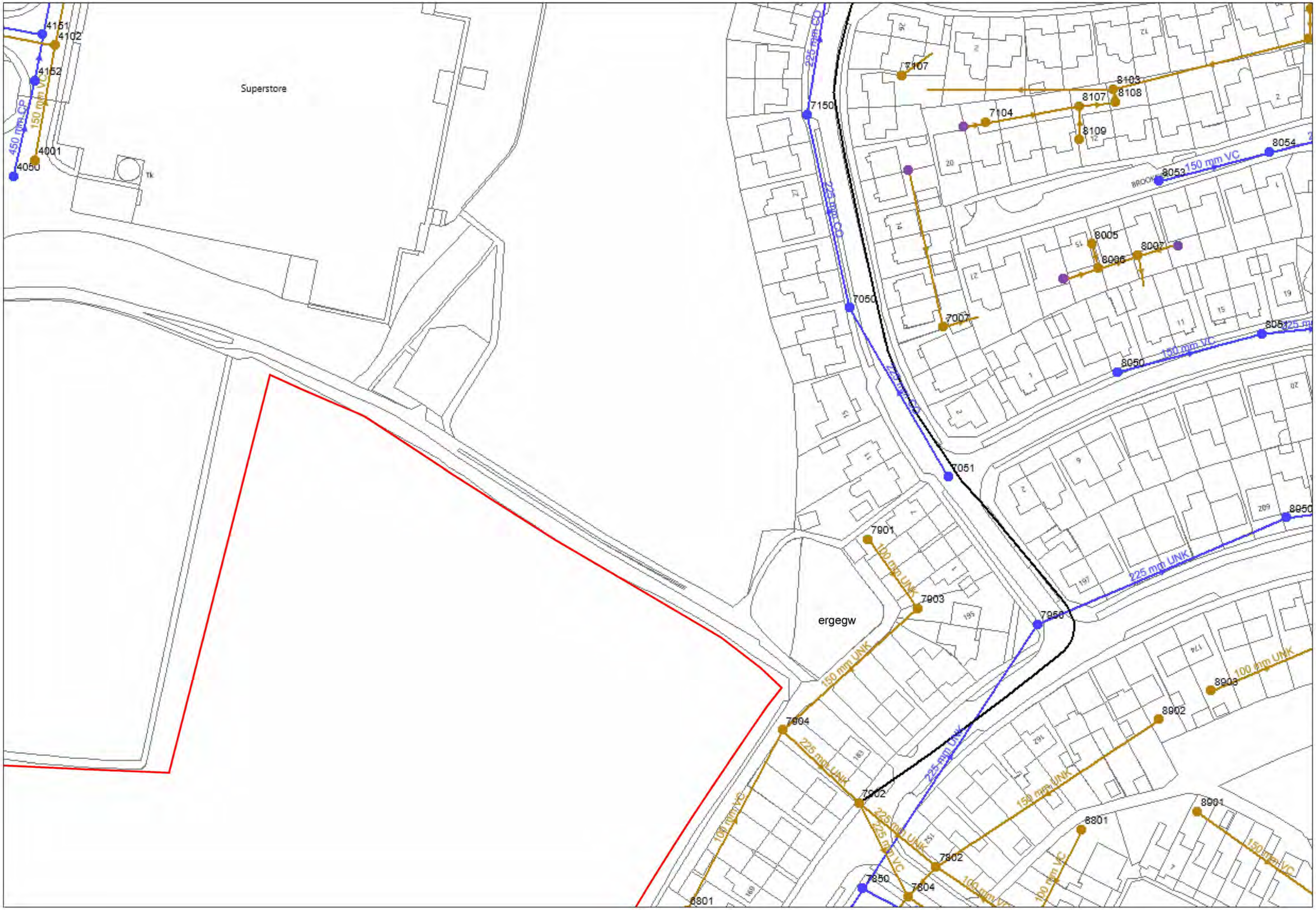
Existing Site Layout Plan

TITLE
Existing Site Layout Plan

SCALE	PROJECT. No.
1:2,500	23586
REPORT TYPE	DRG. No.
FRA	02A

Appendix 3

Sewer Records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7007
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225 mm
8050
150 mm VC
7051
8950
7901
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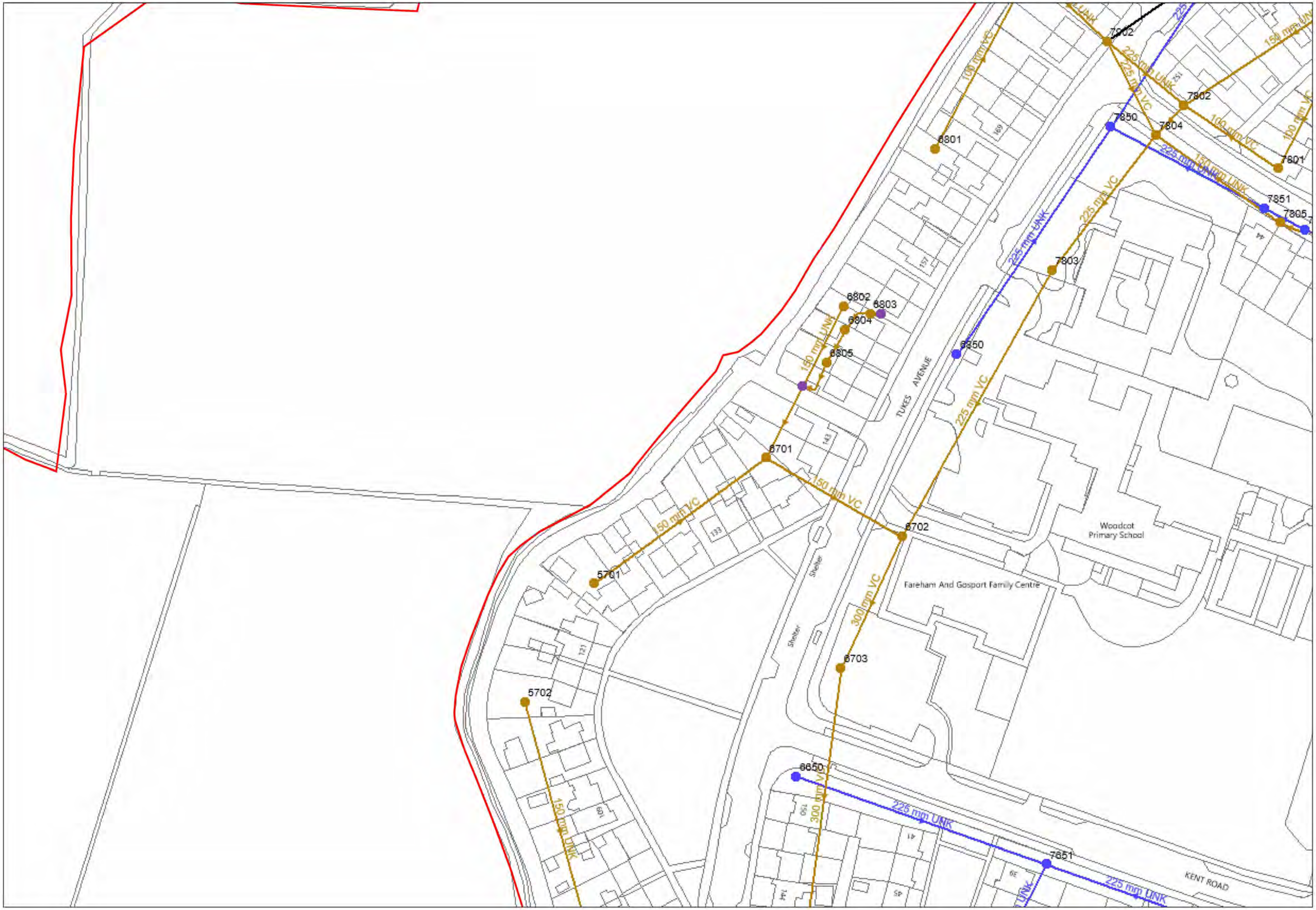

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6650
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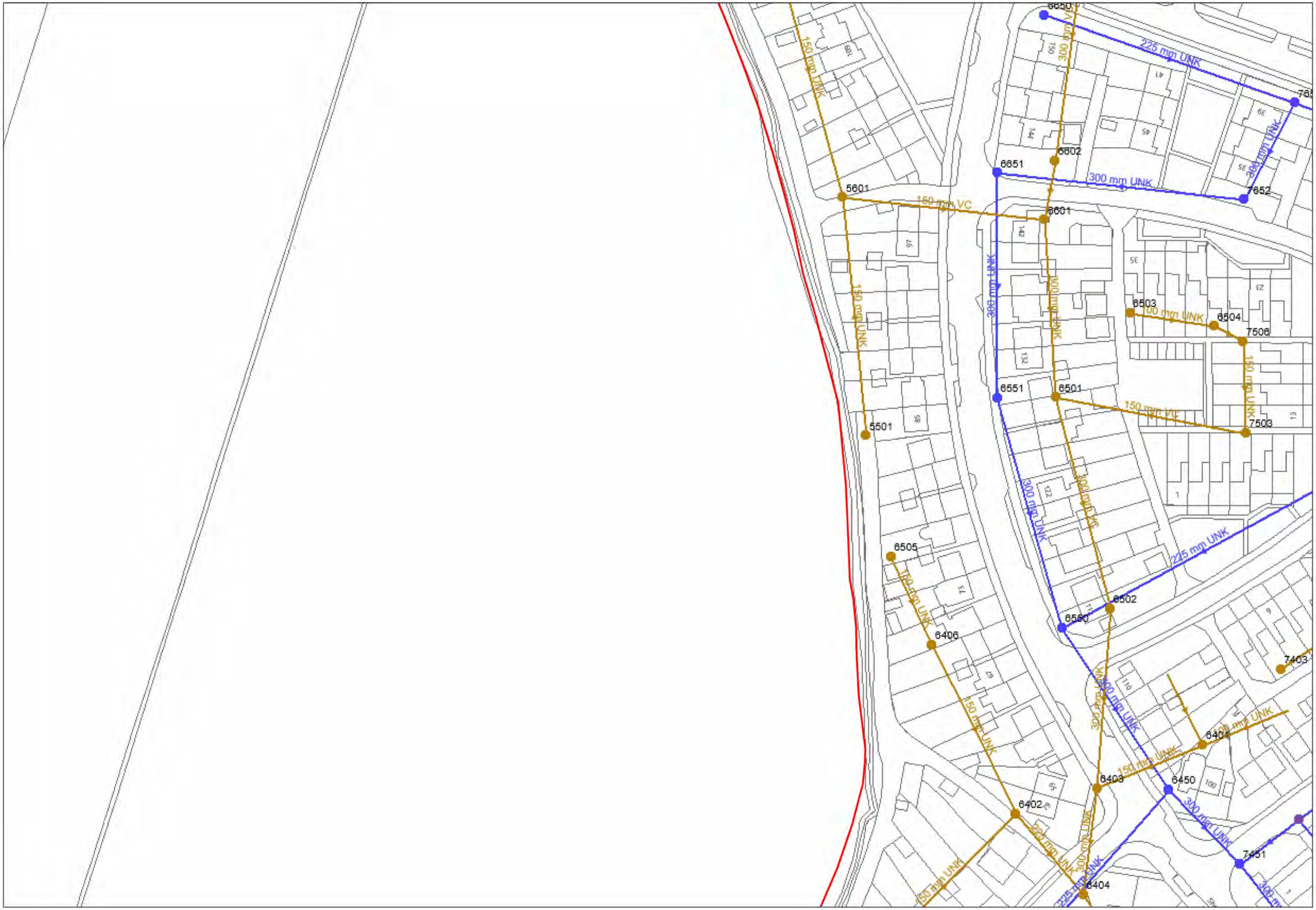
Woodcot Primary School
Fareham And Gosport Family Centre
KENT ROAD
Shelter



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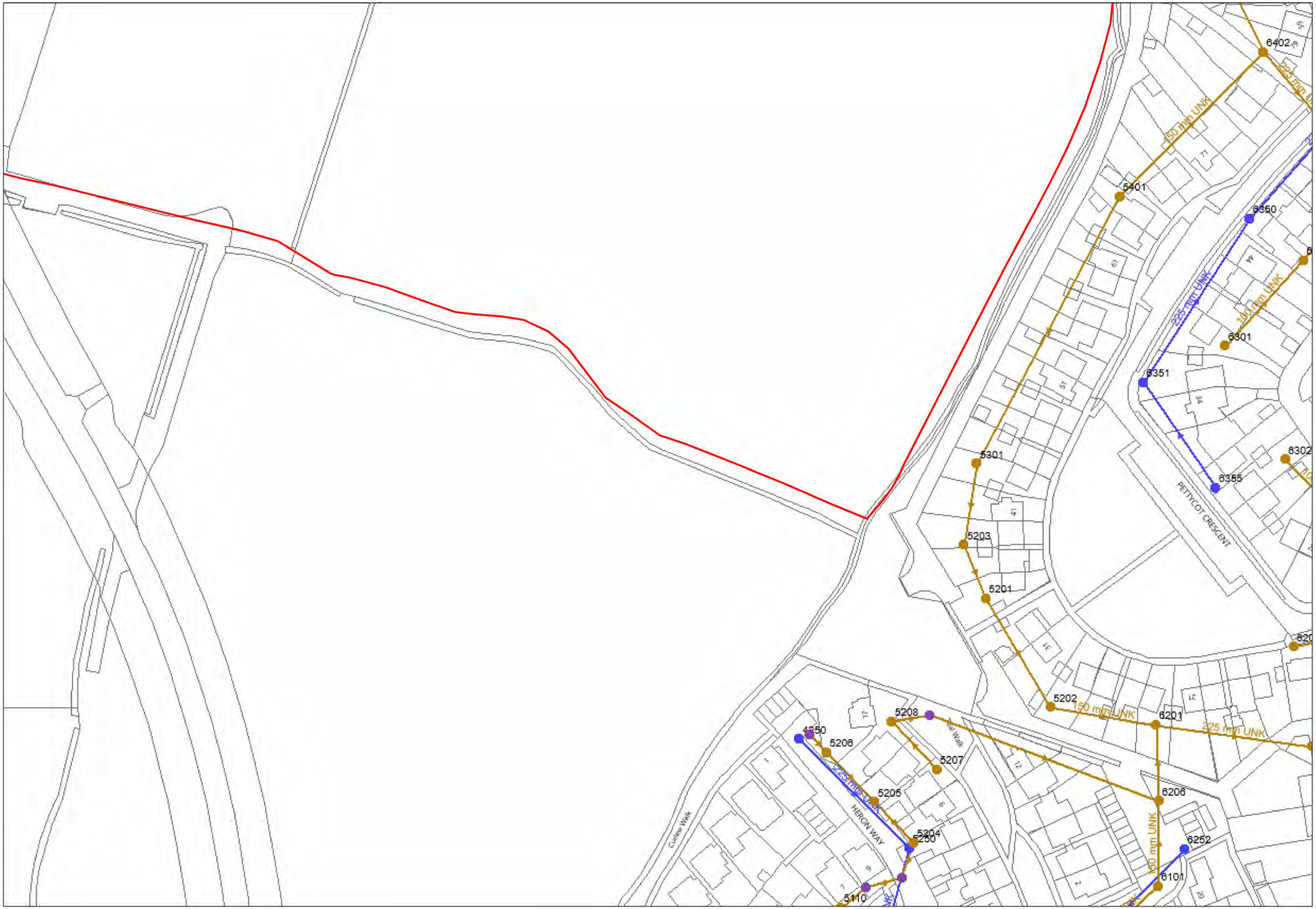

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5204
5250
HERON WAY
6206
6252
150 mm UNK
6101
5110
Curlew Walk

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
0001	F	30.05	26.70	
0101	F	30.58	27.03	
0902	F	0.00	0.00	
3201	F	9.36	7.45	
4001	F	9.53	7.87	
4001	F	10.15	7.70	
4002	F	9.33	0.00	
4003	F	9.55	7.98	
4004	F	9.89	0.00	
4005	F	0.00	0.00	
4006	F	0.00	0.00	
4007	F	0.00	0.00	
4101	F	9.56	0.00	
4101	F	9.87	7.55	
4102	F	10.27	7.15	
4201	F	9.77	7.00	
4202	F	9.57	7.23	
4903	F	9.19	7.42	
5001	F	9.06	0.00	
5002	F	9.18	0.00	
5003	F	9.16	8.40	
5004	F	0.00	0.00	
5005	F	0.00	0.00	
5006	F	0.00	0.00	
5007	F	0.00	0.00	
5008	F	0.00	0.00	
5009	F	0.00	0.00	
5101	F	9.57	8.23	
5101	F	9.92	6.79	
5102	F	9.31	7.89	
5103	F	0.00	0.00	
5104	F	0.00	0.00	
5105	F	0.00	0.00	
5106	F	0.00	0.00	
5107	F	0.00	0.00	
5108	F	0.00	0.00	
5109	F	0.00	0.00	
5110	F	0.00	0.00	
5201	F	9.76	0.00	
5201	F	9.55	6.40	
5202	F	0.00	0.00	
5202	F	9.65	6.15	
5203	F	0.00	0.00	
5204	F	0.00	0.00	
5205	F	0.00	0.00	
5206	F	0.00	0.00	
5207	F	0.00	0.00	
5208	F	0.00	0.00	
5301	F	9.37	5.88	
5301	F	0.00	0.00	
5302	F	0.00	0.00	
5303	F	8.67	5.73	
5305	F	8.25	6.80	
5306	F	8.80	5.52	
5307	F	8.73	5.76	
5308	F	0.00	0.00	
5401	F	9.64	8.08	
5501	F	0.00	0.00	
5601	F	9.96	0.00	
5701	F	10.16	9.34	
5702	F	10.10	9.22	
5904	F	0.00	0.00	
5905	F	0.00	0.00	
6001	F	9.16	0.00	
6002	F	0.00	0.00	
6003	F	0.00	0.00	
6004	F	0.00	0.00	
6005	F	0.00	0.00	
6006	F	0.00	0.00	
6007	F	0.00	0.00	
6101	F	9.41	7.75	
6102	F	9.39	8.63	
6103	F	9.29	8.43	
6201	F	9.52	0.00	
6202	F	9.29	8.57	
6203	F	9.12	7.61	
6204	F	9.18	7.82	
6205	F	8.69	6.72	
6206	F	0.00	0.00	
6301	F	9.62	8.71	
6301	F	8.10	6.45	
6302	F	9.61	8.44	
6303	F	9.55	7.87	
6304	F	9.33	7.20	
6305	F	0.00	0.00	
6306	F	0.00	0.00	
6401	F	9.77	8.19	
6402	F	9.63	7.61	
6403	F	9.46	7.58	
6404	F	9.59	0.00	
6405	F	9.55	7.32	
6406	F	0.00	0.00	
6501	F	9.85	7.76	
6502	F	9.66	7.63	
6503	F	9.93	9.20	
6504	F	0.00	0.00	
6505	F	0.00	0.00	
6601	F	9.88	0.00	
6602	F	10.15	7.88	
6701	F	10.48	8.81	
6702	F	10.26	8.42	
6703	F	10.24	8.08	
6801	F	10.62	9.78	
6802	F	0.00	0.00	
6803	F	0.50	0.00	
6804	F	0.00	0.00	
6805	F	0.00	0.00	
7001	F	9.91	0.00	
7002	F	9.64	7.57	
7003	F	9.47	7.50	
7004	F	9.59	7.30	
7005	F	9.50	8.42	
7006	F	0.00	0.00	
7007	F	0.00	0.00	
7101	F	9.60	7.89	
7102	F	9.69	6.77	
7103	F	9.81	7.32	
7104	F	9.51	6.72	
7104	F	0.00	0.00	
7105	F	0.00	0.00	
7105	F	9.50	7.54	
7106	F	0.00	0.00	
7106	F	9.69	8.51	
7107	F	9.70	6.74	
7107	F	0.00	0.00	
7108	F	9.54	7.48	
7109	F	9.61	0.00	
7110	F	9.51	6.62	
7111	F	9.52	6.48	
7201	F	9.73	8.79	
7201	F	9.66	6.78	
7202	F	9.66	0.00	
7202	F	9.59	6.86	
7203	F	9.63	8.82	
7203	F	9.99	0.00	
7204	F	9.26	0.00	
7205	F	9.84	0.00	
7206	F	0.00	0.00	
7207	F	0.00	0.00	
7208	F	0.00	0.00	
7209	F	0.00	0.00	
7301	F	9.78	0.00	
7301	F	0.00	0.00	
7302	F	9.45	0.00	
7303	F	9.54	7.17	
7401	F	9.83	7.79	
7402	F	9.61	8.82	
7403	F	0.00	0.00	
7501	F	0.00	0.00	
7502	F	10.02	8.21	
7503	F	9.80	8.22	
7506	F	9.84	0.00	
7507	F	10.17	8.69	
7601	F	0.00	0.00	
7602	F	0.00	0.00	
7801	F	10.51	9.13	
7802	F	10.60	8.84	
7803	F	10.53	0.00	
7804	F	0.00	0.00	
7805	F	10.53	0.00	
7901	F	10.47	0.00	
7902	F	10.53	8.94	
7903	F	9.20	0.00	
7903	F	10.58	9.47	
7904	F	10.84	0.00	
8001	F	9.58	7.24	
8002	F	9.60	7.07	
8004	F	0.00	0.00	
8005	F	0.00	0.00	
8005	F	0.00	0.00	
8006	F	0.00	0.00	
8007	F	0.00	0.00	
8007	F	0.00	0.00	
8008	F	0.00	0.00	
8009	F	0.00	0.00	
8010	F	0.00	0.00	
8011	F	0.00	0.00	
8012	F	0.00	0.00	
8101	F	9.44	0.00	
8101	F	0.00	0.00	
8102	F	9.50	7.00	
8103	F	0.00	0.00	
8103	F	9.47	6.69	
8104	F	0.00	0.00	
8104	F	9.51	6.59	
8105	F	9.45	0.00	
8105	F	0.00	0.00	
8106	F	9.49	0.00	
8107	F	0.00	0.00	
8107	F	9.36	7.94	
8108	F	0.00	0.00	
8108	F	9.45	6.46	
8109	F	0.00	0.00	
8109	F	9.35	6.41	
8110	F	0.00	0.00	
8110	F	9.30	6.34	
8111	F	0.00	0.00	
8113	F	0.00	0.00	
8114	F	0.00	0.00	
8115	F	0.00	0.00	
8201	F	9.75	8.46	
8202	F	9.75	0.00	
8203	F	9.75	8.46	
8204	F	9.54	8.67	
8205	F	0.00	0.00	
8206	F	0.00	0.00	
8207	F	0.00	0.00	
8301	F	9.70	8.99	
8302	F	9.65	8.68	
8302	F	0.00	0.00	
8303	F	9.78	0.00	
8304	F	9.77	8.91	
8304	F	0.00	0.00	
8305	F	9.79	9.80	
8305	F	0.00	0.00	

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
8306	F	0.00	0.00	
8401	F	9.67	8.79	
8402	F	9.78	8.72	
8403	F	9.77	8.31	
8404	F	9.66	0.00	
8405	F	9.49	6.77	
8406	F	9.96	0.00	
8407	F	0.00	0.00	
8408	F	0.00	0.00	
8409	F	0.00	0.00	
8410	F	0.00	0.00	
8411	F	0.00	0.00	
8412	F	0.00	0.00	
8413	F	0.00	0.00	
8414	F	0.00	0.00	
8415	F	0.00	0.00	
8416	F	0.00	0.00	
8417	F	0.00	0.00	
8501	F	10.03	8.84	
8503	F	10.12	8.35	
8504	F	0.00	0.00	
8505	F	0.00	0.00	
8506	F	0.00	0.00	
8601	F	10.30	9.10	
8602	F	0.00	0.00	
8603	F	0.00	0.00	
8604	F	0.00	0.00	
8701	F	10.41	8.39	
8702	F	11.24	8.99	
8703	F	10.36	7.39	
8705	F	10.49	9.49	
8707	F	10.50	9.25	
8708	F	10.36	0.00	
8709	F	10.46	8.71	
8710	F	10.18	8.14	
8711	F	10.10	7.96	
8712	F	10.15	7.72	
8714	F	0.00	0.00	
8715	F	0.00	0.00	
8801	F	10.40	9.60	
8802	F	0.00	0.00	
8803	F	10.42	0.00	
8804	F	10.54	0.00	
8805	F	10.42	9.26	
8901	F	8.85	0.00	
8901	F	0.00	0.00	
8902	F	0.00	0.00	
8903	F	10.35	9.26	
8904	F	0.00	0.00	
8906	F	0.00	0.00	
8907	F	0.00	0.00	
8908	F	0.00	0.00	
9001	F	8.55	7.32	
9002	F	10.38	8.81	
9003	F	10.05	8.43	
9004	F	0.00	0.00	
9004	F	0.00	0.00	
9005	F	0.00	0.00	
9007	F	0.00	0.00	
9101	F	30.73	27.33	
9102	F	30.68	27.25	
9103	F	9.38	6.38	
9104	F	0.00	0.00	
9105	F	0.00	0.00	
9106	F	0.00	0.00	
9107	F	0.00	0.00	
9108	F	0.00	0.00	
9109	F	0.00	0.00	
9201	F	30.84	27.54	
9201	F	9.44	7.97	
9202	F	0.00	0.00	
9203	F	9.41	8.50	
9204	F	9.55	6.60	
9205	F	9.05	0.00	
9206	F	0.00	0.00	
9301	F	9.41	0.00	
9302	F	9.90	0.00	
9401	F	10.11	8.14	
9402	F	10.01	0.00	
9801	F	0.00	0.00	
9803	F	0.00	0.00	
9804	F	0.00	0.00	
9805	F	0.00	0.00	
9902	F	10.17	8.73	
9903	F	10.18	0.00	
9904	F	10.35	0.00	
3150	S	9.70	8.20	
3151	S	9.75	8.35	
3250	S	9.35	7.30	
4050	S	9.36	0.00	
4050	S	10.14	7.99	
4051	S	9.48	0.00	
4052	S	9.56	7.03	
4150	S	9.45	7.90	
4150	S	9.85	8.02	
4151	S	10.25	7.62	
4152	S	0.00	0.00	
4250	S	9.38	8.14	
4250	S	9.75	7.45	
4251	S	9.55	7.67	
4952	S	9.17	6.61	
5050	S	8.84	7.62	
5051	S	9.18	7.38	
5052	S	9.13	0.00	
5053	S	9.15	0.00	
5054	S	8.86	7.15	
5150	S	8.88	7.66	
5150	S	9.90	7.30	
5151	S	9.58	0.00	
5152	S	9.32	7.95	
5250	S	9.49	7.81	
5250	S	9.55	6.80	
5251	S	9.65	6.67	
5252	S	9.78	7.22	
5350	S	9.37	6.35	
5352	S	8.70	6.05	
5354	S	8.25	6.80	
5355	S	8.49	6.97	
6050	S	9.40	7.36	
6051	S	8.80	7.90	
6052	S	9.15	7.68	
6053	S	9.00	7.52	
6150	S	9.37	8.22	
6151	S	8.86	7.36	
6250	S	9.23	0.00	
6251	S	8.94	7.90	
6252	S	0.00	0.00	
6350	S	9.55	8.19	
6351	S	9.55	0.00	
6352	S	9.45	8.16	
6353	S	9.23	8.18	
6354	S	9.59	8.68	
6355	S	0.00	0.00	
6450	S	9.64	0.00	
6550	S	9.47	0.00	
6551	S	9.82	8.36	
6650	S	10.20	8.99	
6651	S	10.05	8.50	
6850	S	10.44	9.76	
6950	S	9.09	8.19	
7050	S	9.56	7.93	
7050	S	10.18	8.69	
7051	S	9.57	7.79	
7051	S	10.15	8.97	
7150	S	9.64	0.00	
7150	S	9.92	8.42	
7151	S	9.52	7.73	
7151	S	9.83	8.48	
7152	S	9.37	7.67	
7152	S	10.00	8.26	
7250	S	9.80	8.07	
7251	S	0.00	0.00	
7251	S	0.00	0.00	
7252	S	0.00	0.00	
7350	S	9.66	7.80	
7351	S	9.59	8.49	
7352	S	0.00	0.00	
7353	S	0.00	0.00	
7354	S	9.34	8.52	
7450	S	9.71	9.24	
7451	S	9.48	7.96	
7452	S	9.71	7.82	
7550	S	9.61	8.43	
7650	S	9.95	8.94	
7651	S	9.96	0.00	
7652	S	9.93	8.70	
7850	S	10.72	0.00	
7851	S	10.71	0.00	
7852	S	10.49	9.79	
7950	S	10.34	9.14	
7951	S	8.98	0.00	
8050	S	9.57	7.66	
8050	S	9.98	8.94	
8051	S	9.58	0.00	
8051	S	9.82	8.77	
8052	S	9.82	8.63	
8053	S	9.73	8.85	
8054	S	9.73	8.67	
8150	S	9.35	7.16	
8150	S	9.83	0.00	
8151	S	9.42	7.12	
8152	S	0.00	0.00	
8250	S	9.68	0.00	
8250	S	10.00	0.00	
8251	S	9.92	8.75	
8251	S	0.00	0.00	
8252	S	9.80	8.24	
8253	S	10.00	0.00	
8254	S	9.85	7.59	
8255	S	0.00	0.00	
8350	S	9.23	7.58	
8450	S	9.51	9.03	
8451	S	10.05	9.51	
8550	S	10.13	9.44	
8551	S	9.94	0.00	
8650	S	9.77	9.01	
8651	S	9.77	8.98	
8652	S	9.54	9.09	
8653	S	9.46	9.05	
8654	S	9.73	8.88	
8750	S	10.38	9.14	
8751	S	10.42	9.04	
8752	S	11.11	10.30	
8753	S	10.08	9.54	
8850	S	10.57	8.69	
8851	S	10.43	8.62	
8853	S	10.40	0.00	
8950	S	8.90	8.05	
8950	S	10.24	8.80	
8951	S	9.06	8.21	
9050	S	8.59	7.23	
9051	S	10.33	9.05	
9052	S	10.19	9.50	
9053	S	8.78	7.74	
9053	S	0.00	0.00	
9150	S	30.68	29.29	
9150	S	9.82	8.43	
9150	S	9.24	8.07	
9151	S	30.68	29.30	
9151	S	9.71	8.32	
9151	S	9.41	7.08	
9152	S	0.00	0.00	
9152	S	9.54	8.26	
9153	S	0.00	0.00	
9153	S	0.00	0.00	
9251	S	9.14	8.00	
9252	S	9.41	0.00	
9351	S	9.35	8.49	
9352	S	9.23	8.36	
9353	S	9.53	8.63	
9450	S	9.84	8.88	
9451	S	9.96	8.92	
9550	S	10.12	8.72	
9551	S	9.91	8.75	
9750	S	10.58	9.14	
9852	S	10.60	6.90	
985C	S	10.44	9.02	
986C	S	10.04	9.29	
9950	S	10.33	8.99	
9950	S	8.80	7.00	
9951	S	10.44	8.78	
9953	S	10.18	8.61	
995C	S	10.23	8.70	

Appendix 4

BGS Geological Borehole Data


British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL
Geology of Britain viewer
Try the Beta version of our 3D Geology of Britain viewer
More BGS map viewers
Surface Geology
3D Models
Borehole Scans
Earthquake Timeline
Go to Location
Switch Basemap
100%
0%
Geology Transparency
Grid Ref: 457947, 103046
Borehole Scans
Click on a borehole to view scan.
Borehole depth
0 - 10m
10 - 30m
30m+
Unknown
Confidential or Restricted
More on boreholes
SU50SE186
SU50SE211
SU50SE214
SU50SE213
SU50SE212
SU50SE230
SU50SE231
SU50SE32

SU50SE 230

Sampling		Properties			Strata			
Depth	Type	Strength kN/m²	w %	SPT N	Description	Depth	Level	Legend
					Topsoil.	G.L	8.4	
0.5-1.0	U(50)					0.4	8.0	
1.0	D				Firm-stiff brown sandy CLAY with abundant chalk and flint fragments.			
1.5-2.0	U(20)	95	22 22 22			1.7	6.7	
2.0	D				Firm-stiff light brown mottled grey very silty CLAY.			P ▼
2.4 / 2.5-3.0	W / U(12)	120	22 22 22			2.7	5.7	
3.0	D				Firm-stiff dark grey very silty sandy CLAY becoming very sandy towards base.			
3.5-4.0	U(10)	75	18					
4.0	D							
4.5	D		28			4.5	3.9	▽
5.0-5.5	D.S			14	Dense/very dense dark grey clayey very silty SAND.			
6.0-6.5	U(20)	22	26		Stiff grey fissured silty CLAY present 9.5-10.0.			
6.5 / 6.5-7.0	D / D.S			39				
7.5	D							
8.0-8.5	D.S		65					
9.0	D		26 26 24					
9.3-9.8		85						
9.8-10.3	D.S			74	Continued from 10.0.	10.0	-1.6	

Drilling					Ground Water						
Type	From	To	Size	Fluid	Struck	Behaviour	Sealed	Date	Hole	Cased	Water
Shell and Auger.	G.L	10.0	0.15		4.50	Rose to 2.4 in 1 hour	-	2.9.75	-	-	-
						Ingress throughout borehole.		2.9.75	15.0	14.0	14.2
								12.9.75	Piezometer		1.65

Remarks

Borehole Record	**Project** Hampshire County Council Fareham - Gosport Relief Road	Contract S1259/4
exploration associates		**Borehole** 37 Sheet 1 of 2

SU50SE 230

Sampling		Properties			Strata			
Depth	Type	Strength kN/m²	w %	SPT N	Description	Depth	Level	Legend
					Continued from 10.0.	10.0	-1.6	
10.8	D				Dense/very dense dark grey mottled light grey green clayey very silty SAND tending to very sandy SILT, in part.			
11.0-11.5	U(25)	240	25					
11.5-12.0	D.S			90				
12.5	D							
13.0-13.5	U(30)		23					
14.3	D							
14.5-15.0	U(30)	150	25					
15.0	D				End of Borehole.	15.0	-6.6	

Drilling

Type	From	To	Size	Fluid
Shell and Auger.	10.0	15.0		

Ground Water

Struck	Behaviour	Sealed	Date	Hole	Cased	Water
			31.10.75	Piezometer		1.35
			30.12.75	Piezometer		0.94
			29.1.76	Piezometer		1.07

Remarks Piezometer installed to 15.0.

Borehole Record

exploration associates

Project Hampshire County Council
Fareham - Gosport Relief Road

Contract S1259/4

Borehole 37
Sheet 2 of 2

EX1

SU50SE 231

Sampling Depth	Type	Properties Strength kN/m²	w %	SPT N	Strata Description	Depth	Level	Legend
					Topsoil.	G.L	8.4	
0.5-1.0	U(20)					0.4	8.0	
1.0	D				Soft - firm light brown becoming brown silty sandy CLAY with abundant gravel towards base. Carbonaceous inclusions present in upper regions.			
1.5-2.0	U(38)	45	19					
2.0	D							
2.2	W					2.3	6.1	▽
2.5-3.0	U(15)	140	25					
3.0	D				Medium dense/dense light brown slightly clayey sandy SILT with silty SAND.			
3.5-4.0	D.S			14				
4.5-5.0	D.S			18		5.0	3.4	
5.5-6.0	D.S		22	35	Dense/very dense grey clayey very silty SAND with occasional laminated clay zones.			
6.5-7.0	D.S			40				
7.3	D							
7.5-8.0	U(30)	290	20					
8.0-8.5	D.S			34				
9.5-10.0	D.S		17	43				
					Continued from 10.0.	10.0	-1.6	

Drilling

Type	From	To	Size	Fluid
Shell and Auger.	G.L	10.0	0.15	

Ground Water

Struck	Behaviour	Sealed	Date	Hole	Cased	Water
2.50	Medium ingress		3.9.75	-	-	-
	Ingress throughout borehole.					

Remarks

Borehole Record

exploration associates

Project Hampshire County Council Fareham - Gosport Relief Road.

Contract S1259/4

Borehole 38

Sheet 1 of 2

SU 50 SE 231

Sampling Depth	Type	Strength kN/m²	w %	SPT N	Strata Description	Depth	Level	Legend
					Continued from 10.0.	10.0	-1.6	
10.3	D							
10.5-11.0	U(25)	200	20 21 20		Very stiff dark grey mottled grey with occasional light grey veins very silty sandy CLAY, tending to clayey silt and sand in part.			
11.0	D							
11.5	D		20					
12.0-12.5	U(25)							
12.5	D							
13.0	D							
13.5-14.0	U(35)	240	25					
14.0	D							
14.5-15.0	U(35)	300	23 23 23					
15.0	D				End of Borehole.	15.0	-6.6	

Drilling

Type	From	To	Size	Fluid
Shell and Auger.	10.0	15.0	0.15	

Ground Water

Struck	Behaviour	Sealed	Date	Hole	Cased	Water

Remarks

Borehole Record

exploration associates

Project Hampshire County Council Fareham - Gosport Relief Road

Contract S1259/4

Borehole 38

Sheet 2 of 2

Holst Soil Engineering Limited

BOREHOLE LOG

Borehole No. **ah4**

Contract No. F3523
Location Gosport
Client Southern Water Authority
Method of Boring Percussion
Diameter of Borehole 150mm

SU50SE - 213
5746, 0307

Sheet 1 of 1
Chainage
Ground Level .... m.A.O.D.
Date 18.1.77

Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
MADEGROUND : Dark brown silty clay with brick fragments		0.60					
Firm grey brown sandy CLAY with flints		0.90					
firm to stiff light grey silty CLAY with flints		2.1					
Soft to firm dark brown clayey SAND		4.00			3.70		
Soft to firm dark grey clayey fine SAND		6.00					

Type of Sample

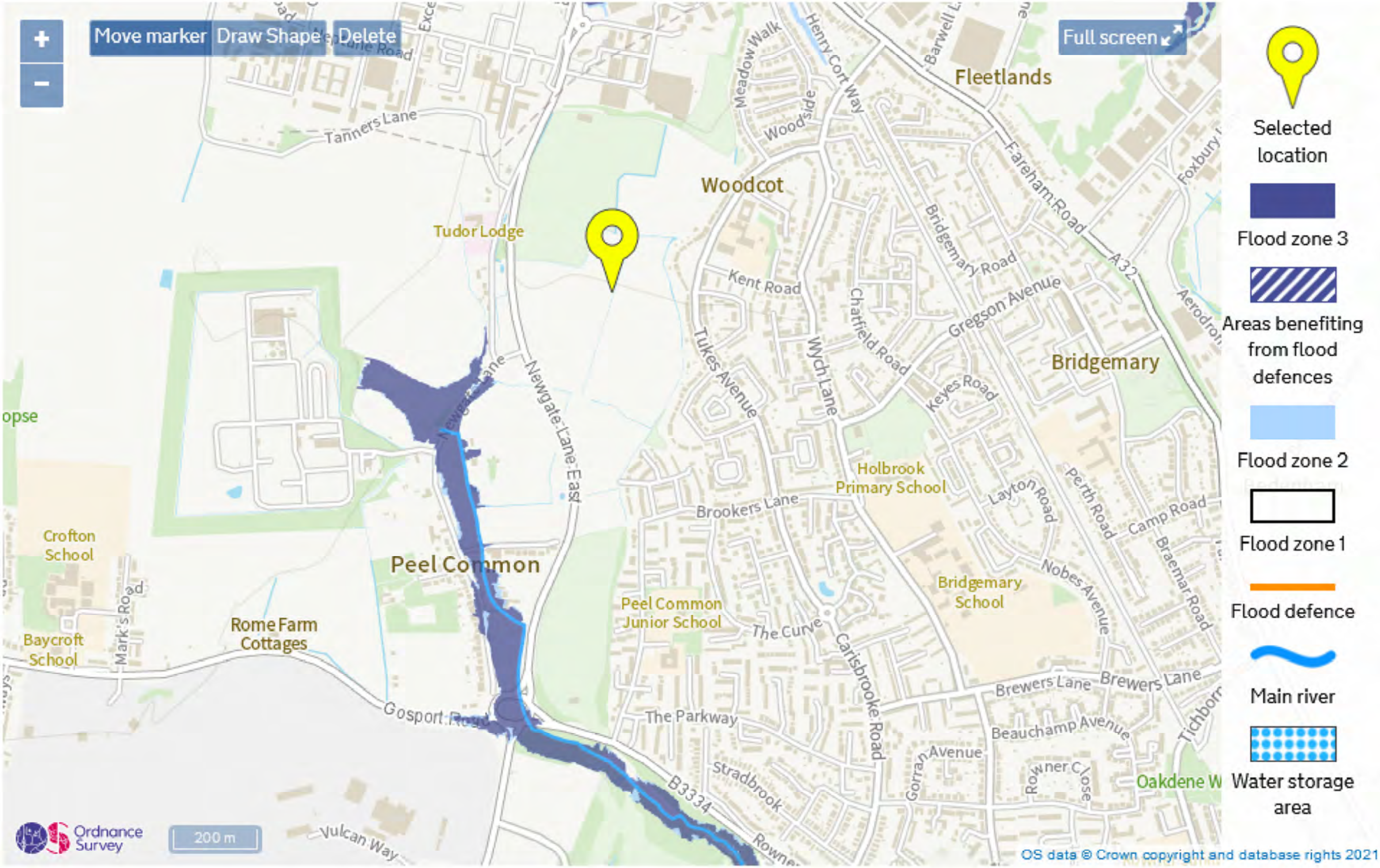
Is S.P.T. ▯ Undisturbed
Ic. C.P.T. × Vane
O Jar Δ Water
Bulk Piezometer

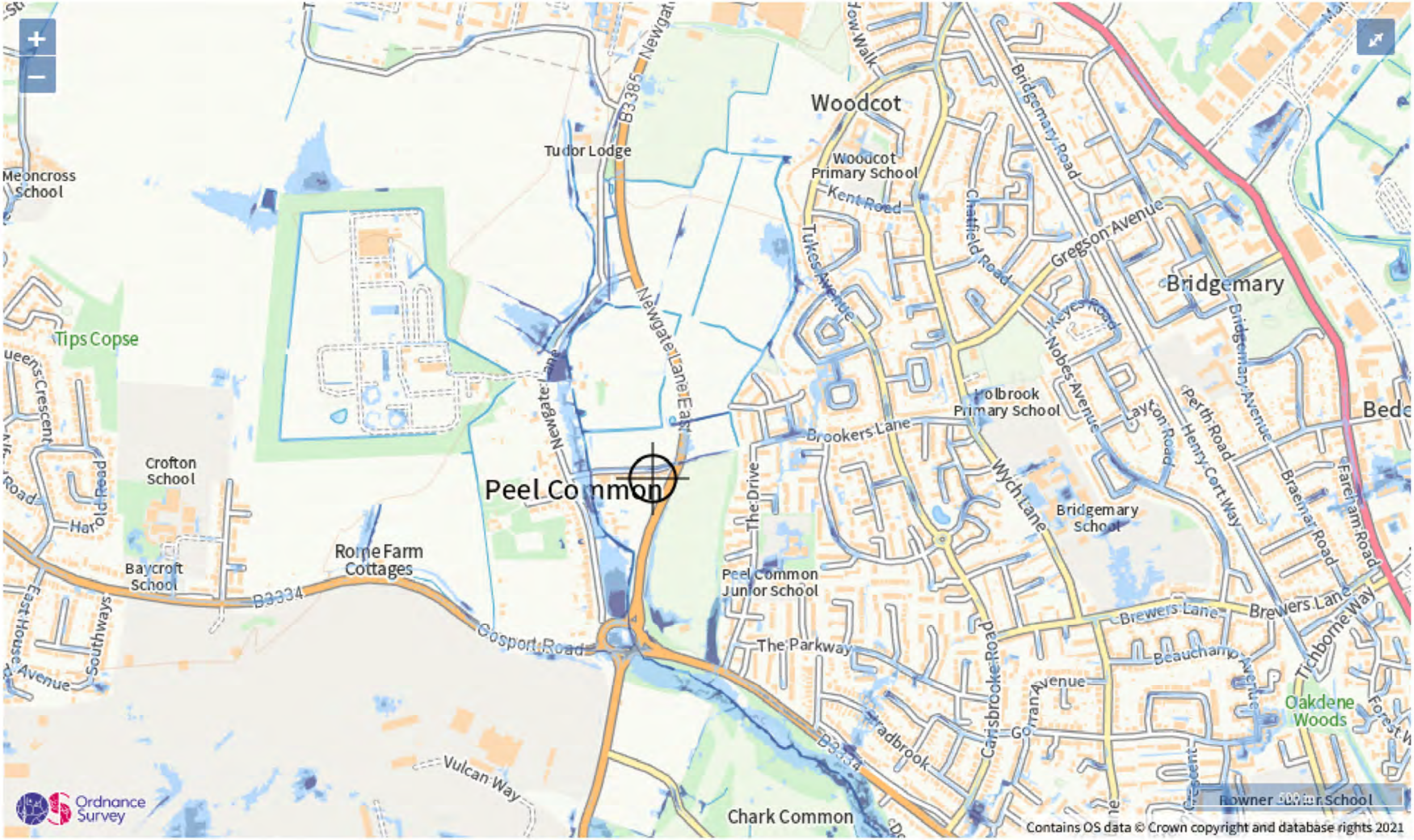
Remarks (Observations of Ground Water etc.)

Slight groundwater seepage at 4.00m depth
Standing water level at 2.00m depth

Appendix 5

Flood Maps


Move marker
Draw Shape
Delete
Full screen
Selected location
Flood zone 3
Areas benefiting from flood defences
Flood zone 2
Flood zone 1
Flood defence
Main river
Water storage area
Fleetlands
Woodcot
Tudor Lodge
Bridgemary
Peel Common
Crofton School
Baycroft School
Rome Farm Cottages
Peel Common Junior School
Holbrook Primary School
Bridgemary School
Tanners Lane
Meadow Walk
Woodside
Henry Cort Way
Barwell L
Fareham Road
A32
Foxbury
Bridgemary Road
Gregson Avenue
Kent Road
Chatfield Road
Keyes Road
Tukes Avenue
Wych Lane
Newgate Lane East
Newgate Lane
Brookers Lane
Layton Road
Perth Road
Camp Road
Braemar Road
Nobes Avenue
The Curve
Carisbrooke Road
Brewers Lane
Beauchamp Avenue
The Parkway
Stradbrook
Gorran Avenue
Rowner Close
Gosport Road
B3334
Mark's Road
Vulcan Way
Oakdene W
Aerodrom
opse
Ordnance Survey
200 m
OS data © Crown copyright and database rights 2021



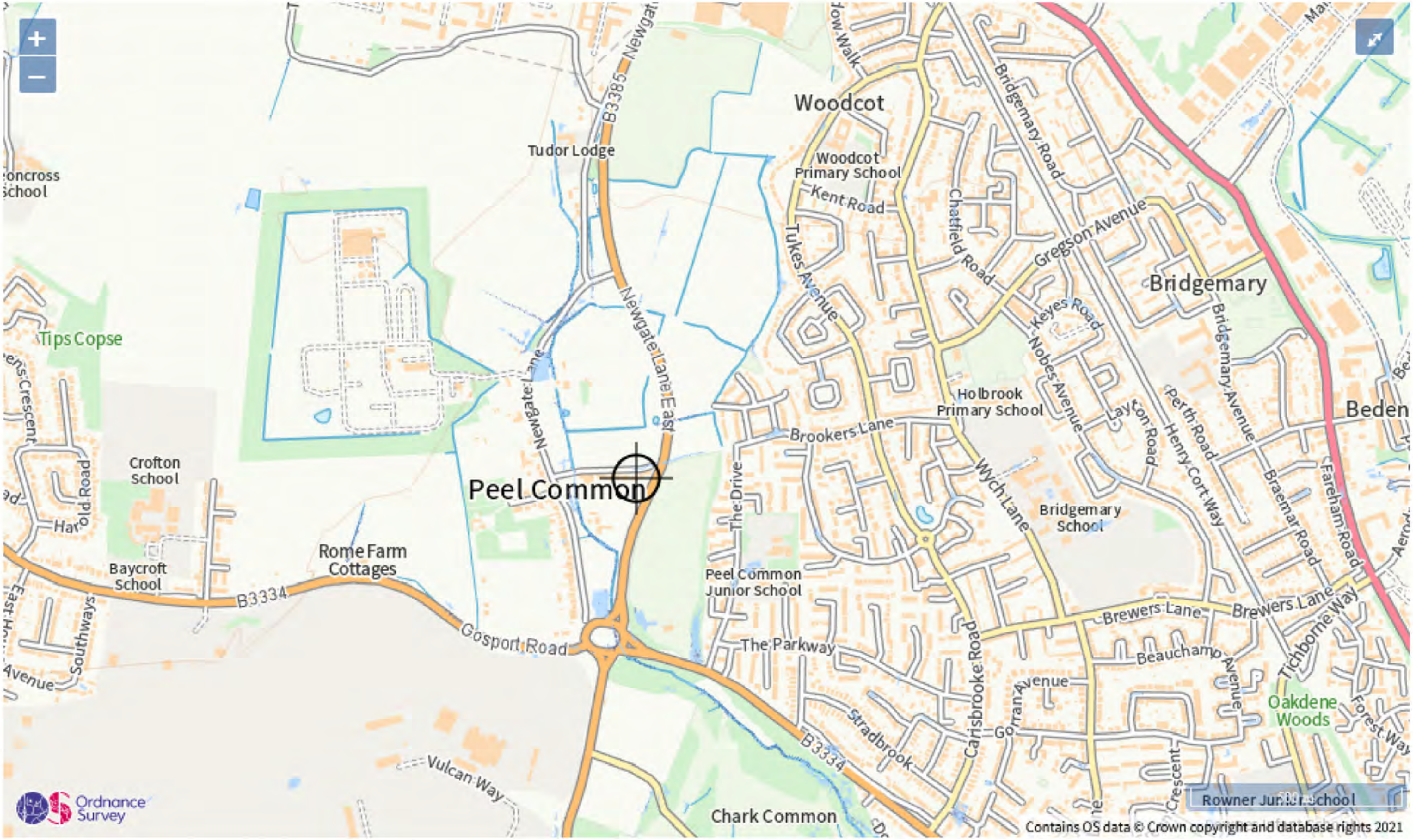
Extent of flooding from surface water

High Medium Low Very low Location you selected

Surface water flood risk: water depth in a high risk scenario

Flood depth (millimetres)

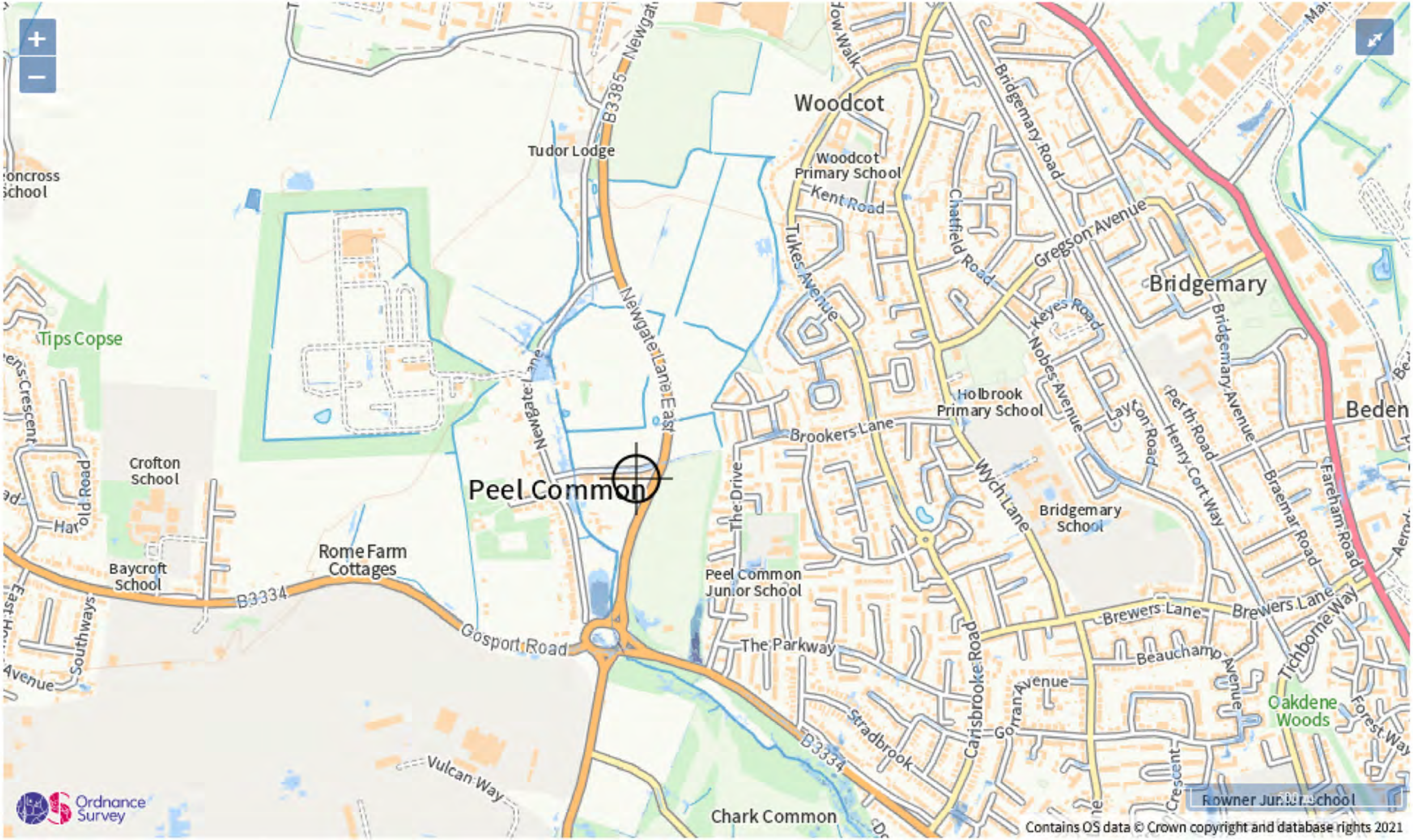
Over 900mm | 300 to 900mm | Below 300mm | Location you selected



Surface water flood risk: water velocity in a high risk scenario

Flood velocity (metres/second)

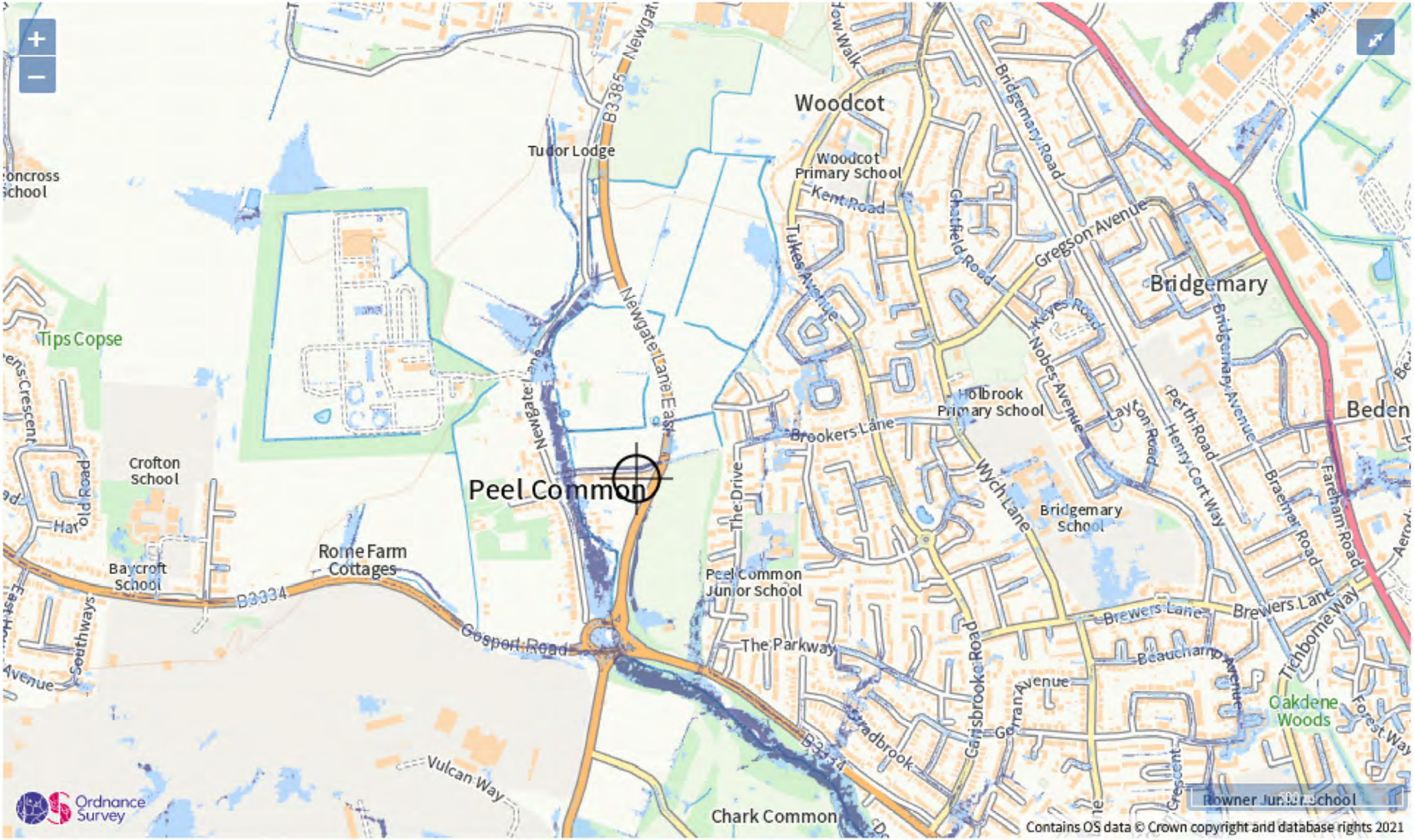
Over 0.25 m/s   Less than 0.25 m/s   Direction of water flow   Location you selected



Surface water flood risk: water depth in a medium risk scenario

Flood depth (millimetres)

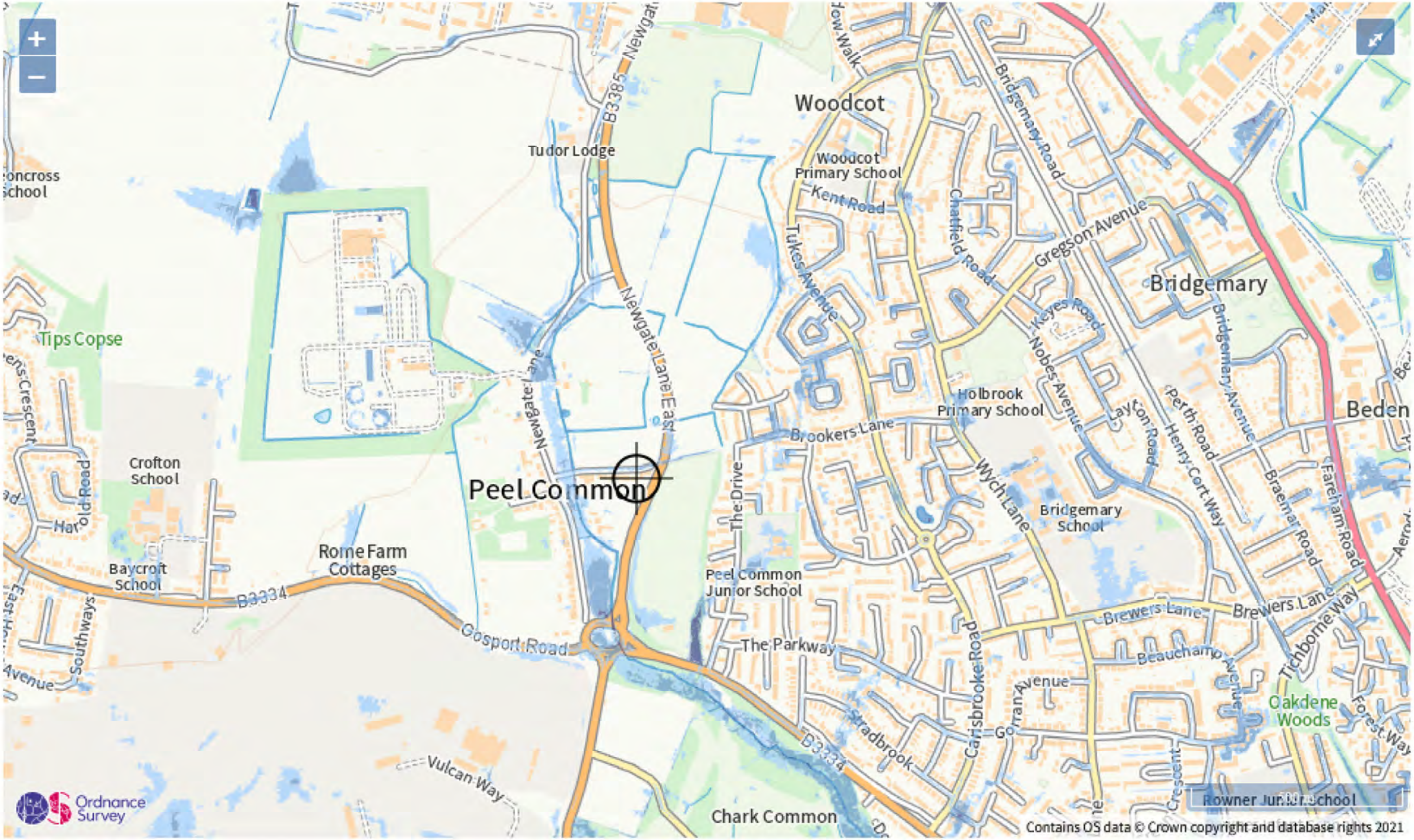
Over 900mm   300 to 900mm   Below 300mm   Location you selected



Surface water flood risk: water velocity in a low risk scenario

Flood velocity (metres/second)

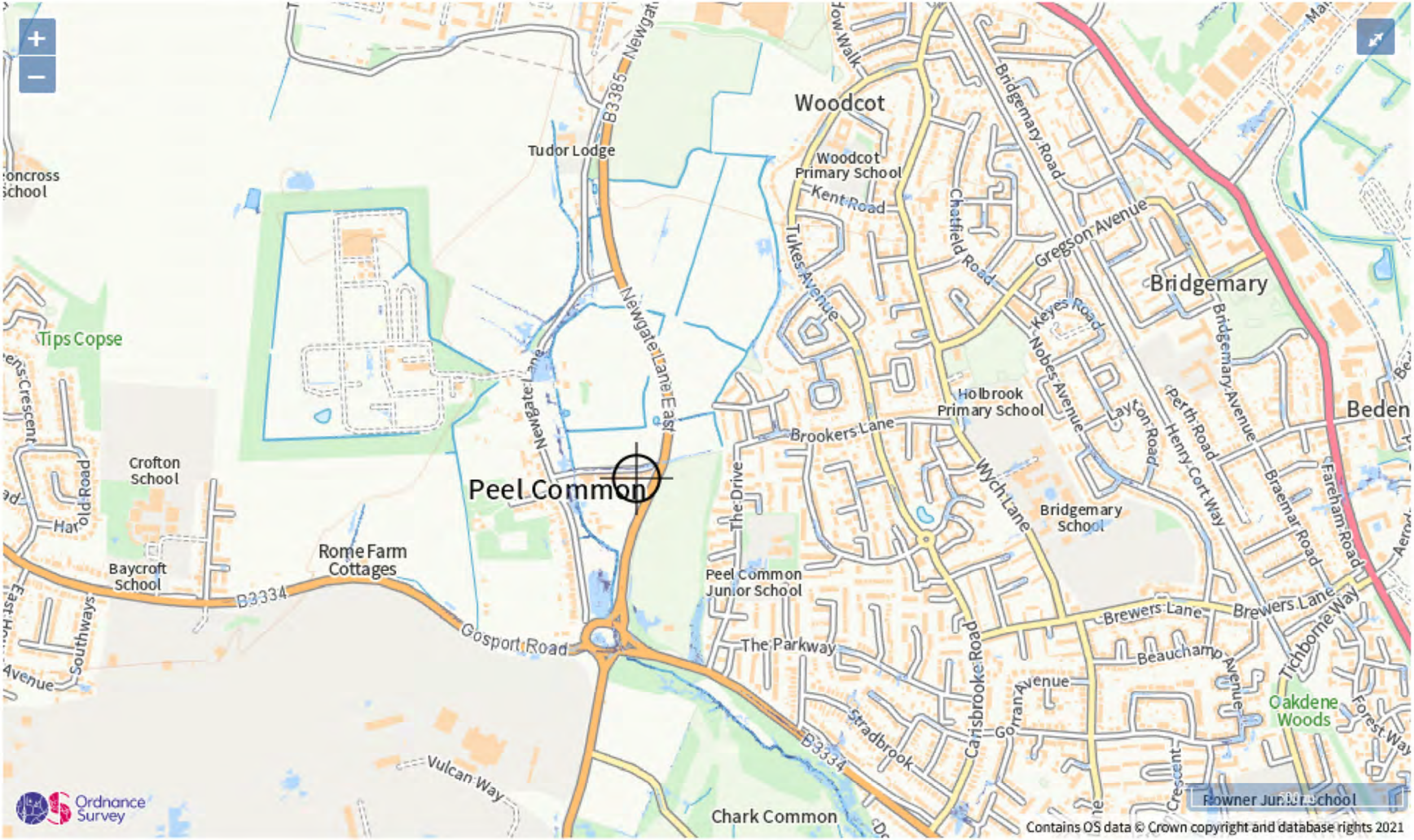
Over 0.25 m/s | Less than 0.25 m/s | Direction of water flow | Location you selected



Surface water flood risk: water depth in a low risk scenario

Flood depth (millimetres)

Over 900mm | 300 to 900mm | Below 300mm | Location you selected



Surface water flood risk: water velocity in a medium risk scenario

Flood velocity (metres/second)

Over 0.25 m/s   Less than 0.25 m/s   Direction of water flow   Location you selected

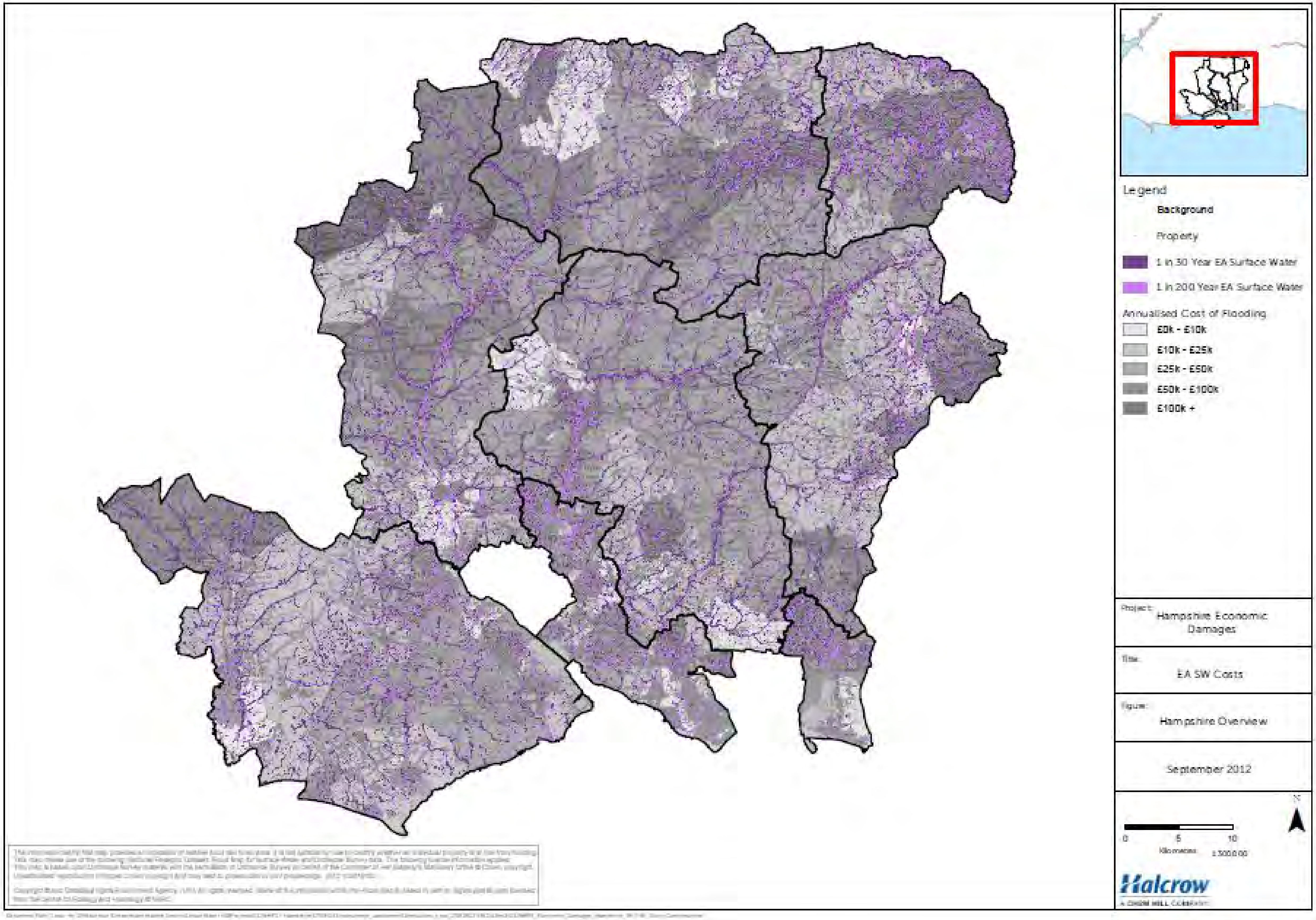
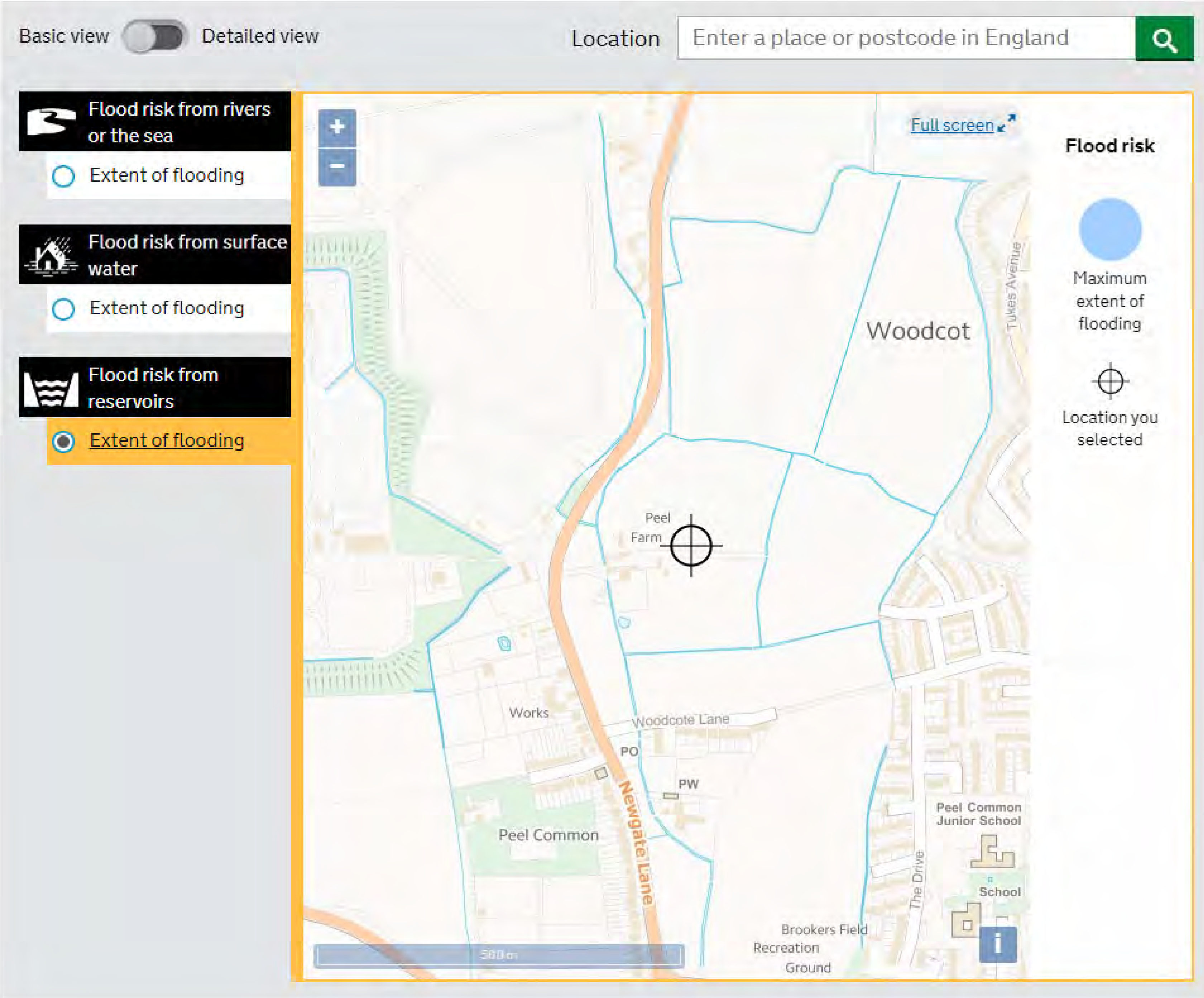
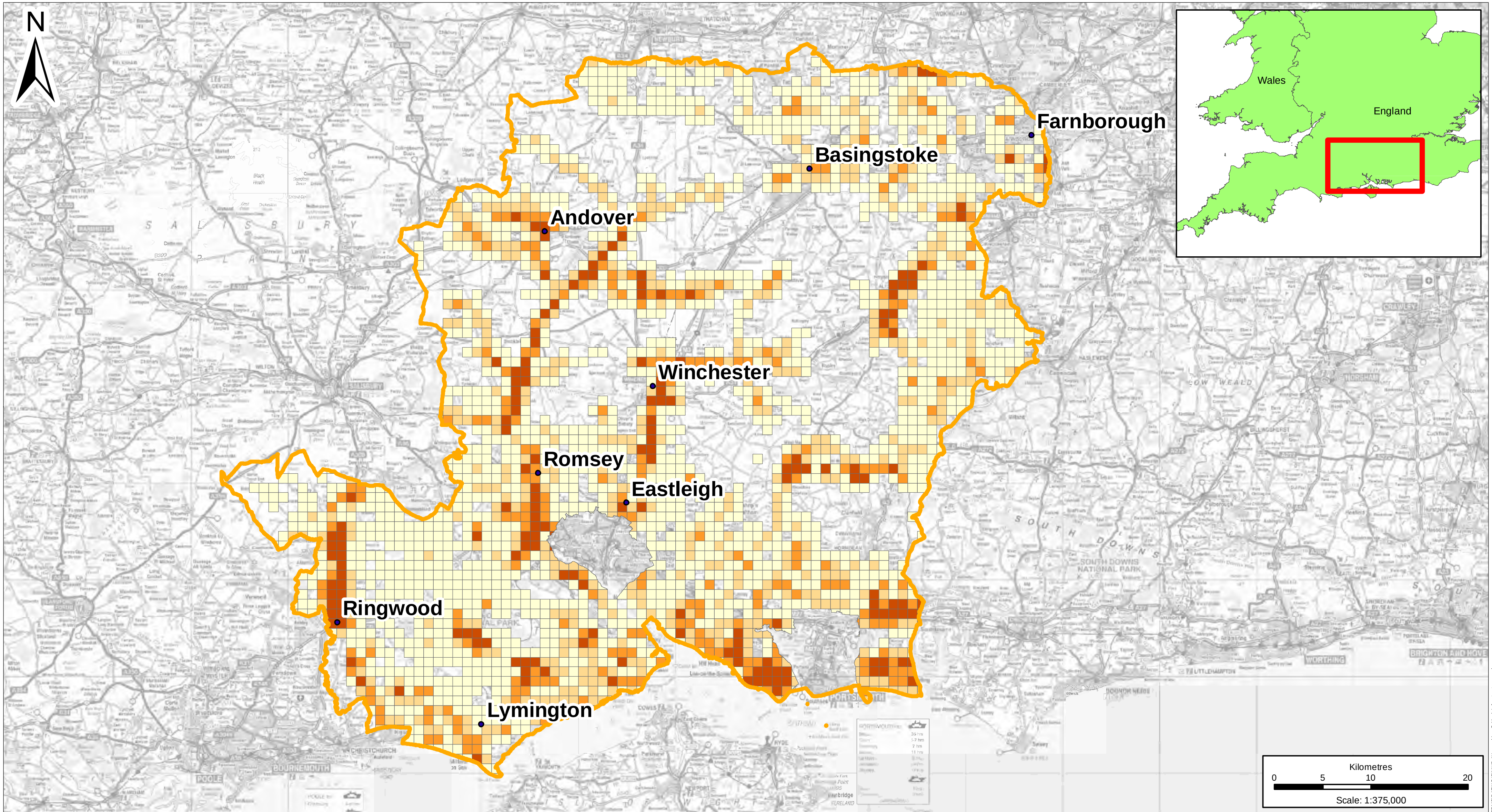


Figure 4.3: Risk of flooding calculated as an economic cost from the Environment Agency Flood Map for Surface Water


Basic view
Detailed view
Location
Enter a place or postcode in England
Flood risk from rivers or the sea
Extent of flooding
Flood risk from surface water
Extent of flooding
Flood risk from reservoirs
Extent of flooding
Full screen
Flood risk
Maximum extent of flooding
Location you selected
Woodcot
Tukes Avenue
Peel Farm
Works
Woodcote Lane
PO
PW
Newgate Lane
Peel Common
Peel Common Junior School
School
The Drive
Brookers Field Recreation Ground



Proportion of 1 km square susceptible to groundwater flood emergence

- >= 75%
- >= 50% <75%
- >= 25% <50%
- < 25%
- Hampshire County Boundary

Figure Number: 7
Job Number: 461312
Drawn By: CLK
Date: 01-05-2013

Hampshire GWMP

Figure 7 Areas susceptible to groundwater flooding

Halcrow
A CH2M HILL COMPANY

Appendix 6

Proposed Site Layout Plan and Proposed Impermeable Area Plan

TITLE: Proposed Site Layout Plan	
SCALE: 1:2,500	PROJECT. No.: 23586
REPORT TYPE: FRA	DRG. No.: 03B

IMPERMEABLE AREAS

A	24,170m^2
B	46,960m^2
C	30,615m^2

TITLE
Proposed Impermeable Areas Plan

SCALE	PROJECT. No.
1:2,500	23586
REPORT TYPE	DRG. No.
FRA	04B

Appendix 7

Outline Drainage Strategy Plan and Calculations


Catchment C - Basin 1
Minimum Surface Area - 1513m^2
Base Area - 1200m^2
Minimum Volume of Storage - 1102m^2
Banks @ 1:3
0.8m Deep
Hydrobrake Restriction 6.9 l/s
Hydrobrake Restriction 10.6 l/s
Catchment B - Basin 2
Minimum Surface Area - 3807m^2
Base Area - 3300m^2
Minimum Volume of Storage - 2883m^2
Banks @ 1:3
0.8m Deep
Catchment C - Swale 1
Minimum Surface Area - 1058m^2
Base Area - 800m^2
Minimum Volume of Storage - 762m^2
Banks @ 1:3
0.8m Deep
Catchment A - Basin 2
Minimum Surface Area - 908m^2
Base Area - 670m^2
Minimum Volume of Storage - 606m^2
Banks @ 1:3
0.8m Deep
Hydrobrake Restriction 5.4 l/s
Catchment A - Basin 1
Minimum Surface Area - 1287m^2
Base Area - 1000m^2
Minimum Volume of Storage - 873m^2
Banks @ 1:3
0.8m Deep
Catchment C
Catchment C
Catchment B
Catchment B
Catchment A
NON-VEHICULAR LINKS TO THE NORTH
KEY
Catchment Area A
Catchment Area B
Catchment Area C
Existing Watercourses / Ditches
Proposed Attenuation Basins
Proposed Flow Restriction Points
-25m 0 25m 50m 75m 100m
TITLE
Proposed Surface Water Drainage Strategy
SCALE 1:2,500
PROJECT. No. 23586
REPORT TYPE FRA
DRG. No. 05B

Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.850	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
Catchment A - Basin 1	0.907		10.000	1800	0.800
Catchment A - Basin 2	0.907	5.00	10.000	1350	0.800

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	Catchment A - Basin 2	Catchment A - Basin 1	5.000	0.600	9.200	9.200	0.000	0.0	450	5.08	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)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.000	159.0	139.3	0.350	0.350	0.907	0.0	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	5.000	0.0	450	Circular	10.000	9.200	0.350	10.000	9.200	0.350

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	Catchment A - Basin 2	1350	Manhole	Adoptable	Catchment A - Basin 1	1800	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Catchment A - Basin 1	10.000	0.800	1800	1	1.000	9.200	450
Catchment A - Basin 2	10.000	0.800	1350	0	1.000	9.200	450

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0
Summer CV	0.850	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.900	Drain Down Time (mins)	2000	Check Discharge Volume	x

Storm Durations

600	720	960	1440	2160

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
10	0	0	0
30	0	0	0
100	40	0	0

Node Catchment A - Basin 1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	9.200	Product Number	CTL-SHE-0112-5400-0800-5400
Design Depth (m)	0.800	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.4	Min Node Diameter (mm)	1200

Node Catchment A - Basin 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	9.200
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)
0.000	1000.0	0.0	0.800	1287.1	0.0	0.801	1287.5	0.0

Node Catchment A - Basin 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	9.200
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)
0.000	670.0	0.0	0.800	908.3	0.0	0.801	908.6	0.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
10 year 600 minute summer	16.861	4.612	30 year 960 minute winter	9.657	3.839
10 year 600 minute winter	11.520	4.612	30 year 1440 minute summer	10.299	2.760
10 year 720 minute summer	14.879	3.988	30 year 1440 minute winter	6.921	2.760
10 year 720 minute winter	10.000	3.988	30 year 2160 minute summer	7.263	2.007
10 year 960 minute summer	12.038	3.170	30 year 2160 minute winter	5.005	2.007
10 year 960 minute winter	7.974	3.170	100 year +40% CC 600 minute summer	34.963	9.563
10 year 1440 minute summer	8.561	2.294	100 year +40% CC 600 minute winter	23.889	9.563
10 year 1440 minute winter	5.754	2.294	100 year +40% CC 720 minute summer	30.682	8.223
10 year 2160 minute summer	6.081	1.681	100 year +40% CC 720 minute winter	20.620	8.223
10 year 2160 minute winter	4.190	1.681	100 year +40% CC 960 minute summer	24.643	6.489
30 year 600 minute summer	20.625	5.641	100 year +40% CC 960 minute winter	16.324	6.489
30 year 600 minute winter	14.092	5.641	100 year +40% CC 1440 minute summer	17.404	4.665
30 year 720 minute summer	18.139	4.862	100 year +40% CC 1440 minute winter	11.697	4.665
30 year 720 minute winter	12.191	4.862	100 year +40% CC 2160 minute summer	12.204	3.373
30 year 960 minute summer	14.579	3.839	100 year +40% CC 2160 minute winter	8.409	3.373

Results for 10 year Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	Catchment A - Basin 1	705	9.543	0.343	29.1	373.1637	0.0000	OK
720 minute winter	Catchment A - Basin 2	705	9.543	0.343	22.7	255.8898	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)
720 minute winter	Catchment A - Basin 1	Hydro-Brake®		5.4				688.8
720 minute winter	Catchment A - Basin 2	1.000	Catchment A - Basin 1	6.4	0.234	0.040	0.6490	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	Catchment A - Basin 1	705	9.627	0.427	34.9	470.4973	0.0000	OK
720 minute winter	Catchment A - Basin 2	705	9.627	0.427	27.6	323.5542	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)
720 minute winter	Catchment A - Basin 1	Hydro-Brake®		5.4				781.7
720 minute winter	Catchment A - Basin 2	1.000	Catchment A - Basin 1	7.3	0.244	0.046	0.7773	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	Catchment A - Basin 1	1410	9.952	0.752	33.4	873.0021	0.0000	OK
1440 minute winter	Catchment A - Basin 2	1410	9.952	0.752	26.5	606.6015	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	Catchment A - Basin 1	Hydro-Brake®		5.4				931.5
1440 minute winter	Catchment A - Basin 2	1.000	Catchment A - Basin 1	6.9	0.233	0.043	0.7922	

Results for 10 year 600 minute summer. 2610 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute summer	Catchment A - Basin 1	600	9.520	0.320	45.2	346.9080	0.0000	OK
600 minute summer	Catchment A - Basin 2	600	9.520	0.320	36.1	237.6999	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute summer	Catchment A - Basin 1	Hydro-Brake®		5.4				626.7
600 minute summer	Catchment A - Basin 2	1.000	Catchment A - Basin 1	9.1	0.240	0.057	0.6037	

Results for 10 year 600 minute winter. 2610 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	Catchment A - Basin 1	585	9.541	0.341	33.2	370.4880	0.0000	OK
600 minute winter	Catchment A - Basin 2	585	9.541	0.341	26.1	254.0357	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute winter	Catchment A - Basin 1	Hydro-Brake®		5.4				659.6
600 minute winter	Catchment A - Basin 2	1.000	Catchment A - Basin 1	7.1	0.256	0.045	0.6445	

Results for 10 year 720 minute summer. 2730 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute summer	Catchment A - Basin 1	720	9.521	0.321	40.1	347.4627	0.0000	OK
720 minute summer	Catchment A - Basin 2	720	9.521	0.321	31.9	238.0833	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute summer	Catchment A - Basin 1	Hydro-Brake®		5.4				652.8
720 minute summer	Catchment A - Basin 2	1.000	Catchment A - Basin 1	8.2	0.223	0.052	0.6047	

Results for 10 year 720 minute winter. 2730 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	Catchment A - Basin 1	705	9.543	0.343	29.1	373.1637	0.0000	OK
720 minute winter	Catchment A - Basin 2	705	9.543	0.343	22.7	255.8898	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute winter	Catchment A - Basin 1	Hydro-Brake®		5.4				688.8
720 minute winter	Catchment A - Basin 2	1.000	Catchment A - Basin 1	6.4	0.234	0.040	0.6490	

Results for 10 year 960 minute summer. 2970 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	Catchment A - Basin 1	825	9.520	0.320	32.8	346.0252	0.0000	OK
960 minute summer	Catchment A - Basin 2	825	9.520	0.320	25.8	237.0878	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute summer	Catchment A - Basin 1	Hydro-Brake®		5.4				699.4
960 minute summer	Catchment A - Basin 2	1.000	Catchment A - Basin 1	7.0	0.201	0.044	0.6021	

Results for 10 year 960 minute winter. 2970 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
960 minute winter	Catchment A - Basin 1	915	9.542	0.342	23.7	371.1712	0.0000	OK
960 minute winter	Catchment A - Basin 2	915	9.542	0.342	18.1	254.5094	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
960 minute winter	Catchment A - Basin 1	Hydro-Brake®		5.4				737.5
960 minute winter	Catchment A - Basin 2	1.000	Catchment A - Basin 1	5.6	0.210	0.035	0.6456	

Results for 10 year 1440 minute summer. 3450 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	Catchment A - Basin 1	1080	9.513	0.313	23.9	338.7829	0.0000	OK
1440 minute summer	Catchment A - Basin 2	1080	9.513	0.313	18.3	232.0746	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute summer	Catchment A - Basin 1	Hydro-Brake®		5.4				771.0
1440 minute summer	Catchment A - Basin 2	1.000	Catchment A - Basin 1	5.6	0.174	0.035	0.5891	

Results for 10 year 1440 minute winter. 3450 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	Catchment A - Basin 1	1140	9.531	0.331	17.6	359.0248	0.0000	OK
1440 minute winter	Catchment A - Basin 2	1140	9.531	0.331	13.0	246.0912	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	Catchment A - Basin 1	Hydro-Brake®		5.4				815.7
1440 minute winter	Catchment A - Basin 2	1.000	Catchment A - Basin 1	4.6	0.184	0.029	0.6250	

Results for 10 year 2160 minute summer. 4200 minute analysis at 60 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute summer	Catchment A - Basin 1	1500	9.506	0.306	17.6	330.2682	0.0000	OK
2160 minute summer	Catchment A - Basin 2	1500	9.506	0.306	13.0	226.1834	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2160 minute summer	Catchment A - Basin 1	Hydro-Brake®		5.4				867.0
2160 minute summer	Catchment A - Basin 2	1.000	Catchment A - Basin 1	4.6	0.155	0.029	0.5735	

Results for 10 year 2160 minute winter. 4200 minute analysis at 60 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute winter	Catchment A - Basin 1	1620	9.518	0.318	13.4	344.3696	0.0000	OK
2160 minute winter	Catchment A - Basin 2	1620	9.518	0.318	9.5	235.9416	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2160 minute winter	Catchment A - Basin 1	Hydro-Brake®		5.4				920.4
2160 minute winter	Catchment A - Basin 2	1.000	Catchment A - Basin 1	3.9	0.164	0.025	0.5992	

Results for 30 year 600 minute summer. 2610 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute summer	Catchment A - Basin 1	600	9.598	0.398	54.7	436.6532	0.0000	OK
600 minute summer	Catchment A - Basin 2	600	9.598	0.398	44.2	299.9901	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute summer	Catchment A - Basin 1	Hydro-Brake®		5.4				729.9
600 minute summer	Catchment A - Basin 2	1.000	Catchment A - Basin 1	10.5	0.250	0.066	0.7418	

Results for 30 year 600 minute winter. 2610 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	Catchment A - Basin 1	585	9.624	0.424	40.2	467.0478	0.0000	OK
600 minute winter	Catchment A - Basin 2	585	9.624	0.424	32.0	321.1514	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute winter	Catchment A - Basin 1	Hydro-Brake®		5.4				753.3
600 minute winter	Catchment A - Basin 2	1.000	Catchment A - Basin 1	8.2	0.262	0.051	0.7743	

Results for 30 year 720 minute summer. 2730 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute summer	Catchment A - Basin 1	720	9.601	0.401	48.2	439.3974	0.0000	OK
720 minute summer	Catchment A - Basin 2	720	9.601	0.401	38.8	301.8988	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute summer	Catchment A - Basin 1	Hydro-Brake®		5.4				758.4
720 minute summer	Catchment A - Basin 2	1.000	Catchment A - Basin 1	9.4	0.234	0.059	0.7451	

Results for 30 year 720 minute winter. 2730 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	Catchment A - Basin 1	705	9.627	0.427	34.9	470.4973	0.0000	OK
720 minute winter	Catchment A - Basin 2	705	9.627	0.427	27.6	323.5542	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute winter	Catchment A - Basin 1	Hydro-Brake®		5.4				781.7
720 minute winter	Catchment A - Basin 2	1.000	Catchment A - Basin 1	7.3	0.244	0.046	0.7773	

Results for 30 year 960 minute summer. 2970 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	Catchment A - Basin 1	960	9.598	0.398	39.2	436.9317	0.0000	OK
960 minute summer	Catchment A - Basin 2	960	9.598	0.398	31.2	300.1825	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute summer	Catchment A - Basin 1	Hydro-Brake®		5.4				809.1
960 minute summer	Catchment A - Basin 2	1.000	Catchment A - Basin 1	8.0	0.212	0.050	0.7422	

Results for 30 year 960 minute winter. 2970 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	Catchment A - Basin 1	930	9.627	0.427	28.1	469.9668	0.0000	OK
960 minute winter	Catchment A - Basin 2	930	9.627	0.427	21.9	323.1846	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute winter	Catchment A - Basin 1	Hydro-Brake®		5.4				835.6
960 minute winter	Catchment A - Basin 2	1.000	Catchment A - Basin 1	6.2	0.223	0.039	0.7769	

Results for 30 year 1440 minute summer. 3450 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	Catchment A - Basin 1	1200	9.589	0.389	28.4	425.5482	0.0000	OK
1440 minute summer	Catchment A - Basin 2	1200	9.589	0.389	22.1	292.2648	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute summer	Catchment A - Basin 1	Hydro-Brake®		5.4				896.7
1440 minute summer	Catchment A - Basin 2	1.000	Catchment A - Basin 1	6.3	0.183	0.040	0.7277	

Results for 30 year 1440 minute winter. 3450 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	Catchment A - Basin 1	1350	9.614	0.414	20.8	454.9062	0.0000	OK
1440 minute winter	Catchment A - Basin 2	1350	9.614	0.414	15.7	312.6933	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	Catchment A - Basin 1	Hydro-Brake®		5.4				932.2
1440 minute winter	Catchment A - Basin 2	1.000	Catchment A - Basin 1	5.1	0.197	0.032	0.7626	

Results for 30 year 2160 minute summer. 4200 minute analysis at 60 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute summer	Catchment A - Basin 1	1560	9.579	0.379	20.7	414.0178	0.0000	OK
2160 minute summer	Catchment A - Basin 2	1560	9.579	0.379	15.6	284.2500	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2160 minute summer	Catchment A - Basin 1	Hydro-Brake®		5.4				1015.7
2160 minute summer	Catchment A - Basin 2	1.000	Catchment A - Basin 1	5.1	0.160	0.032	0.7119	

Results for 30 year 2160 minute winter. 4200 minute analysis at 60 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute winter	Catchment A - Basin 1	1680	9.597	0.397	15.6	435.8151	0.0000	OK
2160 minute winter	Catchment A - Basin 2	1680	9.597	0.397	11.3	299.4055	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2160 minute winter	Catchment A - Basin 1	Hydro-Brake®		5.4				1065.7
2160 minute winter	Catchment A - Basin 2	1.000	Catchment A - Basin 1	4.3	0.173	0.027	0.7408	

Results for 100 year +40% CC 600 minute summer. 2610 minute analysis at 15 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute summer	Catchment A - Basin 1	615	9.884	0.684	90.6	784.7647	0.0000	OK
600 minute summer	Catchment A - Basin 2	615	9.884	0.684	74.9	544.1423	0.0000	FLOOD RISK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute summer	Catchment A - Basin 1	Hydro-Brake®		5.4				717.2
600 minute summer	Catchment A - Basin 2	1.000	Catchment A - Basin 1	15.8	0.288	0.099	0.7922	

Results for 100 year +40% CC 600 minute winter. 2610 minute analysis at 15 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	Catchment A - Basin 1	600	9.924	0.724	66.1	836.1367	0.0000	OK
600 minute winter	Catchment A - Basin 2	600	9.924	0.724	54.2	580.4818	0.0000	FLOOD RISK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute winter	Catchment A - Basin 1	Hydro-Brake®		5.4				721.9
600 minute winter	Catchment A - Basin 2	1.000	Catchment A - Basin 1	11.9	0.303	0.075	0.7922	

Results for 100 year +40% CC 720 minute summer. 2730 minute analysis at 15 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute summer	Catchment A - Basin 1	735	9.892	0.692	79.7	795.6887	0.0000	OK
720 minute summer	Catchment A - Basin 2	735	9.892	0.692	65.7	551.8633	0.0000	FLOOD RISK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute summer	Catchment A - Basin 1	Hydro-Brake®		5.4				745.8
720 minute summer	Catchment A - Basin 2	1.000	Catchment A - Basin 1	14.0	0.270	0.088	0.7922	

Results for 100 year +40% CC 720 minute winter. 2730 minute analysis at 15 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	Catchment A - Basin 1	720	9.934	0.734	57.4	848.8488	0.0000	OK
720 minute winter	Catchment A - Basin 2	720	9.934	0.734	46.8	589.4832	0.0000	FLOOD RISK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute winter	Catchment A - Basin 1	Hydro-Brake®		5.4				752.5
720 minute winter	Catchment A - Basin 2	1.000	Catchment A - Basin 1	10.6	0.287	0.066	0.7922	

Results for 100 year +40% CC 960 minute summer. 2970 minute analysis at 15 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	Catchment A - Basin 1	960	9.902	0.702	64.5	808.2957	0.0000	OK
960 minute summer	Catchment A - Basin 2	960	9.902	0.702	52.8	560.7864	0.0000	FLOOD RISK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute summer	Catchment A - Basin 1	Hydro-Brake®		5.4				803.7
960 minute summer	Catchment A - Basin 2	1.000	Catchment A - Basin 1	11.7	0.246	0.073	0.7922	

Results for 100 year +40% CC 960 minute winter. 2970 minute analysis at 15 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	Catchment A - Basin 1	945	9.945	0.745	45.8	863.8208	0.0000	OK
960 minute winter	Catchment A - Basin 2	945	9.945	0.745	37.0	600.0933	0.0000	FLOOD RISK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute winter	Catchment A - Basin 1	Hydro-Brake®		5.4				813.4
960 minute winter	Catchment A - Basin 2	1.000	Catchment A - Basin 1	8.8	0.264	0.055	0.7922	

Results for 100 year +40% CC 1440 minute summer. 3450 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	Catchment A - Basin 1	1440	9.907	0.707	46.2	814.5768	0.0000	OK
1440 minute summer	Catchment A - Basin 2	1440	9.907	0.707	37.3	565.2274	0.0000	FLOOD RISK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute summer	Catchment A - Basin 1	Hydro-Brake®		5.4				917.0
1440 minute summer	Catchment A - Basin 2	1.000	Catchment A - Basin 1	8.9	0.219	0.056	0.7922	

Results for 100 year +40% CC 1440 minute winter. 3450 minute analysis at 30 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	Catchment A - Basin 1	1410	9.952	0.752	33.4	873.0021	0.0000	OK
1440 minute winter	Catchment A - Basin 2	1410	9.952	0.752	26.5	606.6015	0.0000	FLOOD RISK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	Catchment A - Basin 1	Hydro-Brake®		5.4				931.5
1440 minute winter	Catchment A - Basin 2	1.000	Catchment A - Basin 1	6.9	0.233	0.043	0.7922	

Results for 100 year +40% CC 2160 minute summer. 4200 minute analysis at 60 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute summer	Catchment A - Basin 1	2100	9.896	0.696	33.0	799.9014	0.0000	OK
2160 minute summer	Catchment A - Basin 2	2100	9.896	0.696	26.1	554.8482	0.0000	FLOOD RISK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2160 minute summer	Catchment A - Basin 1	Hydro-Brake®		5.4				1092.4
2160 minute summer	Catchment A - Basin 2	1.000	Catchment A - Basin 1	6.9	0.193	0.043	0.7922	

Results for 100 year +40% CC 2160 minute winter. 4200 minute analysis at 60 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute winter	Catchment A - Basin 1	2100	9.944	0.744	24.7	862.5582	0.0000	OK
2160 minute winter	Catchment A - Basin 2	2100	9.944	0.744	19.1	599.1987	0.0000	FLOOD RISK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2160 minute winter	Catchment A - Basin 1	Hydro-Brake®		5.4				1112.3
2160 minute winter	Catchment A - Basin 2	1.000	Catchment A - Basin 1	5.6	0.201	0.035	0.7922	

Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.850	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	Cover Level (m)	Diameter (mm)	Depth (m)
Catchment B	3.522	10.000	1800	0.800

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0
Summer CV	0.850	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.900	Drain Down Time (mins)	2000	Check Discharge Volume	x

Storm Durations

600	720	960	1440	2160

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
10	0	0	0
30	0	0	0
100	40	0	0

Node Catchment B Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	9.200	Product Number	CTL-SHE-0152-1060-0800-1060
Design Depth (m)	0.800	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	10.6	Min Node Diameter (mm)	1200

Node Catchment B Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	9.200
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)
0.000	3300.0	0.0	0.800	3806.8	0.0	0.801	3807.5	0.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
10 year 600 minute summer	16.861	4.612
10 year 600 minute winter	11.520	4.612
10 year 720 minute summer	14.879	3.988
10 year 720 minute winter	10.000	3.988
10 year 960 minute summer	12.038	3.170
10 year 960 minute winter	7.974	3.170
10 year 1440 minute summer	8.561	2.294
10 year 1440 minute winter	5.754	2.294
10 year 2160 minute summer	6.081	1.681
10 year 2160 minute winter	4.190	1.681
30 year 600 minute summer	20.625	5.641
30 year 600 minute winter	14.092	5.641
30 year 720 minute summer	18.139	4.862
30 year 720 minute winter	12.191	4.862
30 year 960 minute summer	14.579	3.839

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year 960 minute winter	9.657	3.839
30 year 1440 minute summer	10.299	2.760
30 year 1440 minute winter	6.921	2.760
30 year 2160 minute summer	7.263	2.007
30 year 2160 minute winter	5.005	2.007
100 year +40% CC 600 minute summer	34.963	9.563
100 year +40% CC 600 minute winter	23.889	9.563
100 year +40% CC 720 minute summer	30.682	8.223
100 year +40% CC 720 minute winter	20.620	8.223
100 year +40% CC 960 minute summer	24.643	6.489
100 year +40% CC 960 minute winter	16.324	6.489
100 year +40% CC 1440 minute summer	17.404	4.665
100 year +40% CC 1440 minute winter	11.697	4.665
100 year +40% CC 2160 minute summer	12.204	3.373
100 year +40% CC 2160 minute winter	8.409	3.373

Results for 10 year Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
720 minute winter	Catchment B	705	9.551	0.351	88.0	1230.6160	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m^3)
720 minute winter	Catchment B	Hydro-Brake®	10.6	1287.0

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
720 minute winter	Catchment B	705	9.639	0.439	107.3	1551.0010	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m^3)
720 minute winter	Catchment B	Hydro-Brake®	10.6	1491.9

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
1440 minute winter	Catchment B	1410	9.992	0.792	103.0	2883.1880	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m^3)
1440 minute winter	Catchment B	Hydro-Brake®	10.6	1840.9

Results for 10 year 600 minute summer. 2610 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute summer	Catchment B	600	9.527	0.327	140.2	1142.3430	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
600 minute summer	Catchment B	Hydro-Brake®	10.6	1166.3

Results for 10 year 600 minute winter. 2610 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
600 minute winter	Catchment B	585	9.549	0.349	101.4	1222.8360	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m^3)
600 minute winter	Catchment B	Hydro-Brake®	10.6	1232.7

Results for 10 year 720 minute summer. 2730 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute summer	Catchment B	720	9.528	0.328	123.7	1147.4950	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
720 minute summer	Catchment B	Hydro-Brake®	10.6	1217.9

Results for 10 year 720 minute winter. 2730 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	Catchment B	705	9.551	0.351	88.0	1230.6160	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
720 minute winter	Catchment B	Hydro-Brake®	10.6	1287.0

Results for 10 year 960 minute summer. 2970 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	Catchment B	825	9.528	0.328	100.1	1146.7550	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
960 minute summer	Catchment B	Hydro-Brake®	10.6	1307.2

Results for 10 year 960 minute winter. 2970 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	Catchment B	915	9.551	0.351	70.2	1228.0990	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
960 minute winter	Catchment B	Hydro-Brake®	10.6	1381.0

Results for 10 year 1440 minute summer. 3450 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	Catchment B	1080	9.525	0.325	71.2	1133.8330	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
1440 minute summer	Catchment B	Hydro-Brake®	10.6	1447.6

Results for 10 year 1440 minute winter. 3450 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	Catchment B	1140	9.542	0.342	50.7	1198.1560	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
1440 minute winter	Catchment B	Hydro-Brake®	10.6	1533.2

Results for 10 year 2160 minute summer. 4200 minute analysis at 60 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute summer	Catchment B	1500	9.519	0.319	50.6	1115.1200	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
2160 minute summer	Catchment B	Hydro-Brake®	10.6	1633.9

Results for 10 year 2160 minute winter. 4200 minute analysis at 60 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute winter	Catchment B	1620	9.531	0.331	36.9	1155.7950	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
2160 minute winter	Catchment B	Hydro-Brake®	10.6	1732.6

Results for 30 year 600 minute summer. 2610 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute summer	Catchment B	600	9.609	0.409	171.5	1439.5900	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
600 minute summer	Catchment B	Hydro-Brake®	10.6	1378.7

Results for 30 year 600 minute winter. 2610 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	Catchment B	585	9.636	0.436	124.1	1538.4930	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
600 minute winter	Catchment B	Hydro-Brake®	10.6	1436.3

Results for 30 year 720 minute summer. 2730 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute summer	Catchment B	720	9.612	0.412	150.8	1449.0210	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
720 minute summer	Catchment B	Hydro-Brake®	10.6	1433.0

Results for 30 year 720 minute winter. 2730 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	Catchment B	705	9.639	0.439	107.3	1551.0010	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
720 minute winter	Catchment B	Hydro-Brake®	10.6	1491.9

Results for 30 year 960 minute summer. 2970 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	Catchment B	960	9.610	0.410	121.2	1444.9160	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
960 minute summer	Catchment B	Hydro-Brake®	10.6	1529.7

Results for 30 year 960 minute winter. 2970 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	Catchment B	930	9.639	0.439	85.0	1550.8860	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
960 minute winter	Catchment B	Hydro-Brake®	10.6	1593.2

Results for 30 year 1440 minute summer. 3450 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	Catchment B	1170	9.603	0.403	85.6	1416.7530	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
1440 minute summer	Catchment B	Hydro-Brake®	10.6	1694.0

Results for 30 year 1440 minute winter. 3450 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
1440 minute winter	Catchment B	1350	9.628	0.428	60.9	1509.6330	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m^3)
1440 minute winter	Catchment B	Hydro-Brake®	10.6	1772.6

Results for 30 year 2160 minute summer. 4200 minute analysis at 60 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute summer	Catchment B	1560	9.594	0.394	60.4	1385.4940	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
2160 minute summer	Catchment B	Hydro-Brake®	10.6	1914.4

Results for 30 year 2160 minute winter. 4200 minute analysis at 60 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute winter	Catchment B	1680	9.614	0.414	44.1	1457.5330	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
2160 minute winter	Catchment B	Hydro-Brake®	10.6	2018.7

Results for 100 year +40% CC 600 minute summer. 2610 minute analysis at 15 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute summer	Catchment B	615	9.915	0.715	290.7	2586.6960	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
600 minute summer	Catchment B	Hydro-Brake®	10.6	1427.0

Results for 100 year +40% CC 600 minute winter. 2610 minute analysis at 15 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
600 minute winter	Catchment B	600	9.959	0.759	210.3	2755.5670	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m^3)
600 minute winter	Catchment B	Hydro-Brake®	10.6	1438.7

Results for 100 year +40% CC 720 minute summer. 2730 minute analysis at 15 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute summer	Catchment B	735	9.925	0.725	255.1	2623.9590	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
720 minute summer	Catchment B	Hydro-Brake®	10.6	1481.4

Results for 100 year +40% CC 720 minute winter. 2730 minute analysis at 15 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
720 minute winter	Catchment B	720	9.970	0.770	181.6	2797.5440	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m^3)
720 minute winter	Catchment B	Hydro-Brake®	10.6	1497.0

Results for 100 year +40% CC 960 minute summer. 2970 minute analysis at 15 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	Catchment B	960	9.937	0.737	204.9	2670.9400	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
960 minute summer	Catchment B	Hydro-Brake®	10.6	1591.9

Results for 100 year +40% CC 960 minute winter. 2970 minute analysis at 15 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
960 minute winter	Catchment B	945	9.983	0.783	143.7	2850.6390	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m^3)
960 minute winter	Catchment B	Hydro-Brake®	10.6	1613.9

Results for 100 year +40% CC 1440 minute summer. 3450 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	Catchment B	1440	9.942	0.742	144.7	2690.9740	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
1440 minute summer	Catchment B	Hydro-Brake®	10.6	1807.7

Results for 100 year +40% CC 1440 minute winter. 3450 minute analysis at 30 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	Catchment B	1410	9.992	0.792	103.0	2883.1880	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
1440 minute winter	Catchment B	Hydro-Brake®	10.6	1840.9

Results for 100 year +40% CC 2160 minute summer. 4200 minute analysis at 60 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
2160 minute summer	Catchment B	1980	9.932	0.732	101.5	2649.9390	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m^3)
2160 minute summer	Catchment B	Hydro-Brake®	10.6	2144.5

Results for 100 year +40% CC 2160 minute winter. 4200 minute analysis at 60 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute winter	Catchment B	2040	9.984	0.784	74.0	2853.1680	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
2160 minute winter	Catchment B	Hydro-Brake®	10.6	2191.5

Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.850	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
Catchment C - Basin	1.148		10.000	1800	0.800
Catchment C - Swale	1.148	5.00	10.000	1500	0.800

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	Catchment C - Swale	Catchment C - Basin	5.000	0.600	9.200	9.200	0.000	0.0	525	5.08	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)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.000	216.5	176.3	0.275	0.275	1.148	0.0	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	5.000	0.0	525	Circular	10.000	9.200	0.275	10.000	9.200	0.275

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	Catchment C - Swale	1500	Manhole	Adoptable	Catchment C - Basin	1800	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Catchment C - Basin	10.000	0.800	1800	1	1.000	9.200	525
Catchment C - Swale	10.000	0.800	1500	0	1.000	9.200	525

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0
Summer CV	0.850	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.900	Drain Down Time (mins)	2000	Check Discharge Volume	x

Storm Durations

600	720	960	1440	2160

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
10	0	0	0
30	0	0	0
100	40	0	0

Node Catchment C - Basin Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	9.200	Product Number	CTL-SHE-0126-6900-0800-6900
Design Depth (m)	0.800	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	6.9	Min Node Diameter (mm)	1200

Node Catchment C - Basin Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	9.200
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)
0.000	1200.0	0.0	0.800	1512.8	0.0	0.801	1513.2	0.0

Node Catchment C - Swale Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	9.200
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)
0.000	800.0	0.0	0.800	1058.7	0.0	0.801	1059.1	0.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
10 year 600 minute summer	16.861	4.612	30 year 960 minute winter	9.657	3.839
10 year 600 minute winter	11.520	4.612	30 year 1440 minute summer	10.299	2.760
10 year 720 minute summer	14.879	3.988	30 year 1440 minute winter	6.921	2.760
10 year 720 minute winter	10.000	3.988	30 year 2160 minute summer	7.263	2.007
10 year 960 minute summer	12.038	3.170	30 year 2160 minute winter	5.005	2.007
10 year 960 minute winter	7.974	3.170	100 year +40% CC 600 minute summer	34.963	9.563
10 year 1440 minute summer	8.561	2.294	100 year +40% CC 600 minute winter	23.889	9.563
10 year 1440 minute winter	5.754	2.294	100 year +40% CC 720 minute summer	30.682	8.223
10 year 2160 minute summer	6.081	1.681	100 year +40% CC 720 minute winter	20.620	8.223
10 year 2160 minute winter	4.190	1.681	100 year +40% CC 960 minute summer	24.643	6.489
30 year 600 minute summer	20.625	5.641	100 year +40% CC 960 minute winter	16.324	6.489
30 year 600 minute winter	14.092	5.641	100 year +40% CC 1440 minute summer	17.404	4.665
30 year 720 minute summer	18.139	4.862	100 year +40% CC 1440 minute winter	11.697	4.665
30 year 720 minute winter	12.191	4.862	100 year +40% CC 2160 minute summer	12.204	3.373
30 year 960 minute summer	14.579	3.839	100 year +40% CC 2160 minute winter	8.409	3.373

Results for 10 year Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	Catchment C - Basin	705	9.563	0.363	36.9	472.6643	0.0000	OK
720 minute winter	Catchment C - Swale	705	9.563	0.363	28.7	322.7507	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)
720 minute winter	Catchment C - Basin	Hydro-Brake®		6.9				870.5
720 minute winter	Catchment C - Swale	1.000	Catchment C - Basin	8.2	0.249	0.038	0.7964	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	Catchment C - Basin	705	9.652	0.452	44.4	596.7065	0.0000	OK
720 minute winter	Catchment C - Swale	705	9.652	0.452	35.0	408.5807	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)
720 minute winter	Catchment C - Basin	Hydro-Brake®		6.9				994.2
720 minute winter	Catchment C - Swale	1.000	Catchment C - Basin	9.4	0.260	0.043	0.9892	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	Catchment C - Basin	1410	9.995	0.795	42.4	1102.7810	0.0000	OK
1440 minute winter	Catchment C - Swale	1410	9.995	0.795	33.6	762.6891	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	Catchment C - Basin	Hydro-Brake®		6.9				1206.4
1440 minute winter	Catchment C - Swale	1.000	Catchment C - Basin	8.8	0.246	0.041	1.0802	

Results for 10 year 600 minute summer. 2610 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute summer	Catchment C - Basin	600	9.539	0.339	57.3	439.2639	0.0000	OK
600 minute summer	Catchment C - Swale	600	9.539	0.339	45.7	299.7170	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute summer	Catchment C - Basin	Hydro-Brake®		6.9				791.0
600 minute summer	Catchment C - Swale	1.000	Catchment C - Basin	11.6	0.256	0.054	0.7360	

Results for 10 year 600 minute winter. 2610 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	Catchment C - Basin	585	9.561	0.361	42.2	470.4253	0.0000	OK
600 minute winter	Catchment C - Swale	585	9.561	0.361	33.1	321.2065	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute winter	Catchment C - Basin	Hydro-Brake®		6.9				834.9
600 minute winter	Catchment C - Swale	1.000	Catchment C - Basin	9.1	0.273	0.042	0.7924	

Results for 10 year 720 minute summer. 2730 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute summer	Catchment C - Basin	720	9.539	0.339	50.8	440.3792	0.0000	OK
720 minute summer	Catchment C - Swale	720	9.539	0.339	40.3	300.4846	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute summer	Catchment C - Basin	Hydro-Brake®		6.9				824.7
720 minute summer	Catchment C - Swale	1.000	Catchment C - Basin	10.5	0.238	0.048	0.7381	

Results for 10 year 720 minute winter. 2730 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	Catchment C - Basin	705	9.563	0.363	36.9	472.6643	0.0000	OK
720 minute winter	Catchment C - Swale	705	9.563	0.363	28.7	322.7507	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute winter	Catchment C - Basin	Hydro-Brake®		6.9				870.5
720 minute winter	Catchment C - Swale	1.000	Catchment C - Basin	8.2	0.249	0.038	0.7964	

Results for 10 year 960 minute summer. 2970 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	Catchment C - Basin	840	9.538	0.338	41.6	438.5788	0.0000	OK
960 minute summer	Catchment C - Swale	840	9.538	0.338	32.6	299.2433	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute summer	Catchment C - Basin	Hydro-Brake®		6.9				883.7
960 minute summer	Catchment C - Swale	1.000	Catchment C - Basin	9.0	0.213	0.041	0.7348	

Results for 10 year 960 minute winter. 2970 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	Catchment C - Basin	915	9.561	0.361	30.0	469.7985	0.0000	OK
960 minute winter	Catchment C - Swale	915	9.561	0.361	22.9	320.7741	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute winter	Catchment C - Basin	Hydro-Brake®		6.9				931.9
960 minute winter	Catchment C - Swale	1.000	Catchment C - Basin	7.1	0.223	0.033	0.7913	

Results for 10 year 1440 minute summer. 3450 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	Catchment C - Basin	1080	9.532	0.332	30.4	430.3463	0.0000	OK
1440 minute summer	Catchment C - Swale	1080	9.532	0.332	23.2	293.5708	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute summer	Catchment C - Basin	Hydro-Brake®		6.9				975.3
1440 minute summer	Catchment C - Swale	1.000	Catchment C - Basin	7.2	0.186	0.033	0.7196	

Results for 10 year 1440 minute winter. 3450 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	Catchment C - Basin	1140	9.550	0.350	22.4	454.2554	0.0000	OK
1440 minute winter	Catchment C - Swale	1140	9.550	0.350	16.5	310.0514	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	Catchment C - Basin	Hydro-Brake®		6.9				1030.3
1440 minute winter	Catchment C - Swale	1.000	Catchment C - Basin	5.9	0.196	0.027	0.7634	

Results for 10 year 2160 minute summer. 4200 minute analysis at 60 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute summer	Catchment C - Basin	1500	9.524	0.324	22.4	419.3105	0.0000	OK
2160 minute summer	Catchment C - Swale	1500	9.524	0.324	16.5	285.9695	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2160 minute summer	Catchment C - Basin	Hydro-Brake®		6.9				1094.9
2160 minute summer	Catchment C - Swale	1.000	Catchment C - Basin	5.9	0.164	0.027	0.6990	

Results for 10 year 2160 minute winter. 4200 minute analysis at 60 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute winter	Catchment C - Basin	1620	9.536	0.336	17.0	435.8803	0.0000	OK
2160 minute winter	Catchment C - Swale	1620	9.536	0.336	12.0	297.3839	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2160 minute winter	Catchment C - Basin	Hydro-Brake®		6.9				1163.2
2160 minute winter	Catchment C - Swale	1.000	Catchment C - Basin	5.0	0.176	0.023	0.7298	

Results for 30 year 600 minute summer. 2610 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute summer	Catchment C - Basin	600	9.621	0.421	69.3	553.6531	0.0000	OK
600 minute summer	Catchment C - Swale	600	9.621	0.421	55.9	378.7449	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute summer	Catchment C - Basin	Hydro-Brake®		6.9				925.9
600 minute summer	Catchment C - Swale	1.000	Catchment C - Basin	13.4	0.267	0.062	0.9291	

Results for 30 year 600 minute winter. 2610 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	Catchment C - Basin	585	9.649	0.449	50.8	591.7094	0.0000	OK
600 minute winter	Catchment C - Swale	585	9.649	0.449	40.4	405.1157	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute winter	Catchment C - Basin	Hydro-Brake®		6.9				957.5
600 minute winter	Catchment C - Swale	1.000	Catchment C - Basin	10.4	0.278	0.048	0.9827	

Results for 30 year 720 minute summer. 2730 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute summer	Catchment C - Basin	720	9.624	0.424	61.3	557.1295	0.0000	OK
720 minute summer	Catchment C - Swale	720	9.624	0.424	49.2	381.1516	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute summer	Catchment C - Basin	Hydro-Brake®		6.9				961.9
720 minute summer	Catchment C - Swale	1.000	Catchment C - Basin	12.1	0.250	0.056	0.9343	

Results for 30 year 720 minute winter. 2730 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	Catchment C - Basin	705	9.652	0.452	44.4	596.7065	0.0000	OK
720 minute winter	Catchment C - Swale	705	9.652	0.452	35.0	408.5807	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute winter	Catchment C - Basin	Hydro-Brake®		6.9				994.2
720 minute winter	Catchment C - Swale	1.000	Catchment C - Basin	9.4	0.260	0.043	0.9892	

Results for 30 year 960 minute summer. 2970 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	Catchment C - Basin	960	9.621	0.421	49.7	553.6888	0.0000	OK
960 minute summer	Catchment C - Swale	960	9.622	0.422	39.5	378.7680	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute summer	Catchment C - Basin	Hydro-Brake®		6.9				1025.9
960 minute summer	Catchment C - Swale	1.000	Catchment C - Basin	10.2	0.225	0.047	0.9291	

Results for 30 year 960 minute winter. 2970 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	Catchment C - Basin	930	9.651	0.451	35.7	595.2000	0.0000	OK
960 minute winter	Catchment C - Swale	930	9.651	0.451	27.7	407.5358	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute winter	Catchment C - Basin	Hydro-Brake®		6.9				1061.7
960 minute winter	Catchment C - Swale	1.000	Catchment C - Basin	8.0	0.236	0.037	0.9873	

Results for 30 year 1440 minute summer. 3450 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	Catchment C - Basin	1170	9.611	0.411	35.9	539.2204	0.0000	OK
1440 minute summer	Catchment C - Swale	1170	9.611	0.411	27.9	368.7519	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute summer	Catchment C - Basin	Hydro-Brake®		6.9				1135.4
1440 minute summer	Catchment C - Swale	1.000	Catchment C - Basin	8.0	0.196	0.037	0.9071	

Results for 30 year 1440 minute winter. 3450 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	Catchment C - Basin	1350	9.638	0.438	26.4	576.4677	0.0000	OK
1440 minute winter	Catchment C - Swale	1350	9.638	0.438	19.9	394.5483	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	Catchment C - Basin	Hydro-Brake®		6.9				1183.9
1440 minute winter	Catchment C - Swale	1.000	Catchment C - Basin	6.5	0.209	0.030	0.9621	

Results for 30 year 2160 minute summer. 4200 minute analysis at 60 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute summer	Catchment C - Basin	1560	9.600	0.400	26.2	524.4630	0.0000	OK
2160 minute summer	Catchment C - Swale	1560	9.601	0.401	19.7	358.5417	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2160 minute summer	Catchment C - Basin	Hydro-Brake®		6.9				1283.7
2160 minute summer	Catchment C - Swale	1.000	Catchment C - Basin	6.5	0.171	0.030	0.8839	

Results for 30 year 2160 minute winter. 4200 minute analysis at 60 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute winter	Catchment C - Basin	1680	9.621	0.421	19.9	553.6438	0.0000	OK
2160 minute winter	Catchment C - Swale	1680	9.621	0.421	14.4	378.7366	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2160 minute winter	Catchment C - Basin	Hydro-Brake®		6.9				1351.7
2160 minute winter	Catchment C - Swale	1.000	Catchment C - Basin	5.5	0.183	0.025	0.9291	

Results for 100 year +40% CC 600 minute summer. 2610 minute analysis at 15 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute summer	Catchment C - Basin	615	9.923	0.723	115.0	992.9651	0.0000	OK
600 minute summer	Catchment C - Swale	615	9.923	0.723	94.8	685.3565	0.0000	FLOOD RISK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute summer	Catchment C - Basin	Hydro-Brake®		6.9				925.6
600 minute summer	Catchment C - Swale	1.000	Catchment C - Basin	20.2	0.304	0.093	1.0802	

Results for 100 year +40% CC 600 minute winter. 2610 minute analysis at 15 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	Catchment C - Basin	600	9.967	0.767	83.9	1058.8750	0.0000	OK
600 minute winter	Catchment C - Swale	600	9.967	0.767	68.6	731.7410	0.0000	FLOOD RISK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute winter	Catchment C - Basin	Hydro-Brake®		6.9				934.7
600 minute winter	Catchment C - Swale	1.000	Catchment C - Basin	15.3	0.323	0.071	1.0802	

Results for 100 year +40% CC 720 minute summer. 2730 minute analysis at 15 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute summer	Catchment C - Basin	735	9.932	0.732	101.2	1006.7240	0.0000	OK
720 minute summer	Catchment C - Swale	735	9.932	0.732	83.2	695.0318	0.0000	FLOOD RISK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute summer	Catchment C - Basin	Hydro-Brake®		6.9				963.1
720 minute summer	Catchment C - Swale	1.000	Catchment C - Basin	18.0	0.286	0.083	1.0802	

Results for 100 year +40% CC 720 minute winter. 2730 minute analysis at 15 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	Catchment C - Basin	720	9.976	0.776	72.7	1073.5460	0.0000	OK
720 minute winter	Catchment C - Swale	720	9.976	0.776	59.2	742.0770	0.0000	FLOOD RISK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute winter	Catchment C - Basin	Hydro-Brake®		6.9				974.6
720 minute winter	Catchment C - Swale	1.000	Catchment C - Basin	13.5	0.306	0.062	1.0802	

Results for 100 year +40% CC 960 minute summer. 2970 minute analysis at 15 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	Catchment C - Basin	960	9.943	0.743	81.7	1022.6240	0.0000	OK
960 minute summer	Catchment C - Swale	960	9.943	0.743	66.8	706.2259	0.0000	FLOOD RISK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute summer	Catchment C - Basin	Hydro-Brake®		6.9				1038.6
960 minute summer	Catchment C - Swale	1.000	Catchment C - Basin	14.9	0.261	0.069	1.0802	

Results for 100 year +40% CC 960 minute winter. 2970 minute analysis at 15 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	Catchment C - Basin	945	9.989	0.789	58.0	1092.4530	0.0000	OK
960 minute winter	Catchment C - Swale	945	9.989	0.789	46.8	755.4063	0.0000	FLOOD RISK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute winter	Catchment C - Basin	Hydro-Brake®		6.9				1053.9
960 minute winter	Catchment C - Swale	1.000	Catchment C - Basin	11.2	0.280	0.052	1.0802	

Results for 100 year +40% CC 1440 minute summer. 3450 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	Catchment C - Basin	1440	9.946	0.746	58.5	1027.8620	0.0000	OK
1440 minute summer	Catchment C - Swale	1440	9.946	0.746	47.2	709.9102	0.0000	FLOOD RISK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute summer	Catchment C - Basin	Hydro-Brake®		6.9				1184.6
1440 minute summer	Catchment C - Swale	1.000	Catchment C - Basin	11.4	0.230	0.052	1.0802	

Results for 100 year +40% CC 1440 minute winter. 3450 minute analysis at 30 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	Catchment C - Basin	1410	9.995	0.795	42.4	1102.7810	0.0000	OK
1440 minute winter	Catchment C - Swale	1410	9.995	0.795	33.6	762.6891	0.0000	FLOOD RISK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	Catchment C - Basin	Hydro-Brake®		6.9				1206.4
1440 minute winter	Catchment C - Swale	1.000	Catchment C - Basin	8.8	0.246	0.041	1.0802	

Results for 100 year +40% CC 2160 minute summer. 4200 minute analysis at 60 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute summer	Catchment C - Basin	1980	9.934	0.734	41.9	1008.8760	0.0000	OK
2160 minute summer	Catchment C - Swale	1980	9.934	0.734	33.1	696.5523	0.0000	FLOOD RISK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2160 minute summer	Catchment C - Basin	Hydro-Brake®		6.9				1409.1
2160 minute summer	Catchment C - Swale	1.000	Catchment C - Basin	8.8	0.204	0.041	1.0802	

Results for 100 year +40% CC 2160 minute winter. 4200 minute analysis at 60 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute winter	Catchment C - Basin	2040	9.984	0.784	31.2	1086.0600	0.0000	OK
2160 minute winter	Catchment C - Swale	2040	9.984	0.784	24.1	750.9002	0.0000	FLOOD RISK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2160 minute winter	Catchment C - Basin	Hydro-Brake®		6.9				1438.4
2160 minute winter	Catchment C - Swale	1.000	Catchment C - Basin	7.1	0.215	0.033	1.0802	

Appendix 8

Outline Drainage Maintenance Schedule

Outline Drainage Maintenance Schedule

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Project	**Land East of Newgate Lane East, Fareham**
Project Number	**23586**
By	Steve Burgess
Date	26 January 2022

1 Schedule of Maintenance

1.1 Once appointed the Contractor will prepare a site specific method statement for the control of silt and other pollutants during construction. CIRIA Report C532, Control of water pollution from construction sites, provides further guidance on this.

1.2 The Contractor will maintain the proposed drainage system during construction and until the handing over of the site.

1.3 Upon completion management of the shared drainage facilities will be passed on to Southern Water. Management of shared drainage facilities (where not adopted) will be passed on to a Management Company appointed by the Developer on behalf of the Residents.

1.4 In the event that the Management Company becomes unable to discharge its duties within two years of first appointment the Developer will endeavour to appoint an alternative on behalf of the Residents.

1.5 Maintenance of individual property drainage connections is the responsibility of the individual property owners.

1.6 The following maintenance schedule details the typical tasks to be undertaken at different intervals.

Maintenance Schedule	**Required Action**	**Frequency**
Regular Maintenance	Manage vegetation and remove nuisance plants – aesthetics	As required
	Litter and debris removal – catchpits and attenuation basins	Monthly or as required
	Mow all dry swales, SuDS basins and margins to low flow channels and other SuDS features at to be maintained between 100mm and 150mm max.	Monthly or as required
	Cleaning of gutters and any filters on down pipes.	3 Monthly
	Remove sediment and debris from silt trap chambers, channel drains and inlet chambers	6 monthly
	Visual inspection of permeable paving for defects and settlement	Annually
	Sweeping / brushing of permeable paving	Every 2 years
	Surface and foul water pipework – jetting / rodding	Every 2 years or as required
Occasional Maintenance	Remove sediment and debris from pre-treatment components and floor of storage structures inspection tubes or chambers and inside of concrete manhole rings.	As required based on inspections

Maintenance Schedule	Required Action	Frequency
	Remove silt and debris from oil interceptors where provided	When alarm indicates
Corrective Maintenance	Remove debris / blockages to silt traps / channel drains / headwalls	As required
	Repairs to access chambers / manhole covers	As required
	Replace any broken permeable blocks / surface, remedial works to any depressions or rutting	As required
	Inspect inlet, outlet from downpipes, channel drains, attenuation basins, swales, headwalls and gullies for blockages, standing water and clear	As required
	Reconstruct storage structures if performance deteriorates or failure occurs	As required
	Where there is a build-up of silt in swales or at inlets, i.e. 50mm or more above the design level, then remove and spread on site. Undertake when ground is damp in autumn or early spring and transplant turf and overseed to original design levels.	As required
Monitoring	Inspect silt traps and note the rate sediment has accumulated	Monthly in the first year and then annually
	Inspect storage structures to ensure they are fully emptying	Annually

Indicative Schedule of Maintenance for the Proposed Drainage System

1.7 Any parts, materials or products that require replacement or come to the end of the manufactures recommended design life will be replaced by the private Management Company or individual homeowner as required.

Component	Inspection Frequency						
	1 Month	3 Months	6 Months	1 Year	After leaf fall in Autumn	2 Years	When alarm indicates
Gullies, Channels and Gutters		✓			✓		
Catchpits	✓				✓		
Surface and Foul Water Pipework						✓	
Permeable Paving				✓			
Swale / Detention Basin		✓					
Flow Controls			✓				
Storage Facilities				✓			
Foul Pumping Station				✓			✓
Existing Watercourse	✓						

Inspection Frequency Summary

2 Design Life

2.1 The design life of the development is likely to exceed the design life of the components within the SuDS network. During the routine drainage inspections it may be determined that some components have reached the end of their functional life cycle.

2.2 Where possible repairs should be the first option considered however if repairs are unviable, it will be necessary for the property owner / Management Company to replace the faulty component.

3 Emergency Plan

3.1 Potential flood and maintenance indicators:

- Manhole chambers / PPICs overflowing
- Gullies overflowing or ponding
- Channel drains overflowing or ponding
- Other visual indicators of the drainage system not performing as it should

3.2 Should any of the items above occur then immediate action as outlined below should be undertaken:

- Inspect for blockages in the problem area
- Should the problem not be identified via an initial inspection:
  - For unadopted onsite drainage the Management Company should appoint a suitable drainage engineer to inspect and survey the system and jet any blockages
  - For adopted onsite drainage the relevant statutory undertaker should be alerted
  - Where it is suspected that there is a problem with the downstream drainage network the owner or relevant statutory undertaker of that system should be alerted

3.3 Spillages

3.3.1 If a serious spillage in volume or toxicity occurs on site then the spillage should be isolated with soil, turf or specialist fabric and all downstream outlets should be bunged / blocked.

3.3.2 Once the spillage is contained the Environment Agency should be contacted immediately on 0370 850 6506.