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Flood Risk Assessment

Proposed Residential Development at

37 Barfield Park
Lancing, West Sussex

On behalf of

The Community Stadium Limited

January 2022

Document History and Status

Project Number 23592

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1 Non Technical Summary

1.1 This Flood Risk Assessment has been undertaken in accordance with the National Planning Policy Framework on behalf of The Community Stadium Limited in support of a Full Planning Application for construction of two new dwellings together with associated access and gardens on the site of the former bungalow at 37 Barfield Park, Lancing, West Sussex.

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 defended Tidal Flood Zone 3 and protected from tidal flooding by the Adur Tidal Walls scheme and the secondary defences being constructed as part of the New Monks Farm development to the east.

1.4 These defences will provide protection beyond the future year 2125 and safe refuge will be available at first floor level in the unlikely event of their failure.

1.5 The proposed development will incorporate a sustainable drainage system which will discharge surface water by infiltration to ground and provide storage for all storm return periods up to and including the 1:100 year rainfall event with an allowance for climate change.

1.6 The existing foul drainage connection from the former dwelling will be reused and discharge foul water to the existing public foul sewer located beneath Barfield Park immediately southwest of the site.

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

1.8 In terms of flood risk and the level of protection afforded to the site from two forms of tidal flood defence the proposed development is considered 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 minor developments the NPPF states that *'applications for some minor development and changes of use (reference footnote 56) should not be subject to the sequential or exception tests but should still meet the requirements for site-specific flood risk assessments set out in footnote 54.'* [Sic footnote 54 should read footnote 55.]

2.1.4 Footnote 54 reads *'except for applications for the repowering of existing wind turbines, a proposed wind energy development involving one or more turbines should not be considered acceptable unless it is in an area identified as suitable for wind energy development in the development plan; and, following consultation, it can be demonstrated that the planning impacts identified by the affected local community have been fully addressed and the proposal has their backing.'*

2.1.5 Footnote 55 reads *'a site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.'*

2.2 Lead Local Flood Authority

2.2.1 West Sussex 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.

2.2.2 As part of its role West Sussex County Council has commissioned and produced the following documents:

- Strategic Flood Risk Assessment - January 2010
- Preliminary Flood Risk Assessment - May 2011
- Local Flood Risk Management Strategy - May 2014

2.2.3 In addition to the above documents the West Sussex Policy for the Management of Surface Water was updated in November 2018.

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

2.3 Adur District Council

2.3.1 Adur and Worthing Councils commissioned and produced a Strategic Flood Risk Assessment dated January 2012. This has been reviewed in the preparation of this report.

2.4 Local Planning Policy

2.4.1 The Adur District Council Local Plan was adopted in December 2017.

2.4.2 **Policy 35** states that *'Development will be permitted provided that:*

It does not have an unacceptable impact on the quality and potential yield of local water resources and the water environment; also

It protects and enhances groundwater, surface water features and controls aquatic pollution to help achieve the objectives of the Water Framework Directive; and

It has an adequate means of water supply (even in a drought), sufficient foul and surface water drainage and adequate sewage treatment capacity.

Development must be phased to take into account the timing of any water and/or wastewater infrastructure required which must be in place prior to the occupation of development.

A preliminary risk assessment will be required for any development where there is potential risk of contamination of controlled waters.

New development within Groundwater Source Protection Zones will only be permitted provided that it has no adverse impact on the quality of the groundwater source or a risk to its ability to maintain a public water supply.'

2.4.3 **Policy 36** states that *'The Council will work with relevant bodies to ensure that flood risk in Adur is reduced.*

A site specific flood risk assessment must be submitted with planning applications for:

Proposals of 1 hectare or greater in Flood Zone 1

All development or changes of use to a more vulnerable use in Flood Zones 2 and 3.

All development or changes of use to a more vulnerable use, regardless of flood zone or size, where flood risk from other sources (surface water, sewer, groundwater) is identified by the Strategic Flood Risk Assessment.'

3 Existing Site

3.1 Site Location

3.1.1 The development site is located at 37 Barfield Park, Lancing, West Sussex, BN15 9DF and centred on Ordnance Survey reference TQ 188 049.



Image 1: Site Location

3.1.2 The site is surrounded by residential properties and bounded on its north side by Mash Barn Lane. Access is from Barfield Park at the southwest corner of the site.

3.1.3 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 1,215m^2 in area and currently comprises the site of the demolished former Bungalow (37 Barfield Park), the existing garage of 36 Barfield Park, and the existing access from Barfield Park.

3.2.2 Existing ground levels are highest at the northeast corner of the site at approximately 3.6m AOD. The site falls towards its southwest corner to a level of approximately 2.85m 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 historic method of surface water drainage from the former Bungalow was by infiltration to ground via a soakaway.

3.3.2 Foul water from the former dwelling was discharged by gravity to the existing drainage beneath Barfield Park.

3.3.3 The sewer records do not show this existing drainage but given that it serves more than one dwelling it is likely that this drainage is not classified as a public sewer.

3.3.4 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 Site investigation undertaken by Soils Limited in January 2022 confirms the presence of superficial Alluvium overlying the Newhaven Chalk Formation.

3.4.2 The superficial Alluvium consists generally of silty clays with organic content, occasional lenses of sand, gravel and commonly pockets of peat and is between 2.90m and 4.20m thick.

3.4.3 The Newhaven Chalk Formation consists of a soft, white and friable coccolithic limestone with large proportions of calcareous shell fragments and soft chalk with marl seams and flint nodules.

3.4.4 Groundwater monitoring has recorded groundwater at 1.86m and 2.04m below ground level.

3.4.5 Permeability testing has been carried out on site and confirms permeability of $2.99x10^{-6}$ m/s at a depth of 550mm below ground level and permeability of $1.205x10^{-6}$ m/s at a depth of 1.25m below ground level.

3.4.6 The online “Magic Map” available from Defra confirms that the site is located above a principal aquifer classified as having a medium to high vulnerability.

3.4.7 A copy of the Site Investigation report is located in Appendix 4 at the rear of this report.

4 Flood Zone, Flood Defences and Flood History

4.1 Tidal Flood Zone

4.1.1 The Environment Agency's online mapping confirms that the site is located in defended Tidal Flood Zone 3.

4.1.2 The tidal flood level data supplied by the Environment Agency is based on the data model from 2012 with updated Adur Tidal Walls Modelling from 2018. The predicted climate change models were updated in July 2021.

4.1.3 Reference has been made to the Environment Agency's latest predicted sea level rise data at https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances in order to establish the present day and future year tidal flood levels using the updated climate change predictions.

4.1.4 These are presented by the Environment Agency as a higher central allowance (70th percentile exceeded by 30% of the projections in the range) and an upper end allowance (95th percentile exceeded by 5% of the projections in the range).

4.1.5 The undefended 1:200 year tidal flood level supplied by the Environment Agency based on the data model from 2018 is 4.26m AOD.

4.1.6 The predicted undefended levels based on the updated climate change predictions are as follows:

- 2018 1:200 year flood level 4.26m AOD

  Currently predicted Higher Central increase:
  2000 to 2035 5.7mm per annum
  2036 to 2065 8.7mm per annum
  2066 to 2095 13.1mm per annum
  2096 to 2125 13.1mm per annum

- 2021 1:200 year flood level 4.277m AOD
- 2125 1:200 year flood level 5.359m AOD

4.2 Fluvial Flood Zone

4.2.1 The site is not at risk of fluvial flooding from anything less extreme than a 1:1,000 year flood event.

4.3 Flood Defences

4.3.1 There are newly constructed flood defences on the banks of the River Adur in the form of an embankment. The crest level is 5.1m AOD which will provide protection up until at least 2105.

4.3.2 In addition there are secondary defences being constructed on the New Monks Farm development to the east of the site which have a crest level of 5.4m AOD which will provide protection beyond 2125.

4.4 Flood History

4.4.1 Environment Agency

4.4.1.1 The Environment Agency maps of historic flood incidents do not identify any historic incidents of flooding in the locality of the site.

4.4.2 West Sussex County Council

4.4.2.1 Neither the Strategic Flood Risk Assessment dated January 2010, the Preliminary Flood Risk Assessment dated May 2011 nor the Local Flood Risk Management Strategy dated May 2014 identify any specific flood incidents in the immediate vicinity of the site.

4.4.3 Adur District Council

4.4.3.1 The Strategic Flood Risk Assessment dated January 2012 does not identify any specific flood incidents in the immediate vicinity of the site.

4.4.3.2 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 As previously noted the present day 2021 and future year 2125 predicted tidal flood levels are as follows:

- 1:200 Year present day 2021 Flood level 4.277m AOD
- 1:200 future Year 2125 Flood level 5.359m AOD

5.1.2 There are newly constructed flood defences on the banks of the River Adur in the form of an embankment. The crest level is 5.1m AOD and secondary defences are being constructed on the New Monks Farm development to the east of the site which have a crest height of 5.4m AOD.

5.1.3 Based on the updated climate change predictions for sea level rise these defences should provide protection beyond the future year 2125 flood level in their current form.

5.2 Fluvial Flooding

5.2.1 The area of the proposed site 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 log information recorded groundwater at a depth of 2.9m below ground level.

5.3.2 There are no records identified within West Sussex County Council's Strategic Flood Risk Assessment, Preliminary Flood Risk Assessment or Local Flood Risk Management Strategy nor in Adur District Council's Strategic Flood Risk Assessment of groundwater flooding affecting the site.

5.4 Overland Flow

5.4.1 The Environment Agency maps confirm that the site is unaffected by flooding from overland surface water.

5.4.2 The flood mapping contained within the various flood documents produced by West Sussex County Council and Adur District Council does not identify any flood risk associated with overland flow routes.

5.5 Flood Routing

5.5.1 The natural route for flood waters to dissipate, should any event occur on the site, is towards Barfield Park at the southwest corner of the site.

6 Development Proposals

6.1 Description

6.1.1 The development proposals are summarised as follows:

- Construction of two new 3 bedroom dwellings and garages in replacement of 37 Barfield Park
- Demolition of the garage of 36 Barfield Park
- Reconstruction of existing access from Barfield Park to serve 36 Barfield Park
- Construction of vehicle crossover to Mash Barn Lane to serve the two new dwellings
- Provision of a pedestrian link between Barfield Park and Mash Barn Lane

6.1 Impermeable areas

6.1.1 The impermeable areas of the various elements of the development are summarised as follows:

- Roof areas of new dwellings and garages 207m^2
- Driveways of new dwellings 119m^2
- New access and parking for 36 Barfield Park 108m^2

6.1.2 A copy of the proposed site layout plan is located in Appendix 6 at the rear of this report.

6.2 Surface Water Drainage

6.2.1 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.

6.2.2 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

6.2.3 The proposed surface water drainage strategy will be based on infiltration to ground with sufficient storage provided to accommodate a 1:100 year storm event including an additional 40% to account for the predicted effects of future climate change.

6.2.4 Calculations have been undertaken for the design of permeable paving driveways with a 30% voided subbase and two soakaways constructed as 95% voided crate style soakaways each taking the rainwater collected from one house and one garage. These are proposed at 2 crates high with 600mm cover such that they remain at least 450mm above groundwater.

6.2.5 Permeability beneath the driveways has been taken as $2.99x10^{-6}$ m/s as measured at a depth of 550mm below ground level and the base of the crate soakaways has been taken as $1.205x10^{-6}$ m/s as recorded at a depth of 1.25m below ground level.

6.2.6 The calculations confirm that the driveways can adequately accommodate a 1:100 year return period storm including an additional 40%.

6.2.7 The northern driveway fronting Mash Barn Lane at the north of the site will require a 230mm depth of subbase and will half drain within 2.7 hours.

6.2.8 The southern driveway fronting Barfield Park at the south of the site will require a 240mm depth of subbase and will also half drain within 2.7 hours.

6.2.9 The crate soakaways can adequately accommodate a 1:100 year return period storm including an additional 40% and will half fill during a 1:10 year event. The half drain time following a 1:100 year +40% event is however 3.7 days.

6.2.10 A further calculation has therefore been undertaken (on the assumption that the crate soakaways are full following a 1:100 year event) with an overflow from the crate soakaways into the southern driveway in order determine the depth of subbase required to accommodate a subsequent 1:10 year rainfall event from the combined contributing area.

6.2.11 An increased in depth of subbase to 330mm is sufficient and a half drain time of 3.5 hours is achieved.

6.3 Foul Water Drainage

6.3.1 The existing foul drainage connection from the former dwelling will be reused and discharge foul water to the existing public foul sewer located beneath Barfield Park immediately southwest of the site.

6.3.2 Copies of the preliminary drainage strategy plan and calculations are located in Appendix 7 at the rear of this report.

6.4 Water Quality

6.4.1 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 low depending on the use / area of the site.

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

6.4.3 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

Table 1: Pollution Hazard Indices

6.4.4 The surface water drainage design incorporates permeable paving and will meet the target treatment level required as follows:

SuDS Type	Total suspended solids (TSS)	Metals	Hydrocarbons
Permeable pavement	0.7	0.6	0.7
Soakaway with 300mm minimum depth underlying soil drainage media	0.4	0.4	0.4

Table 2: Pollution Mitigation Indices

6.4.5 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 is located in defended Tidal Flood Zone 3 and will remain defended 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 classified as More Vulnerable

- Table 3: Flood Risk Vulnerability and Flood Zone Compatibility

  More Vulnerable development is appropriate in Flood Zones 1 and 2

7.1.3 The site is however defended against Tidal Flooding. All bedrooms will be located at first floor level and safe refuge will be available at first floor level in the event of a failure of the existing defences.

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 defended Tidal Flood Zone 3 and will remain defended beyond the future year 2125.

8.2 Safe refuge will be available at first floor level for the duration of high tide in the event of a failure of the existing defences on the River Adur and the secondary defences on the New Monks Farm development to the east of the site.

8.3 The site is not at risk from any other source of flooding.

8.4 There are no historic records of flooding from any source affecting the site.

8.5 The geology of the area is predominantly clay but is known to support infiltration to ground.

8.6 A suitable SuDS drainage system is proposed which accords with the requirements of national and local policy.

8.7 Calculations confirm 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.

8.8 The drainage design is suitable to accommodate a 1:10 year storm event following a 1:100 year +40% event and to drain that event in less than 24 hours.

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

8.10 The existing foul drainage connection from the former dwelling will be reused and discharge foul water to the existing public foul sewer located beneath Barfield Park immediately southwest of the site.

8.11 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.

9 List of Appendices, Images and Tables

Appendix 1	Site Location Plan
Appendix 2	Existing Site Layout Plan
Appendix 3	Sewer Records
Appendix 4	Site Investigation
Appendix 5	Flood Maps and Correspondence
Appendix 6	Proposed Site Layout Plan
Appendix 7	Drainage Strategy Plan and Calculations
Appendix 8	Outline Drainage Maintenance Schedule

Image 1	Site Location

Table 1	Pollution Hazard Indices
Table 2	Pollution Mitigation Indices

Appendix 1

Site Location Plan

TO BRIGHTON AND LONDON

TO WORTHING

A27 OLD SHOREHAM ROAD

SITE

LANCING

SHOREHAM

TO PORTSLADE

North Lancing

Sompting

Upper Cokeham

Lower Cokeham

South Lancing

Lancing

Lancing Beach

West Beach

Brighton City Airport

Old Shoreham

New Monks Farm

River Adur

Latham Lodge

Long Acre Farm

Education Facility

Sports/Leisure Centre

Police Station

Fire Station

Library

Art Gallery

Museum



N

-100m 0 100 200 300 400 500m

TITLE
Site Location Plan - No.37 Barfield Park, BN15 9DF, OS Grid Reference: TQ 188 049

SCALE	PROJECT. No.
1:12,500	23592
REPORT TYPE	DRG. No.
FRA	01 -

Appendix 2

Existing Site Layout Plan

MASH BARN LANE

ADJOINING PROPERTY

39

38

BARFIELD PARK

35

ADJOINING PROPERTY

Brighton and Hove Albion Training ground

N

-2.5m 0 2.5m 5.0m 7.5m 10m

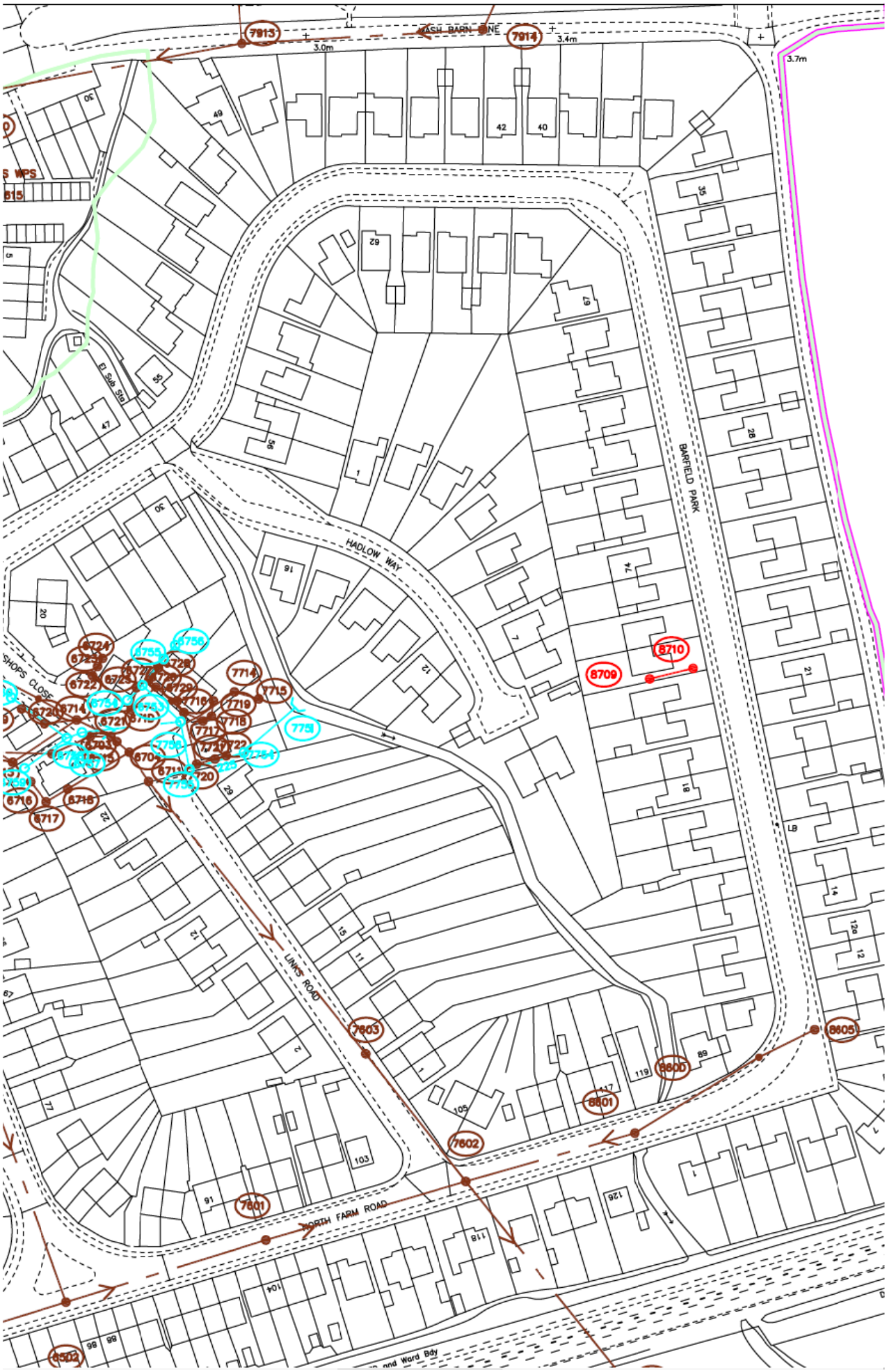
TITLE
Existing Site Layout Plan

SCALE	PROJECT. No.
1:250	23592
REPORT TYPE	DRG. No.
FRA	02 -

Appendix 3

Sewer Records

SEWER RECORDS



Appendix 4

Site Investigation

Thomas Telford House, Sun Valley Business Park
Winnall Close
Winchester
S023 OLB

01962 673 330
soilslimited.co.uk

The Civil Engineering Practice

Via email only: stuart@civil.co.uk
13th January 2022
Our Ref.: 19786/LR

Dear Tom,

Re: 37 Barfield Park, Lancing, BN15 9DF

We are writing regarding the intrusive investigation undertaken at the above-named site.

Brief

The Soils Limited quotation (reference Q25328 dated 11th October 2021) set the scope of the investigation. The investigation was to comprise, 2No. machine excavated trial pits, 1No. at 0.50m below ground level (bgl) and 1No. at 1.25m bgl, with one day of infiltration testing in accordance with the principles of BRE DG365:2016. This was to be undertaken to inform the design of a surface water drainage system and disposal of treated effluent.

General

The site was located at 37 Barfield Park, Lancing, BN15 9DF, a site location plan has been included as Figure 1. The site was located upon the superficial Alluvium overlying the Newhaven Chalk Formation. The superficial Alluvium consists generally of silty clays with organic content, occasional lenses of sand, gravel and commonly pockets of peat. The Newhaven Chalk Formation consists of a soft, white and friable coccolithic limestone with large proportions of calcareous shell fragments and soft chalk with marl seams and flint nodules.

Previous intrusive investigation indicated Alluvium to be present between 2.90 – 4.20m bgl. It was therefore considered that the underlying chalk was too deep for a conventional soakaway infiltration test, particularly with groundwater encountered between 2.03 – 2.23m bgl post siteworks.

Site Works

Site works were undertaken on the 6th January 2022 and comprised the machine excavation of two trial pits, identified as TPSA1 to a depth of 0.50m bgl and TPSA2 to a depth of 1.25m bgl. All trial hole locations were selected by the client. Prior to excavation, all locations were scanned for services using a CAT and signal generator (Genny).

Soils Limited is a limited company registered in England and Wales number 1612073. VAT number 318273558

Registered Office: Newton House, Cross Road, Tadworth, Surrey KT20 5SR

Following the construction of trial pits, infiltration testing in accordance with the principles of BRE DG 365:2016 were carried out.
A trial hole location plan is included as Figure 2.

Ground Conditions
The ground conditions encountered during the site investigation have been summarised in Table 1.

Made Ground (MG)
Alluvium (ALV)

Table 1 – Summary of Ground Conditions

Strata	Depth Encountered (m bgl)		Typical Description
	Top	Base	
MG	0.00	0.56	Turf overlying brown slightly clayey, gravelly SILT. Gravel is fine to coarse sub-angular flint and brick with brick cobbles. Frequent rootlets.
ALV	0.56	>1.25 [1,2]	Brown slightly silty, slightly gravelly CLAY. Gravel is fine to coarse sub-angular flint. Rootlets noted.

Notes: [1] encountered to the final depth of trial hole [2] base of strata not encountered

Roots
Roots were encountered within both trial holes to their final depths 0.60m (TPSA1) and 1.25m bgl (TPSA2).

Roots may be found to greater depth at other locations on the site particularly close to trees and/or trees that have been removed both within the site and its close environs.

Groundwater
No groundwater was encountered during excavation of the trial pits TPSA1 and TPSA2, but groundwater monitoring was undertaken on the day of site work previously installed groundwater monitoring wells. WS1 and WS2 recorded groundwater at 1.86m bgl and 2.04m bgl, respectively.

Infiltration Testing
Infiltration testing was performed within both trial pits (TPSA1 and TPSA2) in order to provide guidance on the suitability of the ground for the adoption of a surface water drainage system. The tests were undertaken within the cohesive soils of the superficial Alluvium at a depth of 0.50m and 1.25m bgl in TPSA1 and TPSA2, respectively.

The test comprised piping fresh water via a water tanker into the open trial hole, the drop in water level over time was then recorded to give an indication of soakage potential. BRE DG365:2016 states that for an accurate infiltration rate to be obtained a soakage pit needs to be filled three times in quick succession. Each test is completed once 75% of the water present has drained away, in order to determine whether or not the underlying ground conditions may be suitable for surface water drainage.

Due to the cohesive nature of the superficial Alluvium the infiltration was relatively slow

within both TPSA1 and TPSA2. Reduction in the head of water was 44% over 4 hours (TPSA1), 34% over 5.5 hours (TPSA2), therefore only a single test was carried out within each of the trial holes.

Table 2 – Infiltration Test Results

Trial Hole (Test No.)	Test Stratum	Test Depth (m bgl)	Infiltration Rate (m/sec)	Notes
TPSA1 (1)	ALV	0.55	2.992E-06	Data extrapolated after 236min.
TPSA2 (1)	ALV	1.25	1.205E-06	Data extrapolated after 326min,

Notes: ALV-Alluvium,

Due to the relatively slow infiltration extrapolated rates of between $1.205x10^{-6}$ and $2.992x10^{-6}$ m/sec were calculated for the cohesive soils of the Alluvium.

Full results are included within Appendix A.

Conclusion

Given the very slow infiltration observed during the tests it is considered likely that alternative methods of surface water disposal (e.g. existing storm water drainage system, rainwater harvesting or a combination of both) should be considered.

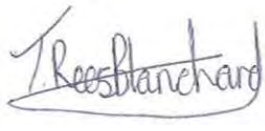
The following attachments make up the remainder of this letter report.

Figure 1. Site Location Plan
Figure 2. Trial Hole Location Plan
Appendix A. Field Data

Should you have any further questions please do not hesitate to contact the undersigned.

Yours sincerely,

T Rees-Blanchard BEng (Hons), MIMMM, FGS.
(trb@soilslimited.co.uk)



For and on behalf of Soils Limited.

Enc.

Figure 1 – Site location Plan



Figure number 1	**Title** Site Location Plan
Project 37 Barfield Park, Lancing, BN15 9DF	**Date** January 2022
Client The Civil Engineering Practice	**Reference** 19786

Figure 2. Trial Hole Location Plan



Figure number 2	**Title** Trial Hole Location Plan
Project 37 Barfield Park, Lancing, BN15 9DF	**Date** January 2022
Client The Civil Engineering Practice	**Reference** 19786

Soils Limited
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Tel: 01737 814221 Email: admin@soilslimited.co.uk

Trial Pit Log

Trial Pit No.
TPSA1
Sheet 1 of 1

Project Name: 37 Barfield Park	Project No.: 19786	Method:	Hole Type TP
Location: Lancing, West Sussex, BN15 9DF		Plant:	
		Support:	Scale 1:25
Client: The Civil Engineering Practice	Trial Pit Length: 1.70m	Trial Pit Width: 0.60m	
Dates: 06/01/2022	Level:	Co-ords:	Logged By JC

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.20	D		0.26			Turf overlying brown, slightly clayey, gravelly SILT. Gravel is fine to coarse sub-angular flint, frequent cobble brick. Occasional metallic fragments. Frequent rootlets. MADE GROUND
	0.50	D		0.50			Brown slightly silty, slightly gravelly CLAY. Gravel is fine to coarse sub-angular flint. Rare rootlets.
							End of Pit at 0.500m



General Remarks:
Rootlets observed to 0.50m bgl.

Groundwater Remarks: No groundwater encountered.

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No. **TPSA2** Sheet 1 of 1

Project Name: 37 Barfield Park	Project No.: 19786	Method:	Hole Type: TP
Location: Lancing, West Sussex, BN15 9DF		Plant:	
		Support:	Scale: 1:25
Client: The Civil Engineering Practice	Trial Pit Length: 1.70m	Trial Pit Width: 0.60m	
Dates: 06/01/2022	Level:	Co-ords:	Logged By: JC

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.20	D					Turf overlying brown, slightly clayey, gravelly SILT. Gravel is fine to coarse sub-angular flint, frequent cobble brick. Occasional metallic fragments. Frequent rootlets. MADE GROUND
	0.50	D		0.56			Brown slightly silty, slightly gravelly CLAY. Gravel is fine to coarse sub-angular flint. Rare rootlets.
	1.00	D					
	1.25	D		1.25			End of Pit at 1.250m



General Remarks:
Rootlets observed to 1.25m bgl.

Groundwater Remarks: No groundwater encountered.

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

Soakaway Calculations

Soakaway Test No.	TPSA1 Test 1
Contract:	37 Barfield Park
Contract No.	19786

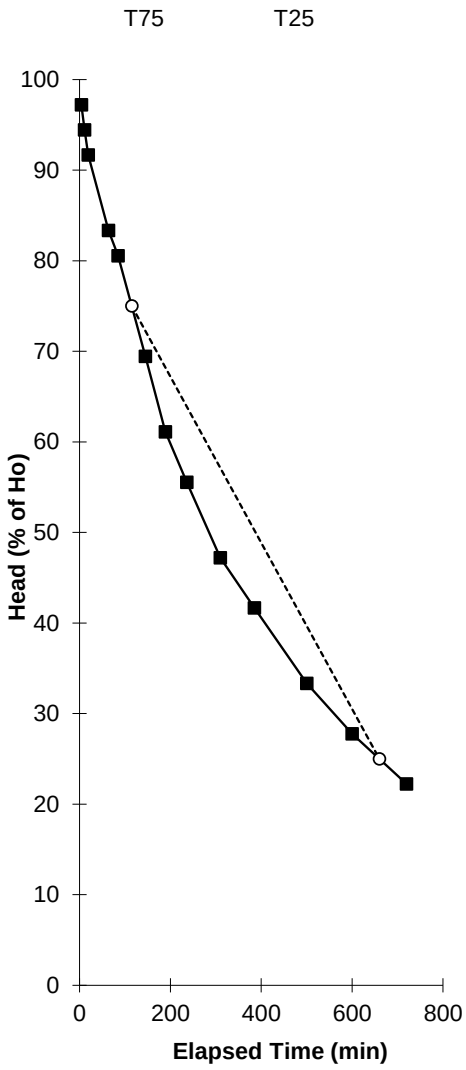
Field Test

Trial Pit Log (include details of groundwater):
See trial Pit record

Depth of Pit	0.55	m
Width of Pit	0.60	m
Length of Pit	1.50	m
Depth of Pit Soaked	0.36	m
ap50	1.656	m2
Vp75-25	0.162	m3
t75-25	545.0	min
water used	0.3240	m3
f	2.992E-06	m/sec.

Field Data

Depth to Water (m)	Elapsed Time (min)	Head of Water (% of Ho)	Head of Water (m)
0.19	0	100	0.36
0.20	4	97	0.35
0.21	11	94	0.34
0.22	19	92	0.33
0.25	64	83	0.30
0.26	85	81	0.29
0.30	145	69	0.25
0.33	189	61	0.22
0.35	236	56	0.20
0.38	310	47	0.17
0.40	385	42	0.15
0.43	500	33	0.12
0.45	600	28	0.10
0.47	720	22	0.08



T75	115.000	75
T25	660.000	25
T75-25	545.000	Derived from Best Fit

Comments

Extrapolated after 236min.

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Newton House, Cross Road, Tadworth
Surrey, KT20 5SR
Telephone: 01737 814 221
Facsimile: 01737 812 557

Soakaway Calculations

Soakaway Test No.	TPSA2 Test 1
Contract:	37 Barfield Park
Contract No.	19786

Field Test

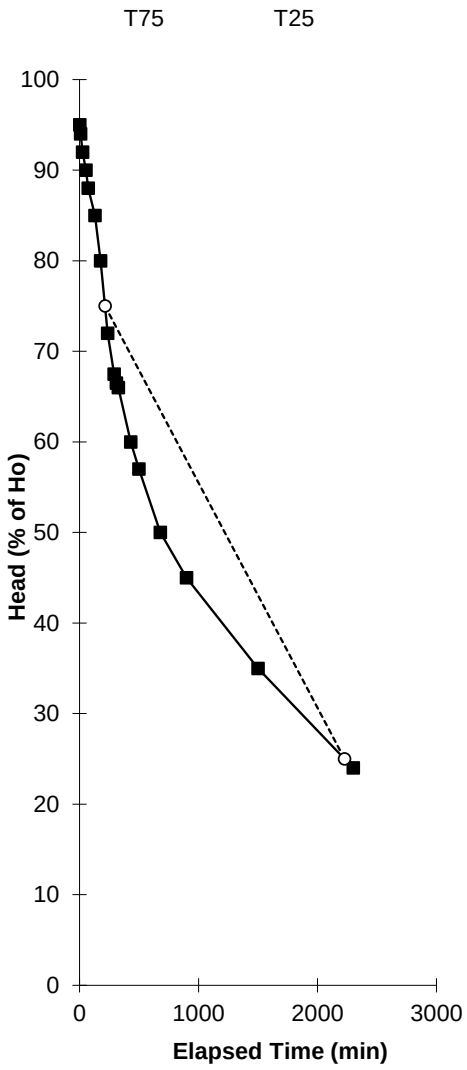
Trial Pit Log (include details of groundwater):
See trial Pit record

Depth of Pit	1.25	m
Width of Pit	0.60	m
Length of Pit	1.30	m
Depth of Pit Soaked	1.00	m

ap50	2.68	m2
Vp75-25	0.39	m3
t75-25	2013.0	min
water used	0.7800	m3
f	1.205E-06	m/sec.

Field Data

Depth to Water (m)	Elapsed Time (min)	Head of Water (% of Ho)	Head of Water (m)
0.25	0	100	1
0.30	3	95	0.95
0.31	8	94	0.94
0.33	25	92	0.92
0.35	53	90	0.90
0.37	74	88	0.88
0.40	129	85	0.85
0.45	178	80	0.80
0.53	236	72	0.72
0.58	291	68	0.68
0.59	309	67	0.67
0.59	326	66	0.66
0.65	430	60	0.60
0.68	500	57	0.57
0.75	680	50	0.50
0.80	900	45	0.45
0.90	1500	35	0.35
1.01	2300	24	0.24



T75	214.250	75
T25	2227.273	25
T75-25	2013.023	Derived from Best Fit

Comments

Extrapolated after 326min.

SOILS LIMITED
Newton House, Cross Road, Tadworth
Surrey, KT20 5SR
Telephone: 01737 814 221
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Appendix 5

Flood Maps and Correspondence

Paul Reynolds
The Civil Engineering Practice
11 Tungsten Building,
George Street,
Fishersgate,
Sussex,
BN41 1RA

Our ref: SSD229793
Date: 24/08/2021

Dear Paul Reynolds,

Enquiry Regarding Product 4 for Flood Risk Assessment for 37 Barfield Park, Lancing, BN15 9DF.

Thank you for your enquiry which was received on 27 July 2021.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004. The information is attached.

The information on Flood Zones in the area relating to this address is as follows:

The site is in an area located within Flood Zone 3 as shown on our Flood Map for Planning (Rivers and Sea).

Note - This information relates to the area that the above named property is in and is not specific to the property itself as it is influenced by factors such as the height of door steps, air bricks or the height of surrounding walls. We do not have access to this information and is not currently used in our flood modelling.

Flood Zone definitions can be found at www.gov.uk/guidance/flood-risk-and-coastal-change#Table-1-Flood-Zones

Flood Defences
Flood defences in this area have been upgraded as part of the Shoreham Adur Tidal Walls scheme. For more information please visit https://www.gov.uk/government/publications/shoreham-adur-tidal-walls-scheme/shoreham-adur-tidal-walls-scheme

Model Information
The model used was the Arun to Adur Coastal modelling which was completed by JBA Consulting in 2012. The defended scenarios were taken from the 2018 Adur Tidal Walls Scheme modelling update.

Flood History
We hold no record of previous flooding events affecting this site.

Please note our records are not comprehensive and may not include all events. I recommend contacting the Lead Local Flood Authority, **West Sussex County**

Council or the Local Authority, **Adur District Council** for a more comprehensive flood history check.

FRA advisory text

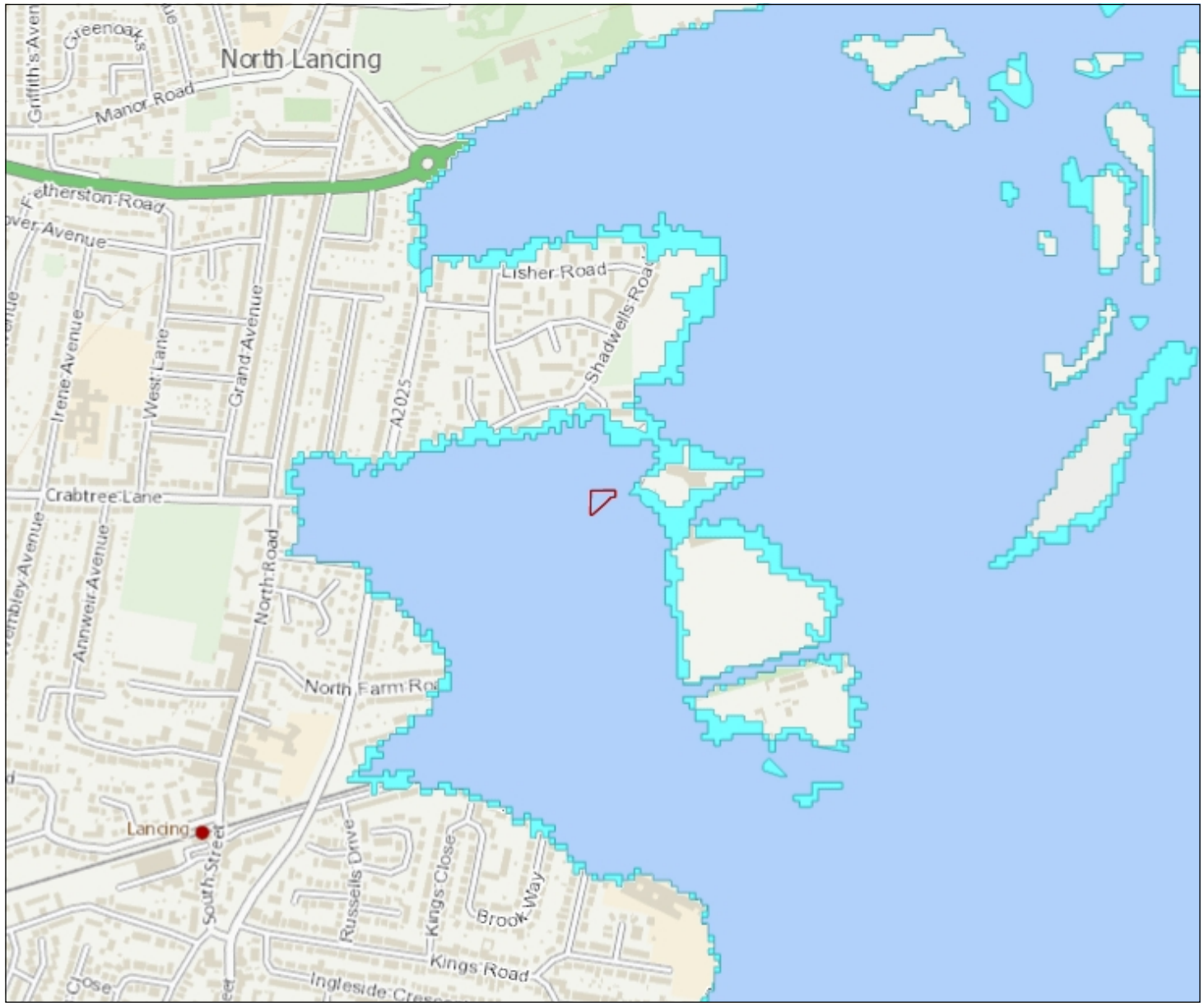
Name	Product 4
Description	Detailed Flood Risk Assessment Map for **37 Barfield Park, Lancing, BN15 9DF.**
Licence	Open Government Licence
Information Warnings	The flood risk data provided is based on existing EA hydraulic models with an allowance for climate change. Please note the climate change allowances provided are not up to date. These were updated on 27 July 2021. You should refer to 'Flood risk assessments: climate change allowances' for the most up to date allowances. You will need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence.
Information Warning - OS background mapping	*The mapping of features provided as a background in this product is © Ordnance Survey. It is provided to give context to this product. The Open Government Licence does not apply to this background mapping. You are granted a non-exclusive, royalty free, revocable licence solely to view the Licensed Data for non-commercial purposes for the period during which the Environment Agency makes it available. You are not permitted to copy, sub-license, distribute, sell or otherwise make available the Licensed Data to third parties in any form. Third party rights to enforce the terms of this licence shall be reserved to OS.*
Attribution	Contains Environment Agency information © Environment Agency and/or database rights. Contains Ordnance Survey data © Crown copyright 2021 Ordnance Survey 100024198.

Data Available Online

Many of our flood datasets are available online:

- Flood Map For Planning (Flood Zone 2, Flood Zone 3 ,Flood Storage Areas, Flood Defences, Areas Benefiting from Defences)
- Risk of Flooding from Rivers and Sea
- Historic Flood Map
- Current Flood Warnings

Flood Map for Planning (Rivers and Sea). Centred BN15 9DF. Created 24/08/2021.



Environment Agency

1: 10,000

0 Metres 250

N W E S

Flood Map for Planning (Rivers & Sea)

- Defences
- Flood Storage Areas
- Areas benefiting from flood defences
- Flood Zone 3
- Flood Zone 2

Flood Map Areas (assuming no defences)

Flood Zone 3 shows the area that could be affected by flooding:

- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occuring each year.

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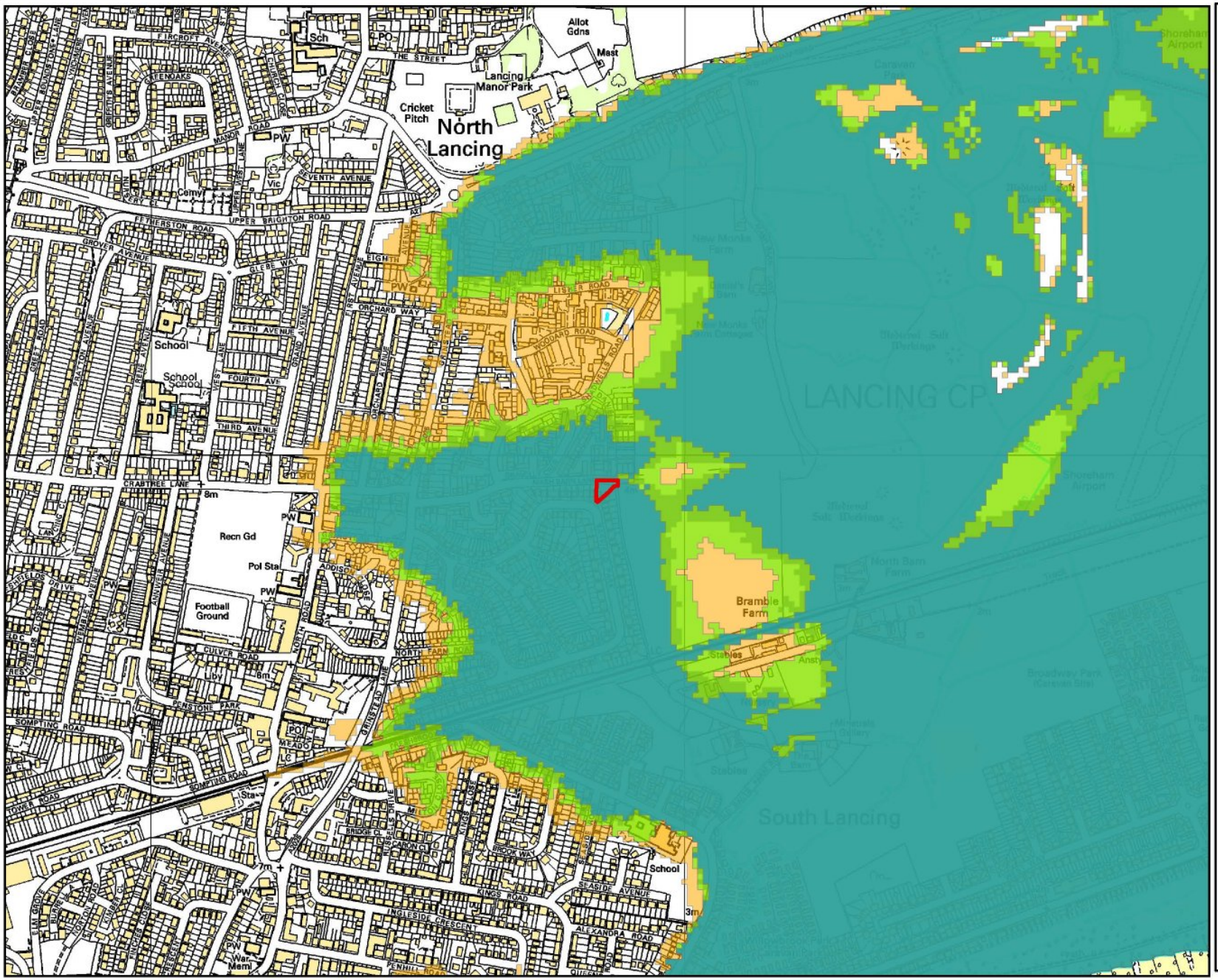
Modelled Flood Outlines (Undefended Tidal). Centred BN15 9DF. Created 24/08/2021.



Environment Agency

N

Legend

- Site Boundary
- 0.5% AEP (2012) (Undefended)
- 0.5% AEP (2070) (Undefended)
- 0.5% AEP (2115) (Undefended)
- 0.1% AEP (2012) (Undefended)

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occurring in any given year.

Scale: 1:10,000

0 0.225 0.45
Kilometers

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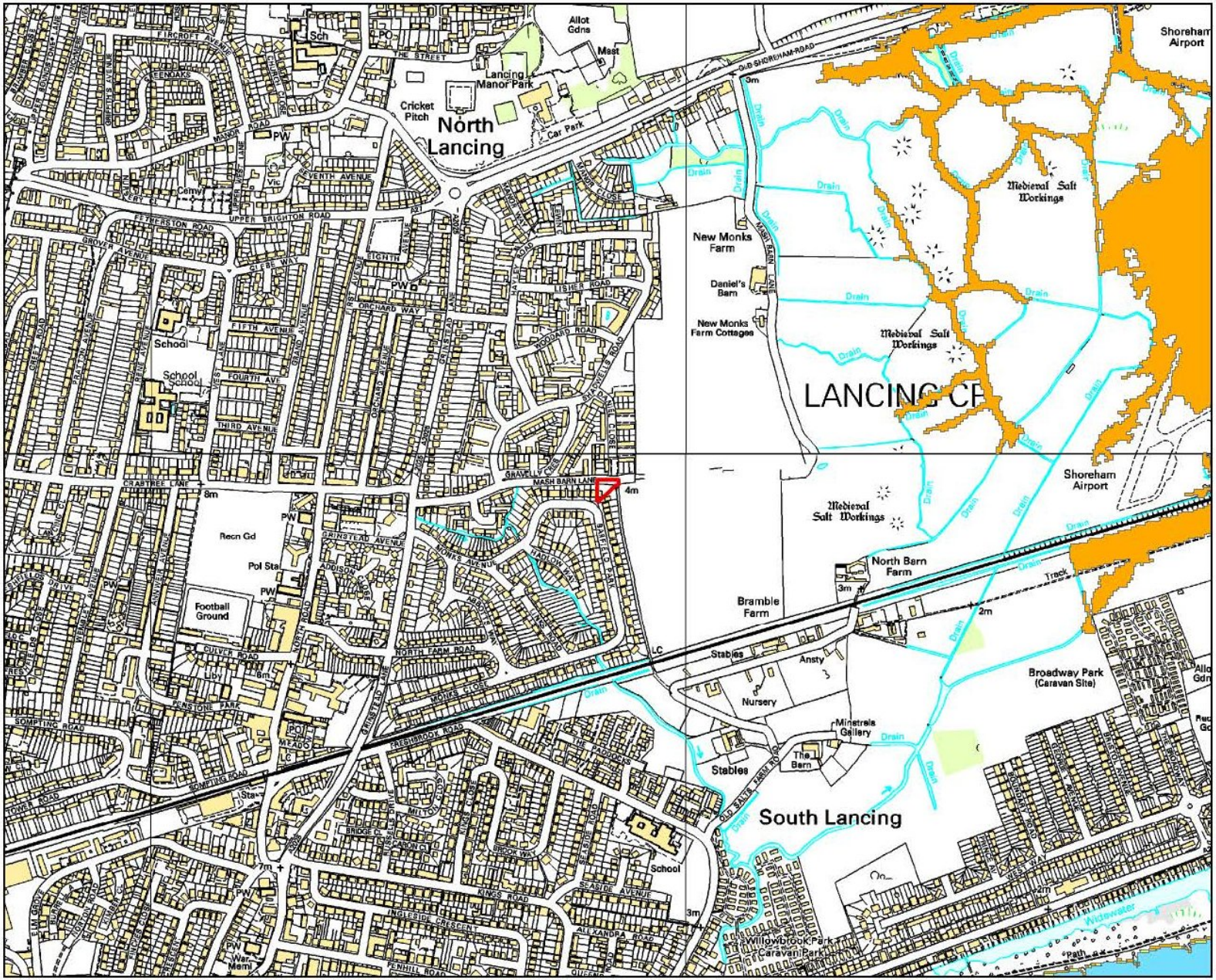
Modelled Flood Outlines (Defended Tidal). Centred BN15 9DF. Created 24/08/2021.



Environment Agency

N

Legend

- Site Boundary
- 0.5% AEP (2018) (Defended)
- 0.5% AEP (2067) (Defended)
- 0.5% AEP (2117) (Defended)

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occurring in any given year.

Scale: 1:10,000

0 0.225 0.45
Kilometers

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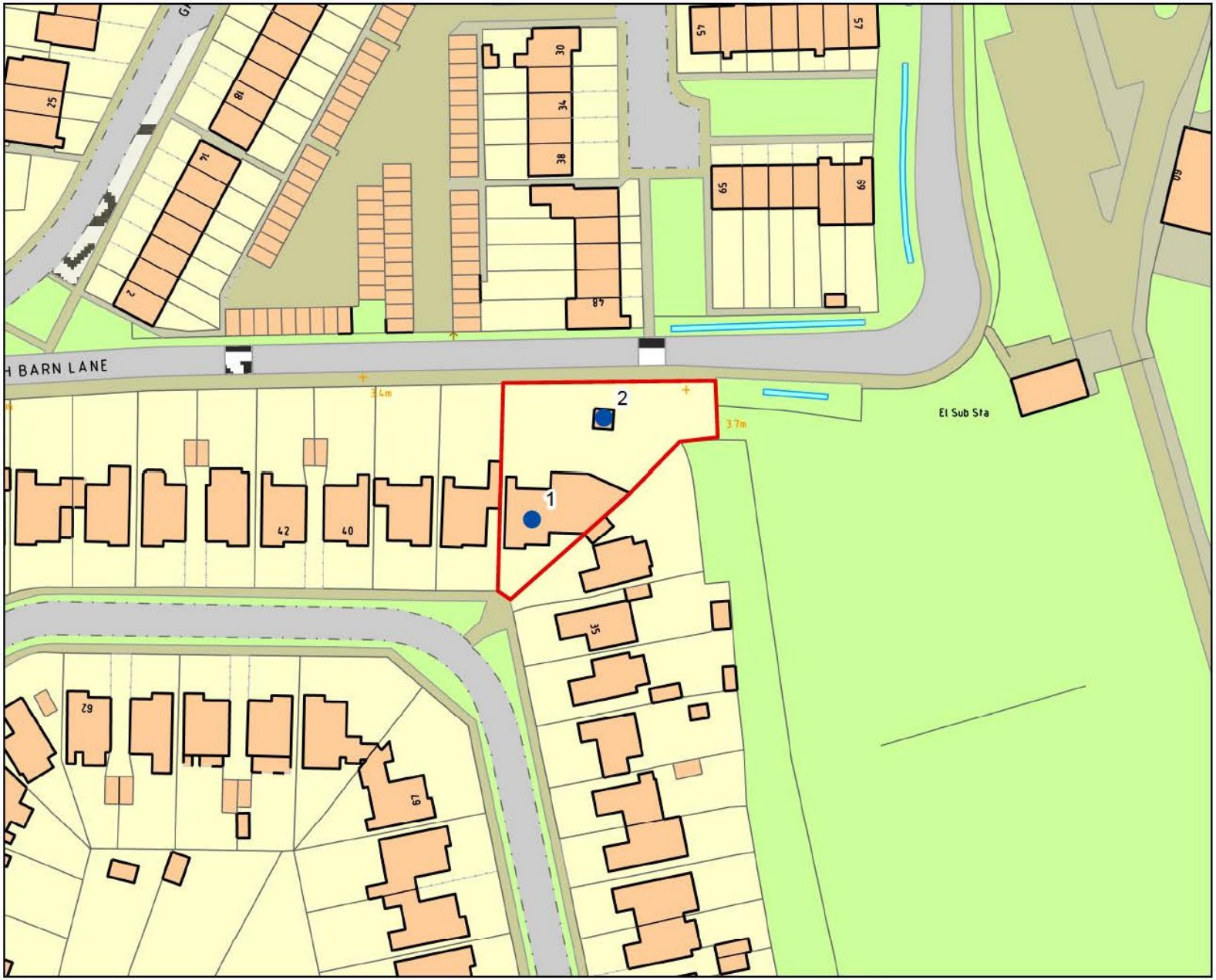
FRA Site Boundary & Node Points. Centred BN15 9DF. Created 24/08/2021.



Environment Agency

N

Legend

- Site Nodes
- Site Boundary

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occurring in any given year.

Scale: 1:1,000

0 0.0225 0.045
Kilometers

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Product 4 Flood Risk Data Requested by: The Civil Engineering Practice

Site: 37 Barfield Park, Lancing, BN15 9DF

Table 1: Water Levels: Tidal Undefended

	NGR		Modelled Flood Levels in Metres AOD Undefended Annual Exceedance Probability			
Node Ref	Eastings	Northings	0.5%	0.5% (2070) *	0.5% (2115) *	0.1%
1	518840	104927	4.26	4.79	5.40	4.48
2	518853	104946	4.26	4.79	5.40	4.48

Table 2: Water Levels: Tidal Defended

	NGR		Modelled Flood Levels in Metres AOD Defended Annual Exceedance Probability		
Node Ref	Eastings	Northings	0.5%	0.5% (2067) *	0.5% (2117) *
1	518840	104927	-	-	-
2	518853	104946	-	-	-

Table 3: Water Depths: Tidal Undefended

	NGR		Modelled Flood Depths in Metres Undefended Annual Exceedance Probability			
Node Ref	Eastings	Northings	0.5%	0.5% (2070) *	0.5% (2115) *	0.1%
1	518840	104927	1.25	1.77	2.39	1.46
2	518853	104946	0.62	1.15	1.76	0.84

Table 4: Water Depths: Tidal Defended

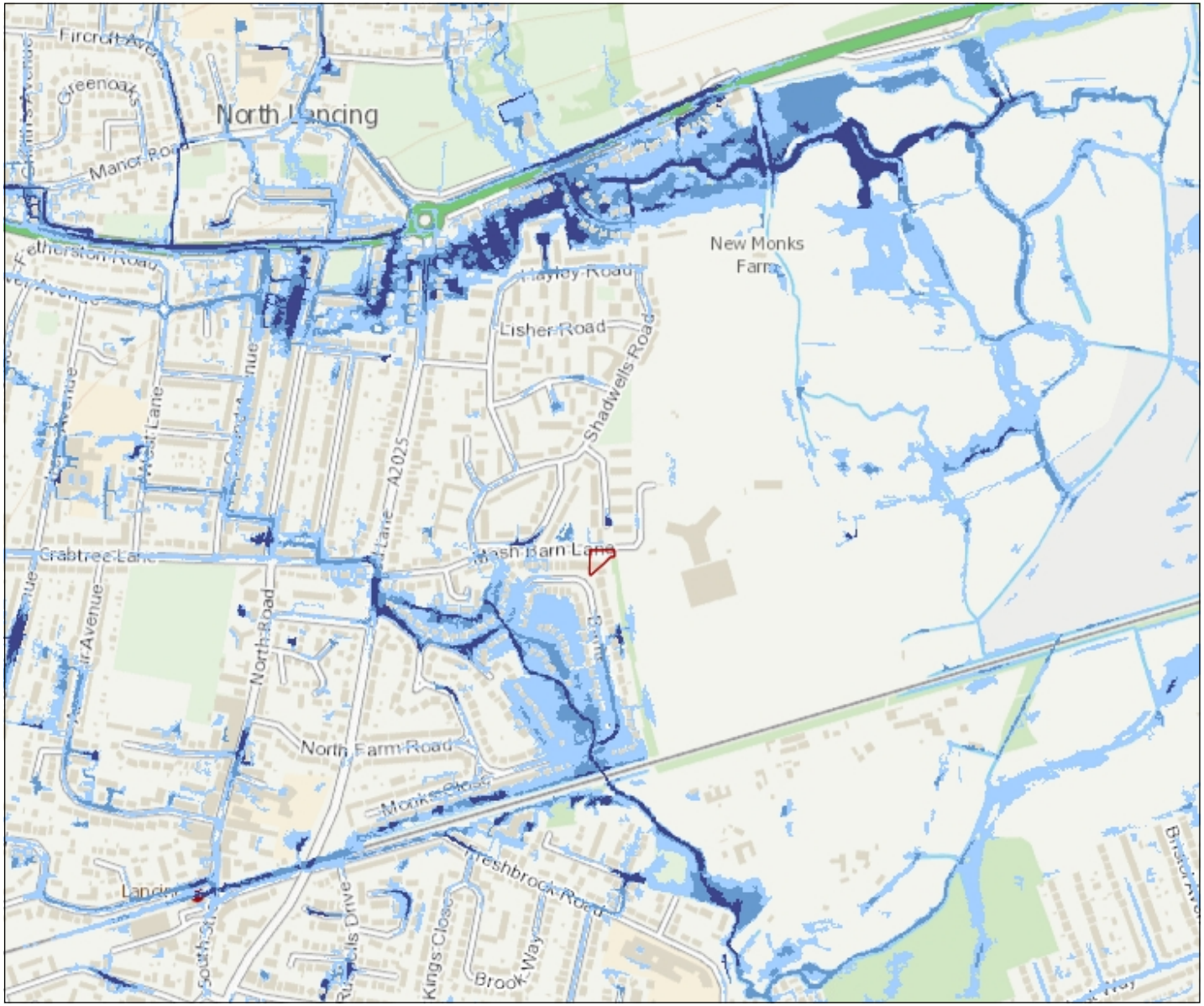
	NGR		Modelled Flood Depths in Metres Defended Annual Exceedance Probability		
Node Ref	Eastings	Northings	0.5%	0.5% (2067) *	0.5% (2117) *
1	518840	104927	-	-	-
2	518853	104946	-	-	-

All levels taken from: Adur Coastal Modelling (2012) with updated Adur Tidal Wall Scheme Modelling (2018)

Produced on: 24/08/2021

Office Address: Guildbourne House, Chatsworth Road, Worthing BN11 1LD.
Customer services line: 03708 506 506. Email: enquiries@environment-agency.gov.uk
www.gov.uk/government/organisations/environment-agency

Risk of flooding from Surface Water. Centred BN15 9DF. Created 24/08/2021.



Environment Agency

1: 10,000

0 Metres 250

N W E S

Likelihood of flooding from Surface Water

- High (>=3.3%)
- Medium (3.3% - 1%)
- Low (1% - 01%)
- Very Low
- Flood Extent 1 in 30
- Flood Extent 1 in 100
- Flood Extent 1 in 1000

Likelihood of flooding from Surface Water

High:	Greater than or equal to 3.3% (1 in 30) chance in any given year
Medium:	Less than 3.3% (1 in 30) but greater than or equal to 1% (1 in 100) chance in any given year
Low:	Less than 1% (1 in 100) but greater than or equal to 0.1% (1 in 1,000) chance in any given year
Very Low:	Less than 0.1% (1 in 1,000) chance in any given year

This information is shown on the Risk of Flooding from Surface Water map on GOV.UK.

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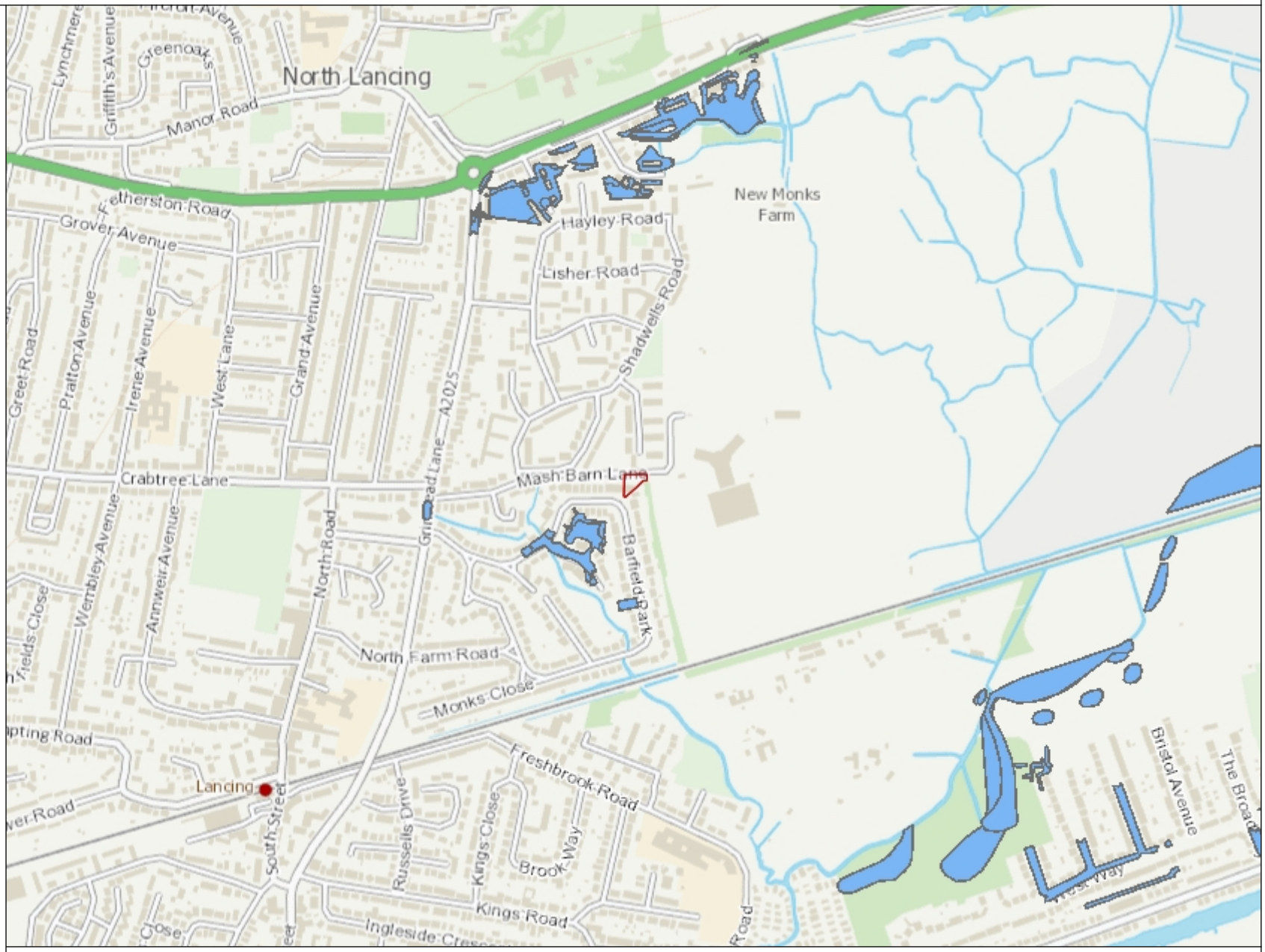
Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). E-mail: enquires@environment-agency.gov.uk

Recorded Flood Outlines. Centred BN15 9DF. Created 24/08/2021.

Environment Agency

Legend

All recorded flood outlines



1: 10,000

0 250

Metres

N W E S

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Appendix 6

Proposed Site Layout Plan

MASH BARN LANE

ADJOINING PROPERTY

39

38

BARFIELD PARK

02
3B6P

01
3B6P

BC

EX

EX

EP

Existing Bungalow

35

ADJOINING PROPERTY

Brighton and Hove Albion Training ground

N

-2.5m 0 2.5m 5.0m 7.5m 10m

TITLE
Proposed Site Layout Plan

SCALE	PROJECT. No.
1:250	23592
REPORT TYPE	DRG. No.
FRA	03 -

Appendix 7

Drainage Strategy Plan and Calculations

DRAINAGE KEY:

- S — CP: Proposed storm inspection chamber / catchpit
- re: Rodding Eye
- dt: Distribution Tank (Single)
- Permeable paving
- SA1: Crate soakaway
  - SA1: 4m x 4m x 0.8m deep (2 crates deep), 600mm cover
  - SA2: 4m x 4m x 0.8m deep (2 crates deep), 600mm cover
- F: Proposed foul drainage

MASH BARN LANE

Driveway 1
Permeable paving
with 350mm thick
30% voided sub base

Brighton and Hove Albion Training ground

ADJOINING PROPERTY

39

38

35

ADJOINING PROPERTY

BARFIELD PARK

Driveway 2
Permeable paving
with 350mm thick
30% voided sub base

Foul discharge
to existing
manhole

Non return valve

Non return valve

Non return valve

SA1

SA2

dt

dt

N

-2.5m 0 2.5m 5.0m 7.5m 10m

Driveway voided sub base drains to ground

Soakaway overflow pipe

Distribution tank

3.300

Non return valve

2.90

2.76

2.60

Crate soakaway

1.80

Catchpit chamber

SECTION THROUGH SURFACE WATER SYSTEM
(NTS)

TITLE
Proposed Drainage Strategy Plan

SCALE	PROJECT. No.
1:250	23592
REPORT TYPE	DRG. No.
FRA	04 A

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)	Depth (m)
Soakaway 1	0.010	2.850	1.450
Soakaway 2	0.010	2.850	1.450
Driveway 1	0.012	2.850	0.330
Driveway 2	0.011	2.850	0.340

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)	10080	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

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

Node Soakaway 1 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00434	Invert Level (m)	1.400	Depth (m)	0.800
Side Inf Coefficient (m/hr)	0.01077	Time to half empty (mins)	5273	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	4.000	Number Required	1
Porosity	0.95	Pit Length (m)	4.000		

Node Soakaway 2 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00434	Invert Level (m)	1.400	Depth (m)	0.800
Side Inf Coefficient (m/hr)	0.01077	Time to half empty (mins)	5232	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	3.500	Number Required	1
Porosity	0.95	Pit Length (m)	4.500		

Node Driveway 1 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.01077	Invert Level (m)	2.520	Depth (m)	0.230
Side Inf Coefficient (m/hr)	0.01077	Time to half empty (mins)	164	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	6.260	Number Required	1
Porosity	0.30	Pit Length (m)	19.000		

Flow+ v10.3 Copyright © 1988-2022 Causeway Technologies Ltd

Node Driveway 2 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.01077	Invert Level (m)	2.510	Depth (m)	0.240
Side Inf Coefficient (m/hr)	0.01077	Time to half empty (mins)	163	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	5.500	Number Required	1
Porosity	0.30	Pit Length (m)	19.600		

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
10 year 15 minute summer	229.327	64.892
10 year 15 minute winter	160.931	64.892
10 year 30 minute summer	150.822	42.677
10 year 30 minute winter	105.840	42.677
10 year 60 minute summer	102.314	27.039
10 year 60 minute winter	67.975	27.039
10 year 120 minute summer	65.555	17.324
10 year 120 minute winter	43.553	17.324
10 year 180 minute summer	50.932	13.106
10 year 180 minute winter	33.107	13.106
10 year 240 minute summer	40.361	10.666
10 year 240 minute winter	26.815	10.666
10 year 360 minute summer	30.637	7.884
10 year 360 minute winter	19.915	7.884
10 year 480 minute summer	23.860	6.306
10 year 480 minute winter	15.852	6.306
10 year 600 minute summer	19.326	5.286
10 year 600 minute winter	13.204	5.286
10 year 720 minute summer	17.051	4.570
10 year 720 minute winter	11.459	4.570
10 year 960 minute summer	13.776	3.627
10 year 960 minute winter	9.125	3.627
10 year 1440 minute summer	9.755	2.614
10 year 1440 minute winter	6.556	2.614
10 year 2160 minute summer	6.866	1.897
10 year 2160 minute winter	4.731	1.897
10 year 2880 minute summer	5.681	1.523
10 year 2880 minute winter	3.818	1.523
10 year 4320 minute summer	4.336	1.134
10 year 4320 minute winter	2.855	1.134
10 year 5760 minute summer	3.638	0.931
10 year 5760 minute winter	2.354	0.931
10 year 7200 minute summer	3.165	0.807
10 year 7200 minute winter	2.042	0.807
10 year 8640 minute summer	2.834	0.723
10 year 8640 minute winter	1.829	0.723
10 year 10080 minute summer	2.595	0.662
10 year 10080 minute winter	1.675	0.662
100 year +40% CC 15 minute summer	537.085	151.976
100 year +40% CC 15 minute winter	376.902	151.976
100 year +40% CC 30 minute summer	360.639	102.048
100 year +40% CC 30 minute winter	253.080	102.048
100 year +40% CC 60 minute summer	247.316	65.358
100 year +40% CC 60 minute winter	164.311	65.358
100 year +40% CC 120 minute summer	149.677	39.555

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Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +40% CC 120 minute winter	99.442	39.555
100 year +40% CC 180 minute summer	113.728	29.266
100 year +40% CC 180 minute winter	73.926	29.266
100 year +40% CC 240 minute summer	89.074	23.540
100 year +40% CC 240 minute winter	59.178	23.540
100 year +40% CC 360 minute summer	66.844	17.201
100 year +40% CC 360 minute winter	43.451	17.201
100 year +40% CC 480 minute summer	51.943	13.727
100 year +40% CC 480 minute winter	34.510	13.727
100 year +40% CC 600 minute summer	42.044	11.500
100 year +40% CC 600 minute winter	28.727	11.500
100 year +40% CC 720 minute summer	37.080	9.938
100 year +40% CC 720 minute winter	24.920	9.938
100 year +40% CC 960 minute summer	29.887	7.870
100 year +40% CC 960 minute winter	19.797	7.870
100 year +40% CC 1440 minute summer	21.060	5.644
100 year +40% CC 1440 minute winter	14.154	5.644
100 year +40% CC 2160 minute summer	14.702	4.063
100 year +40% CC 2160 minute winter	10.130	4.063
100 year +40% CC 2880 minute summer	12.053	3.230
100 year +40% CC 2880 minute winter	8.100	3.230
100 year +40% CC 4320 minute summer	8.996	2.352
100 year +40% CC 4320 minute winter	5.925	2.352
100 year +40% CC 5760 minute summer	7.388	1.891
100 year +40% CC 5760 minute winter	4.782	1.891
100 year +40% CC 7200 minute summer	6.301	1.607
100 year +40% CC 7200 minute winter	4.067	1.607
100 year +40% CC 8640 minute summer	5.542	1.414
100 year +40% CC 8640 minute winter	3.577	1.414
100 year +40% CC 10080 minute summer	4.990	1.273
100 year +40% CC 10080 minute winter	3.221	1.273

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Results for 10 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
4320 minute winter	Soakaway 1	2700	1.724	0.324	0.1	4.9718	0.0000	OK
4320 minute winter	Soakaway 2	2700	1.729	0.329	0.1	4.9675	0.0000	OK
360 minute winter	Driveway 1	272	2.603	0.083	0.6	3.0301	0.0000	OK
180 minute winter	Driveway 2	168	2.598	0.088	0.9	2.8989	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
4320 minute winter	Soakaway 1	Infiltration	0.0
4320 minute winter	Soakaway 2	Infiltration	0.0
360 minute winter	Driveway 1	Infiltration	0.2
180 minute winter	Driveway 2	Infiltration	0.2

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Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
10080 minute winter	Soakaway 1	6360	2.190	0.790	0.1	12.1236	0.0000	OK
10080 minute winter	Soakaway 2	6360	2.214	0.814	0.1	12.0894	0.0000	OK
360 minute winter	Driveway 1	344	2.742	0.222	1.3	8.0927	0.0000	OK
240 minute winter	Driveway 2	236	2.741	0.231	1.6	7.6058	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
10080 minute winter	Soakaway 1	Infiltration	0.0
10080 minute winter	Soakaway 2	Infiltration	0.0
360 minute winter	Driveway 1	Infiltration	0.2
240 minute winter	Driveway 2	Infiltration	0.2

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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)	Depth (m)
Driveway 2	0.032	2.850	0.430

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)	360	Check Discharge Volume	x

Storm Durations

180	240	360	480

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

Node Driveway 2 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.01077	Invert Level (m)	2.420	Depth (m)	0.330
Side Inf Coefficient (m/hr)	0.01077	Time to half empty (mins)	211	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	5.500	Number Required	1
Porosity	0.30	Pit Length (m)	19.600		

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
10 year 180 minute summer	50.932	13.106	10 year 360 minute summer	30.637	7.884
10 year 180 minute winter	33.107	13.106	10 year 360 minute winter	19.915	7.884
10 year 240 minute summer	40.361	10.666	10 year 480 minute summer	23.860	6.306
10 year 240 minute winter	26.815	10.666	10 year 480 minute winter	15.852	6.306

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Results for 10 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	Driveway 2	352	2.737	0.317	1.6	10.7165	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
360 minute winter	Driveway 2	Infiltration	0.2

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Appendix 8

Outline Drainage Maintenance Schedule

Drainage Maintenance Schedule

The Civil Engineering Practice
11 Tungsten Building
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01273 424424
reception@civil.co.uk
www.civil.co.uk

Project	**37 Barfield Park, Lancing, West Sussex**
Project Number	**23592**
By	Steve Doughty
Date	21 October 2021

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 (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 gulleys	Monthly or as required
	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
Corrective Maintenance	Remove debris / blockages to silt traps / channel drains	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 and gullies for blockages, standing water and clear	As required

Indicative Schedule of Maintenance for the Proposed Drainage System

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2 Financing

2.1 The regular maintenance of all private drainage, channels, gutters, rainwater pipes and connections will be the responsibility of the individual property owners.

2.2 The regular and corrective maintenance of all shared elements of the drainage system will be managed and funded through the Management Company on behalf of the Residents.

Inspection / Action Required	Gullies, Channels and Gutters	Catchpits	Permeable Surface	Surface Water Pipework
6 Months	✓	✓	✓	
1 Year			✓	
After leaf fall in Autumn	✓	✓		
2 Years				✓

Drainage System Maintenance Summary