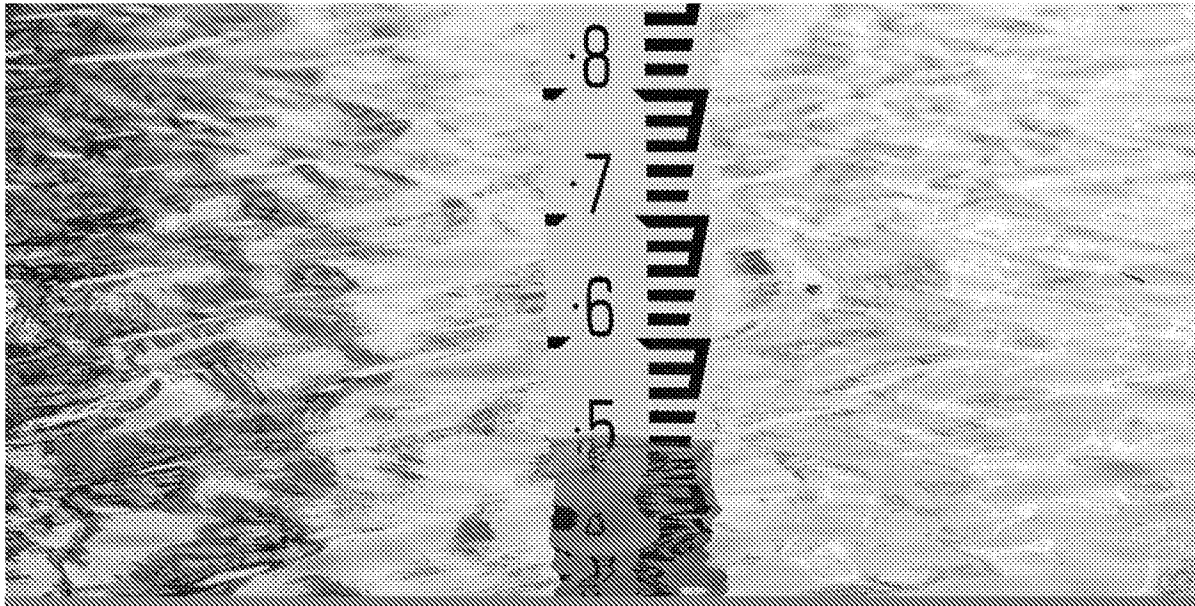




Flood Risk Assessment

Unit T, Riverside Industrial Estate, Littlehampton, BN17 5DF

Client

Thompson Civil Engineering

1 Spencer Street

Bognor Regis

West Sussex

PO21 1AP

Ref: 10201

Date: February 2020

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A	Site Location Maps & Aerial Photo
B	Environment Agency Flood Data
C	Topographic Survey and Sewer Records
D	Proposed Scheme Drawings
E	Micro Drainage Calculations

Annexe: Flood Risk Management Plan

Issue	Issue date	Compiled	Checked
Preliminary Issue	06 February 2020	JP	MR
2 nd Preliminary Issue	12 February 2020	JP	MR
First Issue	13 February 2020	JP	MR

Report by: John Pakenham BSc (Hons)

Checked by: Martin Roberts I Eng, ACIWEM, MCIHT

1 Introduction

- 1.1 This FRA report has been prepared for Thompson Civil Engineering in relation to Unit T, Riverside Industrial Estate, Littlehampton, BN17 5DF. No responsibility is accepted to any third party for all or part of this study in connection with this or any other development.
- 1.2 GTA Civils & Transport Ltd. was appointed by the client to provide a Flood Risk Assessment (FRA) required by the Environment Agency and Arun District Council, in order to achieve Planning Permission at said property.
- 1.3 This report will take the form of a formal Flood Risk Assessment in accordance with the 2019 National Planning Policy Framework (NPPF) and the current Planning Practice Guidance (PPG).
- 1.4 Sequential Test: passing the Sequential and Exception Tests are to be carried out by others (usually a town planning consultancy); this procedure is outside the scope of this report
- 1.5 Limitations of this report: this report examines flood risk and drainage issues only. It does not consider potential contamination, bio-diversity or other environmental/ecological issues.

2 Existing Site and Current Flood Conditions

- 2.1 The subject site lies within the area administered by Arun District Council (ADC). It comprises a vacant concrete yard with B2/B8 industrial planning use class. Apart from 3 shipping containers there is a small fuel tank near to the NE corner. It is understood that civil engineering materials are stored on this currently. A site location map and aerial view are shown in Appendix A.

The site centres on national OS grid ref Easting 501813, Northing 102357. The postal address is:

Unit T, Riverside Industrial Estate
Littlehampton
BN17 5DF

- 2.2 Hydrology: The River Arun flows southeast, some 50m at its closest to the site, to the south. This discharges into the English Channel into the Sea approximately 1.6km away. A surface water drain flows in an anti-clockwise direction around the industrial estate.
- 2.3 Topography: a topographic survey was commissioned – see Appendix C. The ambient levels range between 2.60m AOD and 2.3m AOD approximately. A defence bund runs along the south boundary; the lowest measured crest level of this is 3.311m AOD.
- 2.4 Geology: the BGS's online geology map shows that the bedrock is Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation and Portsdown Chalk Formation (Chalk). This is overlain by a stratum of Raised Marine Deposits (clay, silt, sand and gravel). The chalk may possess good infiltration but, due to the proximity of the river, it is likely that the water table level will make infiltration methods unviable.
- 2.5 The EA's Groundwater Vulnerability Zone map (in Appendix B) shows the site to be overlying a 'Major High' (aquifer). The site is removed from the nearest Groundwater Source Protection Zone, according to the EA's map in Appendix B.
- 2.6 Surface water drainage: no positive drainage was recorded. The local area sewer records were procured from Southern Water – see Appendix C. The industrial estate is not served by public sewers, either surface or foul. The surface water runs to ground, therefore - or discharges directly into the River Arun
- 2.7 Fluvial Risk: the Environment Agency's (EA) Rivers and Seas flood map in Appendix B indicates that the site lies within tidal Flood Zone 3 (FZ3). Sites in tidal or coastal FZ3 have an annual expectation of

greater than 0.5% (or more than once in 200 years on average) of flooding from tidally influenced rivers and/or the sea.

- 2.8 The EA's data-pack in Appendix B shows 2 modelled scenarios of flood levels for this site, defended and undefended. These models are 2D, meaning that there are nodes within this site as opposed to flood levels within the river channel. Both nodes' flood levels are the same, meaning that there is negligible hydraulic gradient within the site. It is necessary to consider the undefended scenario as, although the bund offers some protection the flood water from the river could find a path on to this site around this through undefended properties to the east and/or west. Only the undefended levels will be considered from this point onwards. The 0.5% (1 in 200 years) level is 3.09m AOD. This is lower than the lowest crest level of the bunding at the SE corner.
- 2.9 The NPPF states that the predicted effects of climate change should be taken into account when determining a proposed development's flood risk, because the flood risk has to be assessed for the likely lifetime of developments.
- 2.10 The 0.5% (1 in 200 years) 2070 level is **3.53m AOD**. This takes into account the predicted rise in sea level for the predicted lifetime of industrial and commercial buildings and so is the critical flood level for the proposed development. This is the relevant level for considering any potential development. As the bund's level is lower than this the site is liable to flood – to a depth of over 1.2m in the lowest parts of the site.
- 2.11 Surface water flooding can occur when excess rainwater does not infiltrate into the ground, or is not intercepted by urban drainage systems, and instead flows across the surface. The EA's Online 'Surface Water Depth - Low Risk Scenario' (1 in 1000 years) Flood Map in Appendix B shows that the site is unaffected in this extreme storm.
- 2.12 Groundwater flooding can occur when groundwater rises up from the underlying aquifer to flood subsurface infrastructure or to emerge at the ground surface. This is generally caused by the rise of groundwater levels to extreme high levels in permeable consolidated aquifers (primarily chalk) in response to prolonged above average rainfall - or from hydraulic continuity with high water levels in adjacent rivers. Unless the proposed development includes a basement level, this can be discounted here.

Other sources of flooding

- 2.13 Sewer flooding occurs due to limited capacity or blockage in the sewer system causing backing up of storm water and effluent. There is no indication in ADC's Strategic Flood Risk Assessment (SFRA) – or

from the EA – that this site is prone to flooding from sewer failure.

- 2.14 Artificial sources: flooding from reservoirs, canals and docks. The EA reservoir flooding map in Appendix B shows the site is removed from this threat. There are no docks or canals in this vicinity.
- 2.15 History of Flooding: the EA's historical flood maps in Appendix B show the site is removed from the nearest recorded event.
- 2.16 In summary, the flood risk profile of this site is 'High' as the site is liable to flood from the Arun once the predicted rise in sea level is taken into account.

3 Proposed Development & 'The Sequential Test'

- 3.1 The proposal is to build a row of portal framed 4 industrial (workshop/storage) units with a first floor office in each – plus a WC and tea room on each of the ground floors. The total roofed area is 411m². The proposed scheme drawings are shown in Appendix D of this report.
- 3.1 The site lies in tidal FZ3A (High Risk), as summarised in Section 2.16 above.
- 3.2 Sequential / Exception Tests: The Sequential and Exception Tests are policy mechanisms created to discourage 'vulnerable use' developments in FZ3 – and Highly Vulnerable developments in FZ2. Unless wider planning benefits exist that offset the flood risk issues, this process 'steers' higher vulnerability uses to lower flood-risk zones (eg FZ2 and FZ1).
- 3.3 Vulnerability and the Sequential Test: the vulnerability classification of any new development should be considered. According to Table 2 Commercial and industrial uses (including offices) are classed as Less Vulnerable in Table 2 of the NPPF. Table 3 – see below – shows that Less Vulnerable uses are 'appropriate development' in FZ2 and FZ3A.

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

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	×	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	×	×	×

Key: ✓ Development is appropriate.
× Development should not be permitted.

Notes to table 3:

This table does not show:

- the application of the Sequential Test which guides development to Flood Zone 1 first, then Zone 2, and then Zone 3;
- flood risk assessment requirements; or
- the policy aims for each flood zone.

Figure 1: Table 3 of the NPPF

- 3.4 New buildings' floor levels have to be set + 0.3m above the 2070 '0.5%' level of 3.53m AOD for full compliance of the NPPF, ie + **3.83m AOD**. As this is 1.23m above the highest level within the 'ambient site' (north of the defence bund), this makes ground floors that comply all but impossible.

- 3.5 It is proposed to set the ground floor level of all 4 units at **2.8m AOD** with the (external) ground levels around the units adjusted to 2.6m AOD. All staff (occupants) of these units would be stationed at first floor level, ie none would be expected to work on a permanent basis at ground level. The first floor level will be set at 5.525m AOD, ie 1.995m above the critical flood level of 3.53m AOD.
- 3.6 Flood Mitigation: Due to the ground floor being 0.73m below the critical flood level, flood resilient construction (techniques and measures that minimise flood damage/disruption) are proposed up to **3.83m AOD**, this providing 0.3m of freeboard above the flood level.
- 3.7 Flood resilient measures and techniques are proposed up to 3.83m AOD. Industrial units' typical construction that includes solid concrete flooring and plastic coated metal cladding (or brick/block masonry) and electrical distribution boards, cabling and sockets above the critical level are proposed.
- 3.8 In addition to the resilient construction, a non-return valve will be fitted to the foul drainage network. This will reduce the risk of foul sewage flooding the ground floor, this being just as valuable in lesser storm events.
- 3.9 Safe Access To Dry Land: In order to comply with the NPPF, all occupants must be able to make their way, unassisted by the Emergency Services, to dry land. This is known as 'safe access to dry land' and it does not have to be dry, just not *hazardous* (safe).
- 3.10 The access/egress of the site, being at 2.345m AOD makes the critical depth over 1200mm. This depth would be hazardous to all users, whether able bodied or not. Because there is no guarantee of comfortable seating for all the unit's occupants (staff) at first floor, this office would not qualify as a 'flood refuge'. This space, which has a WC and facility for making hot drinks and snacks could be used as a refuge - but only as a last resort.
- 3.11 The Annexe at the back of this report contains a Flood Risk Management Plan, which is needed to raise the awareness of the flood risk profile and the predicted flood depth of up to 1.2m (hazardous). With this Plan fully implemented and reviewed regularly by each business, it is contended that the lack of safe access/egress will have been mitigated.

4 Sustainable Surface Water Drainage Design

4.1 One of the main tenets of the PPG is for new developments *not* to increase the flood risk of neighbouring/downstream properties. The PPG states that all developments should be designed in a sustainable manner and where SUDS (sustainable urban drainage systems) techniques are not incorporated, this approach must be justified.

4.2 The SuDS hierarchy must be applied before deciding how the development's surface water should be dealt with, this being:-

- Infiltration to ground, namely features such as soakaways, infiltration trenches and the like;
- Discharging to a watercourse;
- Discharging to a public sewer.

As there is no public sewer serving this area only the 1st and 2nd option are available. Much depends on the findings of the Site Investigation (SI) and Drainage Survey that will be carried out at the next stage.

4.3 The measures in the 'SUDS management train' have been considered here:

- Green roofs: not considered in keeping with the area's character; also not a practical solution due to excessive weight and maintenance costs;
- Rainwater harvesting: limited benefits due to there not being enough demand for harvested water, ie relatively few wc flushes for the area of roof;
- Porous paving/ infiltration trenches/blankets: these are proposed here;
- Balancing Ponds/swales/wetlands/filter strips: there is limited space for these features;
- Attenuation tanks: not needed with porous pavings;
- Soakaways: not needed if porous pavings work. The probable high water table may make these unviable here.

4.4 SW drainage strategy and the SUDS hierarchy: as stated in section 2 above, infiltration is likely to be feasible due to the combination of gravels and Chalk geology. A full Site Investigation BRE365 soakage test will be carried out at the next stage to confirm this. The water table may be too high for infiltration to be relied upon.

4.5 Rainwater harvesting is considered to be unviable in industrial units where there is very limited scope for WC flushing. Unless an active system is installed (and these are expensive) no reduction in the stored volume is possible. Green roofs (and the similar, grey, brown and blue roofs) are similarly hard to justify over the long-term due to structural load and ongoing maintenance costs.

4.6 The surface water from the roofed areas shall be discharged via an infiltration blanket under the external hardstanding. The parking bays will be surfaced with porous pavings. Depending on the

findings in the forthcoming SI, the water will be allowed to infiltrate or be routed to the same outfall as the current drainage system (ie assuming the site is positively drained). This is subject to a drainage survey being carried out.

- 4.7 The surface water offsite runoff rate from *new* developments has to be restricted to the current site's greenfield runoff rate – as closely as practically possible. The greenfield runoff calculation in Appendix E shows that in this area (which has a very low soil runoff coefficient because of the chalk/gravels) the Q1 – Q30 rates are negligible and the Q100 rate is 0.1l/s – for 1230m² of contributing area.
- 4.8 2 Source Control calculations have been worked up (see Appendix E). The first set assume that infiltration is viable. An assumed soakage rate of 2×10^{-5} m/s has been used to show the maximum depth within a realistic infiltration blanket (namely 60m x 13m). In the critical, 120 minute winter, storm – 100 years + 40% climate change scenario – this depth would be 0.179m. This is significantly less than the depth of sub-base needed as a matter of course for strength/load distribution/anti-frost.
- 4.9 The second set of Source Control calculations in Appendix E show no infiltration being relied on. Instead, the surface water would be routed to the same outfall as the current site, ie the nearby river. It is proposed to restrict the flow rate to the practical minimum rate of vortex restriction devices such as hydrobrakes – namely 2.0l/s. The excess water volume shall be stored upstream of the control device's manhole in the infiltration blanket. This will have the same dimensions as the infiltrating option – as set out in section 4.8 above. The maximum depth within the sub-base is 0.237m, again less than the depth needed for strength/load distribution/anti-frost.
- 4.10 Maintenance: A Management and Maintenance Plan will be drafted once a strategy has been determined, which will include the SuDS components' inspections/intervals to industry standards. The Maintenance role will be contracted out to a Property Maintenance Company.
- 4.11 Foul water drainage: as outlined in section 2.6 above, there are no public sewers serving Riverside Industrial Estate. It is likely that a privately owned sewerage network covers the estate, as it is unlikely that every unit would have its own sewage treatment facility. This shall be explored during the drainage survey.

5 Summary

- 5.1 In summary, this site is in tidal Flood Zone 3A, according to the EA's fluvial modelled flood data. The 2070 '0.5%' (1 in 200 years) level is **3.53m AOD**, making most of the site liable to flood to over 1.2m in depth.
- 5.2 The proposed development is for building 4 new industrial (workshop/storage) units with first floor offices and w.c.s. The ground floor level of all units will be set at 2.8m AOD with the (external) ground levels around the units adjusted to 2.6m AOD. The first floor level will be set at 5.525m AOD, ie 1.995m above the critical flood level.
- 5.3 The building's construction will be resilient (eg concrete floor and concrete/ steel frame with minimum of finishes) up to the critical flood level plus 0.3 freeboard, ie **3.83m AOD**.
- 5.4 A non-return valve will be fitted to the foul drainage network, to reduce the risk of foul sewage flooding the ground floor.
- 5.5 There is no safe route to dry land. The first floor office will provide only a refuge of last resort. Although there is a WC and area for making hot drinks and snacks, there is no guarantee that all the occupants in each unit would have comfortable seating.
- 5.6 A Flood Risk Management Plan will raise the awareness of the flood risk profile and the predicted flood depth of up to 1.2m (hazardous). The first draft of such a Plan is contained within the Annexe at the back of this report. Each unit's Manager will be responsible for implementing and reviewing this – all as set out in this first draft.
- 5.7 Surface water drainage: as the soil type is Chalk overlain by sand/gravels infiltration should be viable, subject to the water table level. A Site Investigation will be undertaken at the next stage, which will show how viable infiltration methods are here.
- 5.8 The development's surface water will be routed off site sustainably – either to ground or to the River Arun at the same rate as the practical minimum limit of vortex devices, namely 2.0l/s in the critical 100 years + 40% climate change storm event.

Conclusion: with the flood mitigation measures and SuDS features outlined in this report in place, this development complies fully with the 2019 NPPF and current PPG.

- End of Report -

Appendix A

Site Location Maps & Aerial Photo

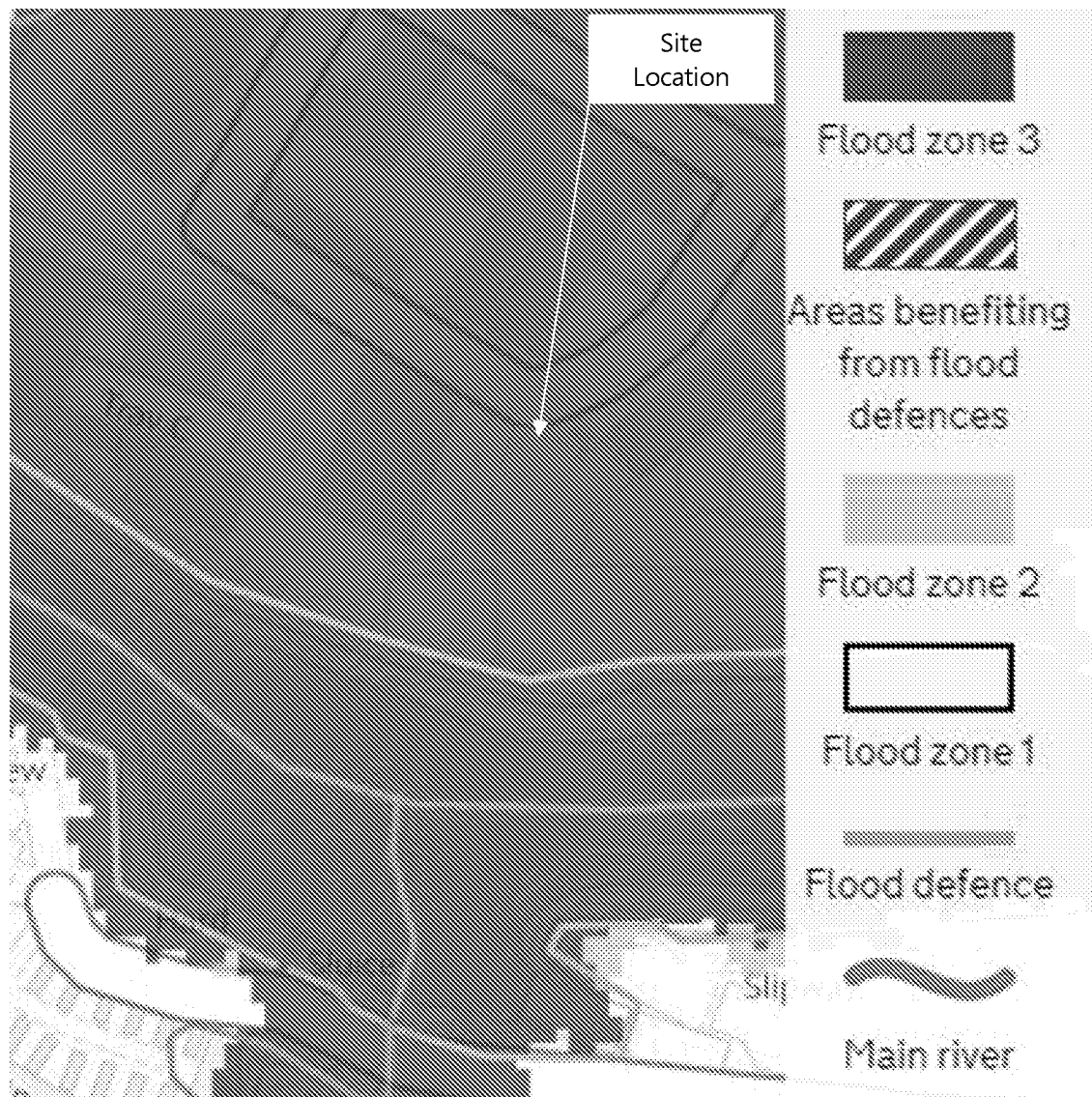






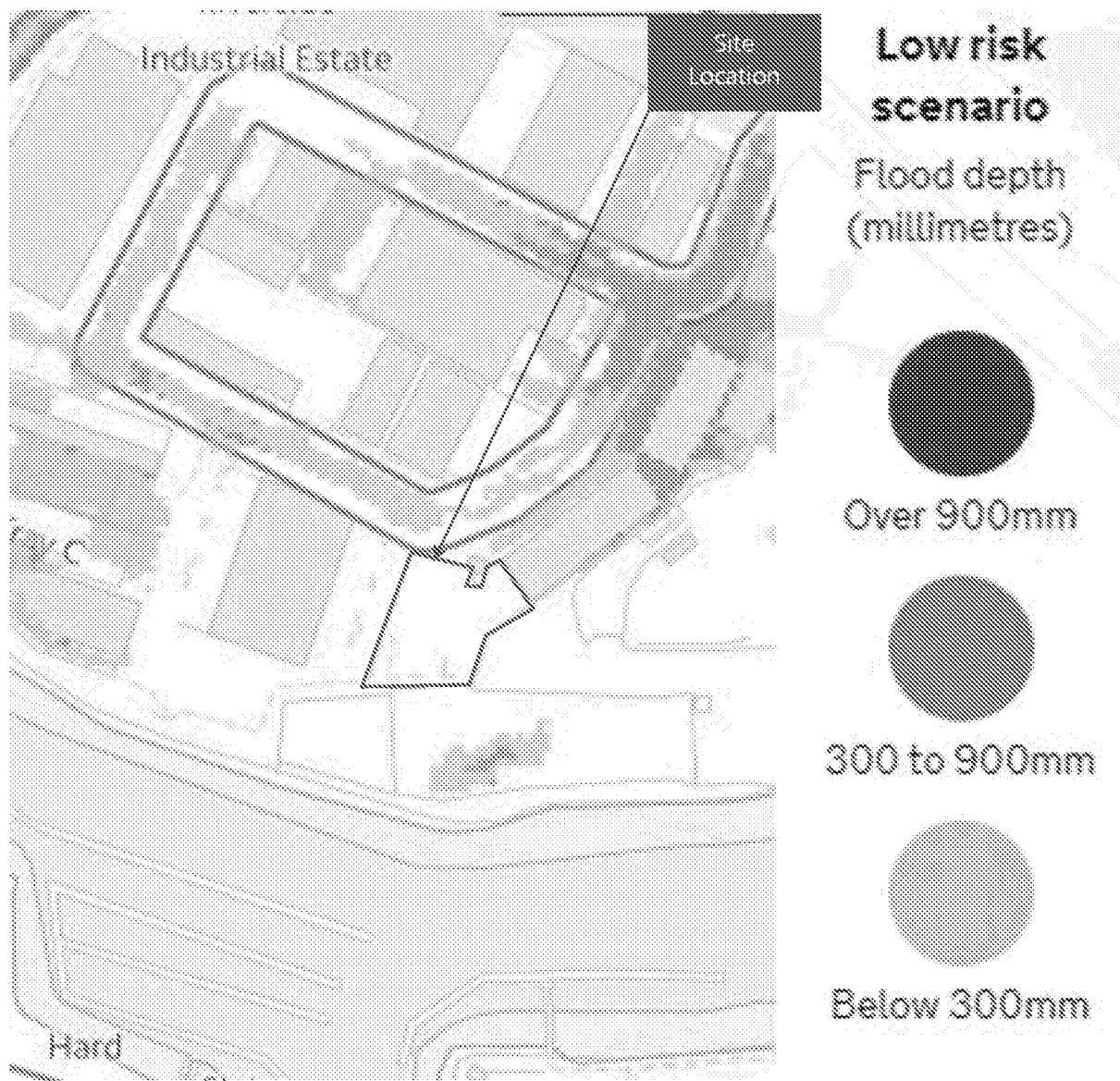
Appendix B

Environment Agency Flood Data



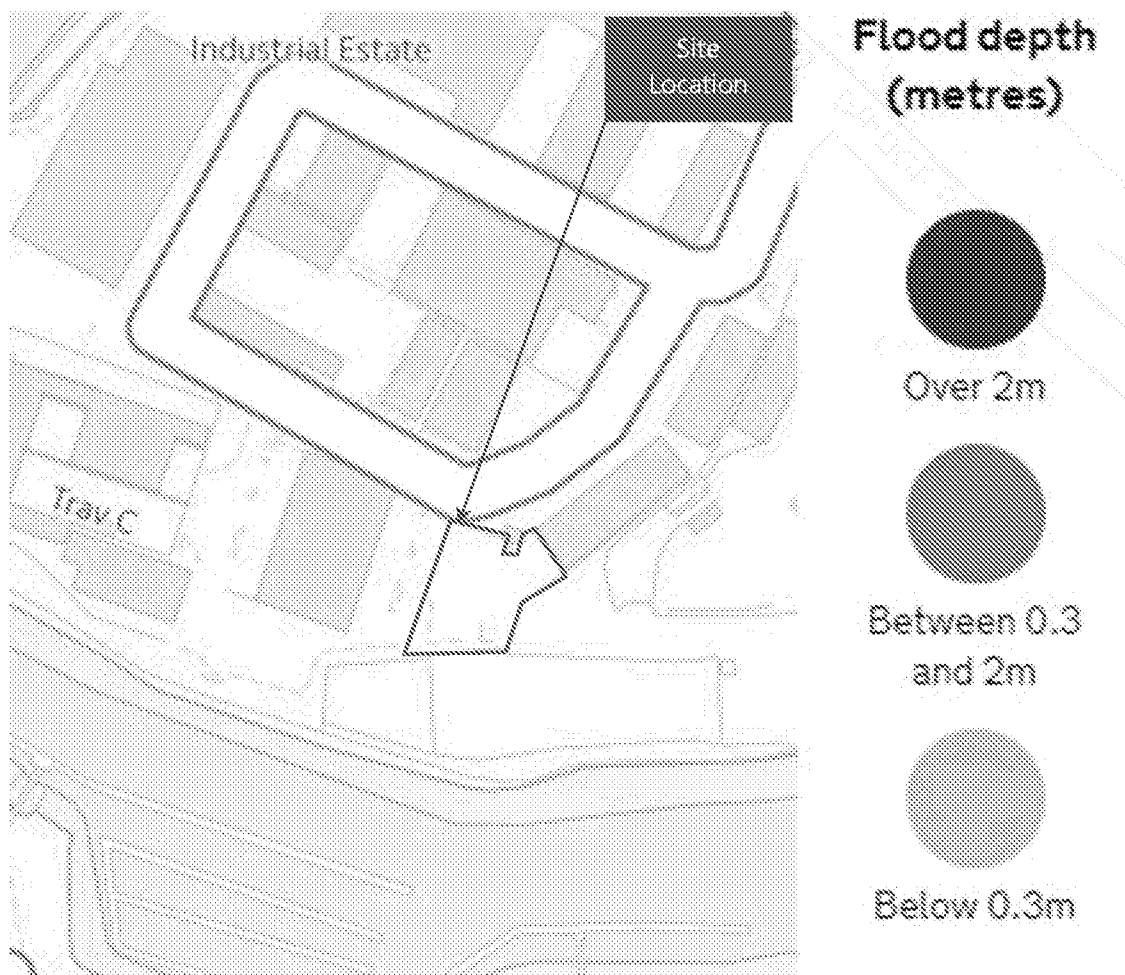
EA's Online Flood Map for Planning (Rivers and Seas)

The site is in fluvial Flood Zone 3 (FZ3)



EA's Online Surface Water Flood Depth Map in the 'Low Risk Scenario'
(1 in 1000 years storm event)

The site is not susceptible to flooding in this extreme scenario.



EA's Online Risk of Flooding from Reservoirs' Map

The site is not susceptible to flooding if a nearby reservoir were to fail

John Pakenham
Gta Civils And Transport
66a Church Walk,
Burgess Hill,
West Sussex,
RH15 9AS

Our ref: SSD137266
Date: 20/08/2019

Dear John Pakenham,

Enquiry Regarding Product 4 for Flood Risk Assessment for the Site Address Unit T, Riverside Industrial Estate, Bridge Road, Littlehampton, BN17 5DF.

Thank you for your enquiry which was received on 02 August 2019.

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

There are flood defences in the form of a riverside flood wall. The Asset ID is 447212. The upstream crest level is 4.8 and the downstream is 4.8. The estimated standard of protection is 1 in 300 years (0.3% AEP). The estimated condition grade is good. The asset is maintained by a Private 3rd Party.

Model Information

The model used was the River Arun To East Head Model which was completed by JBA Consulting in 2016.

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, **Arun District Council** for a more comprehensive flood history check.

FRA advisory text

Name	Product 4
Description	Detailed Flood Risk Assessment Map for Unit T, Riverside Industrial Estate, Bridge Road, Littlehampton, BN17 5DF
Licence	Open Government Licence
Information Warning - OS background mapping	<i>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.</i>
Attribution	Contains Environment Agency information © Environment Agency and/or database rights. Contains Ordnance Survey data © Crown copyright 2018 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](#)

Please get in touch if you have any further queries or contact us within two months if you'd like us to review the information we have sent.

Yours sincerely,

Misha Misri
Flood & Coastal Risk Management Officer,
Partnership & Strategic Overview,
West Sussex,
Solent and South Downs





Environment
Agency



N

Legend

-  Site Boundary
-  Main River
-  0.5% AEP (Undefended Tidal)
-  0.5% AEP (2070) NPPF (Undefended Tidal)
-  0.5% AEP (2115) NPPF (Undefended Tidal)
-  0.1% AEP (Undefended Tidal)

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

Scale: 1:10,000



00.2250.45

Kilometers



Environment
Agency

N



Legend

 Site Nodes



 Site Boundary

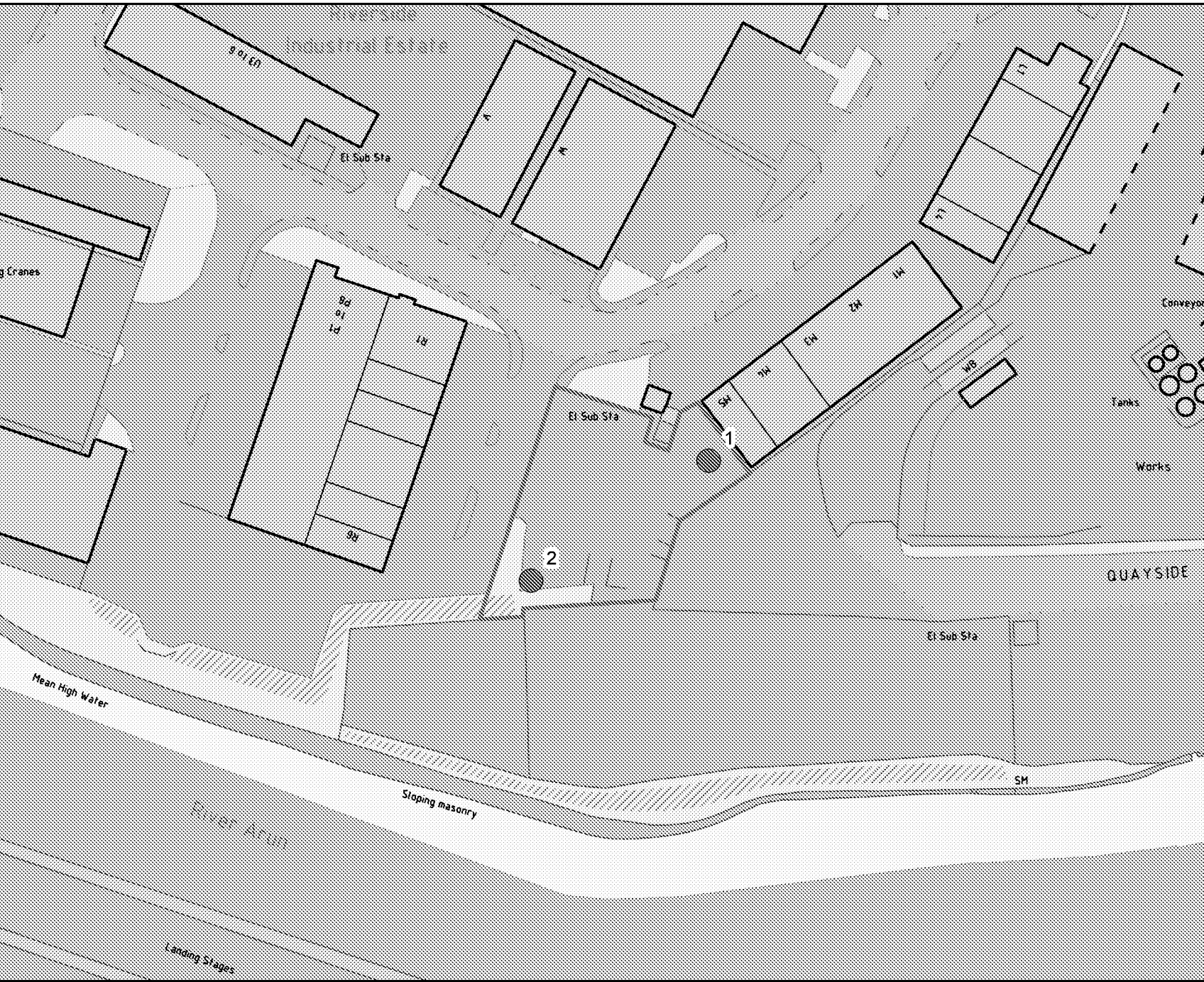
Scale: 1:1,000

0

0.0225

0.045

Kilometers



Product 4 Flood Risk Data Requested by: Gta Civils and Transport

Site: Unit T, Riverside Industrial Estate, Bridge Road, Littlehampton, BN17 5DF

Table 1: Water Levels: Tidal Undefended

Node Ref	NGR		Modelled Flood Levels in Metres AOD			
	Eastings	Northings	Undefended Annual Exceedance Probability			
			0.5%	0.5% (2070)	0.5% (2115)	0.1%
1	501835	102381	3.09	3.53	4.29	3.25
2	501802	102358	3.09	3.53	4.29	3.25

Table 2: Water Levels: Tidal Defended

Node Ref	NGR		Modelled Flood Levels in Metres AOD			
	Eastings	Northings	Defended Annual Exceedance Probability			
			0.5%	0.5% (2070)	0.5% (2115)	0.1%
1	501835	102381	2.52	3.52	4.05	2.65
2	501802	102358	2.56	3.52	4.05	2.72

Table 3: Water Depths: Tidal Undefended

Node Ref	NGR		Modelled Flood Depths in Metres			
	Eastings	Northings	Undefended Annual Exceedance Probability			
			0.5%	0.5% (2070)	0.5% (2115)	0.1%
1	501835	102381	0.66	1.10	1.86	0.82
2	501802	102358	0.60	1.03	1.79	0.75

Table 4: Water Depths: Tidal Defended

Node Ref	NGR		Modelled Flood Depths in Metres			
	Eastings	Northings	Defended Annual Exceedance Probability			
			0.5%	0.5% (2070)	0.5% (2115)	0.1%
1	501835	102381	0.08	1.09	1.62	0.22
2	501802	102358	0.04	0.98	1.51	0.19

All levels taken from: River Arun To East Head Model

Produced on: 20/08/2019

There is no additional information or health warnings for these levels/depths or the model from which they have been produced.

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

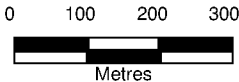
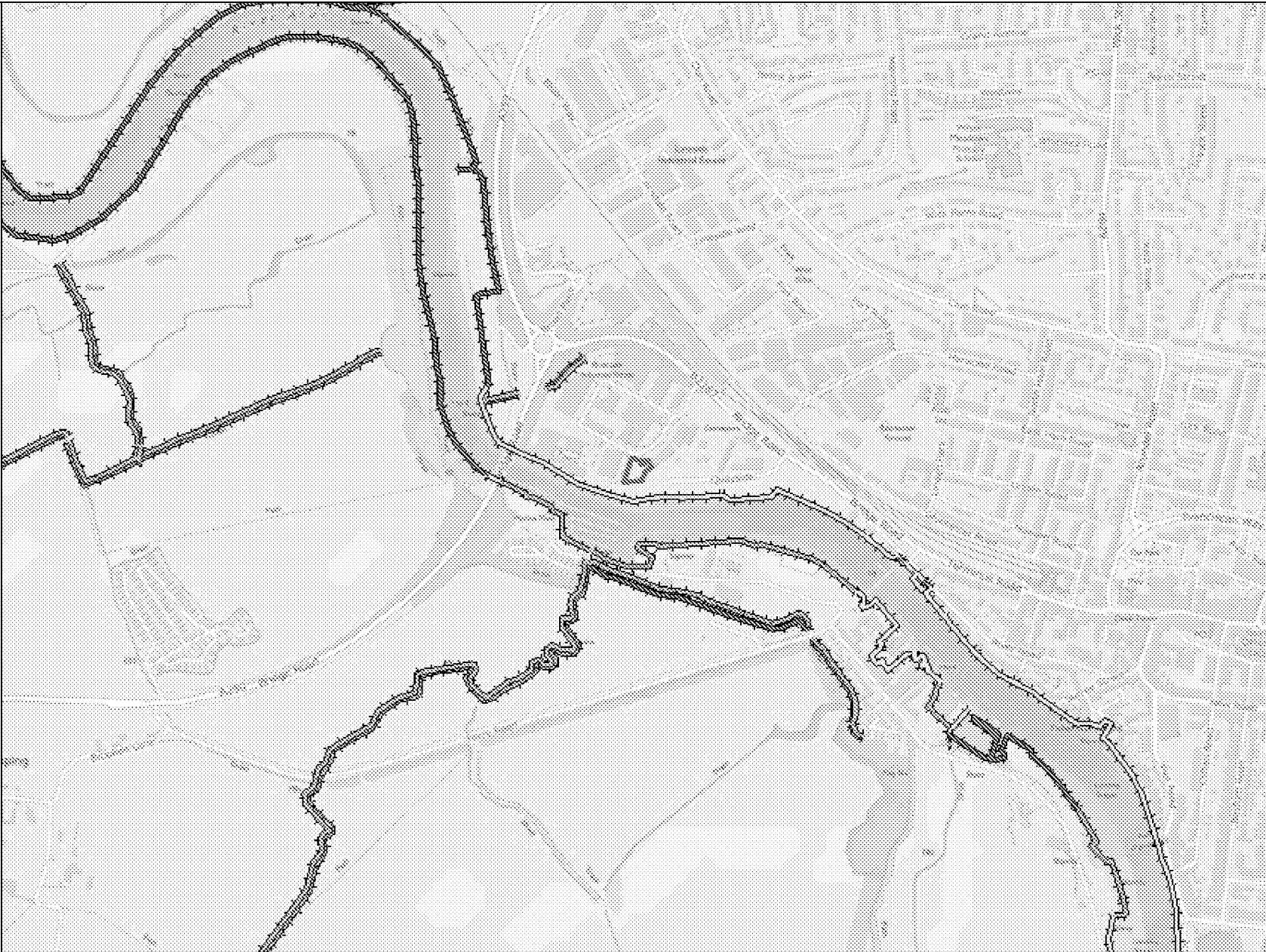
Legend

Defences (EA maintained)

- Asset type not defined
- Embankment
- Wall
- Flood Gate
- Demountable Defence
- Bridge Abutment
- High Ground
- Beach
- Barrier Beach
- Promenade
- Quay
- Cliff
- Dunes

Defences (3rd party maintained)

- Asset type not defined
- Embankment
- Wall
- Flood Gate
- Demountable Defence
- Bridge Abutment
- High Ground
- Beach
- Barrier Beach
- Promenade
- Quay
- Cliff
- Dunes

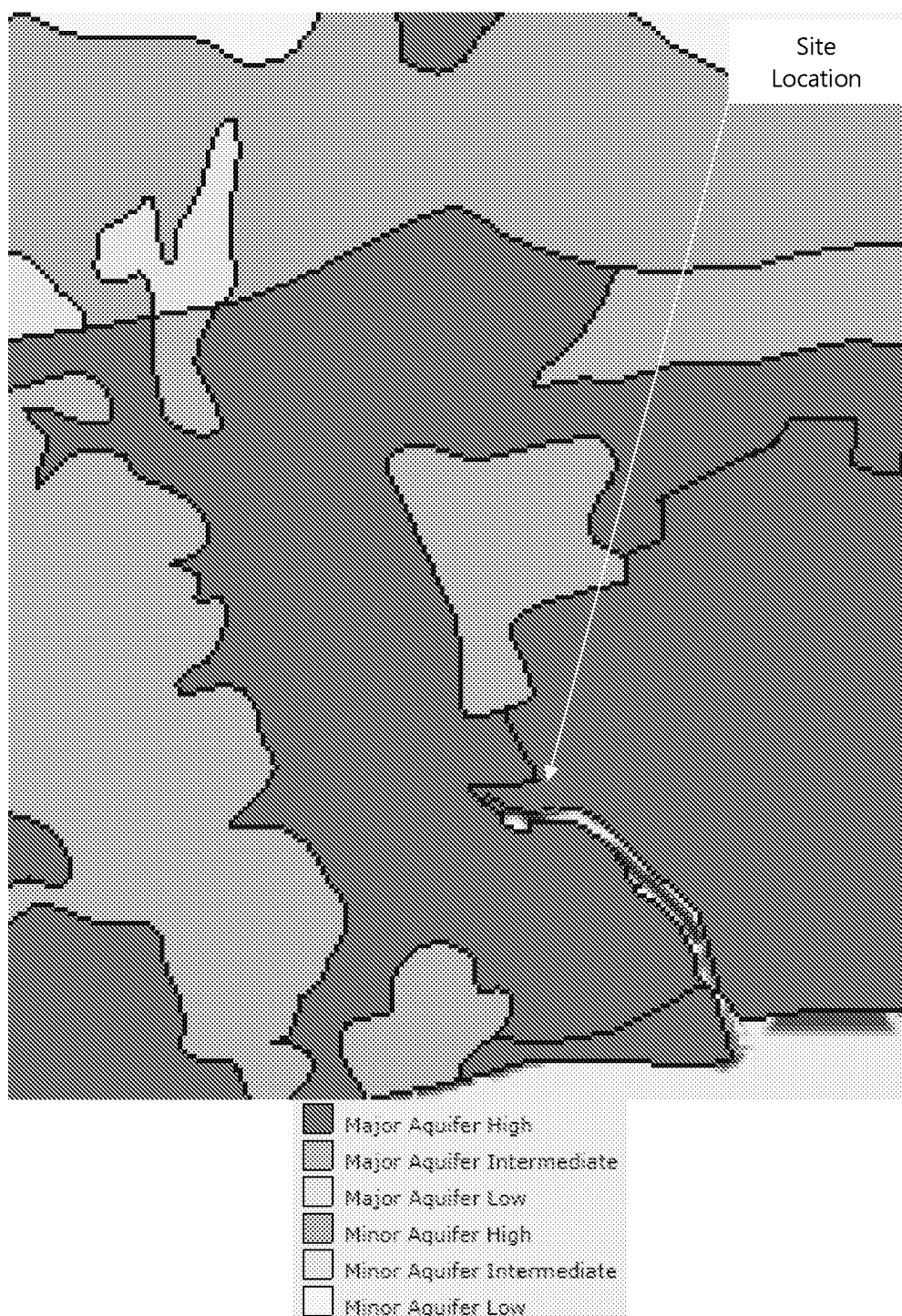




Historic Flood Map

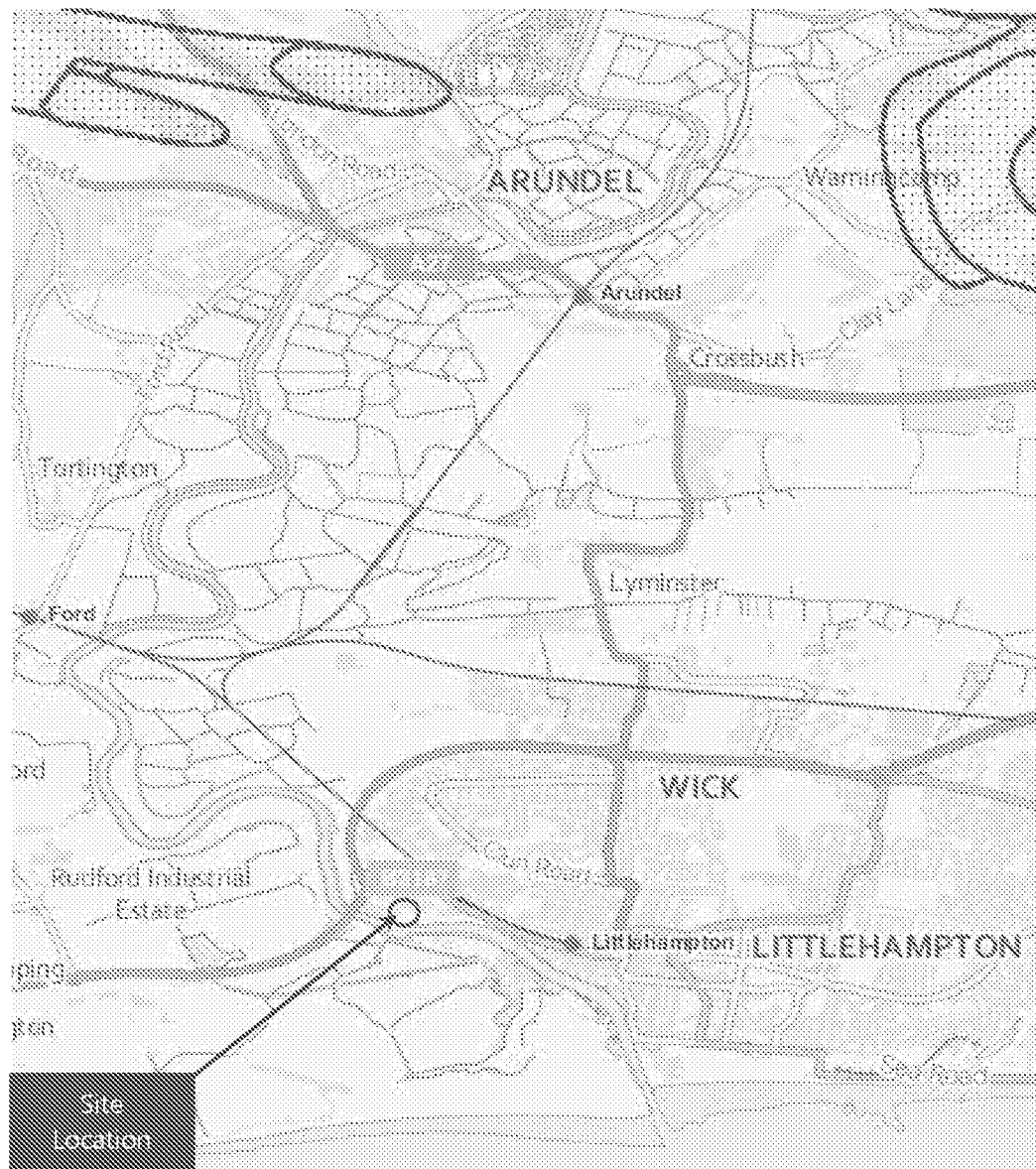
Environment Agency's Online Historic Flood Map

The site is removed from the nearest recorded Historic Flood



Environment Agency's Groundwater Vulnerability Zone Map

The site overlies a 'Major Aquifer High'



Legend

Source Protection Zones (Merged)

- ☐ Zone I = Inner Protection Zone
- ☐ Zone II = Outer Protection Zone
- ☐ Zone III = Total Catchment
- ☐ Zone of Special Interest
- ☐ Other

Environment Agency's Online Groundwater Source Protection Zones Map

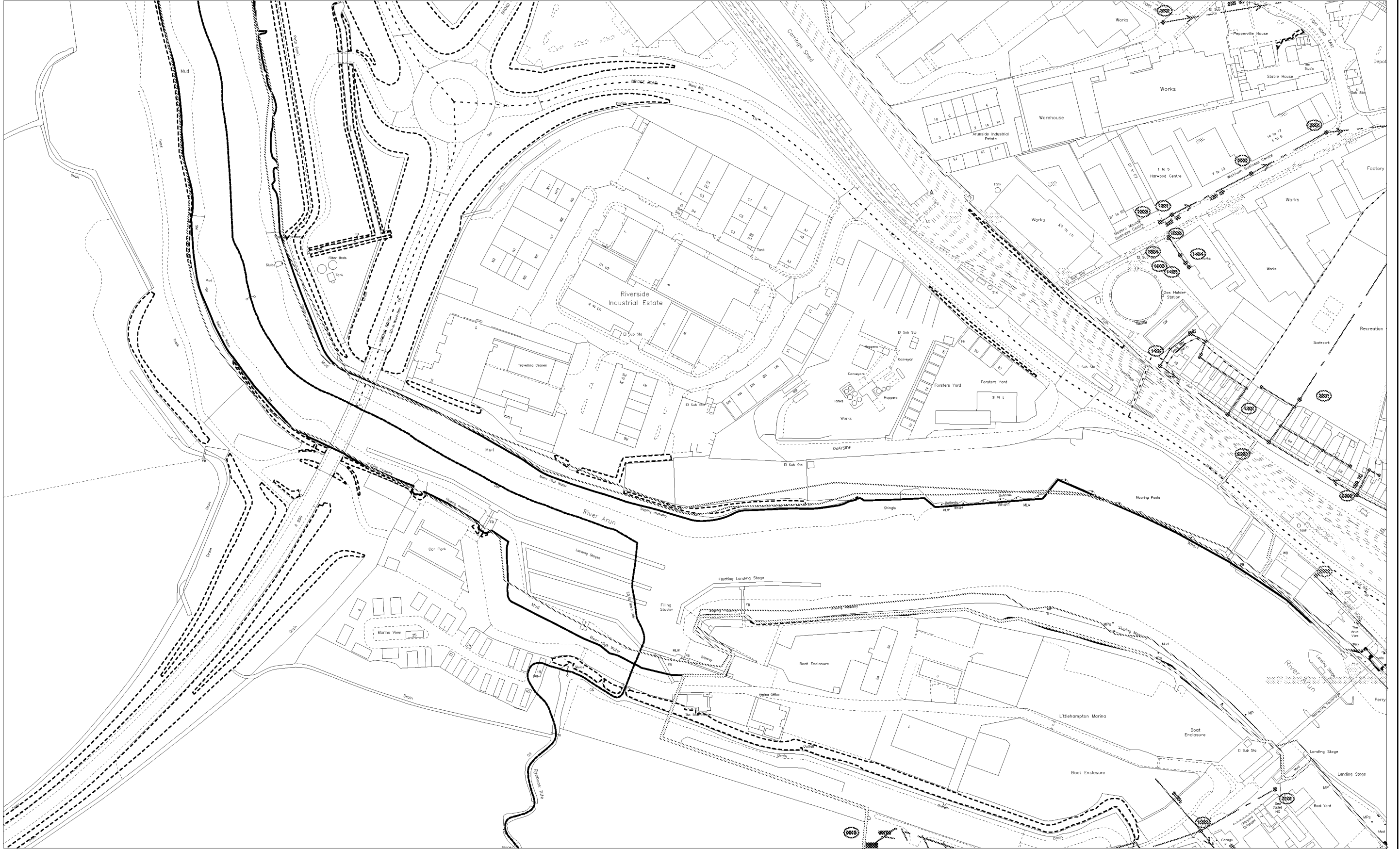
The site lies outside of all recorded Groundwater Protection Zones

Appendix C

Topographic Survey and Sewer Records

SEWER RECORDS PAGE 1 OF 2

102665



102087

501345

O.S. REF.

TQ0102SE

Title: 351970_Sussex Building, Unit T

Drawn by: kumaria

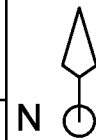
Scale: 1:2500

Date: 11/09/2019

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy.

The actual positions should be determined on site.
WARNING: BAC pipes are constructed of Bonded Asbestos Cement
WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement

Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved
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 Southern Water

END

SEWER RECORDS PAGE 2 OF 2

Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape
0450X	1.84		300	CP	CIRC																		
0552X			300	CP	CIRC																		
1002X	2.25	0.45	150	PVC	CIRC																		
1301X		1.75	200	VC	CIRC																		
1401X	2.79	1.93	200	VC	CIRC																		
1402X			UNK	VC	CIRC																		
1403X			UNK	UNK	UNK																		
1404X			UNK	UNK	UNK																		
1405X			UNK	UNK	UNK																		
140DX			UNK	UNK	UNK																		
141DX			UNK	UNK	UNK																		
142DX			UNK	VC	CIRC																		
143DX			UNK	VC	CIRC																		
144DX			UNK	VC	CIRC																		
1450X	2.35	0.99	300	CP	CIRC																		
1501X	2.37	1.05	225	CP	CIRC																		
1502X	2.53	0.91	225	CP	CIRC																		
1503X	2.32	0.92	225	VC	CIRC																		
1504X			100	VC	CIRC																		
1551X	2.3	1.23	300	CP	CIRC																		
1601X			225	VC	CIRC																		
2101X			UNK	UNK	CIRC																		
2202X	3.68	2.61	150	VC	CIRC																		
2301X	3.92		250	VC	CIRC																		
2302X	4.09	2.24	200	VC	CIRC																		
2303X	3.82	1.4	250	VC	CIRC																		
230DX			UNK	UNK	UNK																		
231DX			250	VC	CIRC																		
232DX			250	VC	CIRC																		
233BX			150	VC	CIRC																		
233DX			UNK	UNK	UNK																		
234DX			UNK	UNK	UNK																		
240DX			UNK	UNK	UNK																		
2501X	2.85	0.75	225	CP	CIRC																		
2550X	2.87	1.6	300	CP	CIRC																		

LINE STYLES / COLOURS

Brown	----- Foul
	----- Foul Siphon Sewer
	----- Foul Vacuum Main
	----- Foul Rising Main
Red	----- Combined
	----- Combined Siphon Sewer
	----- Combined Rising Main
	----- Lateral Drain
Orange	----- Building Over Agreement Area
Dark Blue	----- Treated Effluent
Purple	----- Sludge
	----- Sewer Catchment
	----- Section 104 Area
Light Blue	----- Surface Water
	----- Surface Water Rising Main
Yellow	----- Private
Green	----- Access Shaft
	----- Decommissioned

MATERIALS

AK	Alkaline
BAC	Bonded Asbestos Cement
BRC	Brick (Common)
BRE	Brick (Engineering)
CC	Concrete Box Culvert
CI	Cast Iron
CO	Concrete (In-Situ)
CP	Concrete (Pre-Cast)
CSB	Concrete Segments (bolted)
CSU	Concrete Segments (unbolted)
DI	Ductile Iron
GRG	Glass Reinforced Concrete
GRP	Glass Reinforced Plastic
MAC	Masonry in regular Courses
MAR	Masonry in random Courses
PE	Polyethylene
PF	Pitch Fibre
PP	Polypropylene
PVC	Polyvinyl Chloride
RFW	Reinforced Plastic Matrix
SI	Spun Iron
ST	Steel
VC	Verified Clay
XXX	Other
ZZZ	Unknown

Manhole (SW)
Manhole (F&C)
Lamp hole (SW)
Lamp hole (F&C)
Pumping Station (SW)
Pumping Station (F&C)
Side entry manhole (SW)
Side entry manhole (F&C)
Blind shaft (SW)
Blind shaft (F&C)
Ejector station (SW)
Ejector station (F&C)
Watertight door (SW)
Watertight door (F&C)
Flushing ch. Min-e (SW)
Flushing ch. Min-e (F&C)
Flushing ch. No-e (SW)
Flushing ch. No-e (F&C)
Demanction Chamber

LEGEND - SEWERS

Washout (SW)
Washout (F&C)
Rodding Eye (SW)
Rodding Eye (F&C)
Gauging point (SW)
Gauging point (F&C)
Intercept chamber (SW)
Intercept chamber (F&C)
Storm Tank (SW)
Storm Tank (F&C)
Vortex chamber (SW)
Vortex chamber (F&C)
Label ellipse
Dummy/S24 manhole
Outfall
Penstock chamber
Demiboards
Storm Overflow
Backdrop manhole

Other (s)
Other
Change In sewer (s)
Change In sewer
Rafflux valve
Flap valve
Cascade
Anode
Valve
Closed Valve
Air Valve
Hatch box (SW)
Hatch box (F&C)
Direction arrow
Emptying valve
Catchpit
Soakaway
Inlet
Balancing Pond

SHAPES (S)

A	Arched	R	Rectangular
B	Barrel	S	Square
C	Circular	T	Trapezoidal
E	Egg	U	U Shape
H	Horseshoe	X	Other

NODE REFERENCING SYSTEM	
1st digit:	hundred metre easting identifier
2nd digit:	hundred metre northing identifier
3rd digit:	sewer type identifier
4th digit:	next sequential node

Drawn by: kumaria

Title: 351970_Sussex Building, Unit T

Date: 11/09/2019



Appendix D

Proposed Scheme Drawings

R1

M2

M3

M4

M5

El Sub Sta

UNIT 1

UNIT 2

UNIT 3

UNIT 4

3
4
5
6
7

8
9
10
11
12

PROPOSED SITE PLAN

SUSSEX BUILDING CONSULTANCY LIMITED

UNIT T RIVERSIDE INDUSTRIAL ESTATE,
LITTLEHAMPTON, WEST SUSSEX.

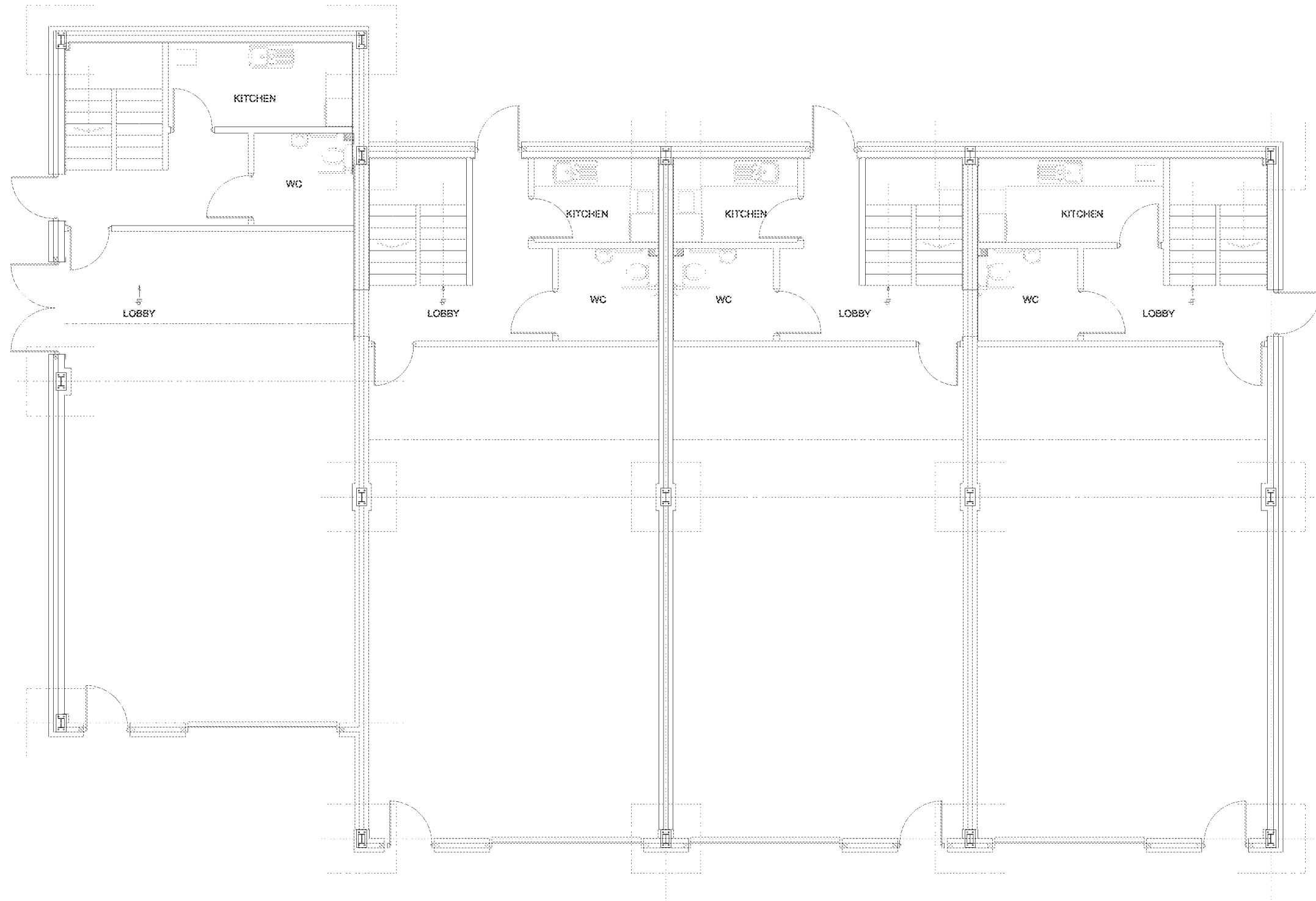
SCALE - 1/250 REV - DATE - 31/01/2020



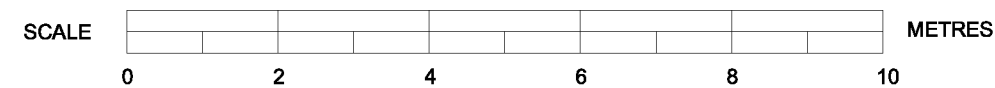
LABC

3 NORTHCOTE ROAD
BOGNOR REGIS
PO21 5LZ

TEL/FAX - (01243) 861379



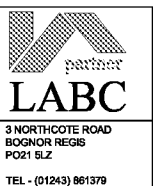
PROPOSED GROUND FLOOR PLAN



SUSSEX BUILDING CONSULTANCY LIMITED

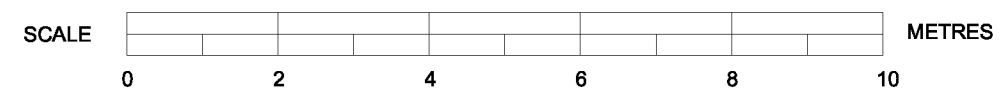
UNIT T RIVERSIDE INDUSTRIAL ESTATE,
LITTLEHAMPTON, WEST SUSSEX.

SCALE - 1/100 REV - DATE - 31/01/2020

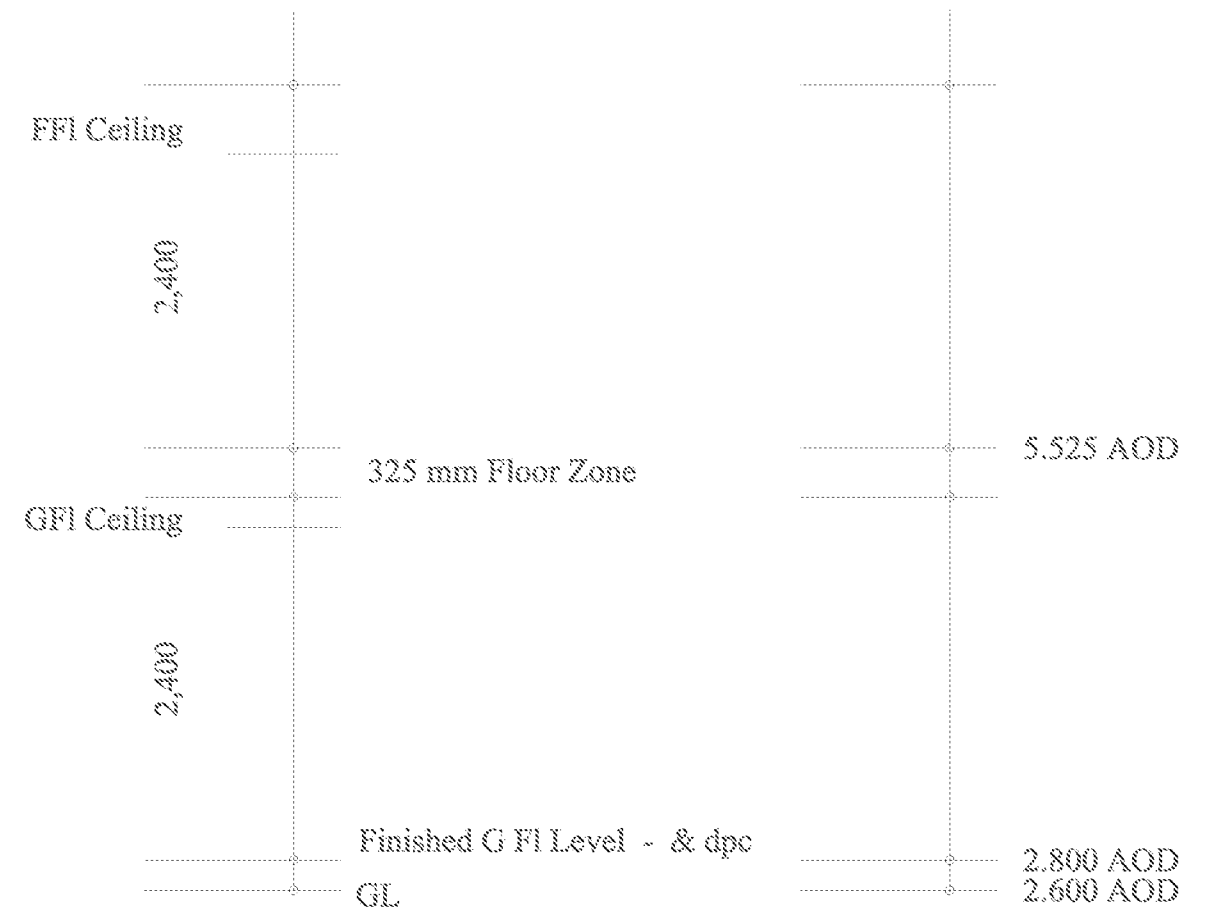
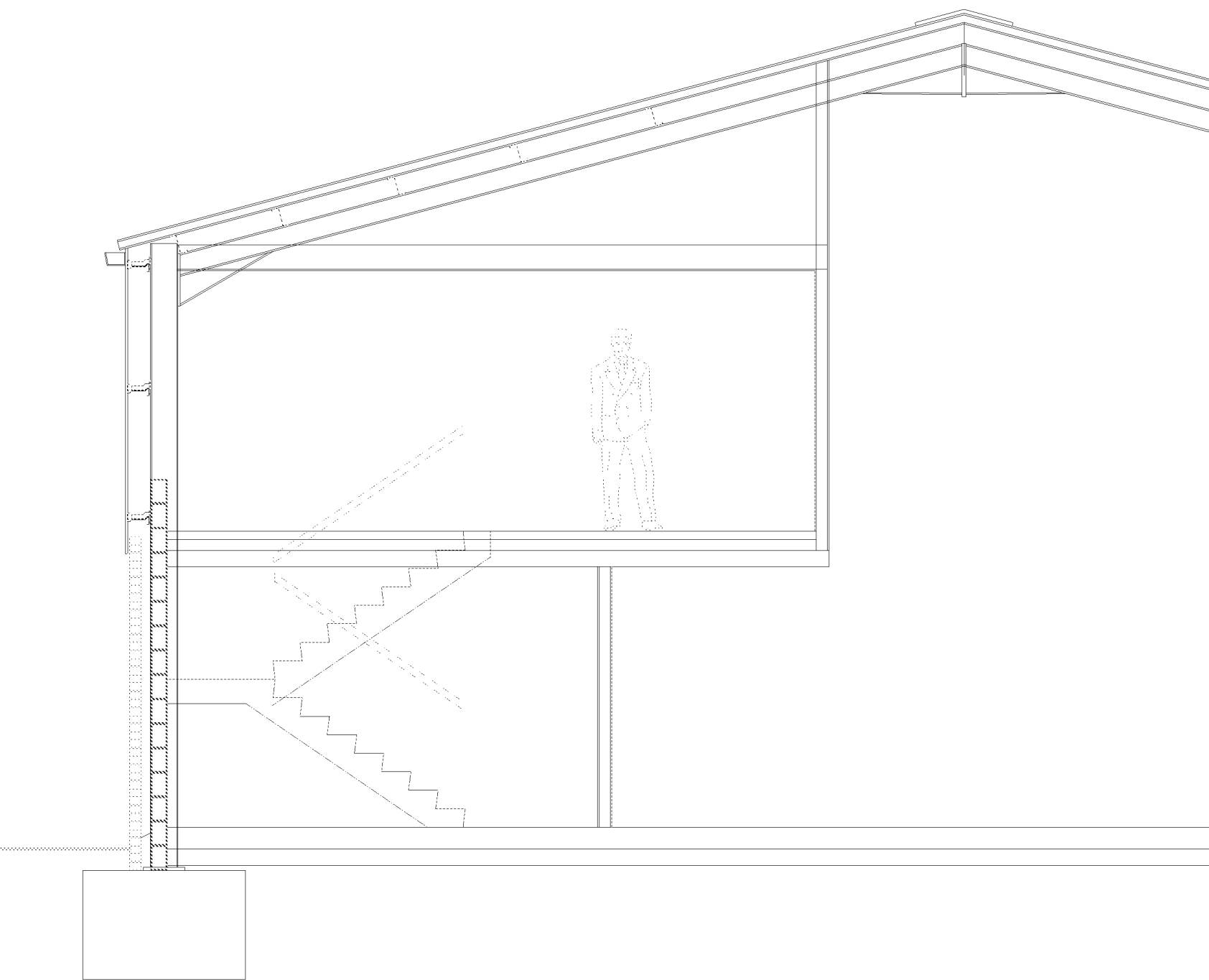




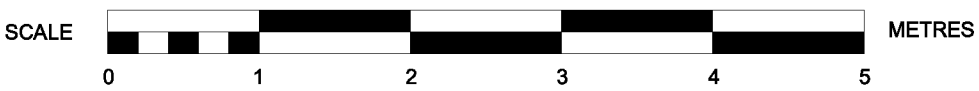
PROPOSED FIRST FLOOR PLAN



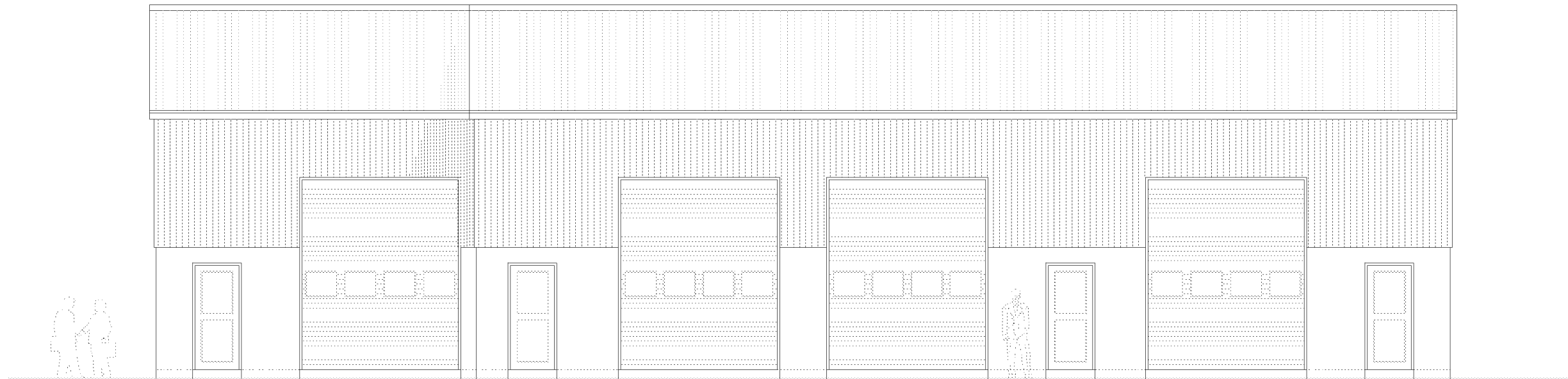
SUSSEX BUILDING CONSULTANCY LIMITED		 LABC 3 NORTHCOTE ROAD BOGNOR REGIS PO21 9LZ TEL - (01243) 961379
UNIT T RIVERSIDE INDUSTRIAL ESTATE, LITTLEHAMPTON, WEST SUSSEX.		
SCALE - 1/100 REV - A DATE - 11/02/2020		



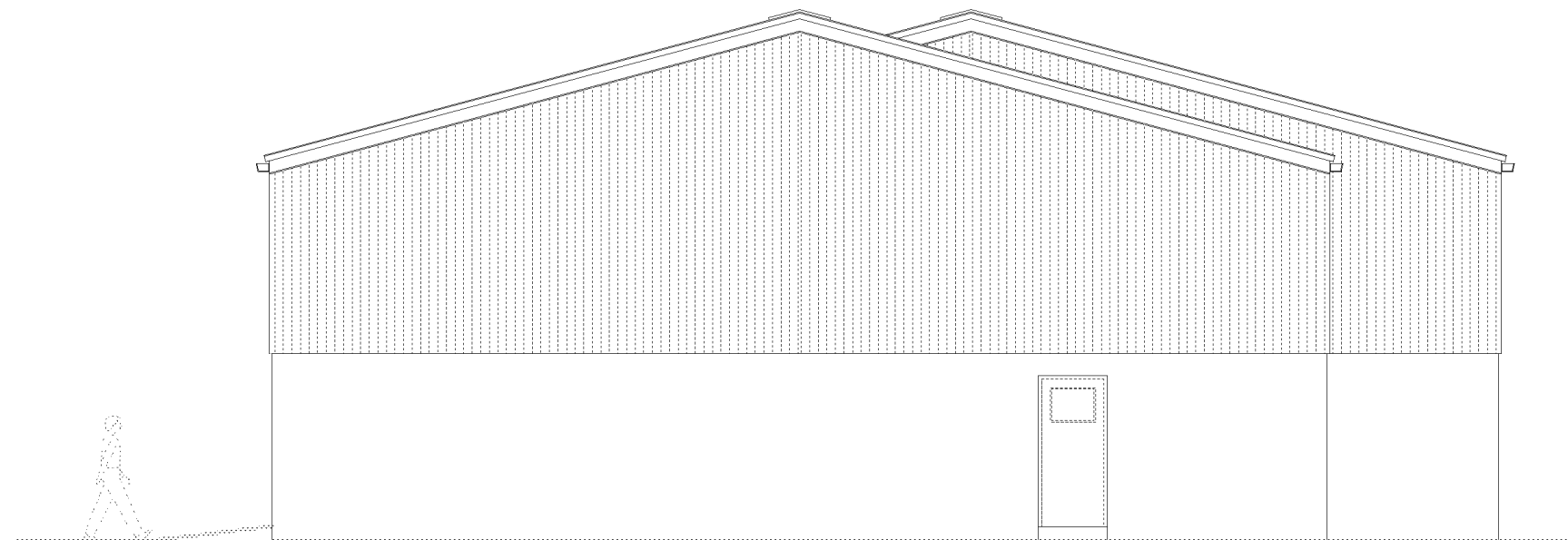
PROPOSED CROSS SECTION



SUSSEX BUILDING CONSULTANCY LIMITED		 LABC 3 NORTHCOTE ROAD BOGNOR REGIS PO21 5LZ TEL/FAX - (01243) 861379
UNIT T, RIVERSIDE INDUSTRIAL ESTATE, LITTLEHAMPTON.		
SCALE - 1/50 REV - DATE - 31/01/2020		



WEST ELEVATION



SOUTH ELEVATION

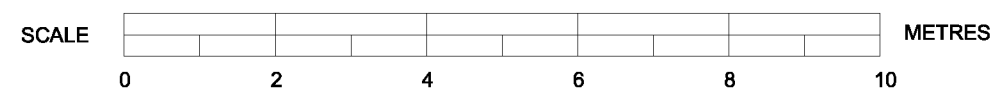
NOTES

ROOF - Corrugated profiled steel roofing panels.

WALLS - Face brick detail to lower plinth with corrugated insulated steel profiled cladding above.

DOORS - Main doors to be metal roller shutter types with vision panels. Personnel doors to be white PVC framed double glazed units.

WINDOWS - White PVC framed double glazed units.



PROPOSED ELEVATIONS

SUSSEX BUILDING CONSULTANCY LIMITED	 LABC 3 NORTHCOTE ROAD BOGNOR REGIS PO21 5LZ TEL - (01243) 881379
UNIT T RIVERSIDE INDUSTRIAL ESTATE, LITTLEHAMPTON, WEST SUSSEX.	
SCALE - 1/100 REV - A DATE - 11/02/2020	

Appendix E

Micro Drainage Calculations

GTA Civils Ltd		Page 1
Gloucester House 66a Church Walk Burgess Hill, BN43 6LB		
Date 03-Feb-20 11:56 File porous pavings attenuat...	Designed by jpakenham Checked by	
XP Solutions Source Control 2016.1.1		

ICP SUDS Mean Annual Flood

Input

Return Period (years)	1	Soil	0.150
Area (ha)	0.123	Urban	0.000
SAAR (mm)	700	Region Number	Region 7

Results 1/s

QBAR Rural	0.0
QBAR Urban	0.0
Q1 year	0.0
Q1 year	0.0
Q30 years	0.1
Q100 years	0.2

©1982-2016 XP Solutions

GTA Civils Ltd				Page 1																																																																																																																																																																																																																			
Gloucester House 66a Church Walk Burgess Hill, BN43 6LB		Unit T, Riverside Ind Est Littlehampton Porous Pavings																																																																																																																																																																																																																					
Date 03-Feb-20 8:39 File porous pavings Inf 100y...		Designed by JP Checked by																																																																																																																																																																																																																					
XP Solutions		Source Control 2016.1.1																																																																																																																																																																																																																					
<u>Summary of Results for 100 year Return Period (+40%)</u> Half Drain Time : 47 minutes. <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>2.105</td><td>0.105</td><td>6.8</td><td>21.4</td><td>O K</td></tr><tr><td>30 min Summer</td><td>2.136</td><td>0.136</td><td>6.8</td><td>27.6</td><td>O K</td></tr><tr><td>60 min Summer</td><td>2.155</td><td>0.155</td><td>6.8</td><td>31.4</td><td>O K</td></tr><tr><td>120 min Summer</td><td>2.159</td><td>0.159</td><td>6.8</td><td>32.3</td><td>O K</td></tr><tr><td>180 min Summer</td><td>2.150</td><td>0.150</td><td>6.8</td><td>30.4</td><td>O K</td></tr><tr><td>240 min Summer</td><td>2.137</td><td>0.137</td><td>6.8</td><td>27.7</td><td>O K</td></tr><tr><td>360 min Summer</td><td>2.111</td><td>0.111</td><td>6.8</td><td>22.5</td><td>O K</td></tr><tr><td>480 min Summer</td><td>2.089</td><td>0.089</td><td>6.8</td><td>18.0</td><td>O K</td></tr><tr><td>600 min Summer</td><td>2.071</td><td>0.071</td><td>6.8</td><td>14.5</td><td>O K</td></tr><tr><td>720 min Summer</td><td>2.058</td><td>0.058</td><td>6.8</td><td>11.9</td><td>O K</td></tr><tr><td>960 min Summer</td><td>2.046</td><td>0.046</td><td>6.3</td><td>9.4</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>2.035</td><td>0.035</td><td>4.8</td><td>7.2</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>2.027</td><td>0.027</td><td>3.6</td><td>5.4</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>2.022</td><td>0.022</td><td>2.9</td><td>4.4</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>2.016</td><td>0.016</td><td>2.1</td><td>3.2</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>2.013</td><td>0.013</td><td>1.7</td><td>2.5</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>2.011</td><td>0.011</td><td>1.5</td><td>2.1</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>2.009</td><td>0.009</td><td>1.3</td><td>1.8</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>2.008</td><td>0.008</td><td>1.1</td><td>1.6</td><td>O K</td></tr><tr><td>15 min Winter</td><td>2.122</td><td>0.122</td><td>6.8</td><td>24.6</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>124.633</td><td>0.0</td><td>17</td></tr><tr><td>30 min Summer</td><td>83.789</td><td>0.0</td><td>30</td></tr><tr><td>60 min Summer</td><td>53.779</td><td>0.0</td><td>48</td></tr><tr><td>120 min Summer</td><td>33.337</td><td>0.0</td><td>82</td></tr><tr><td>180 min Summer</td><td>24.832</td><td>0.0</td><td>116</td></tr><tr><td>240 min Summer</td><td>20.006</td><td>0.0</td><td>150</td></tr><tr><td>360 min Summer</td><td>14.706</td><td>0.0</td><td>214</td></tr><tr><td>480 min Summer</td><td>11.818</td><td>0.0</td><td>274</td></tr><tr><td>600 min Summer</td><td>9.966</td><td>0.0</td><td>332</td></tr><tr><td>720 min Summer</td><td>8.665</td><td>0.0</td><td>386</td></tr><tr><td>960 min Summer</td><td>6.943</td><td>0.0</td><td>500</td></tr><tr><td>1440 min Summer</td><td>5.071</td><td>0.0</td><td>738</td></tr><tr><td>2160 min Summer</td><td>3.696</td><td>0.0</td><td>1104</td></tr><tr><td>2880 min Summer</td><td>2.949</td><td>0.0</td><td>1468</td></tr><tr><td>4320 min Summer</td><td>2.142</td><td>0.0</td><td>2168</td></tr><tr><td>5760 min Summer</td><td>1.705</td><td>0.0</td><td>2896</td></tr><tr><td>7200 min Summer</td><td>1.427</td><td>0.0</td><td>3656</td></tr><tr><td>8640 min Summer</td><td>1.235</td><td>0.0</td><td>4408</td></tr><tr><td>10080 min Summer</td><td>1.093</td><td>0.0</td><td>5080</td></tr><tr><td>15 min Winter</td><td>124.633</td><td>0.0</td><td>17</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	2.105	0.105	6.8	21.4	O K	30 min Summer	2.136	0.136	6.8	27.6	O K	60 min Summer	2.155	0.155	6.8	31.4	O K	120 min Summer	2.159	0.159	6.8	32.3	O K	180 min Summer	2.150	0.150	6.8	30.4	O K	240 min Summer	2.137	0.137	6.8	27.7	O K	360 min Summer	2.111	0.111	6.8	22.5	O K	480 min Summer	2.089	0.089	6.8	18.0	O K	600 min Summer	2.071	0.071	6.8	14.5	O K	720 min Summer	2.058	0.058	6.8	11.9	O K	960 min Summer	2.046	0.046	6.3	9.4	O K	1440 min Summer	2.035	0.035	4.8	7.2	O K	2160 min Summer	2.027	0.027	3.6	5.4	O K	2880 min Summer	2.022	0.022	2.9	4.4	O K	4320 min Summer	2.016	0.016	2.1	3.2	O K	5760 min Summer	2.013	0.013	1.7	2.5	O K	7200 min Summer	2.011	0.011	1.5	2.1	O K	8640 min Summer	2.009	0.009	1.3	1.8	O K	10080 min Summer	2.008	0.008	1.1	1.6	O K	15 min Winter	2.122	0.122	6.8	24.6	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	124.633	0.0	17	30 min Summer	83.789	0.0	30	60 min Summer	53.779	0.0	48	120 min Summer	33.337	0.0	82	180 min Summer	24.832	0.0	116	240 min Summer	20.006	0.0	150	360 min Summer	14.706	0.0	214	480 min Summer	11.818	0.0	274	600 min Summer	9.966	0.0	332	720 min Summer	8.665	0.0	386	960 min Summer	6.943	0.0	500	1440 min Summer	5.071	0.0	738	2160 min Summer	3.696	0.0	1104	2880 min Summer	2.949	0.0	1468	4320 min Summer	2.142	0.0	2168	5760 min Summer	1.705	0.0	2896	7200 min Summer	1.427	0.0	3656	8640 min Summer	1.235	0.0	4408	10080 min Summer	1.093	0.0	5080	15 min Winter	124.633	0.0	17
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GTA Civils Ltd				Page 2	
Gloucester House 66a Church Walk Burgess Hill, BN43 6LB		Unit T, Riverside Ind Est Littlehampton Porous Pavings			
Date 03-Feb-20 8:39 File porous pavings Inf 100y...		Designed by JP Checked by			
XP Solutions		Source Control 2016.1.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	2.157	0.157	6.8	31.9	O K
60 min Winter	2.178	0.178	6.8	36.1	O K
120 min Winter	2.179	0.179	6.8	36.2	O K
180 min Winter	2.162	0.162	6.8	32.9	O K
240 min Winter	2.141	0.141	6.8	28.7	O K
360 min Winter	2.101	0.101	6.8	20.5	O K
480 min Winter	2.070	0.070	6.8	14.1	O K
600 min Winter	2.051	0.051	6.8	10.3	O K
720 min Winter	2.044	0.044	6.0	9.0	O K
960 min Winter	2.036	0.036	4.9	7.3	O K
1440 min Winter	2.027	0.027	3.6	5.4	O K
2160 min Winter	2.020	0.020	2.7	4.0	O K
2880 min Winter	2.016	0.016	2.1	3.2	O K
4320 min Winter	2.011	0.011	1.5	2.3	O K
5760 min Winter	2.009	0.009	1.3	1.8	O K
7200 min Winter	2.008	0.008	1.0	1.5	O K
8640 min Winter	2.007	0.007	0.9	1.3	O K
10080 min Winter	2.006	0.006	0.8	1.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	83.789	0.0	30		
60 min Winter	53.779	0.0	56		
120 min Winter	33.337	0.0	90		
180 min Winter	24.832	0.0	128		
240 min Winter	20.006	0.0	162		
360 min Winter	14.706	0.0	226		
480 min Winter	11.818	0.0	282		
600 min Winter	9.966	0.0	324		
720 min Winter	8.665	0.0	384		
960 min Winter	6.943	0.0	502		
1440 min Winter	5.071	0.0	738		
2160 min Winter	3.696	0.0	1092		
2880 min Winter	2.949	0.0	1452		
4320 min Winter	2.142	0.0	2204		
5760 min Winter	1.705	0.0	2928		
7200 min Winter	1.427	0.0	3592		
8640 min Winter	1.235	0.0	4264		
10080 min Winter	1.093	0.0	5048		
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GTA Civils Ltd		Page 4																								
Gloucester House 66a Church Walk Burgess Hill, BN43 6LB	Unit T, Riverside Ind Est Littlehampton Porous Pavings																									
Date 03-Feb-20 8:39	Designed by JP																									
File porous pavings Inf 100y...	Checked by																									
XP Solutions		Source Control 2016.1.1																								
<u>Model Details</u> Storage is Online Cover Level (m) 2.500 <u>Porous Car Park Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.07200</td> <td>Width (m)</td> <td>13.0</td> </tr> <tr> <td>Membrane Percolation (mm/hr)</td> <td>1000</td> <td>Length (m)</td> <td>52.0</td> </tr> <tr> <td>Max Percolation (l/s)</td> <td>187.8</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Depression Storage (mm)</td> <td>5</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Evaporation (mm/day)</td> <td>3</td> </tr> <tr> <td>Invert Level (m)</td> <td>2.000</td> <td>Membrane Depth (m)</td> <td>0</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.07200	Width (m)	13.0	Membrane Percolation (mm/hr)	1000	Length (m)	52.0	Max Percolation (l/s)	187.8	Slope (1:X)	0.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	2.000	Membrane Depth (m)	0
Infiltration Coefficient Base (m/hr)	0.07200	Width (m)	13.0																							
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Invert Level (m)	2.000	Membrane Depth (m)	0																							
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<u>Summary of Results for 100 year Return Period (+40%)</u> Half Drain Time : 248 minutes. <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Control (l/s)</th><th>Max Σ Outflow (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>2.150</td><td>0.100</td><td>0.0</td><td>1.9</td><td>1.9</td><td>23.4</td><td>O K</td></tr><tr><td>30 min Summer</td><td>2.187</td><td>0.137</td><td>0.0</td><td>1.9</td><td>1.9</td><td>32.1</td><td>O K</td></tr><tr><td>60 min Summer</td><td>2.221</td><td>0.171</td><td>0.0</td><td>1.9</td><td>1.9</td><td>40.1</td><td>O K</td></tr><tr><td>120 min Summer</td><td>2.247</td><td>0.197</td><td>0.0</td><td>1.9</td><td>1.9</td><td>46.1</td><td>O K</td></tr><tr><td>180 min Summer</td><td>2.252</td><td>0.202</td><td>0.0</td><td>1.9</td><td>1.9</td><td>47.3</td><td>O K</td></tr><tr><td>240 min Summer</td><td>2.249</td><td>0.199</td><td>0.0</td><td>1.9</td><td>1.9</td><td>46.6</td><td>O K</td></tr><tr><td>360 min Summer</td><td>2.241</td><td>0.191</td><td>0.0</td><td>1.9</td><td>1.9</td><td>44.6</td><td>O K</td></tr><tr><td>480 min Summer</td><td>2.233</td><td>0.183</td><td>0.0</td><td>1.9</td><td>1.9</td><td>42.9</td><td>O K</td></tr><tr><td>600 min Summer</td><td>2.226</td><td>0.176</td><td>0.0</td><td>1.9</td><td>1.9</td><td>41.2</td><td>O K</td></tr><tr><td>720 min Summer</td><td>2.218</td><td>0.168</td><td>0.0</td><td>1.9</td><td>1.9</td><td>39.4</td><td>O K</td></tr><tr><td>960 min Summer</td><td>2.203</td><td>0.153</td><td>0.0</td><td>1.9</td><td>1.9</td><td>35.9</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>2.173</td><td>0.123</td><td>0.0</td><td>1.9</td><td>1.9</td><td>28.8</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>2.131</td><td>0.081</td><td>0.0</td><td>1.9</td><td>1.9</td><td>18.9</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>2.094</td><td>0.044</td><td>0.0</td><td>1.9</td><td>1.9</td><td>10.2</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>2.055</td><td>0.005</td><td>0.0</td><td>1.9</td><td>1.9</td><td>1.2</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>2.050</td><td>0.000</td><td>0.0</td><td>1.7</td><td>1.7</td><td>0.0</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>2.050</td><td>0.000</td><td>0.0</td><td>1.4</td><td>1.4</td><td>0.0</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>2.050</td><td>0.000</td><td>0.0</td><td>1.2</td><td>1.2</td><td>0.0</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>2.050</td><td>0.000</td><td>0.0</td><td>1.1</td><td>1.1</td><td>0.0</td><td>O K</td></tr><tr><td>15 min Winter</td><td>2.165</td><td>0.115</td><td>0.0</td><td>1.9</td><td>1.9</td><td>26.9</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>124.633</td><td>0.0</td><td>24.7</td><td>18</td></tr><tr><td>30 min Summer</td><td>83.789</td><td>0.0</td><td>34.6</td><td>33</td></tr><tr><td>60 min Summer</td><td>53.779</td><td>0.0</td><td>45.5</td><td>62</td></tr><tr><td>120 min Summer</td><td>33.337</td><td>0.0</td><td>57.2</td><td>122</td></tr><tr><td>180 min Summer</td><td>24.832</td><td>0.0</td><td>64.4</td><td>180</td></tr><tr><td>240 min Summer</td><td>20.006</td><td>0.0</td><td>69.5</td><td>212</td></tr><tr><td>360 min Summer</td><td>14.706</td><td>0.0</td><td>76.8</td><td>274</td></tr><tr><td>480 min Summer</td><td>11.818</td><td>0.0</td><td>82.5</td><td>340</td></tr><tr><td>600 min Summer</td><td>9.966</td><td>0.0</td><td>87.0</td><td>410</td></tr><tr><td>720 min Summer</td><td>8.665</td><td>0.0</td><td>90.8</td><td>478</td></tr><tr><td>960 min Summer</td><td>6.943</td><td>0.0</td><td>96.8</td><td>616</td></tr><tr><td>1440 min Summer</td><td>5.071</td><td>0.0</td><td>105.9</td><td>882</td></tr><tr><td>2160 min Summer</td><td>3.696</td><td>0.0</td><td>115.3</td><td>1276</td></tr><tr><td>2880 min Summer</td><td>2.949</td><td>0.0</td><td>121.8</td><td>1612</td></tr><tr><td>4320 min Summer</td><td>2.142</td><td>0.0</td><td>131.2</td><td>2244</td></tr><tr><td>5760 min Summer</td><td>1.705</td><td>0.0</td><td>137.7</td><td>0</td></tr><tr><td>7200 min Summer</td><td>1.427</td><td>0.0</td><td>142.4</td><td>0</td></tr><tr><td>8640 min Summer</td><td>1.235</td><td>0.0</td><td>146.1</td><td>0</td></tr><tr><td>10080 min Summer</td><td>1.093</td><td>0.0</td><td>149.2</td><td>0</td></tr><tr><td>15 min Winter</td><td>124.633</td><td>0.0</td><td>28.2</td><td>18</td></tr></table>									Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status	15 min Summer	2.150	0.100	0.0	1.9	1.9	23.4	O K	30 min Summer	2.187	0.137	0.0	1.9	1.9	32.1	O K	60 min Summer	2.221	0.171	0.0	1.9	1.9	40.1	O K	120 min Summer	2.247	0.197	0.0	1.9	1.9	46.1	O K	180 min Summer	2.252	0.202	0.0	1.9	1.9	47.3	O K	240 min Summer	2.249	0.199	0.0	1.9	1.9	46.6	O K	360 min Summer	2.241	0.191	0.0	1.9	1.9	44.6	O K	480 min Summer	2.233	0.183	0.0	1.9	1.9	42.9	O K	600 min Summer	2.226	0.176	0.0	1.9	1.9	41.2	O K	720 min Summer	2.218	0.168	0.0	1.9	1.9	39.4	O K	960 min Summer	2.203	0.153	0.0	1.9	1.9	35.9	O K	1440 min Summer	2.173	0.123	0.0	1.9	1.9	28.8	O K	2160 min Summer	2.131	0.081	0.0	1.9	1.9	18.9	O K	2880 min Summer	2.094	0.044	0.0	1.9	1.9	10.2	O K	4320 min Summer	2.055	0.005	0.0	1.9	1.9	1.2	O K	5760 min Summer	2.050	0.000	0.0	1.7	1.7	0.0	O K	7200 min Summer	2.050	0.000	0.0	1.4	1.4	0.0	O K	8640 min Summer	2.050	0.000	0.0	1.2	1.2	0.0	O K	10080 min Summer	2.050	0.000	0.0	1.1	1.1	0.0	O K	15 min Winter	2.165	0.115	0.0	1.9	1.9	26.9	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	124.633	0.0	24.7	18	30 min Summer	83.789	0.0	34.6	33	60 min Summer	53.779	0.0	45.5	62	120 min Summer	33.337	0.0	57.2	122	180 min Summer	24.832	0.0	64.4	180	240 min Summer	20.006	0.0	69.5	212	360 min Summer	14.706	0.0	76.8	274	480 min Summer	11.818	0.0	82.5	340	600 min Summer	9.966	0.0	87.0	410	720 min Summer	8.665	0.0	90.8	478	960 min Summer	6.943	0.0	96.8	616	1440 min Summer	5.071	0.0	105.9	882	2160 min Summer	3.696	0.0	115.3	1276	2880 min Summer	2.949	0.0	121.8	1612	4320 min Summer	2.142	0.0	131.2	2244	5760 min Summer	1.705	0.0	137.7	0	7200 min Summer	1.427	0.0	142.4	0	8640 min Summer	1.235	0.0	146.1	0	10080 min Summer	1.093	0.0	149.2	0	15 min Winter	124.633	0.0	28.2	18
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																																																																																		
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15 min Winter	124.633	0.0	28.2	18																																																																																																																																																																																																																																																																																					
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Gloucester House 66a Church Walk Burgess Hill, BN43 6LB			Unit T, Riverside Ind Est Littlehampton Porous Pavings - Attenuation				
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XP Solutions			Source Control 2016.1.1				
<u>Summary of Results for 100 year Return Period (+40%)</u>							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	2.207	0.157	0.0	1.9	1.9	36.6	O K
60 min Winter	2.247	0.197	0.0	1.9	1.9	46.0	O K
120 min Winter	2.278	0.228	0.0	2.0	2.0	53.3	O K
180 min Winter	2.287	0.237	0.0	2.0	2.0	55.4	O K
240 min Winter	2.286	0.236	0.0	2.0	2.0	55.3	O K
360 min Winter	2.275	0.225	0.0	2.0	2.0	52.7	O K
480 min Winter	2.265	0.215	0.0	2.0	2.0	50.4	O K
600 min Winter	2.254	0.204	0.0	2.0	2.0	47.9	O K
720 min Winter	2.243	0.193	0.0	1.9	1.9	45.1	O K
960 min Winter	2.219	0.169	0.0	1.9	1.9	39.6	O K
1440 min Winter	2.173	0.123	0.0	1.9	1.9	28.7	O K
2160 min Winter	2.104	0.054	0.0	1.9	1.9	12.7	O K
2880 min Winter	2.059	0.009	0.0	1.9	1.9	2.2	O K
4320 min Winter	2.050	0.000	0.0	1.5	1.5	0.0	O K
5760 min Winter	2.050	0.000	0.0	1.2	1.2	0.0	O K
7200 min Winter	2.050	0.000	0.0	1.0	1.0	0.0	O K
8640 min Winter	2.050	0.000	0.0	0.9	0.9	0.0	O K
10080 min Winter	2.050	0.000	0.0	0.8	0.8	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	83.789	0.0	39.2	32			
60 min Winter	53.779	0.0	51.5	62			
120 min Winter	33.337	0.0	64.6	118			
180 min Winter	24.832	0.0	72.7	176			
240 min Winter	20.006	0.0	78.3	230			
360 min Winter	14.706	0.0	86.6	290			
480 min Winter	11.818	0.0	93.0	366			
600 min Winter	9.966	0.0	97.9	444			
720 min Winter	8.665	0.0	102.2	520			
960 min Winter	6.943	0.0	109.2	666			
1440 min Winter	5.071	0.0	119.3	952			
2160 min Winter	3.696	0.0	129.8	1320			
2880 min Winter	2.949	0.0	137.6	1588			
4320 min Winter	2.142	0.0	148.4	0			
5760 min Winter	1.705	0.0	155.9	0			
7200 min Winter	1.427	0.0	161.4	0			
8640 min Winter	1.235	0.0	166.0	0			
10080 min Winter	1.093	0.0	169.7	0			
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XP Solutions	Source Control 2016.1.1	

Model Details

Storage is Online Cover Level (m) 2.500

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	13.0
Membrane Percolation (mm/hr)	1000	Length (m)	60.0
Max Percolation (l/s)	216.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	2.050	Membrane Depth (m)	0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0075-2000-0480-2000
Design Head (m)	0.480
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	75
Invert Level (m)	1.800
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.480	2.0
Flush-Flo™	0.143	2.0
Kick-Flo®	0.331	1.7
Mean Flow over Head Range	-	1.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.0	1.200	3.0	3.000	4.6	7.000	7.0
0.200	2.0	1.400	3.3	3.500	5.0	7.500	7.2
0.300	1.8	1.600	3.5	4.000	5.3	8.000	7.5
0.400	1.8	1.800	3.7	4.500	5.6	8.500	7.7
0.500	2.0	2.000	3.8	5.000	5.9	9.000	7.9
0.600	2.2	2.200	4.0	5.500	6.2	9.500	8.1
0.800	2.5	2.400	4.2	6.000	6.5		
1.000	2.8	2.600	4.3	6.500	6.7		

Annexe – Flood Risk Management Plan

1. Background

This building is liable to flood in the event of the River Arun's defences breaching or overtopping. At the time of publication, these defences are not to a high standard and will not protect the site with the rise in sea levels predicted between 2020 and 2080. It is possible that there would be a short warning time given by the EA.

The maximum depth from a breach is likely to be 1.20m or so (from current flood modelling data). This would be hazardous to all (categories of) users, ie whether fully able or elderly/disabled.

The emphasis in this Plan is for the Manager to heed the warnings issued by the Environment Agency and local media outlets - and taking appropriate action (and prompt evacuation to dry land *if necessary*) well in advance of the premises flooding.

This plan shall be part of the Manager's operational documents. It shall be reviewed on a regular basis, e.g. every 3 years until 2026 and then possibly extended to 5 year spans, depending on how much change is needed within the first 6 years.

Any staff acting temporarily as Duty Manager must be involved during the testing and review of this Plan and assume the responsibilities, albeit temporarily, as if they were the Manager whilst on duty.

2. Warning Arrangements

The Manager shall sign up to the Environment Agency's (free) flood warning system, 'Floodline Warnings Direct'. This is explained on the EA's website:

<https://www.gov.uk/sign-up-for-flood-warnings>.

The possibility of flooding to the property will trigger an automatic 24 warning message to the registered address contact. Although such flood warnings are intended to provide sufficient time to allow evacuation plans to be implemented, the risk here is greater due to breach failures being sudden events. There is a possibility that only approximately 6-8 hours' notice will be provided.

The registered contact for the site is [INSERT OCCUPIER'S NAME], and his contact number is [INSERT OPCCUPIER'S TELEPHONE NUMBER]. His email address is [INSERT OCCUPIER'S EMAIL ADDRESS]. The Manager is responsible for ensuring that the details in this section are completed with the correct occupant details at the beginning of tenancy/ownership. As soon as a new occupant takes up residency, their details should be recorded by the Manager; who will then update this Plan accordingly.

In addition to the automated service, further information on the flooding can be obtained by consulting the Environment Agency website (www.environment-agency.gov.uk/flood) and phoning Floodline on 0345 988 1188, selecting option 1 and following further instructions. The site lies within an EA Flood Warning Area. Information given out on these telephone numbers is updated every 15 minutes.

For a local media outlet offering flood information use 1) BBC Radio Sussex broadcast on 95.3 FM, 104.5 FM and 104.8 FM, DAB digital (auto tune or manual tune) and online – or 2) local radio station SpiritFM 96.6 FM, 102.3 FM and 106.6 FM.

3. Flood Warning Codes

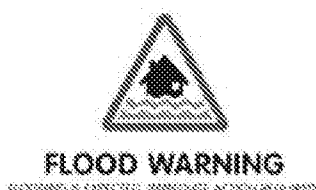
If flooding is forecast, warnings are issued using a set of four easily recognisable codes.

Each of the four codes indicates the level of danger associated with the warning. The EA *aims* to issue flood warnings up to 12 hours in advance. A Severe Flood Warning may be issued immediately, with no other warning code preceding it.

The Flood Warning Codes and their meanings are:



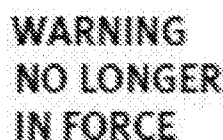
- What it means: Flooding is possible. Be prepared.
- When it's used: two hours to two days in advance of flooding.



- What it means: Flooding is expected. Immediate action required.
- When it's used: Half an hour to one day in advance of flooding.



- What it means: Severe flooding. Danger to life.
- When it's used: When flooding poses a significant threat to life.



- No further flooding is currently expected in your area.
- When it's used: When river and sea conditions return to normal.

4. Action to be Taken on Receipt of Flood Warnings



- What it means: Be prepared to act on your flood plan.
- Call Floodline on 0845 988 1188, select option 1 for up-to-date flooding information.
- Prepare a flood kit of essential items – refer to Section 6.0.
- Monitor local water levels and flood forecast on the EA website.

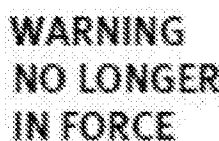


- What it means: Flooding is expected. Immediate action.
- Move valuables, pets to first floor level.
- Turn off gas, electricity and water supplies if safe to do so.



THE PROPERTY MUST BE EVACUATED IF SAFE TO DO SO.

- Co-operate with the emergency services. Call 999 if you are in immediate danger.
- If there are hazardous floodwaters surrounding the site, seek safe refuge at first floor level.



- Be careful. Floodwater may still be around for several days.
- If you've been flooded, ring your insurance company as soon as possible.

5. Preparation for a Flood Event

- Advice to the Manager and any appointed Deputies:
- Because of the possible lack of notice, it is essential that you are well prepared before a flood, as remote this possibility may seem at this time.
- Prepare a list of all your important contacts written in a notebook - and keep this to hand.
- Ensure you know *exactly* how to turn off electricity, gas and water.
- Prepare an Evacuation Action Checklist, this to contain all the tasks that must be actioned prior to evacuating - such as turning off the utilities and organising transport plus any other important items (people with special needs/medications). If any equipment has to be moved to first floor level – or higher level on the ground floor - this should be listed – or completed. This should be part of the Overall Action Checklist, which includes the Recovery procedures (see section 8 below).

6. Evacuation and Safe Refuge

The Manager should be able to assess from the EA's and Local Authority Emergency Services' warnings the likely flood warning time, ie how long there is before the unit is likely to be inundated. Much depends on the severity of the defences' failure. Once this is known it will be clear how quickly the evacuation must be carried out.

Once the flood depth reaches and exceeds 0.3m (or 12" = 1 foot) there will be no safe route to dry ground (away from this property).

Well in advance of having to evacuate the Manager and any Deputies should study the map in Figure 1 overleaf, which shows the best (shortest) route to dry land. "Turn left at Bridge Road and at the roundabout take the A259 – 2nd exit – to the north - northeast."

Once the decision has been made to evacuate, the Manager will shut and lock up the premises, once he/she is satisfied that any members of staff and visitors are able to reach dry land (whether driving or via another means of transport).

A car (or other motor vehicle) that is capable of transporting wheel-chair bound people, shall be available to ferry up to 4 people to dry land. Note that this 'target site' must be identified in advance by the Manager. This is to be added to this Plan and thereby included into the review process.

The first floor office may be used as a refuge – *IF* the decision to evacuate has been left too late and it is clear that the flood depth is too hazardous. The Manager should organise all occupants to bring seats up from ground floor and move furniture around to maximise the comfort level.



Figure 1: Flood Map Showing Best/Shortest Route to Dry Land

7. When is it Safe to Return?

The responding organisations will be providing updates on the situation and notification when it is safe to return to your home. Follow their advice.

8. Recovery?

The Manager should consider this phase well in advance of a flood. The insurance company should be consulted and the unit organised with the threat of saline water flooding up to the critical depth (1.20m) in mind.

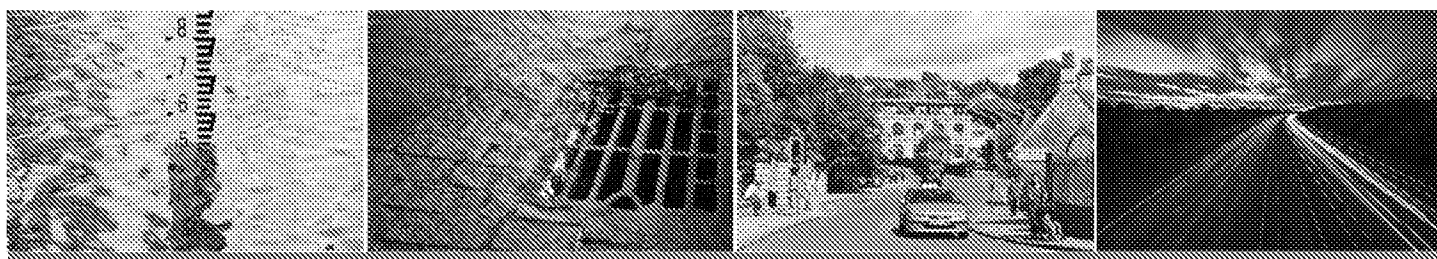
All other aspects of recovery and clean up should be listed by the Manager as part of the Overall Action Plan.

9. Awareness and Review

This plan shall be part of the Manager's operational documents and treated in a similar way to Fire Risk.

This Plan shall be reviewed on a regular basis, every 3 years between 2020 and 2026. The target date of the first review is 01 July 2023. After 2026 each review may take place every 5 years – or as soon as increased defences or other significant change to the site's flood risk profile is learned. The site's flood risk profile should be assessed using the data available at that time - and the Plan updated to reflect the current standards and policies.

- End of Plan -



Civil Engineering - Transport Planning - Flood Risk

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