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Interbridges Site
New Brighton Road
Emsworth

Flood Risk Assessment

for

Nash & Partners

April 2016

R7-02

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Version	Date	Circulation	Description of Amendments
1.1	21 April 2016	Planning	

Report Prepared by:

M J Harvey

BSc. (Hons), C.Eng., M.I.C.E.

Introduction

A planning application is to be made to Havant District Council for a variation to the approved layout of planning consent APP/10/00912. As part of the development site is indicated to be located within Flood Zone 2, a flood risk assessment is required to accompany the planning application.

Therefore, this site specific Flood Risk Assessment (FRA) has been undertaken in in accordance with the National Planning Policy Framework - 2012 (NPPF) and with the National Planning Practice Guidance – 2014.

From the National Planning Practice Guidance – 2014, Flood Zones and Flood Risk Tables, Table 2: Flood Risk Vulnerability Classification – buildings used for professional and other services, offices, general industry, storage and distribution have a flood risk vulnerability classification of 'less vulnerable'. From Table 3: Flood Risk Vulnerability and Flood Zone 'Compatibility' - development is appropriate in Flood Zones 1, 2 and 3a but not Zone 3b 'The Functional Floodplain'.

This assessment has been prepared undertaken by M J Harvey BSc. (Hons), C.Eng., M.I.C.E.

Development Description

Planning consent APP/10/00912 is for a development comprising 12 No. Industrial units within B1 (b&c) and 3 No. Office units, open storage and provision of commuter car park with new access to New Brighton Road. The proposed application is a replacement with 4 No. B1 units and a Veterinary Practice. The total site area is 0.89 Ha but the application site is on a lesser site area of 0.56 Ha. The proposed site layout plan is included in Appendix C.

The site may be located by Ordnance Survey grid reference E475007m, N106354m. The following figures show the location of the site and aerial view.

Figure 1 - Site Location

Figure 2 – Site Location Aerial View

Site Assessment – Sources, Mechanisms and Pathways of Flooding

This flood risk assessment has considered the six possible sources of flooding: Tidal (Seas); Fluvial (Rivers); Surface Water; Groundwater; Sewers and Infrastructure Failure.

The detailed site assessment is as follows:

Tidal

Tidal flooding occurs by the sea or estuary and can be due to breach or over topping of flood defences, wave action and fluvial flows due to tide locking.

The site is outside the influence of tidal flooding so there is a 'low probability' of flooding from this risk.

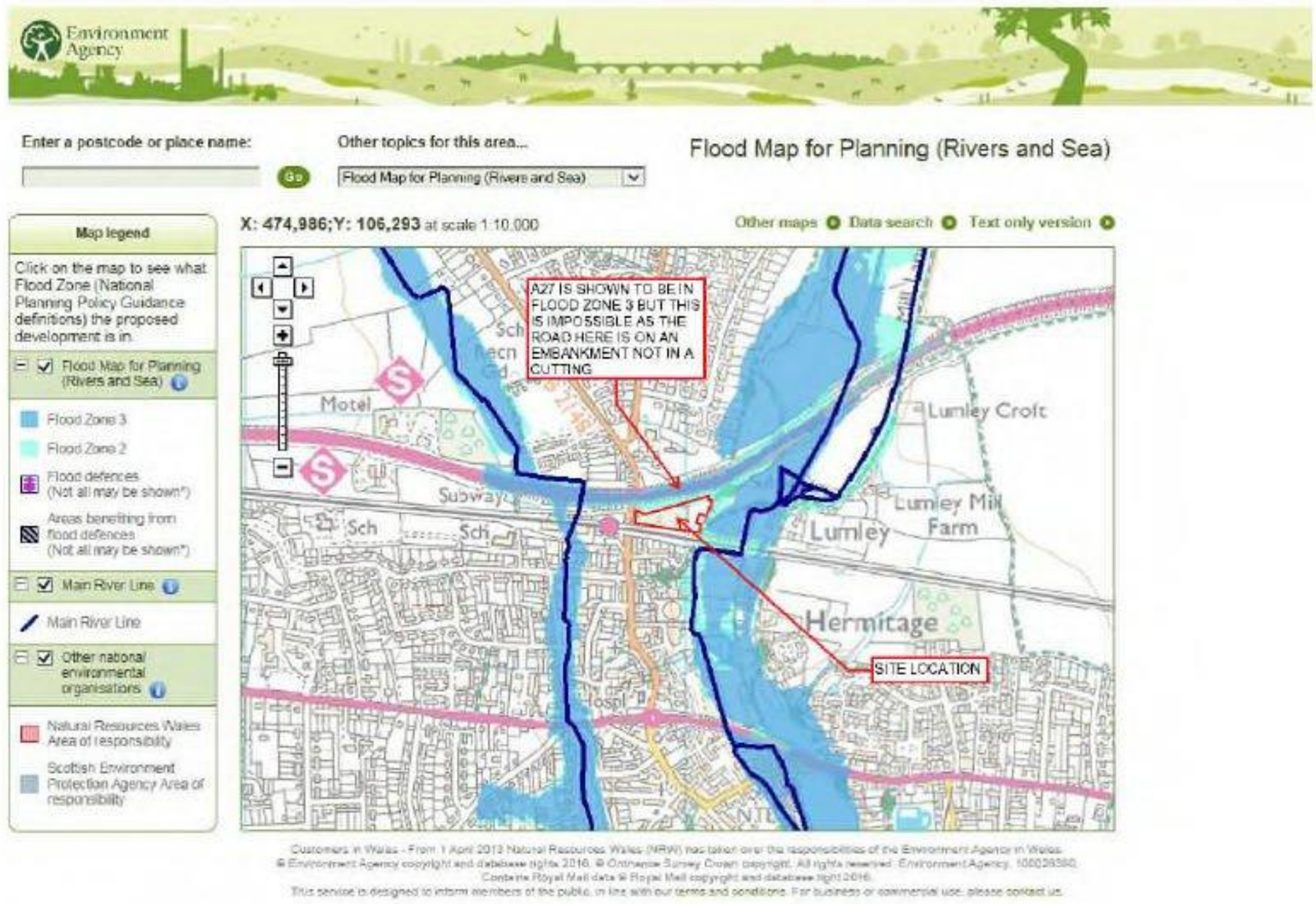
Fluvial

Fluvial flooding is due to out-of-bank flow, overtopping or breach of river defences and blockages to culverts, flood channel or flood corridors.

Product 4 flood level data has been requested from the Environment Agency (EA) to enable the extent of the flooding across the site to be established. This flood data has yet to be received but if this data changes the conclusions of this report then the report will be amended.

The following figure 3 show the Environment Agency website flood map with the site edged with a red line. The north east corner of the site is indicated to be in Flood Zone 2 with the remainder of the site in Flood Zone 1.

Figure 3 – Flood Map



The range of flooding risks is as follows:

Flood Zone 1 - land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).

Flood Zone 2 - land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year.

Flood Zone 3 - land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year. This is not applicable to this site but there is a Flood Zone 3 area to the east of the site related to a main river.

There are Flood Zone 2 and 3 areas indicated to the north of the site following the line of the A27 highway. However, these indicated flood zones cannot be correct as the road is on an embankment above existing ground levels and not in a cutting as implied by the flood map. The Main Rivers cross under the road in culverts. (The plan in Appendix 4 of Havant Borough Council's 'Emsworth Flood Risk Strategy Review' dated October 2015 also indicates this anomaly). This therefore calls into question whether an area of Flood Zone 2 actually affects the north east corner of the site especially as the south east corner is approximately 0.7m lower than the north east corner.

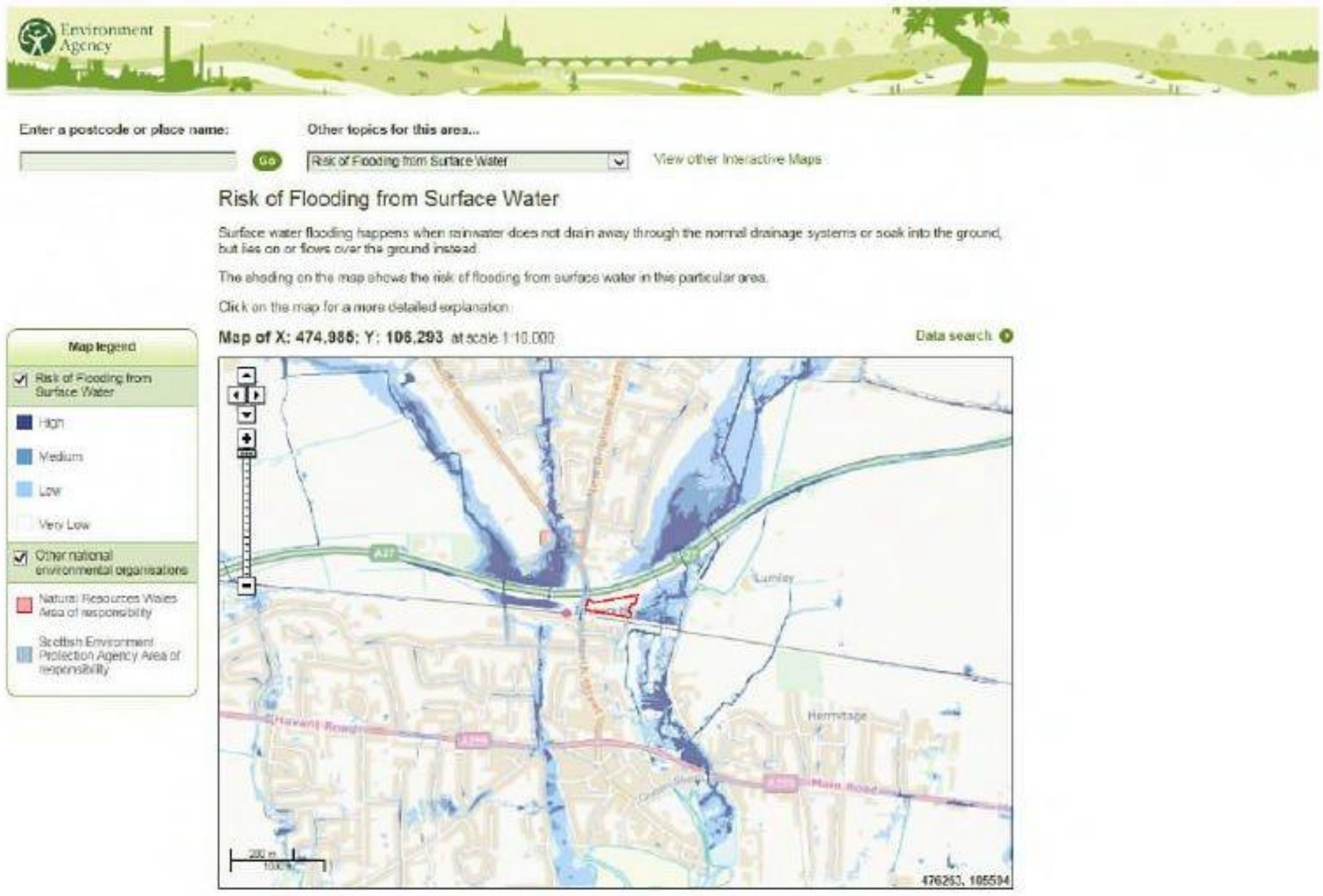
The proposed development with a vulnerability classification of 'less vulnerable' is suitable in Flood Zones 1, 2 and 3b but my conclusion is that all of the site is actually in Flood Zone 1 due to the inaccuracies of the EA flood map.

Surface Water Runoff

Sheet runoff from adjacent land (urban and rural) can result in local surface water flooding.

The following figure 4 show the Environment Agency website surface water flood map with the site edged with a red line.

Figure 4 – Flood Map



The low south east corner of the site is indicated to be at low risk of surface water flooding. Car parking is to be located in this area which will be suitable for this low flooding risk.

A ground investigation carried out at the site encountered superficial deposits of soft to firm clay with varying amounts of flint gravel over bedrock deposits of the London Clay Formation comprising stiff to very stiff grey clay.

Groundwater

The level of groundwater rises during wet winter months, and fall again in the summer as water flows out into rivers. In very wet winters, rising water levels may emerge to the surface and lead to flooding of normally dry land. This is most likely to occur in low-lying areas underlain by permeable rock (aquifers).

The site is indicated on the EA groundwater website map to be located over a Secondary A superficial deposits aquifer but is not located in a low-lying area which would result in flooding of the site if groundwater emerged to the surface and therefore it is considered that there is a 'low probability' of flooding by groundwater.

Sewers

Combined, foul or surface water sewers can surcharge due to insufficient capacity causing flooding of the surface depending upon the ground topography. Surface water sewers are now required to be designed not to flood for 1 in 30-year storm events but the older sewer networks may not have this level of capacity. Foul sewers can flood in periods of intense rainfall due to connection of surface water to the system.

Although the site is crossed by 3 public foul water sewers, no historical flooding incidents caused by flooding by sewers in the locality have been established so there is a 'low probability' of flooding caused by sewers.

Infrastructure Failure

Flooding due to infrastructure failure could be due to reservoirs, canals, industrial processes, burst water mains, blocked sewers or failed pumping stations.

No artificial sources of flooding have been identified i.e. reservoirs etc. that may have influence on the site. Therefore, there is a 'low probability' of flooding due to infrastructure failure.

Drainage Strategy – Surface Water

The site of 0.89 hectares is undeveloped and should be classed as greenfield development.

The Micro Drainage calculated rate and volume of runoff from the site pre-development is contained in Appendix A but is summarised are as follows:

Pre-Development	
Return Period	Greenfield Runoff 0.89 Ha
1 year	2.6 l/s
100-year	9.7 l/s
100-year 6-hour duration volume	206.242 m^3

Post development there will be an increase in the hard paved areas.

The Building Regulations 2000 H3. (3) requires that rainwater from a system serving a roof and paved areas around a building shall be discharged to one of the following, listed in order of priority -

a) an adequate soakaway or some other adequate infiltration system; or where this is not reasonably practical,

b) a watercourse; or, where this is not reasonably practical,

c) a sewer.

Drainage for the revised application will be to the principles laid out in the Drainage Statement as approved for Condition 11 of planning permission APP/10/0912 and presented in Appendix B.

Appendix A

Micro Drainage Greenfield Runoff Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years) 2 SAAR (mm) 704 Urban 0.000
Area (ha) 0.890 Soil 0.400 Region Number Region 7

Results	**l/s**
QBAR Rural	3.0
QBAR Urban	3.0
Q2 years	2.7
Q1 year	2.6
Q30 years	6.9
Q100 years	9.7

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Greenfield Runoff Volume

FSR Data

Return Period (years)	100
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	19.300
Ratio R	0.350
Areal Reduction Factor	1.00
Area (ha)	0.890
SAAR (mm)	704
CWI	105.516
Urban	0.000
SPR	37.000

Results

Percentage Runoff (%)	36.28
Greenfield Runoff Volume (m^3)	206.242

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Appendix B

Drainage Statement

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DRAINAGE STATEMENT

INTERBRIDGES
NEW BRIGHTON ROAD
EMSWORTH

15 BUSINESS UNITS

PLANNING PERMISSION APP/10/00912

CONDITION 11 SURFACE AND FOUL WATER DRAINAGE

Nash and Partners Limited
Address: 5 Dukes Court, Bognor Road, Chichester, PO19 8FX

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Introduction

The existing site is vacant land, comprising a strip left following the construction of the A27 in the late 1980s it is to all intents and purposes Green Field but is crossed by three significant foul sewers and a high pressure gas main.

The existing site has no formal access to the main highway only a right of way to the rear via Seagull Lane and has no existing service connections.

Foul Water

The main 375mm sewer at the rear of the site along Seagull Lane is best placed for connection of a gravity based system in the site. The sewer is located within the site boundary, not in the lane, possibly re-aligned during the road construction.

A 150mm connection is proposed via an external backdrop on the existing Manhole 0301, with 150mm services available if required to all of the industrial Units to provide for any trade effluents (these would be subject to specific planning and discharge permission) and 100mm to the Office Units.

The site levels have a natural gradual fall to the rear enabling ordinary drainage gradients, flows and depths.

Surface Water

Due to the poor infiltration rate of the clay based sub-soil (worst known VP 5.14x 10^{-6} m/s) the ideal would be to discharge to an outfall with appropriate regulation, however, it cannot be guaranteed that either the Highways Agency piped spring and outfall at the rear is available or that the New Brighton Road Outfall at the front can be upgraded. The latter would surcharge with the added Road Junction area without the intended overflow soakaways as are included in the 278 Agreement. As a result a soakaway system is shown, but due to site constraints together with oil separation, this requires pumping.

The system assumes rainfall based upon BRE 365 for the design, but the permeable surface storage and surcharge restricting initial extreme flows plus use of second pump capacity make some provision for increase due to climate change; this would however rely upon prompt attention to any pump failure. The ultimate failure would be overflow of the kerbs and run off to Seagull Lane and the River Ems as would be the case with the existing site on saturation.

Soakaway System

Paving

Other than the isolated concrete bin store and building ramps, plus the highway specification macadam areas the paving will be either permeable concrete block or hoggin.

The macadam areas will drain via the highway system per the 278 Agreement.

The hoggin path, given the location will rely entirely upon percolation into the surrounding areas via the granular base and CellWeb tree root protection.

The remaining areas will drain via the granular media sub-base of the paving system, this will vary between 250mm and 500mm in depth dependent upon loading and the CellWeb root protection.

Even in extreme surcharge conditions, due to the poor permeability of the sub-soil, negligible percolation will occur direct to the subsoil, thus all paved areas will be taken to soakaways by underdrains.

Pipework

Underdrains of 75 flexible perforated upvc pipe throughout the paving will be spaced at approximately 2 metre centres to imperforate collection header drains and to the main distribution system.

The worst case area at the East end of the site serves 2500 sq.m.

The 1 in 10 year storm produces peak flow rates of between 6.25 and 42.5 litres per second for a four hour and 15 minute storm duration respectively. The permeable paving system would be expected to attenuate that initially; the three main 150mm runs at 1 in 100 falls have a capacity of 6 litres/second each increasing to 225 (50litres/second) where shown before the oil separator.

The area of the West end or the site, other than the access road is 1800 square metres and will follow the same principal.

Oil Separators

Two 3500 litre by-pass oil separators will be provided to suit the low risk contamination potential of the permeable paving. These will include a silt trap capacity in addition to catchpits on the system and oil limit alarms.

Attenuation

Attenuation storage is provided in this particular case to limit the size of pumps required for the peak flows, which would be excessive for general usage.

Two 30 000 litre underground tanks are to be provided, each with tandem 10 litre/second submersible pumps, dual operation/changeover relays, pump failure and high level alarms. Discharge to the soakaways will be via 75mm HDPE flexible pipe to the soakaway perforated dip pipes.

The most onerous storm duration in terms of flow rate from the figures is 15 min, producing on average 42.5 litres/second or 38250 litres; in that period a single pump at 10litres/second would reduce that by 9000 litres, i.e. within the capacity of the empty tank and empty the tank within 1 hour There is no requirement, but the extreme event of a second storm of that intensity within an hour in the future, would be dealt with by activation of the alternate pump in tandem. This safeguard requires prompt attention to pump failures.

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Soakaways

Large area cellular plastic soakaways are to be formed to provide surface infiltration areas to counter the poor permeability of the soil. The result being that from full a 50% infiltration would take approximately 60 hours; this is more than the ideal maximum of 24 hours

The resulting cell volume in the worst case at the East end of the site beneficially provides sufficient storage in the cells and if necessary the surcharged drainage system for two storm sequences, countering the slow discharge rate. The Landscape Architect is content to allow encroachment upon the extended root zone to locate the soakaways away from the new tree planting area. The resultant shape is not ideal for surface area, but this is compensated by leaving void areas and there is reciprocal benefit with the trees.

Roof Water

Roof water will be collected from the rear of the buildings via three separate average 600sq.m. systems directly via 150mm pipework to three separate cellular soakaways sized to suit.

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Rainfall Calculation for Soakaways

Using BRE Digest 365.

For the worst case area of 2500 sq.m.

The local rainfall rate for a 10 year return storm compiled from 5 year return figures is as follows:

Minutes	10	15	30	60	120	240	360	600
Cu metres	31	38.25	49	62	75.75	90	102.25	116.5
Litres/sec	25.83	42.5	27.22	17.22	10.5	6.25	not considered	

Soakaway Size

Constructed of preformed heavy duty stacked plastic cells 1 m by 0.5 m by 0.4 m in three layers, 384 cells on plan, wrapped in two layers of geotextile with granular fill bed and surround.

Surface area of the soakaway taken as the usual exposed area of cell walls by 50% = 100.8 sq.m.

Volume taken as 95% of 384x3 cells = 218 cubic metres.

Infiltration Rates

Duration x area x VP (5.14×10^{-6}) x 60

Minutes	10	15	30	60	120	240	360	600
M3 total	0.31	0.47	0.93	1.86	3.72	7.44	11.19	18.65

The low infiltration rate of 1.86 cubic metres per hour shows no advantage in pumping the stored water faster than necessary to clear the storage tanks.

Part of the soakaway in the heavily loaded areas will be capped with reinforced concrete under the paving system, thus set at depth

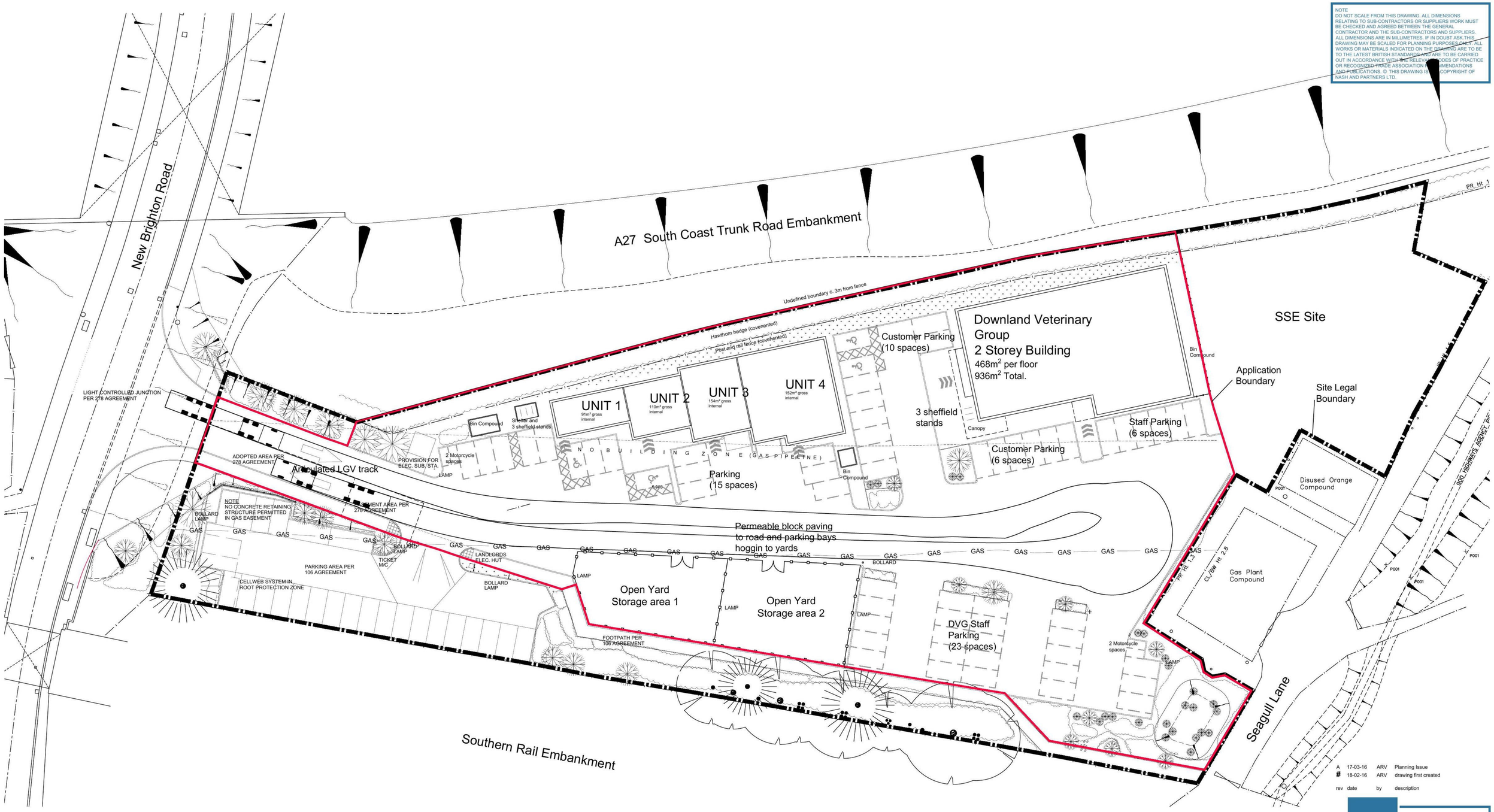
Other Soakaways

The Carpark soakaway will be three cells deep un-protected with LGV no entry signing, the two overflow soakaways two cells deep and the rainwater soakaways will be three cells deep, all concrete capped to allow for LGV loading.

Appendix C

Site Layout Plan

NOTE
DO NOT SCALE FROM THIS DRAWING. ALL DIMENSIONS RELATING TO SUB-CONTRACTORS OR SUPPLIERS WORK MUST BE CHECKED AND AGREED BETWEEN THE GENERAL CONTRACTOR AND THE SUB-CONTRACTORS AND SUPPLIERS. ALL DIMENSIONS ARE IN MILLIMETRES. IF IN DOUBT ASK.THIS DRAWING MAY BE SCALED FOR PLANNING PURPOSES ONLY. ALL WORKS OR MATERIALS INDICATED ON THE DRAWING ARE TO BE TO THE LATEST BRITISH STANDARDS AND ARE TO BE CARRIED OUT IN ACCORDANCE WITH THE RELEVANT CODES OF PRACTICE OR RECOGNIZED TRADE ASSOCIATION RECOMMENDATIONS AND PUBLICATIONS. © THIS DRAWING IS COPYRIGHT OF NASH AND PARTNERS LTD.



SITE LAYOUT PLAN (Scale 1:250)

North

Scale Bar
0 1 2 3 4 5 10 15 20 25 30m

rev	date	by	description
A	17-03-16	ARV	Planning Issue
#	18-02-16	ARV	drawing first created

PLANNING ISSUE

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Client
Downland Veterinary Group

Location
INTERBRIDGES SITE
NEW BRIGHTON ROAD
EMSWORTH

Drawing Title
Downland Veterinary Group
PROPOSED SITE LAYOUT

Date	Drawn By	Scale
Feb 2016	ARV	as noted @ A1

CAD file name
Interbridges Alternative Development DVG Rev02.dwg

Drawing No	Revision
2045/SK-10	A