



Accommodation Schedule
RM 1 Bed Apartments
75/10 2 Bed Apartments
37/10 2 Bed Houses
30/10 3 Bed Houses
Total 154 Dwellings



Judith's Path

Wells

FB

Valve

3.1m

Spring

Balancing Pond

DOYLE CLOSE

ETL

RIDGWAY

MARPLES

CRITICAL NOTES

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All dimensions are in millimetres unless otherwise stated.
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This drawing may incorporate information from other professionals and all such HGP Architects cannot accept responsibility for the accuracy or adequacy of such information.

SHAFT, HEALTH & ENVIRONMENTAL INFORMATION

As required by the Health and Safety (Safety) Regulations 1992, the following information is provided for the purpose of the Health and Safety (Safety) Regulations 1992.



REVISIONS	DATE	BY	REV
Amended to new layout	02.05.19	HE	HE
Added landscaping	30.04.19	HE	HE
Amended as client's comments	15.10.18	HE	HE



Kings Croft Farm

Illustrative Site Plan

STATUS	DATE	BY	REV
Sketch	18.09.02	C	

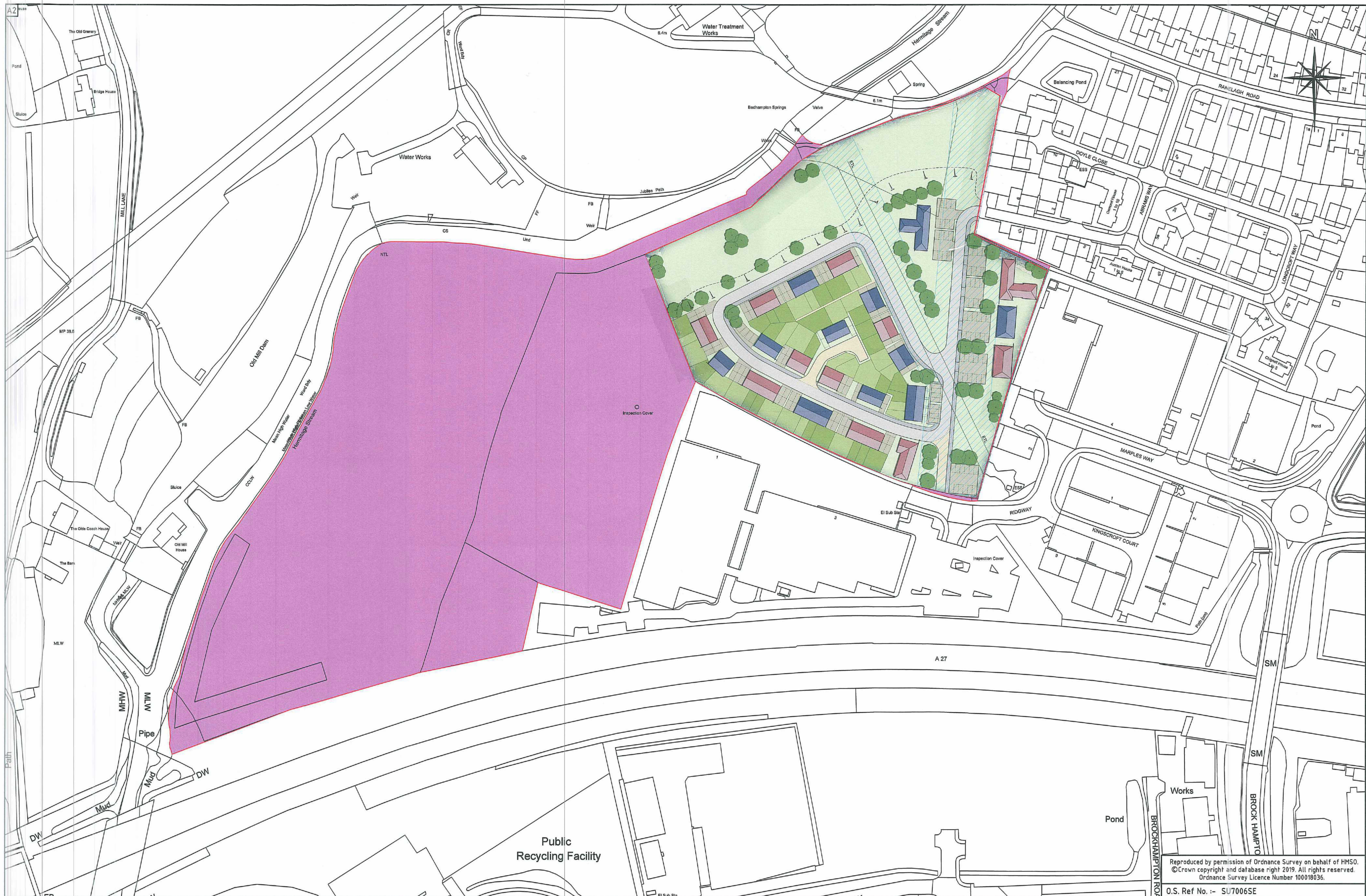
HGP

ARCHITECTS

1, 01329 893 825
E: EMAIL@HGP-ARCHITECTS.CO.UK
W: WWW.HGP-ARCHITECTS.CO.UK

FURZEHALL FARM, WICKHAM ROAD
FAREHAM, HAMPSHIRE, PO16 7JH

HGP ARCHITECTS LTD
Check office on site



 Telephone: Havant (023) 9249 9888 Fax: Havant (023) 9245 3632 Website: www.portsmouthwater.co.uk Registered Office: PO Box 8 West Street Havant Hampshire PO9 1LG REGISTERED IN ENGLAND No. 2536455	REVISION				LAND TO BE SOLD KINGS CROFT FARM HAVANT	Drawing No.	Job No.	Date	Scale
	DESCRIPTION					57/273		02-04-19	1:1250
	DATE					Drawn By	Traced By	Checked By	
							DCR	SPB	

Soils Limited
Geotechnical & Environmental Consultants

Newton House
Cross Road, Tadworth
Surrey KT20 5SR

T 01737 814221
W soilslimited.co.uk

Foreman Homes Ltd.
Brockhampton Holdings Ltd.
Portsmouth Water Ltd.
Brockhampton Property Investments Ltd.

01962 673 330
soilslimited.co.uk

Via email only: Neil.Calderwood@foremanhomes.co.uk

January 2020

Our Ref.: 17877/SGLR

Dear Neil

Re: Kingscroft Farm, Ranelagh Road, Havant, Hampshire PO9 1FJ

Foreman Homes Ltd., Brockhampton Holdings Ltd., Portsmouth Water Ltd. and Brockhampton Property Investments Ltd. commissioned Soils Limited to undertake a Soil-Gas Risk Assessment at the site referred to as Kingscroft Farm, Ranelagh Road, Havant, Hampshire PO9 1FJ.

This letter report must be read in conjunction with the following documents:

Preliminary Investigation Report (Soils Limited report ref.: 17877/PIR_R26, dated November 2019)

Main Investigation Report (Soils Limited report ref.: 17877/MIR_R27, dated November 2019)

Background

The Preliminary Investigation Report (PIR) undertaken on the site identified a low to moderate risk of soil gas onsite associated with offsite sources.

The site was situated within an area where protection or risk assessment against the ingress of radon was required. The site location within an area of 1km grid square were in bands of elevated radon potential. Maximum radon potential was 3-5%.

Radon protection measures are typically only required when the radon potential is 5-10% and therefore it is possible that radon protection measures will not be required as part of the proposed development, however, consultation with the local Building Control department at the Local Authority is recommended as they will be able to advise on whether or not radon protection measures are required in new developments within the



site's vicinity. It is not possible in the course of a survey or inspection to determine whether radon gas is present as the gas is colourless and odourless. Tests can be undertaken to assess the concentration of radon in existing structures.

To quantify the risk posed to the site from the identified sources, a soil gas risk assessment was recommended. This comprised six soil gas monitoring visits undertaken over a period of approximately three months.

Gas Monitoring Records

Soil gas monitoring standpipes were installed in WS1, WS2 and WS4 each to a depth of 4.00m bgl. The locations were selected to provide a general coverage of the site as appropriate to the identified offsite sources.

Monitoring of the standpipes were undertaken on six occasions between 22nd October 2019 and 31st December 2019, targeting periods of low and falling atmospheric pressure where possible.

The concentration of methane (both total and LEL), hydrogen sulphide, carbon monoxide, carbon dioxide and oxygen were measured using a portable infrared monitor. Readings of flowrate were taken with a differential manometer calibrated to give flow rate. A Photo Ionisation Detector (PID) was used to detect for Volatile Organic Compounds (VOCs). The results of the monitoring are provided in Table 1.

Table 1. Soil Gas Monitoring Results

Date (Baro Trend)	Trial Hole	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	H ₂ S (ppm)	CO (ppm)	LEL (%)	aP (mb)	Flow (l/h)	VOC (ppm)	H ₂ O (m bgl)	Base of hole
22/10/2019 (Steady)	ATM	0.0	0.0	21.0	0.0	0.0	0.0	1022	0.0	0.0	-	-
	WS1	0.0	1.3	19.4	0.0	0.0	0.0	1022	0.0	0.0	DRY	3.80
	WS2	0.0	2.7	14.8	0.0	0.0	0.0	1022	0.0	0.0	DRY	3.61
	WS4	0.0	1.0	20.0	0.0	0.0	0.0	1022	0.0	0.0	DRY	3.86
07/11/2019 (Steady)	ATM	0.0	0.0	21.3	0.0	0.0	0.0	995	0.0	0.0	-	-
	WS1	0.0	2.5	16.8	0.0	0.0	0.0	995	0.0	0.0	2.36	3.78
	WS2	0.0	2.6	16.6	0.0	0.0	0.0	995	0.0	0.0	2.56	3.59
	WS4	0.0	0.0	20.7	0.0	0.0	0.0	995	0.0	0.0	3.72	3.85
19/11/2019 (Steady)	ATM	0.0	0.0	21.3	0.0	0.0	0.0	1016	0.0	0.0	-	-
	WS1	0.0	2.2	19.1	0.0	0.0	0.0	1016	0.0	0.0	2.36	3.77
	WS2	0.0	3.3	14.3	0.0	0.0	0.0	1016	0.0	0.0	2.68	3.54
	WS4	0.0	3.8	9.5	0.0	0.0	0.0	1016	0.0	0.0	DRY	3.82
05/12/2019 (Falling)	ATM	0.0	0.0	19.9	0.0	0.0	0.0	1020	0.0	0.0	-	-
	WS1	0.0	1.5	18.0	0.0	0.0	0.0	1020	0.0	0.0	DRY	3.80
	WS2	0.0	0.0	19.9	0.0	0.0	0.0	1020	0.0	0.0	2.67	3.56
	WS4	0.0	2.5	8.1	0.0	0.0	0.0	1019	0.0	0.0	3.81	3.83
16/12/2019 (Rising)	ATM	0.0	0.0	19.9	0.0	0.0	0.0	999	0.0	0.0	-	-
	WS1	0.0	0.7	18.9	0.0	0.0	0.0	999	0.1	0.0	1.99	3.75
	WS2	0.0	2.5	11.6	0.0	0.0	0.0	999	0.0	0.0	2.37	3.53
	WS4	0.0	2.1	10.6	0.0	0.0	0.0	999	0.0	0.0	3.50	3.84
31/12/2019 (Steady)	ATM	0.0	0.0	19.8	0.0	0.0	0.0	1030	0.0	0.0	-	-
	WS1	0.0	2.0	12.5	0.0	0.0	0.0	1030	0.0	0.0	2.17	3.78
	WS2	0.0	2.9	10.5	0.0	0.0	0.0	1030	0.0	0.0	2.51	3.52
	WS4	0.0	2.2	8.9	0.0	0.0	0.0	1030	0.0	0.0	3.64	3.84

Notes: Zero reading = below the equipment detection limit. Published barometric pressure trend data obtained for each monitoring visit from Southampton Airport Weather Station.

The monitoring undertaken detected the presence of carbon dioxide at concentrations of between <0.1% and 3.8% v/v and oxygen at concentrations between 8.1% and 20.7% v/v within the monitoring wells.

No concentrations of methane (total or LEL), hydrogen sulphide, carbon monoxide or VOCs were recorded above instrument detection levels, atmospheric pressure was recorded between 995 and 1030mb and no positive gas flow rates were recorded during the monitoring period.

Data Quality

A review was made of the quality of the available data for the site, which can be viewed in Table 2. CIRIA 665 (2007) and BS 8485:2015 stress the need for risk assessments to be based on good quality data and give guidance as to best practice in this respect.

Table 2 – Review of Data Quality

Data Type	Current Situation	UK Practice
Geological and hydro-geological conditions	With regard to soil gas risk assessment the data collected from the intrusive investigation was considered to be good.	CIRIA 665, Wilson and Card (1999) and BS 8485:2015 recommend that geology and hydrogeology be fully understood.
Monitoring period	Monitoring has been undertaken on a total of six occasions over an approximate period of approximately three months. Monitoring has been undertaken over a range of seasons and weather conditions including falling-rising and low and high atmospheric pressures.	CIRIA 665 recommends approximately 9 to 12 monitoring visits over approximately 6 months residential development with development with low to moderate soil gas generation potential of identified sources. Wilson and Card (1999) recommend that for less than 12 months monitoring the protective measures should be made more conservative.
Gas data sets	Borehole flow velocity has been measured on each monitoring occasion.	Borehole flow velocity and borehole gas volume required to define characteristic gas saturation. Modified Wilson and Card, Table 8.5 of CIRIA 665 (2006)/Table 2 of BS 8485:2015.

Data quality was considered good, covering a range of atmospheric pressure trends including readings taken during falling pressure and a low-pressure event (<1000mb), known as worst case conditions. Geological and hydrogeological conditions have been investigated as indicated in previous reports relating to this site. The dataset gained is considered sufficient to characterise the sites gassing regime and no further soil gas monitoring is deemed necessary.

Risk Assessment

Based on the documentation presented in the “BS 8485:2015, Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings” the hazardous gas flow rate (Q_{hg}) was calculated using Equation 1:

$$Q_{hg} = (C_{hg}/100) * q \quad \text{Equation 1}$$

Where:

C_{hg} is the measured hazardous gas concentration in percentage volume-by-volume.

q is the flow rate in litres per hour of combined gases found by direct measurement.

If soil gas borehole flow was not detectable, it should be assumed to be at the detection limit of the equipment used, which was 0.1l/hr.

Consequently, the Q_{hg} for carbon dioxide was calculated using Equation 2.

$$\begin{aligned} Q_{hg} \text{ (l/hr)} &= \text{gas concentration} * \text{borehole flow rate (l/hr)} && \text{Equation 2} \\ &= 3.8/100 * 0.1 = \mathbf{0.0038 \text{ l/h}} \end{aligned}$$

The maximum carbon dioxide concentration was taken as the gas concentration as a percentage and the instrument detection limit was taken as the maximum for the borehole flow rate (0.1l/h) as no positive flow was recorded, thus increasing the degree of conservatism adopted.

Based on the Site Characteristic hazardous gas flow rate of 0.0038l/h, the site falls into Characteristic Gas Situation 1 (CS1), which does not require gas protection measures to be emplaced in accordance with BS 8485:2015.

Groundwater Monitoring

At the time of the intrusive investigation (October 2019), groundwater was recorded during the excavation of one trial hole (TP2) struck at a depth of 3.50m bgl within the River Terrace Deposits.

Changes in groundwater level occur for a number of reasons including seasonal effects and variations in drainage. The investigation was conducted in October (2019), when groundwater levels should be rising from their annual minimum (lowest) elevation, which typically occurs around September to the annual maximum (highest) which typically occurs around March.

Post-works groundwater monitoring was undertaken simultaneously with the soil gas readings comprising six readings from the standpipes installed onsite (WS1, WS2 and WS4) between 22nd October 2019 and 31st December 2019, and results tabulated in Table 1.

The post-works groundwater monitoring recorded water levels within the standpipes at a highest elevation of 1.99m bgl.

Conclusion

A review of the soil gas monitoring undertaken on the site indicated the sites gassing regime to be representative of CS1 under BS 8485:2015 based on the hazardous gas concentration of carbon dioxide screening values, indicating that gas protection measures are not required for the site.

Should you have any queries regarding the above, please do not hesitate to contact the undersigned.

Yours sincerely



Tim Rudkin BSc. (Hons.), MSc., FGS.

Geo-Environmental Engineer

tr@soilslimited.co.uk

For and on behalf of Soils Limited.

Appendix F

Appendix G

HYDRAULIC MODELLING NOTE

Prepared on behalf of Portsmouth Water



Date : 9 September 2019
Project : Kingscroft Farm, Portsmouth – Hydraulic Modelling Note
Project Ref : 191930
Report Ref : 191930-01
Report Title : Hydraulic Modelling Note

DOCUMENT CONTROL

REV	ISSUE PURPOSE	AUTHOR	CHECKED	APPROVED	DATE
-	Draft for EA	GA	BC	DRAFT	09-09-19

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SITE: Kingscroft Farm, Portsmouth

1.0 INTRODUCTION

Ardent Consulting Engineers (hereafter referred to as Ardent) has been commissioned by Portsmouth Water to undertake a hydraulic modelling exercise for a Site Kingscroft Farm, Portsmouth at NGR 470616, 106208. The nearest postcode to the Site is PO9 1QJ (refer to Figure 1).

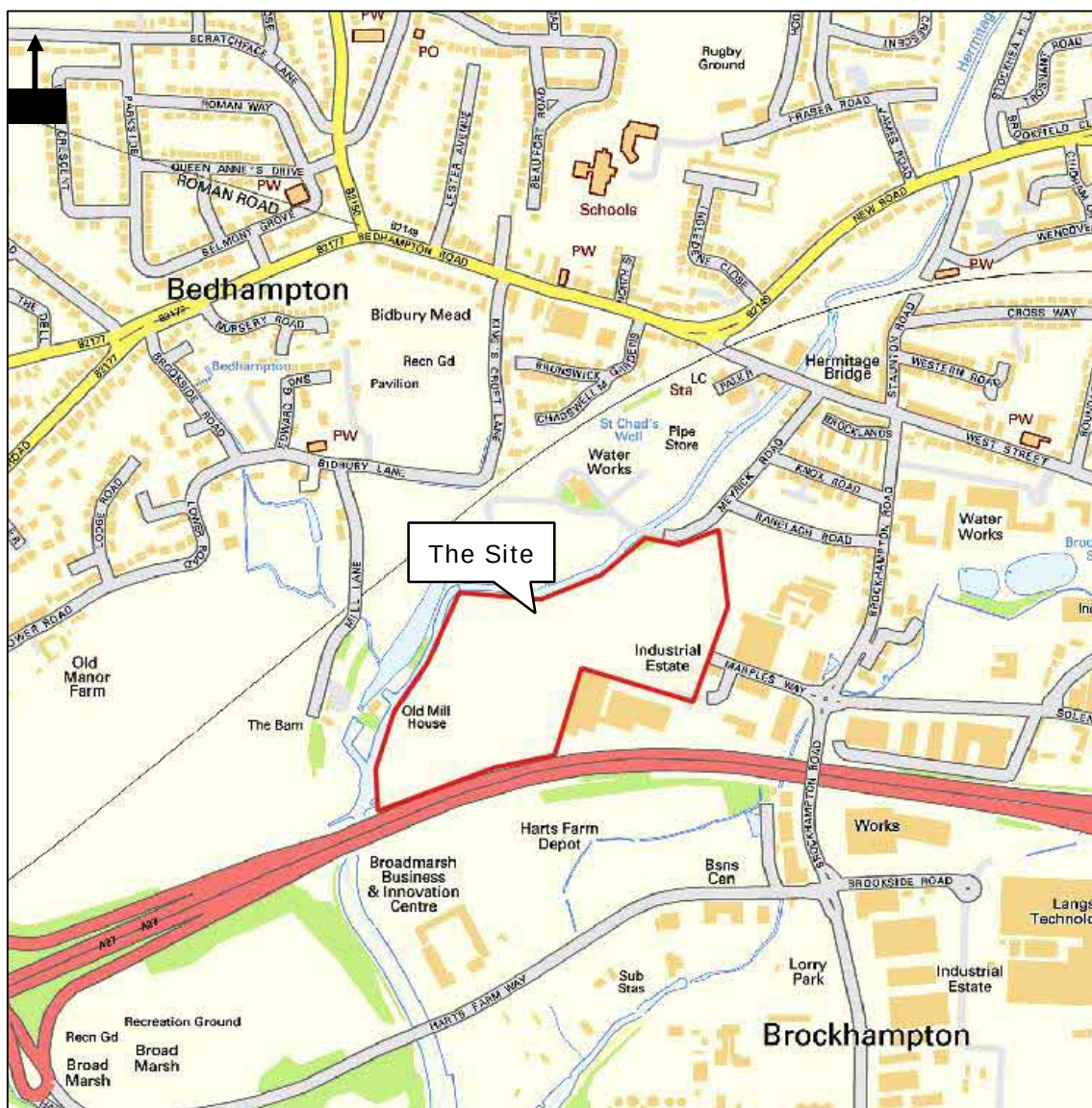


Figure 1: Site Location

The Environment Agency's online flood mapping indicate that the Site is located within Flood Zone 3. As the Site is considered sensitive to flood risk, it is required that the revised climate change allowances should be used to determine minimum Finished Floor Levels and safe access and egress routes. Following consultation with the Environment Agency (EA), it was requested that the latest 100 year climate change requirements, which came into force on the 29th February 2016 for South East River Basin, were run.

This Technical Note outlines the methodology adopted to assess the latest Climate Change requirements and provides details of hydraulic model updates and results.

2.0 HYDRAULIC MODELLING

2.1 Background

The hydraulic model used to provide additional flood outlines was the existing InfoWorks RS Model of the streams which flow through the town of Havant in Hampshire. The model was developed by Atkins in 2008 as part of The Havant Flood Mapping Study.

2.2 Model Changes

As mentioned above the original model was built using the legacy InfoWorks RS software which is no longer supported. Therefore, it was necessary that the RS model was migrated into InfoWorks ICM.

No major changes were made to the model apart from those necessary to completely rebuilt connectivity among the separate river reaches and storage areas. These were all manually checked against the original RS model to ensure that everything connects back up.

It was also necessary to recreate all boundary inputs. The way these are applied to a model is very different in ICM compared to RS. Therefore, the boundary conditions were also manually imported and checked against the original RS model to ensure that inflows and outflows were correctly applied to the model.

2.3 Hydrology

Fluvial Inflows

Suitable allowance for increased river flow due to climate change were considered based on the EA's February 2016 guidance.

For more vulnerable residential developments in Flood Zone 3 the 'higher central' allowance is used and for less vulnerable commercial developments the 'central' climate change allowance is required and this should be considered for the lifetime of the development.

The Site of interest is located in the South East Region, therefore the following climate change allowances were assessed:

- 1 in 100yr plus 45% event which should be used as the design event
- 1 in 100yr plus 105% event which should be used for sensitivity testing

All QT boundaries were revised to account for the new climate change allowances.

Tidal Boundaries

The Tidal boundary was updated based on the East Solent Tidal Model built by JBA in July 2018. The model domain covering the area of interest is that of the Hayling Island model and the closest node to the Site of interest is BNDRY_5 as shown in Figure 2. The remaining nodes are located further east and south away from the Site of interest.

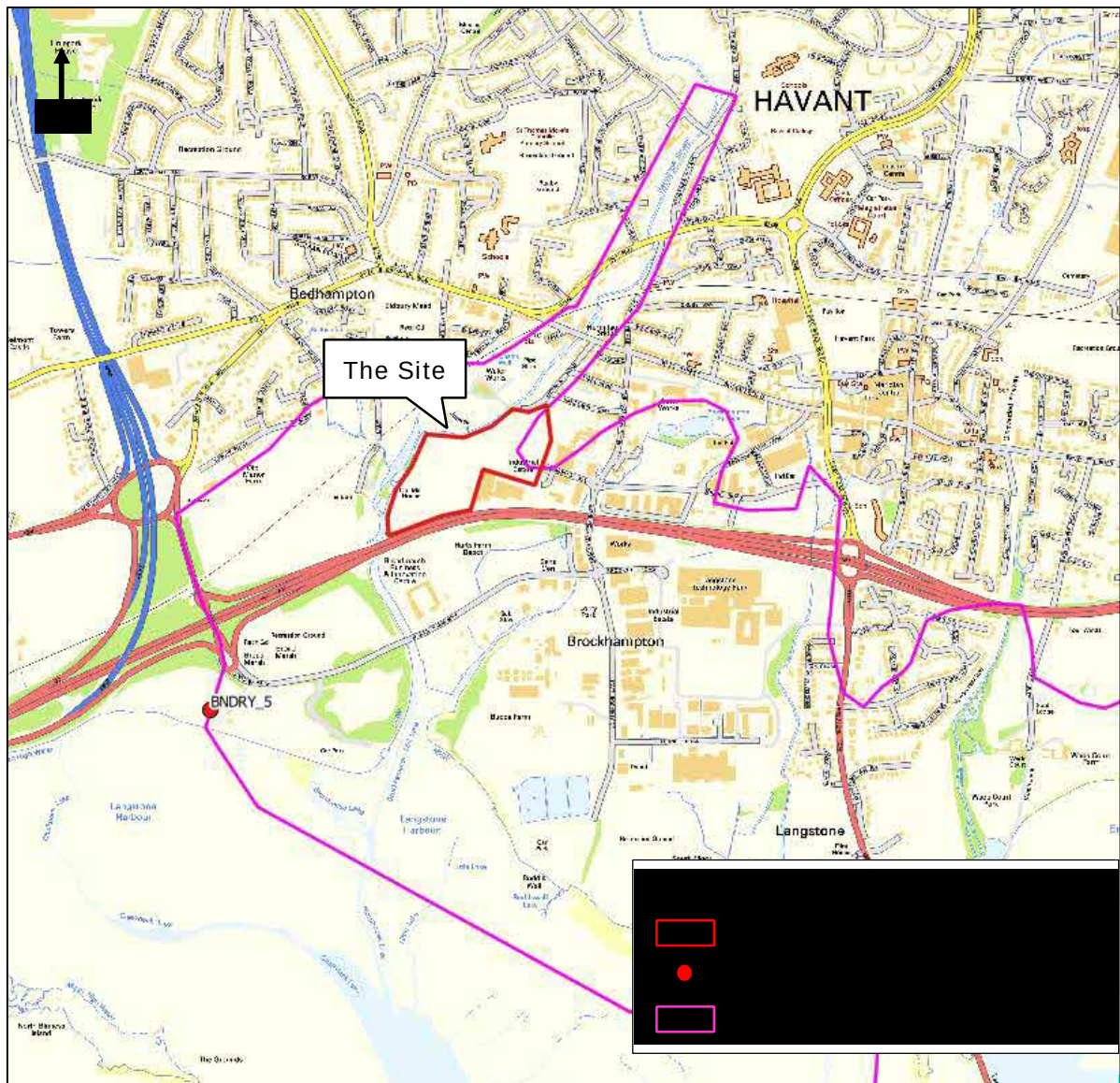


Figure 2: Hayling Island Tide Level Node Locations

The 2yr climate change tidal curve was used in the model. The 2yr present day tidal peak level, according to the East Solent Modelling study undertaken by JBA in July 2018, is 2.91m AOD. Guidance from the EA states¹ that the anticipated rise in sea level for the south east of England up to the year 2115 is expected to be 1.21 m. Therefore, this value was used for the Climate Change adjustment. Based on the above the 2yr climate change tidal peak level is 4.11m AOD.

3.0 MODEL RESULTS

The EA's Havant Model was rerun to produce the 1 in 100 + 45% CC and 1 in 100 + 105% CC flood outlines.

The model results indicated that the maximum in channel predicted flood level for the 100 + 45% Climate Change is 6.12m AOD within close proximity to the Site. The maximum in channel predicted flood level for the 100 + 105% Climate Change is 6.29m AOD.

Figure 3 and Table 1 below show the predicted flood levels within close proximity to the Site.

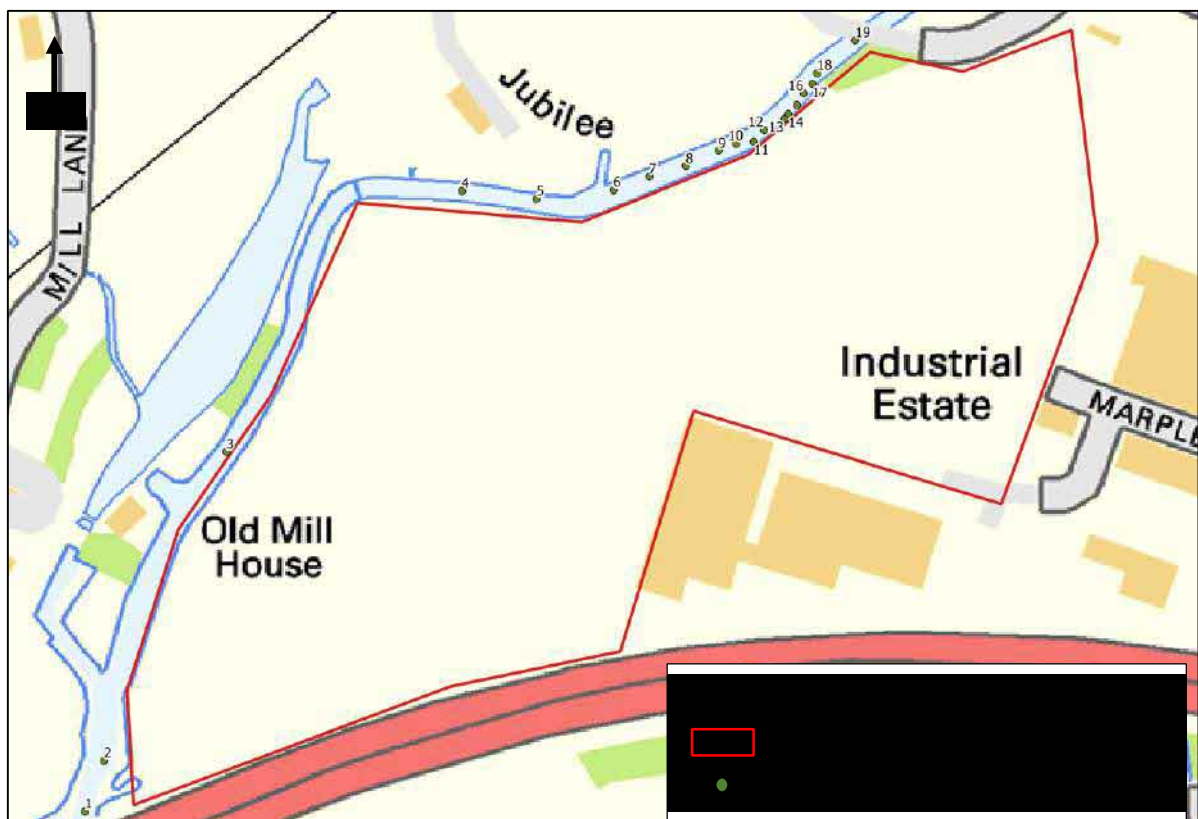


Figure 3: Node Location

¹ <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#future-flood-risk-management>

Table 1: Predicted Flood Levels

Node ID	1 in 100+45 %CC yr event (m AOD)	1 in 100+105 %CC yr event (m AOD)
1	4.26	4.35
2	4.27	4.36
3	4.28	4.37
4	4.29	4.39
5	4.31	4.42
6	4.33	4.45
7	4.35	4.46
8	4.36	4.47
9	4.37	4.49
10	4.38	4.49
11	4.39	4.5
12	5.1	5.37
13	5.19	5.39
14	5.29	5.47
15	5.51	5.68
16	5.75	5.92
17	6	6.18
18	6.12	6.29
19	5.96	6.13

The flood extents generated were taken from different in channel levels across the watercourse within close proximity to the site and interpolation was used between consecutive nodes. 1 m resolution LiDAR data were used to produce the outlines shown below.

Figure 4 below shows the predicted flood outlines for the 1 in 100yr+45%CC and the 1 in 100yr+105%CC including a 2yr+CC tidal boundary. The same figure also includes the current 100yr and 1000yr event including a 2yr tidal boundary.

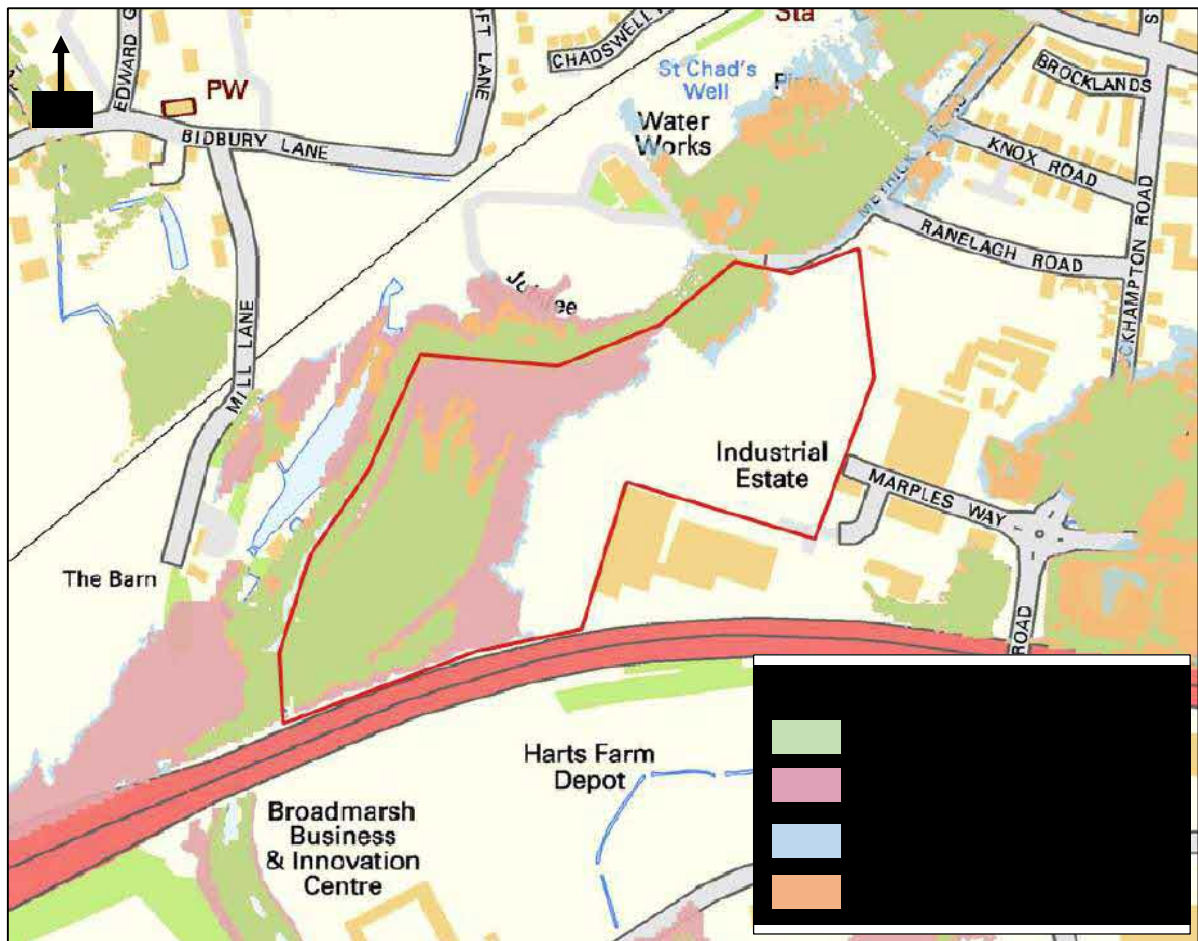


Figure 4: Flood outlines

4.0 CONCLUSIONS AND RECOMENDATIONS

Ardent Consulting Engineers (hereafter referred to as Ardent) has been commissioned by Portsmouth Water to undertake a hydraulic modelling exercise for a Site Kingscroft Farm, Portsmouth.

The purpose of this modelling task was to produce additional flood outlines for the new climate change scenarios updated in February 2016.

The existing InfoWorks RS Model of the streams which flow through the town of Havant in Hampshire was rerun using ICM software for the 100 year+45% climate change and 100 year+105% climate change events.

The maximum predicted water level for the 1 in 100 year+45% climate change event is 6.12m AOD and can be found in the northern part of the Site. Predicted water levels drop as we move towards the southern part of the site.

It is proposed that all residential development is located outside the 100 year +45% flood outline. Floodplain compensation will need to be provided for any development located within the 100 year +45% flood outline, in consultation with the EA. It is proposed that all finished floor levels for residential development are set 300mm above the 100 year +45% predicted flood. Finished Floor levels can vary across the Site.

In terms of safe access and egress in the event of a flood, the road network which serves the site remains dry during the 100 year +45% flood event. Occupants can leave the site via A27 heading east and subsequently north or west and subsequently north.

Georgia Athanasia

From: Rabone, Anna <Anna.Rabone@environment-agency.gov.uk>
Sent: 09 March 2020 13:17
To: Georgia Athanasia
Subject: RE: Cost Recovered Advice: Site at Kingscroft Farm, Portsmouth: ENVPAC/1/SSD/00109 [Filed 09 Mar 2020 14:23]
Attachments: Non-Real Time Hydraulic Model Review_Kingscroft Farm_v2.xlsm

Dear Georgia,

I hope you are well.

As promised, please find attached the full review report for our recent review of the hydraulic model. Please also note our further comments below:

Summary of the hydraulic model review

Following the second review, many of the previous 'Red' or 'Amber' comments have been downgraded. One 'Red' (Must Do) comment remains, however this is related to the extent of the modelling versus the existing Flood Map for Planning, which in this instance is due to the site also being at risk of tidal flooding.

Therefore, we deem the fluvial flood extents and levels from the ICM model suitable for use in a site specific Flood Risk Assessment (FRA).

Advice to the Applicant

As the site is also at risk of tidal flooding, the Applicant will also need to consider the tidal flood risk in their FRA, which should be used together with the fluvial flood risk to set the limits of the residential development, finished floor levels and access/egress routes.

If you have any queries regarding the review, please do not hesitate to contact me.

Thank you very much.

Kind regards,
Anna

Anna Rabone

Sustainable Places Advisor | Solent and South Downs Area

Environment Agency | Chichester Office, Oving Road, Chichester, West Sussex, PO20 2AG

Direct dial: 02077 140525



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Appendix H

FLOOD RESPONSE PLAN

KINGSCROFT FARM, MEYRICK ROAD
PORTSMOUTH, PO9 1NX

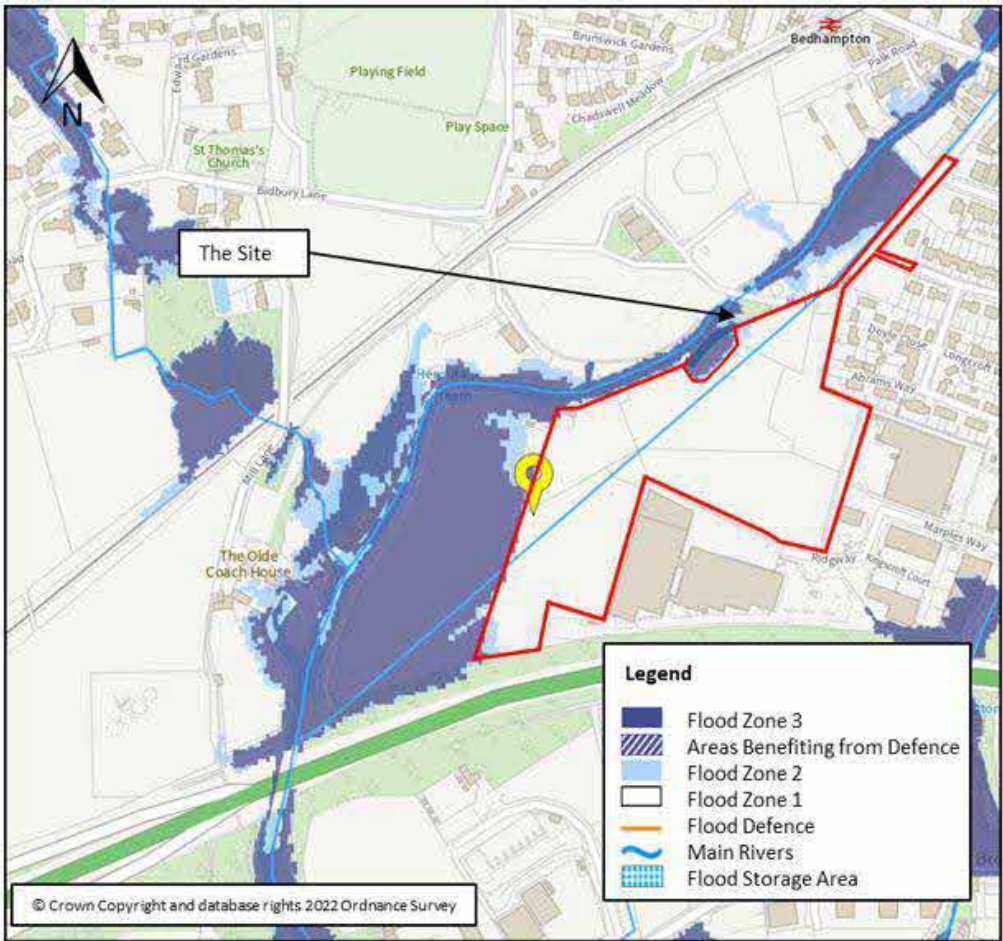
JUNE 2022

IF FLOODING IS IN PROGRESS

If the reader is referring to this plan because flooding is in progress without a flood warning at or near the site:

- Sound the alarm and prepare to instruct staff and visitors;
- Turn off gas, electricity and water supplies if safe to do so;
- Await further information from the Emergency Services or via local radio; and,
- Don't walk or drive through flood water, unless directed to by Emergency Services; six inches of fast flowing water can knock you over and two feet of water will float your car.

ENVIRONMENT AGENCY FLOOD MAP



EMERGENCY KIT

This is a useful bag that is packed with essentials in case you need to evacuate your home. It should be stored somewhere you can easily get to. Handy things to keep in your grab bag include:

- A list of useful telephone numbers (local authority, insurance company, family and friends, Corgi registered gas engineer and trained electrician).
- Mobile phone charger.
- Spare home and car keys.
- Toiletries, sanitary supplies.
- First-aid kit.
- Any essential medication
- A wind-up or battery-operated radio.
- Torch with spare batteries.
- Cash and credit cards.
- Spare clothes and blankets.
- Sensible flat shoes.
- Bottled water.
- A stock of non-perishable snack items.
- Essential items for babies or pets.

If asked by the emergency services to leave your home, please do so as quickly and calmly as possible. If you have time, turn off electricity, gas, and water supplies, unplug appliances, and lock all windows and doors. Take your grab bag with you.

Residents should listen to the advice and guidance from the emergency services at the time of an incident for actions to take. A Rest Centre will be announced at the time and widely communicated using all available media.

ENVIRONMENT AGENCY FLOOD WARNING CODES

The Environment Agency operates three levels of flood warnings as summarised below. Refer to the Environment Agency's website for details regarding Flood Warning Codes: <https://www.gov.uk/government/publications/flood-warnings-what-they-are-and-what-to-do>.

FLOOD ALERT	FLOOD WARNING	SEVERE FLOOD WARNING
Flooding is possible. Be prepared.	Flooding is expected. Act Now.	Severe flooding. Danger to life. Action Needed.
What to do: Be prepared to act on the flood evacuation plan. Prepare a flood kit of essential items. Monitor local water levels and the flood forecast. Look out for flood news updates. http://apps.environment-agency.gov.uk/river-and-sea-levels/ . Stay calm – check flood warnings, tune in to BBC London	What to do: Move family, pets and valuables to a safe place. Keep a flood kit ready. Turnoff gas, electricity and water suppliers if safe to do so. Put flood protection equipment in place.	What to do: Stay in a safe place with a means of escape. Be ready should you need to evacuate from your home. Co-operate with the emergency services. Call 999 if you are in immediate danger.

EMERGENCY CONTACT NUMBERS:

Agency	Number
Emergency Services	999 or 112
Environment Agency Flood Line	0845 988 1188
Environment Agency Flood Line type talk (for the hard of hearing)	0345 602 6340
Havant Borough Council	023 9244 6019
National Gas Emergency Service	0800 111 999
UK Power Networks (power cut)	0800 028 0247
Thames Water (loss of water supply)	0800 316 9800
NHS 111 Services	111

IF THERE IS A DANGER TO LIFE ALWAYS DIAL 999 OR 112 AND ASK FOR THE APPROPRIATE EMERGENCY SERVICE.

FLOOD RESPONSE PLAN

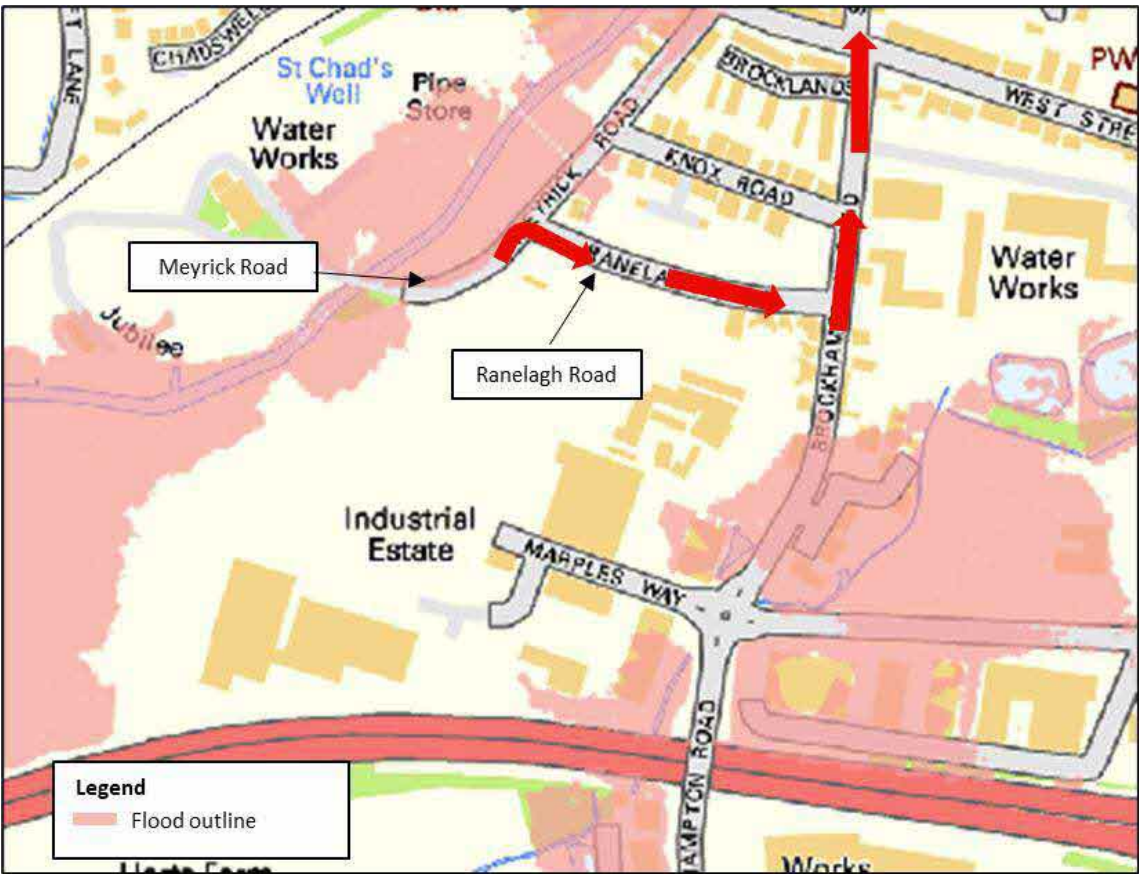
KINGSCROFT FARM, MEYRICK ROAD
PORTSMOUTH, PO9 1NX

JUNE 2022

SAFE ACCESS AND EGRESS ROUTES

Safe access and egress are required to enable the evacuation of people from the development and provide the emergency services with access to the development during times of flood.

If time allows and following the advice of the emergency services, it is recommended for site users to evacuate in the event of a flood. The road network which serves the site remains dry during the 100 year +45% flood event. Residents can leave the site via Meyrick Road, turning right onto Ranelagh Road and subsequently Brockhampton Road to the north of the development and away from the flood extents.



Flood Evacuation Route

An offsite refuge will be confirmed by Emergency Services during an event.

Staff and visitors should listen to the advice and guidance from the emergency services at the time of an incident.

ANNUAL REVIEW OF PLAN

- Check the management team and contacts lists and update details if necessary;
- Contact the Environment Agency Floodline Service to check that the flood risk to the Site has not changed;
- Check if the evacuation procedures are still correct;
- Undertake Flood Evacuation exercise;

In accordance with the flood risk assessment and planning requirements for the site the development has been designed and constructed to provide a safe egress.

Note the flood extents were obtained from the Environment Agency, and the information contained in this notice will be reviewed annually by the developments managing agent.

Appendix I

Ardent Consulting Engineers		Page 1
Suite 207 One Alie Street London E1 8DE		
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Innovyze	Source Control 2020.1	

ICP SUDS Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 787 Urban 0.000
Area (ha) 0.960 Soil 0.450 Region Number Region 7

Results l/s

QBAR Rural 4.8
QBAR Urban 4.8

Q100 years 15.4

Q1 year 4.1
Q30 years 11.0
Q100 years 15.4

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ICP SUDS Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 787 Urban 0.000
Area (ha) 0.510 Soil 0.450 Region Number Region 7

Results l/s

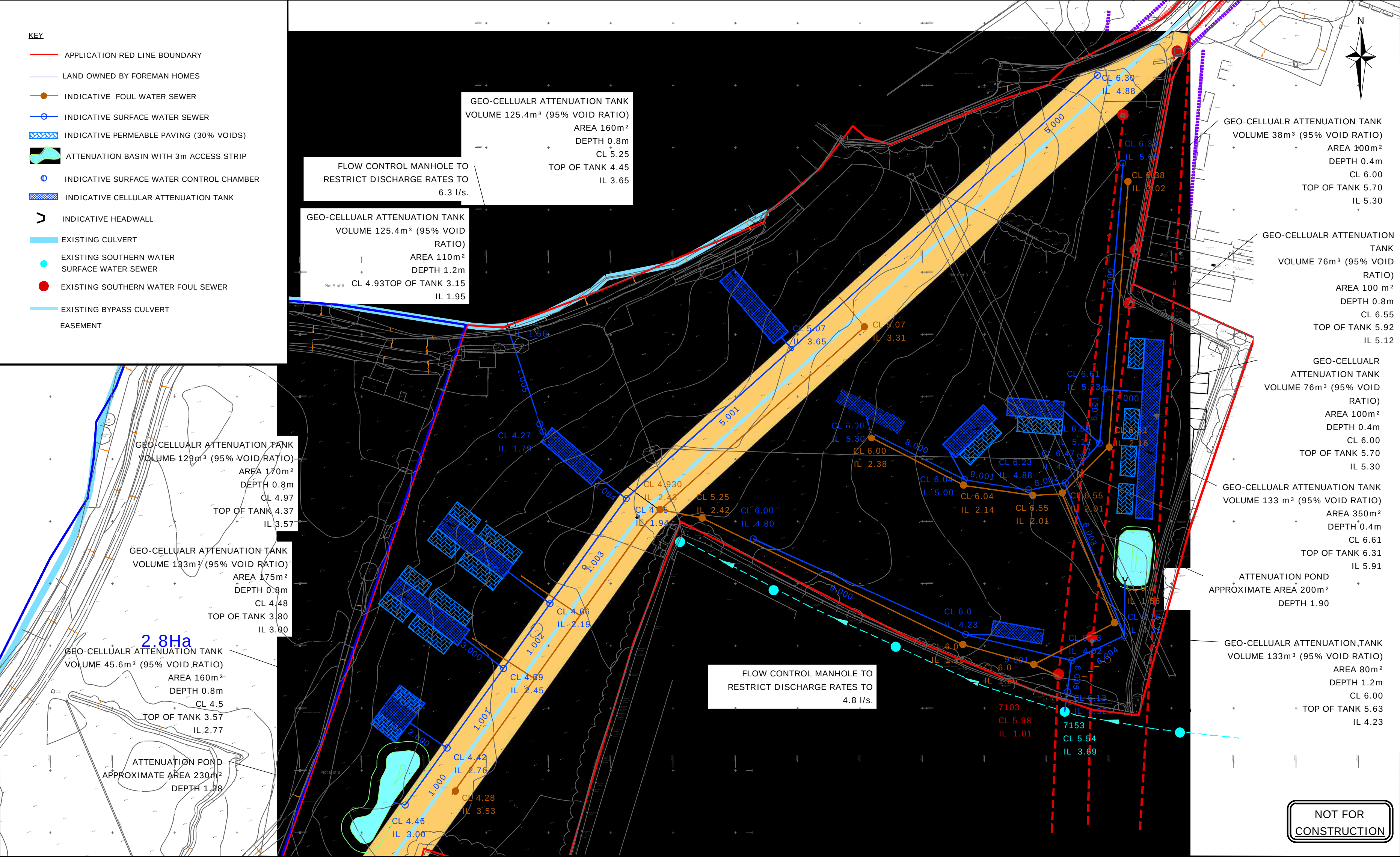
QBAR Rural 2.6
QBAR Urban 2.6

Q100 years 8.2

Q1 year 2.2
Q30 years 5.8
Q100 years 8.2

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Appendix J



- NOTES**
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
 - DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.
 - ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES, UNLESS OTHERWISE STATED. ALL LEVELS SHOWN ARE IN METRES ABOVE ORDNANCE DATUM.
 - ALL DIMENSIONS, LEVELS AND SURVEY GRID CO-ORDINATES ARE TO BE CHECKED ON SITE AND THE ENGINEER NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF THE WORKS.
 - NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.
 - EXISTING DRAINAGE AND UTILITIES TO BE CONFIRMED IN-SITU BY THE CONTRACTOR, PRIOR TO STARTING WORKS.
 - THE DRAINAGE STRATEGY IS INDICATIVE ONLY, TO DEMONSTRATE DESIGN INTENT AND ATTENUATION STORAGE REQUIREMENTS.
 - INDICATIVE DRAINAGE STRATEGY SUBJECT TO SOUTHERN WATER AND LEAD LOCAL FLOOD AUTHORITY APPROVAL.

PERMEABLE PAVING NOTES

LIGHT DUTY: SHOULD ONLY BE USED FOR SINGULAR OR DOUBLE DRIVES SERVING 1 OR 2 PLOTS - **NOT** SUITABLE FOR AREAS WHICH WILL BE SUBJECT TO CONSTRUCTION TRAFFIC OR POTENTIAL LOADING FROM HEAVY GOODS VEHICLES inc. DELIVERY, PANTECHNICON, REFUSE COLLECTION AND FIRE RESCUE VEHICLES

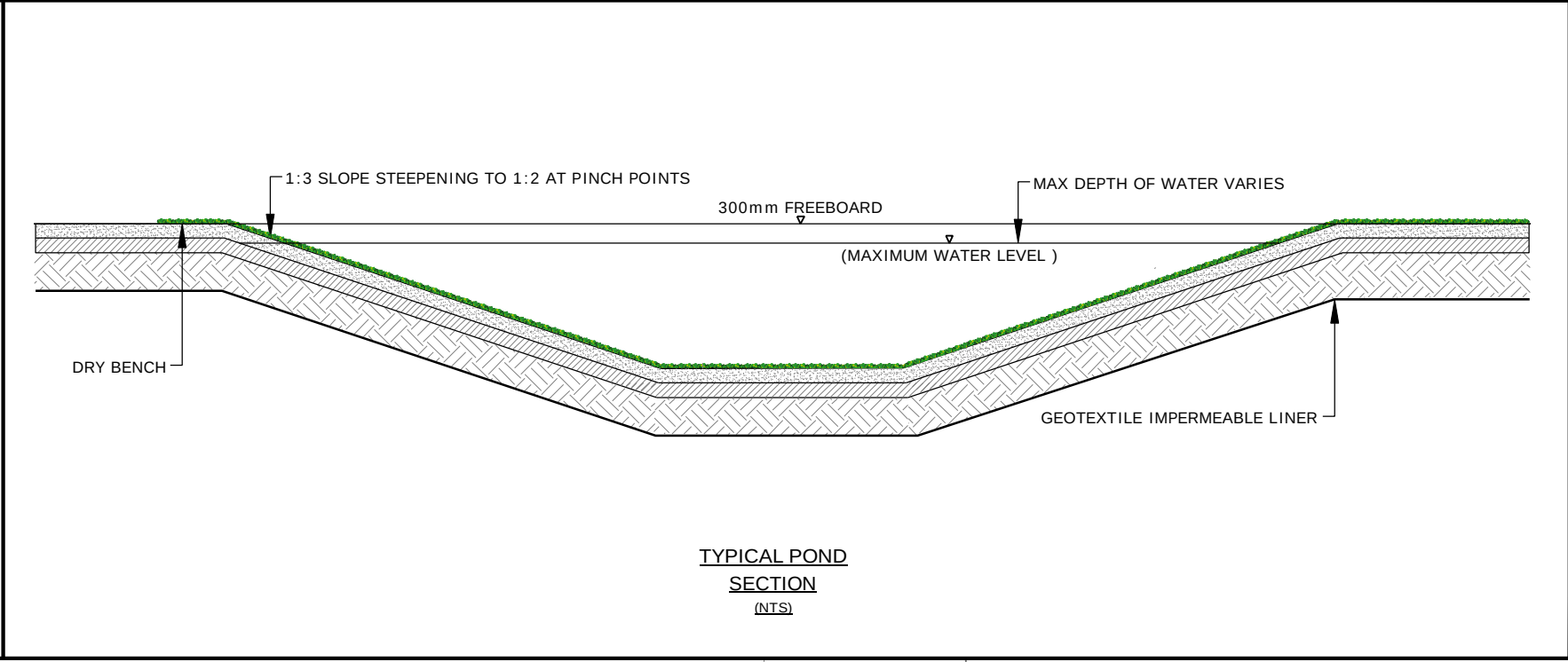
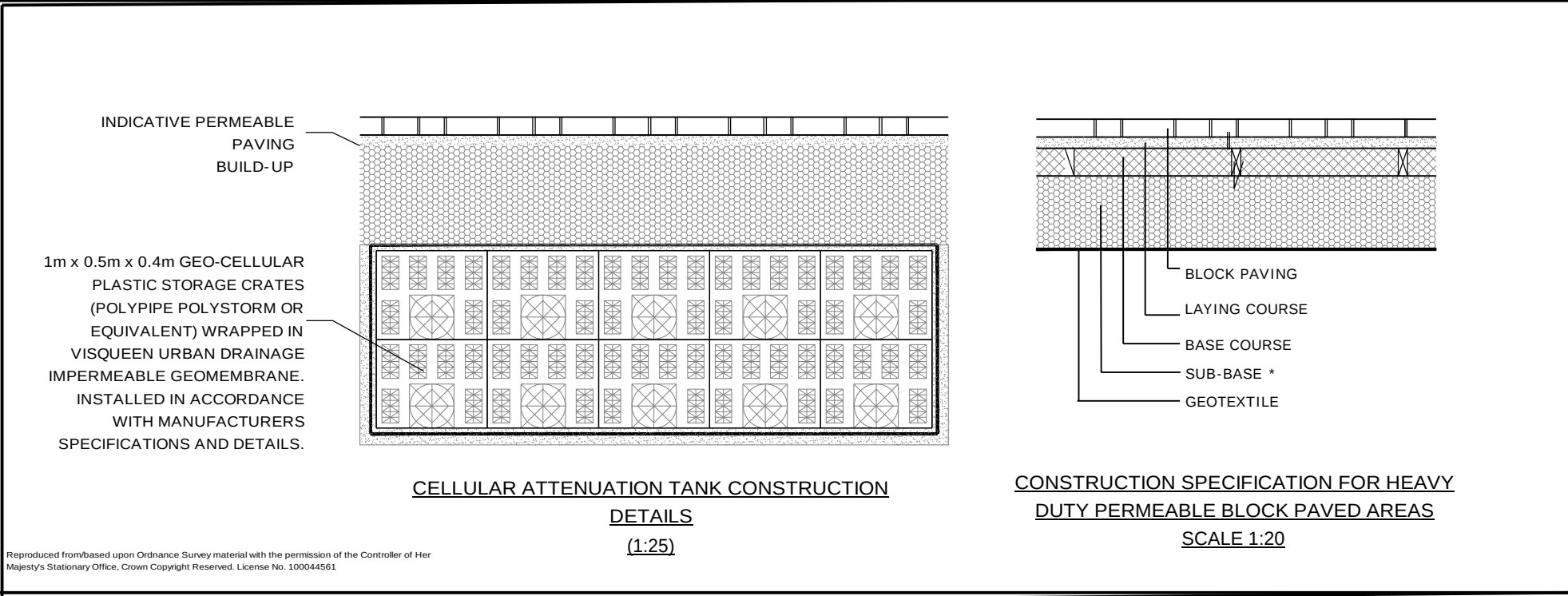
HEAVY DUTY: TO BE USED FOR **ALL** SHARED DRIVES, PARKING COURTS AND PRIVATE ACCESS ROADS

* THE FORMATION OF THE PERMEABLE PAVING SUB-BASE MUST NOT EXCEED A GRADIENT OF 1/40.

FOR STEEPER GRADIENTS, USE MAXIMUM GRADIENT OF 1/40 FOR FORMATION, APPLYING VERTICAL STEPS AS NECESSARY, BUT ENSURING MINIMUM SUB-BASE THICKNESS IS ALWAYS ACHIEVED.

PERMEABLE PAVING CONSTRUCTION SPECIFIED ABOVE IS SUITABLE FOR CBR VALUES OF BETWEEN 2% & 5%. FOR CBR VALUES OUTSIDE OF THIS RANGE, REFER BACK TO THE ENGINEER FOR CLARIFICATION.

ALL MATERIAL SPECIFICATION AND WORKMANSHIP OF PERMEABLE PAVING CONSTRUCTION TO BE STRICTLY IN ACCORDANCE WITH RECOMMENDATIONS BY MARSHALLS.



Rev	Description	Dwn	Chk	App	Date
ARDENT		CONSULTING ENGINEERS			
Third Floor The Hallmark Building 52-56 Leadenhall Street London EC3M 5JE		 www.smasitd.com SSIP SAFETY SOUNDNESS IN PROCUREMENT			
Tel: 020 7680 4088 Web: www.ardent-ce.co.uk E-mail: enquiries@ardent-ce.co.uk		a b c d e			

Client: FOREMAN HOMES					
Project Title: KINGSCROFT FARM					
Drawing Title: FOUL AND SURFACE WATER DRAINAGE STRATEGY					
A2 Scale	Date	Designed by			
VARIES	JUNE 2022	FH			
Drawn by	Checked by	Approved by			
FH	CC	BC			
Drawing Number		2200 510-0 0 2			Rev -

Appendix K

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
4.000	38.900	0.389	100.0	0.300	4.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	41.500	0.249	166.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
5.000	112.000	1.230	91.1	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
5.001	91.300	0.544	167.8	0.300	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.004	36.500	0.153	238.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.005	35.800	0.150	238.7	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
4.000	50.00	4.50	3.570	0.300	0.0	0.0	0.0	1.31	52.0	40.6
1.003	50.00	5.71	2.194	0.400	0.0	0.0	0.0	1.01	40.2«	54.2
5.000	50.00	5.36	4.875	0.000	0.0	0.0	0.0	1.37	54.5	0.0
5.001	50.00	6.87	3.645	0.300	0.0	0.0	0.0	1.01	40.0«	40.6
1.004	50.00	7.47	1.945	0.700	0.0	0.0	0.0	1.01	71.6«	94.8
1.005	50.00	8.06	1.792	0.700	0.0	0.0	0.0	1.01	71.6«	94.8

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.000	0.000	0.000
1.001	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.100	0.100	0.100
1.002	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.300	0.300	0.300
1.003	-	-	100	0.000	0.000	0.000
5.000	-	-	100	0.000	0.000	0.000
5.001	-	-	100	0.300	0.300	0.300
1.004	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.700	0.700	0.700

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
---------------------	--------------	--------------	--------------	------------------	-----------	--------

1.005		3.550	1.642	1.750	0	0
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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 6 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.600	Storm Duration (mins)	30
Ratio R	0.345		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: 10, DS/PN: 1.004, Volume (m³): 8.6

Unit Reference	MD-SHE-0103-6300-2000-6300
Design Head (m)	2.000
Design Flow (l/s)	6.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	103
Invert Level (m)	1.945
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	6.3	Kick-Flo®	0.920	4.4
Flush-Flo™	0.448	5.5	Mean Flow over Head Range	-	5.1

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	3.5	1.200	5.0	3.000	7.6	7.000	11.4
0.200	5.0	1.400	5.3	3.500	8.2	7.500	11.8
0.300	5.4	1.600	5.7	4.000	8.7	8.000	12.1
0.400	5.5	1.800	6.0	4.500	9.2	8.500	12.5
0.500	5.5	2.000	6.3	5.000	9.7	9.000	12.8
0.600	5.4	2.200	6.6	5.500	10.1	9.500	13.2
0.800	5.0	2.400	6.9	6.000	10.6		
1.000	4.6	2.600	7.1	6.500	11.0		

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Storage Structures for Storm

Tank or Pond Manhole: 1, DS/PN: 1.000

Invert Level (m) 3.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	50.0	1.460	230.0

Tank or Pond Manhole: 2, DS/PN: 2.000

Invert Level (m) 2.770

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	160.0	0.800	160.0	0.801	0.0

Complex Manhole: 4, DS/PN: 3.000

Tank or Pond

Invert Level (m) 3.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	175.0	0.800	175.0	0.801	0.0

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	23.0
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	63.9	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	3.980	Cap Volume Depth (m)	0.500

Complex Manhole: 6, DS/PN: 4.000

Tank or Pond

Invert Level (m) 3.570

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Tank or Pond

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	170.0	0.800	170.0	0.801	0.0

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	23.0
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	63.9	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	4.470	Cap Volume Depth (m)	0.500

Complex Manhole: 9, DS/PN: 5.001

Tank or Pond

Invert Level (m) 3.645

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	160.0	0.800	160.0	0.801	0.0

Tank or Pond Manhole: 10, DS/PN: 1.004

Invert Level (m) 1.945

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	110.0	1.200	110.0	1.201	0.0

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	6	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.349
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.500	Cv (Winter)	0.840
Margin for Flood Risk Warning (mm)			300.0
Analysis Timestep	2.5	Second Increment (Extended)	
DTS Status			ON
DVD Status			OFF
Inertia Status			OFF

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 45

									Water
PN	US/MH			Return	Climate	First (X)	First (Y)	First (Z)	Overflow
	Name	Storm		Period	Change	Surcharge	Flood	Overflow	Act.
1.000	1	15	Summer	1	+0%	100/60	Winter		
2.000	2	15	Summer	1	+0%	30/120	Winter		
1.001	3	15	Summer	1	+0%	30/120	Summer		
3.000	4	120	Winter	1	+0%	100/60	Summer		
1.002	5	120	Winter	1	+0%	30/30	Summer		
4.000	6	30	Winter	1	+0%	100/15	Summer		
1.003	7	240	Winter	1	+0%	1/240	Winter		
5.000	8	15	Summer	1	+0%				
5.001	9	60	Winter	1	+0%	100/15	Summer		
1.004	10	240	Winter	1	+0%	1/60	Summer		
1.005	11	120	Summer	1	+0%				

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged		Flooded		Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow	Volume						
1.000	1	-0.225	0.000	0.00					0.0	OK	
2.000	2	-0.225	0.000	0.00					0.0	OK	
1.001	3	-0.461	0.000	0.00					0.0	OK	
3.000	4	-0.190	0.000	0.06				65	2.7	OK	
1.002	5	-0.191	0.000	0.06					2.7	OK	
4.000	6	-0.143	0.000	0.29				23	14.1	OK	
1.003	7	0.041	0.000	0.27					10.3	SURCHARGED	
5.000	8	-0.225	0.000	0.00					0.0	OK	
5.001	9	-0.134	0.000	0.34				31	13.4	OK	
1.004	10	0.205	0.000	0.08					5.5	SURCHARGED	
1.005	11	-0.242	0.000	0.08					5.5	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 6 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.349
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 19.500 Cv (Winter) 0.840

 Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status OFF
 Inertia Status OFF

 Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	360 Winter	30	+0%	100/60 Winter				3.074
2.000	2	360 Winter	30	+0%	30/120 Winter				3.075
1.001	3	360 Winter	30	+0%	30/120 Summer				3.075
3.000	4	360 Winter	30	+0%	100/60 Summer				3.081
1.002	5	360 Winter	30	+0%	30/30 Summer				3.080
4.000	6	30 Winter	30	+0%	100/15 Summer				3.739
1.003	7	240 Winter	30	+0%	1/240 Winter				3.125
5.000	8	15 Summer	30	+0%					4.875
5.001	9	30 Winter	30	+0%	100/15 Summer				3.836
1.004	10	240 Winter	30	+0%	1/60 Summer				3.145
1.005	11	960 Winter	30	+0%					1.850

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.151	0.000	0.01		0.5	OK	
2.000	2	0.080	0.000	0.06		2.6	SURCHARGED	
1.001	3	0.080	0.000	0.06		2.7	SURCHARGED	
3.000	4	-0.144	0.000	0.10	115	4.6	OK	
1.002	5	0.399	0.000	0.07		3.5	SURCHARGED	
4.000	6	-0.056	0.000	0.92	16	45.1	OK	
1.003	7	0.706	0.000	0.60		22.8	SURCHARGED	
5.000	8	-0.225	0.000	0.00		0.0	OK	
5.001	9	-0.034	0.000	1.00	16	39.1	OK	
1.004	10	0.900	0.000	0.08		5.5	SURCHARGED	
1.005	11	-0.242	0.000	0.08		5.5	OK	

Simulation Criteria

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	6	Number of Real Time Controls	0

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 45

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.394	0.000	0.03		1.6	SURCHARGED	
2.000	2	0.624	0.000	0.05		2.2	SURCHARGED	
1.001	3	0.625	0.000	0.07		3.3	SURCHARGED	
3.000	4	0.397	0.000	0.13	452	5.7	SURCHARGED	
1.002	5	0.941	0.000	0.12		5.6	SURCHARGED	
4.000	6	0.123	0.000	1.16	16	57.1	SURCHARGED	
1.003	7	1.321	0.000	1.49		57.1	SURCHARGED	
5.000	8	-0.225	0.000	0.00		0.0	OK	
5.001	9	0.180	0.000	1.16	21	45.4	SURCHARGED	
1.004	10	1.694	0.000	0.09		6.2	SURCHARGED	
1.005	11	-0.239	0.000	0.09		6.1	OK	

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Innovyze Network 2020.1																																																																										
Online Controls for Storm																																																																										
Hydro-Brake® Optimum Manhole: 13, DS/PN: 6.006, Volume (m³): 2.7																																																																										
Unit Reference MD-SHE-0087-4800-2300-4800 Design Head (m)2.300 Design Flow (l/s)4.8 Flush-Flo™Calculated ObjectiveMinimise upstream storage ApplicationSurface Sump AvailableYes Diameter (mm)87 Invert Level (m)3.920 Minimum Outlet Pipe Diameter (mm)100 Suggested Manhole Diameter (mm)1200																																																																										
<table><tr><td>Control Points</td><td>Head (m)</td><td>Flow (l/s)</td><td>Control Points</td><td>Head (m)</td><td>Flow (l/s)</td></tr><tr><td>Design Point (Calculated)</td><td>2.300</td><td>4.8</td><td>Kick-Flo®</td><td>0.774</td><td>2.9</td></tr><tr><td>Flush-Flo™</td><td>0.379</td><td>3.6</td><td>Mean Flow over Head Range</td><td>-</td><td>3.7</td></tr></table>			Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	2.300	4.8	Kick-Flo®	0.774	2.9	Flush-Flo™	0.379	3.6	Mean Flow over Head Range	-	3.7																																																						
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<u>Storage Structures for Storm</u> <u>Tank or Pond Manhole: 2, DS/PN: 7.000</u> Invert Level (m) 5.910 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>350.0</td><td>0.400</td><td>350.0</td><td>0.401</td><td>0.0</td></tr></table> <u>Tank or Pond Manhole: 4, DS/PN: 6.002</u> Invert Level (m) 5.119 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>100.0</td><td>0.800</td><td>100.0</td><td>0.801</td><td>0.0</td></tr></table> <u>Tank or Pond Manhole: 5, DS/PN: 8.000</u> Invert Level (m) 5.300 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>100.0</td><td>0.400</td><td>100.0</td><td>0.401</td><td>0.0</td></tr></table> <u>Tank or Pond Manhole: 6, DS/PN: 8.001</u> Invert Level (m) 4.997 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>100.0</td><td>0.800</td><td>100.0</td><td>0.802</td><td>0.0</td></tr></table> <u>Tank or Pond Manhole: 9, DS/PN: 6.004</u> Invert Level (m) 4.306 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>127.0</td><td>1.900</td><td>200.0</td></tr></table> <u>Tank or Pond Manhole: 11, DS/PN: 9.001</u> Invert Level (m) 4.234			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	350.0	0.400	350.0	0.401	0.0	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	100.0	0.800	100.0	0.801	0.0	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	100.0	0.400	100.0	0.401	0.0	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	100.0	0.800	100.0	0.802	0.0	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	127.0	1.900	200.0
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Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)									
0.000	80.0	1.200	80.0	1.201	0.0									
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Storm

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Online Controls 1 Number of Storage Structures 6 Number of Real Time Controls 0

Rainfall Model	FSR	Ratio R	0.345
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.600	Cv (Winter)	0.840

Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 45

	US/MH		Return	Climate	First (X)		First (Y)	First (Z)	Overflow
PN	Name	Storm	Period	Change	Surcharge		Flood	Overflow	Act.
6.000	1	15 Winter	1	+0%	100/15	Winter	100/960	Winter	
7.000	2	15 Winter	1	+0%	1/15	Summer			
6.001	3	15 Winter	1	+0%	1/15	Summer			
6.002	4	30 Winter	1	+0%	30/15	Winter			
8.000	5	60 Winter	1	+0%	100/120	Summer			
8.001	6	240 Winter	1	+0%	30/60	Winter			
8.002	7	30 Winter	1	+0%	30/15	Summer			
6.003	8	30 Winter	1	+0%	1/15	Winter			
6.004	9	360 Winter	1	+0%	1/30	Summer			
9.000	10	15 Summer	1	+0%	30/60	Winter			
9.001	11	360 Winter	1	+0%	1/30	Summer			
6.005	12	360 Winter	1	+0%	1/15	Summer			
6.006	13	360 Winter	1	+0%	1/15	Summer			

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Innovyze						Network 2020.1					
1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm											
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded		
6.000	1	5.680	-0.225	0.000	0.00		0.0	OK			
7.000	2	5.914	0.299	0.000	2.04		68.9	SURCHARGED			
6.001	3	5.682	0.228	0.000	1.78		64.1	SURCHARGED			
6.002	4	5.277	-0.067	0.000	0.79		50.2	OK			
8.000	5	5.330	-0.195	0.000	0.04		1.7	OK	1		
8.001	6	5.020	-0.202	0.000	0.02		0.8	OK			
8.002	7	5.068	-0.033	0.000	0.08		2.8	OK			
6.003	8	5.088	0.056	0.000	1.06		53.0	SURCHARGED			
6.004	9	4.723	0.192	0.000	0.18		11.6	SURCHARGED*			
9.000	10	4.800	-0.225	0.000	0.00		0.0	OK			
9.001	11	4.707	0.248	0.000	0.09		3.5	SURCHARGED			
6.005	12	4.787	0.540	0.000	0.14		6.5	SURCHARGED			
6.006	13	4.804	0.659	0.000	0.15		3.6	SURCHARGED			
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	6	Number of Real Time Controls	0

Synthetic Rainfall Details

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 45

	US/MH		Return	Climate	First (X)		First (Y)	First (Z)	Overflow
PN	Name	Storm	Period	Change	Surcharge		Flood	Overflow	Act.
6.000	1	30 Winter	30	+0%	100/15	Winter	100/960	Winter	
7.000	2	15 Winter	30	+0%	1/15	Summer			
6.001	3	30 Winter	30	+0%	1/15	Summer			
6.002	4	120 Winter	30	+0%	30/15	Winter			
8.000	5	30 Winter	30	+0%	100/120	Summer			
8.001	6	480 Winter	30	+0%	30/60	Winter			
8.002	7	480 Winter	30	+0%	30/15	Summer			
6.003	8	480 Winter	30	+0%	1/15	Winter			
6.004	9	480 Winter	30	+0%	1/30	Summer			
9.000	10	480 Winter	30	+0%	30/60	Winter			
9.001	11	480 Winter	30	+0%	1/30	Summer			
6.005	12	480 Winter	30	+0%	1/15	Summer			
6.006	13	480 Winter	30	+0%	1/15	Summer			

Simulation Criteria

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
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Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 45

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Appendix L

**C753 SIMPLE INDEX TREATMENT
METHOD**

JUNE 2022

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/industrial roofs)	Low	0.3	0.2	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, home zones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g. hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7
Sites with heavy pollution (e.g. haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways	High	0.8	0.8	0.9

Table 1: Pollution hazard indices for different land use classifications

(land use in bold applicable for the development).

Type of SuDS component	Mitigation indices		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bio retention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8
Proprietary treatment systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Table 2: Indicative SuDS mitigation indices for discharges to surface waters

(bold text is applicable to this development).

C753 SIMPLE INDEX TREATMENT
METHOD

JUNE 2022

For surface water discharge from Residential Parking Areas and Low Traffic Roads <300 traffic movements/day			
	Required mitigation indices		
Source	TSS	Metals	Hydrocarbons
Very Low	0.2	0.2	0.05
Low	0.5	0.4	0.4
Total	0.7	0.6	0.45
Type of SuDS component provided			
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Total	1.2	1.1	1.3
Check	+0.5	+0.5	+0.85

Table 3: SuDS mitigation indices provided

Appendix M

SuDS MANAGEMENT PLAN

1.0 INTRODUCTION

- 1.1 The development at Kingscroft Farm includes a number of Sustainable Drainage Systems (SuDS) as part of the surface water drainage system including, detention basin/ponds, attenuation tanks and permeable paving. This Technical Note sets out an outline management plan for the aforementioned SuDS components.
- 1.2 The proposed SuDS components in addition to addressing climate change will bring a number of benefits in terms of water quality, environmental, and social amenity.
- 1.3 The maintenance of all SuDS components will be in accord with the best practices and CIRIA document C753 "The SuDS Manual". Typical maintenance activities for the proposed SuDS components have been reproduced from Table 32.1 of "The SuDS Manual" in Table 1 below. A private management company will be set up to maintain the surface water drainage network, including on-site SuDS.

SuDS MANAGEMENT PLAN

Table 1: Typical SuDS Maintenance Activities

Operation and maintenance activity	SuDS component		
	Geo-cellular Tank	Permeable paving	Detention basin / pond
Regular Maintenance			
Inspection			
Litter and debris removal	☐		
Grass cutting			
Weed and invasive plant control		☐	☐
Shrub management		☐	☐
Shoreline vegetation			☐
Aquatic vegetation management			☐
Occasional Maintenance			
Sediment management			
Vegetation replacement			☐
Vacuum sweeping and brushing			
Remedial Maintenance			
Structure rehabilitation / repair	☐	☐	☐
will be required ☐ may be required			

SuDS MANAGEMENT PLAN

2.0 SuDS MANAGEMENT PLAN

- 2.1 This plan is intended to cover all on-site drainage structures. The Site Management Team should oversee and implement the SuDS Management Plan and designate a qualified person who will be responsible for the proper operation and maintenance of the surface water drainage structures.

Water Quality Management

- 2.2 In line with Tables 26.2 and 26.3 of the CIRIA C753 The SuDS Manual, the proposed permeable paving, attenuation ponds and swales would provide sufficient treatment for the surface water runoff from the Site.
- 2.3 The surface drainage network would also be designed to protect and enhance the quality of surface water runoff through the removal of sediment and pollutants. Catchpit manholes and silt trapped gullies will reduce the amount of pollutants entering the system. Preventive maintenance of the system will include a comprehensive source reduction program of regular sweeping and litter removal, prohibitions on the use of pesticides, and maintenance of bin areas.

Maintenance Program

- 2.4 The Site Management Team will conduct the SuDS Management Plan set forth in this document. The Site Management will ensure that inspections and record keeping are timely and accurate. Inspection & Maintenance Log Forms should include the date and physical conditions of the structures, depth of sediment in structures, evidence of overtopping or debris blockage and maintenance required of each structure. Records of maintenance will be kept on file on-site and copies of Inspection & Maintenance Log sheets indicating all work and inspections will be available to the Council upon request. A model Maintenance log is appended for reference.
- 2.5 Regular maintenance should include:

SuDS MANAGEMENT PLAN

Inspect channel and gully inlet grates and remove any debris every 6 months or as determined to be reasonable based on experience with the installed systems to ensure that the gullies are working in their intended fashion and that they are free of debris;

Inspect gully sumps and bottom of drain manholes quarterly; if depth of sediment in sumps exceeds 50% capacity, sediment must be removed. Excessive sediment shall be removed and properly disposed by a licensed drainage cleaning company.

All litter shall be picked up and removed from the parking areas, and soft landscaping.

Inspect external bin stores for spillage and scattered litter must be performed on a regular basis to prevent the spread of pollutants into the surface water drainage network.

The inlets, outlet and vents and overflows of SuDS components should be checked annually and after large storms to ensure that they are in good condition and operating as designed. Regular maintenance includes inspection and identification of any areas that are not operating correctly monthly for the first 3 months and then every 6 months after.

Basin/Pond inlets, outlet/headwalls should be checked annually and after large storms to ensure that they are in good condition and operating as designed. Regular maintenance includes inspection and identification of any areas that are not operating correctly monthly for the first 3 months and then every 6 months after.

Winter Maintenance Program

- 2.6 Ensure that drainage structures are not blocked by ice, snow, debris or rubbish during winter months.

SuDS MANAGEMENT PLAN

Operation and Maintenance requirements

2.7 Recommendations for the operation and maintenance including typical frequencies are included in Tables 2, 3 and 4 below.

Table 2: SuDS Operation and Maintenance Requirements- Permeable paving

SUDS Element	Permeable Paving	
Maintenance Period	Maintenance Task	Frequency
Regular Maintenance	Brushing and vacuuming	Once a year or as required
Occasional Maintenance	Stabilise and mow contributing adjacent area	As required
	Removal of weed or management using glyphosate applied directly into weeds by an applicator rather than spraying	As required
Remedial Work	Remediate any landscaping which has been raised to within 50mm of the level of the paving	As required.
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to structural performance or a hazard to users.	As required.
Monitoring	Rehabilitation of surface or upper structure by remedial sweeping	Every 10 to 15 years, or as required
	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	3 monthly, 48hrs after large storms in first 6 months

SuDS MANAGEMENT PLAN

	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Table 3: SuDS Operation and Maintenance Requirements- Attenuation tank

SUDS Element	Attenuation Tank	
Maintenance Period	Maintenance Task	Frequency
Maintenance Work	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risk to performance)	Monthly
	Remove sediment from pre-treatment structures and/or internal forebays.	Annually, or as required
Remedial Work	Repair/rehabilitate inlets, outlets, overflows and vents	As required.
Monitoring	Inspect/check all inlets, outlets, vents, and overflows to ensure that they are in good condition and operating as designed	Annually.
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required.

SuDS MANAGEMENT PLAN

Table 4: SuDS Operation and Maintenance Requirements - Swales

SuDS Element	Detention Basin	
Maintenance Period	Maintenance Task	Frequency
Regular Maintenance	Remove litter and debris	Monthly, or as required
	Cut the grass – for spillways and access routes	Monthly (during growing season) or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring before nesting season and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and blockages and clear as required	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt removal frequencies	Monthly (for first year) then annually or as required
	Check and penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlets and forebays	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually
Occasional Maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years or as required

SuDS MANAGEMENT PLAN

	Remove sediment from inlets, outlets, forebay and main basin when required.	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is required).
Remedial Actions	Repair erosion or other damage by re-turfing or reseeded	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows.	As required
	Relevel uneven levels and reinstate design levels.	As required

SuDS MANAGEMENT PLAN

Suds Management Plan- Appendix A

Drainage Operation and Maintenance Log

Site Maintenance Supervisor: _____ Date: _____

☐ Routine ☐ Response to rainfall event _ in ☐ Other: _____

BMP	Frequency	Date Performed	Comments
Gullies and Manholes	Monthly Inspections		
	Maintenance Quarterly and as necessary		
Culverts and Headwalls	Inspect and identify areas not operating property every 3 months (for the first 3 months) and every 6 months after.		
	Monthly trash screens inspection and remove debris		
Pavement Areas (parking, driveways, service areas)	Monthly Sweeping		
	Rubbish & Litter Removal as Necessary		
Landscaped & Vegetated Areas	Maintenance as necessary		

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Permeable Paving	Rubbish, litter & debris removal on a monthly basis		
	Inspect for evidence of poor operation and silt accumulation on a quarterly basis		
	Specialist sweeping, jetting and vacuuming, as required		
	Remediation of any depressions, rutting or broken paving elements, as required		
	Annual inspection of inlets, outlets, overflows and vents to ensure correct operation.		
	Survey of inside of pond to assess debris / silt build up that may affect operation and clear, as required.		
Detention Basin	Monthly clearance of debris from catchment surface		
	Annual inspection of inlets, outlets, overflows and vents to ensure correct operation.		
	Survey of inside of pond to assess debris /		

SuDS MANAGEMENT PLAN

	silt build up that may affect operation and clear, as required.		
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Appendix N

PRELIMINARY DRAINAGE CALCULATIONS

24/06/2022

EXISTING FOUL WATER



Unit Type	Existing Area/Units	Hours (hrs)	Foul Water Flow Rate l/day	Peak Factor	Peaked Loading l/s	Loading (l/s)
General Housing p	2 units	24	600 per property	6.6	0.0458333 per property	0.092

TOTAL EXISTING FOUL LOADING = 0.092

PROPOSED FOUL WATER

Unit Type	Proposed Area/Units	Hours (hrs)	Foul Water Flow Rate l/day	Peak Factor	Peaked Loading l/s	Loading (l/s)
General Housing p	140 units	24	600 per property	6.6	0.0458333 per property	6.417

TOTAL PROPOSED FOUL LOADING = 6.417