Notes

© 2018 RPS Group

1. This drawing has been prepared in accordance with the scope of RPS's appointment with its client and is subject to the terms and conditions of that appointment. RPS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.
2. If received electronically it is the recipients responsibility to print to correct scale. Only written dimensions should be used.
3. This drawing should be read in conjunction with all other relevant drawings and specifications.

SURVEY KEY

AV	AIR VALVE	LB	LETTER BOX
BL	BOLLARD	LP	LAMP POST
BM	BENCH MARK	L/L	LARCH LAP
BN	BEACON	MG	MULTI GIRTH
BS	B/S STOP SIGN	MH	MANHOLE
BT	BRITISH TELECOM COVER	MK	MARKER POST
B/W	BARBED WIRE	MW	MONITORING WELL
CB	CONTROL BOX	NP	NAME PLATE
CCTV	CLOSED CIRCUIT TV	OB	OAK BEAM
CL	COVER LEVEL	P/WM	POST AND WIRE MESH
C/I	CORRUGATED IRON	P/R	POST AND RAIL
C/L	CHAIN LINK	P/W	POST AND WIRE
CONC	CONCRETE	RE	RODDING EYE
CPS	CONCRETE PAVING SLABS	RS	ROAD SIGN
COL	COLUMN	RW	RETAINING WALL
C/B	CLOSE BOARDED	SC	STOP COCK
CNP	CHESTNUT PALING	SF	SOFFIT LEVEL
C/P	CONCRETE PANEL	SP	SIGN POST
CTV	CABLE TV	S/R	STEEL RAILING
D	TRUNK DIAMETER	ST	STUMP
DP	DOWN PIPE	SV	STOP VALVE
DPC	DAMP PROOF COURSE	SW	SURFACE WATER
EB	ELECTRICITY BOX	TACT	TACTILE PAVING
EC	ELECTRICITY COVER	TB	TELE BOX
EP	ELECTRICITY POLE	TL	TRAFFIC LIGHT
ER	EARTH ROD	TLC	TRAFFIC LIGHT IC COVER
FL	FINISHED FLOOR LEVEL	TP	TELEPHONE POLE
FH	FIRE HYDRANT	T/W	TOP OF WALL LEVEL
FW	FOUL WATER	U/L	UNABLE TO LIFT
GL	GROUND LIGHT	VC	UNKNOWN VALVE COVER
GM	GAS METER	VP	VENT PIPE
GP	GATE POST	W/CL	WINDOW CILL LEVEL
GV	GAS VALVE	W/HL	WINDOW HEAD LEVEL
GY	GULLY	WL	WATER LEVEL
IC	INSPECTION COVER	WM	WATER METER
IL	INVERT LEVEL	W/M	WIRE MESH
INV	INVERT LEVEL	W/O	WOOD SLIP VALVE
I/R	IRON RAIL	W/P	WOOD PANEL
KO	KERB OUTLET		

1. UNDERGROUND DRAINAGE INFORMATION HAS BEEN MEASURED FROM SURFACE INSPECTION ONLY AND SHOULD BE CONFIRMED BY SPECIALISTS IF CRITICAL.
2. TREE AND HEDGE SPECIES HAVE BEEN IDENTIFIED AS ACCURATELY AS POSSIBLE BUT SHOULD BE CONFIRMED BY SPECIALISTS IF CRITICAL.
3. SURVEY GRID & LEVELS RELATED TO ORDNANCE SURVEY NATIONAL GRID. OBTAINED THROUGH REAL TIME GPS OBSERVATIONS. SCALE FACTOR 0.99970 HAS BEEN USED.
4. LEVEL CONTOURS AND 3D TRIANGLES ARE ON FROZEN LAYER.

Station	Easting	Northing	Level
S1	308075.325	167982.525	70.502
S2	308048.739	167937.650	71.435
S3	308037.056	167982.090	70.041
S4	307435.394	167437.439	63.086
S5	307433.675	167507.989	63.168
S6	307433.916	167537.928	63.451
S7	307400.472	167542.956	63.355
D1	307591.011	167619.354	62.549
D2	307751.936	167745.308	62.229
D3	307921.622	167852.199	67.105

Rev	Description	By	Ckd	Date
A	ORIGINAL DRAWING ISSUE	DJR	AHP	13:12:18

RPS
Noble House, Capital Drive, Linford Wood,
Milton Keynes, MK14 6QP
T: 01908 669 898 E: rpsmks@rpsgroup.com F: 01908 302 625

Client

Project LAND NEAR CARDIFF AIRPORT, MODEL FARM, RHOOSE.

Title TOPOGRAPHICAL SURVEY

Status	Scale	Date Created
FINAL	1:500 @A0	13th Dec. 2018
Project Leader	Drawn By	Checked by
AHP	PMC/JL/DJR	AHP

Document Number	Revision	Suitability
JKK9669 – 06	A	

Project Number | Originator | Zone | Level | Type | Role | Drawing Number

rpsgroup.com/uk

Appendix C – GI - Infiltration Report

1 INTRODUCTION

Legal & General Homes are planning to develop land near Cardiff Airport at Model Farm, Rhoose. RPS undertook a Hydrological Appraisal (HA) fulfilling the requirements of the Planning Policy Wales (PPW) and the Technical Advice Note 15 (TAN15). The HA indicated that SuDS measures would be required to provide an appropriate standard of surface water management taking into account the proposed development type.

This report provides the methodology and results for ground investigation works undertaken to provide factual information for the development of SuDS and soakaways design according to BS 8301. This comprised soakaway testing which was undertaken in accordance with BRE Digest 365 guidance.

The British Geological Survey (BGS) identified the geology underlying the site as Porthkerry Member comprising interbedded limestone and mudstone and Lavernock Shales Member comprising mudstone. Alluvium has also been indicated around the stream in the southwest of the site. The geology reported is indicative of a potentially large variation in the infiltration potential of the site.

2 SAMPLING METHODOLOGY

Soakaway infiltration tests were planned for five no locations as indicated on Drawing JER1849-SI-001 (Appendix B). These were undertaken in accordance with Building Research Establishment (BRE) Digest 365 Soakaway Design 2003.

Three tests were planned at each location to gather a representative dataset on the same day or consecutive days. The test duration varied depending on the nature of the substrata.

A subcontractor was used to operate an 8-tonne mini excavator with toothed bucket to excavate the trial pits and operate a tractor and water bowser which was required to fill each trial pit with water. An RPS engineer attended site to undertake the soil logging and infiltration test measurements. Water was released into each trial pit following excavation and filled to ground level before the water level measurements were collected. The water level readings were collected with a combination of manual measure using a tape measure and water level loggers which were corrected for atmospheric pressure using a barometric logger.

The works were undertaken between 9th and 12th April 2019.

3 RESULTS

3.1 Ground Conditions

Trial pits were excavated to depths of between 0.5 metres below ground level (mbgl) and 2.6 mbgl. Trial pits were typically terminated on refusal due to hard ground.

The general geological strata encountered was as follows:

- Topsoil comprising dark brown slightly sandy silty clay with grass cover with occasional gravel of limestone;
- Firm to very stiff light brown and grey gravelly clay with medium to high cobble content and occasional boulders of mudstone and limestone. Gravel, cobble and boulders are typically grey angular to subrounded stone including limestone and mudstone (0.2 – 2.2 mbgl – trial pits TP1, TP2, TP3, TP5).
- Weak grey and brown mudstone (trial pit TP5 2.1 – 2.3 mbgl) with medium strong to very strong grey limestone (trial pit TP2 at 2.2 – 2.6 mbgl);
- Medium strong to very strong grey limestone (at trial pit TP4 at 0.4 mbgl).

3.2 Infiltration Test Results

The results are provided in Appendix A with the summary of results provided in Table 1 below.

There were test failures at two locations (TP2, TP3) indicating very low infiltration rates. Where results were obtained these ranged from 3.86 x 10^{-6} metres per second (m/s) (at TP1) to 2.05 x 10^{-5} m/s (at TP4).

Table 1: **Summary of Infiltration Test Results**

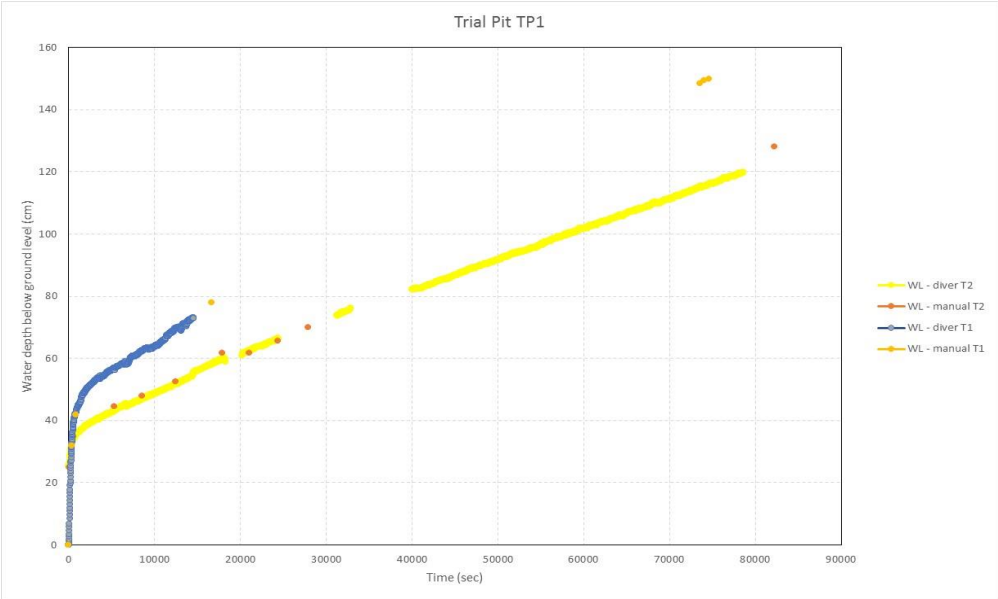
	Test Depth (m)	Time Taken [$t_{75\%-25\%}$] (hrs)	Infiltration Rate (m/s)	Comments
TP1 (Test 1)	2.0	20.14	4.37 x 10^{-6}	Test completed with all water drained out of trial pit.
TP1 (Test 2)	2.0	22.79	3.86 x 10^{-6}	Trial pit showed collapsed to below 1.3 mbgl at end of second test therefore no further testing was undertaken. For test 2, the test duration was calculated between 36% and 86% of original base of trial pit due to collapse and 25% depth not being reached by falling water level.
TP2	2.6	19.0	NA (<<5.18 x 10^{-6})	Soil infiltration rate could not be calculated. Water level dropped 0.12m in 19.0 hours. Soakaway test failure. No repeat test could be undertaken due to water level.
TP3	2.0	6.4	NA (<<1.20 x 10^{-5})	Soil infiltration rate could not be calculated. Water level dropped 0.071m in 6.4 hours and appeared to stabilise. Soakaway test failure. No repeat test could be undertaken due to water level.
TP4 (Test 1)	0.5	1.85	2.05 x 10^{-5}	Tests completed with all water drained out of trial pit.
TP4 (Test 2)		1.90	1.99 x 10^{-5}	
TP4 (Test 3)		2.47	1.54 x 10^{-5}	
TP5 (Test 1)	2.3	15.30	5.66 x 10^{-6}	Linear trend line was used to estimate time for water level at 25% effective depth of trial pit.
TP5 (Test 2)		NA	NA	Repeat test was not competed due to trial collapse from 0.3 mbgl to 1.4 mbgl.

It should be noted that the trial pits were terminated at shallow depths (up to 2.6 mbgl). If penetration further through the bedrock could be achieved, it may indicate a greater variation in permeability with higher permeabilities along bedding or fractures where present.

Soakaway Test - TP1

Date: 9th and 10th April 2019

Project Name: Model Farm, Rhoose
Project No: JER1849
Location: TP1



T = No. of test (e.g T1 = test 1)

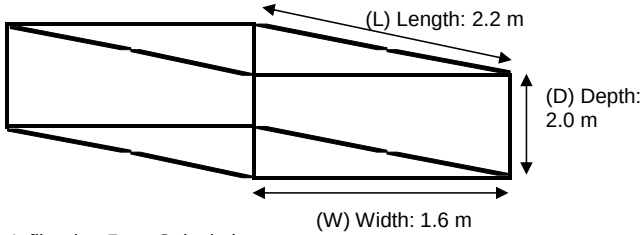
Test Date: 9th and 10th April 2019 (T1), 10th April (T2)

Comments:

Trial pit showed collapsed to below 1.3 mbgl at end of second test therefore no further testing was undertaken. For test 2, the test duration was calculated between 36% and 86% of original base of trial pit due to collapse and 25% depth not being reached by falling water level.

Soakaway Description \ Dimensions

0-0.2 mbgl	Dark brown slightly sandy silty CLAY with grass cover. (TOPSOIL)
0.2-2.0 mbgl	Stiff to very stiff light brown and grey gravelly CLAY with medium cobble content and occasional boulders of mudstone and limestone. Cobbles and gravel are grey angular to subrounded stone including limestone and mudstone. Gravel is fine to coarse.
2.0 mbgl	Trial pit terminated due to hard ground.



Infiltration Rate Calculations

Effective Depth: V_{p75}

L x W x D(25% - 75%) **3.5200 m^3**

Mean Surface Area Outflow: a_{p50}

(L x D(25%-75%) x 2) + (W x D(25%-75%) x 2) + (L x W)

11.1200 m^2

Test Duration / Outflow time: t_{p75-25} **sec**

	Test 1	Test 2	
75%	2070	170	-86%
25%	74580	82200	-36%
Duration	**72510**	**82030**	

Soil Infiltration Rate , *f*

$$\frac{V_{p75}}{a_{p50} \times t_{p75-25}}$$

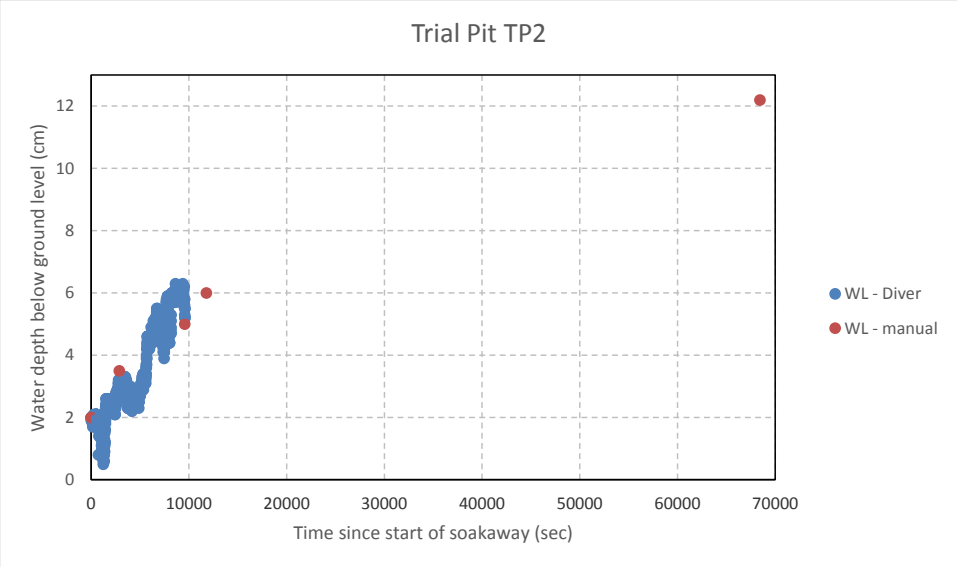
Test 1	Test 2	Test 3	
4.37E-06	3.86E-06	-	m/sec

(Used t_{p86-36})

Soakaway Test - TP2

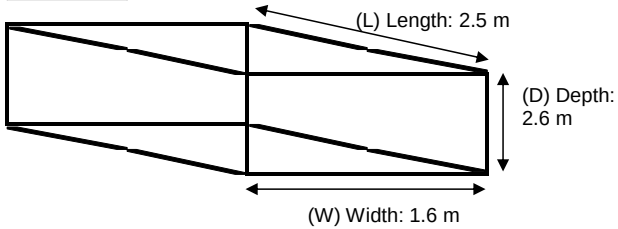
Date: 9th and 10th April 2019

Project Name: Model Farm, Rhoose
Project No: JER1849
Location: TP2



Soakaway Description \ Dimensions

0-0.2 mbgl	Dark brown slightly sandy silty CLAY with grass cover. (TOPSOIL)
0.2-2.2 mbgl	Stiff to very stiff light brown and grey gravelly CLAY with medium to high cobble content and occasional boulders. Gravel, cobble and boulders are grey angular to subrounded stone including limestone and mudstone . Gravel is fine to coarse.
2.2-2.6 mbgl	Weak grey and brown MUDSTONE and medium strong to very strong LIMESTONE with stiff clay bands. Recovered as clayey angular to subangular gravel and cobbles of angular to subrounded limestone and mudstone.



Infiltration Rate Calculations

Effective Depth: V_{p75}

L **x** W **x** D(25% - 75%) **5.2000 m^3**

Mean Surface Area Outflow: a_{p50}

(L x D(25%-75%) x 2) + (W x D(25%-75%) x 2) + (L x W)

14.6600 m^2

Test Duration / Outflow time: t_{p75-25} **sec**

	Test 1	Test 2	Test 3
75%	NA	-	-
25%	NA	-	-
Duration	**>68450**	**-**	**-**

Soil Infiltration Rate , *f*

$$\frac{V_{p75}}{a_{p50} \times t_{p75-25}}$$

Test 1	Test 2	Test 3	
NA	-	-	m/sec

(<< 5.182E-06)

Test Date: 9th and 10th April 2019

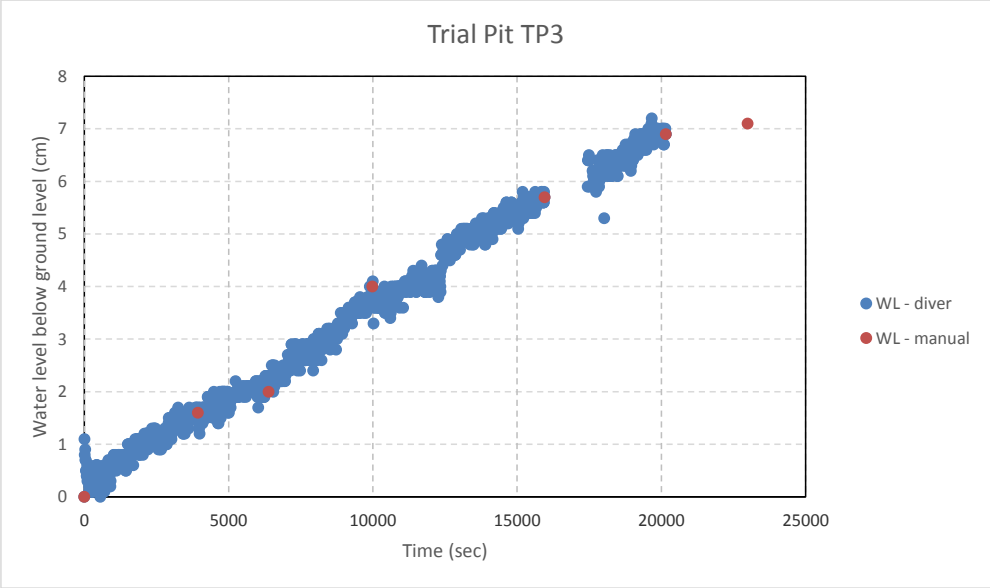
Comments:

Soil infiltration rate could not be calculated. Water level dropped 12.2cm in 68450 secs (19.0 hours). Soakaway test failure. No repeat tests could be undertaken due to water level.

Soakaway Test - TP3

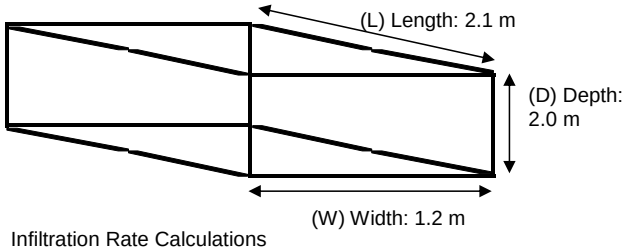
Date: 10th April 2019

Project Name: Model Farm, Rhoose
Project No: JER1849
Location: TP3



Soakaway Description \ Dimensions

0-0.2 mbgl	Dark brown slightly sandy silty CLAY with grass cover. (TOPSOIL)
0.2-2.0 mbgl	Stiff to very stiff light brown and grey gravelly CLAY with medium cobble content. Cobbles and gravel are grey angular to subrounded stone including limestone and mudstone . Gravel is fine to coarse.
	Trial pit terminated due to hard ground.



Infiltration Rate Calculations

Effective Depth: V_{p75}

L x W x D(25% - 75%) **2.5200 m³**

Mean Surface Area Outflow: a_{p50}

(L x D(25%-75%) x 2) + (W x D(25%-75%) x 2) + (L x W)

9.1200 m²

Test Duration / Outflow time: t_{p75-25} **sec**

	Test 1	Test 2	Test 3
75%	NA	-	-
25%	NA	-	-
Duration	**>22990**	**-**	**-**

Soil Infiltration Rate , *f*

$$\frac{V_{p75}}{a_{p50} \times t_{p75-25}}$$

Test 1	Test 2	Test 3	
NA	-	-	m/sec

(<< 1.202E-05)

Test Date: 10th April 2019

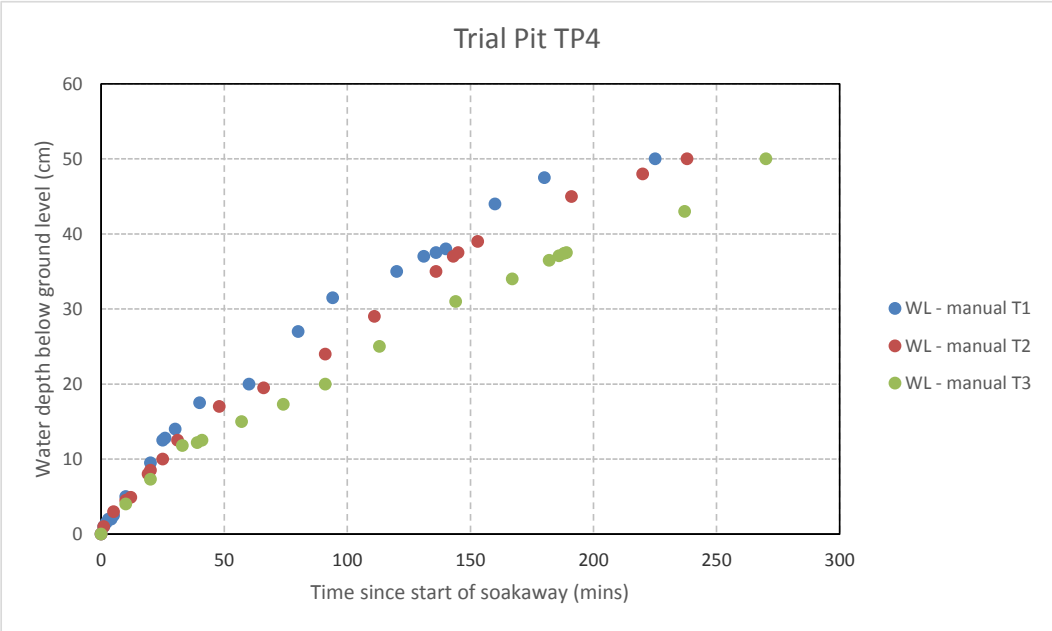
Comments:

Soil infiltration rate could not be calculated. Water level dropped 7.1cm in 22990 secs (6.4 hours) and appeared to stabilise. Soakaway test failure. No repeat tests could be undertaken due to water level.

Soakaway Test - TP4

Date: 11th and 12th April 2019

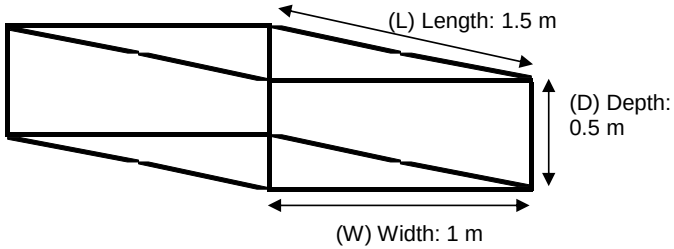
Project Name: Model Farm, Rhoose
Project No: JER1849
Location: TP4



Test Date: 11th April 2019 (T1, T2), 12th April 2019 (T3)

Soakaway Description \ Dimensions

0-0.4	Dark brown slightly gravelly slightly silty CLAY. Gravel is angular limestone.
0.4-0.5 mbgl	Medium strong to very strong grey fine grained LIMESTONE with extremely closely spaced horizontal bedding factures.
	Trial pit terminated due to hard ground.



Infiltration Rate Calculations

Effective Depth: V_{p75}

L x W x D(25% - 75%) **0.3750 m^3**

Mean Surface Area Outflow: a_{p50}

(L x D(25%-75%) x 2) + (W x D(25%-75%) x 2) + (L x W)

2.7500 m^2

Test Duration / Outflow time: t_{p75-25}

	Test 1	Test 2	Test 3
75%	1500	1860	2460
25%	8160	8700	11340
Duration	**6660**	**6840**	**8880**

Soil Infiltration Rate , f

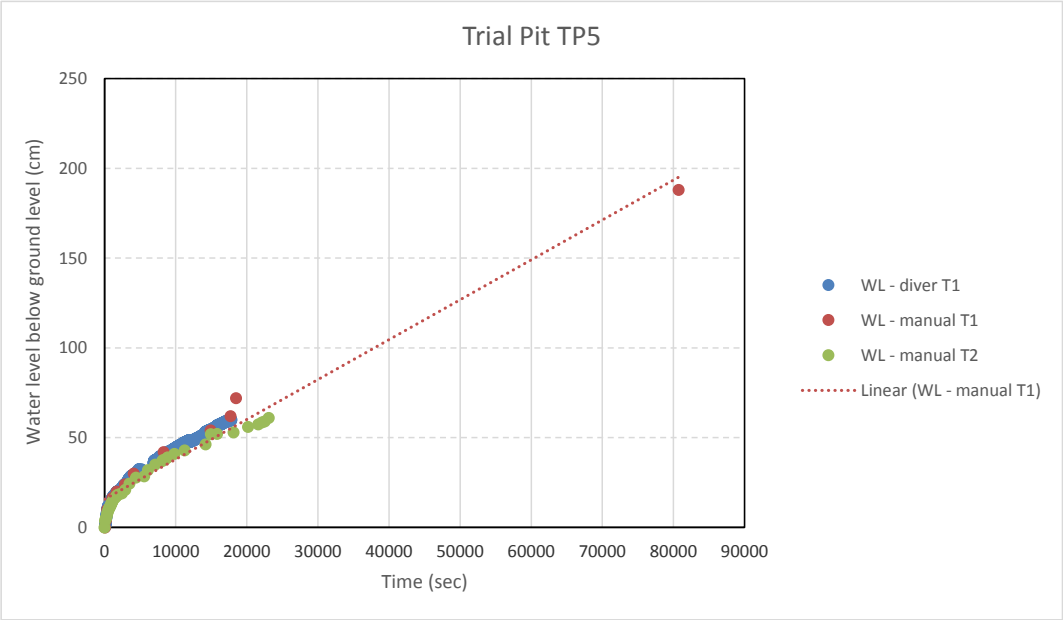
$$\frac{V_{p75}}{a_{p50} \times t_{p75-25}}$$

Test 1	Test 2	Test 3	
2.05E-05	1.99E-05	1.54E-05	m/sec

Soakaway Test - TP5

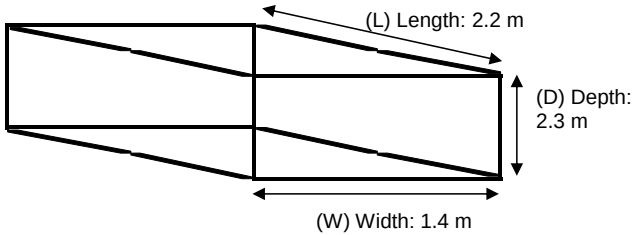
Date: 11th and 12th April 2019

Project Name: Model Farm, Rhoose
Project No: JER1849
Location: TP5



Soakaway Description \ Dimensions

0-0.4 mbgl	Dark brown slightly sandy silty CLAY with grass cover. (TOPSOIL)
0.4-2.3 mbgl	Firm to very stiff light brown and grey gravelly CLAY with medium to high cobble content and occasional boulders. Gravel, cobbles and boulders are grey angular to subrounded stone including limestone and mudstone. Gravel is fine to coarse.
2.1-2.3 mbgl	Weak dark grey and brown MUDSTONE.



Infiltration Rate Calculations

Effective Depth: V_{p75}

L x W x D(25% - 75%) **3.5420 m³**

Mean Surface Area Outflow: a_{p50}

(L x D(25%-75%) x 2) + (W x D(25%-75%) x 2) + (L x W)

11.3600 m²

Test Duration / Outflow time: t_{p75-25}

	Test 1	Test 2	Test 3
75%	16210	NA	
25%	71283.6	NA	
Duration	**55073.6**		

Soil Infiltration Rate , *f*

$$\frac{V_{p75}}{a_{p50} \times t_{p75-25}}$$

Test 1	Test 2	Test 3	
5.66E-06	NA		m/sec

Test Date: 11th April 2019 (T1), 12th April 2019 (T2)

Comments:

Linear trendline was used to estimate time for water level at 25% of trial pit depth. Repeat test was not completed due to trial pit collapse between 0.3 mbgl and 1.4 mbgl.

Appendix D – Greenfield Discharge Rates

ICP SUDS Mean Annual Flood

Input

Return Period (years)	1	Soil	0.450
Area (ha)	1.000	Urban	0.000
SAAR (mm)	967	Region Number	Region 9

Results	**l/s**
QBAR Rural	6.4
QBAR Urban	6.4
Q1 year	5.6
Q1 year	5.6
Q30 years	11.3
Q100 years	14.0

©1982-2018 Innovyze

Appendix E – SAB's Pre-Application Response Letter

MEMORANDUM / COFNOD

The Vale of Glamorgan Council
The Alps, Wenvoe, CF5 6AA

To / I:	Tono Perales
Dept / Adran:	
Date / Dyddiad:	10/05/2019
Your Ref / Eich Cyf:	

From / Oddi Wrth:	Vale of Glamorgan County Council SuDS Approval Body
My Ref / Cyf:	SAB/PRE/2019/009
Tel / Ffôn:	02920 673 235
Fax / Ffacs:	02920 673 114

Subject / Testyn: **Pre-Application No. SAB/PRE/2019/009 Model Farm, Rhoose.**
Proposal: **Development of new enterprise zone situated immediately to the east of Cardiff Airport.**

The Flood and Water Management Act 2010 (Schedule 3), implemented in Wales on January 7th 2019 requires all new developments to include Sustainable Drainage System features that are compliant with national standards.

Overview:
Information submitted to support this pre-application suggests that surface waters generated by the development will be disposed of via a combination of rainwater harvesting, infiltration together with discharge to a surface watercourse (Bullhouse Brook and Whitelands Brook).

Standard S1 – Surface Water Runoff Destination

Priority Level 1: Collection for Use:
The submitted pre-application form indicates that rainwater harvesting will be utilised where possible by the inclusion of rainwater harvesting tanks at individual property units. It is recognised that water is a valuable resource and we would be in favour of the collection of rainwater for non-portable use where practicable.

Priority Level 2: Discharge of surface water into ground:
The submitted pre-application form also indicates that surface water will be disposed of through the use of infiltration techniques. Infiltration test results submitted in support of this application indicate that infiltration at shallow depths to be generally poor. It has been stated within Infiltration Testing Report (RPS April 2019) that further penetration through the bedrock may indicate a greater variation in permeability. In line with the Environment Agency's Approach to Groundwater Protection (February 2018) adopted by NRW we would discourage the use of any infiltration system that bypasses the soil layer, limiting the ability of the ground to attenuate pollutants.

Where the use of shallow infiltration features are to be used all testing should be undertaken at the proposed site of infiltration inclusive of permeable surfaces. Where larger infiltration systems are to be used we would require additional testing to be undertaken on a 25m grid basis. Infiltration testing should be completed at an appropriate depth to that of the proposed design.

Priority Level 3: Discharge to a Surface Water Body:
It has also been suggested within the pre-application form that surface waters not collected or discharged to ground under priority levels 1 and 2 will be discharged to Bullhouse / whitelands Brook. Although we have no objection to this method of disposal in principle, on full application further information will be required with regard to the location of proposed discharge point.

The design of any off-site drainage system should demonstrate that the scheme does not adversely affect off-site flood risk elsewhere. Documented evidence of a right to discharge will also be required with the riparian owner at the proposed point of discharge.

Priority Level 4: Discharge to surface water sewer or highway:

It has been acknowledged that the submitted pre-application does not propose to discharge surface water directly into surface water sewer, highway drain or any other drainage system.

Priority Level 5: Discharge to combined sewer:

It has been acknowledged that the submitted pre-application does not propose to discharge surface waters directly to combined sewer.

Standard S2 – Surface Water Runoff Hydraulic Control

It has been indicated that the drainage scheme will provide hydraulic control up to a 1 in 100 year return period + 30% allowance for climate change. No hydraulic calculations have been provided at this stage and will be required to be submitted on full application. The surface water drainage scheme should be designed so that flooding does not occur on any part of the site for a 1 in 30 year return period plus climate change (30%) and not in any part of any building for a 1 in 100 year return period plus climate change with consideration made to any receiving flows from outside of the catchment. The submitted calculations should also include the volume of storage utilised within the drainage system.

It is accepted that the proposed drainage system would manage flows for the majority of rainfall events of less than 5mm through infiltration and interception.

It is stated within the Preliminary Sustainable Drainage Strategy (RPS April 2019) that surface waters not collected or discharged to ground under priority levels 1 and 2 will be discharged at a controlled rate to match that of existing greenfield runoff rates to both the Whitelands and Bullhouse Brooks. We find this discharge rate acceptable in principle and would request further hydraulic calculations demonstrating the proposed discharge to both watercourses.

No Flood Exceedance Plan has been submitted with this pre-application and will be required on full submission. the plan must consider the risks associated with events exceeding the capacity of the drainage system. The design of the site and its drainage system should be integrated so that flooding is appropriately managed.

Standard S3 – Water Quality

The proposed drainage scheme has the potential to allow the effective management of sediment and other pollutants, ensuring discharges from the system are of an acceptable quality and will not cause a pollution risk. Given the use of features allowing interception throughout the system together with the inclusion of shallower infiltration features we are in general agreement that the drainage scheme proposed will adequately manage water quality. The various stages in the SuDS also increase the potential for managing pollution incidents close to source before they discharge offsite. No hydraulic calculations have been provided at this stage and will be required to be

submitted, demonstrating adequate residency times for flows to allow appropriate treatment within the system.

Standard S4 – Amenity

We acknowledge that the proposed drainage scheme provides amenity benefits through the promotion of green space whilst also providing enhanced visual character. It would be requested on full application that an appropriate risk assessment is submitted that considers the design and location of the basins and that any such risk is appropriately managed. We offer no objection to the amenity benefits the scheme will bring.

Standard S5 – Biodiversity

We acknowledge that the proposed drainage scheme has the potential to provide a self – sustaining ecosystem which will contribute to the delivery of local biodiversity objectives. It is requested that additional biodiverse planting is included on final design. Such planting should be easily maintained, resilient to its proposed environment and native to the region where possible. The introduction of invasive species will not be permitted. We offer no objection to the biodiversity benefits the scheme will bring.

It should be noted that the creation of permanent water bodies could provide habitats for protected species such as Great Crested Newts. As such appropriate consideration should be given to reduce or mitigate the potential risk of fatalities in features such as highway gully pots and oil interceptors.

Standard S6 – Design

At this pre-application stage limited information has been provided with regard to the construction, operation and maintenance of the drainage system. All elements of the surface water drainage system should be designed to ensure maintenance and operation can be undertaken by the responsible body easily, safely, cost effectively and in a timely manner.

Conclusion

An appraisal of this application has been made by the SuDS Approval Body in line with Welsh Governments Statutory Standards for Sustainable Drainage Systems. From the details provided as part of this pre-application we offer no objection in principle to the proposed drainage scheme.

Gareth Thelwell-Davies
Engineer – Environment

for Operational Manager Environment and Engineering
ar gyfer Rheolwr Gweithredol Amgylchedd a Pheirianneg

Appendix F – MicroDrainage Source Control Storage Volume Calculations

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 249 minutes.

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	0.644	0.644	0.0	170.4	170.4	2028.8	O K
30 min Summer	0.846	0.846	0.0	170.8	170.8	2735.9	O K
60 min Summer	1.046	1.046	0.0	170.8	170.8	3468.5	O K
120 min Summer	1.215	1.215	0.0	170.8	170.8	4114.3	Flood Risk
180 min Summer	1.272	1.272	0.0	170.8	170.8	4335.2	Flood Risk
240 min Summer	1.284	1.284	0.0	170.8	170.8	4385.5	Flood Risk
360 min Summer	1.293	1.293	0.0	170.8	170.8	4418.4	Flood Risk
480 min Summer	1.282	1.282	0.0	170.8	170.8	4376.5	Flood Risk
600 min Summer	1.261	1.261	0.0	170.8	170.8	4292.5	Flood Risk
720 min Summer	1.233	1.233	0.0	170.8	170.8	4182.6	Flood Risk
960 min Summer	1.164	1.164	0.0	170.8	170.8	3915.7	O K
1440 min Summer	1.006	1.006	0.0	170.8	170.8	3319.8	O K
2160 min Summer	0.795	0.795	0.0	170.8	170.8	2554.8	O K
2880 min Summer	0.635	0.635	0.0	170.3	170.3	1999.7	O K
4320 min Summer	0.454	0.454	0.0	163.6	163.6	1397.1	O K
5760 min Summer	0.392	0.392	0.0	138.0	138.0	1196.5	O K
7200 min Summer	0.354	0.354	0.0	119.0	119.0	1074.9	O K
8640 min Summer	0.326	0.326	0.0	104.9	104.9	985.7	O K
10080 min Summer	0.304	0.304	0.0	94.1	94.1	917.5	O K
15 min Winter	0.718	0.718	0.0	170.8	170.8	2282.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	111.414	0.0	2086.0	24
30 min Summer	76.298	0.0	2881.4	38
60 min Summer	49.937	0.0	3842.4	66
120 min Summer	31.521	0.0	4859.4	124
180 min Summer	23.680	0.0	5479.9	180
240 min Summer	19.162	0.0	5915.0	214
360 min Summer	14.247	0.0	6599.6	278
480 min Summer	11.521	0.0	7117.8	344
600 min Summer	9.762	0.0	7539.7	414
720 min Summer	8.520	0.0	7897.5	484
960 min Summer	6.867	0.0	8486.8	620
1440 min Summer	5.055	0.0	9366.1	880
2160 min Summer	3.711	0.0	10363.4	1240
2880 min Summer	2.976	0.0	11076.0	1588
4320 min Summer	2.175	0.0	12119.7	2252
5760 min Summer	1.742	0.0	12992.5	2944
7200 min Summer	1.468	0.0	13676.4	3680
8640 min Summer	1.276	0.0	14258.4	4408
10080 min Summer	1.134	0.0	14756.5	5144
15 min Winter	111.414	0.0	2344.4	25

©1982-2018 Innovyze

Summary of Results for 100 year Return Period (+30%)

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	0.943	0.943	0.0	170.8	170.8	3086.6	O K
60 min Winter	1.168	1.168	0.0	170.8	170.8	3929.6	O K
120 min Winter	1.355	1.355	0.0	170.8	170.8	4665.9	Flood Risk
180 min Winter	1.422	1.422	0.0	170.8	170.8	4937.7	Flood Risk
240 min Winter	1.438	1.438	0.0	170.8	170.8	5004.8	Flood Risk
360 min Winter	1.436	1.436	0.0	170.8	170.8	4994.6	Flood Risk
480 min Winter	1.416	1.416	0.0	170.8	170.8	4916.1	Flood Risk
600 min Winter	1.382	1.382	0.0	170.8	170.8	4777.8	Flood Risk
720 min Winter	1.339	1.339	0.0	170.8	170.8	4605.1	Flood Risk
960 min Winter	1.238	1.238	0.0	170.8	170.8	4203.7	Flood Risk
1440 min Winter	0.989	0.989	0.0	170.8	170.8	3254.9	O K
2160 min Winter	0.675	0.675	0.0	170.7	170.7	2135.6	O K
2880 min Winter	0.483	0.483	0.0	165.3	165.3	1491.9	O K
4320 min Winter	0.376	0.376	0.0	130.1	130.1	1143.6	O K
5760 min Winter	0.326	0.326	0.0	105.1	105.1	986.4	O K
7200 min Winter	0.294	0.294	0.0	88.8	88.8	885.8	O K
8640 min Winter	0.271	0.271	0.0	77.5	77.5	813.6	O K
10080 min Winter	0.253	0.253	0.0	69.2	69.2	758.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	76.298	0.0	3235.0	38
60 min Winter	49.937	0.0	4307.7	66
120 min Winter	31.521	0.0	5446.8	122
180 min Winter	23.680	0.0	6141.8	178
240 min Winter	19.162	0.0	6629.2	232
360 min Winter	14.247	0.0	7396.0	292
480 min Winter	11.521	0.0	7976.5	368
600 min Winter	9.762	0.0	8449.0	446
720 min Winter	8.520	0.0	8849.8	522
960 min Winter	6.867	0.0	9509.9	674
1440 min Winter	5.055	0.0	10497.5	940
2160 min Winter	3.711	0.0	11610.5	1284
2880 min Winter	2.976	0.0	12409.5	1588
4320 min Winter	2.175	0.0	13583.2	2252
5760 min Winter	1.742	0.0	14553.9	2992
7200 min Winter	1.468	0.0	15320.8	3680
8640 min Winter	1.276	0.0	15974.5	4416
10080 min Winter	1.134	0.0	16538.2	5144

©1982-2018 Innovyze

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.314	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 10.370

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	3.000	4	8	4.370	8	12	3.000

©1982-2018 Innovyze

Model Details

Storage is Online Cover Level (m) 1.500

Infiltration Basin Structure

Invert Level (m) 0.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2900.0	1.500	4150.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0488-1708-1450-1708
Design Head (m)	1.450
Design Flow (l/s)	170.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	488
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	500
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.450	170.8
Flush-Flo™	0.709	170.8
Kick-Flo®	1.173	154.1
Mean Flow over Head Range	-	134.5

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	12.4	1.200	155.8	3.000	243.7	7.000	369.3
0.200	45.5	1.400	167.9	3.500	262.8	7.500	382.1
0.300	92.0	1.600	179.2	4.000	280.6	8.000	394.4
0.400	141.6	1.800	189.8	4.500	297.3	8.500	406.4
0.500	166.2	2.000	199.8	5.000	313.0	9.000	418.0
0.600	169.7	2.200	209.4	5.500	328.1	9.500	429.3
0.800	170.2	2.400	218.5	6.000	342.4		
1.000	164.7	2.600	227.2	6.500	356.1		

©1982-2018 Innovyze

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 278 minutes.

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	0.659	0.659	0.0	292.6	292.6	4510.2	O K
30 min Summer	0.861	0.861	0.0	340.2	340.2	6051.7	O K
60 min Summer	1.068	1.068	0.0	340.2	340.2	7723.7	O K
120 min Summer	1.242	1.242	0.0	340.2	340.2	9194.2	Flood Risk
180 min Summer	1.307	1.307	0.0	347.1	347.1	9758.8	Flood Risk
240 min Summer	1.329	1.329	0.0	349.9	349.9	9951.3	Flood Risk
360 min Summer	1.355	1.355	0.0	353.3	353.3	10179.1	Flood Risk
480 min Summer	1.360	1.360	0.0	354.0	354.0	10229.9	Flood Risk
600 min Summer	1.354	1.354	0.0	353.2	353.2	10175.0	Flood Risk
720 min Summer	1.340	1.340	0.0	351.4	351.4	10052.5	Flood Risk
960 min Summer	1.301	1.301	0.0	346.3	346.3	9703.2	Flood Risk
1440 min Summer	1.201	1.201	0.0	340.2	340.2	8844.1	Flood Risk
2160 min Summer	1.044	1.044	0.0	340.2	340.2	7524.1	O K
2880 min Summer	0.872	0.872	0.0	340.2	340.2	6143.8	O K
4320 min Summer	0.701	0.701	0.0	308.7	308.7	4826.1	O K
5760 min Summer	0.602	0.602	0.0	269.1	269.1	4088.8	O K
7200 min Summer	0.537	0.537	0.0	239.4	239.4	3609.6	O K
8640 min Summer	0.488	0.488	0.0	214.8	214.8	3261.9	O K
10080 min Summer	0.454	0.454	0.0	195.7	195.7	3020.9	O K
15 min Winter	0.732	0.732	0.0	319.9	319.9	5055.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	111.414	0.0	4364.8	25
30 min Summer	76.298	0.0	6083.8	39
60 min Summer	49.937	0.0	8277.8	68
120 min Summer	31.521	0.0	10488.8	124
180 min Summer	23.680	0.0	11837.1	180
240 min Summer	19.162	0.0	12782.1	214
360 min Summer	14.247	0.0	14268.0	278
480 min Summer	11.521	0.0	15391.6	344
600 min Summer	9.762	0.0	16305.1	412
720 min Summer	8.520	0.0	17078.9	482
960 min Summer	6.867	0.0	18349.7	618
1440 min Summer	5.055	0.0	20235.9	888
2160 min Summer	3.711	0.0	22521.7	1280
2880 min Summer	2.976	0.0	24062.7	1616
4320 min Summer	2.175	0.0	26286.0	2304
5760 min Summer	1.742	0.0	28277.1	3016
7200 min Summer	1.468	0.0	29757.1	3752
8640 min Summer	1.276	0.0	31006.6	4488
10080 min Summer	1.134	0.0	32050.3	5152
15 min Winter	111.414	0.0	4923.5	25

©1982-2018 Innovyze

Summary of Results for 100 year Return Period (+30%)

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	0.958	0.958	0.0	340.2	340.2	6827.0	O K
60 min Winter	1.185	1.185	0.0	340.2	340.2	8706.5	O K
120 min Winter	1.379	1.379	0.0	356.3	356.3	10395.0	Flood Risk
180 min Winter	1.455	1.455	0.0	365.9	365.9	11081.4	Flood Risk
240 min Winter	1.481	1.481	0.0	369.1	369.1	11316.9	Flood Risk
360 min Winter	1.497	1.497	0.0	371.0	371.0	11459.0	Flood Risk
480 min Winter	1.495	1.495	0.0	370.8	370.8	11441.6	Flood Risk
600 min Winter	1.477	1.477	0.0	368.6	368.6	11282.8	Flood Risk
720 min Winter	1.451	1.451	0.0	365.4	365.4	11041.2	Flood Risk
960 min Winter	1.383	1.383	0.0	356.9	356.9	10433.5	Flood Risk
1440 min Winter	1.228	1.228	0.0	340.2	340.2	9071.0	Flood Risk
2160 min Winter	0.975	0.975	0.0	340.2	340.2	6962.4	O K
2880 min Winter	0.769	0.769	0.0	330.8	330.8	5340.2	O K
4320 min Winter	0.597	0.597	0.0	266.8	266.8	4046.3	O K
5760 min Winter	0.502	0.502	0.0	222.2	222.2	3362.1	O K
7200 min Winter	0.446	0.446	0.0	190.6	190.6	2960.8	O K
8640 min Winter	0.408	0.408	0.0	166.8	166.8	2695.0	O K
10080 min Winter	0.379	0.379	0.0	148.9	148.9	2493.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	76.298	0.0	6847.5	39
60 min Winter	49.937	0.0	9289.8	66
120 min Winter	31.521	0.0	11766.4	122
180 min Winter	23.680	0.0	13276.8	178
240 min Winter	19.162	0.0	14335.4	232
360 min Winter	14.247	0.0	16000.1	292
480 min Winter	11.521	0.0	17259.0	368
600 min Winter	9.762	0.0	18282.5	446
720 min Winter	8.520	0.0	19149.7	522
960 min Winter	6.867	0.0	20573.8	670
1440 min Winter	5.055	0.0	22689.8	954
2160 min Winter	3.711	0.0	25239.1	1360
2880 min Winter	2.976	0.0	26968.7	1648
4320 min Winter	2.175	0.0	29476.0	2344
5760 min Winter	1.742	0.0	31680.3	3056
7200 min Winter	1.468	0.0	33341.4	3752
8640 min Winter	1.276	0.0	34748.1	4496
10080 min Winter	1.134	0.0	35938.1	5240

©1982-2018 Innovyze

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.314	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 22.600

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	7.000	4	8	8.600	8	12	7.000

©1982-2018 Innovyze

Model Details

Storage is Online Cover Level (m) 1.500

Infiltration Basin Structure

Invert Level (m) 0.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	6240.0	1.500	9175.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-CHE-0576-3724-1450-3724
Design Head (m)	1.450
Design Flow (l/s)	372.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	576
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	Site Specific Design (Contact Hydro International)
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

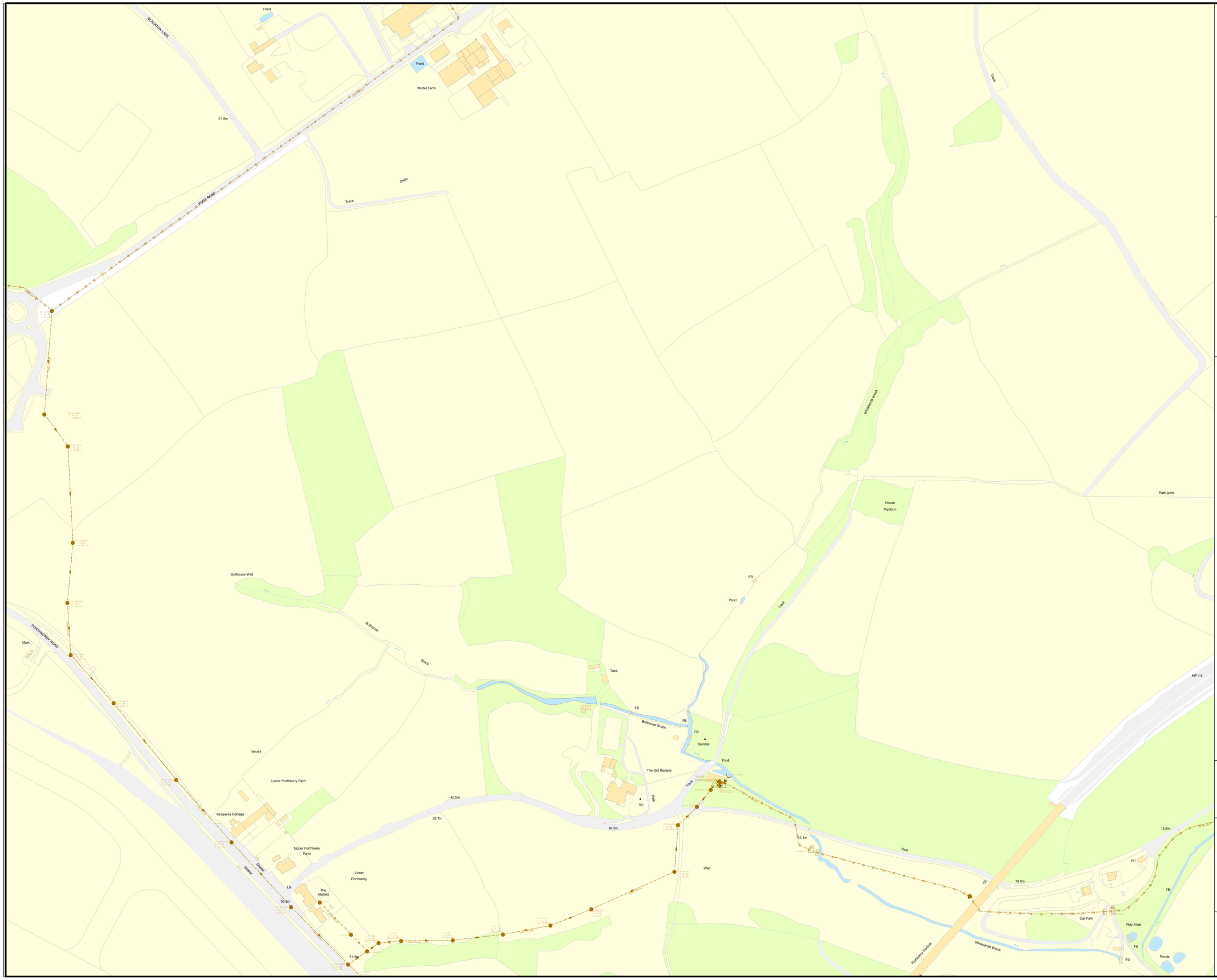
Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.450	365.3
Flush-Flo™	0.843	340.2
Kick-Flo®	0.993	307.6
Mean Flow over Head Range	-	238.6

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	13.1	1.200	332.8	3.000	522.3	7.000	792.6
0.200	48.9	1.400	359.0	3.500	563.5	7.500	820.0
0.300	101.2	1.600	383.4	4.000	601.8	8.000	846.5
0.400	162.0	1.800	406.3	4.500	637.7	8.500	872.1
0.500	221.0	2.000	427.9	5.000	671.6	9.000	897.0
0.600	268.2	2.200	448.4	5.500	703.9	9.500	921.2
0.800	336.3	2.400	468.0	6.000	734.7		
1.000	307.8	2.600	486.8	6.500	764.2		

©1982-2018 Innovyze

Appendix G – DC Welsh Water Sewer Map and Pre-Development Enquiry



Dŵr Cymru
Welsh Water

PPA0003927

N
W E
S

LEGEND(Representative of most common features)

Waste network:

- Foul chamber
- Outfall
- Surface water chamber
- Lamphole
- Combined chamber
- Storm Overflow
- Combined sewer overflow
- Rising main
- Special purpose chamber
- Gravity sewer
- Treatment works
- Private sewer
- Pumping station
- Private sewer subject to Sect. 104 adoption agreement
- Private Sewer Transfer
- Lateral Drain
- Inspection Chamber

NB: Sewer symbol colour indicates the type.

RED - Combined
GREEN - Surface Water
BROWN - Foul
Purple - Former S24 sewers (for indicative purposes only)

Notes:

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases, pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be asbestos cement (AC) or Pitch Fibre (PF) . It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation

Dŵr Cymru Cyfyngedig ('the Company') gives this information as to the position of its underground apparatus by way of general guidance only and on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works made in the vicinity of the company's apparatus. The onus of locating apparatus before carrying out any excavations rests entirely on you. The information which is supplied by the Company, is done so in accordance with statutory requirements of sections 198 and 199 of the Water Industry Act 1991 which is based upon the best information available and, in particular, but without prejudice to the generality of the foregoing, it should be noted that the records that are available to the Company may not disclose the existence of a water main, service pipe, sewer, lateral drain or disposal main and any associated apparatus laid before 1 September 1989, or, if they do, the particulars thereof including their position underground may not be accurate. It must be understood that the furnishing of this information is entirely without prejudice to the provision of the New Roads and Street Works Act 1991 and the Company's right to be compensated for any damage to its apparatus.

Service pipes are not generally shown but their presence should be anticipated.

EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

Reproduced by permission of the Ordnance Survey on behalf of HMSO. © Crown copyright and database right 2017. All rights reserved. Ordnance Survey Licence number 100019534

Map Ref:	308042,167337
Map scale:	1:1250
Printed by:	Motley Louise
Printed on:	08 Apr 2019

Dŵr Cymru
Welsh Water

Developer Services
PO Box 3146
Cardiff
CF30 0EH

Tel: +44 (0)800 917 2652
Fax: +44 (0)2920 740472
E.mail: developer.services@dwrcymru.com

Gwasanaethau Datblygu
Blwch Post 3146
Caerdydd
CF30 0EH

Ffôn: +44 (0)800 917 2652
Ffacs: +44 (0)2920 740472
E.bost: developer.services@dwrcymru.com

Tono Perales
RPS Consulting Services Ltd
20 Western Avenue
Abingdon
Oxon
OX14 4SH

Date: 10/04/2019
Our Ref: PPA0003927

Dear Sir/Madam,

Grid Ref: 308066 167351
Site Address: Model Farm, Rhoose, Vale of Glamorgan
Development: New Mixed Use Development

I refer to your pre-planning enquiry received relating to the above site, seeking our views on the capacity of our network of assets and infrastructure to accommodate your proposed development. Having reviewed the details submitted I can provide the following comments which should be taken into account within any future planning application for the development.

APPRAISAL

Firstly, we note that the proposal relates to a new mixed use development on Model Farm, land adjacent to Cardiff International Airport, and acknowledge that part of the site is located in a wider strategic employment allocation (Ref: MG 9(2)) within the Local Development Plan (LDP) for B1, B2 and B8 uses. In reference to our representations during the LDP consultation process, namely the 'Statement of Common Ground', we can confirm that an assessment has been undertaken of the public sewerage system to accommodate an allocation of 76.64 ha for employment use and informs our appraisal as follows.

Please note, notwithstanding the following assessment, we would advise there is also a mandatory requirement to undertake pre-application consultation with all 'Specialist Consultees', including Dwr Cymru Welsh Water as the statutory water and sewerage undertaker, in accordance with Schedule 4 of Town & Country Planning (Development Management Procedure) (Wales) (Amendment) Order 2016. As a major development, amounting to an area greater than 1 ha, you will be statutorily required to consult Welsh Water and a substantive response will be issued within 28 days from the date of the notice as per the requirements of Article 2E.

Public Sewerage Network

The proposed development site is located in the immediate vicinity of a separate sewerage system, comprising foul and surface water public sewers, which drains to Cog Moors Wastewater Treatment Works (WwTW) via a series of Sewerage Pumping Stations (SPS') including Porthkerry SPS located on site.

Whilst we acknowledge proposals for an *"Allocated Porthkerry Park Extension"* in this vicinity, we would advise the developer that no habitable buildings be constructed within a 15m vicinity of the SPS, as to minimise any effects of noise and odour nuisance.

The site is crossed by a foul water public sewer, along with the rising main from Porthkerry SPS, and their approximate positions are marked on the attached Statutory Public Sewer Record. In accordance with the Water Industry Act 1991, Dwr Cymru Welsh Water requires access to its apparatus at all times in order to carry out maintenance and repairs. However, having regard to the current masterplan (Drawing No. JCD0064-010 Rev. D), certain parcels of land for *"B1 Small Business Units, Office, Ancillary Development and Leisure"* would be situated within the protection zone of the public sewer, measured 3 metres either side of the centreline, in addition to an element of the *"Allocated Porthkerry Park Extension"* which is also located in the protection zone of the rising main, measured 3 metres either side of the centreline as well. Our strong recommendation is that your site layout is updated to take into account the location of the assets crossing the site and should be referred to in any master-planning exercises or site layout plans submitted as part of any subsequent planning application. Alternatively, it may be possible to divert assets if the developer applies under Section 185 of the Water Industry Act and we request that they contact us to discuss and consider possible solutions. Further information regarding Asset Protection is provided in the attached Advice & Guidance note.

You are also advised that some public sewers and lateral drains may not be recorded on our maps of public sewers because they were originally privately owned and were transferred into public ownership by nature of the Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011. The presence of such assets may affect the proposal. In order to assist you may contact Dwr Cymru Welsh Water on 0800 085 3968 to establish the location and status of the apparatus in and around your site. Please be mindful that under the Water Industry Act 1991 Dwr Cymru Welsh Water has rights of access to its apparatus at all times.

<u>Foul Water Drainage</u>

No problems are envisaged with the Waste Water Treatment Works for the treatment of domestic discharges from this site. Notwithstanding this, we have considered the impact of foul flows generated by the proposed development upon the local public sewerage network and concluded that it is unlikely that sufficient capacity exists to accommodate your development without causing detriment to the existing services we provide to our customers, or in regard to the protection of the environment. No improvements are planned within Dwr Cymru Welsh Water's Capital Investment Programme.

Accordingly, we are unable at this stage to provide you with a point of adequacy on the network and our recommendation is that you instruct us to undertake a Hydraulic Modelling Assessment of the local public sewerage network, which is at the developer's expense and consistent with our representations to the LDP consultation process. This Assessment will examine the existing network and consider the impact of the introduction of flows from your development upon its performance. Where required and appropriate, the Assessment will then identify solutions and points of communication to ensure that your site can be accommodated within the system.

Please note that we will seek to control the outcomes of the Hydraulic Modelling Assessment via appropriate planning conditions. However in the absence of known solutions to accommodate your site we will not be able to support your development through the planning process. We therefore recommend that the Assessment is undertaken in advance of the planning application being submitted in order to avoid any subsequent delays. Further information on Hydraulic Modelling Assessments as well as any implications on the planning process is provided in the attached Advice & Guidance note.

Furthermore, if the development will give rise to a new discharge (or alter an existing discharge) of trade effluent, directly or indirectly to the public sewerage system, then a Discharge Consent under Section 118 of the Water Industry Act 1991 is required from Dwr Cymru / Welsh Water. Please note that the issuing of a Discharge Consent is independent of the planning process and a consent may be refused although planning permission is granted.

Surface Water Drainage

As of 7th January 2019, this proposed development is subject to Schedule 3 of the Flood and Water Management Act 2010. The development therefore requires approval of Sustainable Drainage Systems (SuDS) features, in accordance with the 'Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems'. As highlighted in these standards, the developer is required to explore and fully exhaust all surface water drainage options in accordance with a hierarchy which states that discharge to a combined sewer shall only be made as a last resort. Disposal should be made through the hierarchical approach, preferring infiltration and, where infiltration is not possible, disposal to a surface water drainage body in liaison with the Land Drainage Authority and/or Natural Resources Wales.

With respect to additional information received by e-mail 27th March 2019, we acknowledge that a surface water drainage strategy is currently being prepared and based on a hybrid concept in agreement with the Vale of Glamorgan Council, as the determining SuDS Approval Body (SAB). However, your e-mail refers to SuDS guidance in the Welsh Government FAQs and we believe is misconstrued on sections *'3.4 – What drainage systems are approved but not adopted by the SAB?'* and *'4.23 – Who maintains SuDS which are in or beside a publically maintained road?'*. Section 3.4 refers to developments which may be exempt from adoption, albeit approved by the SAB, whereas section 4.23 highlights that the responsibility of surface water drainage along a publically maintained road in isolation, and therefore highway drainage flows, is the highways authority and not the SAB. In this instance your proposals relates to a new development with a drainage system serving both highways and property, which subsequently requires SAB approval and adoption and therefore, we recommended that you engage in further liaison with Vale of Glamorgan Council in relation to your proposals for SuDS features. Please note, DCWW is a statutory consultee to the SAB application process and will provide comments to any SuDS proposals, by response to SAB consultation, but would not be responsible for adoption of your proposed surface water drainage network. In addition, please note that no highway or land drainage run-off will be permitted to discharge directly or indirectly into the public sewerage system.

Potable Water Supply

As part of this pre-planning enquiry submission, we acknowledge receipt of the 'Cardiff Airport and St Athan Enterprise Zone – Strategic Land Use Infrastructure Plan Working Draft' which indicates *"a daily water consumption demand of 890m3 and a preliminary peak flowrate of 122 l/s"*. However, the proposed development is in an area where there are water supply problems for which there are no improvements planned within our current Capital Investment Programme AMP7 (years 2020 to 2025). Therefore, notwithstanding our reference to domestic water supply as part of our LDP representations, it will be necessary for the developer to fund the undertaking of a hydraulic modelling assessment on the water supply network, in order to establish what would be required to serve the site with an adequate water supply. For the developer to obtain a quotation for the hydraulic modelling assessment, we will require a fee of £250 + VAT.

In addition, the proposed development is crossed by a trunk/distribution watermain, the approximate position being shown on the attached plan. Dwr Cymru Welsh Water as Statutory Undertaker has statutory powers to access our apparatus at all times. I enclose our Conditions for Development near Watermain(s). It may be possible for this watermain to be diverted under Section 185 of the Water Industry Act 1991, the cost of which will be re-charged to the developer. The developer must consult Dwr Cymru Welsh Water before any development commences on site.

I trust the above information is helpful and will assist you in forming water and drainage strategies that should accompany any future planning application. I also attach copies of our water and sewer extract plans for the area, and a copy of our Planning Guidance Note which provides further information on our approach to the planning process, making connections to our systems and ensuring any existing public assets or infrastructure located within new development sites are protected.

Please note that our response is based on the information provided in your enquiry and should the information change we reserve the right to make a new representation. Should you have any queries or wish to discuss any aspect of our response please do not hesitate to contact our dedicated team of planning officers, either on 0800 917 2652 or via email at **developer.services@dwrcymru.com**

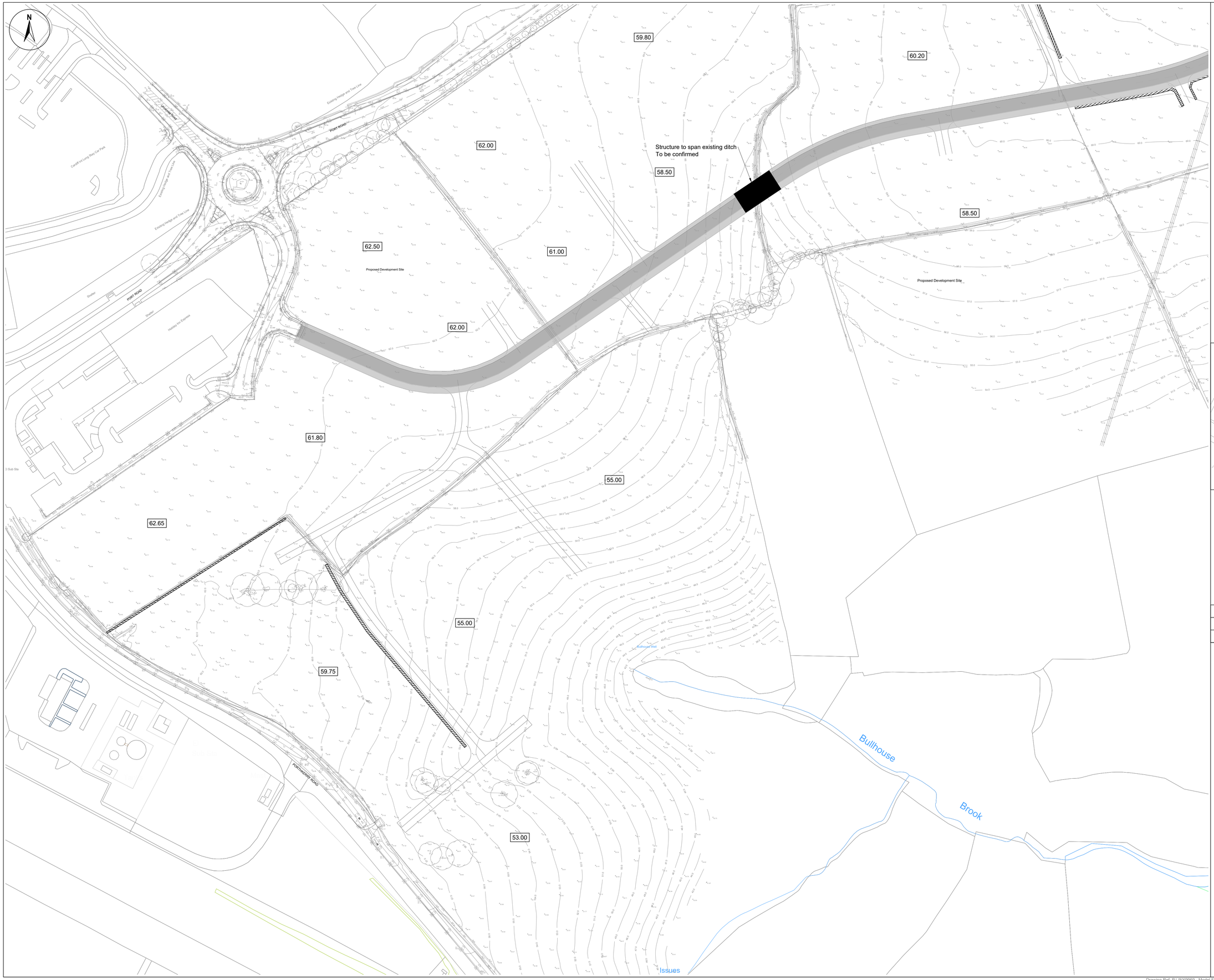
Please quote our reference number in all communications and correspondence.

Yours faithfully,

Owain George
Planning Liaison Manager
Developer Services

***Please Note** that demands upon the water and sewerage systems change continually; consequently the information given above should be regarded as reliable for a maximum period of 12 months from the date of this letter.*

Appendix H – Preliminary Levels Strategy Layout



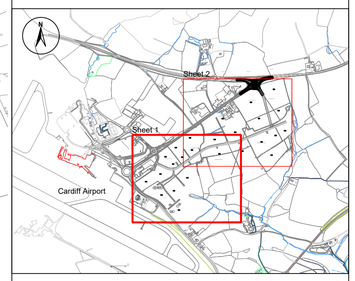
© 2019 RPS Group

NOTES

1. This drawing has been prepared in accordance with the scope of RPS's appointment with its client and is subject to the terms and conditions of that appointment. RPS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.
2. If received electronically it is the recipients responsibility to print to correct scale. Only written dimensions should be used.
3. This drawing is to be read in conjunction with all relevant scheme drawings.
4. Drawing based on topographical survey undertaken by RPS drawing number JKK9669-03-06.
5. Unit boundaries taken from RPS masterplan drawing number JCD0064-L&G-001.

KEY

- Proposed Carriageway
- Proposed Footway
- Proposed Retaining Structure
- 71.00 Proposed Boundary and Level



Rev	Description	By	CB	Date
B	Retaining structures and slopes added	CA	SJ	10.05.19
A	Proposed plot boundaries updated	DH	SJ	25.04.19

MAKING COMPLEX EASY

20 Milton Park, Abingdon, Oxfordshire, OX14 4SH
T: +44(0)1235 432 190 E: transport@rpsgroup.com

Client Legal & General (Strategic Land) Ltd

Project Model Farm, Rhoose

Title Preliminary Site Levels (Sheet 1 of 2)

Status	Drawn By	PM/Checked by
INFORMATION	DH	MB

Project Number	Scale @ A1	Date Created
JNY9969	1:1000	01/04/2019

RPS Drawing/Figure Number	Rev
JNY9969-RPS-0100-005	B

rpsgroup.com

Issues

Drawing Ref: P:\JNY9969 - Model Farm, Rhoose\Highways\Drawings\JNY9969-RPS-0100-005B & 006B-Preliminary Site Levels.dwg