From: Price, Jason [mailto:jason.price@persimmonhomes.com]
Sent: 01 October 2018 16:50
To: Thomas, Edward
Cc: 'Joel.Hockenhull@balfourbeatty.com'; 'Ruth.Blair@balfourbeatty.com'
Subject: FW: 180964 - Land between The Seven Stars and Gosmore Road comments

Ed,

I write further to the submission of information pursuant to the discharge of condition no. 19 of the outline planning permission and attach for your consideration the requested information.

For completeness, listed below are the original comments together with a response from our engineer.

I trust this is sufficient to expedite the application. If however you require additional information or wish to discuss the matter further please do not hesitate to contact me

Regards

Jason Price Strategic Land Manager Persimmon Homes East Wales Charles Church East Wales Llantrisant Business Park Llantrisant CF72 8YP Tel No: 01443 223653 Direct Dial: 01443 445432 Fax: 01443 237328 jason.price@persimmonhomes.com

From: Thomas, Edward [mailto:Edward.Thomas@herefordshire.gov.uk]
Sent: 25 June 2018 09:27
To: Price, Jason
Cc: Hockenhull, Joel (Joel.Hockenhull@balfourbeatty.com); Blair, Ruth (Ruth.Blair@balfourbeatty.com)
Subject: FW: 180964 - Land between The Seven Stars and Gosmore Road comments Importance: High

Dear Jason,

I previously omitted to share comments in respect of condition 19. Please see these below.

Can you confirm whether you are in discussion with the Council's Drainage Consultants (BBLP) in respect of discharge consent? Phoenix will be making the application to BBLP for discharge consent

Kind regards Ed Thomas

Hi Ed,

We have reviewed the reserved matters for this application and recommend that the Council do not approve the discharge of condition 19 until further information is provided as summarised below. Given the extent of information required before we can complete a

detailed review we have provided this summary via email instead of our usual response template.

Whilst the applicant has provided some information regarding the proposed drainage design, we do not believe the principals of the drainage design have been established, principally: The principles of drainage design have been followed – see below.

 No infiltration testing has been carried so the hierarchy of surface water drainage has not been correctly assessed. At minimum the following should be provided:
 a. Proposal for discharge demonstrating the hierarchy of preference:

i. Infiltration Infiltration tests were carried out in February 2017 where zero infiltration was recorded. The ground consists of stiff clay thus preventing the use of infiltration systems. See SI report (attached)
ii. Watercourse This option was considered following the failure of infiltration. A ditch was confirmed to run along the eastern boundary which we have discharged the proposed storm water at a restricted QBAR rate.
iii. Sewer (for this site this is not permitted by condition 17 and 18)

- b. Discharge rate to the proposed location if not via infiltration
- c. Attenuation requirements to meet this discharge rate Storm Water has been restricted to QBAR rate

Additionally:

- The information submitted by the applicant discusses the culvert under the adjacent road flooding and causing a potential risk to the properties (as shown within the EA flood maps). However no assessment has been carried out beyond review of the maximum flood depth indicated by the EA flood maps. We would recommend that the existing culvert is cleared out to maximise capacity, the site already discharges to the ditch therefore we would be replicating the existing situation. As the restriction is to QBar, and this will only be achieved as the basin fills, there is actually an improvement on a larger storm return periods.
- The adoption of the foul raising main should be clarified as it is not marked as S104 adoptable. The rising main is adoptable and shown on the S104 drawing

If following review of the above points the preferred surface water drainage solution remains as the proposed surface water sewer network connecting to a drainage ditch/watercourse via an attenuation pond, then the following will need to be addressed:

- It is suggested that the maintenance of the surface water system is to be by
 residents or the community, which is not appropriate. The surface water drainage is
 laid out as if it was S104 adoptable, and it's not an appropriate suggestion for
 residents to maintain it, or the pond and outfall. The surface water system will be
 maintained by a management company as is common place on residential estates.
 The storm water will be maintained in line with the SUDS Manual with regular
 inspections and annual maintenance.
- As part of a drainage strategy the applicant should propose a discharge rate to the receiving waterbody. The applicant should calculate the Greenfield runoff rate and volume for the site and submit calculations of this, noting these should use FEH methods and 2013 rainfall data. Additionally the applicant should submit calculations to show the required attenuation and storage on site to achieve required rates and volumes in accordance with the Non-Statutory Technical Standards for SuDS. Calculations attached
- The design of the proposed basin is as an offline structure so it fills and empties through the same pipe. This is not best practice in terms of treatment and it is unclear why an offline basin has been designed when there is no apparent impediment to online storage (with the flow control downstream of the basin) being designed in this location. This system is the system accepted by DCWW as they do not permit online storage. As a consequence, the system could be offered to DCWW for adoption in the future if we decide to progress that route.

- No calculations to support design of piped systems have been provided. Attached
- The capacity of the receiving watercourse is also in doubt owing to the poor condition
 of the culvert underneath the B4349 which has not been investigated, but from the
 photos the inlet and outlet are clearly poor-functioning leading to flood risk (below).
 The culvert accommodates flows from the site in its greenfield state and therefore the
 proposals are not of detriment to the existing system. Furthermore, the system is
 attenuated to QBAR which is an improvement on events in excess of 2 year storm
 thus reducing the chances of flooding. It is recommended that the culvert be cleaned
 out to maximise capacity and further reduces the chances of flooding

Figure 6 Entrance of the road culvert, beneath the B4349



K0496_Clehonger_FRA-Rep1Rev0.doc

Hydro-Logis Services LLP. Registered in England No. 00001974. Registered Office: The Old Grammar School, Church Street, Bromyard, Herefordshire HR7-4DP, UK





If you have any questions, please do not hesitate contact me or Joel

Regards,

Ruth Blair BSc (Hons)

Graduate Civil Engineer | Balfour Beatty Living Places

E: ruth.blair@balfourbeatty.com | M: +44 (0)7815 555232

Balfour Beatty Living Places | Unit 3, Thorn Business Park | Rotherwas | Hereford | HR2 6JT

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Peter Amies Consu	ulting Ltd		Page 1
Unit 9 Westway G Marksbury Bath BA2 9HN	Jarage		Micco
Date 22/06/2017 1	10:05	Designed by NickL	Desinado
File		Checked by	Drainage
Micro Drainage		Source Control 2014.1.1	
	Return Period (years) 1 Area (ha) 2.7		
		Results 1/s OBAR Rural 10.3	
		QBAR Rural 10.3 QBAR Urban 10.3	
		Q100 years 22.5	
		Q1 year 9.1	
		Q30 years 18.2	
		Q100 years 22.5	

Phoenix Desigr	n Partr	nershi	p Ltd	l								Page 0
Titan House												
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Cardiff, CF24	5BS											Micco
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File STORM WAT	TER NET	WORK.	MDX		Che	ecked	by					Diamaye
Innovyze					Net	work	2017	.1.2				
		STORM	A SEWE	ER DESI	IGN by	the	Modif	ied R	atior	nal M	lethod	
		D	esign	Crite	ria fo	or ST	ORM WA	ATER N	NETWO	RK.S	WS	
			Pip	e Sizes	STANDA	ARD Ma	anhole	Sizes	STAND	ARD		
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		Ti	me Ar	ea Dia	gram 1	or S	TORM V	WATER	NETW	ORK.	SWS	
				Time A	Area	lime	Area	Time	Area	1		
			(mins)	(ha) (n	nins)	(ha)	(mins)	(ha)	1		
				0-4 0	.473	4-8	0.631	8-12	0.01	8		
				Total A	area Con	ntribu	iting (ha) =	1.122			
				Tota	l Pipe	Volum	e (m³)	= 41.8	310			
		Net	vork I	Design	Table	for	STORM	I WATE	R NET	rwork	C.SWS	
PN	Length	Fall	Slope	I.Area	T.E.	в	ase	k	HYD	στα	Section Type	Auto
	(m)	(m)	(1:X)	(ha)			(1/s)	(mm)	SECT	(mm)	peccion type	Design
	o	0		0 0						0.55		~
	24.077 30.096		30.9 39.8	0.070 0.041	6.00 0.00			0.600 0.600	0		Pipe/Conduit Pipe/Conduit	d
	16.976		39.8	0.041	0.00			0.600	0		Pipe/Conduit Pipe/Conduit	d d
									2		1	-
	31.949		31.8	0.078	6.00			0.600	0		Pipe/Conduit	₽ [®]
2.001	18.495	0.473	39.1	0.000	0.00		0.0	0.600	0	225	Pipe/Conduit	ð

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	ase (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	24.077	0.779	30.9	0.070	6.00	0.0	0.600	0	225	Pipe/Conduit	d
1.001	30.096	0.756	39.8	0.041	0.00	0.0	0.600	0	225	Pipe/Conduit	Ū
1.002	16.976	0.557	30.5	0.076	0.00	0.0	0.600	0	225	Pipe/Conduit	ð
2.000	31.949	1.005	31.8	0.078	6.00	0.0	0.600	0	225	Pipe/Conduit	æ
2.001	18.495	0.473	39.1	0.000	0.00	0.0	0.600	0	225	Pipe/Conduit	ð
1.003	16.028	0.427	37.5	0.053	0.00	0.0	0.600	0	300	Pipe/Conduit	o
1.004	23.325	0.632	36.9	0.066	0.00	0.0	0.600	0	300	Pipe/Conduit	ē
1.005	26.737	2.075	12.9	0.074	0.00	0.0	0.600	0	300	Pipe/Conduit	ē

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)		Add Flow (1/s)	Vel (m/s)	Cap (1/s)	Flow (1/s)
1.000	50.00	6.17	93.158	0.070	0.0	0.0	0.0	2.36	93.9	9.5
1.001	50.00	6.41	92.379	0.111	0.0	0.0	0.0	2.08	82.7	15.0
1.002	50.00	6.53	91.623	0.187	0.0	0.0	0.0	2.38	94.6	25.3
2.000	50.00	6.23	92.544	0.078	0.0	0.0	0.0	2.33	92.6	10.6
2.001	50.00	6.38	91.539	0.078	0.0	0.0	0.0	2.10	83.4	10.6
1.003	50.00	6.63	90.991	0.318	0.0	0.0	0.0	2.57	182.0	43.1
1.004	50.00	6.78	90.564	0.384	0.0	0.0	0.0	2.60	183.5	52.0
1.005	50.00	6.88	89.932	0.458	0.0	0.0	0.0	4.40	311.3	62.0

Phoenix Design Partnership Ltd		Page 1
Titan House		
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File STORM WATER NETWORK.MDX	Checked by	Drainage
Innovyze	Network 2017.1.2	

		Netv	work I	esign	Table	for STORM	WATE	R NEI	WORK	.SWS	
PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (1/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
3.000	36.176	0.391	92.5	0.173	6.00	0.0	0.600	0	375	Pipe/Conduit	ð
	26.268 34.557			0.043 0.010	0.00 0.00		0.600 0.600	0 0		Pipe/Conduit Pipe/Conduit	ď
4.000	54.745	0.549	99.7	0.312	6.00	0.0	0.600	0	300	Pipe/Conduit	8
1.008 1.009	22.850 18.662 19.358	0.124	150.5	0.062 0.040 0.024	0.00 0.00 0.00	0.0	0.600 0.600 0.600	0 0	525	Pipe/Conduit Pipe/Conduit Pipe/Conduit	e e e
5.000		0.025		0.000	6.00		0.600	0		Pipe/Conduit	8
1.011 1.012 1.013	12.173 10.902 5.519		150.0	0.000 0.000 0.000	0.00 0.00 0.00	0.0	0.600 0.600 0.600	0 0 0	150	Pipe/Conduit Pipe/Conduit 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 (1/s)	Add Flow (1/s)	Vel (m/s)	Cap (1/s)	Flow (1/s)
3.000	50.00	6.32	88.173	0.173	0.0	0.0	0.0	1.88	208.1	23.4
1.006 1.007	50.00 50.00		87.707 87.532	0.674 0.684	0.0	0.0	0.0		263.6 263.6	91.3 92.6
4.000	50.00	6.58	88.000	0.312	0.0	0.0	0.0	1.57	111.3	42.2
1.008 1.009 1.010	50.00 50.00 50.00	7.88	87.226 87.074 86.950	1.058 1.098 1.122	0.0 0.0 0.0	0.0 0.0 0.0	0.0 0.0 0.0	1.82	395.0 394.8 395.4	148.7
5.000	50.00	6.05	86.921	0.000	0.0	0.0	0.0	1.58	342.1	0.0
1.011 1.012 1.013	50.00 50.00 50.00	6.51	86.821 86.760 86.687	0.000 0.000 0.000	10.2 10.2 10.2	0.0 0.0 0.0	0.0 0.0 0.0	0.71 0.82 0.82	12.5 14.5 14.5	10.2 10.2 10.2

Free Flowing Outfall Details for STORM WATER NETWORK.SWS

	Outfall Name					Min Level (m)	,	
1.013	HW2	8	37.300	8	86.651	86.650	600	600

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ate 01/01/0001	Designed by NickL	MILIU
ile STORM WATER NETWORK.MDX	Checked by	Urainage
nnovyze	Network 2017.1.2	
-	eria for STORM WATER NETWORK.SWS	
Manhole Headloss Coeff (Global Foul Sewage per hectare (1/s Number of Input Hydrographs 0 Numbe	r 1.000 MADD Factor * 10m ³ /ha Storage 7.0) 0 Inlet Coefficient 0.8) 0 Flow per Person per Day (1/per/day) 0.0) 0.500 Run Time (mins)	00 00 60 1 agrams 0
Synthe	etic Rainfall Details	
Rainfall Model	FSR Profile Type Summer	
Return Period (years)	2 Cv (Summer) 0.750	
Region Eng M5-60 (mm)	pland and Wales Cv (Winter) 0.840 20.000 Storm Duration (mins) 30	
Ratio R	0.410	

Phoenix Design Partnership Ltd					F	Page 3
Titan House						
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Cardiff, CF24 5BS						Micro
Date 01/01/0001	Designed	by Nick	L			Desinado
File STORM WATER NETWORK.MDX	Checked b	У				Drainage
Innovyze	Network 2	017.1.2				
Online Control:	s for STOR	M WATER	NETWORK.S	SWS		
Hydro-Brake® Optimum Manho	le: 12 HB,	DS/PN:	1.011, Vo	olume (m³): 7.1	<u>-</u>
Un:	it Reference	MD-SHE-	0146-1030-11	44-1030		
	ign Head (m)			1.144		
Design	n Flow (l/s)			10.3		
	Flush-Flo™		Cal	lculated		
	Objective		se upstream	-		
	Application			Surface		
	mp Available			Yes		
	iameter (mm)			146		
	rt Level (m)			86.821 225		
Minimum Outlet Pipe D: Suggested Manhole D:				1200		
Suggested Mainore D.	Iameter (mm)			1200		
Control Points Head (m) Fl	.ow (1/s)	Contro	ol Points	Head (m) Flow	r (l/s)
Design Point (Calculated) 1.144	10.3		Kick-F	lo® 0.7	49	8.4
Flush-Flo™ 0.341	10.3 Mea	an Flow o	over Head Ra	nge	-	8.9
The hydrological calculations have been base Optimum as specified. Should another type then these storage routing calculations will	of control d	evice oth	-	-	-	
Depth (m) Flow (1/s) Depth (m) Flow (1/s) De	epth (m) Flo	w (1/s)	Depth (m) F	low (l/s)	Depth (m) Flow (l/s)

Depth (m)	FIOW (1/S)	Depth (m)	FIOW (I/S)	Depth (m)	FIOW (1/S)	Depth (m)	FIOW (1/S)	Depth (m)	FIOW (1/S)
0.100	5.2	0.800	8.7	2.000	13.4	4.000	18.7	7.000	24.4
0.200	9.8	1.000	9.7	2.200	14.0	4.500	19.7	7.500	25.2
0.300	10.3	1.200	10.5	2.400	14.6	5.000	20.8	8.000	26.0
0.400	10.2	1.400	11.3	2.600	15.2	5.500	21.7	8.500	26.8
0.500	10.1	1.600	12.1	3.000	16.3	6.000	22.7	9.000	27.5
0.600	9.7	1.800	12.8	3.500	17.5	6.500	23.6	9.500	28.3

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Innovyze	Network 2017.1.2	
Storage Structur	es for STORM WATER NETWORK.SWS	
Tank or Pond	Manhole: Pond, DS/PN: 5.000	
Inv	ert Level (m) 86.921	
Depth (m) A	rea (m²) Depth (m) Area (m²)	
0.000	358.6 1.279 691.0	

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Innovyze				Network	2017.1.2					
Sum	mary o	of Critica	l Resu	lts by	Maximum Lev	el (Rank	1) for SI	TORM WATH	ER NETV	VORK.SWS
		Area	al Reduc	tion Fact	<u>Simulation (</u> tor 1.000 Ad		Flow - % of	Total Flo	ow 0.000	1
					ns) O	MADD Fac	ctor * 10m³		5	
	M			Level (r	nm) 0 al) 0.500 Flow	a por Dorge		oeffiecier		
	1*10	Foul Sewage				v per rerso	л рег рау	(1/per/uay	/) 0.000	
	_	_	_			_				
N					mber of Offlir er of Storage				-	
				Sy	nthetic Rainf		_			
		Rainfal		England	FSR M5- and Wales		.000 Cv (Su .410 Cv (W:			
		Massain						2.		
		Margin	LOL LIC		Warning (mm) sis Timestep	2.5 Second	Increment			
				-	DTS Status			OF	F	
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				11.	LICIA DIALUS			OF	-	
				Profile(a)			Winte	r	
				PIOLITE(WILLCE		
			Duration	ı(s) (mir	ıs) 15. 30. 60	. 120. 240	. 360. 480.	. 960. 144	0	
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			Period		s)	, 120, 240	, 360, 480,	10		
			Period	(s) (year	s)	, 120, 240	, 360, 480,	10	0	
	115/мн		Period Climate	(s) (year Change (s) %)			10 3	0 0 Water	Surcharged
PN	US/MH Name	Return	Period Climate Return	(s) (year Change (Climate	s)	First (Y)) First (Z)	10 3 Overflow	0 0 Water Level	Depth
PN 1.000	Name	Return	Period Climate Return Period	(s) (year Change (Climate	S) %) First (X)	First (Y)) First (Z)	10 3 Overflow	0 0 Water Level	Depth
	Name 1	Return Storm	Period Climate Return Period	(s) (year Change (Climate Change +30% +30%	First (X) Surcharge	First (Y) Flood) First (Z)	10 3 Overflow	0 Water Level (m)	Depth (m)
1.000 1.001 1.002	Name 1 2 3	Return Storm 15 Winter 15 Winter 15 Winter	Return Period 100 100	(s) (year Change (Climate Change +30% +30% +30%	S) %) First (X)	First (Y) Flood) First (Z)	10 3 Overflow	0 Water Level (m) 93.258 92.529 92.089	Depth (m) -0.125 -0.075 0.241
1.000 1.001 1.002 2.000	Name 1 2 3 15	Return Storm 15 Winter 15 Winter 15 Winter 15 Winter	Return Period 100 100 100 100	(s) (year Change (Climate Change +30% +30% +30% +30%	First (X) Surcharge	First (Y) Flood) First (Z)	10 3 Overflow	0 Water Level (m) 93.258 92.529 92.089 92.651	Depth (m) -0.125 -0.075 0.241 -0.118
1.000 1.001 1.002 2.000 2.001	Name 1 2 3 15 16	Return Storm 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter	Return Period 100 100 100 100	<pre>(s) (year Change (Climate Change +30% +30% +30% +30% +30%</pre>	<pre>S) %) First (X) Surcharge 100/15 Winter</pre>	First (Y) Flood) First (Z)	10 3 Overflow	0 Water Level (m) 93.258 92.529 92.089 92.651 91.655	Depth (m) -0.125 -0.075 0.241 -0.118 -0.108
1.000 1.001 1.002 2.000 2.001 1.003	Name 1 2 3 15 16 4	Return Storm 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter	Period Climate Return Period 100 100 100 100 100 100 100 100 100 100	<pre>(s) (year Change (Climate Change +30% +30% +30% +30% +30% +30%</pre>	First (X) Surcharge	First (Y) Flood) First (Z)	10 3 Overflow	0 Water Level (m) 93.258 92.529 92.089 92.651 91.655 91.448	Depth (m) -0.125 -0.075 0.241 -0.118 -0.108 0.157
1.000 1.001 1.002 2.000 2.001	Name 1 2 3 15 16 4 5	Return Storm 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter	Period Climate Return Period 100 100 100 100 100 100 100 100 100 100 100 100	<pre>(s) (year Change (Climate Change +30% +30% +30% +30% +30% +30%</pre>	<pre>First (X) Surcharge 100/15 Winter 100/15 Winter</pre>	First (Y) Flood) First (Z)	10 3 Overflow	0 Water Level (m) 93.258 92.529 92.089 92.651 91.655	Depth (m) -0.125 -0.075 0.241 -0.118 -0.108
1.000 1.001 1.002 2.000 2.001 1.003 1.004	Name 1 2 3 15 16 4 5 6	Return Storm 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter	Period Climate Return Period 100 100 100 100 100 100 100 100 100 100 100 100 100 100	<pre>(s) (year Change (Climate Change +30% +30% +30% +30% +30% +30% +30%</pre>	<pre>First (X) Surcharge 100/15 Winter 100/15 Winter 100/15 Winter</pre>	First (Y) Flood) First (Z)	10 3 Overflow	0 0 Water Level (m) 93.258 92.529 92.089 92.651 91.655 91.448 91.024	Depth (m) -0.125 -0.075 0.241 -0.118 -0.108 0.157 0.160
1.000 1.001 2.000 2.001 1.003 1.004 1.005 3.000 1.006	Name 1 2 3 15 16 4 5 6 17 7	Storm 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter	Period Climate Return Period 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100	<pre>(s) (year Change (Climate Change +30% +30% +30% +30% +30% +30% +30% +30%</pre>	<pre>First (X) Surcharge 100/15 Winter 100/15 Winter 100/15 Winter 100/15 Winter</pre>	First (Y) Flood) First (Z)	10 3 Overflow	0 Water Level (m) 93.258 92.529 92.651 91.655 91.448 91.024 90.238 89.316 89.163	Depth (m) -0.125 -0.075 0.241 -0.118 -0.108 0.157 0.160 0.006 0.768 1.007
1.000 1.001 2.000 2.001 1.003 1.004 1.005 3.000 1.006 1.007	Name 1 2 3 15 16 4 5 6 17 7 8	Storm 15 Winter 15 Winter	Period Climate Return Period 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100	<pre>(s) (year Change (Climate Change +30% +30% +30% +30% +30% +30% +30% +30%</pre>	<pre>First (X) Surcharge 100/15 Winter 100/15 Winter</pre>	First (Y) Flood) First (Z)	10 3 Overflow	0 Water Level (m) 93.258 92.529 92.651 91.655 91.448 91.024 90.238 89.316 89.163 88.908	Depth (m) -0.125 -0.075 0.241 -0.118 -0.108 0.157 0.160 0.006 0.768 1.007 0.927
1.000 1.001 2.000 2.001 1.003 1.004 1.005 3.000 1.006 1.007 4.000	Name 1 2 3 15 16 4 5 6 17 7 8 18	Storm 15 Winter 15 Winter	Period Climate Return Period 100	<pre>(s) (year Change (Climate Change +30% +30% +30% +30% +30% +30% +30% +30%</pre>	<pre>First (X) Surcharge 100/15 Winter 100/15 Winter</pre>	First (Y) Flood) First (Z)	10 3 Overflow	0 Water Level (m) 93.258 92.529 92.651 91.655 91.448 91.024 90.238 89.316 89.163 88.908 89.361	Depth (m) -0.125 -0.075 0.241 -0.118 -0.108 0.157 0.160 0.006 0.768 1.007 0.927 1.061
1.000 1.001 2.000 2.001 1.003 1.004 1.005 3.000 1.006 1.007 4.000 1.008	Name 1 2 3 15 16 4 5 6 17 7 8 18 9	Storm 15 Winter 15 Winter	Period Climate Return Period 100	<pre>(s) (year Change (Climate Change +30% +30% +30% +30% +30% +30% +30% +30%</pre>	<pre>First (X) Surcharge 100/15 Winter 100/15 Winter</pre>	First (Y) Flood) First (Z)	10 3 Overflow	0 0 Water Level (m) 93.258 92.529 92.651 91.655 91.448 91.024 90.238 89.316 89.163 88.908 89.361 88.592	Depth (m) -0.125 -0.075 0.241 -0.118 -0.108 0.157 0.160 0.006 0.768 1.007 0.927 1.061 0.841
1.000 1.001 1.002 2.000 2.001 1.003 1.004 1.005 3.000 1.006 1.007 4.000 1.008 1.009	Name 1 2 3 15 16 4 5 6 17 7 8 18 9 10	Return Storm 15 Winter 15 Winter	Return Period 100 100 100 100 100 100 100 100 100 10	<pre>(s) (year Change (Climate Change +30% +30% +30% +30% +30% +30% +30% +30%</pre>	<pre>First (X) Surcharge 100/15 Winter 100/15 Winter</pre>	First (Y) Flood) First (Z)	10 3 Overflow	0 Water Level (m) 93.258 92.529 92.651 91.655 91.448 91.024 90.238 89.316 89.163 89.908 89.361 88.592 88.308	Depth (m) -0.125 -0.075 0.241 -0.118 -0.108 0.157 0.160 0.006 0.768 1.007 0.927 1.061 0.841 0.709
1.000 1.001 1.002 2.000 2.001 1.003 1.004 1.005 3.000 1.006 1.007 4.000 1.008 1.009 1.010	Name 1 2 3 15 16 4 5 6 17 7 8 18 9 10 11	Return Storm 15 Winter 15 Winter	Period Climate Return Period 100 100 100 100 100 100 100 100 100 10	<pre>(s) (year Change (Climate Change +30% +30% +30% +30% +30% +30% +30% +30%</pre>	First (X) Surcharge 100/15 Winter 100/15 Winter	First (Y) Flood) First (Z)	10 3 Overflow	0 Water Level (m) 93.258 92.529 92.651 91.655 91.448 91.024 90.238 89.316 89.163 89.908 89.361 88.592 88.308 88.011	Depth (m) -0.125 -0.075 0.241 -0.118 -0.108 0.157 0.160 0.006 0.768 1.007 0.927 1.061 0.841 0.709 0.536
1.000 1.001 1.002 2.000 2.001 1.003 1.004 1.005 3.000 1.006 1.007 4.000 1.008 1.009 1.010 5.000	Name 1 2 3 15 16 4 5 6 17 7 8 18 9 10 11	Return Storm 15 Winter 15 Winter	Period Climate Return Period 100	<pre>(s) (year Change (Climate Change +30% +30% +30% +30% +30% +30% +30% +30%</pre>	<pre>First (X) Surcharge 100/15 Winter 100/15 Winter</pre>	First (Y) Flood) First (Z)	10 3 Overflow	0 Water Level (m) 93.258 92.529 92.651 91.655 91.448 91.024 90.238 89.316 89.163 89.908 89.361 88.592 88.308	Depth (m) -0.125 -0.075 0.241 -0.118 -0.108 0.157 0.160 0.006 0.768 1.007 0.927 1.061 0.841 0.709
1.000 1.001 1.002 2.000 2.001 1.003 1.004 1.005 3.000 1.006 1.007 4.000 1.008 1.009 1.010 5.000	Name 1 2 3 15 16 4 5 6 17 7 8 18 9 10 11 Pond 12 HB	Return Storm 15 Winter 15 Winter 240 Winter	Period Climate Return Period 100 100 100 100 100 100 100 100 100 10	<pre>(s) (year Change (Climate Change +30% +30% +30% +30% +30% +30% +30% +30%</pre>	First (X) Surcharge 100/15 Winter 100/15 Winter	First (Y) Flood) First (Z)	10 3 Overflow	0 Water Level (m) 93.258 92.529 92.651 91.655 91.448 91.024 90.238 89.316 89.163 88.908 89.361 88.592 88.308 88.011 87.945	Depth (m) -0.125 -0.075 0.241 -0.118 -0.108 0.157 0.160 0.006 0.768 1.007 0.927 1.061 0.841 0.709 0.536 0.499
1.000 1.001 1.002 2.000 2.001 1.003 1.004 1.005 3.000 1.006 1.007 4.000 1.008 1.009 1.010 5.000 1.011	Name 1 2 3 15 16 4 5 6 17 7 8 18 9 10 11 Pond 12 HB 13	Return Storm 15 Winter 15 Winter 1440 Winter	Period Climate Climate Return Period 100 100 100 100 100 100 100 100 100 10	<pre>(s) (year Change (Climate Change +30% +30% +30% +30% +30% +30% +30% +30%</pre>	First (X) Surcharge 100/15 Winter 100/15 Winter	First (Y) Flood) First (Z)	10 3 Overflow	0 Water Level (m) 93.258 92.529 92.651 91.655 91.448 91.024 90.238 89.316 89.163 88.908 89.361 88.592 88.308 88.011 87.945 87.983	Depth (m) -0.125 -0.075 0.241 -0.118 -0.108 0.157 0.160 0.006 0.768 1.007 0.927 1.061 0.841 0.709 0.536 0.499 1.012 -0.049
1.000 1.001 1.002 2.000 2.001 1.003 1.004 1.005 3.000 1.006 1.007 4.000 1.008 1.009 1.010 5.000 1.011 1.012	Name 1 2 3 15 16 4 5 6 17 7 8 18 9 10 11 Pond 12 HB 13	Return Storm 15 Winter 15 Winter 1440 Winter	Period Climate Climate Return Period 100 100 100 100 100 100 100 100 100 10	<pre>(s) (year Change (Change (Change +30% +30% +30% +30% +30% +30% +30% +30%</pre>	First (X) Surcharge 100/15 Winter 100/15 Winter	First (Y) Flood) First (Z)	10 3 Overflow	0 Water Level (m) 93.258 92.529 92.651 91.655 91.448 91.024 90.238 89.316 89.163 89.361 88.908 89.361 88.592 88.308 88.011 87.945 87.983 86.861	Depth (m) -0.125 -0.075 0.241 -0.118 -0.108 0.157 0.160 0.006 0.768 1.007 0.927 1.061 0.841 0.709 0.536 0.499 1.012 -0.049
1.000 1.001 1.002 2.000 2.001 1.003 1.004 1.005 3.000 1.006 1.007 4.000 1.008 1.009 1.010 5.000 1.011 1.012	Name 1 2 3 15 16 4 5 6 17 7 8 18 9 10 11 Pond 12 HB 13	Return Storm 15 Winter 15 Winter 1440 Winter	Period Climate Climate Return Period 100 100 100 100 100 100 100 100 100 10	<pre>(s) (year Change (Climate Change +30% +30% +30% +30% +30% +30% +30% +30%</pre>	First (X) Surcharge 100/15 Winter 100/15 Winter	First (Y) Flood) First (Z)	10 3 Overflow Act.	0 Water Level (m) 93.258 92.529 92.651 91.655 91.448 91.024 90.238 89.316 89.163 89.361 88.908 89.361 88.592 88.308 88.011 87.945 87.983 86.861	Depth (m) -0.125 -0.075 0.241 -0.118 -0.108 0.157 0.160 0.006 0.768 1.007 0.927 1.061 0.841 0.709 0.536 0.499 1.012 -0.049
1.000 1.001 1.002 2.000 2.001 1.003 1.004 1.005 3.000 1.006 1.007 4.000 1.008 1.009 1.010 5.000 1.011 1.012	Name 1 2 3 15 16 4 5 6 17 7 8 18 9 10 11 Pond 12 HB 13	Return Storm 15 Winter 15 Winter 1440 Winter	Period Climate Climate Return Period 100 100 100 100 100 100 100 100 100 10	<pre>(s) (year Change (Climate Change +30% +30% +30% +30% +30% +30% +30% +30%</pre>	First (X) Surcharge 100/15 Winter 100/15 Winter	First (Y) Flood) First (Z)	10 3 Overflow	0 Water Level (m) 93.258 92.529 92.651 91.655 91.448 91.024 90.238 89.316 89.163 89.361 88.908 89.361 88.592 88.308 88.011 87.945 87.983 86.861	Depth (m) -0.125 -0.075 0.241 -0.118 -0.108 0.157 0.160 0.006 0.768 1.007 0.927 1.061 0.841 0.709 0.536 0.499 1.012 -0.049
1.000 1.001 1.002 2.000 2.001 1.003 1.004 1.005 3.000 1.006 1.007 4.000 1.008 1.009 1.010 5.000 1.011 1.012	Name 1 2 3 15 16 4 5 6 17 7 8 18 9 10 11 Pond 12 HB 13	Return Storm 15 Winter 15 Winter	Period Climate Return Period 100 100 100 100 100 100 100 100 100 10	<pre>(s) (year Change (Climate Change +30% +30% +30% +30% +30% +30% +30% +30%</pre>	<pre>First (X) Surcharge 100/15 Winter 100/15 Winter</pre>	First (Y) Flood) First (Z) Overflow Status	10 3 Overflow Act.	0 Water Level (m) 93.258 92.529 92.651 91.655 91.448 91.024 90.238 89.316 89.163 89.361 88.908 89.361 88.592 88.308 88.011 87.945 87.983 86.861	Depth (m) -0.125 -0.075 0.241 -0.118 -0.108 0.157 0.160 0.006 0.768 1.007 0.927 1.061 0.841 0.709 0.536 0.499 1.012 -0.049
1.000 1.001 1.002 2.000 2.001 1.003 1.004 1.005 3.000 1.006 1.007 4.000 1.008 1.009 1.010 5.000 1.011 1.012	Name 1 2 3 15 16 4 5 6 17 7 8 18 9 10 11 Pond 12 HB 13	Storm 15 Winter 15 Winter 16 Winter 17 Winter 17 Winter 18 Winter 19 Winter	Period Climate Return Period 100 100 100 100 100 100 100 100 100 10	<pre>(s) (year Change (Climate Change +30% +30% +30% +30% +30% +30% +30% +30%</pre>	First (X) Surcharge 100/15 Winter 100/15 Winter	First (Y) Flood) First (Z) Overflow	10 3 Overflow Act.	0 Water Level (m) 93.258 92.529 92.651 91.655 91.448 91.024 90.238 89.316 89.163 89.361 88.908 89.361 88.592 88.308 88.011 87.945 87.983 86.861	Depth (m) -0.125 -0.075 0.241 -0.118 -0.108 0.157 0.160 0.006 0.768 1.007 0.927 1.061 0.841 0.709 0.536 0.499 1.012 -0.049
1.000 1.001 1.002 2.000 2.001 1.003 1.004 1.005 3.000 1.006 1.007 4.000 1.008 1.009 1.010 5.000 1.011 1.012	Name 1 2 3 15 16 4 5 6 17 7 8 18 9 10 11 Pond 12 HB 13	Return Storm 15 Winter 15 Winter 240 Winter 240 Winter 240 Winter 240 Winter 240 Winter 240 Winter	Period Climate Return Period 100 100 100 100 100 100 100 100 100 10	<pre>(s) (year Change (Climate Change +30% +30% +30% +30% +30% +30% +30% +30%</pre>	First (X) Surcharge 100/15 Winter 100/15 Winter	First (Y) Flood Pipe Low Flow) (1/s) 35.6 58.1) First (Z) Overflow Status	10 3 Overflow Act.	0 Water Level (m) 93.258 92.529 92.651 91.655 91.448 91.024 90.238 89.316 89.163 89.361 88.908 89.361 88.592 88.308 88.011 87.945 87.983 86.861	Depth (m) -0.125 -0.075 0.241 -0.118 -0.108 0.157 0.160 0.006 0.768 1.007 0.927 1.061 0.841 0.709 0.536 0.499 1.012 -0.049
1.000 1.001 1.002 2.000 2.001 1.003 1.004 1.005 3.000 1.006 1.007 4.000 1.008 1.009 1.010 5.000 1.011 1.012	Name 1 2 3 15 16 4 5 6 17 7 8 18 9 10 11 Pond 12 HB 13	Storm 15 Winter 15 Winter 16 Winter 16 Winter 17 Winter 18 Winter 19 Winter 10 W	Period Climate Return Period 100 100 100 100 100 100 100 100 100 10	<pre>(s) (year Change (Climate Change +30% +30% +30% +30% +30% +30% +30% +30%</pre>	<pre>First (X) Surcharge 100/15 Winter 100/1</pre>	First (Y) Flood Pipe Low Flow) (1/s) 35.6 58.1 90.0 39.6) First (Z) Overflow Status Status OK OK SURCHARGED OK	10 3 Overflow Act.	0 Water Level (m) 93.258 92.529 92.651 91.655 91.448 91.024 90.238 89.316 89.163 89.361 88.908 89.361 88.592 88.308 88.011 87.945 87.983 86.861	Depth (m) -0.125 -0.075 0.241 -0.118 -0.108 0.157 0.160 0.006 0.768 1.007 0.927 1.061 0.841 0.709 0.536 0.499 1.012 -0.049
1.000 1.001 1.002 2.000 2.001 1.003 1.004 1.005 3.000 1.006 1.007 4.000 1.008 1.009 1.010 5.000 1.011 1.012	Name 1 2 3 15 16 4 5 6 17 7 8 18 9 10 11 Pond 12 HB 13	Storm 15 Winter 15 Winter 16 Winter 17 Winter 18 Winter 19 Winter 10 Winter 10 Winter 10 Winter 10 Winter 10 Winter	Period Climate Return Period 100 100 100 100 100 100 100 100 100 10	<pre>(s) (year Change (Climate Change +30% +30% +30% +30% +30% +30% +30% +30%</pre>	<pre>First (X) Surcharge 100/15 Winter 100/1</pre>	First (Y) Flood Pipe Low Flow) (1/s) 35.6 58.1 90.0 39.6 39.7) First (Z) Overflow Status OK OK SURCHARGED	10 3 Overflow Act.	0 Water Level (m) 93.258 92.529 92.651 91.655 91.448 91.024 90.238 89.316 89.163 89.361 88.908 89.361 88.592 88.308 88.011 87.945 87.983 86.861	Depth (m) -0.125 -0.075 0.241 -0.118 -0.108 0.157 0.160 0.006 0.768 1.007 0.927 1.061 0.841 0.709 0.536 0.499 1.012 -0.049

Phoenix Design Partnership Ltd	Page 6	
Titan House		
Lewis Road		L
Cardiff, CF24 5BS		Micco
Date 01/01/0001	Designed by NickL	Desinado
File STORM WATER NETWORK.MDX	Checked by	Diamage
Innovyze	Network 2017.1.2	

Summary of Critical Results by Maximum Level (Rank 1) for STORM WATER NETWORK.SWS

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.004	5	0.000	1.12		181.5	SURCHARGED	
1.005	б	0.000	0.77		216.3	SURCHARGED	
3.000	17	0.000	0.39		73.0	SURCHARGED	
1.006	7	0.000	1.21		268.5	SURCHARGED	
1.007	8	0.000	1.17		269.8	SURCHARGED	
4.000	18	0.000	1.17		122.9	SURCHARGED	
1.008	9	0.000	1.36		407.4	SURCHARGED	
1.009	10	0.000	1.54		416.8	SURCHARGED	
1.010	11	0.000	1.53		422.3	SURCHARGED	
5.000	Pond	0.000	0.06		10.3	SURCHARGED	
1.011	12 HB	0.000	0.90		10.3	SURCHARGED	
1.012	13	0.000	0.79		10.3	OK	
1.013	14	0.000	0.86		10.3	OK	