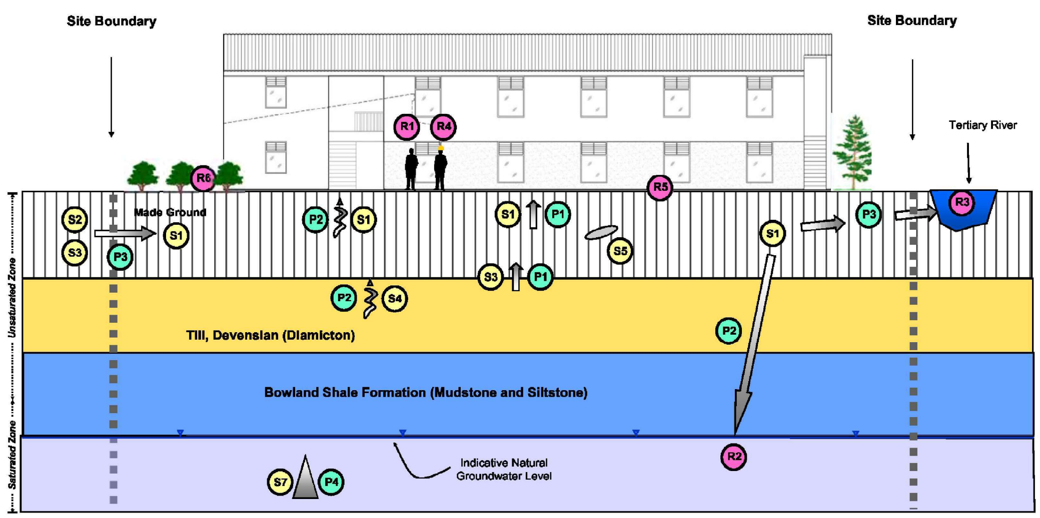
Appendix A3 – Diagrammatic Conceptual Model

Boland Meadow, Higgin Brook



Sources

- S1 Made-ground (On site)
- S2 Made-ground (Off site)
- S3 Natural soils (On & off site)
- S4 Ground gas sources
- S5 Unexploded ordnance
- S6 Radon geology
- S7 Mine workings

Pathways

- P1 Direct contact, ingestion and or inhalation
- P2 Vertical migration
- P3 Horizontal migration
- P4 Collapse

Receptors

- R1 End users
- R2 Groundwater
- R3 Surface water
- R4 Construction workers
- R5 Construction materials
- R6 Local ecology

curtins

10 Oxford Court, Bishopsgate,
Manchester, M2 3WQ
Tel: 0161 236 2394

Project	Job Reference	Author	Client
Boland Meadow, Higgin Brook	EB1355	GL	Barratt Homes
Drawing Title	**Date**	**Checked**	**Scale**
Diagrammatic Conceptual Model	28.03.2014	AW	Not to scale

Appendix A4 – Qualitative Risk Assessment Rationale

The site-specific qualitative risk assessment of environmental harm, as detailed in Section 3.0 of this reporting, is summarised in Table A4.1 hereafter; the principle being to establish connecting links between a hazardous source to a potential receptor via an exposure pathway.

The qualitative risk assessment corresponds with the **total** site area.

Risk assessment is the process of collating known information on a hazard or set of hazards in order to estimate actual or potential risk to receptors. The receptor may be humans, a water resource, a sensitive local ecosystem or future construction materials. Receptors can be connected to the hazardous source by one or several exposure pathways such as direct contact for example. Risks are generally managed by isolating the receptor or intercepting the exposure pathway or by isolating or removing the hazard.

Without the three essential components of a source, pathway and receptor there can be no risk. Therefore the presence of hazard on a site does not necessarily mean there is a risk.

By considering where a viable pathway exists which connects a source with a receptor the risk assessment in Section 3.0 and Table A4.1 identifies where pollutant linkage exists. If there is no pollutant linkage there is no risk and only where a pollutant linkage is established does the risk assessment consider the level of risk.

The risk assessment considers the likelihood of a particular event taking place (accounting for the presence of the hazard and receptor and the integrity of the exposure pathway) in conjunction with the severity of the potential consequence (accounting for the potential severity of the hazard and the sensitivity of the receptor).

In the risk assessment the consequence of the hazard has been classified as severe or medium or mild or minor and the probability (likelihood) of the circumstances actually occurring classified as high likelihood or likely or low likelihood or unlikely.

The consequences and probabilities are subsequently cross-correlated to give a qualitative estimation of the risk using Department of the Environment risk classifications as detailed in the table below and as referenced in CIRIA C552.

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability (Likelihood)	**High Likelihood**	Very High Risk	High Risk	Moderate Risk	Negligible Risk
	Likely	High Risk	Moderate Risk	Moderate/Low Risk	Negligible Risk
	Low Likelihood	High/Moderate Risk	Moderate/Low Risk	Low Risk	Negligible Risk
	Unlikely	Moderate/Low Risk	Low Risk	Negligible Risk	Negligible Risk

In accordance with DoE guidance, the following categorisation of **consequence** has been developed.

Classification	Definition	Examples
Severe	Short-term (acute) risk to human health likely to result in "significant harm" as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution of sensitive water resource. Catastrophic damage to buildings/property. A short-term risk to a particular ecosystem or organisation forming part of such ecosystem.	High concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from site into controlled water. Explosion, causing building collapse (can also equate to a short-term human health risk if buildings are occupied).
Medium	Chronic damage to Human Health. Pollution of sensitive water resources. A significant change in a particular ecosystem or organism forming part of such ecosystem.	Concentration of a contaminant from site exceeds the generic or site-specific assessment criteria. Leaching of contaminants from a site to a Principal or Secondary A aquifer. Death of a species within a designated nature reserve. Lesser toxic and asphyxiate effects
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services. Damage to sensitive buildings/structures/services or the environment.	Pollution of non-classified groundwater (inc. Secondary B aquifers). Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability).
Minor	Harm, although not necessarily significant harm, which may result in a financial loss or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective clothing, etc). Easily repairable effects of damage to buildings, structures and services.	The presence of contaminants at such concentrations that protective equipment is required during site works. The loss of plants in a landscaping scheme. Discoloration of concrete.

In accordance with DoE guidance, the following categorisation of **probability** has been developed.

Classification	Definition
High Likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low Likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

In accordance with DoE guidance, the following categorisation of **risk** has been developed.

Classification	Definition
Very High Risk	There is a *high probability* that *severe harm* could arise to a designated receptor from an identified hazard at the site without appropriate further action.
High Risk	*Harm* is *likely to arise* to a designated receptor from an identified hazard at the site without appropriate further action.
Moderate Risk	*It is possible* that without appropriate further action *harm could arise* to a designated receptor. It is relatively *unlikely* that any such harm would be *severe,* and if any harm were to occur it is *more likely* that such harm would be *relatively mild.*
Low Risk	*It is possible* that *harm could arise* to a designated receptor from an identified hazard. It is *likely* that, at worst, if any harm was realised any effects would be *mild.*
Negligible Risk	The presence of an identified hazard does not give rise to the potential to cause harm to a designated receptor.

The term 'risk' in this instance refers to the risk that the source, pathway, receptor linkage for a given source of contamination is complete. It does not refer to immediate risk to individuals or features present on the site from potential contaminants and is intended to be used as a tool to assess the necessity of further investigation.

Appendix A4.1 – Table and Summary of Potential Risks, Sheet 1

Conceptual Site Model			Qualitative Risk Assessment		
Source	Pathway(s)	Receptor(s)	Consequence (Potential Severity)	Likelihood of Occurrence	Risk*
S1: Made ground soils on site	**P2**: Vertical migration	**R2:** Controlled waters (Groundwater)	Medium	Low Likelihood	Moderate/Low
	P3: Horizontal migration	**R3:** Controlled waters (Surface Waters)	Medium	Low Likelihood	Moderate/Low
	P1: Direct contact, ingestion, inhalation (dust and vapours)	**R1:** End user of site	Medium	Low Likelihood	Moderate/Low
	P1: Direct contact, ingestion, inhalation (dust and vapours)	**R4:** Construction workers	Minor	Low Likelihood	Negligible
	P1 & P3: Direct contact, ingestion, inhalation (dust and vapours) and horizontal migration	**R5:** Construction materials	Mild	Low Likelihood	Low
	P1 & P3: Direct contact, ingestion, inhalation (dust and vapours) and horizontal migration	**R6:** Local ecology	Minor	Low Likelihood	Negligible
S2: Made ground soils off site	**P3 & P1**: Horizontal migration and direct contact, ingestion, inhalation (dust and vapours)	**R1:** End user of site	Medium	Likely	Moderate
	P3 & P1: Horizontal migration and direct contact, ingestion, inhalation (dust and vapours)	**R4:** Construction workers	Minor	Likely	Negligible

Appendix A4.1 – Table and Summary of Potential Risks, Sheet 2

Conceptual Site Model			Qualitative Risk Assessment		
Source	Pathway	Receptor	Consequence (Potential Severity)	Likelihood of Occurrence	Risk*
S3: Natural soils on or off site	**P1 & P3**: Direct contact, ingestion, inhalation (dust and vapours) and horizontal migration	**R1:** End user of site	Medium	Unlikely	Moderate/Low
	P1 & P3: Direct contact, ingestion, inhalation (dust and vapours) and horizontal migration	**R4:** Construction workers	Minor	Unlikely	Negligible
S4: Ground gases	**P2 & P3**: Vertical and horizontal migration	**R1:** End user of site	Severe	Low Likelihood	High/Moderate
S5: Radon	**P2 & P3**: Vertical and horizontal migration	**R1:** End user of site	Medium	Unlikely	Low
S6: Unexploded ordnance	**P1**: Direct contact	**R1:** End user of site	Severe	Unlikely	Moderate/Low
	P1: Direct contact	**R4:** Construction workers	Severe	Unlikely	Moderate/Low

Risk refers to the potential risk that the Source, Pathway, Receptor linkage is complete and is used to determine if any further investigation is required. It does not indicate immediate emergency risk to any individual or feature present on the site unless specifically noted.

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NG1 5DW
T. 0115 941 5551
nottingham@curtins.com


Key
Application Site Boundary
Homes
Avenue
Village Streets
Village Lanes
Squares & Mews
Footpath/Cycleway
Existing Trees (Retained)
Existing Hedgerows (Retained & enhanced)
Proposed Trees & Hedgerows
Sustainable Urban Drainage Network
Play Area - Locally Equiped Area for Play
Play Area - Neighbourhood Equiped Area for Play
LEAP
NEAP
Paddock
Paddock
Pavilion
Car Park
Nets
Pond
Proposed Cricket Pitch
Primary School Playing Fields
Primary School
Mews
Square
Park
Circus
Crescent
Land Retained in Agriculture
Superstore
Barnacre Road Primary School
Play Area
e*SCAPE
urbanists
Project Title
Higgins Brook, Longridge
e*SCAPE Job No.
013-008
Client
Barratt Homes
Drawing Number
013-008-P008
Revision
REV F
Drawing Title
Illustrative Masterplan/
Indicative Layout
Scale
1:1,250 @ A1
Date
Feb'15

Sam Dean

From: Daniel Sutcliffe <Daniel.Sutcliffe@ribblevalley.gov.uk>
Sent: 15 February 2016 10:53
To: Sam Dean; Linden Richardson
Cc: Stephen Kilmartin
Subject: RE: STN3505NM: Gas monitoring at Longridge Preston

Follow Up Flag: Follow up
Flag Status: Flagged

Good Morning,

Apologies for the delay in responding but I have been off sick recently and I'm still catching up. I am happy for you to forego the gas monitoring on this site as I agree the likelihood/risk is relatively minimal. Please report on the intrusive ground investigations that you carry out and ensure that your findings (and details of any remediation work carried out) are submitted with your verification statement.

I've copied in the relevant planning officer for your site so that he is kept up to date and can make any necessary comment.

Kind Regards

Daniel Sutcliffe
Engineering Assistant
Ribble Valley Borough Council

From: Sam Dean [mailto:Sam.Dean@soiltechnics.net]
Sent: 11 February 2016 12:21
To: Sam Dean; Daniel Sutcliffe; Linden Richardson
Subject: RE: STN3505NM: Gas monitoring at Longridge Preston

Afternoon Daniel

have you had a chance to review our comments as per below?

Any queries please give me a call

Kind regards

Sam Dean
B.Sc. (Hons)., MIEnvSc., FGS
Associate Director

[redacted]
e sam.dean@soiltechnics.net
w www.soiltechnics.net

Head Office
Cedar Barn, White Lodge, Walgrave, Northamptonshire NN6 9PY **t** 01604 781877

Manchester Office
Ivy Mill Business Centre, Crown Street, Failsworth, Manchester M35 9BG **t** 0161 9470270

From: Sam Dean
Sent: 04 February 2016 12:37
To: Daniel Sutcliffe; Linden Richardson
Subject: RE: STN3505NM: Gas monitoring at Longridge Preston

Daniel

Ref is Application 3/2014/0764

Any queries please give me a call

Kind regards

Sam Dean
B.Sc. (Hons)., MIEnvSc., FGS
Associate Director

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From: Daniel Sutcliffe [mailto:Daniel.Sutcliffe@ribblevalley.gov.uk]
Sent: 04 February 2016 10:34
To: Sam Dean <Sam.Dean@soiltechnics.net>; Linden Richardson <Linden.Richardson@soiltechnics.net>
Subject: RE: STN3505NM: Gas monitoring at Longridge Preston

Morning,

Could you please send me the relevant planning application reference for this site so that I can look it up?

Regards

Daniel Sutcliffe
Engineering Assistant
Ribble Valley Borough Council

From: Sam Dean [mailto:Sam.Dean@soiltechnics.net]
Sent: 02 February 2016 13:43
To: Linden Richardson
Cc: Daniel Sutcliffe
Subject: Re: STN3505NM: Gas monitoring at Longridge Preston

Daniel

Just to add to what Linden outlined, the site has outline planning (phase 1 and phase 2 approx 350 dwellings) and I believe you would have been in receipt of a phase 1 desk study report for the site already undertaken by a third party. They have outlined that gas is a source of concern based on the presence of potential Made Ground offsite.

The site is greenfield and geology is glacial till (clays). Landfill sources and historic pits are limited and distant. In our opinion even if there was a source of gas in Made Ground soils offsite, there is no preferential migration pathway to the site and the source, unless it contained significant concentrations of degradable and putrescible material of significant thickness, is considered low risk.

As you can appreciate, this may cause some conflict and delays later in the planning process if the LA are expecting to see some gas monitoring based on he recommendations of the desk study report and we do not undertake based on our assessment. If the LA recommend that such monitoring is undertaken as a matter course on all sites within their remit the we would obviously have no objection to this.

We would appreciate any feedback at your earliest convenience, we are programmed to undertake intrusive ground investigations at the site Weds and Thursday this week in the phase 1 area, with phase 2 following next week.

Regards

Sam Dean
(Associate Director for Soiltechnics Ltd)

Sent from my iPhone

On 2 Feb 2016, at 12:50, Linden Richardson <Linden.Richardson@soiltechnics.net> wrote:

> Dear Mr Sutcliffe
>
> I am working on the ground investigation for a proposed residential development at the above address (postcode PR3 2NA, it is the land north of the village and east of Chipping Lane) and will shortly be undertaking the site investigation.
>
> It has been suggested to me that I get in touch with you to get your position on the requirements for gas monitoring at the site. Our desk study has revealed no clear sources of ground gas and we are of the opinion that gas monitoring is not required at the site. If you agree with this position it would be useful to receive confirmation of this so that gas monitoring can be discounted. This would allow the planning application to be completed more promptly and at lower expense. However, should you need more time to deliberate, or not be able to respond before the works are undertaken then we will happily proceed with installations and monitoring.
>
> Many thanks for any input you can provide.
>
> Regards

Linden Richardson
B.Eng. (Hons)., MSc., AIEMA
Geo-environmental Engineer

t 0161 9470270
[redacted]
e linden.richardson@soiltechnics.net
www.soiltechnics.net

<image001.png>

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soiltechnics
environmental and geotechnical consultants

Initial Conceptual Model

Current site use commercial/industrial
Proposed site use residential

Source	Pathway										Receptor		Risk assessment to CIRIA C552	
	Humans						Vegetation	Water					Consequence of risk occurring via most likely pathway	Risk
	Ingestion of air-borne dusts	Ingestion of soil	Ingestion of vegetables and soil attached to vegetables	Inhalation of air-borne dusts	Inhalation of vapours	Dermal contact with soil and dust	Root uptake, deposition to shoots and foliage contact	Percolation of water through contaminated soils	Near-surface water run-off through contaminated soils	Saturation of contaminated soils by flood waters				
Soils														
Historic land uses, pollution incidents and landfills/restored quarries in local area - Metals, PAHS, TPHs, organic pathogens and bacteria	Likely	Likely	Unlikely	Likely	Likely	Likely	-	-	-	-	Current site users	Adult	Minor	Low
	Likely	Likely	Unlikely	Likely	Likely	Likely	-	-	-	-	Proposed site users	Child	Minor	Low
	Likely	Likely	Unlikely	Likely	Likely	Likely	-	-	-	-	Construction operatives	Adult	Minor	Low
	-	-	-	-	-	-	Likely	-	-	-	Vegetation (current and proposed)	-	Minor	Low
	-	-	-	-	-	-	-	Unlikely	Likely	Unlikely	Water (current and proposed)	-	Minor	Low

Final Conceptual Model

Current site use commercial/industrial
Proposed site use residential

Source	Pathway										Receptor		Risk assessment to CIRIA C552	
	Humans						Vegetation	Water					Consequence of risk occurring via most likely pathway	Risk
	Ingestion of air-borne dusts	Ingestion of soil	Ingestion of vegetables and soil attached to vegetables	Inhalation of air-borne dusts	Inhalation of vapours	Dermal contact with soil and dust	Root uptake, deposition to shoots and foliage contact	Percolation of water through contaminated soils	Near-surface water run-off through contaminated soils	Saturation of contaminated soils by flood waters				
Soils														
Potential for leachable concentrations of copper to exist in Topsoil as identified in Phase 1 and Phase 2 development areas	Likely	Likely	Unlikely	Likely	Likely	Likely	-	-	-	-	Current site users	Adult	Minor	Low
	Likely	Likely	Unlikely	Likely	Likely	Likely	-	-	-	-	Proposed site users	Child	Minor	Low
	Likely	Likely	Unlikely	Likely	Likely	Likely	-	-	-	-	Construction operatives	Adult	Minor	Low
	-	-	-	-	-	-	Likely	-	-	-	Vegetation (current and proposed)	-	Minor	Low
	-	-	-	-	-	-	-	Unlikely	Likely	Unlikely	Water (current and proposed)	-	Minor	Low

Title	Table number
Conceptual Site Model	1

Appendix D
MicroDrainage Simulations

CONTENTS

Network 1 Foul Water Design

Foul Drainage Design

FW Manhole Schedules

Network 2 Foul Water Design

Foul Drainage Design

FW Manhole Schedules

Network 3 Foul Water Design

Foul Drainage Design

FW Manhole Schedules

DRAINAGE LAYOUT

Drainage Network Layout

WARNING TO HOUSE PURCHASERS
Property Misdescriptions Act 1991

Buyers are warned that this is a working drawing and is not intended to be treated as descriptive material describing, in relation to any particular property or development, any of the Specified matters prescribed by any Order made under the above Act. The contents of this drawing may be subject to change at any time and alterations and variations can occur during the progress of the works without revision of the drawing. Consequently the layout, form, content and dimensions of the finished construction may differ materially from those shown. Nor do the contents of this drawing constitute a contract, part of any contract or warranty.

ENGINEERING LAYOUT NOTES

1. All adoptable drainage works have been designed and are to be constructed in accordance with 'Sewers for Adoption, 6th Edition', and United Utilities 'Guidelines for Sewer for adoption 6th Edition'. Where specification conflicts, UU guidelines shall take presidence.

United Utilities Standard details to be used are:

STND/19/001A	Manhole Type 1
STND/19/002A	Manhole Type 2 and Invert Access Detail
STND/19/003A	Shallow Manhole Detail for Small Diameter Pipes (Type 4)
STND/19/004A	Shallow Surface Water Manhole Detail – Restricted Headroom (less than 2.0m) – For Pipe Sizes 450Dia and Above
STND/19/005A	Flow Control Manhole Detail
STND/19/007A	External Backdrop Detail
STND/19/008A	Pipe Bedding Detail
STND/19/010A	Variable Manhole – Guidance Notes
STND/19/011A	Headwall Type 1 and Typical Outlet Grille Detail
STND/19/012A	Typical Outfall Details Type 2 & Type 3

2. All clay pipe work shall be Extra Strength Clayware to BS 295 and BS 65 (SW pipes only).

3. All precast concrete pipework shall be to Class 120 in accordance with BS5911 Part 1, BS EN 1916 and bear the BS kitemark.

4. All adoptable drainage to be bedded in Class S granular surround unless otherwise stated.

5. All Concrete manholes and Soakaways rings, Concrete cover slabs and Con to be manufactured to BS EN 1917 and BS 5911:Part 3.

6. Rising Mains to be Black Polyethylene Pipes complying to BS EN 13244–2. Polyethylene fittings, including fusion joints, and electro–fusion fittings shall comply with BS EN 13244–2.

7. All levels relate to Ordnance Datum. Contractor to ensure that this drawing is read in conjuction with the site specific Topographical Survey provided by Barratt Manchester and the Benchmark information provided.

8. This drawing is to be read in accordance with all other relevant drawings.

9. The contractor shall be responsible for ensuring that any existing invert levels indicated on the drawings are correct before work commences.

10. All proposed connections to the sewer shall be 150Ø unless stated otherwise.

11. All private house drainage shall be 100Ø and all drag–out connections shall be 150Ø at a minimum gradient of 1:80 unless otherwise stated and laid in accordance with Part H of the the Building Regulations.

12. Runoff from private surfaces shall not discharge across the highway. Gullies or channels shall be provided as appropriate to prevent this.

13. Pram crossings shall be provided at the inner tangent points of all junctions.

14. Pipes shall be protected from concentrated loading by construction traffic during the construction period when insufficient cover to the pipe may make them vulnerable to damage.

15. Insitu CBR tests of the road formation level are to be carried out to determine the depth of pavement construction required. This is to be approved by the adopting authority prior to construction of the road pavements.

16. Groundworker to ensure that plot drainage be within the curtilage of the plot they serve where possible and inspection covers kept within hardstandings where possible.

17. Contractor to provide United Utilities with sufficient notice prior to commencement of Sewer works on their Inspections telephone number. Tel 0845 602 0406.

18. Contractor to obtain all necessary Highway opening notices from the relevant Local Authority, obtain approval to work on United Utilities Sewerage System, obtain approval to method statement from the Environment Agency for any works affecting a watercourse.

ENGINEERING KEY

S1	Adoptable S.W. Sewer & Manhole
F1	Adoptable F.W. Sewer & Manhole
	Silt Trap Manhole at Overflow Basins
S1	Adoptable S.W. Sewer Headwall
(10.25)	S. Water Drag–Out and Invert
10.25	Foul Drag–Out and Invert
	Adoptable Road Gully
	Street Name Plate

FLOW CONTROL DETAILS

MH Ref.	Specification
S110	ACO Orifice Plate to be Supplied by ACO Technologies. Tel 01462 816666. Ref: SL20190923 1No. 247mm Q-Plate-RW
S324	Crown Flow Control Device to be Supplied by Crown Water Systems. Tel 01344 886 996. Ref: 4280619 1No. 230mm QR5 Type Vortex Flow Control Unit. Head=3.20m, Flow=42.4 l/s.
S414	Crown Flow Control Device to be Supplied by Crown Water Systems. Tel 01344 886 996. Ref: 4280619 1No. 192mm QR5 Type Vortex Flow Control Unit. Head=2.6m, Flow=26.6 l/s.

REV	DESCRIPTION	DATE	DRAWN
R	Plots 52–53 handed; Plots 118–156 revised; Plots 194–198 added	27.09.21	CD
Q	Revised to Planning Layout Rev 10	07.06.21	CD
P	S107–S109A revised; F102–F105 revised	26.10.20	CD
N	Housetypes, FFLs, and plot drainage revised to suit Planning Layout Rev 09, and new external levels (Sept 2020)	25.09.20	CD
M	SW downpipes revised to suit deep gutters	01.09.20	CD
L	Road 10 chainage revised to suit longsection; Road 10 raised table split into two, gullies and cover levels revised to suit; Street lighting revised	24.06.20	CD
K	S109–S110, F104–F105 revised, S109A & F104A added; S415 split into 2 headwalls. S508 added	27.02.20	CD
J	S501–S502 revised; Cover levels revised within raised tables; Tactiles revised	09.12.19	CD
H	Site lifted to reduce soil leaving site. FFLs and cover levels revised	01.11.19	CD
G	Easement from S201–S49 & F321–F23 added; Flow control units updated to Crown spec. & S110 revised to orifice plate; Pond water levels revised to suit new calcs; Existing sewer in Road 19 revised; S109 & F104 revised	06.09.19	CD
F	Street lighting and plot drainage added	25.06.19	CD
E	Gradients of SW network 2 revised; S403, S406 & F304 removed	17.04.19	CD
D	Updated to planning layout revision 5	04.03.19	CD
C	Full drainage and level designs revised	11.02.19	CD
B	–	–	–
A	Revised from Proposed FFL dwg to Engineering Layout		

BARRATT
HOMES

MANCHESTER

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(A division of BDW Trading Ltd)
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Tel: 0161 872 0161
Fax: 0161 855 2828

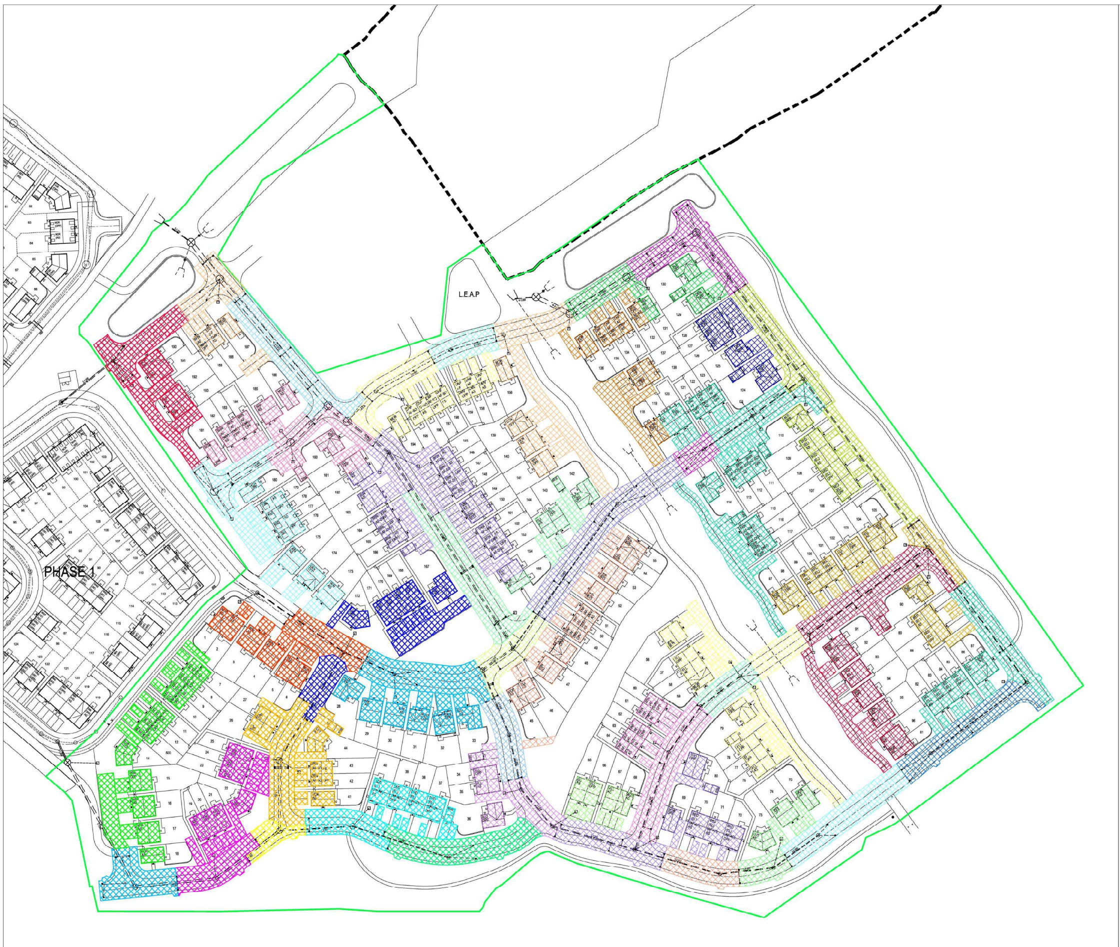
Job
Chipping Lane
Longridge
Phases 2 & 3

Title
Engineering Layout

Design By	Date	Drawing Number	Rev
FB	15.10.18	459/ED/102	R
C.A.D By FB	Scale @ A0 1:500		

DRAINAGE LAYOUT

SW Impermeable Areas Layout



Impermeable Areas	Impermeable Areas + 10% Urban Creep to Domestic Property
1-1.000 = 0.033 Ha of Highway 0.045 Ha of Domestic Property	1-1.000 = 0.033 Ha of Highway 0.050 Ha of Domestic Property
1-1.001 = 0.022 Ha of Highway 0.059 Ha of Domestic Property	1-1.001 = 0.022 Ha of Highway 0.065 Ha of Domestic Property
1-1.002 = 0.045 Ha of Highway 0.048 Ha of Domestic Property	1-1.002 = 0.045 Ha of Highway 0.053 Ha of Domestic Property
1-1.003 = 0.016 Ha of Highway 0 Ha of Domestic Property	1-1.003 = 0.016 Ha of Highway 0 Ha of Domestic Property
1-1.004 = 0.030 Ha of Highway 0.057 Ha of Domestic Property	1-1.004 = 0.030 Ha of Highway 0.063 Ha of Domestic Property
1-1.005 = 0.036 Ha of Highway 0 Ha of Domestic Property	1-1.005 = 0.036 Ha of Highway 0 Ha of Domestic Property
1-1.006 = 0 Ha of Highway 0.098 Ha of Domestic Property	1-1.006 = 0 Ha of Highway 0.108 Ha of Domestic Property
1-2.000 = 0.050 Ha of Highway 0.054 Ha of Domestic Property	1-2.000 = 0.050 Ha of Highway 0.059 Ha of Domestic Property
1-3.000 = 0.056 Ha of Highway 0 Ha of Domestic Property	1-3.000 = 0.056 Ha of Highway 0 Ha of Domestic Property
1-3.001 = 0.030 Ha of Highway 0.036 Ha of Domestic Property	1-3.001 = 0.030 Ha of Highway 0.040 Ha of Domestic Property
2-1.000 = 0.035 Ha of Highway 0.047 Ha of Domestic Property	2-1.000 = 0.035 Ha of Highway 0.052 Ha of Domestic Property
3-1.000 = 0.021 Ha of Highway 0.099 Ha of Domestic Property	3-1.000 = 0.021 Ha of Highway 0.108 Ha of Domestic Property
3-1.001 = 0.023 Ha of Highway 0 Ha of Domestic Property	3-1.001 = 0.023 Ha of Highway 0 Ha of Domestic Property
3-1.002 = 0.053 Ha of Highway 0.026 Ha of Domestic Property	3-1.002 = 0.053 Ha of Highway 0.029 Ha of Domestic Property
3-1.003 = 0.038 Ha of Highway 0.042 Ha of Domestic Property	3-1.003 = 0.038 Ha of Highway 0.046 Ha of Domestic Property
3-1.004 = 0 Ha of Highway 0.028 Ha of Domestic Property	3-1.004 = 0 Ha of Highway 0.031 Ha of Domestic Property
3-1.005 = 0.025 Ha of Highway 0.027 Ha of Domestic Property	3-1.005 = 0.025 Ha of Highway 0.030 Ha of Domestic Property
3-1.006 = 0.030 Ha of Highway 0 Ha of Domestic Property	3-1.006 = 0.030 Ha of Highway 0 Ha of Domestic Property
3-1.007 = 0.032 Ha of Highway 0 Ha of Domestic Property	3-1.007 = 0.032 Ha of Highway 0 Ha of Domestic Property
3-1.008 = 0 Ha of Highway 0.081 Ha of Domestic Property	3-1.008 = 0 Ha of Highway 0.089 Ha of Domestic Property
3-1.009 = 0.066 Ha of Highway 0.037 Ha of Domestic Property	3-1.009 = 0.066 Ha of Highway 0.041 Ha of Domestic Property
3-1.010 = 0.031 Ha of Highway 0.108 Ha of Domestic Property	3-1.010 = 0.031 Ha of Highway 0.119 Ha of Domestic Property
3-1.011 = 0 Ha	3-1.011 = 0 Ha
3-1.012 = 0.058 Ha of Highway 0 Ha of Domestic Property	3-1.012 = 0.058 Ha of Highway 0 Ha of Domestic Property
3-1.013 = 0.029 Ha of Highway 0.023 Ha of Domestic Property	3-1.013 = 0.029 Ha of Highway 0.025 Ha of Domestic Property
3-1.014 = 0 Ha	3-1.014 = 0 Ha
3-2.000 = 0.052 Ha of Highway 0 Ha of Domestic Property	3-2.000 = 0.052 Ha of Highway 0 Ha of Domestic Property
3-2.001 = 0.018 Ha of Highway 0.026 Ha of Domestic Property	3-2.001 = 0.018 Ha of Highway 0.029 Ha of Domestic Property
3-2.002 = 0.028 Ha of Highway 0 Ha of Domestic Property	3-2.002 = 0.028 Ha of Highway 0 Ha of Domestic Property
3-3.000 = 0.081 Ha of Highway 0 Ha of Domestic Property	3-3.000 = 0.081 Ha of Highway 0 Ha of Domestic Property
3-4.000 = 0.027 Ha of Highway 0.061 Ha of Domestic Property	3-4.000 = 0.027 Ha of Highway 0.067 Ha of Domestic Property
3-4.001 = 0.024 Ha of Highway 0 Ha of Domestic Property	3-4.001 = 0.024 Ha of Highway 0 Ha of Domestic Property
3-4.002 = 0.017 Ha of Highway 0.046 Ha of Domestic Property	3-4.002 = 0.017 Ha of Highway 0.050 Ha of Domestic Property
3-5.000 = 0.035 Ha of Highway 0.077 Ha of Domestic Property	3-5.000 = 0.035 Ha of Highway 0.085 Ha of Domestic Property
3-5.001 = 0.031 Ha of Highway 0.059 Ha of Domestic Property	3-5.001 = 0.031 Ha of Highway 0.065 Ha of Domestic Property
4-1.000 = 0.052 Ha of Highway 0 Ha of Domestic Property	4-1.000 = 0.052 Ha of Highway 0 Ha of Domestic Property
4-1.001 = 0.042 Ha of Highway 0.035 Ha of Domestic Property	4-1.001 = 0.042 Ha of Highway 0.039 Ha of Domestic Property
4-1.002 = 0.017 Ha of Highway 0.077 Ha of Domestic Property	4-1.002 = 0.017 Ha of Highway 0.085 Ha of Domestic Property
4-1.003 = 0.043 Ha of Highway 0.061 Ha of Domestic Property	4-1.003 = 0.043 Ha of Highway 0.067 Ha of Domestic Property
4-1.004 = 0 Ha of Highway 0.042 Ha of Domestic Property	4-1.004 = 0 Ha of Highway 0.046 Ha of Domestic Property
4-1.005 = 0.054 Ha of Highway 0 Ha of Domestic Property	4-1.005 = 0.054 Ha of Highway 0 Ha of Domestic Property
4-1.006 = 0.023 Ha of Highway 0.028 Ha of Domestic Property	4-1.006 = 0.023 Ha of Highway 0.031 Ha of Domestic Property
4-1.007 = 0 Ha of Highway 0.070 Ha of Domestic Property	4-1.007 = 0 Ha of Highway 0.077 Ha of Domestic Property
4-1.008 = 0 Ha	4-1.008 = 0 Ha
4-2.000 = 0.061 Ha of Highway 0.083 Ha of Domestic Property	4-2.000 = 0.061 Ha of Highway 0.091 Ha of Domestic Property
4-3.000 = 0.015 Ha of Highway 0 Ha of Domestic Property	4-3.000 = 0.015 Ha of Highway 0 Ha of Domestic Property
4-3.001 = 0.040 Ha of Highway 0.113 Ha of Domestic Property	4-3.001 = 0.040 Ha of Highway 0.124 Ha of Domestic Property

WARNING TO HOUSE PURCHASERS
Property Misdescriptions Act 1991

Buyers are warned that this is a working drawing and is not intended to be treated as descriptive material describing, in relation to any particular property or development, any of the specified matters prescribed by any Order made under the above Act. The contents of this drawing may be subject to change at any time and alterations and variations can occur during the progress of the works without revision of the drawing. Consequently the layout, form, content and dimensions of the finished construction may differ materially from those shown. Nor do the contents of this drawing constitute a contract, part of any contract or warranty.

REV	DESCRIPTION	DATE	DRAWN
B	Plots 118-136 revised; Plots 194-198 added	27.09.21	CD
A	Plots 42-43 drives revised; Road 10 raised table revised, gullies moved to suit	24.06.20	CD

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Job			
Chipping Lane Longridge Phases 2 & 3			
Title: Surface Water Drainage Areas			
Design By: CD	Date: April 2019	Drawing Number: 459/ED/103	Rev: B
C.A.D. By: CD	Scale @ A0: 1:500		

Storm Water Network 1

STORM SEWER DESIGN

Network Design Details (1 in 2 yr) & Online Controls

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Network 1

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	18.800	Add Flow / Climate Change (%)	0
Ratio R	0.281	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Surface Network 1

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
1.000	39.386	0.394	100.0	0.083	5.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	20.526	1.069	19.2	0.109	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	47.242	0.304	155.4	0.087	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.002	26.364	0.195	135.2	0.098	0.00	0.0	0.600	o	750	Pipe/Conduit	
3.000	37.767	1.511	25.0	0.056	5.00	0.0	0.600	o	225	Pipe/Conduit	
3.001	27.458	1.016	27.0	0.070	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	29.942	0.222	134.9	0.016	0.00	0.0	0.600	o	750	Pipe/Conduit	
1.004	33.120	0.224	147.9	0.093	0.00	0.0	0.600	o	750	Pipe/Conduit	
1.005	22.342	0.056	399.0	0.036	0.00	0.0	0.600	o	750	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)
1.000	50.00	5.50	108.550	0.083	0.0	0.0	0.0	1.31	52.0	11.2
2.000	50.00	5.11	110.650	0.109	0.0	0.0	0.0	3.00	119.3	14.8
1.001	50.00	6.13	108.081	0.279	0.0	0.0	0.0	1.26	89.0	37.8
1.002	50.00	6.31	107.327	0.377	0.0	0.0	0.0	2.41	1062.6	51.1
3.000	50.00	5.24	111.159	0.056	0.0	0.0	0.0	2.63	104.5	7.6
3.001	50.00	5.42	109.648	0.126	0.0	0.0	0.0	2.53	100.5	17.1
1.003	49.62	6.52	107.132	0.519	0.0	0.0	0.0	2.41	1063.9	69.7
1.004	48.87	6.76	106.910	0.612	0.0	0.0	0.0	2.30	1015.8	81.0
1.005	48.08	7.02	106.686	0.648	0.0	0.0	0.0	1.39	616.2	84.4

Network Design Table for Surface Network 1

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
1.006	30.374	0.335	90.7	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
1.007	8.610	0.035	246.0	0.108	0.00	0.0	0.600	o	450	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)
1.006	47.59	7.20	106.630	0.648	0.0	0.0	0.0	2.94	1298.8	84.4
1.007	47.27	7.31	106.295	0.756	0.0	0.0	0.0	1.29	205.4	96.8

Online Controls for Surface Network 1

Orifice Manhole: S110, DS/PN: 1.007, Volume (m^3): 21.1

Diameter (m) 0.247 Discharge Coefficient 0.600 Invert Level (m) 106.295

STORM SEWER DESIGN

SW Manhole Schedules

Manhole Schedules for Surface Network 1

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S101	110.167	1.617	Open Manhole	1350	1.000	108.550	225				
S102	112.318	1.668	Open Manhole	1500	2.000	110.650	225				
S103	111.709	3.628	Open Manhole	2100	1.001	108.081	300	1.000	108.156	225	
								2.000	109.581	225	1425
S104	110.918	3.591	Open Manhole	2400	1.002	107.327	750	1.001	107.777	300	
S105	112.727	1.568	Open Manhole	1500	3.000	111.159	225				
S106	111.782	2.134	Open Manhole	1350	3.001	109.648	225	3.000	109.648	225	
S107	111.491	4.359	Open Manhole	2400	1.003	107.132	750	1.002	107.132	750	
								3.001	108.632	225	975
S108	111.004	4.094	Open Manhole	2400	1.004	106.910	750	1.003	106.910	750	
S109	110.583	3.897	Open Manhole	2400	1.005	106.686	750	1.004	106.686	750	
S109A	110.009	3.379	Open Manhole	1800	1.006	106.630	750	1.005	106.630	750	
S110	108.200	1.905	Open Manhole	2400	1.007	106.295	450	1.006	106.295	750	
S27	107.938	1.678	Open Manhole	1500		OUTFALL		1.007	106.260	450	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S101	360330.611	437925.095	360330.611	437925.095	Required	
S102	360381.960	437894.730	360381.960	437894.730	Required	
S103	360363.102	437902.834	360363.102	437902.834	Required	
S104	360338.786	437862.331	360338.786	437862.331	Required	
S105	360402.238	437825.920	360402.238	437825.920	Required	
S106	360366.337	437837.645	360366.337	437837.645	Required	
S107	360338.930	437835.967	360338.930	437835.967	Required	

Manhole Schedules for Surface Network 1

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S108	360314.995	437817.979	360314.995	437817.979	Required	
S109	360282.033	437814.747	360282.033	437814.747	Required	
S109A	360276.512	437836.396	360276.512	437836.396	Required	
S110	360259.497	437861.557	360259.497	437861.557	Required	
S27	360255.818	437869.342			No Entry	

STORM SEWER DESIGN

Rainfall Simulation

1:30 year event

Simulation Criteria for Surface Network 1

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	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 Storage Structures	0
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.800	Storm Duration (mins)	30
Ratio R	0.281		

Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

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

Synthetic Rainfall Details

Rainfall Model FSR   Ratio R 0.281
Region England and Wales   Cv (Summer) 0.750
M5-60 (mm) 18.800   Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0   DVD Status ON
Analysis Timestep Fine   Inertia Status ON
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360
Return Period(s) (years) 30
Climate Change (%) 0

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	S101	15 Winter	30	+0%					108.660
2.000	S102	15 Winter	30	+0%					110.732
1.001	S103	15 Winter	30	+0%					108.315
1.002	S104	15 Winter	30	+0%					107.524
3.000	S105	15 Winter	30	+0%					111.219
3.001	S106	15 Winter	30	+0%					109.747
1.003	S107	30 Winter	30	+0%					107.440
1.004	S108	30 Winter	30	+0%					107.408
1.005	S109	30 Winter	30	+0%					107.351
1.006	S109A	30 Winter	30	+0%					107.299
1.007	S110	30 Winter	30	+0%	30/15 Summer				107.193

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S101	-0.115	0.000	0.47			23.1	OK	
2.000	S102	-0.143	0.000	0.29			30.9	OK	
1.001	S103	-0.066	0.000	0.95			79.7	OK	
1.002	S104	-0.553	0.000	0.15			105.9	OK	
3.000	S105	-0.165	0.000	0.16			15.9	OK	

Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
3.001	S106	-0.126	0.000	0.40			37.0	OK	
1.003	S107	-0.442	0.000	0.16			119.6	OK	
1.004	S108	-0.252	0.000	0.17			125.1	OK	
1.005	S109	-0.085	0.000	0.22			99.6	OK	
1.006	S109A	-0.081	0.000	0.09			81.2	OK	
1.007	S110	0.448	0.000	0.67			92.1	SURCHARGED	

STORM SEWER DESIGN

Rainfall Simulation

1:30 year event with Surcharged Outfall

Surcharged Outfall Details for Surface Network 1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	S27	107.938	106.260	106.260	1500	0

Datum (m) 106.723 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1	1.000	42	1.000	83	1.000	124	1.000	165	1.000	206	1.000
2	1.000	43	1.000	84	1.000	125	1.000	166	1.000	207	1.000
3	1.000	44	1.000	85	1.000	126	1.000	167	1.000	208	1.000
4	1.000	45	1.000	86	1.000	127	1.000	168	1.000	209	1.000
5	1.000	46	1.000	87	1.000	128	1.000	169	1.000	210	1.000
6	1.000	47	1.000	88	1.000	129	1.000	170	1.000	211	1.000
7	1.000	48	1.000	89	1.000	130	1.000	171	1.000	212	1.000
8	1.000	49	1.000	90	1.000	131	1.000	172	1.000	213	1.000
9	1.000	50	1.000	91	1.000	132	1.000	173	1.000	214	1.000
10	1.000	51	1.000	92	1.000	133	1.000	174	1.000	215	1.000
11	1.000	52	1.000	93	1.000	134	1.000	175	1.000	216	1.000
12	1.000	53	1.000	94	1.000	135	1.000	176	1.000	217	1.000
13	1.000	54	1.000	95	1.000	136	1.000	177	1.000	218	1.000
14	1.000	55	1.000	96	1.000	137	1.000	178	1.000	219	1.000
15	1.000	56	1.000	97	1.000	138	1.000	179	1.000	220	1.000
16	1.000	57	1.000	98	1.000	139	1.000	180	1.000	221	1.000
17	1.000	58	1.000	99	1.000	140	1.000	181	1.000	222	1.000
18	1.000	59	1.000	100	1.000	141	1.000	182	1.000	223	1.000
19	1.000	60	1.000	101	1.000	142	1.000	183	1.000	224	1.000
20	1.000	61	1.000	102	1.000	143	1.000	184	1.000	225	1.000
21	1.000	62	1.000	103	1.000	144	1.000	185	1.000	226	1.000
22	1.000	63	1.000	104	1.000	145	1.000	186	1.000	227	1.000
23	1.000	64	1.000	105	1.000	146	1.000	187	1.000	228	1.000
24	1.000	65	1.000	106	1.000	147	1.000	188	1.000	229	1.000
25	1.000	66	1.000	107	1.000	148	1.000	189	1.000	230	1.000
26	1.000	67	1.000	108	1.000	149	1.000	190	1.000	231	1.000
27	1.000	68	1.000	109	1.000	150	1.000	191	1.000	232	1.000
28	1.000	69	1.000	110	1.000	151	1.000	192	1.000	233	1.000
29	1.000	70	1.000	111	1.000	152	1.000	193	1.000	234	1.000
30	1.000	71	1.000	112	1.000	153	1.000	194	1.000	235	1.000
31	1.000	72	1.000	113	1.000	154	1.000	195	1.000	236	1.000
32	1.000	73	1.000	114	1.000	155	1.000	196	1.000	237	1.000
33	1.000	74	1.000	115	1.000	156	1.000	197	1.000	238	1.000
34	1.000	75	1.000	116	1.000	157	1.000	198	1.000	239	1.000
35	1.000	76	1.000	117	1.000	158	1.000	199	1.000	240	1.000
36	1.000	77	1.000	118	1.000	159	1.000	200	1.000	241	1.000
37	1.000	78	1.000	119	1.000	160	1.000	201	1.000	242	1.000
38	1.000	79	1.000	120	1.000	161	1.000	202	1.000	243	1.000
39	1.000	80	1.000	121	1.000	162	1.000	203	1.000	244	1.000
40	1.000	81	1.000	122	1.000	163	1.000	204	1.000	245	1.000
41	1.000	82	1.000	123	1.000	164	1.000	205	1.000	246	1.000

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
247	1.000	266	1.000	285	1.000	304	1.000	323	1.000	342	1.000
248	1.000	267	1.000	286	1.000	305	1.000	324	1.000	343	1.000
249	1.000	268	1.000	287	1.000	306	1.000	325	1.000	344	1.000
250	1.000	269	1.000	288	1.000	307	1.000	326	1.000	345	1.000
251	1.000	270	1.000	289	1.000	308	1.000	327	1.000	346	1.000
252	1.000	271	1.000	290	1.000	309	1.000	328	1.000	347	1.000
253	1.000	272	1.000	291	1.000	310	1.000	329	1.000	348	1.000
254	1.000	273	1.000	292	1.000	311	1.000	330	1.000	349	1.000
255	1.000	274	1.000	293	1.000	312	1.000	331	1.000	350	1.000
256	1.000	275	1.000	294	1.000	313	1.000	332	1.000	351	1.000
257	1.000	276	1.000	295	1.000	314	1.000	333	1.000	352	1.000
258	1.000	277	1.000	296	1.000	315	1.000	334	1.000	353	1.000
259	1.000	278	1.000	297	1.000	316	1.000	335	1.000	354	1.000
260	1.000	279	1.000	298	1.000	317	1.000	336	1.000	355	1.000
261	1.000	280	1.000	299	1.000	318	1.000	337	1.000	356	1.000
262	1.000	281	1.000	300	1.000	319	1.000	338	1.000	357	1.000
263	1.000	282	1.000	301	1.000	320	1.000	339	1.000	358	1.000
264	1.000	283	1.000	302	1.000	321	1.000	340	1.000	359	1.000
265	1.000	284	1.000	303	1.000	322	1.000	341	1.000	360	1.000

Simulation Criteria for Surface Network 1

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	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 Storage Structures	0
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.800	Storm Duration (mins)	30
Ratio R	0.281		

Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.281
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.800	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	ON
Analysis Timestep	Fine	Inertia Status	ON
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	30
Climate Change (%)	0

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	S101	15 Winter	30	+0%					108.660
2.000	S102	15 Winter	30	+0%					110.732
1.001	S103	60 Winter	30	+0%	30/60 Summer				108.501
1.002	S104	60 Winter	30	+0%	30/30 Summer				108.440
3.000	S105	15 Winter	30	+0%					111.219
3.001	S106	15 Winter	30	+0%					109.747
1.003	S107	60 Winter	30	+0%	30/15 Winter				108.436
1.004	S108	60 Winter	30	+0%	30/15 Summer				108.410
1.005	S109	60 Winter	30	+0%	30/15 Summer				108.303
1.006	S109A	60 Winter	30	+0%	30/15 Summer				108.295
1.007	S110	60 Winter	30	+0%	30/15 Summer				108.100

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S101	-0.115	0.000	0.47			23.1	OK	
2.000	S102	-0.143	0.000	0.29			30.9	OK	
1.001	S103	0.120	0.000	0.54			45.5	SURCHARGED	

Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.002	S104	0.363	0.000	0.07			47.4	SURCHARGED	
3.000	S105	-0.165	0.000	0.16			15.9	OK	
3.001	S106	-0.126	0.000	0.40			37.0	OK	
1.003	S107	0.554	0.000	0.08			56.5	SURCHARGED	
1.004	S108	0.750	0.000	0.09			65.1	SURCHARGED	
1.005	S109	0.867	0.000	0.15			66.5	SURCHARGED	
1.006	S109A	0.915	0.000	0.07			66.1	SURCHARGED	
1.007	S110	1.355	0.000	0.57			77.7	FLOOD RISK	

STORM SEWER DESIGN

Rainfall Simulation

1:100 year event +30% Climate Change

Simulation Criteria for Surface Network 1

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	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 Storage Structures	0
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
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