



Technical Note – LLFA Comments

Land West of Marlborough Road, Royal Wootton Bassett

Written on behalf of Miller Homes South West



Flood Risk



Transportation



Engineering

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1 EXECUTIVE SUMMARY

Residential and Commercial Engineering Ltd were requested to carry out a Technical Note, by Miller Homes South West, to address comments made by Wiltshire Council, acting as Lead Local Flood Authority [LLFA] in relation to a Reserved Matters planning application for the site Marlborough Road Royal, Wootton Bassett.

2 TECHNICAL NOTE

2.1 WILTSHIRE COUNCIL [LLFA] – RM COMMENTS

Subsequent to the submission of the Reserved Matters application Wiltshire Council, acting as LLFA, has provided comments as part of their consultation response to the application. These comments can be found in **Appendix A**.

The comments outline six areas of objection which need to be addressed in order for the LLFA to support the Reserved Matters application. These are listed below: -

- Hydraulic calculations including modelling outputs for 1 in 1, 30 and 100 plus climate change events, demonstrating a 30% reduction in GFR rates.
- Interception Storage
- Exceedance flow path drawing.
- Design of proposed culverts.
- Water quality treatment.
- Maintenance proposals

The details of each comment can be found in **Appendix A**.

2.2 HYDRAULIC CALCULATIONS

As outlined in the FRA, approved as part of the outline planning approval, it was stated that surface water drainage system will convey flows to two attenuation basins on site. The surface water flows generated within the development up to and including a 1%AEP45CC will be stored on-site and discharged at a greenfield QBAR rate of 8.2l/s. This rate was established based on an impermeable area of 1.64Ha. A 30% reduction in greenfield run rate is required by the LLFA for the proposed development. This equate to a proposed maximum discharge rate of 5.7l/s which the development is controlled to, for all storm events upto the 1 in 100 + 45% event.

Hydraulic calculations using FEH-22 data for the 1 in 1, 30 and 100 + 45% events are contained in **Appendix C** together with a copy of the Drainage Strategy Plan in **Appendix B**. These calculations demonstrate that the attenuation basins and associated cellular storage (Network 2 only) restrict the surface water flows to the required maximum discharge rates. The calculations also allow for a surcharged outfall within the design.

2.3 INTERCEPTION STORAGE

Due to the impermeable nature of the existing subsoils, infiltration is not permissible on this development. Therefore the wet areas in the ponds cater for the first 5mm of rainfall for the initial surface water rainfall event, these have been calculated with the impermeable area for each network. As follows:

$$\text{Network 1} = 5314\text{m}^2 \times 0.005\text{m} = 26.6\text{m}^3$$

$$\text{Network 2} = 9632\text{m}^2 \times 0.005\text{m} = 48.1\text{m}^3$$

Additionally and in line with SUDs guidance the detention ponds and permeable paving surface area provide more than half the total impermeable area for the development, this together with the swales will give adequate interception storage.

$$\text{Total impermeable area} = 14946\text{m}^2$$

$$\text{Total permeable paving area} = 4782\text{m}^2$$

$$\text{Total pond surface area} = 2681\text{m}^2$$

$$\text{Total pond + permeable paving} = 7463\text{m}^2$$

2.4 SURFACE WATER EXCEEDANCE

The Surface Water Exceedance Plan, provided in Appendix D, demonstrates that the proposed drainage system has been designed to prevent flooding during all rainfall events up to and including the 1 in 100 year event, with a 45% allowance for climate change. In the unlikely event that this design capacity is exceeded, the plan illustrates the overland exceedance flow routes.

Exceedance flows will be contained within the proposed highway corridor, where surface water will be temporarily stored within the road alignment before being conveyed via overland flow paths towards the existing watercourses, directing flows away from residential properties. The proposed external level strategy has been developed to ensure that finished ground levels and highway gradients route exceedance flows away from buildings, thereby minimising flood risk to adjacent properties and providing appropriate mitigation against extreme rainfall events.

2.5 PROPOSED CULVERTED WATERCOURSE

The current layout proposals mean that a culvert crossing under the proposed access road is the only available scenario. MEC who were the consultants responsible for the original design for the site, highlight that the culvert is required as part of the proposals.

Survey work is currently being carried out to gather more information for the sizing of the proposed culvert. The proposed culvert will be hydraulically sized to provide a cross-sectional area equivalent to that of the existing watercourse, ensuring that existing flow conveyance is maintained without increasing upstream flood risk or creating a hydraulic restriction..

2.6 WATER QUALITY

1. As consideration of any type of SuDS within a development, one of the main functions is to ensure that water quality is maintained. Any SuDS feature incorporated into a design will need to sufficient mitigation as to offset any increase in potential pollutants hazard as a result of the development.
2. A detailed water quality assessment, in accordance with the principles set out in C753 The SuDS Manual, will inform the SuDS principles to be utilised during the detailed drainage design which forms part of the reserved matters application.
3. Based on the current layout and the SuDS features proposed A Simple Index approach to assess whether the proposed SuDS features provide the necessary mitigation for the potential hazard levels generated from this type of site.
4. Table 4.3 from C753 The SuDS Manual classifies the land use of the site in terms of Pollution Hazard Level as 'very low' for residential roofs and 'low' for external paved areas. This hazard level requires that the Simple Index approach is followed to formulate the appropriate drainage solution for the site, as indicated in Table 26.2 below:

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways ¹	High	0.8 ²	0.8 ²	0.9 ²

The pollution hazard indices relevant to the site are therefore **0.2, 0.2 & 0.05** for roof areas and **0.5, 0.4 & 0.4** for external paved areas. This gives a combined indices of **0.7, 0.6 & 0.45** for pollution hazards.

- It is therefore necessary to select SuDS which provide a mitigation index at least equal to those indicated above. Typical mitigation indices are provided in Table 26.3 of C753 (The SuDS Manual)

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

Type of SuDS component	Mitigation indices ¹		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4 ²	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond ⁴	0.7 ³	0.7	0.5
Wetland	0.8 ³	0.8	0.8
Proprietary treatment systems ^{5,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

- The use of permeable paving, filter drains and ponds will provide a three-stage treatment train to all areas of the site. This will provide adequate mitigation as follows:
- Total SuDS mitigation Index = mitigation index₁ + 0.5 x (mitigation index₂)

For roads and parking areas: mitigation index =	Paving [1.0]	0.7	0.6	0.7
	+			
	Filter drain [0.5]	0.5	0.6	0.6
	Basin [0.5]	0.5	0.5	0.6
	=	1.2	1.15	1.3
Pollution combined index =		0.70	0.60	0.45

8. The combined mitigation indices exceed the potential hazard indices and therefore will provide a satisfactory solution to pollution control.
9. As the combined mitigation indices for the paving, filter drains & basins [**1.2, 1.15 & 1.3**] exceed the combined potential hazard indices referred to in 11.2.5 above [**0.7, 0.6 & 0.45**] the use of permeable paving, filter drains & basins will provide sufficient treatment to offset the potential hazards, therefore water quality is maintained.
10. In addition to the above trapped gullies will also be used for all access roads, drives and parking areas which will remove sediments and debris, prior to it entering the surface water drainage system.

During construction there is an increased risk of pollution, particularly in the form of silt and sediment. Temporary pre-treatment to remove silt, and other pollutants, may be required in accordance with current guidance and good practice.

2.7 MAINTENANCE REGIME

1. The future management of any SuDS feature needs to be considered, as to whether they will be adopted by the Water Authority (STW), the Local Authority or maintained privately by a suitably employed management company. Based on the current design, it is proposed that most of the elements will be offered initially to Wessex Water. If adoption by WW is not possible, it is proposed that a private management company would maintain those elements that they do not. Adequate access for maintenance will be provided according to the requirements of the future maintainer, currently via the proposed estate roads and a grassed verge around the pond area.
2. The engineering design will be submitted to and approved by WC land drainage team (as Lead Local Flood Authority), to ensure the proposals are in accordance with this, and the previously approved Flood Risk Assessment, via the reserved matters planning application.

3. It is proposed that any maintenance is in accordance with the standards detailed within CIRIA C753 'The SuDS Manual'. For ponds and detention basins the operational and maintenance requirements are summarised in Tables 2.6.1, 2.6.2 & 2.6.3 (see below): -

Table 2.7.1 Operation and Maintenance requirements for Ponds

Maintenance Schedule	Required Action	Typical frequency
Regular Maintenance	Remove Litter and debris	Monthly (or as required)
	Cut grass – public areas	Monthly (during growing season)
	Cut the meadow grass	Half-yearly (Spring, [before nesting season], and Autumn)
	Inspect marginal and bankside vegetation and remove nuisance plants (for first 3 years)	Monthly (at start, then as required)
	Inspect inlets, outlets, banksides, structures, pipework etc. for evidence of blockage and/or physical damage	Monthly
	Inspect water body for signs of poor water quality	Monthly (May to October)
	Inspect silt accumulation rates in any forebay and in main body of pond and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal options	Half yearly
	Check any mechanical devices, e.g. penstocks	Half yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1m above pond base; include max 25% of pond surface)	Annually
	Remove 25% of bank vegetation from water's edge to minimum of 1.0m above water level	Annually
	Tidy all dead growth (scrub clearance) before start of growing season (NOTE: Tree maintenance is usually part of overall landscape management contract).	Annually
	Remove sediment from any forebay	Every 1 to 5 years, or as required
	Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays	Every 5 years, or as required
Occasional maintenance	Remove sediment from the main body of big ponds when water volume is reduced by 20%	With effective pre-treatment (via trapped gullies) this will only be required rarely, e.g. every 25 years
Remedial Actions	Repair erosion or other damage	As required
	Replant, where necessary	As required
	Aerate pond when signs of eutrophication are detected	As required
	Realign rip-rap or repair other damage	As required
	Repair/rehabilitate inlet, outlets and overflows	As required

Table 2.7.2 Operation and Maintenance requirements for Permeable Paving

Maintenance Schedule	Required Action	Typical frequency
Regular Maintenance	Brushing and vacuuming [standard cosmetic sweep over whole surface]	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto previous surface from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional Maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has raised to within 50mm of level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required [if infiltration performance is reduced due to significant clogging]
Monitoring	Initial Inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48hr after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Table 2.7.3 Operation and Maintenance requirements for Filter Drains

Maintenance Schedule	Required Action	Typical frequency
Regular Maintenance	Remove Litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly (or as required)
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six monthly
	Remove sediment from pre-treatment devices	Half yearly (or as required)
Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods [e.g. NJUG 2007 & BS 3998:2010]	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly, or as required
	Clear perforated pipework of blockages	As required

3 CONCLUSIONS

This technical note shows that the comments raised by the LLFA have been addressed as far as possible whilst we await the additional information required on the culverted watercourse details.

Based on this information there are no significant risks due to flooding to either existing or proposed properties and that there will be no increase in flood risk due to the construction of the proposed development and there should be no reason to refuse the planning application on the grounds of flood risk.

END OF REPORT

APPENDIX A – LLFA comments dated 1.7.26

To:	Audrey Lo	From:	Drainage Team
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Planning App Ref:	PL/2026/02895
Service Ref:	Drainage
Date:	01/07/2026

PROPOSAL

Application for the approval of reserved matters relating to appearance, landscaping, scale and layout for a development of 95 dwellings, along with associated car parking, open space, landscaping, drainage and other infrastructure on the land west of Marlborough Road, Royal Wootton Bassett.

SITE LOCATION

Land West of Marlborough Road, Royal Wootton Bassett

SUMMARY OF THE CONSULTEE POSITION

Object	
Holding Objection: Further information required	X
Support	
No comment	
No objection	
No objection subject to conditions	
Consultation not required	

APPLICATION DOCUMENTS REVIEWED

- Application Form
- Site Location Plan
- Drainage Strategy Plan

ASSESSMENT OF THE PROPOSAL

Context

In planning terms, flood risk refers to the potential for development to increase the likelihood or severity of flooding on-site or elsewhere, while drainage considerations relate to the capacity of the site and surrounding infrastructure to manage surface water runoff in a sustainable and effective manner.

The local planning authority must be satisfied that the proposed development will not increase flood risk, either on-site or elsewhere, and that surface water will be managed in a sustainable and coordinated manner.

Where necessary, planning conditions or legal agreements may be used to secure the implementation, maintenance, and monitoring of SuDS and other drainage infrastructure.

Assessment

Application for the approval of reserved matters following outline planning permission ref. PL/2024/08724 in relation to drainage.

A drainage layout plan has been submitted as part of this application; however, no supporting technical information has been provided, such as hydraulic calculations, modelling outputs, detailed attenuation design, or evidence to demonstrate the performance of the proposed drainage system. Consequently, the submission does not provide the necessary information to demonstrate a safe & feasible drainage strategy compliant with Wiltshire Council requirements, NPPF, PPG and the National Standards for SuDS.

RECOMMENDATION

Holding objection as further information required

At this stage, a full assessment cannot be completed due to insufficient information. The following documents/information are required to enable a detailed review of the drainage and flood risk aspects of the proposal:

- The applicant is required to provide a clear demonstration of whether the proposed drainage strategy delivers betterment over the current site conditions. In particular, the design should demonstrate a minimum 30% betterment against the greenfield runoff rates for the 1 in 1 year, 1 in 30 year and 1 in 100 year plus climate change events. As the submitted drainage strategy states that the impermeable areas used within the design are indicative, confirmation is required that the proposed attenuation volumes, discharge controls and drainage infrastructure remain suitable based on the final impermeable extents.
- It is noted the applicant has stated the proposed basin wet areas are intended to cater for the first 5mm of rainfall, however the applicant must provide interception storage calculations demonstrating the first 5mm of rainfall from the majority of rainfall events will be managed by interception features and will not result in runoff from the site to surface water or piped systems in accordance with the [National Standards for SuDS \(standard 2\)](#).
 - The applicant must outline how the proposed attenuation basins, filter drains and permeable paving contribute to interception storage.
 - As part of providing further information related to interception storage, the applicant must provide clarification on water reuse measures, and provide justification where such measures are not proposed as part of the drainage strategy. Noting the drainage disposal hierarchy, the applicant must outline why water reuse is not feasible at the site ([Standard 1: runoff destinations](#)).
- The applicant must provide an overland exceedance drawing identifying the exceedance routing on the drainage plan for flows in excess of the 1 in 100 year plus climate change (40%) rainfall event to demonstrate no adverse flood risk to existing & future people and property. This assessment must account for the proposed re-grading outlined by the applicant and demonstrate how flow paths across the extent of the development are safely managed in accordance with [Standard 3: management of extreme rainfall and flooding](#).
- The applicant must provide a detailed justification for the proposed culverting of the existing ditch/watercourse running through the centre of the site – the LLFA would emphasise that culverting is a last resort solution and should be avoided where possible. The applicant must provide:
 - clarification & explanation of why open channel solutions are not feasible
 - demonstration that in the 1 in 100yr + cc event can be safely conveyed by the culvert, with the culvert achieving D/4 freeboard and D/4 embedment
 - discussion as to why culverting has been proposed at this stage of the application process, rather than during the outline stage
- The applicant must provide details of water quality treatment measures within the drainage strategy and submit calculations demonstrating that a sufficient level of treatment is achieved to prevent pollution of the receiving waterbody and/or groundwater, in accordance with the CIRIA SuDS Manual (C753) and [Standard 4](#) of the National Standards for SuDS.
- The applicant must outline the proposed maintenance regime of all drainage & SuDS features, including who is responsible for maintenance, and the frequency of maintenance undertaken over the lifetime of the development.

- The applicant must provide a a construction management plan, which shall include monitoring of, and measures to retain, the existing vegetation across the site, together with details of drainage arrangements during the construction phase, has been submitted to and approved in writing by the Local Planning Authority in consultation with the Lead Local Flood Authority. ([Standard 7: design of drainage for construction, operation, maintenance, decommissioning and structural integrity](#)).

INFORMATIVES

- All new drainage will need to comply fully with Building Regulations Part H (and they should engage with the building control department in order to ensure this).
- Any new connections to sewers will be subject to S106 agreement under the Water Industry Act with the Sewerage Undertaker.
- There must be no interruption to the existing surface water and/or land drainage arrangements of the surrounding land as a result of the operations on the site. Provisions must be made to ensure that all existing drainage systems continue to operate effectively.
- An environmental permit is required for any works within 8m of a main river. Consult the [Environment Agency's main river map](#) to see if a river/watercourse is designated as a main river. For more guidance on environmental permits, consult the [website](#). The Environment Agency issues environmental permits, however, as Wiltshire Council is the Lead Local Flood Authority that has the lead responsibility for surface water management, the discharge rate from the site must be agreed with Wiltshire Council as part of agreeing the surface water drainage strategy for the site.
- Prior to any works commencing on the upstream drainage network, the approved outfall structure and flow control device shall be fully constructed, tested, and commissioned. No discharge to the receiving system (including watercourses, waterbodies, sewers, or drains) shall occur until these measures are operational to ensure compliance with agreed discharge rates and prevent an increase in flood risk elsewhere.

RELEVANT PLANNING POLICY & GUIDANCE

National Planning Policy Framework (NPPF) [NPPF December 2024 Link](#)
Planning and Flood Risk (Paras 170–182)

Wiltshire Core Strategy – Adopted January 2015 [Wiltshire Core Strategy Link](#)
Core Policy 67 requires that all new development must address flood risk from all sources and not increase flood risk elsewhere. It supports the use of Sustainable Drainage Systems (SuDS) and requires that developments demonstrate how surface water will be managed sustainably.

Wiltshire Local Plan (emerging) [Local Plan Review Link](#)
Development must avoid high flood risk areas using the sequential approach. Proposals require a Flood Risk Assessment, Surface Water Drainage Strategy, and Groundwater Assessment where relevant. All schemes must include Sustainable Drainage Systems (SuDS), with major developments achieving a 30% reduction in runoff compared to greenfield rates, following the surface water discharge hierarchy.

Culverting and building over watercourses is discouraged, and natural drainage features should be retained or restored. Drainage strategies must ensure safety during extreme flood events (1-in-100-year + climate change) and provide safe access/egress. SuDS should also deliver biodiversity, amenity, and water quality benefits.

Supplementary Planning Documents

Wiltshire Council Drainage Betterment Strategy (2024) [SPD Link](#)
This technical guidance outlines expectations for surface water discharge hierarchy, attenuation, exceedance routes, water quality, and post-development monitoring.

Wiltshire Design Guide (March 2024) [SPD Link](#)
Includes principles of good design, including integration of SuDS and flood resilience.

Other Relevant Policies and Guidance

Planning Practice Guidance (PPG) – Flood Risk and Drainage [Guidance Link](#)
Covers detailed expectations for flood risk assessments, SuDS design, discharge hierarchy, sequential testing and climate change allowances.

Wiltshire SFRA (2024) [SFRA Link](#)

This document underpins the Sequential and Exception Test application and provides site screening evidence.

Section 19 Flood Investigation Reports [Section 19 Reports Link](#)

These documents summarise investigations into significant local flood incidents and establish what caused the flooding, how authorities responded, and actions needed to prevent future floods.

National Standards for Sustainable Drainage Systems (SuDS) June 2025 [Guidance Link](#)

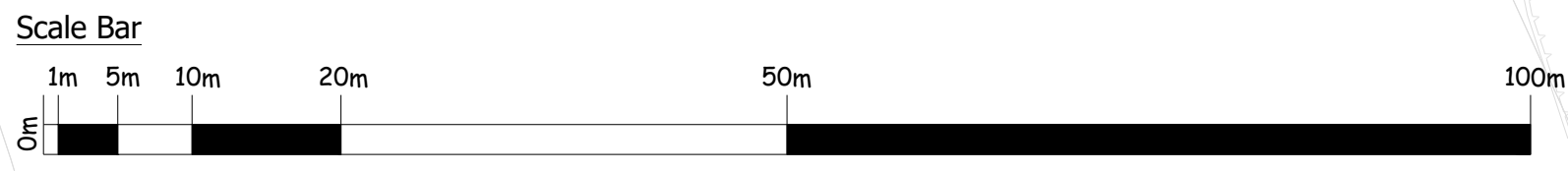
Establishes mandatory criteria for runoff destination hierarchy, interception, flood resilience, water quality, amenity, biodiversity, and long-term maintenance for all new developments in England.

SuDS Manual (CIRIA C753)

This document set outs design principles, especially where attenuation, exceedance routing, and water quality are discussed.

Infiltration drainage design must be supported by ground investigations, including infiltration testing in accordance with *British Research Establishment (BRE) Digest 365 – Soakaway Design*, and groundwater level monitoring that accounts for seasonal variation.

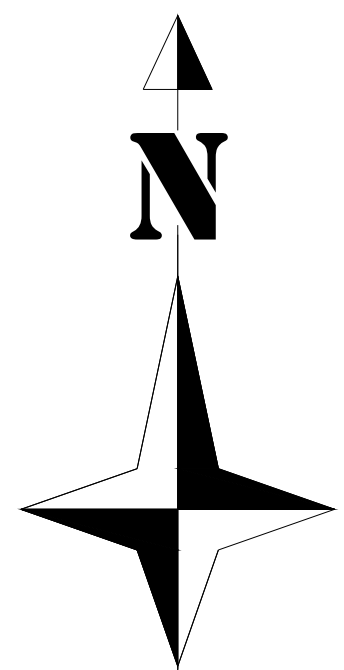
APPENDIX B – Drainage Strategy Plan



- BOTH SURFACE AND FOUL WATER DESIGNS SHOULD BE IN ACCORDANCE WITH WESSEX WATER REQUIREMENTS

STORM Network 2												
Time	Phase	Case	Gridset	Time	Phase	Case	Time	Phase	Case	Time	Phase	Case
h:m:s	h:m:s	h:m:s	h:m:s	h:m:s	h:m:s	h:m:s	h:m:s	h:m:s	h:m:s	h:m:s	h:m:s	h:m:s
1:00:0	225	107	Circular	13:41	5200	88:0	11:27	5204	89:74	11:51	5210	91:61
1:00:0	230	108	Circular	13:46	5204	88:0	11:32	5208	89:74	11:56	5214	91:66
1:00:0	235	109	Circular	13:51	5208	88:0	11:37	5212	89:74	12:01	5218	91:71
1:00:0	240	110	Circular	13:56	5212	88:0	11:42	5216	89:74	12:06	5222	91:76
1:00:0	245	111	Circular	14:01	5216	88:0	11:47	5220	89:74	12:11	5226	91:81
1:00:0	250	112	Circular	14:06	5220	88:0	11:52	5224	89:74	12:16	5230	91:86
1:00:0	255	113	Circular	14:11	5224	88:0	11:57	5228	89:74	12:21	5234	91:91
1:00:0	260	114	Circular	14:16	5228	88:0	12:02	5232	89:74	12:26	5238	91:96
1:00:0	265	115	Circular	14:21	5232	88:0	12:07	5236	89:74	12:31	5242	92:01
1:00:0	270	116	Circular	14:26	5236	88:0	12:12	5240	89:74	12:36	5246	92:06
1:00:0	275	117	Circular	14:31	5240	88:0	12:17	5244	89:74	12:41	5250	92:11
1:00:0	280	118	Circular	14:36	5244	88:0	12:22	5248	89:74	12:46	5254	92:16
1:00:0	285	119	Circular	14:41	5248	88:0	12:27	5252	89:74	12:51	5258	92:21
1:00:0	290	120	Circular	14:46	5252	88:0	12:32	5256	89:74	12:56	5262	92:26
1:00:0	295	121	Circular	14:51	5256	88:0	12:37	5260	89:74	13:01	5266	92:31
1:00:0	300	122	Circular	14:56	5260	88:0	12:42	5264	89:74	13:06	5270	92:36
1:00:0	305	123	Circular	15:01	5264	88:0	12:47	5268	89:74	13:11	5274	92:41
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1:00:0	315	125	Circular	15:11	5272	88:0	12:57	5276	89:74	13:21	5282	92:51
1:00:0	320	126	Circular	15:16	5276	88:0	13:02	5280	89:74	13:26	5286	92:56
1:00:0	325	127	Circular	15:21	5280	88:0	13:07	5284	89:74	13:31	5290	93:01
1:00:0	330	128	Circular	15:26	5284	88:0	13:12	5288	89:74	13:36	5294	93:06
1:00:0	335	129	Circular	15:31	5288	88:0	13:17	5292	89:74	13:41	5298	93:11
1:00:0	340	130	Circular	15:36	5292	88:0	13:22	5296	89:74	13:46	5302	93:16
1:00:0	345	131	Circular	15:41	5296	88:0	13:27	5300	89:74	13:51	5306	93:21
1:00:0	350	132	Circular	15:46	5300	88:0	13:32	5304	89:74	13:56	5310	93:26
1:00:0	355	133	Circular	15:51	5304	88:0	13:37	5308	89:74	14:01	5314	93:31
1:00:0	360	134	Circular	15:56	5308	88:0	13:42					

The Contractor is to check and verify all building and site conditions and to report any conditions that may be a potential source of claims or disputes to the Engineer. The Contractor is to be responsible for all aspects with current Building Regulations, British Standard BS5938:2000, BS5939:2000, BS5940:2000, BS5941:2000, BS5942:2000, BS5943:2000, BS5944:2000, BS5945:2000, BS5946:2000, BS5947:2000, BS5948:2000, BS5949:2000, BS5950:2000, BS5951:2000, BS5952:2000, BS5953:2000, BS5954:2000, BS5955:2000, BS5956:2000, BS5957:2000, BS5958:2000, BS5959:2000, BS5960:2000, BS5961:2000, BS5962:2000, BS5963:2000, BS5964:2000, BS5965:2000, BS5966:2000, BS5967:2000, BS5968:2000, BS5969:2000, BS5970:2000, BS5971:2000, BS5972:2000, BS5973:2000, BS5974:2000, BS5975:2000, BS5976:2000, BS5977:2000, BS5978:2000, BS5979:2000, BS5980:2000, BS5981:2000, BS5982:2000, BS5983:2000, BS5984:2000, BS5985:2000, BS5986:2000, BS5987:2000, BS5988:2000, BS5989:2000, BS5990:2000, BS5991:2000, BS5992:2000, BS5993:2000, BS5994:2000, BS5995:2000, BS5996:2000, BS5997:2000, BS5998:2000, BS5999:2000, BS6000:2000, BS6001:2000, BS6002:2000, BS6003:2000, BS6004:2000, BS6005:2000, BS6006:2000, BS6007:2000, BS6008:2000, BS6009:2000, BS6010:2000, BS6011:2000, BS6012:2000, BS6013:2000, BS6014:2000, BS6015:2000, BS6016:2000, BS6017:2000, BS6018:2000, BS6019:2000, BS6020:2000, BS6021:2000, BS6022:2000, BS6023:2000, BS6024:2000, BS6025:2000, BS6026:2000, BS6027:2000, BS6028:2000, BS6029:2000, BS6030:2000, BS6031:2000, BS6032:2000, BS6033:2000, BS6034:2000, BS6035:2000, BS6036:2000, BS6037:2000, BS6038:2000, BS6039:2000, BS6040:2000, BS6041:2000, BS6042:2000, BS6043:2000, BS6044:2000, BS6045:2000, BS6046:2000, BS6047:2000, BS6048:2000, BS6049:2000, BS6050:2000, BS6051:2000, BS6052:2000, BS6053:2000, BS6054:2000, BS6055:2000, BS6056:2000, BS6057:2000, BS6058:2000, BS6059:2000, BS6060:2000, BS6061:2000, BS6062:2000, BS6063:2000, BS6064:2000, BS6065:2000, BS6066:2000, BS6067:2000, BS6068:2000, BS6069:2000, BS6070:2000, BS6071:2000, BS6072:2000, BS6073:2000, BS6074:2000, BS6075:2000, BS6076:2000, BS6077:2000, BS6078:2000, BS6079:2000, BS6080:2000, BS6081:2000, BS6082:2000, BS6083:2000, BS6084:2000, BS6085:2000, BS6086:2000, BS6087:2000, BS6088:2000, BS6089:2000, BS6090:2000, BS6091:2000, BS6092:2000, BS6093:2000, BS6094:2000, BS6095:2000, BS6096:2000, BS6097:2000, BS6098:2000, BS6099:2000, BS6100:2000, BS6101:2000, BS6102:2000, BS6103:2000, BS6104:2000, BS6105:2000, BS6106:2000, BS6107:2000, BS6108:2000, BS6109:2000, BS6110:2000, BS6111:2000, BS6112:2000, BS6113:2000, BS6114:2000, BS6115:2000, BS6116:2000, BS6117:2000, BS6118:2000, BS6119:2000, BS6120:2000, BS6121:2000, BS6122:2000, BS6123:2000, BS6124:2000, BS6125:2000, BS6126:2000, BS6127:2000, BS6128:2000, BS6129:2000, BS6130:2000, BS6131:2000, BS6132:2000, BS6133:2000, BS6134:2000, BS6135:2000, BS6136:2000, BS6137:2000, BS6138:2000, BS6139:2000, BS6140:2000, BS6141:2000, BS6142:2000, BS6143:2000, BS6144:2000, BS6145:2000, BS6146:2000, BS6147:2000, BS6148:2000, BS6149:2000, BS6150:2000, BS6151:2000, BS6152:2000, BS6153:2000, BS6154:2000, BS6155:2000, BS6156:2000, BS6157:2000, BS6158:2000, BS6159:2000, BS6160:2000, BS6161:2000, BS6162:2000, BS6163:2000, BS6164:2000, BS6165:2000, BS6166:2000, BS6167:2000, BS6168:2000, BS6169:2000, BS6170:2000, BS6171:2000, BS6172:2000, BS6173:2000, BS6174:2000, BS6175:2000, BS6176:2000, BS6177:2000, BS6178:2000, BS6179:2000, BS6180:2000, BS6181:2000, BS6182:2000, BS6183:2000, BS6184:2000, BS6185:2000, BS6186:2000, BS6187:2000, BS6188:2000, BS6189:2000, BS6190:2000, BS6191:2000, BS6192:2000, BS6193:2000, BS6194:2000, BS6195:2000, BS6196:2000, BS6197:2000, BS6198:2000, BS6199:2000, BS6200:2000, BS6201:2000, BS6202:2000, BS6203:2000, BS6204:2000, BS6205:2000, BS6206:2000, BS6207:2000, BS6208:2000, BS6209:2000, BS6210:2000, BS6211:2000, BS6212:2000, BS6213:2000, BS6214:2000, BS6215:2000, BS6216:2000, BS6217:2000, BS6218:2000, BS6219:2000, BS6220:2000, BS6221:2000, BS6222:2000, BS6223:2000, BS6224:2000, BS6225:2000, BS6226:2000, BS6227:2000, BS6228:2000, BS6229:2000, BS6230:2000, BS6231:2000, BS6232:2000, BS6233:2000, BS6234:2000, BS6235:2000, BS6236:2000, BS6237:2000, BS6238:2000, BS6239:2000, BS6240:2000, BS6241:2000, BS6242:2000, BS6243:2000, BS6244:2000, BS6245:2000, BS6246:2000, BS6247:2000, BS6248:2000, BS6249:2000, BS6250:2000, BS6251:2000, BS6252:2000, BS6253:2000, BS6254:2000, BS6255:2000, BS6256:2000, BS6257:2000, BS6258:2000, BS6259:2000, BS6260:2000, BS6261:2000, BS6262:2000, BS6263:2000, BS6264:2000, BS6265:2000, BS6266:2000, BS6267:2000, BS6268:2000, BS6269:2000, BS6270:2000, BS6271:2000, BS6272:2000, BS6273:2000, BS6274:2000, BS6275:2000, BS6276:2000, BS6277:2000, BS6278:2000, BS6279:2000, BS6280:2000, BS6281:2000, BS6282:2000, BS6283:2000, BS6284:2000, BS6285:2000, BS6286:2000, BS6287:2000, BS6288:2000, BS6289:2000, BS6290:2000, BS6291:2000, BS6292:2000, BS6293:2000, BS6294:2000, BS6295:2000, BS6296:2000, BS6297:2000, BS6298:2000, BS6299:2000, BS6300:2000, BS6301:2000, BS6302:2000, BS6303:2000, BS6304:2000, BS6305:2000,



3	Amended to suit revised layout received 17.7.26	20.07.26	APJ	#
2	Added scale bar as requested by LPA	15.06.26	REH	#
1	Drawing updated with the latest layout received 27.04.26 and amended following client comments received 27.04.26	28.04.26	RG	#
Rev	Description	Date	Drawn	Check

Revisions:

millerhomes
RACE
RESIDENTIAL & COMMERCIAL ENGINEERING

Drawing Status:
FOR PLANNING.

Client:
MILLER HOMES (SW)

Project:
ROYAL WOOTTON BASSETT

Title:
DRAINAGE STRATEGY PLAN

Job Number.
RACE/MSW/RWB
Drawing No.
ENG_003
Revision. 3

Scale: 1:500 @ A0
Date: APR ' 26
Drawn by: APJ
Checked by: #

Contact us :
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APPENDIX C – Hydraulic Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	200.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	x
Time of Entry (mins)	4.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
102	0.029	4.00	89.819	1200	407124.295	181346.453	1.782	88.037
126	0.081	4.00	90.505	1200	407066.669	181307.018	1.814	88.691
128	0.140	4.00	90.184	1350	407090.129	181317.100	1.794	88.390
104	0.078	4.00	90.128	1350	407115.032	181338.438	2.389	87.739
106	0.008	4.00	89.948	1350	407124.885	181326.750	2.249	87.699
108	0.036	4.00	89.685	1500	407132.081	181313.637	2.100	87.585
110	0.060	4.00	89.354	1500	407136.216	181294.718	1.812	87.542
112	0.000		89.200	1500	407139.072	181269.020	1.715	87.485
114	0.135	4.00	88.900	1500	407113.219	181262.362	1.474	87.426
116	0.000		88.600		407089.112	181241.307	1.244	87.356
118	0.205	4.00	88.600		407069.806	181221.194	1.300	87.300
120	0.000		89.050	3000	407067.348	181213.482	2.559	86.491
122			86.686		407078.714	181186.941	0.368	86.318

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	102	104	12.249	0.600	88.037	87.964	0.073	167.0	225	4.20	75.4
2.000	126	128	25.535	0.600	88.691	88.540	0.151	169.1	225	4.42	73.9
2.001	128	104	32.794	0.600	88.390	87.814	0.576	56.9	375	4.65	72.4
1.001	104	106	15.287	0.600	87.739	87.699	0.040	382.2	450	4.90	71.8
1.002	106	108	14.958	0.600	87.699	87.660	0.039	383.5	450	5.14	70.4
1.003	108	110	19.366	0.600	87.585	87.542	0.043	450.4	525	5.45	68.7
1.004	110	112	25.856	0.600	87.542	87.485	0.057	453.6	525	5.86	66.4
1.005	112	114	26.697	0.600	87.485	87.426	0.059	455.0	525	6.29	63.5
1.006	114	116	32.007	0.600	87.426	87.356	0.070	455.0	525	6.80	61.2

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.009	40.1	7.9	1.557	1.939	0.029	0.0	67	0.786
2.000	1.002	39.9	21.6	1.589	1.419	0.081	0.0	118	1.022
2.001	2.405	265.6	57.8	1.419	1.939	0.221	0.0	118	1.938
1.001	1.034	164.4	85.1	1.939	1.799	0.328	0.0	230	1.042
1.002	1.032	164.1	85.5	1.799	1.575	0.336	0.0	231	1.042
1.003	1.049	227.0	92.4	1.575	1.287	0.372	0.0	233	0.997
1.004	1.045	226.2	103.7	1.287	1.190	0.432	0.0	249	1.023
1.005	1.043	225.8	99.1	1.190	0.949	0.432	0.0	243	1.011
1.006	1.043	225.8	125.3	0.949	0.719	0.567	0.0	280	1.069

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.008	118	120	8.094	0.600	87.300	86.491	0.809	10.0	600	4.02	76.7
1.009	120	122	28.872	0.600	86.491	86.318	0.173	167.0	225	4.49	73.4

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.008	7.728	2185.1	56.8	0.700	1.959	0.205	0.0	65	3.412
1.009	1.009	40.1	54.4	2.334	0.143	0.205	0.0	225	1.027

Pipeline Schedule

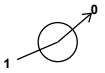
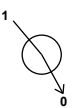
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	12.249	167.0	225	Circular_Default Sewer Type	89.819	88.037	1.557	90.128	87.964	1.939
2.000	25.535	169.1	225	Circular_Default Sewer Type	90.505	88.691	1.589	90.184	88.540	1.419
2.001	32.794	56.9	375	Circular_Default Sewer Type	90.184	88.390	1.419	90.128	87.814	1.939
1.001	15.287	382.2	450	Circular_Default Sewer Type	90.128	87.739	1.939	89.948	87.699	1.799
1.002	14.958	383.5	450	Circular_Default Sewer Type	89.948	87.699	1.799	89.685	87.660	1.575
1.003	19.366	450.4	525	Circular_Default Sewer Type	89.685	87.585	1.575	89.354	87.542	1.287
1.004	25.856	453.6	525	Circular_Default Sewer Type	89.354	87.542	1.287	89.200	87.485	1.190
1.005	26.697	455.0	525	Circular_Default Sewer Type	89.200	87.485	1.190	88.900	87.426	0.949
1.006	32.007	455.0	525	Circular_Default Sewer Type	88.900	87.426	0.949	88.600	87.356	0.719
1.008	8.094	10.0	600	Circular_Default Sewer Type	88.600	87.300	0.700	89.050	86.491	1.959
1.009	28.872	167.0	225	Circular_Default Sewer Type	89.050	86.491	2.334	86.686	86.318	0.143

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	102	1200	Manhole	Adoptable	104	1350	Manhole	Adoptable
2.000	126	1200	Manhole	Adoptable	128	1350	Manhole	Adoptable
2.001	128	1350	Manhole	Adoptable	104	1350	Manhole	Adoptable
1.001	104	1350	Manhole	Adoptable	106	1350	Manhole	Adoptable
1.002	106	1350	Manhole	Adoptable	108	1500	Manhole	Adoptable
1.003	108	1500	Manhole	Adoptable	110	1500	Manhole	Adoptable
1.004	110	1500	Manhole	Adoptable	112	1500	Manhole	Adoptable
1.005	112	1500	Manhole	Adoptable	114	1500	Manhole	Adoptable
1.006	114	1500	Manhole	Adoptable	116		Junction	
1.008	118		Junction		120	3000	Manhole	Adoptable
1.009	120	3000	Manhole	Adoptable	122		Junction	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
102	407124.295	181346.453	89.819	1.782	1200		0	1.000	88.037	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
126	407066.669	181307.018	90.505	1.814	1200				
						0	2.000	88.691	225
128	407090.129	181317.100	90.184	1.794	1350		1	2.000	88.540
						0	2.001	88.390	375
104	407115.032	181338.438	90.128	2.389	1350		1	2.001	87.814
						2	1.000	87.964	225
						0	1.001	87.739	450
106	407124.885	181326.750	89.948	2.249	1350		1	1.001	87.699
						0	1.002	87.699	450
108	407132.081	181313.637	89.685	2.100	1500		1	1.002	87.660
						0	1.003	87.585	525
110	407136.216	181294.718	89.354	1.812	1500		1	1.003	87.542
						0	1.004	87.542	525
112	407139.072	181269.020	89.200	1.715	1500		1	1.004	87.485
						0	1.005	87.485	525
114	407113.219	181262.362	88.900	1.474	1500		1	1.005	87.426
						0	1.006	87.426	525
116	407089.112	181241.307	88.600	1.244			1	1.006	87.356
118	407069.806	181221.194	88.600	1.300			0	1.008	87.300
120	407067.348	181213.482	89.050	2.559	3000		1	1.008	86.491
						0	1.009	86.491	225
122	407078.714	181186.941	86.686	0.368			1	1.009	86.318

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	✓	Check Discharge Rate(s)	x
Summer CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume	x
Winter CV	1.000	Additional Storage (m³/ha)	0.0		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	45	0	0

Node 120 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	86.491	Product Number	CTL-SHE-0061-2200-1809-2200
Design Depth (m)	1.809	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	2.2	Min Node Diameter (mm)	1200

Node 120 Online Weir Control

Flap Valve	x	Invert Level (m)	88.300	Discharge Coefficient	0.590
Replaces Downstream Link	x	Width (m)	3.000		

Node 118 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	28.200
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	87.300	Main Channel Slope (1:X)	500.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.025

Inlets

116

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	631.0	631.0	1.000	1046.0	1058.3	1.300	1190.0	1206.6

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.36%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	102	10	88.085	0.048	3.7	0.0537	0.0000	OK
15 minute summer	126	10	88.771	0.080	10.3	0.0904	0.0000	OK
15 minute summer	128	10	88.472	0.082	28.1	0.1178	0.0000	OK
15 minute summer	104	10	87.906	0.167	41.7	0.2387	0.0000	OK
15 minute summer	106	10	87.859	0.160	42.4	0.2295	0.0000	OK
15 minute summer	108	11	87.760	0.175	45.8	0.3092	0.0000	OK
15 minute summer	110	11	87.724	0.182	52.0	0.3221	0.0000	OK
15 minute summer	112	11	87.666	0.181	52.6	0.3202	0.0000	OK
15 minute summer	114	11	87.602	0.176	65.7	0.3106	0.0000	OK
600 minute winter	116	585	87.486	0.130	8.3	0.0000	0.0000	OK
600 minute winter	118	570	87.486	0.186	33.9	0.0000	0.0000	OK
600 minute winter	120	585	87.497	1.006	28.9	7.1128	0.0000	SURCHARGED
15 minute summer	122	1	86.543	0.225	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	102	1.000	104	3.7	0.622	0.092	0.0728	
15 minute summer	126	2.000	128	10.3	0.833	0.258	0.3147	
15 minute summer	128	2.001	104	28.1	1.500	0.106	0.6350	
15 minute summer	104	1.001	106	41.4	0.795	0.252	0.7953	
15 minute summer	106	1.002	108	41.2	0.905	0.251	0.6896	
15 minute summer	108	1.003	110	45.7	0.712	0.201	1.2535	
15 minute summer	110	1.004	112	52.6	0.795	0.233	1.7136	
15 minute summer	112	1.005	114	51.5	0.817	0.228	1.7262	
15 minute summer	114	1.006	116	64.8	2.383	0.287	1.0465	
600 minute winter	116	Flow through Pond	118	5.3	0.014	0.000	104.9723	
600 minute winter	118	1.008	120	28.9	0.190	0.013	1.4405	
600 minute winter	120	1.009	122	0.0	0.000	0.000	0.5736	0.0
600 minute winter	120	Hydro-Brake®	122	1.6				72.6

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.39%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	102	10	88.177	0.140	15.0	0.1585	0.0000	OK
15 minute summer	126	10	88.902	0.211	41.9	0.2383	0.0000	OK
15 minute summer	128	9	88.561	0.171	113.8	0.2454	0.0000	OK
15 minute summer	104	10	88.166	0.427	167.8	0.6106	0.0000	OK
15 minute summer	106	10	88.100	0.401	167.8	0.5733	0.0000	OK
15 minute summer	108	11	88.028	0.443	184.0	0.7833	0.0000	OK
15 minute summer	110	11	87.984	0.442	210.9	0.7812	0.0000	OK
15 minute summer	112	11	87.906	0.421	208.0	0.7446	0.0000	OK
960 minute winter	114	945	87.829	0.403	15.6	0.7126	0.0000	OK
960 minute winter	116	945	87.829	0.473	15.2	0.0000	0.0000	OK
960 minute winter	118	945	87.829	0.529	31.9	0.0000	0.0000	OK
960 minute winter	120	945	87.829	1.338	31.5	9.4605	0.0000	SURCHARGED
15 minute summer	122	1	86.543	0.225	0.0	0.0000	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	102	1.000	104	14.4	0.820	0.360	0.3892	
15 minute summer	126	2.000	128	41.5	1.157	1.041	0.9065	
15 minute summer	128	2.001	104	113.7	1.506	0.428	2.5503	
15 minute summer	104	1.001	106	163.7	1.086	0.996	2.3272	
15 minute summer	106	1.002	108	165.4	1.178	1.008	2.1507	
15 minute summer	108	1.003	110	179.9	0.940	0.792	3.7631	
15 minute summer	110	1.004	112	208.0	1.100	0.919	4.9111	
15 minute summer	112	1.005	114	209.4	1.208	0.927	4.6653	
960 minute winter	114	1.006	116	15.2	0.845	0.067	6.1306	
960 minute winter	116	Flow through Pond	118	7.3	0.019	0.000	368.7506	
960 minute winter	118	1.008	120	31.5	0.371	0.014	2.2050	
960 minute winter	120	1.009	122	0.0	0.000	0.000	0.5736	0.0
960 minute winter	120	Hydro-Brake®	122	1.9				118.9

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.55%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	102	11	89.140	1.103	28.1	1.2471	0.0000	SURCHARGED
15 minute summer	126	10	90.131	1.440	78.4	1.6291	0.0000	SURCHARGED
15 minute summer	128	10	89.525	1.135	207.7	1.6249	0.0000	SURCHARGED
15 minute summer	104	10	89.099	1.360	300.2	1.9457	0.0000	SURCHARGED
15 minute summer	106	11	88.889	1.190	301.8	1.7029	0.0000	SURCHARGED
15 minute summer	108	11	88.673	1.088	330.7	1.9223	0.0000	SURCHARGED
15 minute summer	110	11	88.525	0.983	382.5	1.7375	0.0000	SURCHARGED
1440 minute winter	112	1410	88.290	0.805	15.5	1.4219	0.0000	SURCHARGED
1440 minute winter	114	1410	88.290	0.864	20.1	1.5262	0.0000	SURCHARGED
1440 minute winter	116	1410	88.290	0.934	19.7	0.0000	0.0000	OK
1440 minute winter	118	1410	88.290	0.990	29.7	0.0000	0.0000	SURCHARGED
1440 minute winter	120	1410	88.290	1.799	30.9	12.7151	0.0000	SURCHARGED
15 minute summer	122	1	86.543	0.225	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	102	1.000	104	27.9	0.754	0.695	0.4872	
15 minute summer	126	2.000	128	72.4	1.820	1.816	1.0156	
15 minute summer	128	2.001	104	201.3	1.825	0.758	3.6171	
15 minute summer	104	1.001	106	294.1	1.856	1.789	2.4221	
15 minute summer	106	1.002	108	297.9	1.880	1.815	2.3700	
15 minute summer	108	1.003	110	331.2	1.533	1.459	4.1837	
15 minute summer	110	1.004	112	383.1	1.774	1.694	5.5857	
1440 minute winter	112	1.005	114	15.0	0.419	0.067	5.7674	
1440 minute winter	114	1.006	116	19.7	0.873	0.087	6.9146	
1440 minute winter	116	Flow through Pond	118	8.0	0.017	0.000	799.1207	
1440 minute winter	118	1.008	120	30.9	0.316	0.014	2.2799	
1440 minute winter	120	1.009	122	0.0	0.000	0.000	0.5736	0.0
1440 minute winter	120	Hydro-Brake®	122	2.2				184.9

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	200.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
202	0.023	4.00	91.273	1200	407044.453	181318.275	1.425	89.848
204	0.064	4.00	91.626	1200	407032.482	181324.816	1.935	89.691
206	0.017	4.00	92.338	1200	406997.810	181317.952	2.796	89.542
208	0.008	4.00	91.880	1200	406966.868	181314.393	2.469	89.411
210	0.125	4.00	91.631	1200	406959.492	181308.296	2.335	89.296
212	0.027	4.00	91.358	1350	406957.999	181297.803	2.100	89.258
214	0.083	4.00	90.403	1350	406958.320	181258.015	1.603	88.800
228	0.061	4.00	90.484	1200	407034.757	181285.564	1.425	89.059
230	0.003	4.00	89.925	1200	407019.719	181268.954	1.425	88.500
232	0.020	4.00	89.798	1200	407011.879	181262.557	1.573	88.225
234	0.146	4.00	89.861	1350	407002.243	181258.912	1.754	88.107
216	0.117	4.00	90.106	1800	406980.961	181258.086	2.598	87.508
218	0.337	4.00	89.124	1800	406980.672	181185.239	1.762	87.362
220	0.000		88.600		406982.629	181173.904	1.261	87.339
220A	0.124	4.00	88.600		406997.148	181159.725	1.300	87.300
222	0.000	4.00	89.050	3000	407002.502	181154.034	2.531	86.519
224			86.500		407029.220	181115.430	0.800	85.700

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	202	204	13.641	0.600	89.848	89.766	0.082	167.0	225	4.23	75.2
1.001	204	206	35.345	0.600	89.691	89.542	0.149	238.0	300	4.81	71.4
1.002	206	208	31.146	0.600	89.542	89.411	0.131	238.0	300	5.32	68.4
1.003	208	210	9.570	0.600	89.411	89.371	0.040	239.3	300	5.48	67.5
1.004	210	212	10.599	0.600	89.296	89.258	0.038	278.9	375	5.64	66.8
1.005	212	214	39.789	0.600	89.258	88.800	0.458	86.9	375	5.98	64.9
1.006	214	216	22.641	0.600	88.800	87.883	0.917	24.7	375	6.08	64.4

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.009	40.1	6.3	1.200	1.635	0.023	0.0	60	0.740
1.001	1.015	71.7	22.5	1.635	2.496	0.087	0.0	115	0.901
1.002	1.015	71.7	25.7	2.496	2.169	0.104	0.0	124	0.933
1.003	1.012	71.5	27.3	2.169	1.960	0.112	0.0	129	0.946
1.004	1.080	119.2	57.2	1.960	1.725	0.237	0.0	183	1.068
1.005	1.945	214.8	62.0	1.725	1.228	0.264	0.0	137	1.690
1.006	3.659	404.1	80.8	1.228	1.848	0.347	0.0	113	2.883

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
2.000	228	230	22.406	0.600	89.059	88.500	0.559	40.1	225	4.18	75.6
2.001	230	232	10.119	0.600	88.500	88.300	0.200	50.6	225	4.27	74.9
2.002	232	234	10.302	0.600	88.225	88.182	0.043	238.0	300	4.44	73.8
2.003	234	216	21.298	0.600	88.107	87.883	0.224	95.1	375	4.63	72.5
1.007	216	218	72.848	0.600	87.508	87.362	0.146	498.7	750	7.06	60.1
1.008	218	220	11.503	0.600	87.362	87.339	0.023	500.0	750	7.21	59.4
1.010	220A	222	7.814	0.600	87.300	86.519	0.781	10.0	750	4.01	76.7
1.011	222	224	46.948	0.600	86.519	85.700	0.819	57.3	225	4.47	73.6

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
2.000	2.072	82.4	16.7	1.200	1.200	0.061	0.0	68	1.628
2.001	1.843	73.3	17.3	1.200	1.273	0.064	0.0	74	1.516
2.002	1.015	71.7	22.4	1.273	1.379	0.084	0.0	115	0.901
2.003	1.858	205.2	60.3	1.379	1.848	0.230	0.0	139	1.623
1.007	1.246	550.5	150.7	1.848	1.012	0.694	0.0	267	1.070
1.008	1.244	549.7	221.5	1.012	0.511	1.031	0.0	331	1.181
1.010	8.877	3921.8	34.4	0.550	1.781	0.124	0.0	49	2.859
1.011	1.731	68.8	33.0	2.306	0.575	0.124	0.0	109	1.711

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	13.641	167.0	225	Circular_Default Sewer Type	91.273	89.848	1.200	91.626	89.766	1.635
1.001	35.345	238.0	300	Circular_Default Sewer Type	91.626	89.691	1.635	92.338	89.542	2.496
1.002	31.146	238.0	300	Circular_Default Sewer Type	92.338	89.542	2.496	91.880	89.411	2.169
1.003	9.570	239.3	300	Circular_Default Sewer Type	91.880	89.411	2.169	91.631	89.371	1.960
1.004	10.599	278.9	375	Circular_Default Sewer Type	91.631	89.296	1.960	91.358	89.258	1.725
1.005	39.789	86.9	375	Circular_Default Sewer Type	91.358	89.258	1.725	90.403	88.800	1.228
1.006	22.641	24.7	375	Circular_Default Sewer Type	90.403	88.800	1.228	90.106	87.883	1.848
2.000	22.406	40.1	225	Circular_Default Sewer Type	90.484	89.059	1.200	89.925	88.500	1.200
2.001	10.119	50.6	225	Circular_Default Sewer Type	89.925	88.500	1.200	89.798	88.300	1.273
2.002	10.302	238.0	300	Circular_Default Sewer Type	89.798	88.225	1.273	89.861	88.182	1.379
2.003	21.298	95.1	375	Circular_Default Sewer Type	89.861	88.107	1.379	90.106	87.883	1.848

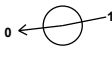
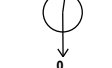
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	202	1200	Manhole	Adoptable	204	1200	Manhole	Adoptable
1.001	204	1200	Manhole	Adoptable	206	1200	Manhole	Adoptable
1.002	206	1200	Manhole	Adoptable	208	1200	Manhole	Adoptable
1.003	208	1200	Manhole	Adoptable	210	1200	Manhole	Adoptable
1.004	210	1200	Manhole	Adoptable	212	1350	Manhole	Adoptable
1.005	212	1350	Manhole	Adoptable	214	1350	Manhole	Adoptable
1.006	214	1350	Manhole	Adoptable	216	1800	Manhole	Adoptable
2.000	228	1200	Manhole	Adoptable	230	1200	Manhole	Adoptable
2.001	230	1200	Manhole	Adoptable	232	1200	Manhole	Adoptable
2.002	232	1200	Manhole	Adoptable	234	1350	Manhole	Adoptable
2.003	234	1350	Manhole	Adoptable	216	1800	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.007	72.848	498.7	750	Circular_Default Sewer Type	90.106	87.508	1.848	89.124	87.362	1.012
1.008	11.503	500.0	750	Circular_Default Sewer Type	89.124	87.362	1.012	88.600	87.339	0.511
1.010	7.814	10.0	750	Circular_Default Sewer Type	88.600	87.300	0.550	89.050	86.519	1.781
1.011	46.948	57.3	225	Circular_Default Sewer Type	89.050	86.519	2.306	86.500	85.700	0.575

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.007	216	1800	Manhole	Adoptable	218	1800	Manhole	Adoptable
1.008	218	1800	Manhole	Adoptable	220		Junction	
1.010	220A		Junction		222	3000	Manhole	Adoptable
1.011	222	3000	Manhole	Adoptable	224		Junction	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
202	407044.453	181318.275	91.273	1.425	1200				
						0	1.000	89.848	225
204	407032.482	181324.816	91.626	1.935	1200		1	1.000	89.766
						0	1.001	89.691	300
206	406997.810	181317.952	92.338	2.796	1200		1	1.001	89.542
						0	1.002	89.542	300
208	406966.868	181314.393	91.880	2.469	1200		1	1.002	89.411
						0	1.003	89.411	300
210	406959.492	181308.296	91.631	2.335	1200		1	1.003	89.371
						0	1.004	89.296	375
212	406957.999	181297.803	91.358	2.100	1350		1	1.004	89.258
						0	1.005	89.258	375
214	406958.320	181258.015	90.403	1.603	1350		1	1.005	88.800
						0	1.006	88.800	375
228	407034.757	181285.564	90.484	1.425	1200		0	2.000	89.059
						0	2.000	89.059	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
230	407019.719	181268.954	89.925	1.425	1200		1	2.000	88.500	225
							0	2.001	88.500	225
232	407011.879	181262.557	89.798	1.573	1200		1	2.001	88.300	225
							0	2.002	88.225	300
234	407002.243	181258.912	89.861	1.754	1350		1	2.002	88.182	300
							0	2.003	88.107	375
216	406980.961	181258.086	90.106	2.598	1800		1	2.003	87.883	375
							2	1.006	87.883	375
							0	1.007	87.508	750
218	406980.672	181185.239	89.124	1.762	1800		1	1.007	87.362	750
							0	1.008	87.362	750
220	406982.629	181173.904	88.600	1.261			1	1.008	87.339	750
220A	406997.148	181159.725	88.600	1.300			0	1.010	87.300	750
222	407002.502	181154.034	89.050	2.531	3000		1	1.010	86.519	750
							0	1.011	86.519	225
224	407029.220	181115.430	86.500	0.800			1	1.011	85.700	225

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Starting Level (m)
Rainfall Events	Singular	Skip Steady State	✓	Check Discharge Rate(s) x
Summer CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume x
Winter CV	1.000	Additional Storage (m³/ha)	0.0	

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	45	0	0

Node 222 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	86.519	Product Number	CTL-SHE-0078-3500-1781-3500
Design Depth (m)	1.781	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	3.5	Min Node Diameter (mm)	1200

Node 222 Online Weir Control

Flap Valve	x	Invert Level (m)	88.300	Discharge Coefficient	0.590
Replaces Downstream Link	x	Width (m)	3.000		

Node 220A Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	20.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	87.300	Main Channel Slope (1:X)	525.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.025

Inlets

220

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	568.0	568.0	0.500	814.0	818.3	1.000	1235.0	1243.1	1.300	1458.0	1469.5

Node 218 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	87.450
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	452.0	452.0	0.800	452.0	512.3	0.801	0.0	512.3

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.47%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	202	10	89.890	0.042	2.9	0.0472	0.0000	OK
15 minute summer	204	10	89.771	0.080	11.0	0.0901	0.0000	OK
15 minute summer	206	10	89.629	0.087	13.2	0.0988	0.0000	OK
15 minute summer	208	11	89.506	0.095	13.7	0.1072	0.0000	OK
15 minute summer	210	10	89.421	0.125	28.2	0.1417	0.0000	OK
15 minute summer	212	10	89.358	0.100	31.3	0.1425	0.0000	OK
15 minute summer	214	11	88.883	0.083	40.8	0.1183	0.0000	OK
15 minute summer	228	10	89.105	0.046	7.7	0.0524	0.0000	OK
15 minute summer	230	10	88.553	0.053	8.1	0.0599	0.0000	OK
15 minute summer	232	10	88.307	0.082	10.6	0.0930	0.0000	OK
15 minute summer	234	10	88.206	0.099	29.1	0.1420	0.0000	OK
15 minute summer	216	10	87.702	0.194	83.4	0.4932	0.0000	OK
480 minute winter	218	464	87.515	0.153	17.8	28.6283	0.0000	OK
480 minute winter	220	456	87.515	0.176	16.2	0.0000	0.0000	OK
480 minute winter	220A	472	87.516	0.216	69.3	0.0000	0.0000	OK
600 minute winter	222	585	87.532	1.013	57.6	7.1625	0.0000	SURCHARGED
15 minute summer	224	1	85.925	0.225	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	202	1.000	204	2.9	0.583	0.072	0.0677	
15 minute summer	204	1.001	206	11.0	0.691	0.154	0.5650	
15 minute summer	206	1.002	208	12.8	0.726	0.178	0.5559	
15 minute summer	208	1.003	210	13.8	0.758	0.192	0.1738	
15 minute summer	210	1.004	212	27.9	1.006	0.234	0.2946	
15 minute summer	212	1.005	214	30.7	1.495	0.143	0.8213	
15 minute summer	214	1.006	216	40.4	2.315	0.100	0.3948	
15 minute summer	228	2.000	230	7.7	1.195	0.093	0.1454	
15 minute summer	230	2.001	232	8.1	1.181	0.110	0.0694	
15 minute summer	232	2.002	234	10.6	0.706	0.147	0.1541	
15 minute summer	234	2.003	216	29.0	1.291	0.141	0.4777	
15 minute summer	216	1.007	218	83.2	1.243	0.151	4.9851	
480 minute winter	218	1.008	220	16.2	1.311	0.029	0.8234	
480 minute winter	220	Flow through Pond	220A	15.4	0.022	0.000	121.0183	
480 minute winter	220A	1.010	222	52.9	0.464	0.013	2.1276	
600 minute winter	222	1.011	224	0.0	0.000	0.000	0.9328	0.0
600 minute winter	222	Hydro-Brake®	224	2.8				122.7

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.33%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	202	10	89.937	0.089	11.9	0.1002	0.0000	OK
15 minute summer	204	10	89.871	0.180	45.0	0.2031	0.0000	OK
15 minute summer	206	10	89.748	0.206	54.0	0.2333	0.0000	OK
15 minute summer	208	10	89.643	0.232	56.6	0.2625	0.0000	OK
15 minute summer	210	10	89.585	0.289	119.8	0.3274	0.0000	OK
15 minute summer	212	10	89.486	0.228	132.8	0.3257	0.0000	OK
15 minute summer	214	10	88.989	0.189	174.3	0.2702	0.0000	OK
15 minute summer	228	10	89.157	0.098	31.5	0.1108	0.0000	OK
15 minute summer	230	10	88.618	0.118	33.1	0.1334	0.0000	OK
15 minute summer	232	10	88.408	0.183	43.4	0.2073	0.0000	OK
15 minute summer	234	10	88.333	0.226	118.9	0.3228	0.0000	OK
15 minute summer	216	10	87.911	0.403	351.7	1.0260	0.0000	OK
960 minute winter	218	945	87.853	0.491	28.3	174.6661	0.0000	OK
960 minute winter	220	945	87.853	0.514	20.1	0.0000	0.0000	OK
960 minute winter	220A	945	87.853	0.553	62.1	0.0000	0.0000	OK
960 minute winter	222	930	87.855	1.336	46.9	9.4417	0.0000	SURCHARGED
15 minute summer	224	1	85.925	0.225	0.0	0.0000	0.0000	OK

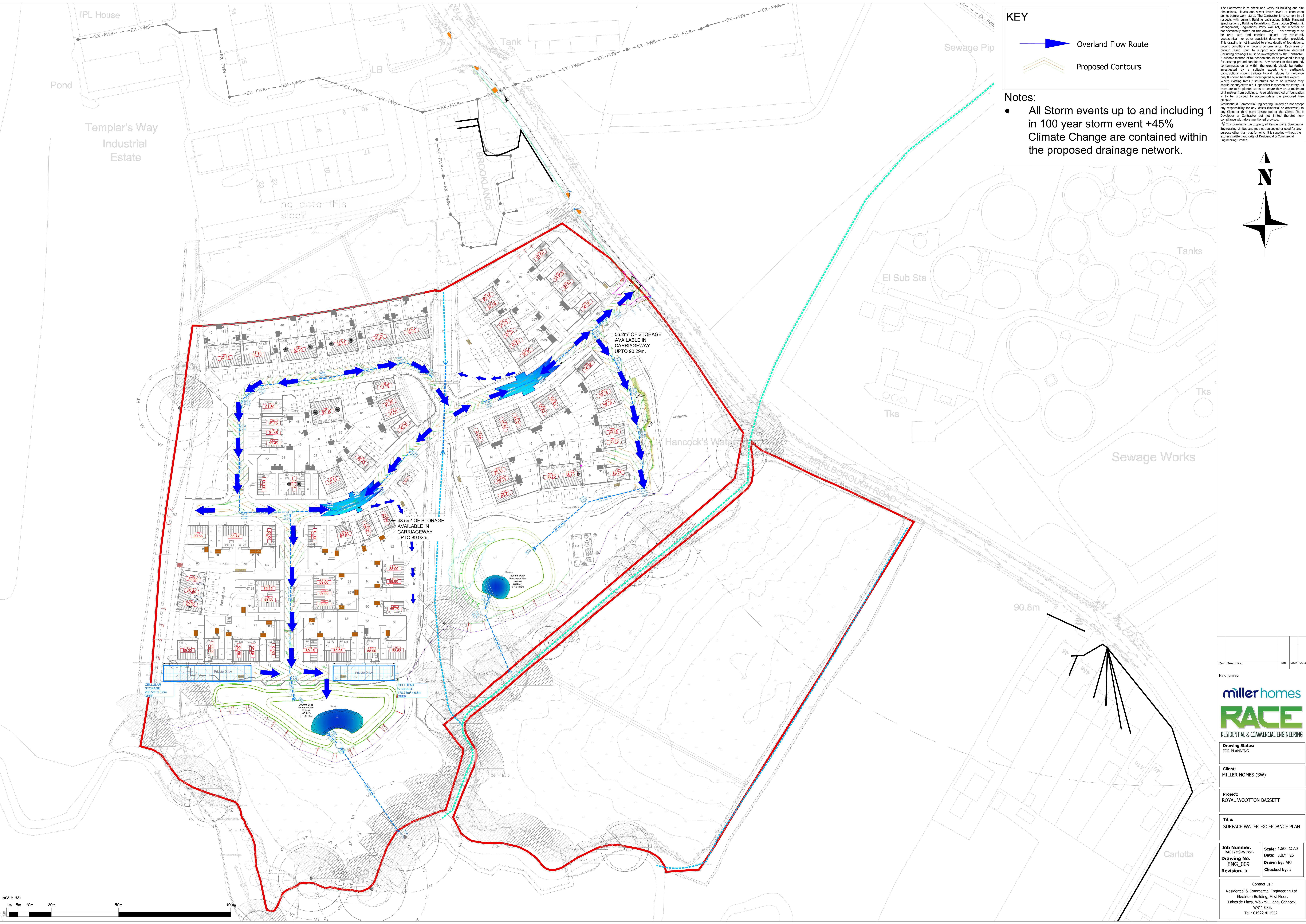
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	202	1.000	204	11.9	0.763	0.297	0.2221	
15 minute summer	204	1.001	206	45.2	0.948	0.630	1.6907	
15 minute summer	206	1.002	208	52.5	0.958	0.732	1.7152	
15 minute summer	208	1.003	210	57.4	1.085	0.802	0.5377	
15 minute summer	210	1.004	212	118.8	1.466	0.996	0.8547	
15 minute summer	212	1.005	214	131.4	2.113	0.612	2.4975	
15 minute summer	214	1.006	216	172.2	3.327	0.426	1.1725	
15 minute summer	228	2.000	230	31.5	1.674	0.382	0.4217	
15 minute summer	230	2.001	232	33.1	1.656	0.452	0.2021	
15 minute summer	232	2.002	234	43.5	1.040	0.607	0.4310	
15 minute summer	234	2.003	216	119.0	1.836	0.580	1.3794	
15 minute summer	216	1.007	218	348.8	1.914	0.634	14.1382	
960 minute winter	218	1.008	220	17.2	1.069	0.031	3.6095	
960 minute winter	220	Flow through Pond	220A	15.8	0.019	0.000	374.1353	
960 minute winter	220A	1.010	222	-53.1	0.360	-0.014	3.0805	
960 minute winter	222	1.011	224	0.0	0.000	0.000	0.9328	0.0
960 minute winter	222	Hydro-Brake®	224	3.1				196.2

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 95.10%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	202	11	90.587	0.739	22.3	0.8362	0.0000	SURCHARGED
15 minute summer	204	11	90.554	0.863	80.3	0.9760	0.0000	SURCHARGED
15 minute summer	206	11	90.354	0.812	91.4	0.9180	0.0000	SURCHARGED
15 minute summer	208	10	90.087	0.676	98.9	0.7649	0.0000	SURCHARGED
15 minute summer	210	10	89.973	0.677	212.9	0.7655	0.0000	SURCHARGED
15 minute summer	212	10	89.758	0.500	236.0	0.7160	0.0000	SURCHARGED
15 minute summer	214	10	89.084	0.284	308.5	0.4064	0.0000	OK
15 minute summer	228	10	89.217	0.158	59.0	0.1792	0.0000	OK
15 minute summer	230	10	88.852	0.352	61.3	0.3987	0.0000	SURCHARGED
15 minute summer	232	10	88.657	0.432	78.4	0.4886	0.0000	SURCHARGED
15 minute summer	234	10	88.572	0.465	218.9	0.6650	0.0000	SURCHARGED
2160 minute winter	216	2100	88.294	0.786	18.5	2.0004	0.0000	SURCHARGED
2160 minute winter	218	2100	88.294	0.932	27.0	346.3218	0.0000	SURCHARGED
2160 minute winter	220	2100	88.294	0.955	18.0	0.0000	0.0000	OK
2160 minute winter	220A	2100	88.294	0.994	45.3	0.0000	0.0000	SURCHARGED
2160 minute winter	222	2100	88.294	1.775	43.9	12.5490	0.0000	SURCHARGED
15 minute summer	224	1	85.925	0.225	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	202	1.000	204	23.1	0.745	0.577	0.5425	
15 minute summer	204	1.001	206	76.1	1.081	1.062	2.4890	
15 minute summer	206	1.002	208	92.5	1.313	1.289	2.1933	
15 minute summer	208	1.003	210	101.3	1.439	1.416	0.6739	
15 minute summer	210	1.004	212	209.9	1.903	1.760	1.1690	
15 minute summer	212	1.005	214	231.0	2.383	1.075	3.9759	
15 minute summer	214	1.006	216	302.7	3.724	0.749	1.8477	
15 minute summer	228	2.000	230	58.4	1.807	0.708	0.7803	
15 minute summer	230	2.001	232	59.9	1.656	0.817	0.4024	
15 minute summer	232	2.002	234	78.2	1.140	1.091	0.7255	
15 minute summer	234	2.003	216	218.0	1.991	1.062	2.2804	
2160 minute winter	216	1.007	218	17.9	0.320	0.032	32.0619	
2160 minute winter	218	1.008	220	18.0	1.031	0.033	5.0627	
2160 minute winter	220	Flow through Pond	220A	17.0	0.013	0.000	827.8024	
2160 minute winter	220A	1.010	222	43.9	0.177	0.011	3.4391	
2160 minute winter	222	1.011	224	0.0	0.000	0.000	0.9328	0.0
2160 minute winter	222	Hydro-Brake®	224	3.5				427.3

APPENDIX D – Surface Water Exceedance Plan



KEY

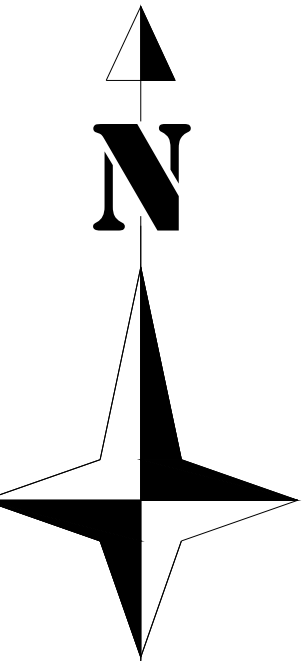
Overland Flow Route

Proposed Contours

Notes:

- All Storm events up to and including 1 in 100 year storm event +45% Climate Change are contained within the proposed drainage network.

The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work starts. The Contractor is to comply in all respects with current Building Legislation, British Standard Specifications, Building Regulations, Construction (Design & Management) Regulations, Party Wall Act, etc. whether or not specifically stated on this drawing. This drawing must be read with and checked against any structural, geotechnical or other specialist documentation provided. This drawing is not intended to show details of foundations, ground conditions or ground contaminants. Each area of ground relied upon to support any structure depicted (including drainage) must be investigated by the Contractor. A suitable method of foundation should be provided allowing for existing ground conditions. Any suspect or fluid ground, contaminants on or within the ground, should be further investigated by a suitable expert. Any earthwork constructions shown indicate typical slopes for guidance only & should be further investigated by a suitable expert. Where existing trees / structures are to be retained they should be subject to a full specialist inspection for safety. All trees are to be planted so as to ensure they are a minimum of 5 metres from buildings. A suitable method of foundation is to be provided to accommodate the proposed tree planting. Residential & Commercial Engineering Limited do not accept any responsibility for any losses (financial or otherwise) to any Client or third party arising out of the Client (or its Developer or Contractor but not limited thereto) non-compliance with above mentioned provisions. © This drawing is the property of Residential & Commercial Engineering Limited and may not be copied or used for any purpose other than that for which it is supplied without the express written authority of Residential & Commercial Engineering Limited.



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Title:				
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Job Number:				
RACE/MSW/RWB				
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