Flood Risk Assessment & Sustainable Drainage Strategy

For the Proposed Development on Land

South of Roman Road, Mouton Chapel, PE12 0XQ

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Flood Risk Assessment & Sustainable Drainage Strategy
For the Proposed Development on Land
South of Roman Road, Mouton Chapel, PE12 0XQ

1 Introduction

1.1 MTC Engineering (Cambridge) Limited has been asked to provide a Flood Risk Assessment and Drainage Strategy for the proposed development South of Roman Road, Moulton Chapel on behalf of Postland Developments.

1.2 This Drainage Strategy is based on the following information: -

1.2.1 Site layout by B M Design Consultancy;

1.2.2 Site survey by Axis Surveys Ltd;

1.2.3 Environment Agency Modelled Flood Data.

1.2.4 Flood Risk Assessment completed by Drainage Engineer Stuart Hemmings;

1.2.5 Lincolnshire SuDS Design Guide;

1.2.6 British Geological Survey information.

1.3 All the comments and opinions contained in this report including any conclusions are based on the information available to MTC Engineering (Cambridge) Limited during our investigations. The conclusions drawn could therefore differ if the information is found to be inaccurate, incomplete or misleading. MTC Engineering (Cambridge) Limited accept no liability should this prove to be the case, nor if additional information exists or becomes available with respect to this site.

1.4 MTC Engineering (Cambridge) Limited makes no representation whatsoever concerning the legal significance of its findings or any other matters referred to in the following report. Except as otherwise requested by the client, MTC Engineering (Cambridge) Limited are not obliged and disclaim any obligation to update the report for events taking place after the Assessment was undertaken.

1.5 This report is a Flood Risk Assessment and Sustainable Drainage Strategy relating to flooding and drainage issues associated with the proposed development. The information presented and conclusions drawn are based on statistical data and are for guidance purposes only. This report provides no guarantee against flooding of the study site or elsewhere, nor as to the absolute accuracy of water levels, flow rates and associated probabilities quoted.

2 Site Description

2.1 The site is located on the southern side Mouton Chapel approximately 6 kilometers from the Centre of Spalding. A copy of the site location plan is provided in Appendix 1.

2.2 To the north the site is bounded by existing residential development off Roman Road, then a mixture of residential development to the northwest and agricultural land to the northeast.

2.3 To the east the site is bounded by small drain which runs in a southerly direction to join the network of South Holland IDB maintained Watercourses located to the southeast of the site. Further east is residential development and associated garden space of Cekhira Avenue.

2.4 To the south the site is bounded by the remainder of the agricultural field in which the site is it located, then a small drain which runs east to join to drain along the eastern boundary, past which further open agricultural land.

2.5 To the west the site is bounded by the remainder of the agricultural field in which the site is located, past which is residential development off Woodgate Road.

2.6 The site is currently formed of undeveloped grassland, the majority of which falls steadily in a southernly direction from levels of between 2.9m above Ordnance Datum (AOD) in the north, to levels of 2.6m am AOD along the southern boundary.

2.7 Other than the small drain along the eastern boundary and drain to the south of the site as detailed above there are no significant surface water features in the vicinity of the site, with the River Wellend being the closest significant surface water feature. This runs in a northerly direction approximately 4.3km to the west of the site.

2.8 Anglian Water Asset Mapping (Appendix 2) shows two Anglian Water foul water sewers to be present in the vicinity of the site, the first being a 150mm diameter gravity

system which runs southeast through the northeastern corner of the site to a public pumping station just east of the site. The second foul system is a 100mm diameter foul rising main which runs northwest from the pumping station to join the a rising main on Roman Road.

2.9 British Geological Survey Mapping shows the site to be underlain by a bedrock geology of the Oxford Clay Formation, mudstone, with a superficial geology of Tidal Flat Deposits of Clay and Silt also present.

2.10 A ground investigation has been undertaken with infiltration testing in line with BRE365 carried out at the site, with a copy of the test report, trial pit logs and test provided in Appendix 3.

2.11 A 1.8m deep trial hole was excavated and showed the site to be underlain by silt and ground water was found at a depth of 1.75m.

2.12 A second hole was excavated to a depth of 930mm and a percolation test was carried out. The rate of fall of the water was very small. The percolation rate was calculated to be 2.09 x 10-6 m/s. As such soakaway drainage systems are not considered a suitable means of surface water discharge at the development.

2.13 It is considered that surface water drainage from the site is currently to the drain via run off and through flow, with little in the way of loss through infiltration.

3 Sources of Potential Flood Risk

3.1 In accordance with The National Planning Policy Framework all forms of flood risk need to be considered in relation to any development.

3.2 The first form of flood risk to be considered in respect of The National Planning Policy Framework is fluvial flooding, whilst the second form of flood risk to be considered is tidal flooding.

3.3 The first significant source of either fluvial or tidal flood risk to the site is from the River Wellend, which is approximately 4.3km to the west of the site at its closest point, and is tidal at this point thus in this instance it's considered appropriate to consider both fluvial and tidal risks arising from the River Wellend together.

3.4 The Environment Agency Flood Map for Planning (Appendix 4) shows the site to lie almost entirely in Flood Zone 1 but indicates that the most western part of the site lies in a small isolated patch of Flood Zone 2 that is entirely enclosed by the Flood Zone 1 extent.

3.5 The Environment Agency Flood Map in this location is based on predicted water levels in the low lying land in the large area in which flooding would occur should water come out of bank of the River Wellend or any fluvial/tidal storage reservoir. This has simply been applied to any land at or below the modelled water level in the wider area without consideration for surrounding land with higher levels.

3.6 This is partly due to the network of drains that would allow water to propagate through the area and reach low lying land across a wide area. Whilst this is a generally sound method, it can lead to some errors occurring where low spots that do not have drains running through them are completely surrounded by higher land and would therefore not actually flood are incorrectly indicated as at risk of flooding. In this instance, given that the Flood Zone 2 extent is an isolated patch within a field enclosed entirely by the Flood Zone 1 extent and not connected to a drain it is reasonable to assume that this

area would not actually flood during a 1 in 1000 year event and the site should in fact be considered as being located entirely within Flood Zone 1.

3.7 There is a minor flood risk associated with the drain along the eastern boundary of the site, particularly in the event of a blockage. Should this occur water may flow in a southerly direction across the site and either re-enter the drain downstream of the blockage or continue south to enter the drain to the south of the site. This drain has no significant catchment thus any flows would be low and would not have any significant impact upon the site.

3.8 There are no further significant watercourses in the vicinity of the site that are considered to pose any significant fluvial flood risk to the site and the overall risk of fluvial/tidal flooding is considered to be low.

3.9 The third form of flood risk to be considered in respect of The National Planning Policy Framework is flooding from land.

3.10 Intense rainfall, often of short duration, that is unable to soak into the ground or enter drainage systems can quickly run off land and result in local flooding. In developed areas, this flood water can be polluted with domestic sewage with foul sewer surcharge and overflow. Local topography and built form can have a strong influence on the direction and depth of flow. The design of development down to a micro level can influence or exacerbate this. Overland flow paths need to be taken into account in development to minimise the risk of flooding from overland flow.

3.11 Land to the south and east of the site is lower than the site thus overland flow would not come onto site from these directions, whilst in any event the drains to the east and south would channel flow in a southerly and easterly direction away from the site.

3.12 Land to the north and west of the site is largely permeable agricultural land where significant flows are unlikely to develop, whilst the small area of development associated with Moulton Chapel to the north and west would have a drainage system

present and it is unlikely that any significant flow would develop towards the site from these areas.

3.13 This is confirmed by the Environment Agency Surface Water Flood Risk Map which indicates the site to be at a very low risk of flooding from surface water.

3.14 The fourth form of flood risk to be considered in accordance with The National Planning Policy Framework is flooding from rising groundwater.

3.15 Groundwater flooding occurs when water levels in the ground rise above surface elevations. It is most likely to occur in low lying areas underlain by permeable rocks (aquifers). These may be extensive, regional aquifers, such as chalk or sandstone, or may be localised sands and river gravels in valley bottoms underlain by less permeable rocks. Water levels below the ground rise during wet winter months, and fall again in the summer as water flows out into rivers. In very wet winters, rising water levels may lead to the flooding of normally dry land.

3.16 British Geological Survey Mapping indicates the site to be underlain by Oxford Clay Formation, mudstone, with a superficial geology of Tidal Flat Deposits of Clay and Silt also present.

3.17 The bedrock clay geology is generally a low permeability geology that does not have significant ground water present, however the superficial geology of Tidal Flat Deposits may have ground water present. The ground investigation conducted at the site (Appendix 3) confirmed ground water to be present approximately 1.75m below ground level, however it is anticipated that any outflow of ground water would be directly to the adjacent drain.

3.18 It is unlikely that any outflow of ground water would occur on the site itself under any circumstance and the overall risk of flooding from rising groundwater levels is considered to be low.

3.19 The fifth form of flood risk to be considered in accordance with the National Planning Policy Framework is the risk of flooding from blocked, overloaded, or burst sewers and water mains.

3.20 Should the foul sewers running through the northeastern corner of the site become blocked or overloaded water would flow south across the site to the drain to the south without having any significant impact upon the site itself.

3.21 The overall risk of flooding from blocked, overloaded or burst sewers or water mains in therefore considered to be low.

3.22 The last form of flood risk to be considered in accordance with the National Planning Policy Framework is flooding from reservoirs, canals or other artificial sources.

3.23 There are no significant artificial sources of flood risk in the vicinity of the site and it is not considered that the site is at any significant risk of flooding from any artificial source.

4 The Proposal

4.1 The proposal involves the development of 58 new dwellings along with associated access and parking areas on land on land South of Roman Road, Moulton Chapel, as shown on the layout provided in Appendix 5.

4.2 As detailed in Section 3, the site is at a low risk of flooding by any means, thus it is not considered that either the setting of minimum floor levels on flood related grounds or the specification of flood resistant or resilient construction measures is required.

4.3 General good practice will also be followed during the detailed design phase with finished external levels designed to ensure that flow paths are available between buildings and that the finished floor levels set sufficiently above adjacent ground levels to ensure that water will not pond in the vicinity of access points or enter the buildings under any circumstances.

4.4 Drainage areas based upon the current layout are shown on the impermeable area plan provided in Appendix 6 and are as follows:

- Roof areas: Approximately 5,110m^2
- Adoptable highway area: Approximately 3,895m^2
- Private parking areas: Approximately 3,060m^2

4.5 To deal with surface water runoff from these areas the Surface Water Drainage Strategy detailed in Section 4 has been developed in compliance with current relevant local and national guidance. Full detailed design is to be completed in line with this strategy and submitted for approval once conditional planning permission is granted.

5 Sustainable Drainage Strategy

5.1 In line with the surface water drainage hierarchy, the preferable means of disposal for surface water is via infiltration or re-use. However, the site is underlain by a bedrock geology of the West Walton Formation and Ampthill Clay Formation, which has a low permeability, thus infiltration systems are not considered to provide a feasible method of draining surface water from the site in this instance. This has been confirmed by on site infiltration testing with confirmation of low permeability and high water table present on site.

5.2 The second preferable method of discharge in line with the drainage hierarchy is discharge to a surface watercourse. Discharge from the site will therefore be made to the drain along the eastern boundary of the site which then discharges to the South Holland Drainage Board network.

5.3 Further details relating to the proposed discharge rates, attenuation volumes, sustainable drainage systems, pollution treatment, and the future management and maintenance of systems are provided in the following sections.

5.4 Proposed Discharge Rates and Attenuation Volumes

5.4.2 The site is currently completely permeable, however based upon the indicative layout post development the access, parking and unit roof areas of the development will occupy an area of approximately 1.23Ha in total. Micro Drainage calculations (Appendix 7) show the 1 in 1-year greenfield discharge rate from the site to be 5.0 litres per second (l/s), rising to 5.0l/s during a 1 in 30 year event and 10.9l/s during a 1 in 100 year event. The QBAR discharge rate is 4.9l/s.

5.4.3 SuDS Design Guidance requires the post development discharge rate from the site to be limited to the QBAR greenfield run off rate during all rainfall events up to and including a 1 in 100 year plus climate change event where feasible.

5.4.4 Post development discharge rates will therefore be restricted to the QBAR discharge rate of 5.0l/s during all events up to and including a 1 in 100 year plus 40% climate change rainfall event.

5.4.5 Micro Drainage calculations (Appendix 8) indicate that to restrict discharge from an impermeable area of 1.230Ha to a maximum discharge rate of 5.0l/s during a 1 in 100 year plus 40% climate change event will require an attenuation volume of 790.2m^3 provided at the development.

5.5 SuDS Systems Proposed at the Development and Attenuation Volumes

5.5.1 A range of SuDS systems have been considered in relation to the proposed development at an early stage.

5.5.2 Living/green roof systems are a preferred SuDS technique, given that they are a flood reduction measure, reduce pollution through filtration and provide landscape and wildlife benefits. The design of the structures, which will have light pitched roof systems, will however mean that green roofs cannot be provided in this instance.

5.5.3 Basin and ponds are considered a preferred SuDS feature as they provide both a flood and pollution reduction measure along with landscape and wildlife benefits.

5.5.4 Four ponds/basins/swales will be provided at the proposed development. The first of which will be located in the area of open space on site, as shown on the indicative drainage layout provided in Appendix 9.

5.5.5 This will be a landscaped feature allowing pollution treatment to take place via settlement and adsorption. Assuming a base area of 110m^2 with side slopes of 1 in 3 to a design depth of 1m the pond will be able to provide approximately 210m^3 of attenuation.

5.5.6 A Swale will be provided along the southwestern boundary of the site and will convey surface water runoff from the northern section of main access road to the detention basins located in the area of public open space.

5.5.7 Two detention basins/swale systems will then be provided in the area of public open space in the southern area of the site to which all impermeable areas on site will drain to prior to discharge at a controlled rate.

5.5.8 The southwestern detention basin has a base area 260m^2 and will provide an attenuation volume of 510m^3 based upon a side slope of 1 in 3 to a design depth of 1m.

5.5.9 The southeastern detention basin has a base area 280m^2 and will provide an attenuation volume of 640m^3 based upon a side slope of 1 in 3 to a design depth of 1.2m.

5.5.10 All surface water will drain through the pond and swales, with a flow control structure (most likely a hydrobrake) located on the eastern side of this to restrict discharge from the site to a maximum rate of 5.0l/s during all rainfall events up to and including a 1 in 100 year plus 40% climate change rainfall event.

5.5.11 Permeable paving is a SuDS feature that is appropriate to use at most developments, including the proposed development and provides both a flood reduction benefit due to the attenuation provided in the base and a pollution reduction benefit due to the filtration of water as it passes through the permeable surfacing.

5.5.12 Permeable paving will therefore be provided where it is structurally feasible, thus on the areas of car parking at the proposed development that will not be subject to HGV loading. Discharge from roof areas (which is relatively clean discharge) will be drained to the base of the permeable paved areas prior to discharge to the pond.

5.5.13 The main access road is to be impermeably surfaced for structural reasons, thus will drain via a conventional drainage systems with appropriate pollution measures (such as trapped gullies/smart sponges) to the pond and swale system located in the northeastern corner of the site.

5.5.14 Using a base material with a minimum void space of 30% and thickness of 300mm the permeable paving will provide 0.09m^3 of attenuation per 1m^2. The area of private and shared parking to be permeably paved is 3060m^2 this will provide approximately 275.4m^3 of attenuation.

5.5.15 Large diameter pipe, tank and storm cells system are considered to be the least sustainable/preferred SuDs system given that they solely provide a flood reduction system without providing either pollution reduction or landscape and wildlife benefits, and will therefore only be used when absolutely necessary for conveyance.

5.6 SuDS Treatment Stages

5.6.1 All surface water will receive an appropriate level of treatment in line with requirements prior to discharge to the South Holland Drainage Board system.

5.6.2 Drainage from all parking areas will initially be through permeable paving which provides a filtration system removing pollutants such as hydrocarbons and provides the first treatment stage for drainage from all lightly trafficked areas.

5.6.3 A second treatment stage will then be provided by filtration through the membrane (such as terram) in which the storage beneath will be wrapped, removing further pollutants from discharge and ensuring that surface water from these areas is suitably rerated in line with requirements prior to discharge.

5.6.4 Surface water from roof areas is considered clean discharge, thus only requires one treatment stage drainage will be through the base of the permeable paved areas, thus a treatment stage will be provided by filtration through the membrane in which the storage beneath will be wrapped.

5.6.5 Discharge from the main access road and yard areas which will be impermeable for structural reasons will be through conventional drainage systems incorporating features such as smart sponges located within gullies or trapped gullies absorbing pollutants such as hydrocarbons and oils to ensure discharge is adequately treated.

5.6.6 The balancing pond will then provide an area in which settlement and adsorption can take place prior to discharge to the adjacent South Holland Drainage Board Drain, and will provide an additional treatment stage to all surface water discharge from the site, ensuring discharge is treated to above minimum required levels.

5.6.7 Appropriate treatment will therefore be provided to all surface water discharge from the proposed development.

5.7 **Future Maintenance of SuDS Systems**

5.7.1 Several bodies will be responsible for various aspects of the proposed surface water drainage system to be provided at the development as detailed below.

5.7.2 All carriageways will be offered to the Local Highway Authority for adoption subject to a Section 38 Agreement. Surface water drainage systems for the adoptable highway will be located either in the highway itself or in adjacent public open space and will be adopted either by the Local Highways Authority or Local Water Authority as appropriate.

5.7.3 Drainage systems in communal areas of the development such as shared private driveways will be the responsibility of the management company set up to maintain all communal areas of the development.

5.7.4 Drainage systems serving single dwellings only will be the responsibility of the dwelling owner to maintain.

5.7.5 A full maintenance plan for the SuDS and drainage systems used at the proposed development will be provided at the detailed design phase to ensure that the owner is aware of all maintenance requirements, schedules and responsibilities.

5.8 This Sustainable Drainage Strategy provides sufficient information in relation to the use of SuDS at the development at an early stage, with the principles established and indicative area and attenuation volumes required to be refined as a detailed application is developed. It has been adequately demonstrated that the site can be developed without increasing the offsite risk of flooding and that there are no flood risk or drainage grounds on which to object to the proposed development.

5.9 Full detailed design of surface water drainage systems will only take place once conditional planning approval has been granted, however the final detailed design will be based upon this Sustainable Drainage Strategy and designed to accommodate all

rainfall events up to a 1 in 100 year plus 40% climate change event whilst restricting discharge to the greenfield 1 in 1 year rate of 5.0l/s.

6 Conclusion

6.1 The proposal involves the development of 58 new dwellings along with associated access and parking areas on land on land South of Roman Road, Moulton Chapel, as shown on the layout provided in Appendix 3.

6.2 The site is considered to lie entirely in Flood Zone 1 and as detailed in Section 3 is considered to be at a low risk of flooding by any means. No specific flood resistant or resilient construction methods are required. Good practice will however be followed when setting floor levels relative to external levels to ensure that ponding of water in the vicinity of access points will not occur under any circumstances.

6.3 In line with the National Planning Policy Framework the residential development is considered a “more vulnerable” development. This type of development is appropriate in Flood Zone 1 without the need to apply the Exception Test, whilst in Flood Zone 1 the Sequential Test is automatically passed.

6.4 Surface water drainage from the proposed development will discharge via an existing riparian drain with an eventual discharge to the South Holland IDB system along the eastern boundary with discharge rates restricted to the existing QBAR discharge rate of 5.0l/s by means of attenuation and a flow control, which will be designed to accommodate a 1 in 100 year plus 40% climate change event.

6.5 Surface water drainage from the site will be via a new SuDS system that will include:

- A landscaped basin that will be used to provide a landscape/wildlife benefit whilst allowing settlement and adsorption to reduce pollution prior to discharge.
- Permeable paving that will provide a treatment system by filtration of water from lightly trafficked areas of the proposed development.

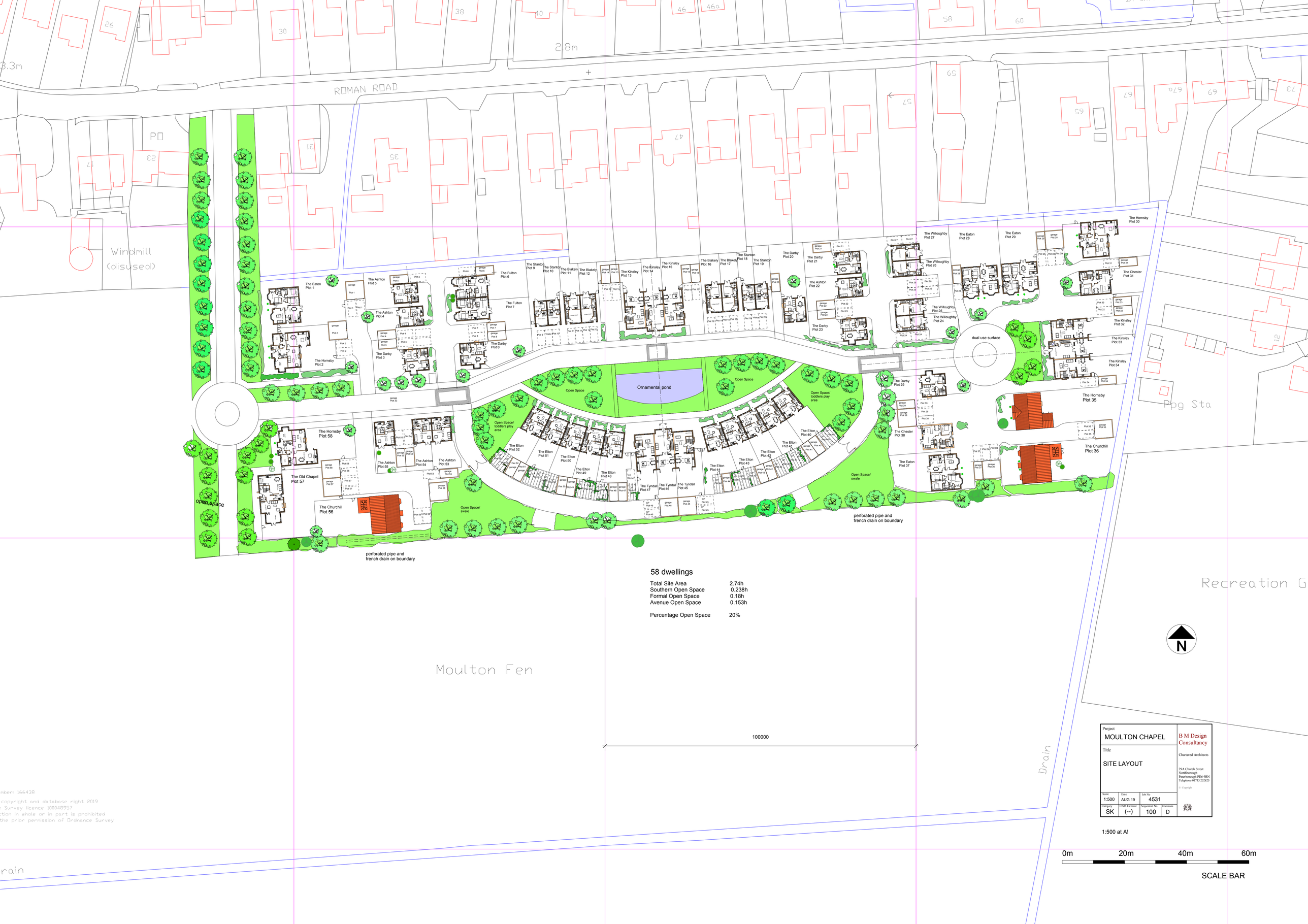
6.6 The Sustainable Drainage Strategy provided successfully demonstrates an available and workable solutions for managing surface water in accordance with applicable SuDS guidance exists, and it is therefore appropriate to apply a surface water drainage

condition to any planning approval granted requiring the final detailed drainage design to be undertaken once conditional planning approval has been granted.

6.7 There are no drainage related grounds under the National Planning Policy Framework on which to object to the proposed development of 58 new dwellings along with associated access and parking areas on land on land South of Roman Road, Moulton Chapel.

APPENDIX 1

SITE LOCATION PLAN



58 dwellings

Total Site Area	2.74h
Southern Open Space	0.238h
Formal Open Space	0.18h
Avenue Open Space	0.153h
Percentage Open Space	20%

mber: 166438
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Project				
MOULTON CHAPEL				B M Design Consultancy
Title				Chartered Architects
SITE LAYOUT				29A Church Street Northborough Peterborough PE6 9BN Telephone 01733 252823
				© Copyright
Scale 1:500	Date AUG 19	Job No 4531		
Category SK	CDB Element (--)	Sequential No 100	Revisions D	

1:500 at A!

0m 20m 40m 60m

SCALE BAR

APPENDIX 2

ANGLIAN WATER ASSET MAPPING

(c) Crown copyright and database rights 2019 Ordnance Survey 100022432 | Date: 07/10/19 | Scale: 1:1250 | Map Centre: 529535,318121 | Data updated: 01/10/19 | Our Ref: 336606 - 1 | Wastewater Plan A3

This plan is provided by Anglian Water pursuant its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. This plan is produced by Anglian Water Services Limited (c) Crown copyright and database rights 2019 Ordnance Survey 100022432.This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

Foul Sewer			
Surface Sewer	Outfall*	Sewage Treatment Works	
Combined Sewer			
Final Effluent	Inlet*	Public Pumping Station	
Rising Main*			
Private Sewer*	Manhole*	Decommissioned Pumping Station	
Decommissioned Sewer*			

*(Colour denotes effluent type)

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2351

love every drop anglianwater

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
2203	F	2.452	0.38	2.072
3001	F	2.88	-0.86	3.74
3101	F	2.87	-0.16	3.03
3102	F	2.79	-0.29	3.08
3103	F	2.68	-1.25	3.93
3202	F	2.53	0.3	2.23
3203	F	2.61	0.13	2.48
3204	F	3.07	-0.06	3.13
3901	F	2.83	-0.47	3.3
4201	F	2.95	1.45	1.5
4202	F	2.95	1.23	1.72
4203	F	3.16	0.84	2.32
4204	F	3.11	0.43	2.68
4205	F	-	-	-
5201	F	2.75	0.85	1.9
6201	F	2.85	-0.68	3.53
6202	F	2.82	-0.06	2.88
7202	F	2.63	-1.47	4.1
7203	F	2.81	-1.21	4.02

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

APPENDIX 3

INFILTRATION TESTING

RESULTS OF PERCOLATION TESTS

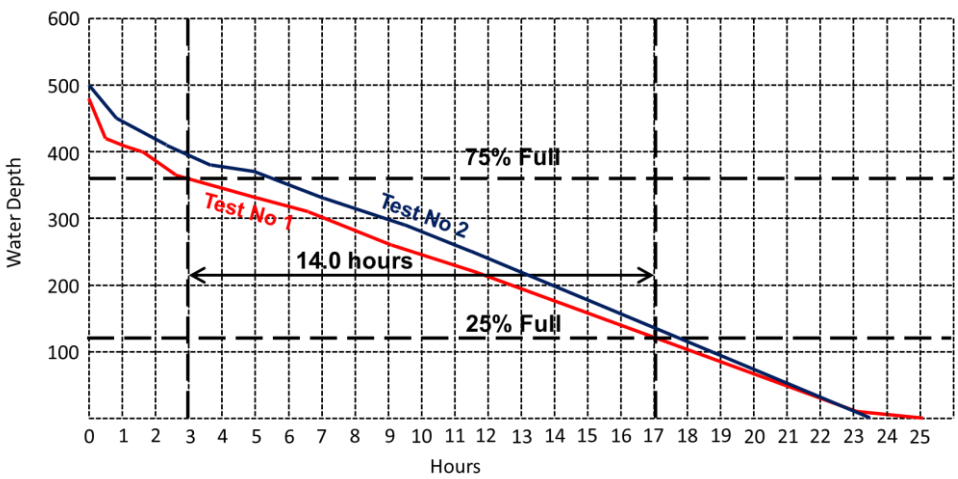
Results of test No 1 on

Hours	Time	Measurement mm	Water Depth
0.00	9.55am	450	480
0.50	10.25am	510	420
1.10	11.00am	522	408
1.60	11.30am	530	400
2.60	12.30pm	565	365
5.10	3.00pm	600	330
6.60	4.30pm	620	310
9.10	7.00pm	670	260
11.60	9.30pm	710	220
23.10	9.00am	920	10
25.10	11.00am	930	0

Results of test No 2 on

Hours	Time	Measurement mm	Water Depth
0.00	8.55am	500	500
0.50	9.45am	550	450
1.10	11.15am	590	410
1.60	12.35pm	620	380
2.60	1.55pm	630	370
5.10	4.00pm	670	330
6.60	6.25pm	710	290
9.10	8.25pm	750	250
25.10	8.30am	1000	0

Graph of Water Level and Time



CALCULATION OF SOIL INFILTRATION RATE

On 11th July 2016 a trial hole was excavated to assess the depth of the ground water table on the site. This was excavated to a depth of 1.8 metres when ground water started to enter the hole. The whole depth of the soil was found to be silty soil. On the same day a percolation tests was carried out on the site. In this test a 1.0m long x 600mm wide hole was excavated 930mm deep. This hole was filled to a depth of 480mm and water soaked away completely in 25 hours. Referring to the graph of the results the time taken to drain between 75% and 25% of the depth filled was 14 hours.

A second hole was excavated on 30th September 2016. This was also 1.0m long x 600mm wide and was 1000mm deep. This hole was filled to a depth of 500mm and water soaked away completely in 23 hours. This gave results similar to the first test.

The soil infiltration rate will be calculated as follows:

$$\text{Soil Infiltration Rate} = \frac{V_{p75\text{-}25}}{A_{p50} \times t_{p75\text{-}25}}$$

Volume outflowing between 75% and 25% effective depth:

$$V_{p75\text{-}25} = (0.36 - 0.12) \times 1.0 \times 0.6 = \underline{0.144 \text{ cu m}}$$

The mean surface area through which the outflow occurs, taken to be the pit sides to 50% effective depth and including the base of the pit:

$$A_{p50} = (1.0 \times 0.24 \times 2) + (0.6 \times 0.24 \times 2) + (1.0 \times 0.6) = \underline{1.368 \text{ s m}}$$

The time of outflow between 75% and 25% effective depth

$$t_{p75\text{-}25} = 14 \times 60 \times 60 = \underline{50{,}400}$$

$$\text{Soil Infiltration Rate} = \frac{0.144}{1.368 \times 50{,}400} = \underline{2.09 \times 10^{-6} \text{ m/sec}}$$

S M HEMMINGS B Sc C Eng MICE MIWEM

stuart.hemmings@btinternet.com

5th December 2016

APPENDIX 4

ENVIRONMENT AGENCY FLOOD MAP FOR PLANNING

Flood map for planning

Your reference	Location (easting/northing)	Created
2351	**529601/318102**	**7 Nov 2019 14:20**

Your selected location is in flood zone 1, an area with a low probability of flooding.

This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

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https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

Environment Agency

Flood map for planning

Your reference
2351

Location (easting/northing)
529601/318102

Scale
1:2500

Created
7 Nov 2019 14:20

- Selected point
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 20 40 60m

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APPENDIX 5

PROPOSED DEVELOPMENT LAYOUT

ROMAN ROAD

Windmill (disused)

Moulton Fen

Recreation G

Ppg Sta

Drain

Open Space/ tree avenue and wild flowers, boundary hedge and post and rail fence.

Open Space/ swale tree avenue and wild flowers, boundary hedge and post and rail fence.

surface water drainage as MTC design adjacent boundary. Swale with post and rail fence, native hedge/ wild flowers/ tree planting

surface water drainage as MTC design adjacent boundary. Swale with post and rail fence, native hedge/ wild flowers/ tree planting

Ornamental pond

dual use turning surface

speed restraint build out

change of surface material/ rubble strips

low railings around ornamental pond

low railings around open space/ toddlers play area

Open Space

Open Space/ toddlers play area

Open Space/ swale

pergolas used as a linking feature planted with climbing plants

design along access

The Hornsby Plot 58

The Old Chapel Plot 57

The Churchill Plot 56

The Ashton Plot 55

The Ashton Plot 54

The Ashton Plot 53

The Hornsby Plot 2

The Eaton Plot 1

The Ashton Plot 5

The Ashton Plot 4

The Darby Plot 3

The Darby Plot 8

The Fulton Plot 6

The Fulton Plot 7

The Stanton Plot 9

The Stanton Plot 10

The Blakely Plot 11

The Blakely Plot 12

The Kinsley Plot 13

The Kinsley Plot 14

The Kinsley Plot 15

The Blakely Plot 16

The Blakely Plot 17

The Stanton Plot 18

The Stanton Plot 19

The Darby Plot 20

The Darby Plot 21

The Ashton Plot 22

The Darby Plot 23

The Willoughby Plot 24

The Willoughby Plot 25

The Willoughby Plot 26

The Willoughby Plot 27

The Eaton Plot 28

The Eaton Plot 29

The Hornsby Plot 30

The Chester Plot 31

The Kinsley Plot 32

The Kinsley Plot 33

The Kinsley Plot 34

The Hornsby Plot 35

The Churchill Plot 36

The Eaton Plot 37

The Chester Plot 38

The Darby Plot 39

The Elton Plot 40

The Elton Plot 41

The Elton Plot 42

The Elton Plot 43

The Elton Plot 44

The Tyndall Plot 45

The Tyndall Plot 46

The Tyndall Plot 47

The Elton Plot 48

The Elton Plot 49

The Elton Plot 50

The Elton Plot 51

The Elton Plot 52

Seating area

Feature

58 dwellings

Total Site Area	2.74h
Southern Open Space	0.238h
Formal Open Space	0.18h
Avenue Open Space	0.153h
Percentage Open Space	20%

100000

N

Project CHAPEL WALK MOULTON CHAPEL			B M Design Consultancy
Title SITE LAYOUT			Chartered Architects 29A Church Street Northborough Peterborough PE6 9BN Telephone 01733 252823
			© Copyright
Scale 1:500	Date AUG 19	Job No 4531	
Category D	CDB Element (--)	Sequential No 200	Revisions

1:500 at A!

0m 20m 40m 60m

SCALE BAR

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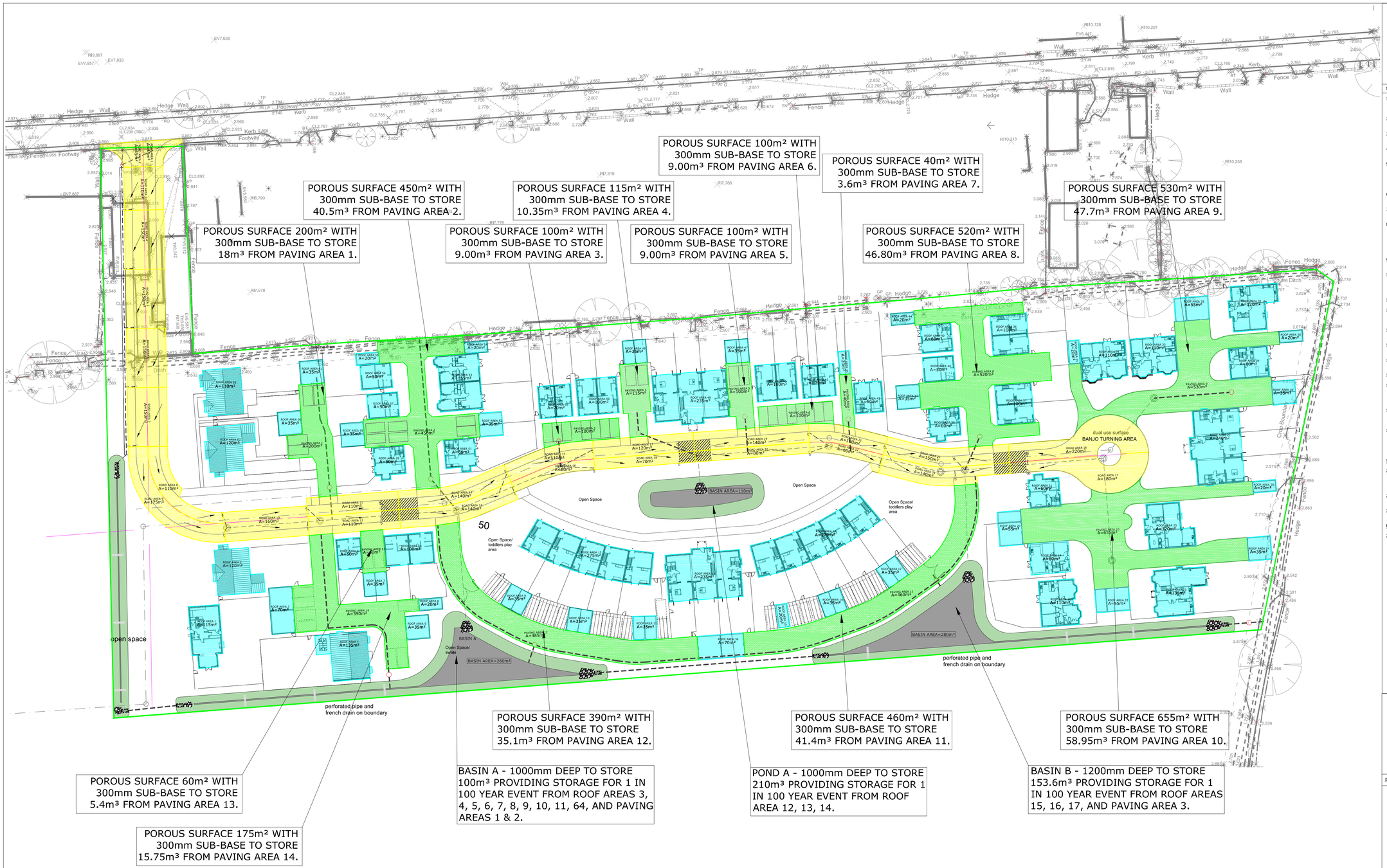
APPENDIX 6

PROPOSED IMPERMEABLE AREA PLAN



DRAINAGE AREAS - KEY

- ROOF = 5108m²
- SHARED ACCESSES = 3061m²
- ADOPTABLE ROAD = 3895m²
- SITE BOUNDARY

TOTAL DRAINAGE AREA =	12064 m² 1.21 ha
TOTAL SITE AREA =	27400 m² 2.74 ha

NOTES

1. The contractor shall check all tie-ins for line and level with existing before commencing any works. The Engineer shall be notified immediately, in writing, should any errors be found.
2. Any discrepancies, of whatever nature, must be reported to the Engineer prior to the commencement or continuance of any further works.
3. All private drainage works to be in accordance with the requirements of Building Regulations 2010, Part H, "Drainage and waste disposal", (01st October 2015).
4. All pipes to be bedded and backfilled in accordance with Part H, Diagram 10. Shallow pipes shall be protected in accordance with Part H, Diagram 11.
5. Unless otherwise stated, all private drainage to be 100mm diameter. Gradients have been shown where there are pipe capacity issues and these should be regarded as minimums. Unless there are constraints dictating otherwise, gradients shall generally be 1 in 60, 100mm diameter pipes shall not be laid flatter than 1 in 80, 150mm diameter pipes shall not be laid flatter than 1 in 150.
6. All pipes, chambers and fittings to be installed strictly in accordance with the manufacturers instructions.
7. Pipes which run adjacent to buildings shall be installed in strict accordance with Part H, Clauses 2.23 to 2.25 and Diagram 8.
8. All private manholes, inspection chambers and drainage channels to comply with BS EN124. Cover strengths to be:
   Class D400 in heavy trafficked areas (access roads, service yards etc.)
   Class C250 in lightly trafficked areas (car parks, driveways etc)
   Class B125 in Non trafficked areas
   Class A15 in landscaping areas
9. All drains in the vicinity of existing or proposed trees to be constructed in accordance with the requirements of NHBC Practice Note 3.
10. Private drainage frames must be tied to manhole risers by use of manufacturers ties (e.g. Polypipe ref. FRK500 fixing kit and FRK501 black ties.) The ground works contractor will be held fully responsible for any accidents due to incorrect fitting or failure to use the correct manufacturers fixing equipment.
11. All existing land drains encountered on site during construction to be re-connected.
12. Should any departure from the slab level be considered, agreement shall be sought from the Engineer immediately and prior to commencement or continuance of any works, and should take full account of all restrictions to the slab level.
13. Garage slabs relate to the finished level of the concrete at the front entrance of the garage.
14. Where a drive slopes towards a garage there is to be a 75mm ramp up to the garage slab.
15. Maximum gradients of gardens to be 1 in 6 (unless stated otherwise), except for designed banking works.
16. All dimensions in metres unless otherwise stated.
17. As underlying ground conditions may be variable across the site the Contractor shall undertake onsite porosity tests at the location and depth of each soakaway. Tests should be undertaken in accordance with BRE365 and results forwarded to the Engineers to allow verification of designs.
18. All existing services, sewers and drains indicated on this drawing and any other related drawings are shown only indicatively, and shall have their positions and level confirmed on site by the Contractor.
19. The invert levels of all existing sewers, drains, ditches, tanks or other features and apparatus where a new connection is to be made shall have their precise position and level confirmed on site by the Contractor prior to commencement of any construction work. The results of the investigations shall be confirmed to MTC Engineering (Cambridge) Ltd so that the design can be verified.

STORM WATER

20. All run-off from domestic roofs shall drain via a series of surface drainage systems with each outfall to cellular soakaways. The soakaways and drainage systems are to remain private and have been designed to accommodate all storms up to and including the 100yr + 40% event.
21. All private driveways and shared accesses shall drain via permeable paving. The paving shall be designed based on CBR results and to accommodate the required loading.
22. The design of each soakaway has been undertaken on the basis of infiltration rates established on site by BRE 365 testing. The rate used in design is 0.036 m/hr.

FOUL WATER DRAINAGE

23. Domestic foul sewerage from all properties shall drain via a private gravity foul water drainage system which shall discharge to the existing public foul sewer at new Type B manhole chamber F4. Connection will be subject to a S106 Connection Agreement with the Water Authority.

SOAKAWAY PROTECTION:
Please ensure that during the construction phase all soakaways, gullies and gully laterals are protected from the ingress of silt or grit from the site. Placing a fine heavy duty geotextile under the gully grating, between it and the frame should suffice.

NOTE:
At the location of the proposed lateral connection the contractor shall establish the position and depth of any existing services to prevent any clash in level and abortive costs.

REV	DATE	DESCRIPTION/REASON FOR ISSUE	APPR

MTC ENGINEERING
MTC Engineering (Cambridge) Ltd.
Ground Floor, 24 High Street
Whittlesford, Cambridgeshire, CB22 4LT
Tel (01223) 837270, fax (01223) 835648
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TITLE
PROPOSED RESIDENTIAL DEVELOPMENT
MOULTON CHAPEL, SPALDING
PROPOSED DRAINAGE AREAS

ORIG A.O	DATE SEPTEMBER 2019
CHKD	SCALE 1:500 @ A1
APPR	DRAWING NO 2351-02 REV -

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APPENDIX 7

MICRO DRAINAGE CALCULATIONS:
GREENFIELD RUNOFF RATES

CALCULATION OF VOLUMES OF ATTENUATION SCHEME

Total area of site = 3.75ha.

The IDB allow for an outfall equivalent to 1.4 cumecs/1000ha from agricultural fields.

Therefore existing design outfall of surface water from the site = 3.75 x 1.4 / 1000

= 0.0049 cumecs or 4.9 litres/sec

The impermeable areas from which rainfall needs to be disposed are:

Roofs of 78 No buildings …….…… 4648 sq m

Impermeable Roads …….. 5636 sq m

Total impermeable area …… 10284 sq m

The volumes of rainfall in a 1 in 100 year event in 2115, with 30% increase for climate change can be calculated as follows:

Duration	M5_60min	Z1	M5-D	Z2	M100-D	Intensity mm/hour	Areal Factor	Areal Intensity mm/hour	Area (ha)	Volume cum/hr	Vol + 30% climate Change cum/hr	Total Volume cu m climate	Total Volume cu m	Volume litres/sec
15	24	0.64	15.36	1.98	30.41	121.65	0.94	114.35	1.029	1176.683	1529.69	382.4	294.17	326.856
30	24	0.81	19.44	1.97	38.30	76.59	0.95	72.76	1.029	748.741	973.36	486.7	374.37	207.984
60	24	1	24	1.93	46.32	46.32	0.96	44.47	1.029	457.567	594.84	594.8	457.57	127.102
120	24	1.2	28.8	1.89	54.43	27.22	0.97	26.40	1.029	271.651	353.15	706.3	543.30	75.459
240	24	1.42	34.08	1.86	63.39	15.85	0.97	15.37	1.029	158.176	205.63	822.5	632.70	43.938
360	24	1.57	37.68	1.83	68.95	11.49	0.98	11.26	1.029	115.892	150.66	904.0	695.35	32.192
600	24	1.74	41.76	1.81	75.59	7.56	0.98	7.41	1.029	76.222	99.09	990.9	762.22	21.173
1440	24	2.16	51.84	1.81	93.83	3.91	0.98	3.83	1.029	39.425	51.25	1230.1	946.20	10.951
2880	24	2.5	60	1.81	108.60	2.26	0.98	2.22	1.029	22.816	29.66	1423.7	1095.14	6.338

If an outflow from the system of 4.9 litres/sec is taken then the volume of attenuation required can be calculated as follows:

Duration mins	Total Rainfall in Duration mm	Total Rainfall Volume cu m into storage facility	Outflow into IDB Drain at 4.9 litres/sec	Total Storage Required	Total Time to empty Soakaway hours
15	1529.7	382.42	4.41	378.01	42.49
30	973.4	486.68	8.82	477.86	54.08
60	594.8	594.84	17.64	577.20	66.09
120	353.1	706.29	35.28	671.01	78.48
240	205.6	822.51	70.56	751.95	91.39
360	150.7	903.95	105.84	798.11	100.44
600	99.1	990.89	176.40	814.49	110.10
1440	51.3	1230.07	423.36	806.71	136.67
2880	29.7	1423.69	846.72	576.97	158.19

Therefore from the above table it can be seen that a total storage volume of 815 cu metres is required to store the total surface water drainage outfall from the impervious roads and roofs of in a 1 in 100 year event with 30% increase for climate change.

The surface water will be designed in the following way:

a) Surface water drainage from the road adjacent to the public open space (POS) in the north western corner of the site will be collected by a French drain located on the side of the north and west side of the road, and this will be connected to a storage facility constructed under the POS with plastic modular cells. The area of road is shown in red on the plan on page 6, and is an area of 945 square metres.

b) Surface water drainage from the road adjacent to the public open space (POS) east of the access road will be collected by a French drain located on the north and east side of the road, and this will be connected to a storage facility constructed under the POS with plastic modular cells. The area of road is shown in light green on the plan on page 6, and is an area of 1,500 square metres.

c) Surface water drainage from the central road on the east side of the development will be collected by gullies and will flow in a surface water system eastwards then southwards and discharge into the storage dyke on the southern boundary. The area of road is shown in brown on the plan on page 6.

d) Surface water drainage from the road on the south side of the development will flow directly into the storage dyke on the southern boundary. The area of road is shown in light blue on the plan on page 6.

e) Surface water from the roofs will be discharged into a surface water system as detailed on page 5. This is discharged into the storage dyke on the southern boundary of the site.

The required size of the storage facility in the north west corner of the site can be sized as follows:

Duration mins	Total Rainfall in Duration mm	Total Rainfall Volume cu m into storage facility	Outflow into Storage Dyke at 2.0 litres/sec	Total Storage Required	Total Time to empty Soakaway hours
15	140.5	35.12	1.80	33.32	3.90
30	89.4	44.70	3.60	41.10	4.97
60	54.6	54.63	7.20	47.43	6.07
120	32.4	64.86	14.40	50.46	7.21
240	18.9	75.54	28.80	46.74	8.39
360	13.8	83.02	43.20	39.82	9.22
600	9.1	91.00	72.00	19.00	10.11
1440	4.7	112.97	172.80	-59.83	12.55
2880	2.7	130.75	345.60	-214.85	14.53

It can be seen that the required volume of storage is 50.46 cu metres.

A plastic modular cell (eg Polystorm cell) is 500mm x 1000mm x 400mm deep and each one is capable of storing 0.19 cu m of water. Therefore 264 units will be provided which will store 50.16 cu metres of water. Therefore the units should be constructed 800mm deep and 11.0 metres x 6.0 metres.

The required size of the storage facility on the north east corner of the site can be sized as follows:

Duration mins	Total Rainfall in Duration mm	Total Rainfall Volume cu m into storage facility	Outflow into Storage Dyke at 2.0 litres/sec	Total Storage Required	Total Time to empty Soakaway hours
15	223.0	55.75	1.80	53.95	6.19
30	141.9	70.94	3.60	67.34	7.88
60	86.7	86.71	7.20	79.51	9.63
120	51.5	102.96	14.40	88.56	11.44
240	30.0	119.90	28.80	91.10	13.32
360	22.0	131.77	43.20	88.57	14.64
600	14.4	144.44	72.00	72.44	16.05
1440	7.5	179.31	172.80	6.51	19.92
2880	4.3	207.53	345.60	-138.07	23.06

It can be seen that the required volume of storage is 91.1 cu metres.

A plastic modular cell is 500mm x 1000mm x 400mm deep and each one is capable of storing 0.19 cu m of water. Therefore 480 units will be provided which will store 91.2 cu metres of water. Therefore the storage facility should be 800mm deep and 12.0 metres x 10.0 metres should be provided.

Both of these storage facilities will discharge through a 100mm dia pipeline into the storage dyke on the southern boundary of the site.

The storage dyke will be required to store 675 cu metres, which is 815 (total volume) – 50.5 (volume of attenuation under POS) – 91.1 (volume of attenuation under POS).

This storage dyke will be 350 metres in length, 1.0 metres deep with a top width of 4.5 metres and a bed width of 1.0 metres. The total volume of the dyke will be 962.5 cu metres when full.

ADDITIONAL INFORMATION

1) Water will soakaway from both the attenuation facilities under the POS, and into the ground on either side of the storage dyke. This has not been allowed for in the calculations and provides an extra factor of safety for the design.

2) The level of the public open space should if possible be 150mm below the level of the roads around this area to act as an emergency storage area in the event of an extreme storm.

APPENDIX 8

MICRO DRIANAGE CALCULATIONS:
ATTNEUATION REQUIREMENTS

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes standard Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	100	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 Inverts

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.469	4-8	0.761

Total Area Contributing (ha) = 1.230

Total Pipe Volume (m³) = 633.544

Network Design Table for Storm

« - Indicates pipe capacity < flow

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
S1.000	77.000	0.154	500.0	0.048	3.00	0.0	0.600	\/	-1	Pipe/Conduit	
S1.001	25.000	0.148	168.9	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	32.000	0.064	500.0	0.026	0.00	0.0	0.600	\/	-1	Pipe/Conduit	
S1.003	18.000	0.106	169.8	0.110	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.004	66.000	0.066	1000.0	0.000	0.00	0.0	0.600	\/	-1	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)
S1.000	75.90	3.60	2.547	0.048	0.0	0.0	0.0	2.14	3462.2	9.9
S1.001	72.89	4.02	2.393	0.048	0.0	0.0	0.0	1.00	39.9	9.9
S1.002	71.21	4.27	2.245	0.074	0.0	0.0	0.0	2.14	3462.2	14.3
S1.003	69.31	4.57	2.181	0.184	0.0	0.0	0.0	1.00	39.8	34.5
S1.004	65.13	5.29	2.075	0.184	0.0	0.0	0.0	1.51	2442.2	34.5

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S2.000	32.200	0.191	168.6	0.060	3.00	0.0	0.600	o	225	Pipe/Conduit	
S2.001	32.200	0.191	168.6	0.026	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.000	30.000	0.179	167.6	0.078	3.00	0.0	0.600	o	225	Pipe/Conduit	
S2.002	42.450	0.253	167.8	0.058	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.005	130.000	0.130	1000.0	0.115	0.00	0.0	0.600	\/	-1	Pipe/Conduit	
S4.000	12.000	0.071	169.0	0.078	3.00	0.0	0.600	o	225	Pipe/Conduit	
S4.001	33.300	0.197	169.0	0.086	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.002	29.150	0.199	146.5	0.056	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.003	6.150	0.026	236.5	0.120	0.00	0.0	0.600	o	300	Pipe/Conduit	
S5.000	26.000	0.155	167.7	0.137	3.00	0.0	0.600	o	225	Pipe/Conduit	
S6.000	20.000	0.119	168.1	0.118	3.00	0.0	0.600	o	225	Pipe/Conduit	
S5.001	35.290	0.147	240.1	0.036	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.004	42.510	0.142	299.4	0.078	0.00	0.0	0.600	o	375	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)
S2.000	76.41	3.53	2.644	0.060	0.0	0.0	0.0	1.00	39.9	12.4
S2.001	72.53	4.07	2.452	0.086	0.0	0.0	0.0	1.00	39.9	16.9
S3.000	76.70	3.50	2.439	0.078	0.0	0.0	0.0	1.01	40.0	16.2
S2.002	68.06	4.77	2.261	0.222	0.0	0.0	0.0	1.01	40.0«	40.9
S1.005	58.38	6.73	2.009	0.521	0.0	0.0	0.0	1.51	2442.2	82.4
S4.000	79.10	3.20	2.514	0.078	0.0	0.0	0.0	1.00	39.9	16.7
S4.001	74.76	3.75	2.443	0.164	0.0	0.0	0.0	1.00	39.9	33.2
S4.002	71.62	4.20	2.246	0.220	0.0	0.0	0.0	1.08	42.9	42.7
S4.003	70.96	4.30	2.047	0.340	0.0	0.0	0.0	1.02	72.0	65.3
S5.000	77.22	3.43	2.324	0.137	0.0	0.0	0.0	1.01	40.0	28.7
S6.000	78.01	3.33	2.287	0.118	0.0	0.0	0.0	1.01	40.0	24.9
S5.001	72.91	4.01	2.168	0.291	0.0	0.0	0.0	1.01	71.4	57.5
S4.004	66.83	4.98	2.021	0.709	0.0	0.0	0.0	1.04	115.1«	128.3

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.006	68.000	0.068	1000.0	0.000	0.00	0.0	0.600	\/	-1	Pipe/Conduit	
S1.007	6.000	0.012	500.0	0.000	0.00	0.0	0.600	\/	-1	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)
S1.006	55.45	7.48	1.880	1.230	0.0	0.0	0.0	1.51	2442.2	184.7
S1.007	55.28	7.53	1.812	1.230	0.0	0.0	0.0	2.14	3462.2	184.7

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diamete (mm)
SSWALE 1	3.500	0.953	Junction		S1.000	2.547	-1			
SPIPE RUN	3.000	0.607	Junction		S1.001	2.393	225	S1.000	2.393	-
SSWALE 2	3.000	0.755	Junction		S1.002	2.245	-1	S1.001	2.245	22
SPIPE RUN	3.000	0.819	Junction		S1.003	2.181	225	S1.002	2.181	-
SSWALE 3	3.000	0.925	Junction		S1.004	2.075	-1	S1.003	2.075	22
SS1	3.500	0.856	Open Manhole	1200	S2.000	2.644	225			
SS2	3.500	1.048	Open Manhole	1200	S2.001	2.452	225	S2.000	2.453	22
SS11	3.000	0.561	Open Manhole	1200	S3.000	2.439	225			
SS3	3.000	0.740	Open Manhole	1200	S2.002	2.261	225	S2.001	2.261	22
								S3.000	2.260	22
SSWALE 4	3.000	0.992	Open Manhole	10000	S1.005	2.009	-1	S1.004	2.009	-
								S2.002	2.008	22
SPOND	3.500	0.986	Open Manhole	1200	S4.000	2.514	225			
SS4	3.500	1.057	Open Manhole	1200	S4.001	2.443	225	S4.000	2.443	22
SS5	3.000	0.754	Open Manhole	1200	S4.002	2.246	225	S4.001	2.246	22
SS6	3.000	0.953	Open Manhole	1200	S4.003	2.047	300	S4.002	2.047	22
SS9	3.000	0.676	Open Manhole	1200	S5.000	2.324	225			
SS10	3.000	0.713	Open Manhole	1200	S6.000	2.287	225			
SS8	3.000	0.832	Open Manhole	1200	S5.001	2.168	300	S5.000	2.169	22
								S6.000	2.168	22
SS7	3.000	0.979	Open Manhole	1350	S4.004	2.021	375	S4.003	2.021	30
								S5.001	2.021	30
SSWALE 5	3.000	1.121	Open Manhole	10000	S1.006	1.880	-1	S1.005	1.879	-
								S4.004	1.879	37
SPIPE RUN OUTFALL	2.800	0.988	Junction		S1.007	1.812	-1	S1.006	1.812	-
S	3.000	1.200	Open Manhole	0		OUTFALL		S1.007	1.800	-

No coordinates have been specified, layout information cannot be produced.

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	\/	-1	SSWALE 1	3.500	2.547	0.053	Junction	
S1.001	o	225	SPIPE RUN	3.000	2.393	0.382	Junction	
S1.002	\/	-1	SSWALE 2	3.000	2.245	-0.145	Junction	
S1.003	o	225	SPIPE RUN	3.000	2.181	0.594	Junction	
S1.004	\/	-1	SSWALE 3	3.000	2.075	0.025	Junction	
S2.000	o	225	SS1	3.500	2.644	0.631	Open Manhole	1200
S2.001	o	225	SS2	3.500	2.452	0.823	Open Manhole	1200
S3.000	o	225	SS11	3.000	2.439	0.336	Open Manhole	1200
S2.002	o	225	SS3	3.000	2.261	0.514	Open Manhole	1200
S1.005	\/	-1	SSWALE 4	3.000	2.009	0.091	Open Manhole	10000
S4.000	o	225	SPOND	3.500	2.514	0.761	Open Manhole	1200
S4.001	o	225	SS4	3.500	2.443	0.832	Open Manhole	1200
S4.002	o	225	SS5	3.000	2.246	0.529	Open Manhole	1200
S4.003	o	300	SS6	3.000	2.047	0.653	Open Manhole	1200
S5.000	o	225	SS9	3.000	2.324	0.451	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	77.000	500.0	SPIPE RUN	3.000	2.393	-0.293	Junction	
S1.001	25.000	168.9	SSWALE 2	3.000	2.245	0.530	Junction	
S1.002	32.000	500.0	SPIPE RUN	3.000	2.181	-0.081	Junction	
S1.003	18.000	169.8	SSWALE 3	3.000	2.075	0.700	Junction	
S1.004	66.000	1000.0	SSWALE 4	3.000	2.009	0.091	Open Manhole	10000
S2.000	32.200	168.6	SS2	3.500	2.453	0.822	Open Manhole	1200
S2.001	32.200	168.6	SS3	3.000	2.261	0.514	Open Manhole	1200
S3.000	30.000	167.6	SS3	3.000	2.260	0.515	Open Manhole	1200
S2.002	42.450	167.8	SSWALE 4	3.000	2.008	0.767	Open Manhole	10000
S1.005	130.000	1000.0	SSWALE 5	3.000	1.879	0.221	Open Manhole	10000
S4.000	12.000	169.0	SS4	3.500	2.443	0.832	Open Manhole	1200
S4.001	33.300	169.0	SS5	3.000	2.246	0.529	Open Manhole	1200
S4.002	29.150	146.5	SS6	3.000	2.047	0.728	Open Manhole	1200
S4.003	6.150	236.5	SS7	3.000	2.021	0.679	Open Manhole	1350
S5.000	26.000	167.7	SS8	3.000	2.169	0.606	Open Manhole	1200

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S6.000	o	225	SS10	3.000	2.287	0.488	Open Manhole	1200
S5.001	o	300	SS8	3.000	2.168	0.532	Open Manhole	1200
S4.004	o	375	SS7	3.000	2.021	0.604	Open Manhole	1350
S1.006	\/	-1	SSWALE 5	3.000	1.880	0.220	Open Manhole	10000
S1.007	\/	-1	SPIPE RUN OUTFALL	2.800	1.812	0.088	Junction	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S6.000	20.000	168.1	SS8	3.000	2.168	0.607	Open Manhole	1200
S5.001	35.290	240.1	SS7	3.000	2.021	0.679	Open Manhole	1350
S4.004	42.510	299.4	SSWALE 5	3.000	1.879	0.746	Open Manhole	10000
S1.006	68.000	1000.0	SPIPE RUN OUTFALL	2.800	1.812	0.088	Junction	
S1.007	6.000	500.0	S	3.000	1.800	0.300	Open Manhole	0

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TAKE OFF DETAILS for Storm

Length Calculations based on 'Centre-Centre'

Warning - The following pipes have not been classified:

1.000
1.001
1.002
1.003
1.004
2.000
2.001
3.000
2.002
1.005
4.000
4.001
4.002
4.003
5.000
6.000
5.001
4.004
1.006
1.007

Warning - The following manholes have not been classified:

S1
S2
S11
S3
SWALE 4
POND
S4
S5
S6
S9
S10
S8
S7
SWALE 5

Pipes

Number	20
Total Length (m)	763.250
Volume (m³)	633.5445

Manholes

Number	14
True Depth (m)	12.268
Volume (m³)	89.6110

Outfalls

Number	1

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TAKE OFF DETAILS for Storm

True Depth (m) 1.200
Volume (m³) 0.0000

Flow Controls

Number 1

Storage Structures

Number 12
Volume (m³) 1287.2603

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TOTALS FOR MANHOLES

Diameter (mm)	Width (mm)	Manhole Class	Number	Ring Depth (m)	Cost (£)	Add Cost (£)	Total Cost (£)
1200		Unclassified	11	6.550	?.??	?.??	?.??
1350		Unclassified	1	0.604	?.??	?.??	?.??
10000		Unclassified	2	0.311	?.??	?.??	?.??
TOTALS			14	7.465	0.00	0.00	0.00

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TOTALS FOR PIPES

Diameter (mm)	Pipe Class	Number	Length (m)	Cost (£)
-1	Unclassified	6	379.000	?.??
225	Unclassified	11	300.300	?.??
300	Unclassified	2	41.440	?.??
375	Unclassified	1	42.510	?.??
TOTALS		20	763.250	0.00

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TOTALS FOR MATERIALS

No materials are used

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GROUND WORKS - Pipe Excavation by Depth

Depth <= (m)	Length (m)	Volume (m^3)	Cost (£)
TOTALS	0.000	0.0000	0.00

GROUND WORKS - Totals

Item	Volume / Area (m^3)	(m^2)	Cost (£)
MH Excavation		0.0000	0.00
Pipe Excavation		0.0000	0.00
Pipe Replacement		0.0000	0.00
Pipe Reinstatement		0.0000	0.00
Removal		0.0000	0.00
TOTALS			0.00

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TOTALS FOR FLOW CONTROLS

Name	Number	Cost (£)
Hydro-Brake®	1	0.00
TOTALS	1	0.00

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TOTALS FOR STORAGE STRUCTURES

Name	Number	Volume (m^3)	Cost (£)
Porous Car Park	9	923.9490	0.00
Tank or Pond	3	363.3113	0.00
TOTALS	12	1287.2603	0.00

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TOTAL COSTS

Item	Cost (£)
Manholes	0.00
Pipes	0.00
Materials	0.00
Ground Works	0.00
Flow Controls	0.00
Storage Structures	0.00
TOTAL	0.00

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BREAKDOWN FOR MANHOLES

USMH Name	PN	MH Class	Diameter (mm)	Width (mm)	Ring Depth (m)	Cost (£)	Add Cost (£)	Total (£)
SS1	S2.000	Unclassified	1200		0.631	?.??	?.??	?.??
SS2	S2.001	Unclassified	1200		0.823	?.??	?.??	?.??
SS11	S3.000	Unclassified	1200		0.336	?.??	?.??	?.??
SS3	S2.002	Unclassified	1200		0.514	?.??	?.??	?.??
SSWALE 4	S1.005	Unclassified	10000		0.091	?.??	?.??	?.??
SPOND	S4.000	Unclassified	1200		0.761	?.??	?.??	?.??
SS4	S4.001	Unclassified	1200		0.832	?.??	?.??	?.??
SS5	S4.002	Unclassified	1200		0.529	?.??	?.??	?.??
SS6	S4.003	Unclassified	1200		0.653	?.??	?.??	?.??
SS9	S5.000	Unclassified	1200		0.451	?.??	?.??	?.??
SS10	S6.000	Unclassified	1200		0.488	?.??	?.??	?.??
SS8	S5.001	Unclassified	1200		0.532	?.??	?.??	?.??
SS7	S4.004	Unclassified	1350		0.604	?.??	?.??	?.??
SSWALE 5	S1.006	Unclassified	10000		0.220	?.??	?.??	?.??
TOTALS					7.465	0.00	0.00	0.00

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BREAKDOWN FOR PIPES

PN	Pipe Class	Diameter (mm)	Min Cover D (m)	Max Cover D (m)	Length (m)	Cost / m (£)	Total Cost (£)
S1.000	Unclassified	-1	0.053	0.053	77.000	?.??	?.??
S1.001	Unclassified	225	0.382	0.530	25.000	?.??	?.??
S1.002	Unclassified	-1	-0.145	-0.145	32.000	?.??	?.??
S1.003	Unclassified	225	0.594	0.700	18.000	?.??	?.??
S1.004	Unclassified	-1	0.025	0.091	66.000	?.??	?.??
S2.000	Unclassified	225	0.631	0.822	32.200	?.??	?.??
S2.001	Unclassified	225	0.514	0.823	32.200	?.??	?.??
S3.000	Unclassified	225	0.336	0.515	30.000	?.??	?.??
S2.002	Unclassified	225	0.514	0.767	42.450	?.??	?.??
S1.005	Unclassified	-1	0.091	0.221	130.000	?.??	?.??
S4.000	Unclassified	225	0.761	0.832	12.000	?.??	?.??
S4.001	Unclassified	225	0.529	0.832	33.300	?.??	?.??
S4.002	Unclassified	225	0.529	0.728	29.150	?.??	?.??
S4.003	Unclassified	300	0.653	0.679	6.150	?.??	?.??
S5.000	Unclassified	225	0.451	0.606	26.000	?.??	?.??
S6.000	Unclassified	225	0.488	0.607	20.000	?.??	?.??
S5.001	Unclassified	300	0.532	0.679	35.290	?.??	?.??
S4.004	Unclassified	375	0.604	0.746	42.510	?.??	?.??
S1.006	Unclassified	-1	0.088	0.220	68.000	?.??	?.??
S1.007	Unclassified	-1	0.088	0.300	6.000	?.??	?.??
TOTALS					763.250		0.00

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BREAKDOWN FOR MANHOLE BLINDING (£0.00/m³)

USMH Name	PN	Diameter (mm)	Width (mm)	Height (m)	Volume (m³)	Cost (£)
SS1	S2.000	1200		?.???	?.????	?.??
SS2	S2.001	1200		?.???	?.????	?.??
SS11	S3.000	1200		?.???	?.????	?.??
SS3	S2.002	1200		?.???	?.????	?.??
SSWALE 4	S1.005	10000		?.???	?.????	?.??
SPOND	S4.000	1200		?.???	?.????	?.??
SS4	S4.001	1200		?.???	?.????	?.??
SS5	S4.002	1200		?.???	?.????	?.??
SS6	S4.003	1200		?.???	?.????	?.??
SS9	S5.000	1200		?.???	?.????	?.??
SS10	S6.000	1200		?.???	?.????	?.??
SS8	S5.001	1200		?.???	?.????	?.??
SS7	S4.004	1350		?.???	?.????	?.??
SSWALE 5	S1.006	10000		?.???	?.????	?.??
TOTALS				0.000	0.0000	0.00

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BREAKDOWN FOR PIPE SURROUND

PN	Length (m)	Diameter (mm)	Surround	Volume (m^3)	Cost / m^3 (£)	Cost (£)
S1.000	77.000	-1	Unclassified	?.????	?.??	?.??
S1.001	25.000	225	Unclassified	?.????	?.??	?.??
S1.002	32.000	-1	Unclassified	?.????	?.??	?.??
S1.003	18.000	225	Unclassified	?.????	?.??	?.??
S1.004	66.000	-1	Unclassified	?.????	?.??	?.??
S2.000	32.200	225	Unclassified	?.????	?.??	?.??
S2.001	32.200	225	Unclassified	?.????	?.??	?.??
S3.000	30.000	225	Unclassified	?.????	?.??	?.??
S2.002	42.450	225	Unclassified	?.????	?.??	?.??
S1.005	130.000	-1	Unclassified	?.????	?.??	?.??
S4.000	12.000	225	Unclassified	?.????	?.??	?.??
S4.001	33.300	225	Unclassified	?.????	?.??	?.??
S4.002	29.150	225	Unclassified	?.????	?.??	?.??
S4.003	6.150	300	Unclassified	?.????	?.??	?.??
S5.000	26.000	225	Unclassified	?.????	?.??	?.??
S6.000	20.000	225	Unclassified	?.????	?.??	?.??
S5.001	35.290	300	Unclassified	?.????	?.??	?.??
S4.004	42.510	375	Unclassified	?.????	?.??	?.??
S1.006	68.000	-1	Unclassified	?.????	?.??	?.??
S1.007	6.000	-1	Unclassified	?.????	?.??	?.??
TOTALS	763.250			0.0000		0.00

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BREAKDOWN FOR MANHOLE SURROUND

USMH Name	PN	Diameter (mm)	Width (mm)	Depth (m)	Surround	Volume (m^3)	Cost / m^3 (£)	Cost (£)
SS1	S2.000	1200		0.856	Unclassified	?.????	?.??	?.??
SS2	S2.001	1200		1.048	Unclassified	?.????	?.??	?.??
SS11	S3.000	1200		0.561	Unclassified	?.????	?.??	?.??
SS3	S2.002	1200		0.739	Unclassified	?.????	?.??	?.??
SSWALE 4	S1.005	10000		0.991	Unclassified	?.????	?.??	?.??
SPOND	S4.000	1200		0.986	Unclassified	?.????	?.??	?.??
SS4	S4.001	1200		1.057	Unclassified	?.????	?.??	?.??
SS5	S4.002	1200		0.754	Unclassified	?.????	?.??	?.??
SS6	S4.003	1200		0.953	Unclassified	?.????	?.??	?.??
SS9	S5.000	1200		0.676	Unclassified	?.????	?.??	?.??
SS10	S6.000	1200		0.713	Unclassified	?.????	?.??	?.??
SS8	S5.001	1200		0.832	Unclassified	?.????	?.??	?.??
SS7	S4.004	1350		0.979	Unclassified	?.????	?.??	?.??
SSWALE 5	S1.006	10000		1.120	Unclassified	?.????	?.??	?.??
TOTALS				12.265		0.0000		0.00

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BREAKDOWN FOR MANHOLE BASE

USMH Name	PN	Diameter (mm)	Width (mm)	Height (m)	Base	Volume (m^3)	Cost / m^3 (£)	Cost (£)
SS1	S2.000	1200		?.???	Unclassified	?.????	?.??	?.??
SS2	S2.001	1200		?.???	Unclassified	?.????	?.??	?.??
SS11	S3.000	1200		?.???	Unclassified	?.????	?.??	?.??
SS3	S2.002	1200		?.???	Unclassified	?.????	?.??	?.??
SSWALE 4	S1.005	10000		?.???	Unclassified	?.????	?.??	?.??
SPOND	S4.000	1200		?.???	Unclassified	?.????	?.??	?.??
SS4	S4.001	1200		?.???	Unclassified	?.????	?.??	?.??
SS5	S4.002	1200		?.???	Unclassified	?.????	?.??	?.??
SS6	S4.003	1200		?.???	Unclassified	?.????	?.??	?.??
SS9	S5.000	1200		?.???	Unclassified	?.????	?.??	?.??
SS10	S6.000	1200		?.???	Unclassified	?.????	?.??	?.??
SS8	S5.001	1200		?.???	Unclassified	?.????	?.??	?.??
SS7	S4.004	1350		?.???	Unclassified	?.????	?.??	?.??
SSWALE 5	S1.006	10000		?.???	Unclassified	?.????	?.??	?.??
TOTALS				0.000		0.0000		0.00

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BREAKDOWN FOR DEPTH BANDS

PN	Dia (mm)	Length (m)	> 0.000
S1.000	-1	77.000	77.000
S1.001	225	25.000	25.000
S1.002	-1	32.000	32.000
S1.003	225	18.000	18.000
S1.004	-1	66.000	66.000
S2.000	225	32.200	32.200
S2.001	225	32.200	32.200
S3.000	225	30.000	30.000
S2.002	225	42.450	42.450
S1.005	-1	130.000	130.000
S4.000	225	12.000	12.000
S4.001	225	33.300	33.300
S4.002	225	29.150	29.150
S4.003	300	6.150	6.150
S5.000	225	26.000	26.000
S6.000	225	20.000	20.000
S5.001	300	35.290	35.290
S4.004	375	42.510	42.510
S1.006	-1	68.000	68.000
S1.007	-1	6.000	6.000
TOTALS		763.250	763.250

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BREAKDOWN FOR PIPE EXCAVATION / REINSTATEMENT

PN	Dia (mm)	Length (m)	Ex. Volume (m^3)	Ex. Cost (£)	Rep. Volume (m^3)	Rep. Cost (£)	Rem. Volume (m^3)	Rem. Cost (£)	Rein. Area (m^2)	Rein. Cost (£)
S1.000	-1	77.000	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.?
S1.001	225	25.000	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.?
S1.002	-1	32.000	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.?
S1.003	225	18.000	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.?
S1.004	-1	66.000	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.?
S2.000	225	32.200	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.?
S2.001	225	32.200	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.?
S3.000	225	30.000	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.?
S2.002	225	42.450	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.?
S1.005	-1	130.000	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.?
S4.000	225	12.000	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.?
S4.001	225	33.300	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.?
S4.002	225	29.150	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.?
S4.003	300	6.150	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.?
S5.000	225	26.000	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.?
S6.000	225	20.000	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.?
S5.001	300	35.290	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.?
S4.004	375	42.510	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.?
S1.006	-1	68.000	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.?
S1.007	-1	6.000	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.?
TOTALS		763.250	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0

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BREAKDOWN FOR MANHOLE EXCAVATION

USMH Name	PN	Dia (mm)	Width (mm)	Depth (m)	Total Dia (m)	Total Width (m)	Total Depth (m)	Ex. Volume (m³)	Ex. Cost (£)	Rem. Volume (m³)	Rem
SS1	S2.000	1200		0.631	?.???		?.???	?.????	?.??	?.????	
SS2	S2.001	1200		0.823	?.???		?.???	?.????	?.??	?.????	
SS11	S3.000	1200		0.336	?.???		?.???	?.????	?.??	?.????	
SS3	S2.002	1200		0.514	?.???		?.???	?.????	?.??	?.????	
SSWALE 4	S1.005	10000		0.091	?.???		?.???	?.????	?.??	?.????	
SPOND	S4.000	1200		0.761	?.???		?.???	?.????	?.??	?.????	
SS4	S4.001	1200		0.832	?.???		?.???	?.????	?.??	?.????	
SS5	S4.002	1200		0.529	?.???		?.???	?.????	?.??	?.????	
SS6	S4.003	1200		0.653	?.???		?.???	?.????	?.??	?.????	
SS9	S5.000	1200		0.451	?.???		?.???	?.????	?.??	?.????	
SS10	S6.000	1200		0.488	?.???		?.???	?.????	?.??	?.????	
SS8	S5.001	1200		0.532	?.???		?.???	?.????	?.??	?.????	
SS7	S4.004	1350		0.604	?.???		?.???	?.????	?.??	?.????	
SSWALE 5	S1.006	10000		0.220	?.???		?.???	?.????	?.??	?.????	
TOTALS				7.465			0.000	0.0000	0.00	0.0000	

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BREAKDOWN FOR FLOW CONTROLS

USMH Name	PN	Flow Control	Online/Offline	Cost (£)
SPIPE RUN OUTFALL	S1.007	Hydro-Brake®	Online	0.00
TOTALS				0.000

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BREAKDOWN FOR STORAGE STRUCTURES

USMH Name	PN	Storage Structure	Volume (m³)	Cost (£)
SPIPE RUN	S1.001	Porous Car Park	27.0000	0.00
SSWALE 2	S1.002	Porous Car Park	203.8500	0.00
SS11	S3.000	Porous Car Park	40.3920	0.00
SSWALE 4	S1.005	Tank or Pond	71.8742	0.00
SPOND	S4.000	Tank or Pond	159.3296	0.00
SS4	S4.001	Porous Car Park	66.5910	0.00
SS5	S4.002	Porous Car Park	67.8600	0.00
SS6	S4.003	Porous Car Park	120.0780	0.00
SS9	S5.000	Porous Car Park	121.6800	0.00
SS10	S6.000	Porous Car Park	109.0890	0.00
SS7	S4.004	Porous Car Park	167.4090	0.00
SSWALE 5	S1.006	Tank or Pond	132.1075	0.00
TOTALS			1287.260	0.00

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TAKE OFF DETAILS for Storm

Length Calculations based on 'True Length'

Warning - The following pipes have not been classified:

1.000
1.001
1.002
1.003
1.004
2.000
2.001
3.000
2.002
1.005
4.000
4.001
4.002
4.003
5.000
6.000
5.001
4.004
1.006
1.007

Warning - The following manholes have not been classified:

S1
S2
S11
S3
SWALE 4
POND
S4
S5
S6
S9
S10
S8
S7
SWALE 5

Pipes

Number	20
Total Length (m)	719.825
Volume (m³)	599.7331

Manholes

Number	14
True Depth (m)	12.268
Volume (m³)	89.6110

Outfalls

Number	1

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TAKE OFF DETAILS for Storm

True Depth (m) 1.200
Volume (m³) 0.0000

Flow Controls

Number 1

Storage Structures

Number 12
Volume (m³) 1287.2603

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TOTALS FOR MANHOLES

Diameter (mm)	Width (mm)	Manhole Class	Number	Ring Depth (m)	Cost (£)	Add Cost (£)	Total Cost (£)
1200		Unclassified	11	6.550	?.??	?.??	?.??
1350		Unclassified	1	0.604	?.??	?.??	?.??
10000		Unclassified	2	0.311	?.??	?.??	?.??
TOTALS			14	7.465	0.00	0.00	0.00

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TOTALS FOR PIPES

Diameter (mm)	Pipe Class	Number	Length (m)	Cost (£)
-1	Unclassified	6	359.000	?.??
225	Unclassified	11	285.100	?.??
300	Unclassified	2	38.890	?.??
375	Unclassified	1	36.835	?.??
TOTALS		20	719.825	0.00

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TOTALS FOR MATERIALS

No materials are used

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GROUND WORKS - Pipe Excavation by Depth

Depth <= (m)	Length (m)	Volume (m^3)	Cost (£)
TOTALS	0.000	0.0000	0.00

GROUND WORKS - Totals

Item	Volume / Area (m^3)	(m^2)	Cost (£)
MH Excavation		0.0000	0.00
Pipe Excavation		0.0000	0.00
Pipe Replacement		0.0000	0.00
Pipe Reinstatement		0.0000	0.00
Removal		0.0000	0.00
TOTALS			0.00

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TOTALS FOR FLOW CONTROLS

Name	Number	Cost (£)
Hydro-Brake®	1	0.00
TOTALS	1	0.00

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TOTALS FOR STORAGE STRUCTURES

Name	Number	Volume (m^3)	Cost (£)
Porous Car Park	9	923.9490	0.00
Tank or Pond	3	363.3113	0.00
TOTALS	12	1287.2603	0.00

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TOTAL COSTS

Item	Cost (£)
Manholes	0.00
Pipes	0.00
Materials	0.00
Ground Works	0.00
Flow Controls	0.00
Storage Structures	0.00
TOTAL	0.00

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BREAKDOWN FOR MANHOLES

USMH Name	PN	MH Class	Diameter (mm)	Width (mm)	Ring Depth (m)	Cost (£)	Add Cost (£)	Total (£)
SS1	S2.000	Unclassified	1200		0.631	?.??	?.??	?.??
SS2	S2.001	Unclassified	1200		0.823	?.??	?.??	?.??
SS11	S3.000	Unclassified	1200		0.336	?.??	?.??	?.??
SS3	S2.002	Unclassified	1200		0.514	?.??	?.??	?.??
SSWALE 4	S1.005	Unclassified	10000		0.091	?.??	?.??	?.??
SPOND	S4.000	Unclassified	1200		0.761	?.??	?.??	?.??
SS4	S4.001	Unclassified	1200		0.832	?.??	?.??	?.??
SS5	S4.002	Unclassified	1200		0.529	?.??	?.??	?.??
SS6	S4.003	Unclassified	1200		0.653	?.??	?.??	?.??
SS9	S5.000	Unclassified	1200		0.451	?.??	?.??	?.??
SS10	S6.000	Unclassified	1200		0.488	?.??	?.??	?.??
SS8	S5.001	Unclassified	1200		0.532	?.??	?.??	?.??
SS7	S4.004	Unclassified	1350		0.604	?.??	?.??	?.??
SSWALE 5	S1.006	Unclassified	10000		0.220	?.??	?.??	?.??
TOTALS					7.465	0.00	0.00	0.00

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BREAKDOWN FOR PIPES

PN	Pipe Class	Diameter (mm)	Min Cover D (m)	Max Cover D (m)	Length (m)	Cost / m (£)	Total Cost (£)
S1.000	Unclassified	-1	0.053	0.053	77.000	?.??	?.??
S1.001	Unclassified	225	0.382	0.530	25.000	?.??	?.??
S1.002	Unclassified	-1	-0.145	-0.145	32.000	?.??	?.??
S1.003	Unclassified	225	0.594	0.700	18.000	?.??	?.??
S1.004	Unclassified	-1	0.025	0.091	61.000	?.??	?.??
S2.000	Unclassified	225	0.631	0.822	31.000	?.??	?.??
S2.001	Unclassified	225	0.514	0.823	31.000	?.??	?.??
S3.000	Unclassified	225	0.336	0.515	28.800	?.??	?.??
S2.002	Unclassified	225	0.514	0.767	36.850	?.??	?.??
S1.005	Unclassified	-1	0.091	0.221	120.000	?.??	?.??
S4.000	Unclassified	225	0.761	0.832	10.800	?.??	?.??
S4.001	Unclassified	225	0.529	0.832	32.100	?.??	?.??
S4.002	Unclassified	225	0.529	0.728	27.950	?.??	?.??
S4.003	Unclassified	300	0.653	0.679	4.875	?.??	?.??
S5.000	Unclassified	225	0.451	0.606	24.800	?.??	?.??
S6.000	Unclassified	225	0.488	0.607	18.800	?.??	?.??
S5.001	Unclassified	300	0.532	0.679	34.015	?.??	?.??
S4.004	Unclassified	375	0.604	0.746	36.835	?.??	?.??
S1.006	Unclassified	-1	0.088	0.220	63.000	?.??	?.??
S1.007	Unclassified	-1	0.088	0.300	6.000	?.??	?.??
TOTALS					719.825		0.00

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BREAKDOWN FOR MANHOLE BLINDING (£0.00/m³)

USMH Name	PN	Diameter (mm)	Width (mm)	Height (m)	Volume (m³)	Cost (£)
SS1	S2.000	1200		?.???	?.????	?.??
SS2	S2.001	1200		?.???	?.????	?.??
SS11	S3.000	1200		?.???	?.????	?.??
SS3	S2.002	1200		?.???	?.????	?.??
SSWALE 4	S1.005	10000		?.???	?.????	?.??
SPOND	S4.000	1200		?.???	?.????	?.??
SS4	S4.001	1200		?.???	?.????	?.??
SS5	S4.002	1200		?.???	?.????	?.??
SS6	S4.003	1200		?.???	?.????	?.??
SS9	S5.000	1200		?.???	?.????	?.??
SS10	S6.000	1200		?.???	?.????	?.??
SS8	S5.001	1200		?.???	?.????	?.??
SS7	S4.004	1350		?.???	?.????	?.??
SSWALE 5	S1.006	10000		?.???	?.????	?.??
TOTALS				0.000	0.0000	0.00

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BREAKDOWN FOR PIPE SURROUND

PN	Length (m)	Diameter (mm)	Surround	Volume (m^3)	Cost / m^3 (£)	Cost (£)
S1.000	77.000	-1	Unclassified	?.????	?.??	?.??
S1.001	25.000	225	Unclassified	?.????	?.??	?.??
S1.002	32.000	-1	Unclassified	?.????	?.??	?.??
S1.003	18.000	225	Unclassified	?.????	?.??	?.??
S1.004	61.000	-1	Unclassified	?.????	?.??	?.??
S2.000	31.000	225	Unclassified	?.????	?.??	?.??
S2.001	31.000	225	Unclassified	?.????	?.??	?.??
S3.000	28.800	225	Unclassified	?.????	?.??	?.??
S2.002	36.850	225	Unclassified	?.????	?.??	?.??
S1.005	120.000	-1	Unclassified	?.????	?.??	?.??
S4.000	10.800	225	Unclassified	?.????	?.??	?.??
S4.001	32.100	225	Unclassified	?.????	?.??	?.??
S4.002	27.950	225	Unclassified	?.????	?.??	?.??
S4.003	4.875	300	Unclassified	?.????	?.??	?.??
S5.000	24.800	225	Unclassified	?.????	?.??	?.??
S6.000	18.800	225	Unclassified	?.????	?.??	?.??
S5.001	34.015	300	Unclassified	?.????	?.??	?.??
S4.004	36.835	375	Unclassified	?.????	?.??	?.??
S1.006	63.000	-1	Unclassified	?.????	?.??	?.??
S1.007	6.000	-1	Unclassified	?.????	?.??	?.??
TOTALS	719.825			0.0000		0.00

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BREAKDOWN FOR MANHOLE SURROUND

USMH Name	PN	Diameter (mm)	Width (mm)	Depth (m)	Surround	Volume (m^3)	Cost / m^3 (£)	Cost (£)
SS1	S2.000	1200		0.856	Unclassified	?.????	?.??	?.??
SS2	S2.001	1200		1.048	Unclassified	?.????	?.??	?.??
SS11	S3.000	1200		0.561	Unclassified	?.????	?.??	?.??
SS3	S2.002	1200		0.739	Unclassified	?.????	?.??	?.??
SSWALE 4	S1.005	10000		0.991	Unclassified	?.????	?.??	?.??
SPOND	S4.000	1200		0.986	Unclassified	?.????	?.??	?.??
SS4	S4.001	1200		1.057	Unclassified	?.????	?.??	?.??
SS5	S4.002	1200		0.754	Unclassified	?.????	?.??	?.??
SS6	S4.003	1200		0.953	Unclassified	?.????	?.??	?.??
SS9	S5.000	1200		0.676	Unclassified	?.????	?.??	?.??
SS10	S6.000	1200		0.713	Unclassified	?.????	?.??	?.??
SS8	S5.001	1200		0.832	Unclassified	?.????	?.??	?.??
SS7	S4.004	1350		0.979	Unclassified	?.????	?.??	?.??
SSWALE 5	S1.006	10000		1.120	Unclassified	?.????	?.??	?.??
TOTALS				12.265		0.0000		0.00

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BREAKDOWN FOR MANHOLE BASE

USMH Name	PN	Diameter (mm)	Width (mm)	Height (m)	Base	Volume (m^3)	Cost / m^3 (£)	Cost (£)
SS1	S2.000	1200		?.???	Unclassified	?.????	?.??	?.??
SS2	S2.001	1200		?.???	Unclassified	?.????	?.??	?.??
SS11	S3.000	1200		?.???	Unclassified	?.????	?.??	?.??
SS3	S2.002	1200		?.???	Unclassified	?.????	?.??	?.??
SSWALE 4	S1.005	10000		?.???	Unclassified	?.????	?.??	?.??
SPOND	S4.000	1200		?.???	Unclassified	?.????	?.??	?.??
SS4	S4.001	1200		?.???	Unclassified	?.????	?.??	?.??
SS5	S4.002	1200		?.???	Unclassified	?.????	?.??	?.??
SS6	S4.003	1200		?.???	Unclassified	?.????	?.??	?.??
SS9	S5.000	1200		?.???	Unclassified	?.????	?.??	?.??
SS10	S6.000	1200		?.???	Unclassified	?.????	?.??	?.??
SS8	S5.001	1200		?.???	Unclassified	?.????	?.??	?.??
SS7	S4.004	1350		?.???	Unclassified	?.????	?.??	?.??
SSWALE 5	S1.006	10000		?.???	Unclassified	?.????	?.??	?.??
TOTALS				0.000		0.0000		0.00

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BREAKDOWN FOR DEPTH BANDS

PN	Dia (mm)	Length (m)	> 0.000
S1.000	-1	77.000	77.000
S1.001	225	25.000	25.000
S1.002	-1	32.000	32.000
S1.003	225	18.000	18.000
S1.004	-1	61.000	61.000
S2.000	225	31.000	31.000
S2.001	225	31.000	31.000
S3.000	225	28.800	28.800
S2.002	225	36.850	36.850
S1.005	-1	120.000	120.000
S4.000	225	10.800	10.800
S4.001	225	32.100	32.100
S4.002	225	27.950	27.950
S4.003	300	4.875	4.875
S5.000	225	24.800	24.800
S6.000	225	18.800	18.800
S5.001	300	34.015	34.015
S4.004	375	36.835	36.835
S1.006	-1	63.000	63.000
S1.007	-1	6.000	6.000
TOTALS		719.825	719.825

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BREAKDOWN FOR PIPE EXCAVATION / REINSTATEMENT

PN	Dia (mm)	Length (m)	Ex. Volume (m^3)	Ex. Cost (£)	Rep. Volume (m^3)	Rep. Cost (£)	Rem. Volume (m^3)	Rem. Cost (£)	Rein. Area (m^2)	Rein. Cost (£)
S1.000	-1	77.000	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.??
S1.001	225	25.000	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.??
S1.002	-1	32.000	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.??
S1.003	225	18.000	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.??
S1.004	-1	61.000	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.??
S2.000	225	31.000	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.??
S2.001	225	31.000	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.??
S3.000	225	28.800	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.??
S2.002	225	36.850	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.??
S1.005	-1	120.000	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.??
S4.000	225	10.800	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.??
S4.001	225	32.100	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.??
S4.002	225	27.950	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.??
S4.003	300	4.875	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.??
S5.000	225	24.800	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.??
S6.000	225	18.800	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.??
S5.001	300	34.015	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.??
S4.004	375	36.835	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.??
S1.006	-1	63.000	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.??
S1.007	-1	6.000	?.????	?.??	?.????	?.??	?.????	?.??	?.????	?.??
TOTALS		719.825	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00

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BREAKDOWN FOR MANHOLE EXCAVATION

USMH Name	PN	Dia (mm)	Width (mm)	Depth (m)	Total Dia (m)	Total Width (m)	Total Depth (m)	Ex. Volume (m^3)	Ex. Cost (£)	Rem. Volume (m^3)	Rem
SS1	S2.000	1200		0.631	?.???		?.???	?.????	?.??	?.????	
SS2	S2.001	1200		0.823	?.???		?.???	?.????	?.??	?.????	
SS11	S3.000	1200		0.336	?.???		?.???	?.????	?.??	?.????	
SS3	S2.002	1200		0.514	?.???		?.???	?.????	?.??	?.????	
SSWALE 4	S1.005	10000		0.091	?.???		?.???	?.????	?.??	?.????	
SPOND	S4.000	1200		0.761	?.???		?.???	?.????	?.??	?.????	
SS4	S4.001	1200		0.832	?.???		?.???	?.????	?.??	?.????	
SS5	S4.002	1200		0.529	?.???		?.???	?.????	?.??	?.????	
SS6	S4.003	1200		0.653	?.???		?.???	?.????	?.??	?.????	
SS9	S5.000	1200		0.451	?.???		?.???	?.????	?.??	?.????	
SS10	S6.000	1200		0.488	?.???		?.???	?.????	?.??	?.????	
SS8	S5.001	1200		0.532	?.???		?.???	?.????	?.??	?.????	
SS7	S4.004	1350		0.604	?.???		?.???	?.????	?.??	?.????	
SSWALE 5	S1.006	10000		0.220	?.???		?.???	?.????	?.??	?.????	
TOTALS				7.465			0.000	0.0000	0.00	0.0000	

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BREAKDOWN FOR FLOW CONTROLS

USMH Name	PN	Flow Control	Online/Offline	Cost (£)
SPIPE RUN OUTFALL	S1.007	Hydro-Brake®	Online	0.00
TOTALS				0.000

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BREAKDOWN FOR STORAGE STRUCTURES

USMH Name	PN	Storage Structure	Volume (m³)	Cost (£)
SPIPE RUN	S1.001	Porous Car Park	27.0000	0.00
SSWALE 2	S1.002	Porous Car Park	203.8500	0.00
SS11	S3.000	Porous Car Park	40.3920	0.00
SSWALE 4	S1.005	Tank or Pond	71.8742	0.00
SPOND	S4.000	Tank or Pond	159.3296	0.00
SS4	S4.001	Porous Car Park	66.5910	0.00
SS5	S4.002	Porous Car Park	67.8600	0.00
SS6	S4.003	Porous Car Park	120.0780	0.00
SS9	S5.000	Porous Car Park	121.6800	0.00
SS10	S6.000	Porous Car Park	109.0890	0.00
SS7	S4.004	Porous Car Park	167.4090	0.00
SSWALE 5	S1.006	Tank or Pond	132.1075	0.00
TOTALS			1287.260	0.00

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.007	S	3.000	1.800	1.800	0	0

Simulation Criteria for Storm

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	12
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)	19.000	Storm Duration (mins)	30
Ratio R	0.400		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: SPIPE RUN OUTFALL, DS/PN: S1.007, Volume (m³): 102.1

Unit Reference	MD-SHE-0105-5000-1000-5000
Design Head (m)	1.000
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	105
Invert Level (m)	1.812
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	5.0
Flush-Flo™	0.296	5.0
Kick-Flo®	0.637	4.1
Mean Flow over Head Range	-	4.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.6	1.200	5.4	3.000	8.4	7.000	12.5
0.200	4.8	1.400	5.8	3.500	9.0	7.500	12.9
0.300	5.0	1.600	6.2	4.000	9.6	8.000	13.3
0.400	4.9	1.800	6.6	4.500	10.1	8.500	13.7
0.500	4.7	2.000	6.9	5.000	10.6	9.000	14.1
0.600	4.3	2.200	7.2	5.500	11.1	9.500	14.5
0.800	4.5	2.400	7.5	6.000	11.6		
1.000	5.0	2.600	7.8	6.500	12.1		

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Storage Structures for Storm

Porous Car Park Manhole: SPIPE RUN, DS/PN: S1.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.0
Membrane Percolation (mm/hr)	1000	Length (m)	30.0
Max Percolation (l/s)	50.0	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	2.500	Membrane Depth (mm)	0

Porous Car Park Manhole: SSWALE 2, DS/PN: S1.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.0
Membrane Percolation (mm/hr)	1000	Length (m)	150.0
Max Percolation (l/s)	250.0	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	2.245	Membrane Depth (mm)	0

Porous Car Park Manhole: SS11, DS/PN: S3.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.0
Membrane Percolation (mm/hr)	1000	Length (m)	40.0
Max Percolation (l/s)	66.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	2.439	Membrane Depth (mm)	0

Tank or Pond Manhole: SSWALE 4, DS/PN: S1.005

Invert Level (m) 2.009

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	33.0	0.700	89.6	1.400	173.9	2.100	286.0
0.100	39.4	0.800	100.0	1.500	188.3	2.200	304.2
0.200	46.3	0.900	110.9	1.600	203.1	2.300	323.1
0.300	53.9	1.000	122.4	1.700	218.6	2.400	342.5
0.400	62.0	1.100	134.4	1.800	234.6	2.500	362.4
0.500	70.6	1.200	147.0	1.900	251.1		
0.600	79.8	1.300	160.2	2.000	268.3		

Tank or Pond Manhole: SPOND, DS/PN: S4.000

Invert Level (m) 2.514

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	100.0	0.300	134.4	0.600	174.0	0.900	218.6
0.100	110.9	0.400	147.1	0.700	188.3	1.000	234.6
0.200	122.4	0.500	160.2	0.800	203.2	1.100	251.2

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Tank or Pond Manhole: SPOND, DS/PN: S4.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
1.200	268.3	1.600	342.5	2.000	425.8	2.400	518.1
1.300	286.0	1.700	362.5	2.100	448.0	2.500	542.6
1.400	304.3	1.800	383.0	2.200	470.8		
1.500	323.1	1.900	404.1	2.300	494.2		

Porous Car Park Manhole: SS4, DS/PN: S4.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	42.0
Max Percolation (l/s)	58.3	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	2.443	Membrane Depth (mm)	0

Porous Car Park Manhole: SS5, DS/PN: S4.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	60.0
Max Percolation (l/s)	83.3	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	2.246	Membrane Depth (mm)	0

Porous Car Park Manhole: SS6, DS/PN: S4.003

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	84.0
Max Percolation (l/s)	116.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	2.047	Membrane Depth (mm)	0

Porous Car Park Manhole: SS9, DS/PN: S5.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.0
Membrane Percolation (mm/hr)	1000	Length (m)	100.0
Max Percolation (l/s)	166.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	2.324	Membrane Depth (mm)	0

Porous Car Park Manhole: SS10, DS/PN: S6.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	102.0
Max Percolation (l/s)	141.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	2.287	Membrane Depth (mm)	0

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Porous Car Park Manhole: SS7, DS/PN: S4.004

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	114.0
Max Percolation (l/s)	158.3	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	2.021	Membrane Depth (mm)	0

Tank or Pond Manhole: SSWALE 5, DS/PN: S1.006

Invert Level (m) 1.880

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	60.0	0.700	131.5	1.400	230.7	2.100	357.7
0.100	68.5	0.800	144.0	1.500	247.2	2.200	378.1
0.200	77.6	0.900	157.0	1.600	264.2	2.300	399.0
0.300	87.3	1.000	170.7	1.700	281.8	2.400	420.6
0.400	97.5	1.100	184.8	1.800	299.9	2.500	442.7
0.500	108.3	1.200	199.6	1.900	318.6		
0.600	119.6	1.300	214.9	2.000	337.8		

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 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 12
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 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 450.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
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) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	SSWALE 1	15 Summer	1	+0%				
S1.001	SPIPE RUN	15 Winter	1	+0%				
S1.002	SSWALE 2	30 Winter	1	+0%				
S1.003	SPIPE RUN	15 Winter	1	+0%	100/120 Winter			
S1.004	SSWALE 3	720 Winter	1	+0%				
S2.000	SS1	15 Summer	1	+0%	100/15 Summer			
S2.001	SS2	15 Summer	1	+0%	100/15 Summer			
S3.000	SS11	60 Winter	1	+0%	100/15 Summer			
S2.002	SS3	15 Winter	1	+0%	30/15 Summer			
S1.005	SSWALE 4	720 Winter	1	+0%				
S4.000	SPOND	60 Winter	1	+0%				
S4.001	SS4	60 Winter	1	+0%				
S4.002	SS5	60 Winter	1	+0%	100/60 Winter			
S4.003	SS6	180 Winter	1	+0%	100/60 Summer			
S5.000	SS9	120 Winter	1	+0%				
S6.000	SS10	120 Winter	1	+0%	100/360 Winter			
S5.001	SS8	60 Winter	1	+0%	100/180 Winter			
S4.004	SS7	720 Winter	1	+0%	100/120 Summer			
S1.006	SSWALE 5	960 Winter	1	+0%				

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SSWALE 1	2.554	-0.893	0.000	0.00		7.5	OK	
S1.001	SPIPE RUN	2.439	-0.179	0.000	0.09		3.7	OK*	
S1.002	SSWALE 2	2.253	-0.892	0.000	0.00		3.3	OK	
S1.003	SPIPE RUN	2.256	-0.150	0.000	0.25		9.8	OK*	
S1.004	SSWALE 3	2.120	-0.855	0.000	0.00		1.9	OK	
S2.000	SS1	2.722	-0.147	0.000	0.25		9.2	OK	
S2.001	SS2	2.538	-0.139	0.000	0.31		11.4	OK	
S3.000	SS11	2.482	-0.182	0.000	0.08		3.1	OK	
S2.002	SS3	2.373	-0.113	0.000	0.48		18.4	OK	
S1.005	SSWALE 4	2.120	-0.789	0.000	0.00		4.7	OK	
S4.000	SPOND	2.556	-0.183	0.000	0.08		2.7	OK	
S4.001	SS4	2.505	-0.163	0.000	0.17		6.3	OK	
S4.002	SS5	2.306	-0.165	0.000	0.16		6.4	OK	
S4.003	SS6	2.127	-0.220	0.000	0.14		7.2	OK	
S5.000	SS9	2.366	-0.183	0.000	0.08		2.9	OK	
S6.000	SS10	2.327	-0.185	0.000	0.07		2.7	OK	
S5.001	SS8	2.232	-0.236	0.000	0.10		6.6	OK	
S4.004	SS7	2.123	-0.273	0.000	0.06		6.8	OK	
S1.006	SSWALE 5	2.121	-0.659	0.000	0.00		7.7	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.007	SPIPE RUN OUTFALL	480 Winter	1	+0%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.007	SPIPE RUN OUTFALL	2.124	-0.588	0.000	0.00		4.9	OK	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet 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 12
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 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 450.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
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) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	SSWALE 1	15 Summer	30	+0%				
S1.001	SPIPE RUN	15 Winter	30	+0%				
S1.002	SSWALE 2	480 Winter	30	+0%				
S1.003	SPIPE RUN	480 Winter	30	+0%	100/120 Winter			
S1.004	SSWALE 3	480 Winter	30	+0%				
S2.000	SS1	15 Summer	30	+0%	100/15 Summer			
S2.001	SS2	15 Winter	30	+0%	100/15 Summer			
S3.000	SS11	15 Winter	30	+0%	100/15 Summer			
S2.002	SS3	15 Winter	30	+0%	30/15 Summer			
S1.005	SSWALE 4	480 Winter	30	+0%				
S4.000	SPOND	30 Winter	30	+0%				
S4.001	SS4	30 Winter	30	+0%				
S4.002	SS5	60 Winter	30	+0%	100/60 Winter			
S4.003	SS6	480 Winter	30	+0%	100/60 Summer			
S5.000	SS9	60 Winter	30	+0%				
S6.000	SS10	60 Winter	30	+0%	100/360 Winter			
S5.001	SS8	480 Winter	30	+0%	100/180 Winter			
S4.004	SS7	480 Winter	30	+0%	100/120 Summer			
S1.006	SSWALE 5	480 Winter	30	+0%				

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SSWALE 1	2.567	-0.880	0.000	0.01		18.3	OK	
S1.001	SPIPE RUN	2.479	-0.139	0.000	0.31		12.4	OK*	
S1.002	SSWALE 2	2.322	-0.823	0.000	0.00		2.6	OK	
S1.003	SPIPE RUN	2.322	-0.084	0.000	0.16		6.3	OK*	
S1.004	SSWALE 3	2.321	-0.654	0.000	0.00		6.2	OK	
S2.000	SS1	2.776	-0.093	0.000	0.60		22.5	OK	
S2.001	SS2	2.632	-0.045	0.000	0.75		28.0	OK	
S3.000	SS11	2.548	-0.116	0.000	0.40		14.8	OK	
S2.002	SS3	2.541	0.055	0.000	1.11		42.2	SURCHARGED	
S1.005	SSWALE 4	2.321	-0.588	0.000	0.01		10.2	OK	
S4.000	SPOND	2.599	-0.140	0.000	0.28		9.5	OK	
S4.001	SS4	2.568	-0.100	0.000	0.59		22.1	OK	
S4.002	SS5	2.369	-0.102	0.000	0.58		23.0	OK	
S4.003	SS6	2.324	-0.023	0.000	0.17		8.4	OK	
S5.000	SS9	2.413	-0.136	0.000	0.33		12.3	OK	
S6.000	SS10	2.373	-0.139	0.000	0.31		11.4	OK	
S5.001	SS8	2.325	-0.143	0.000	0.15		10.0	OK	
S4.004	SS7	2.324	-0.072	0.000	0.15		15.8	OK	
S1.006	SSWALE 5	2.321	-0.459	0.000	0.01		9.5	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.007	SPIPE RUN OUTFALL	480 Winter	30	+0%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.007	SPIPE RUN OUTFALL	2.321	-0.391	0.000	0.00		5.0	OK	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet 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 12
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 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 450.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
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) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	SSWALE 1	15 Summer	100	+40%				
S1.001	SPIPE RUN	720 Winter	100	+40%				
S1.002	SSWALE 2	720 Winter	100	+40%				
S1.003	SPIPE RUN	720 Winter	100	+40%	100/120 Winter			
S1.004	SSWALE 3	720 Winter	100	+40%				
S2.000	SS1	15 Summer	100	+40%	100/15 Summer			
S2.001	SS2	15 Summer	100	+40%	100/15 Summer			
S3.000	SS11	30 Winter	100	+40%	100/15 Summer			
S2.002	SS3	15 Winter	100	+40%	30/15 Summer			
S1.005	SSWALE 4	720 Winter	100	+40%				
S4.000	SPOND	30 Winter	100	+40%				
S4.001	SS4	30 Winter	100	+40%				
S4.002	SS5	720 Winter	100	+40%	100/60 Winter			
S4.003	SS6	720 Winter	100	+40%	100/60 Summer			
S5.000	SS9	720 Winter	100	+40%				
S6.000	SS10	720 Winter	100	+40%	100/360 Winter			
S5.001	SS8	720 Winter	100	+40%	100/180 Winter			
S4.004	SS7	720 Winter	100	+40%	100/120 Summer			
S1.006	SSWALE 5	720 Winter	100	+40%				

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SSWALE 1	2.587	-0.860	0.000	0.01		32.6	OK	
S1.001	SPIPE RUN	2.535	-0.083	0.000	0.06		2.3	OK*	
S1.002	SSWALE 2	2.536	-0.609	0.000	0.00		2.4	OK	
S1.003	SPIPE RUN	2.540	0.134	0.000	0.16		6.5	SURCHARGED*	
S1.004	SSWALE 3	2.534	-0.441	0.000	0.00		6.3	OK	
S2.000	SS1	3.208	0.339	0.000	0.91		34.2	FLOOD RISK	
S2.001	SS2	3.049	0.372	0.000	1.20		45.1	SURCHARGED	
S3.000	SS11	2.728	0.064	0.000	0.73		27.3	FLOOD RISK	
S2.002	SS3	2.772	0.286	0.000	1.44		54.9	FLOOD RISK	
S1.005	SSWALE 4	2.534	-0.375	0.000	0.01		10.9	OK	
S4.000	SPOND	2.666	-0.073	0.000	0.54		18.5	OK	
S4.001	SS4	2.643	-0.025	0.000	1.00		37.5	OK	
S4.002	SS5	2.540	0.069	0.000	0.22		8.6	SURCHARGED	
S4.003	SS6	2.538	0.191	0.000	0.18		9.0	SURCHARGED	
S5.000	SS9	2.540	-0.009	0.000	0.16		6.1	OK	
S6.000	SS10	2.539	0.027	0.000	0.13		4.8	SURCHARGED	
S5.001	SS8	2.538	0.070	0.000	0.18		11.7	SURCHARGED	
S4.004	SS7	2.537	0.141	0.000	0.16		17.2	SURCHARGED	
S1.006	SSWALE 5	2.535	-0.245	0.000	0.01		9.5	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.007	SPIPE RUN OUTFALL	720 Winter	100	+40%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.007	SPIPE RUN OUTFALL	2.534	-0.178	0.000	0.00		5.0	FLOOD RISK*

PN	US/MH Name	Level Exceeded
S1.007	SPIPE RUN OUTFALL	

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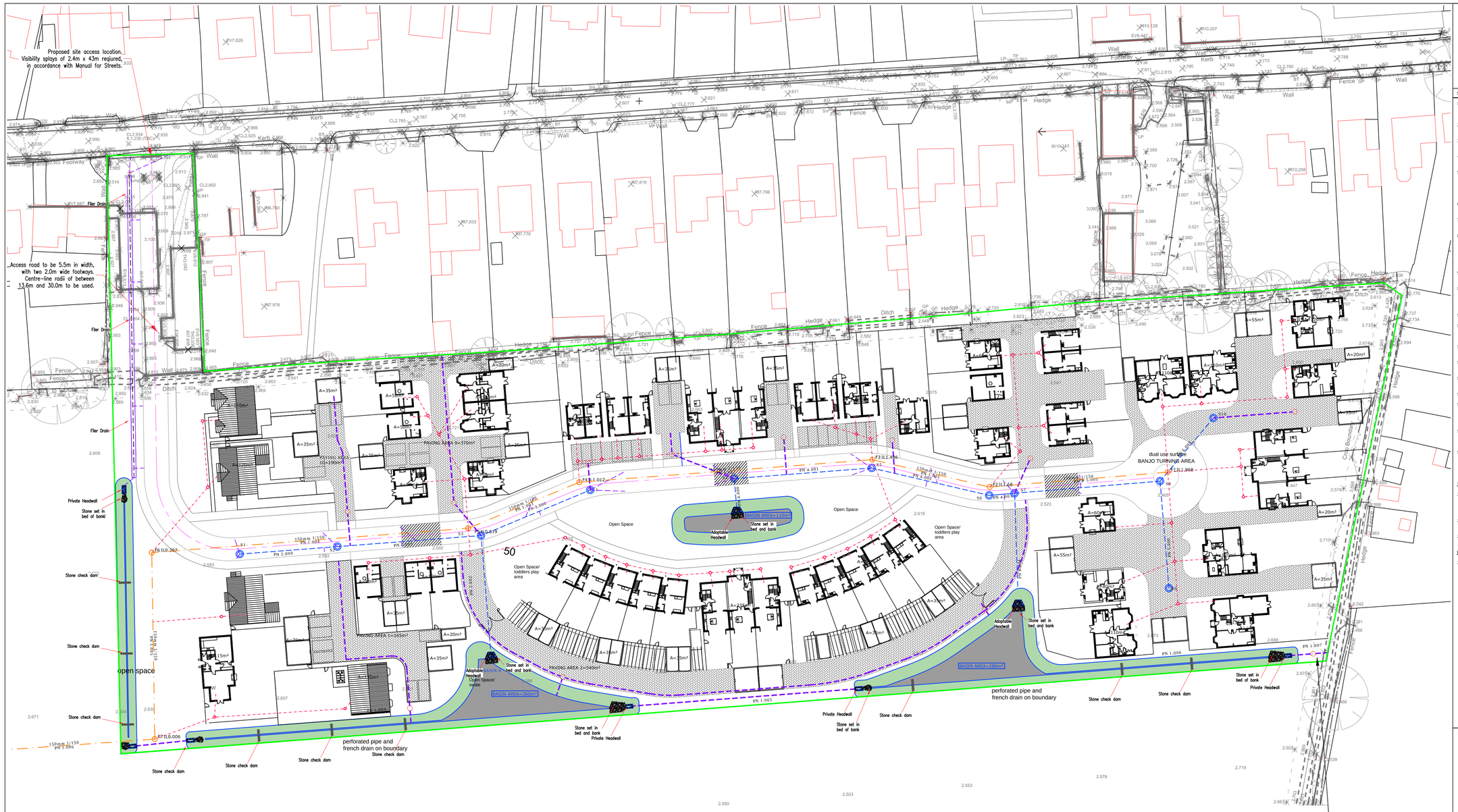
APPENDIX 9

INDICATIVE DRAINAGE LAYOUT



PROPOSED HYDRO-BRAKE FLOW CONTROL MANHOLE. DISCHARGE RESTRICTED TO 5.0 L/SEC FOR ALL STORMS UPTO AND INCLUDING THE 1 IN 100 YEAR PLUS 40% CLIMATE CHANGE

NOTES

1. The contractor shall check all tie-ins for line and level with existing before commencing any works. The Engineer shall be notified immediately, in writing, should any errors be found.
2. Any discrepancies, of whatever nature, must be reported to the Engineer prior to the commencement or continuance of any further works.
3. All private drainage works to be in accordance with the requirements of Building Regulations 2010, Part H, "Drainage and waste disposal", (01st October 2015).
4. All pipes to be bedded and backfilled in accordance with Part H, Diagram 10. Shallow pipes shall be protected in accordance with Part H, Diagram 11.
5. Unless otherwise stated, all private drainage to be 100mm diameter. Gradients have been shown where there are pipe capacity issues and these should be regarded as minimums. Unless there are constraints dictating otherwise, gradients shall generally be 1 in 60. 100mm diameter pipes shall not be laid flatter than 1 in 80, 150mm diameter pipes shall not be laid flatter than 1 in 150.
6. All pipes, chambers and fittings to be installed strictly in accordance with the manufacturers instructions.
7. Pipes which run adjacent to buildings shall be installed in strict accordance with Part H, Clauses 2.23 to 2.25 and Diagram 8.
8. All private manholes, inspection chambers and drainage channels to comply with BS EN124. Cover strengths to be:
   Class D400 in heavy trafficked areas (access roads, service yards etc.)
   Class C250 in lightly trafficked areas (car parks, driveways etc)
   Class B125 in Non trafficked areas
   Class A15 in landscaping areas
9. All drains in the vicinity of existing or proposed trees to be constructed in accordance with the requirements of NHBC Practice Note 3.
10. Private drainage frames must be tied to manhole risers by use of manufacturers ties (e.g. Polypipe ref. FBK500 fixing kit and FBK501 black ties.) The ground works contractor will be held fully responsible for any accidents due to incorrect fitting or failure to use the correct manufacturers fixing equipment.
11. All existing land drains encountered on site during construction to be re-connected.
12. Should any departure from the slab level be considered, agreement shall be sought from the Engineer immediately and prior to commencement or continuance of any works, and should take full account of all restrictions to the slab level.
13. Garage slabs relate to the finished level of the concrete at the front entrance of the garage.
14. Where a drive slopes towards a garage there is to be a 75mm ramp up to the garage slab.
15. Maximum gradients of gardens to be 1 in 6 (unless stated otherwise), except for designed banking works.
16. All dimensions in metres unless otherwise stated.
17. As underlying ground conditions may be variable across the site the Contractor shall undertake onsite porosity tests at the location and depth of each soakaway. Tests should be undertaken in accordance with BRE365 and results forwarded to the Engineers to allow verification of designs.
18. All existing services, sewers and drains indicated on this drawing and any other related drawings are shown only indicatively, and shall have their positions and level confirmed on site by the Contractor.
19. The invert levels of all existing sewers, drains, ditches, tanks or other features and apparatus where a new connection is to be made shall have their precise position and level confirmed on site by the Contractor prior to commencement of any construction work. The results of the investigations shall be confirmed to MTC Engineering (Cambridge) Ltd so that the design can be verified.

STORM WATER

20. All run-off from domestic roofs shall drain via a series of surface drainage systems with each outfall to cellular soakaways. The soakaways and drainage systems are to remain private and have been designed to accommodate all storms up to and including the 100yr + 40% event.
21. All private driveways and shared accesses shall drain via permeable paving. The paving shall be designed based on CBR results and to accommodate the required loading.
22. The design of each soakaway has been undertaken on the basis of infiltration rates established on site by BRE 365 testing. The rate used in design is 0.036 m/hr.

FOUL WATER DRAINAGE

23. Domestic foul sewerage from all properties shall drain via a private gravity foul water drainage system which shall discharge to the existing public foul sewer at new Type B manhole chamber F4. Connection will be subject to a S106 Connection Agreement with the Water Authority.

NOTE:
At the location of the proposed lateral connection the contractor shall establish the position and depth of any existing services to prevent any clash in level and abortive costs.

REV	DATE	DESCRIPTION/REASON FOR ISSUE	APPR
A	25.10.2019	REVISED DRAINAGE TO NEW LAYOUT	JTC

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TITLE
PROPOSED RESIDENTIAL DEVELOPMENT
MOULTON CHAPEL, SPALDING
INDICATIVE DRAINAGE LAYOUT

ORIG A.O	DATE SEPTEMBER 2019
CHKD	SCALE 1:500 @ A1
APPR	DRAWING NO 2351-03 REV A

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Adoptable Sewer Key

225@156 S1(2.25) Storm sewer with pipe dia. & gradient incl. adoptable SWMH with reference & Invert.

Surface Water Attenuation

Permeable Block Paving
Load Category 4 permeable paving (infiltration) on subgrade 5% soaked CBR. 80mm Permeable Block, 50mm laying course material comprising mostly passing 6.3mm sieve and mostly retained on a 3mm sieve. 70mm dense bitumen macadam hole punched with 75mm Dia holes at 750mm centres. 300mm Hydraulically bound coarse graded aggregate laid in layers not exceeding 100mm thick, each layer to be well compacted.

Proposed New Swale

Proposed Concrete Baffles

Proposed Filter Drain

Anglian Water Notes

All S.104 adoptable drainage shall conform to the design and construction guide for developers, Sewers for Adoption 6th Edition published by WRc plc and any AWSL additions & deletions current at the time of execution.

All covers and frames on adoptable AW sewers are to be D400, kitemarked and be badged 'FW' or 'SW' accordingly. Suppliers shall be Stanton, Paul Savage, Norinco or Wrekin.

All connections to adoptable sewers will be made in vitrified clay, to be a minimum of 100mm diameter and be connected at soffit to soffit level.

Adoptable pipework shall be to the following specification:

Clayware: BS EN 295-1:1991
150 dia. Crushing Strength 34kN/m
225 dia. Class 160

Concrete: BS EN 5911-1:2002
>300 dia. Class 120