Land at Christon Mews
Alnwick

Drainage Strategy

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DOCUMENT CONTROL SHEET

Land at Christon Mews, Alnwick

DRAINAGE STRATEGY

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00	12.10.22	Planning	A Abelé	[signature]	R Jones	[signature]	A Short	[signature]

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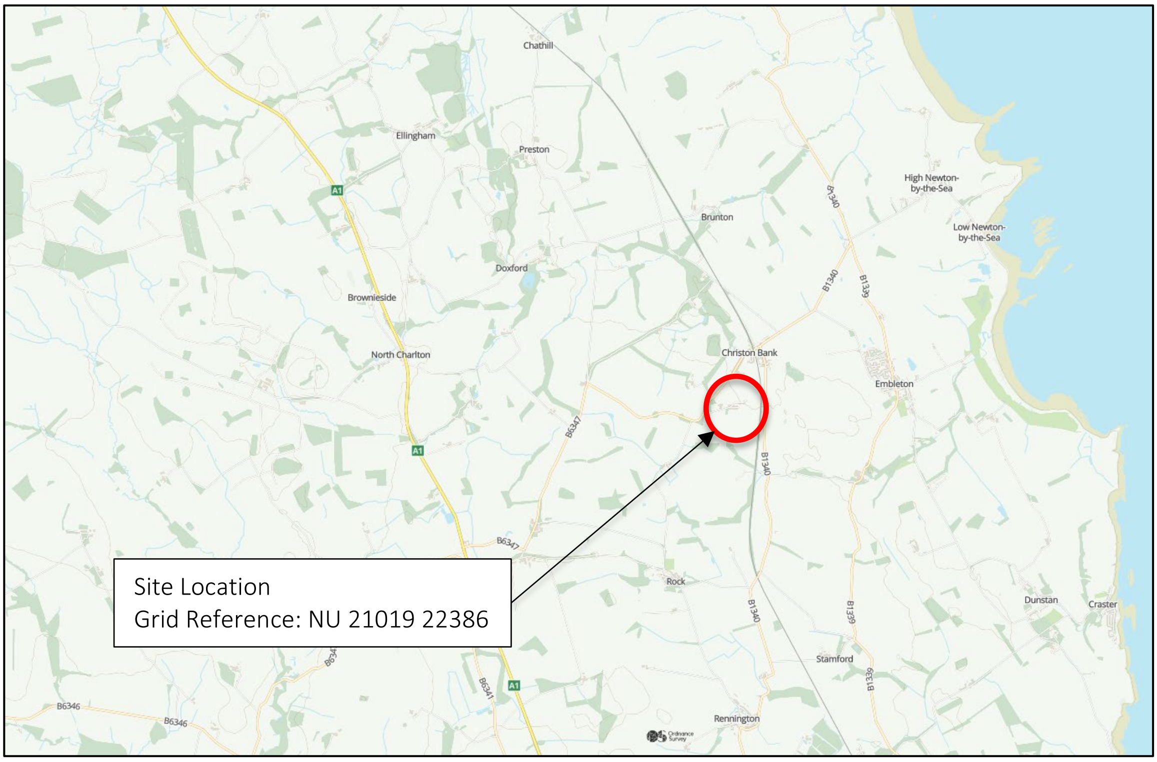
1 INTRODUCTION

1.1 BRIEF

JC Consulting Ltd (JCC) have been commissioned by George F.White to undertake a Drainage Strategy to support a detailed planning application. The planning application consists of 5no. proposed residential dwellings, with associated hard landscaping and infrastructure.

The development site is located at Ordnance Survey (OS) Grid Reference: NU 21019 22386 (E421019, N622386), as shown in Figure 1.1.

Figure 1.1 - Ordnance Survey Map – Site Location



As a new development, Sustainable Drainage Systems (SuDS), surface and foul water drainage must be considered. This report gives an overview of the methodology used, summarises the options investigated and the drainage proposals for the development.

1.2 REPORT SCOPE

The principal objectives of this Drainage Strategy are as follows:

- To establish the appropriate design standards and guidance that will assist the design of the Drainage Strategy.
- To establish the existing site constraints and drainage features.
- To determine a Drainage Strategy for the discharge of surface water flows from the site.
- To determine a suitable Drainage Strategy for the discharge of foul water flows from the site.

2 RELEVANT POLICIES, LEGISLATION AND GUIDANCE

2.1 OVERVIEW

This Drainage Strategy will be in accordance with the following legislation and guidance:

- National Planning Policy Framework
- Planning Practice Guidance
- Non-Statutory Technical Standards for Sustainable Drainage Systems

This Drainage Strategy will be designed using the standards:

- BS EN 725:2017 – Drain and sewer systems outside buildings.
- BS EN 12056-2 2000 – Gravity drainage systems inside buildings.
- SuDS Manual (CIRIA C753)
- Building Regulations Approved Document Part H 2010 Drainage and waste disposal (2015 Edition)
- PPG3 – Use and design of oil separators in surface water drainage systems
- National Building Specification
- Civil Engineering Specification for the Water Industry (7th Edition)
- SSG Appendix C - Design and construction guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England ("the Code"). Approved Version 2.0. 10 March 2020

2.2 NATIONAL PLANNING POLICY FRAMEWORK

The NPPF published in July 2018 and updated in February 2019, is a key part of the government's reform to make the planning system less complex and more accessible; to protect the environment and to promote sustainable growth.

In relation to drainage, the NPPF states that *'Major Developments'* should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

- Take account of advice from the Lead Local Flood Authority.
- Have appropriate proposed minimum operational standards.
- Have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development.
- Where possible provide multifunctional benefits.

2.3 PLANNING PRACTICE GUIDANCE

The Planning Practice Guidance (2014) reiterates the government's expectation that sustainable drainage systems are provided in new developments wherever appropriate. It states that the government expect decisions based on incorporated policies, relating to *'Major Developments'* (developments of 10 dwellings or more, or equivalent non-residential developments) to ensure that sustainable drainage systems for the management of run-off are put in place, unless demonstrated otherwise.

2.4 NON-STATUTORY TECHNICAL STANDARDS FOR SUSTAINABLE DRAINAGE SYSTEMS

The 'Non-Statutory Technical Standards for Sustainable Drainage Systems' states that for greenfield developments, the peak run-off rate and run-off volume from the development to any drain, sewer, or surface water body for the 1 in 1-year rainfall event and the 1 in 100-year, 6-hour rainfall event should never exceed the peak greenfield run-off rate and volume for the same event.

For previously developed sites, the peak run-off rate and volume from the development to any drain, sewer or surface water body for the 1 in 1-year rainfall event and the 1 in 100-year, 6-hour rainfall event must be as close as reasonably possible to the greenfield run-off rate and volume from the development at the same rainfall event but should never exceed the rate of discharge or run-off volume from the development prior to re-development for that event.

Where it is not reasonably practicable to constrain volume of run-off, the volume must be discharged at a rate that does not affect flood risk.

Where the drainage system discharges to a surface water body that can accommodate uncontrolled surface water discharges without any impact on flood risk from that surface water body, the peak flow standards and volume control standards need not apply.

The drainage system must be designed so that flooding does not occur on any part of the site for a 1 in 30-year rainfall event, unless there is an area of the site dedicated for compensatory storage.

The drainage system must also be designed so that flooding does not occur during a 1 in 100-year rainfall event in any part of the building or any utility plant on-site.

The design of the proposed development must ensure that flows resulting from excess rainfall for a 1 in 100-year event are managed in exceedance routes that minimise the risks to people and properties.

Components of the drainage network must be designed to ensure the structural integrity of the network is maintained throughout its design life. Materials, products, or fittings must be of a suitable standard for intended use.

Pumping should only be used to facilitate drainage for parts of the site where it is not practicable to drain water via gravity.

The construction of any communication with an existing sewer or drainage system must be such that the making of the communication would not damage the structural integrity or functionality of the sewerage system. Damage to the drainage system must be minimised, if unavoidable, and must be rectified prior to completion of the system.

3 SITE AND SURROUNDINGS

3.1 SITE LOCATION AND PROPOSED DEVELOPMENT DESCRIPTION

The proposed development site is situated at Christon Bank, Alnwick; see ***Appendix A*** for the ***Proposed Site Plan***. The proposed development site is centred at OS Grid Reference NU 21019 22386 (E421019, N622386).

This Drainage Strategy has been produced to support the planning application of a development site, which consists of 5no. proposed residential dwellings, with associated hard landscaping and infrastructure.

The site at Christon Bank is an irregular shaped parcel of land and encompasses an area of approximately 0.3613 ha (3,613m^2), comprising of an existing structure used for agricultural purposes, and an area of external hard landscaping, used as a car park for the structure. The site is bounded by residential properties and farm cottages to the east, noted as 'Christon Bank Farm'. Land for agricultural use is located south of the site beyond 'Christon Bank Mews' access road, which is accessed via the 'B6347' highway. 'Pringle W Ltd' is directly to the west, which is a commercial property for maintenance and repair of motor vehicles. Further land for agricultural use is located north of the site. The proposed development site can be accessed via 'Christon Bank Mews'.

3.2 TOPOGRAPHY

A topographical survey has not been provided for the site. However, external level information can be obtained via the Ordnance Survey (OS) Maps.

After a review of the OS information, the site appears to slope approximately 1m at an average gradient of approximately 1:100 from west to east.

4 SURFACE WATER DRAINAGE STRATEGY

4.1 METHODOLOGY

The following methodology was used to produce a surface water Drainage Strategy for the site:

- Determine a suitable method for surface water discharge.
- Calculate pre-development/greenfield run-off rate, using the method outlined in the Interim Code of Practice for Sustainable Drainage Systems (ICP SuDS).
- Calculate the required post development attenuation/storage required for the critical storm with a return period of 30 years in line with the National Planning Policy Framework (NPPF).
- Test the sensitivity of the site by investigating the volume of runoff produced during storms with a return period of 100 year plus 40% allowance for climate change in line with the NPPF.
- Test the sites suitability for the use of Sustainable Drainage Systems.
- Test the sites post development water quality & outline any mitigation procedures.
- Outline the maintenance procedures for the proposed drainage network and determine who will be responsible for the maintenance of the network, in accordance with *'CIRIA - The SuDS Manual C753'*.
- Outline the relevant guidance to be followed with respect to safety issues of the network.

4.2 SURFACE WATER DISCHARGE METHOD

The potential methods of surface water discharge, in order of preference, are:

- Discharge to the ground via infiltration.
- Discharge to a nearby watercourse.
- Discharge to an existing surface water sewer.
- Discharge to an existing combined water sewer.

A site investigation has not been carried out for the proposed development site; however, geological information can be obtained from the British Geological Survey (BGS) Geology of Britain Viewer (2014).

According to the BGS Geology of Britain Viewer (2014), the sites bedrock geology comprises of an Alston Formation, which consists of limestone, sandstone, siltstone and mudstone.

The BGS Geology of Britain Viewer (2014) also indicates that the sites superficial deposits consist of till, devensian (diamicton), which is predominantly bolder clay.

Based on the hierarchy of discharge of surface water, the preferred method of surface water disposal is by infiltration. However, using the geological information above, the sites superficial deposits are shown to be predominantly till. Discharge via infiltration is not typically advised in till deposits due to the nature of the soil.

The Ordnance Survey maps, and EA maps, show that the site is within the vicinity of a pond located within Christon Bank Farm.

However, there are no named bodies of water or drainage ditches understood to be within the vicinity of the site. Therefore, it is not considered feasible to dispose of surface water via a watercourse.

NWL have been contacted to identify any sewerage assets within the vicinity of the site (see ***Appendix B*** for the ***NWL Sewerage Plan***).

NWL have verified that there is a 900mm diameter surface water sewer approximately 350m north of the site, within Springfield View, which is accessed via an access road named 'The Village'. The surface water sewer is expected to collect surface water drainage from the properties to the north of the site. This sewer flows to a culverted watercourse north of the site.

A significant amount of excavation and reinstatement to the areas beyond the site boundary would be required to connect to the surface water sewer. Therefore, this option is not considered the most appropriate method of surface water disposal.

Furthermore, the third-party landowner would be required to confirm that they will allow a pipeline to be installed across their land. Therefore, due to the site constraints, it is proposed to discharge surface water flows to the ground via infiltration with an appropriately sized cellular soakaway for each plot.

A percolation test is required, prior to construction, to determine the infiltration rate across the site.

4.3 INFILTRATION RATE CALCULATION

For a typical development of this nature, it would be proposed to restrict surface water flows to a rate agreed with the Lead Local Flood Authority (LLFA) to ensure that there will be no additional flooding to the surrounding area due to the increase in impermeable area. However, due to surface water flows being discharged to the ground via infiltration, it is considered appropriate to restrict flows as close as practicable to that of the typical infiltration rate for the anticipated strata. According to the Ciria SuDS Manual C753, till is considered to have the slowest infiltration rate, which is between $3x10^{-9}$ m/s and $3x10^{-6}$ m/s.

It is proposed to discharge surface water flows using a typical infiltration rate of $3x10^{-9}$ m/s, for a worst-case scenario calculation.

A percolation test is required, prior to construction, to determine the infiltration rate across the site.

4.4 POST DEVELOPMENT ATTENUATION

It is proposed to provide a surface water drainage system serving all hard-standing areas for the site. Surface water flows are to be discharged to the ground via infiltration, with an estimated infiltration rate of $3x10^{-9}$ m/s.

MicroDrainage has been used to model the proposed surface water drainage and carry out a simulation for various return periods for the site. Simulations were carried out to ensure that there is no exceedance of the surface water network for a 1 in 30-year return period event, in line with the NPPF guidelines. Further simulations have been carried out so that, for a 1 in 100-year return period event (+40% for climate change), surface water flows are directed away from any buildings / structures and retained on-site, in accordance with the NPPF guidance.

The proposed drainage model does not show any exceedance of the surface water network for a 1 in 30-year return period event. All storms exceeding a 1 in 30-year return period (including 1 in 100-year return period events +40% for climate change) will be accommodated within the pipework and proposed soakaways. Refer to ***Appendix C*** for the ***Proposed Drainage Stategy***, ***Appendix D*** for the ***MicroDrainage Results***.

Exceedance flow management has been designed to ensure any flows exceeding the discharge rate will be attenuated on-site, within the below ground sewerage network and SuDS features. The required storage has been sized for a 1 in 100-year storm event, with +40% for climate change.

However, based on an infiltration rate of $3x10^{-9}$ m/s; it is unlikely that, for a 1 in 100-year return period event (+40% for climate change), the cellular soakaway system will drain down by 50% in 24 hours. The system has been designed to accommodate flows for a 360minute, 1 in 100-year return period event (+40% for climate change). Therefore, the cellular soakaway sizes for each plot may be adjusted for a 1 in 100-year return period event (+40% for climate change), to satisfy a storm event lasting over 360minutes.

4.5 SUDS SUITABILITY ASSESSMENT

The NPPF states that SuDS should be incorporated in all new developments unless evidence of unsuitability is provided. Therefore, the following SuDS components have been considered for the site:

Table 4.5 – SuDS Component Assessment

SuDS Component	Description	Site Suitability	Comments
Rainwater Harvesting	Systems that collect runoff from the roof of a building or other paved surface for use.	✓	Potential for Rainwater Harvesting.
Green Roof	Planted soil layers on the roof of buildings that slow and store runoff.	×	Roof layout unsuitable.
Soakaway	Systems that collect and store runoff, allowing it to infiltrate into the ground.	✓	Subject to percolation testing results.
Pervious Pavement	Structural paving through which runoff can soak and subsequently be stored in the sub-base beneath, and/ or allowed to infiltrate into the ground below.	✓	Potential for paving as part of car parking arrangements.
Filter Strip	Grass strips that promote sedimentation and filtration as runoff is conveyed over the surface.	✓	Potential for a Filter Strip.
Filter Trench	Shallow stone-filled trenches that provide attenuation, conveyance and treatment of runoff.	✓	Potential for Filter Trench.
Infiltration Trench	Systems that collect and store runoff, allowing it to infiltrate to the ground.	✓	Subject to percolation testing results.
Swale	Vegetated channels (sometimes planted) used to convey and treat runoff.	✓	Potential for a swale on-site.
Bioretention	Shallow landscaped depressions that allow runoff to pond temporarily on the surface. Before filtering through vegetation and underlying soils.	×	Restricted space for ponding.
Infiltration Basin	Vegetated depressions that store and treat runoff, allowing it to infiltrate into the ground.	×	Restricted space on site.
Detention Basin	Vegetated depressions that store and treat runoff.	×	Restricted space on site.
Pond	Permanent pools of water used to facilitate treatment of runoff – runoff can also be stored in attenuation zone above pool.	×	Restricted space on site.
Stormwater Wetlands	Permanent pools of water used to facilitate treatment of runoff – runoff	×	Size of development unsuitable.

	can also be stored in attenuation zone above pool.		

Therefore, it is proposed to incorporate permeable paving, at a depth of 580mm (450mm sub-base), on the access road and all car parking areas, which will be used to manage rainfall landing directly onto the surface. Permeable surfaces will provide a level of surface water treatment to the network and accommodate surface water flows exceeding a 1 in 30-year return period. Refer to ***Appendix D*** to see the ***MicroDrainage Results*** for a volume summary.

4.6 WATER QUALITY MANAGEMENT

The surface water drainage design is required to consider the potential for contaminants to be collected with surface water runoff and discharge to the wider water catchment. Following the guidance within the Ciria SuDS Manual C753, Chapter 26, the impermeable areas to be drained have been classified as having the following pollution hazard levels:

Table 4.6 – Land Classification Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids	Metals	Hydrocarbons
Residential roofs	Very Low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4

Residential roofs have a *'very low'* pollution hazard level; therefore, the risk to water quality is considered very low.

Table 4.6.1 – SuDS Mitigation Indices

SuDS Component	Total Suspended Solids	Metals	Hydrocarbons
Permeable Paving	0.7	0.6	0.7

The pollution load associated with the total run-off volume from all storm events will be retained on-site, where it will have time to biodegrade or be acted on by natural treatment processes. Interception of the pollution load cannot be guaranteed for every rainfall event, due to the variations in evapotranspiration and rainfall. However, to ensure a high probability of interception, it is proposed to provide additional storage for the first 5mm of rainfall for the majority of rainfall events, which will mitigate the risk to water quality entering the network.

Permeable paving has been shown to decrease concentrations of surface water pollutants. Silt can be trapped within the top 30mm of the paving and further treatment is achieved via biodegradation of organic pollutants, such as petrol. The frequency of runoff from all types of pervious paving is significantly reduced compared to gully / pipe networks; therefore, runoff does not typically occur from permeable surfaces for rainfall events up to 5mm.

On this basis, it is considered that suitable SuDS features have been proposed for the development to mitigate potential contaminants to the wider water catchment.

4.7 SURFACE WATER MAINTENANCE ISSUES

Surface water drainage within the plot boundary is anticipated to be retained within private ownership. Therefore, this drainage will be the responsibility of the landowner. Refer to *Appendix E* for the *Drainage Maintenance Schedule*.

4.8 SURFACE WATER SAFETY ISSUES

Surface water pipework and manholes have been designed in accordance with the appropriate building regulations and Sewers for Adoption, to ensure suitable access for maintenance and operation as required.

Exceedance flow management caused by system blockages has been considered and the proposed network has been designed to mitigate the risks to people and property.

Works are to be carried out by an established and professional contractor and in accordance with standard good practice guidance. The potential for flooding, caused by surface water rainfall, during construction is to be mitigated by the contractor by providing an in-depth method statement in accordance with BS8582 2013 and CIRIA C768.

4.9 SURFACE WATER DRAINAGE SUMMARY

Based on the investigation carried out to date, the surface water drainage strategy can be summarised as:

- Flows from rooftop will be collected by traditional rainwater pipes and discharged into the pipe network.
- Flows from car parking areas and access road will be collected by the permeable surface course and discharged into the ground via infiltration.
- Surface water flows will be discharged to the ground via infiltration, through a soakaway for each plot, at an estimated infiltration rate of $3x10^{-9}$ m/s.
- Peak flows in excess of the infiltration rate during storms up to 1 in 100 years, plus 40% for climate change, will be attenuated on-site to ensure there is no flooding of the proposed site or flooding off site.

5 FOUL WATER DRAINAGE STRATEGY

5.1 METHODOLOGY

The following methodology was used to produce a foul water Drainage Strategy for the site:

- Determine a suitable method for foul water discharge.
- Calculate the post development foul water drainage flows, in accordance with BS EN 12056-2:2000.
- Outline the maintenance procedures for the proposed drainage network & who will be responsible for the maintenance of the network, in accordance with the relevant codes of practice.
- Outline the relevant guidance to be followed with respect to safety issues of the network.

5.2 FOUL DRAINAGE DISCHARGE METHOD

The potential methods of foul water discharge, in order of preference, are:

- Discharge to an existing foul water network.
- Discharge to an existing combined water network.
- Discharge to a septic tank, with an appropriate form of treatment or another wastewater treatment system.
- Discharge to a cesspool.

NWL have been contacted to identify any sewerage assets within the vicinity of the site (see ***Appendix B*** for the ***NWL Sewerage Plan***).

NWL have verified that there is a 150mm diameter foul water sewer approximately 350m north of the site, within the Springfield View. The foul water sewer is expected to collect foul water drainage from the properties to the north of the site.

A significant amount of excavation and reinstatement to the areas beyond the site boundary would be required to connect to the foul water sewer. Therefore, this option is not considered the most appropriate method of foul water disposal.

Furthermore, the third-party landowner would be required to confirm that they will allow a pipeline to be installed across their land. Therefore, due to the lack of foul water sewers within the vicinity of the site, it is proposed to dispose of foul water flows via a package treatment plant.

It is understood that there are no feasible watercourses, within the vicinity of the site, for the package treatment plant to discharge to. Therefore, the package treatment plant will discharge to the ground through the use of an infiltration tunnel as a drainage field would not fit within the site boundary.

A permit will be required by the EA for the use of a sewage treatment plant alongside an infiltration tunnel prior to construction.

A percolation test is required, prior to construction, to determine the infiltration rate across the site.

5.3 POST DEVELOPMENT FOUL WATER DRAINAGE CALCULATION

The architect is to confirm soil vent pipe locations prior to construction, in order to determine the foul water flows on-site.

However, each package treatment plant has been sized to accommodate an average of 1-6 persons.

5.4 FOUL WATER MAINTENANCE ISSUES

Foul water drainage within the plot boundary is anticipated to be retained within private ownership. Therefore, this drainage will be the responsibility of the landowner. Refer to *Appendix E* for the *Drainage Maintenance Schedule*.

5.5 FOUL WATER SAFETY ISSUES

Foul water pipework and manholes have been designed in accordance with the appropriate building regulations and Sewers for Adoption, to ensure suitable access for maintenance and operation as required.

Works are to be carried out by an established and professional contractor and in accordance with standard good practice guidance. The potential for flooding, caused by surface water rainfall, during construction is to be mitigated by the contractor by providing an in-depth method statement in accordance with BS8582 2013 and CIRIA C768.

6 CONCLUSION

The Drainage Strategy has been produced for the development of 5no. domestic properties to multiple residential dwellings, with associated hard landscaping and infrastructure. This report has been produced to present the drainage proposals for the development and document the underlying analysis, as required by Northumberland County Council's planning process. The drainage strategy has been produced in accordance with the applicable regulatory framework and relevant best practice guidance, as set out within the report.

Based on the hierarchy of discharge of surface water, the preferred method of surface water disposal is by infiltration. However, using the geological information above, the sites superficial deposits are shown to be predominantly till. Discharge via infiltration is not typically advised in till deposits due to the nature of the soil. However, due to the site constraints, it is proposed to discharge surface water flows to the ground via infiltration with an appropriately sized soakaway for each plot.

Due to the lack of foul water sewers within the vicinity of the site, it is proposed to dispose of foul water flows via a package treatment plant.

7 LIST OF APPENDICES

APPENDIX A: PROPOSED SITE PLAN

APPENDIX B: NORTHUMBRIAN WATER SEWERAGE PLAN

APPENDIX C: PROPOSED DRAINAGE STRATEGY

APPENDIX D: PROPOSED MICRODRAINAGE RESULTS

APPENDIX E: DRAINAGE MAINTENACE SCHEDULE

APPENDIX A

PROPOSED SITE PLAN

EXISTING PLANTING - All trees adjacent to the works are to be protected with fencing to a min height of 1200mm and to be erected prior to commencement of works and to remain throughout the duration of the works to completion.
No materials are to be stored within 10m of the existing trees.
The ground levels adjacent to the existing trees should not be altered by either building up or reducing soil levels.
No fires are permitted within 5m of the existing tree canopies.

All trees noted with ET are to be retained.

NEW PLANTING - All trees are as listed below

T1 - Ilex Aquifolium - Holly
T3 - Quercus robur - Common Oak
T4 - Sorbus aucuparia - Rowan
T5 - Salix cinerea - Grey Willow
T6 - Betula pendula - Silver Birch

Hedges are to be composed of the following plants using bare root stock at 600mm high and at 450mm centres staggered in 2 rows 300mm apart

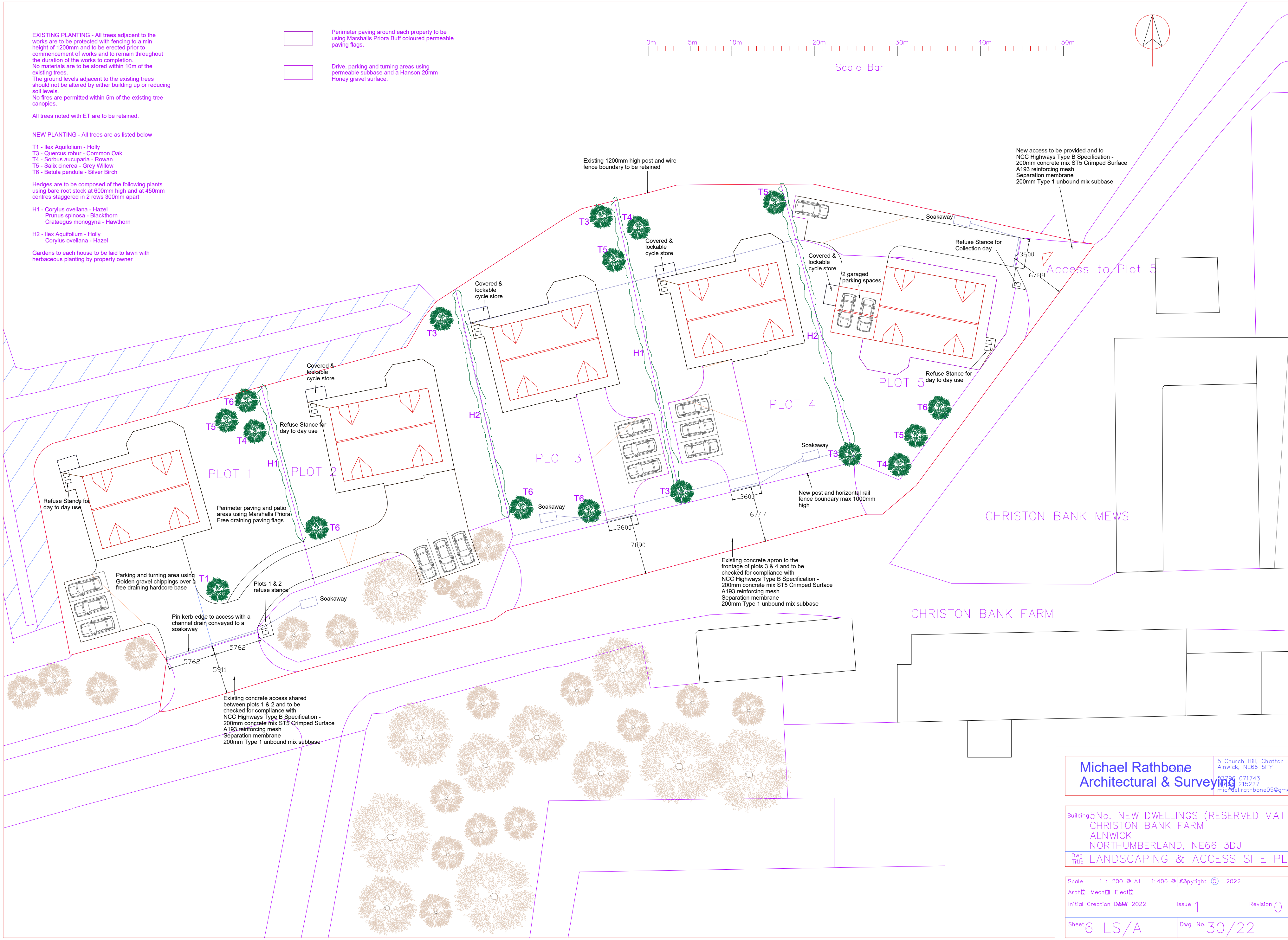
H1 - Corylus ovellana - Hazel
Prunus spinosa - Blackthorn
Crataegus monogyna - Hawthorn

H2 - Ilex Aquifolium - Holly
Corylus ovellana - Hazel

Gardens to each house to be laid to lawn with herbaceous planting by property owner

Perimeter paving around each property to be using Marshalls Priora Buff coloured permeable paving flags.

Drive, parking and turning areas using permeable subbase and a Hanson 20mm Honey gravel surface.



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Building 5No. NEW DWELLINGS (RESERVED MATTERS)
CHRISTON BANK FARM
ALNWICK
NORTHUMBERLAND, NE66 3DJ

Dwg Title LANDSCAPING & ACCESS SITE PLAN

Scale 1 : 200 @ A1 1:400 @ A3	Copyright © 2022
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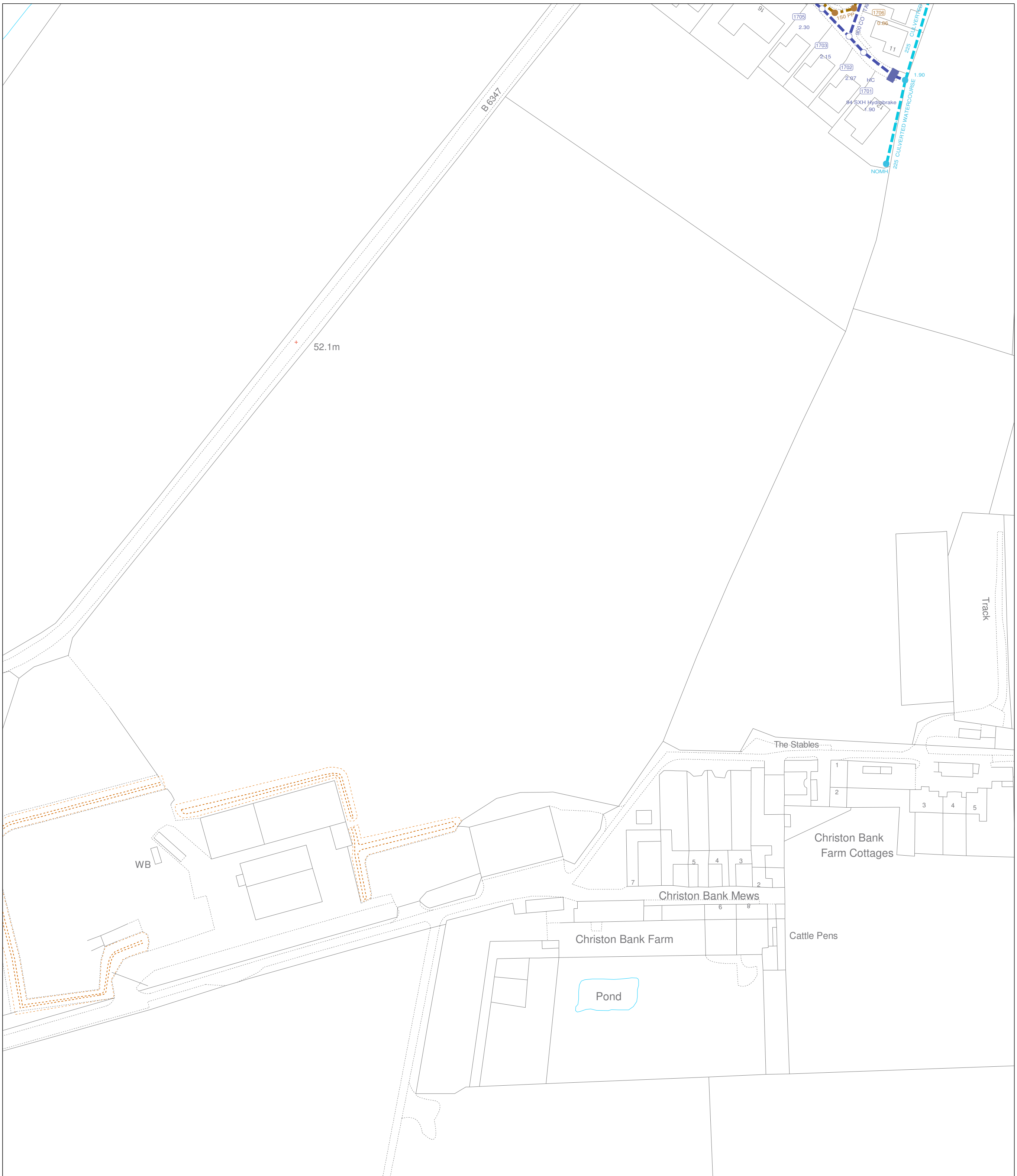
Initial Creation Date MAY 2022	Issue 1 Revision 0
Sheet 6 LS/A	Dwg. No. 30/22

APPENDIX B

NORTHUMBRIAN WATER SEWERAGE PLAN



	NWL Responsibility		Private/Non NWL		Proposed
Combined			Combined		Combined
Foul			Foul		Foul
Surface			Surface		Surface
Treated Eff			Treated Eff		
Untreated Eff			Trade Eff		
Overflow			Watercourse		

Annotations

- Direction of flow
- Backdrop
- Abandoned
- Rising Main

Symbols

- Chambers
- Inlet/Outlet
- STW Treatment Works
- Pumping Station
- Capped End
- Balancing Pond
- Termination Node
- Rodding Eye
- Unknown End
- Attribute Change
- Air Valve
- P Property Connection
- Lamp Hole
- Hatchbox
- Dual Usage Chamber

NORTHUMBRIAN WATER *living water*

User : WYNND1

Date : 14/09/2022

Title : .

Centre Point : 421020,622497

Map Sheet : NU2122SW

The information shown on this plan should be regarded as approximate and is intended for guidance only. No Liability of any kind whatsoever is accepted by Northumbrian Water, it's servants or agents for any omission. The actual position of any water mains or sewers shown on the plan must be established by taking trial holes in all cases. In the case of water mains Northumbrian Water must be given two working days notice of their intention to excavate trial holes. With effect from 1 October 2011, private lateral drains and sewers automatically transferred to Northumbrian Water under a scheme made by the Secretary of State pursuant to section 105A Water Industry Act 1991. These former private drains and sewers together with existing private connections may not be shown but their presence should be anticipated. WARNING...Where indicated on the plan there could be abandoned asbestos cement materials or shards of pipe. If excavating in the vicinity of these abandoned asbestos cement materials, the appropriate Health & Safety precautions should be taken. Northumbrian Water accepts no liability in respect of claims, costs, losses or other liabilities which arise as the result of the presence of the pipes or any failure to take adequate precautions.
Emergency Telephone Number: 0345 717 1100

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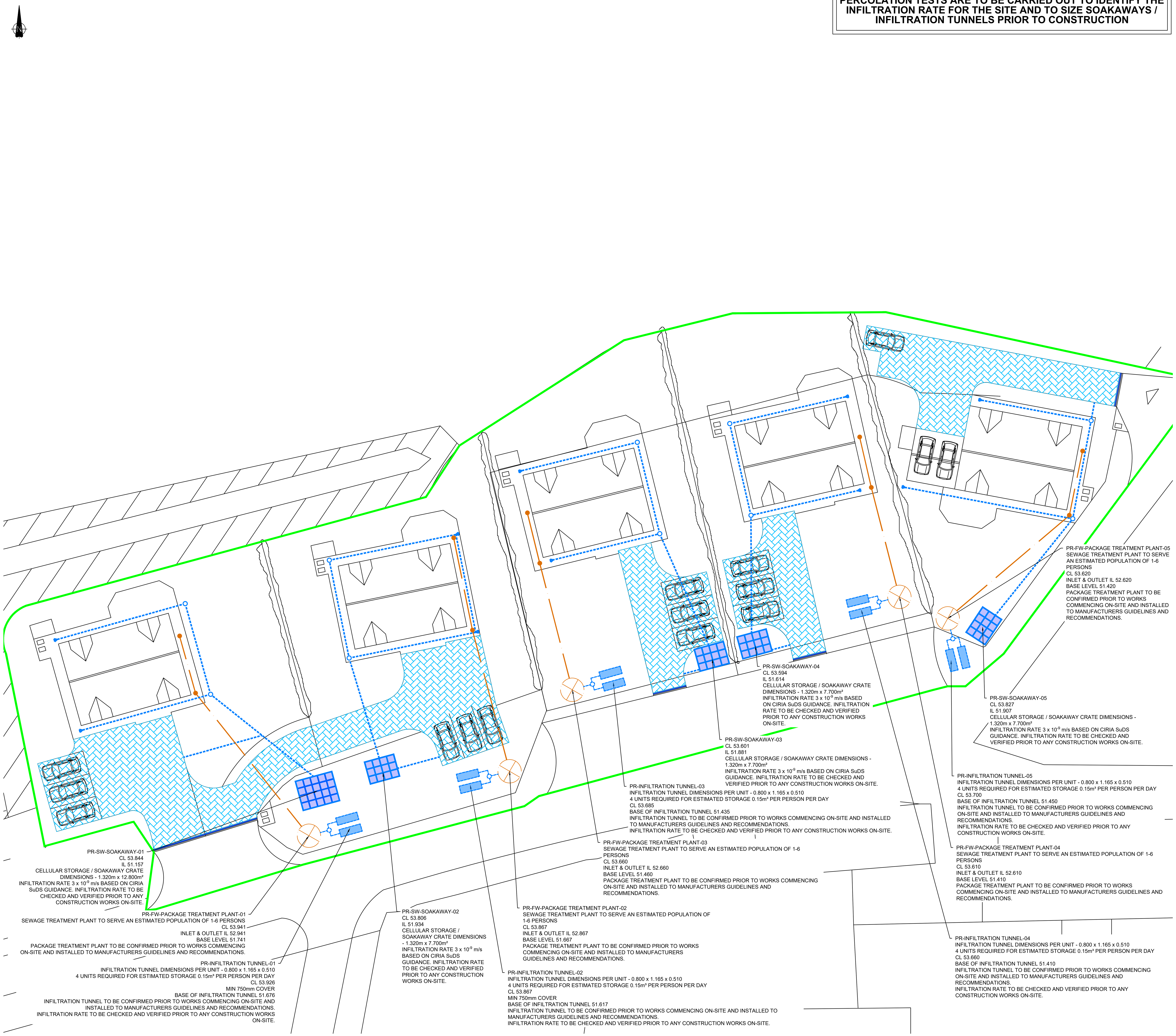
APPENDIX C

PROPOSED DRAINAGE STRATEGY

PERCOLATION TESTS ARE TO BE CARRIED OUT TO IDENTIFY THE INFILTRATION RATE FOR THE SITE AND TO SIZE SOAKAWAYS / INFILTRATION TUNNELS PRIOR TO CONSTRUCTION



DESIGN NOTES

1. *PROPOSED LEVELS HAVE BEEN BASED ON THE EXISTING ORDNANCE SURVEY INFORMATION AVAILABLE IN SEPTEMBER 2022 .*
2. *PROPOSED DRAWING INFORMATION HAS BEEN BASED ON THE ARCHITECTURAL LAYOUT PROVIDED BY GEORGE F.WHITE.*
3. *ALL WORKS TO COMPLY WITH CURRENT VERSION OF THE FOLLOWING DOCUMENTS: DESIGN MANUAL FOR ROADS AND BRIDGES (DMRB), SPECIFICATION FOR HIGHWAY WORKS (SHW), LOCAL AUTHORITY DESIGN GUIDE AND SPECIFICATIONS.*
4. *ALL WORKS WITHIN THE PUBLIC HIGHWAY TO MEET LOCAL AUTHORITY REQUIREMENTS. CONTRACTOR TO APPLY FOR ROAD OPENING NOTICES ETC AS REQUIRED.*

GENERAL NOTES

1. *JC CONSULTING CAN ACCEPT NO LIABILITY FOR INACCURACIES / ERRORS CAUSED BY OS INFORMATION OR TOPOGRAPHICAL SURVEY INFORMATION RECEIVED.*
2. *THIS DESIGN HAS BEEN CARRIED OUT TO APPROPRIATE STANDARDS BUT IT IS TO BE CHECKED IN ACCORDANCE WITH PROCUREMENTS AND REQUIREMENTS PRIOR TO THE COMMENCEMENT OF WORKS.*
3. *ALL LEVELS, DIMENSIONS AND DETAILS ARE TO BE CONFIRMED BY THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF CONSTRUCTION OR FABRICATION.*
4. *EXISTING GROUND LEVELS AND GROUND PROFILES HAVE BEEN TAKEN FROM THE INFORMATION PROVIDED AND AS SUCH ARE TO BE VERIFIED BY THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF ANY ON-SITE WORKS. DISCREPANCIES ARE TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER.*

HEALTH & SAFETY AND CDM

(THE FOLLOWING ARE TO BE READ IN CONJUNCTION WITH CONTRACTORS RISK ASSESSMENTS)

1. *A GROUND PENETRATING RADAR (GPR) SURVEY HAS NOT BEEN CARRIED OUT FOR THE SITE. THEREFORE, THE CONTRACTOR IS TO UNDERTAKE ALL POSSIBLE PRECAUTIONS WHEN EXCAVATING. ALL EXISTING SERVICES INFORMATION TO BE OBTAINED PRIOR TO THE COMMENCEMENT OF WORKS AND IDENTIFIED ON SITE USING CAT SCANNERS. EXCAVATION TO BE UNDERTAKEN WITH DUE DILIGENCE AND HAND DIGGING TO BE ADOPTED WHERE APPROPRIATE.*
2. *CONTRACTOR TO MINIMISE THE AMOUNT OF TIME ANY EXCAVATIONS REMAIN EXPOSED AND COMPLY WITH LEGISLATIVE AND GOOD PRACTICE GUIDELINES.*
3. *ALL TASKS TO BE UNDERTAKEN BY SUITABLY TRAINED AND EXPERIENCED OPERATIVES FOLLOWING APPROVED METHOD STATEMENTS WITH ADEQUATE RESOURCES ALLOCATED TO EACH TASK.*
4. *PERSONNEL TO USE SUITABLE PPE AND USE ONLY LOW VIBRATION EQUIPMENT FOR ANY WORK REQUIRING COMPACTING OF MATERIALS AND CONCRETE. AMOUNT OF TIME OF USE TO BE LIMITED TO SAFE LEVELS IN ACCORDANCE WITH THE CONTRACTORS APPROVED METHOD STATEMENTS.*
5. *APPROPRIATE MANAGEMENT SAFETY PLAN TO BE IN PLACE FOR DEALING WITH POTENTIAL GROUND CONTAMINATION.*
6. *IN ORDER TO ENSURE THAT THE SIDE EXCAVATIONS REMAIN STABLE DURING EXCAVATION, THE CONTRACTOR IS TO ASSESS STABILITY AND PROVIDE TEMPORARY SHORING TO ENSURE A SAFE WORKING AREA.*
7. *CONTRACTOR TO ENSURE ACCESS IS KEPT CLEAR OF PEDESTRIANS AND VEHICLES. ANY ROAD CLOSURES ARE TO BE AGREED WITH THE LOCAL HIGHWAYS AUTHORITY PRIOR TO WORKS COMMENCING ON-SITE.*
8. *A FULL SERVICES SEARCH MUST BE COMPLETED PRIOR TO WORKS COMMENCING. ANY APPLICABLE SERVICES DIVERSION WORKS ARE TO BE COMPLETED BY THE CONTRACTOR, ENSURING THE NECESSARY APPLICATIONS FOR DIVERSIONS ARE AGREED.*
9. *CONTRACTOR SHOULD BE AWARE OF GENERAL CONSTRUCTION RISKS TO PREVENT SLIPS, TRIPS AND FALLS AND TAKE NECESSARY PRECAUTIONS WITHOUT SPECIAL INSTRUCTION.*
10. *THE TIME THAT EXCAVATIONS ARE OPEN ON SITE SHOULD BE KEPT TO A MINIMUM AND ALL TRENCHES SHOULD BE SURROUNDED BY A BARRIER.*
11. *CONNECTIONS TO EXISTING SEWERS TO BE MADE BY APPROVED CONTRACTOR ONLY.*
12. *UNFINISHED MANHOLES MUST BE COVERED WITH LOAD BEARING MATERIALS AND SURROUNDED WITH BARRIER.*

DRAINAGE SUMMARY

1. *SURFACE WATER INFILTRATION RATE: ~3 X10^{-9} m/s IN ACCORDANCE WITH THE CIRIA SuDS MANUAL.*
2. *INFILTRATION RATE IS TO BE CHECKED AND VERIFIED PRIOR TO CONSTRUCTION.*
3. *PROPOSED PERMEABLE PAVING AT CAR PARKING ARRANGEMENTS TO PROVIDE SURFACE WATER TREATMENT.*
4. *FOUL WATER OUTFALL POINT TO PROPOSED PACKAGE TREATMENT PLANT PER PLOT.*
5. *EXISTING FOUL AND SURFACE WATER ARRANGEMENT TO BE CLARIFIED PRIOR TO CONSTRUCTION.*

DRAINAGE NOTES

1. *ALL PIPES 100mmØ UNLESS OTHERWISE STATED.*
2. *ALL PIPES CONNECTIONS TO BE SOFFIT TO SOFFIT UNLESS STATED OTHERWISE.*
3. ALL RWP / SVP LOCATIONS ARE TO BE CONFIRMED BY THE ARCHITECT PRIOR TO CONSTRUCTION. ANY DISCREPANCIES ARE TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
4. ALL DRAINAGE WORKS ARE TO BE CARRIED OUT IN ACCORDANCE WITH BUILDING REGULATIONS PART 'H' 2015 EDITION.
5. MANHOLE COVERS AND FRAMES ARE TO COMPLY WITH RELEVANT PROVISIONS OF BS EN 124.
6. ALL DRAINAGE BELOW PROPOSED BUILDINGS TO HAVE CLASS Z CONCRETE BED AND SURROUND OR CAST INTO FLOOR SLAB CONSTRUCTION.

LEGEND

SITE BOUNDARY
PROPOSED PERMEABLE PAVING
PROPOSED SOAKAWAY
PROPOSED INFILTRATION TUNNEL
PROPOSED PRIVATE SURFACE WATER NETWORK
PROPOSED PRIVATE FOUL WATER NETWORK
PROPOSED PRIVATE PACKAGE TREATMENT PLANT

SUBJECT TO LOCAL AUTHORITY & WATER AUTHORITY APPROVAL

Rev	Description	Drawn	Check'd	Date
A	DRAWING ISSUED FOR PLANNING	AA	RJ	12.10.22

Drawing Status:

PLANNING

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Client:

GEORGE F.WHITE

Project:

LAND AT CHRISTON MEWS
ALNWICK

Drawing Title:

PROPOSED DRAINAGE STRATEGY

Scale:	Drawn:	Checked:	Date:
1:200	AA	RJ	12.10.22
Job Number:	Drawing Number:	Rev:	Size:
JCC22 - 158	C - GA - 001	A	A1

APPENDIX D

PROPOSED MICRODRAINAGE RESULTS

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)	30	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.300	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm at outfall (pipe 8.003)

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.015	4-8	0.011

Total Area Contributing (ha) = 0.026

Total Pipe Volume (m³) = 0.879

Time Area Diagram at outfall (pipe 11.003)

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.018	4-8	0.012

Total Area Contributing (ha) = 0.030

Total Pipe Volume (m³) = 0.754

Time Area Diagram at outfall (pipe 14.003)

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.012	4-8	0.009

Total Area Contributing (ha) = 0.021

Total Pipe Volume (m³) = 0.691

Time Area Diagram at outfall (pipe 17.003)

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.012	4-8	0.008

Total Area Contributing (ha) = 0.020

Total Pipe Volume (m³) = 0.678

Time Area Diagram at outfall (pipe 20.003)

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.014	4-8	0.013

Total Area Contributing (ha) = 0.028

Total Pipe Volume (m³) = 0.709

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
8.000	21.292	1.065	20.0	0.005	5.00	0.0	0.600	o	100	Pipe/Conduit	🔒
8.001	10.942	0.109	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
9.000	21.165	1.058	20.0	0.006	5.00	0.0	0.600	o	100	Pipe/Conduit	🔒
8.002	13.236	0.132	100.0	0.000	0.00	0.0	0.600	o	150	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)
8.000	50.00	5.20	53.513	0.005	0.0	0.0	0.0	1.73	13.6	0.7
8.001	50.00	5.39	52.398	0.005	0.0	0.0	0.0	1.00	17.8	0.7
9.000	50.00	5.20	53.510	0.006	0.0	0.0	0.0	1.73	13.6	0.8
8.002	50.00	5.61	52.289	0.011	0.0	0.0	0.0	1.00	17.8	1.5

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
10.000	11.669	0.583	20.0	0.015	5.00	0.0	0.600	o	100	Pipe/Conduit	
8.003	3.445	0.000	0.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
11.000	16.311	0.816	20.0	0.005	5.00	0.0	0.600	o	100	Pipe/Conduit	
11.001	10.615	0.106	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
12.000	16.311	0.816	20.0	0.006	5.00	0.0	0.600	o	100	Pipe/Conduit	
11.002	13.746	0.137	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
13.000	5.071	0.254	20.0	0.020	5.00	0.0	0.600	o	100	Pipe/Conduit	
11.003	3.515	0.000	0.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
14.000	12.546	0.627	20.0	0.005	5.00	0.0	0.600	o	100	Pipe/Conduit	
14.001	10.615	0.106	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
15.000	12.489	0.624	20.0	0.006	5.00	0.0	0.600	o	100	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)
10.000	50.00	5.11	53.381	0.015	0.0	0.0	0.0	1.73	13.6	2.1
8.003	50.00	6.43	53.744	0.026	0.0	0.0	0.0	0.07	0.5«	3.6
11.000	50.00	5.16	53.043	0.005	0.0	0.0	0.0	1.73	13.6	0.7
11.001	50.00	5.33	52.177	0.005	0.0	0.0	0.0	1.00	17.8	0.7
12.000	50.00	5.16	53.045	0.006	0.0	0.0	0.0	1.73	13.6	0.8
11.002	50.00	5.56	52.071	0.011	0.0	0.0	0.0	1.00	17.8	1.5
13.000	50.00	5.05	53.078	0.020	0.0	0.0	0.0	1.73	13.6	2.7
11.003	50.00	6.40	53.706	0.030	0.0	0.0	0.0	0.07	0.5«	4.1
14.000	50.00	5.12	52.983	0.005	0.0	0.0	0.0	1.73	13.6	0.7
14.001	50.00	5.30	52.306	0.005	0.0	0.0	0.0	1.00	17.8	0.7
15.000	50.00	5.12	52.984	0.006	0.0	0.0	0.0	1.73	13.6	0.8

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
14.002	11.922	0.319	37.4	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
16.000	8.612	0.431	20.0	0.010	5.00	0.0	0.600	o	100	Pipe/Conduit	🔒
14.003	3.658	0.000	0.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	🔒
17.000	12.489	0.624	20.0	0.005	5.00	0.0	0.600	o	100	Pipe/Conduit	🔒
17.001	10.615	0.106	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
18.000	12.489	0.624	20.0	0.005	5.00	0.0	0.600	o	100	Pipe/Conduit	🔒
17.002	11.237	0.643	17.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
19.000	8.516	0.426	20.0	0.010	5.00	0.0	0.600	o	100	Pipe/Conduit	🔒
17.003	3.723	0.000	0.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	🔒
20.000	11.901	0.595	20.0	0.006	5.00	0.0	0.600	o	100	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)
14.002	50.00	5.42	52.200	0.011	0.0	0.0	0.0	1.65	29.2	1.4
16.000	50.00	5.08	53.096	0.010	0.0	0.0	0.0	1.73	13.6	1.3
14.003	50.00	6.29	53.501	0.021	0.0	0.0	0.0	0.07	0.5«	2.8
17.000	50.00	5.12	53.038	0.005	0.0	0.0	0.0	1.73	13.6	0.7
17.001	50.00	5.30	52.364	0.005	0.0	0.0	0.0	1.00	17.8	0.7
18.000	50.00	5.12	53.035	0.005	0.0	0.0	0.0	1.73	13.6	0.7
17.002	50.00	5.37	52.257	0.011	0.0	0.0	0.0	2.42	42.8	1.5
19.000	50.00	5.08	53.114	0.010	0.0	0.0	0.0	1.73	13.6	1.3
17.003	50.00	6.27	53.494	0.020	0.0	0.0	0.0	0.07	0.5«	2.8
20.000	50.00	5.11	53.057	0.006	0.0	0.0	0.0	1.73	13.6	0.8

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
21.000	2.168	0.202	10.7	0.014	5.00	0.0	0.600	o	100	Pipe/Conduit	
20.001	10.215	0.102	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
22.000	17.938	0.897	20.0	0.008	5.00	0.0	0.600	o	100	Pipe/Conduit	
20.002	13.839	0.138	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
20.003	4.135	0.000	0.0	0.000	0.00	0.0	0.600	o	100	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)
21.000	50.00	5.02	52.664	0.014	0.0	0.0	0.0	2.37	18.6	1.9
20.001	50.00	5.28	52.412	0.019	0.0	0.0	0.0	1.00	17.8	2.6
22.000	50.00	5.17	53.058	0.008	0.0	0.0	0.0	1.73	13.6	1.1
20.002	50.00	5.51	52.310	0.028	0.0	0.0	0.0	1.00	17.8	3.7
20.003	50.00	6.51	53.727	0.028	0.0	0.0	0.0	0.07	0.5«	3.7

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
8.000	User	-	100	0.005	0.005	0.005
8.001	-	-	100	0.000	0.000	0.000
9.000	User	-	100	0.006	0.006	0.006
8.002	-	-	100	0.000	0.000	0.000
10.000	User	-	100	0.015	0.015	0.015
8.003	-	-	100	0.000	0.000	0.000
11.000	User	-	100	0.005	0.005	0.005
11.001	-	-	100	0.000	0.000	0.000
12.000	User	-	100	0.006	0.006	0.006
11.002	-	-	100	0.000	0.000	0.000
13.000	User	-	100	0.020	0.020	0.020
11.003	-	-	100	0.000	0.000	0.000
14.000	User	-	100	0.005	0.005	0.005
14.001	-	-	100	0.000	0.000	0.000
15.000	User	-	100	0.006	0.006	0.006
14.002	-	-	100	0.000	0.000	0.000
16.000	User	-	100	0.010	0.010	0.010
14.003	-	-	100	0.000	0.000	0.000
17.000	User	-	100	0.005	0.005	0.005
17.001	-	-	100	0.000	0.000	0.000
18.000	User	-	100	0.005	0.005	0.005
17.002	-	-	100	0.000	0.000	0.000
19.000	User	-	100	0.010	0.010	0.010
17.003	-	-	100	0.000	0.000	0.000
20.000	User	-	100	0.006	0.006	0.006
21.000	User	-	100	0.014	0.014	0.014
20.001	-	-	100	0.000	0.000	0.000
22.000	User	-	100	0.008	0.008	0.008
20.002	-	-	100	0.000	0.000	0.000
20.003	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.125	0.125	0.125

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	10
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Simulation Criteria for Storm

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.300		

Storage Structures for Storm

Porous Car Park Manhole: PP, DS/PN: 10.000

Infiltration Coefficient Base (m/hr)	0.00001	Width (m)	15.4
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	42.8	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	53.381	Cap Volume Depth (m)	0.450

Cellular Storage Manhole: SOAKAWAY, DS/PN: 8.003

Invert Level (m)	52.157	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00001	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00001		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	12.8	0.0	1.321	0.0	0.0
1.320	12.8	0.0			

Porous Car Park Manhole: PP, DS/PN: 13.000

Infiltration Coefficient Base (m/hr)	0.00001	Width (m)	20.4
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	56.7	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	53.078	Cap Volume Depth (m)	0.450

Cellular Storage Manhole: SOAKAWAY, DS/PN: 11.003

Invert Level (m)	51.934	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00001	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00001		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	7.7	0.0	1.321	0.0	0.0
1.320	7.7	0.0			

Porous Car Park Manhole: PP, DS/PN: 16.000

Infiltration Coefficient Base (m/hr)	0.00001	Safety Factor	2.0
Membrane Percolation (mm/hr)	1000	Porosity	0.30
Max Percolation (l/s)	27.2	Invert Level (m)	53.096

Porous Car Park Manhole: PP, DS/PN: 16.000

Width (m)	9.8	Depression Storage (mm)	5
Length (m)	10.0	Evaporation (mm/day)	3
Slope (1:X)	100.0	Cap Volume Depth (m)	0.450

Cellular Storage Manhole: SOAKAWAY, DS/PN: 14.003

Invert Level (m)	51.881	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00001	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00001		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	7.7	0.0	1.321	0.0	0.0
1.320	7.7	0.0			

Porous Car Park Manhole: PP, DS/PN: 19.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.8
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	27.2	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	53.114	Cap Volume Depth (m)	0.450

Cellular Storage Manhole: SOAKAWAY, DS/PN: 17.003

Invert Level (m)	51.614	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00001	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00001		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	7.7	0.0	1.321	0.0	0.0
1.320	7.7	0.0			

Porous Car Park Manhole: PP, DS/PN: 21.000

Infiltration Coefficient Base (m/hr)	0.00001	Width (m)	13.8
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	38.3	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	52.664	Cap Volume Depth (m)	0.450

Cellular Storage Manhole: SOAKAWAY, DS/PN: 20.003

Invert Level (m) 51.907 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00001 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00001

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	7.7	0.0	1.321	0.0	0.0
1.320	7.7	0.0			

Volume Summary (Static)

Length Calculations based on Centre-Centre

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
8.000	RE	0.021	0.167	0.000	0.188
8.001	IC	0.315	0.193	0.000	0.509
9.000	RE	0.021	0.166	0.000	0.187
8.002	IC	0.368	0.234	0.000	0.602
10.000	PP	0.000	0.092	20.790	20.882
8.003	SOAKAWAY	0.028	0.027	16.055	16.111
11.000	RE	0.021	0.128	0.000	0.149
11.001	IC	0.334	0.188	0.000	0.522
12.000	RE	0.021	0.128	0.000	0.149
11.002	IC	0.386	0.243	0.000	0.629
13.000	PP	0.000	0.040	27.540	27.580
11.003	SOAKAWAY	0.028	0.028	9.658	9.714
14.000	RE	0.021	0.099	0.000	0.120
14.001	IC	0.277	0.188	0.000	0.464
15.000	RE	0.021	0.098	0.000	0.119
14.002	IC	0.307	0.211	0.000	0.517
16.000	PP	0.000	0.068	13.230	13.298
14.003	SOAKAWAY	0.028	0.029	9.658	9.715
17.000	RE	0.021	0.098	0.000	0.119
17.001	IC	0.274	0.188	0.000	0.461
18.000	RE	0.021	0.098	0.000	0.119
17.002	IC	0.305	0.199	0.000	0.504
19.000	PP	0.000	0.067	13.230	13.297
17.003	SOAKAWAY	0.028	0.029	9.658	9.716
20.000	RE	0.021	0.093	0.000	0.115
21.000	PP	0.000	0.017	18.630	18.647
20.001	IC	0.265	0.181	0.000	0.446
22.000	RE	0.021	0.141	0.000	0.162
20.002	IC	0.296	0.245	0.000	0.540
20.003	SOAKAWAY	0.113	0.032	9.658	9.803
Total		3.564	3.712	148.108	155.385

Volume Summary (Static)

Length Calculations based on True Length

Pipe Number	USMH Name	Manhole Volume (m^3)	Pipe Volume (m^3)	Storage Structure Volume (m^3)	Total Volume (m^3)
8.000	RE	0.021	0.164	0.000	0.185
8.001	IC	0.315	0.183	0.000	0.498
9.000	RE	0.021	0.163	0.000	0.184
8.002	IC	0.368	0.223	0.000	0.592
10.000	PP	0.000	0.089	20.790	20.879
8.003	SOAKAWAY	0.028	0.025	16.055	16.108
11.000	RE	0.021	0.125	0.000	0.146
11.001	IC	0.334	0.177	0.000	0.511
12.000	RE	0.021	0.125	0.000	0.146
11.002	IC	0.386	0.232	0.000	0.618
13.000	PP	0.000	0.037	27.540	27.577
11.003	SOAKAWAY	0.028	0.025	9.658	9.712
14.000	RE	0.021	0.095	0.000	0.116
14.001	IC	0.277	0.177	0.000	0.454
15.000	RE	0.021	0.095	0.000	0.116
14.002	IC	0.307	0.200	0.000	0.507
16.000	PP	0.000	0.065	13.230	13.295
14.003	SOAKAWAY	0.028	0.026	9.658	9.713
17.000	RE	0.021	0.095	0.000	0.116
17.001	IC	0.274	0.177	0.000	0.451
18.000	RE	0.021	0.095	0.000	0.116
17.002	IC	0.305	0.188	0.000	0.493
19.000	PP	0.000	0.065	13.230	13.295
17.003	SOAKAWAY	0.028	0.027	9.658	9.713
20.000	RE	0.021	0.090	0.000	0.111
21.000	PP	0.000	0.015	18.630	18.645
20.001	IC	0.265	0.170	0.000	0.435
22.000	RE	0.021	0.137	0.000	0.159
20.002	IC	0.296	0.229	0.000	0.524
20.003	SOAKAWAY	0.113	0.028	9.658	9.799
Total		3.564	3.540	148.108	155.212

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 10
Number of Online Controls 0 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 0.300
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360
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.	Water Level (m)
8.000	RE	15 Winter	1	+0%					53.526
8.001	IC	360 Winter	1	+0%	30/120 Summer				52.460
9.000	RE	15 Winter	1	+0%					53.524
8.002	IC	360 Winter	1	+0%	1/360 Winter				52.460
10.000	PP	60 Winter	1	+0%					53.397
8.003	SOAKAWAY	360 Winter	1	+0%					52.460
11.000	RE	15 Winter	1	+0%	100/60 Winter				53.056
11.001	IC	360 Winter	1	+0%	1/240 Winter				52.470
12.000	RE	15 Winter	1	+0%	100/60 Winter				53.059
11.002	IC	360 Winter	1	+0%	1/120 Winter				52.470
13.000	PP	60 Winter	1	+0%	100/120 Winter				53.096
11.003	SOAKAWAY	360 Winter	1	+0%					52.470
14.000	RE	15 Winter	1	+0%	100/120 Winter				52.997
14.001	IC	15 Winter	1	+0%	30/120 Summer				52.324

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
8.000	RE	-0.087	0.000	0.04		0.6	FLOOD RISK	
8.001	IC	-0.088	0.000	0.01		0.1	OK	
9.000	RE	-0.086	0.000	0.05		0.7	FLOOD RISK	
8.002	IC	0.021	0.000	0.01		0.2	SURCHARGED	
10.000	PP	-0.084	0.000	0.06		0.8	OK*	
8.003	SOAKAWAY	-1.384	0.000	0.00		0.0	OK	
11.000	RE	-0.087	0.000	0.04		0.6	FLOOD RISK	
11.001	IC	0.142	0.000	0.01		0.1	SURCHARGED	
12.000	RE	-0.086	0.000	0.05		0.7	FLOOD RISK	
11.002	IC	0.249	0.000	0.01		0.2	SURCHARGED	
13.000	PP	-0.082	0.000	0.07		1.0	OK*	
11.003	SOAKAWAY	-1.336	0.000	0.00		0.0	OK	
14.000	RE	-0.086	0.000	0.04		0.6	FLOOD RISK	
14.001	IC	-0.132	0.000	0.04		0.6	OK	

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.	Water Level (m)
15.000	RE	15 Winter	1	+0%	100/120 Winter				52.998
14.002	IC	360 Winter	1	+0%	30/60 Winter				52.292
16.000	PP	60 Winter	1	+0%	100/240 Winter				53.109
14.003	SOAKAWAY	360 Winter	1	+0%					52.292
17.000	RE	15 Winter	1	+0%	100/180 Winter				53.052
17.001	IC	15 Winter	1	+0%	30/360 Winter				52.383
18.000	RE	15 Winter	1	+0%	100/180 Winter				53.049
17.002	IC	15 Winter	1	+0%	30/180 Winter				52.275
19.000	PP	60 Winter	1	+0%	100/240 Winter				53.127
17.003	SOAKAWAY	360 Winter	1	+0%					52.043
20.000	RE	15 Winter	1	+0%					53.072
21.000	PP	60 Winter	1	+0%	30/360 Winter				52.680
20.001	IC	60 Winter	1	+0%	30/120 Summer				52.437
22.000	RE	15 Winter	1	+0%					53.075
20.002	IC	360 Winter	1	+0%	30/60 Winter				52.402
20.003	SOAKAWAY	360 Winter	1	+0%					52.402

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
15.000	RE	-0.086	0.000	0.05		0.6	FLOOD RISK	
14.002	IC	-0.057	0.000	0.01		0.2	OK	
16.000	PP	-0.087	0.000	0.04		0.6	OK*	
14.003	SOAKAWAY	-1.309	0.000	0.00		0.0	OK	
17.000	RE	-0.086	0.000	0.05		0.6	FLOOD RISK	
17.001	IC	-0.131	0.000	0.04		0.6	OK	
18.000	RE	-0.086	0.000	0.05		0.6	FLOOD RISK	
17.002	IC	-0.133	0.000	0.03		1.2	OK	
19.000	PP	-0.087	0.000	0.04		0.5	OK*	
17.003	SOAKAWAY	-1.551	0.000	0.00		0.0	OK	
20.000	RE	-0.085	0.000	0.05		0.7	FLOOD RISK	
21.000	PP	-0.084	0.000	0.06		0.7	OK*	
20.001	IC	-0.125	0.000	0.07		1.1	OK	
22.000	RE	-0.083	0.000	0.07		0.9	FLOOD RISK	
20.002	IC	-0.058	0.000	0.04		0.6	OK	
20.003	SOAKAWAY	-1.425	0.000	0.00		0.0	OK	

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 10
      Number of Online Controls 0  Number of Time/Area Diagrams  0
     Number of Offline Controls 0  Number of Real Time Controls  0
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Synthetic Rainfall Details

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Rainfall Model                FSR      Ratio R 0.300
        Region England and Wales Cv (Summer) 0.750
   M5-60 (mm)             18.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm)                          300.0
                 Analysis Timestep 2.5 Second Increment (Extended)
                        DTS Status                             ON
                        DVD Status                             ON
                    Inertia Status                             ON

              Profile(s)                  Summer and Winter
         Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360
      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.	Water Level (m)
8.000	RE	15 Winter	30	+0%					53.535
8.001	IC	360 Winter	30	+0%	30/120 Summer				52.901
9.000	RE	15 Winter	30	+0%					53.533
8.002	IC	360 Winter	30	+0%	1/360 Winter				52.901
10.000	PP	30 Summer	30	+0%					53.415
8.003	SOAKAWAY	360 Winter	30	+0%					52.901
11.000	RE	360 Winter	30	+0%	100/60 Winter				53.136
11.001	IC	360 Winter	30	+0%	1/240 Winter				53.136
12.000	RE	360 Winter	30	+0%	100/60 Winter				53.136
11.002	IC	360 Winter	30	+0%	1/120 Winter				53.136
13.000	PP	360 Winter	30	+0%	100/120 Winter				53.136
11.003	SOAKAWAY	360 Winter	30	+0%					53.136
14.000	RE	15 Winter	30	+0%	100/120 Winter				53.005
14.001	IC	360 Winter	30	+0%	30/120 Summer				52.826

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
8.000	RE	-0.078	0.000	0.11		1.4	FLOOD RISK	
8.001	IC	0.353	0.000	0.01		0.2	SURCHARGED	
9.000	RE	-0.077	0.000	0.12		1.6	FLOOD RISK	
8.002	IC	0.462	0.000	0.03		0.4	SURCHARGED	
10.000	PP	-0.066	0.000	0.25		3.4	OK*	
8.003	SOAKAWAY	-0.943	0.000	0.00		0.0	OK	
11.000	RE	-0.007	0.000	0.02		0.2	FLOOD RISK	
11.001	IC	0.809	0.000	0.01		0.2	FLOOD RISK	
12.000	RE	-0.009	0.000	0.02		0.3	FLOOD RISK	
11.002	IC	0.915	0.000	0.02		0.4	FLOOD RISK	
13.000	PP	-0.042	0.000	0.07		1.0	OK*	
11.003	SOAKAWAY	-0.670	0.000	0.00		0.0	OK	
14.000	RE	-0.078	0.000	0.11		1.4	FLOOD RISK	
14.001	IC	0.370	0.000	0.01		0.2	SURCHARGED	

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.	Water Level (m)
15.000	RE	15 Winter	30	+0%	100/120 Winter				53.007
14.002	IC	360 Winter	30	+0%	30/60 Winter				52.826
16.000	PP	15 Winter	30	+0%	100/240 Winter				53.124
14.003	SOAKAWAY	360 Winter	30	+0%					52.826
17.000	RE	15 Winter	30	+0%	100/180 Winter				53.061
17.001	IC	360 Winter	30	+0%	30/360 Winter				52.589
18.000	RE	15 Winter	30	+0%	100/180 Winter				53.058
17.002	IC	360 Winter	30	+0%	30/180 Winter				52.589
19.000	PP	15 Winter	30	+0%	100/240 Winter				53.142
17.003	SOAKAWAY	360 Winter	30	+0%					52.589
20.000	RE	15 Winter	30	+0%					53.080
21.000	PP	360 Winter	30	+0%	30/360 Winter				52.773
20.001	IC	360 Winter	30	+0%	30/120 Summer				52.774
22.000	RE	15 Winter	30	+0%					53.086
20.002	IC	360 Winter	30	+0%	30/60 Winter				52.774
20.003	SOAKAWAY	360 Winter	30	+0%					52.774

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
15.000	RE	-0.077	0.000	0.12		1.6	FLOOD RISK	
14.002	IC	0.477	0.000	0.02		0.4	SURCHARGED	
16.000	PP	-0.072	0.000	0.17		2.4	OK*	
14.003	SOAKAWAY	-0.775	0.000	0.00		0.0	OK	
17.000	RE	-0.077	0.000	0.12		1.5	FLOOD RISK	
17.001	IC	0.075	0.000	0.02		0.3	SURCHARGED	
18.000	RE	-0.077	0.000	0.12		1.5	FLOOD RISK	
17.002	IC	0.182	0.000	0.01		0.5	SURCHARGED	
19.000	PP	-0.072	0.000	0.17		2.3	OK*	
17.003	SOAKAWAY	-1.005	0.000	0.00		0.0	OK	
20.000	RE	-0.077	0.000	0.12		1.6	FLOOD RISK	
21.000	PP	0.009	0.000	0.05		0.7	SURCHARGED*	
20.001	IC	0.212	0.000	0.06		0.9	SURCHARGED	
22.000	RE	-0.072	0.000	0.17		2.2	FLOOD RISK	
20.002	IC	0.314	0.000	0.07		1.2	SURCHARGED	
20.003	SOAKAWAY	-1.053	0.000	0.00		0.0	OK	

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	10
Number of Online Controls	0	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	0.300
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
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.	Water Level (m)
8.000	RE	15 Winter	100	+40%					53.543
8.001	IC	360 Winter	100	+40%	30/120 Summer				53.455
9.000	RE	15 Winter	100	+40%					53.542
8.002	IC	360 Winter	100	+40%	1/360 Winter				53.455
10.000	PP	360 Winter	100	+40%					53.455
8.003	SOAKAWAY	360 Winter	100	+40%					53.455
11.000	RE	360 Winter	100	+40%	100/60 Winter				53.291
11.001	IC	360 Winter	100	+40%	1/240 Winter				53.297
12.000	RE	360 Winter	100	+40%	100/60 Winter				53.292
11.002	IC	360 Winter	100	+40%	1/120 Winter				53.298
13.000	PP	360 Winter	100	+40%	100/120 Winter				53.289
11.003	SOAKAWAY	360 Winter	100	+40%					53.299
14.000	RE	360 Winter	100	+40%	100/120 Winter				53.256
14.001	IC	360 Winter	100	+40%	30/120 Summer				53.256

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
8.000	RE	-0.070	0.000	0.19		2.5	FLOOD RISK	
8.001	IC	0.907	0.000	0.02		0.4	FLOOD RISK	
9.000	RE	-0.068	0.000	0.22		2.9	FLOOD RISK	
8.002	IC	1.016	0.000	0.05		0.8	FLOOD RISK	
10.000	PP	-0.026	0.000	0.10		1.4	OK*	
8.003	SOAKAWAY	-0.389	0.000	0.00		0.0	OK	
11.000	RE	0.148	0.000	0.03		0.4	FLOOD RISK	
11.001	IC	0.969	0.000	0.03		0.4	FLOOD RISK	
12.000	RE	0.147	0.000	0.04		0.5	FLOOD RISK	
11.002	IC	1.076	0.000	0.05		0.9	FLOOD RISK	
13.000	PP	0.111	0.000	0.13		1.7	SURCHARGED*	
11.003	SOAKAWAY	-0.507	0.000	0.00		0.0	OK	
14.000	RE	0.173	0.000	0.03		0.4	FLOOD RISK	
14.001	IC	0.800	0.000	0.02		0.3	FLOOD RISK	

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.	Water Level (m)
15.000	RE	360 Winter	100	+40%	100/120 Winter				53.256
14.002	IC	360 Winter	100	+40%	30/60 Winter				53.256
16.000	PP	360 Winter	100	+40%	100/240 Winter				53.255
14.003	SOAKAWAY	360 Winter	100	+40%					53.256
17.000	RE	360 Winter	100	+40%	100/180 Winter				53.270
17.001	IC	360 Winter	100	+40%	30/360 Winter				53.273
18.000	RE	360 Winter	100	+40%	100/180 Winter				53.270
17.002	IC	360 Winter	100	+40%	30/180 Winter				53.273
19.000	PP	360 Winter	100	+40%	100/240 Winter				53.270
17.003	SOAKAWAY	360 Winter	100	+40%					53.274
20.000	RE	15 Winter	100	+40%					53.089
21.000	PP	360 Winter	100	+40%	30/360 Winter				52.951
20.001	IC	360 Winter	100	+40%	30/120 Summer				52.951
22.000	RE	15 Winter	100	+40%					53.096
20.002	IC	360 Winter	100	+40%	30/60 Winter				52.951
20.003	SOAKAWAY	360 Winter	100	+40%					52.951

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
15.000	RE	0.172	0.000	0.04		0.5	FLOOD RISK	
14.002	IC	0.906	0.000	0.03		0.8	FLOOD RISK	
16.000	PP	0.059	0.000	0.06		0.9	SURCHARGED*	
14.003	SOAKAWAY	-0.345	0.000	0.00		0.0	OK	
17.000	RE	0.132	0.000	0.04		0.5	FLOOD RISK	
17.001	IC	0.759	0.000	0.03		0.4	FLOOD RISK	
18.000	RE	0.135	0.000	0.04		0.5	FLOOD RISK	
17.002	IC	0.866	0.000	0.02		0.8	FLOOD RISK	
19.000	PP	0.056	0.000	0.06		0.8	SURCHARGED*	
17.003	SOAKAWAY	-0.320	0.000	0.00		0.0	OK	
20.000	RE	-0.068	0.000	0.22		2.9	FLOOD RISK	
21.000	PP	0.187	0.000	0.09		1.1	FLOOD RISK*	
20.001	IC	0.389	0.000	0.09		1.4	SURCHARGED	
22.000	RE	-0.062	0.000	0.31		4.1	FLOOD RISK	
20.002	IC	0.491	0.000	0.12		2.0	SURCHARGED	
20.003	SOAKAWAY	-0.876	0.000	0.00		0.0	OK	

APPENDIX E

DRAINAGE MAINTENANCE SCHEDULE

1 DRAINAGE MAINTENANCE SCHEDULE

Maintenance of all drainage features not adopted by the local water authority will be the responsibility of the Landowner. The works will need to be carried out by a competent contractor.

1.1 PERVIOUS PAVEMENTS MAINTENANCE SCHEDULE

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequent as required, based on site-specific observations of clogging or manufacturer's recommendations – paying particular attention to areas where water runs onto permeable surfacing from adjacent impermeable areas as this is the most likely to collect the most sediment
Occasional Maintenance	Stabilise and mow contributing and adjacent areas	As Required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As Required – once per year on less frequently used pavements
Remedial Actions	Remediate and landscaping which, through vegetation maintenance or soil slip, which has been raised to within 50mm of the level of the paving	As Required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replacing lost jointing material.	As Required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for 3 months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three monthly, 48 hours after large storms in first 6 months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chamber	Annually

As required by CDM 2015 designs have been produced to ensure that all maintenance risks have been identified, eliminated, reduced and/ or controlled where appropriate.

Any manufacturer specific maintenance requirements are to be included as part of the site health and safety file.

1 DRAINAGE MAINTENANCE SCHEDULE

Maintenance of all drainage features not adopted by the local water authority will be the responsibility of the Landowner. The works will need to be carried out by a competent contractor.

1.1 SOAKAWAYS MAINTENANCE SCHEDULE

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)
	trimming any roots that may be causing blockages	Annually (or as required)
Occasional Maintenance	Remove sediment and debris from pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	As required, based on inspections
Remedial Actions	Reconstruct soakaway and⍰or replace or clean void fill, if performance deteriorates or failure occurs	As Required
	Replacement of clogged geotextile (will require reconstruction of soakaway)	As Required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually
	Check soakaway to ensure emptying is occurring	Annually

As required by CDM 2015 designs have been produced to ensure that all maintenance risks have been identified, eliminated, reduced and/ or controlled where appropriate.

Any manufacturer specific maintenance requirements are to be included as part of the site health and safety file.