

Proposed Care Home Development,
Former Battle of Britain Pub Site,
Coldharbour Road, Gravesend

Flood Risk Assessment and Drainage Strategy

For Frontier Estates

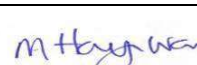
Issue 4



FAIRHURST

CONTROL SHEET**CLIENT:** Frontier Estates**PROJECT TITLE:** Battle of Britain Pub, Gravesend**REPORT TITLE:** Flood Risk Assessment and Drainage Strategy**PROJECT REFERENCE:** 144828**DOCUMENT NUMBER:** 100**STATUS:** FINAL

Issue & Approval Schedule		Name	Signature	Date
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	Approved by	Mark Hayward		15.11.2022

Revision Record	Rev.	Date	Status	Description	Signature	
	2	17.11.2022	FINAL	Updated to latest layout	By	
					Checked	
					Approved	
	3	06.01.2023	FINAL	Updated to EA and LLFA comments.	By	
					Checked	
					Approved	
	4	28.04.2023	FINAL	Updated to LLFA comments.	By	
					Checked	
					Approved	

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Contents	Page No.
1.0 Introduction.....	6
2.0 Site Location and Description.....	6
3.0 Development Proposals	6
4.0 Geology.....	8
5.0 Hydrology	9
7.0 Flood History and Records	11
8.0 Sequential and Exception Tests	11
<i>Sequential test</i>	11
<i>Exception test</i>	11
9.0 Forms of Flooding	12
10.0 Flood Risk, Flood Compensation and Mitigation Measures	13
11.0 Climate Change.....	13
12.0 Existing Drainage	14
13.0 Proposed Surface Water Drainage Strategy.....	14
14.0 Proposed Foul Drainage	17
15.0 Sustainable Drainage System (SuDS).....	17
16.0 Maintenance.....	19
17.0 Conclusion.....	20

Page No.**Figures**

Figure 1 - OS Location Map.....	7
Figure 2 - OS Location Map.....	7
Figure 3: BGS geological mapping.....	9
Figure 4 - Flooding from Rivers and Seas.....	10
Figure 5 - Flooding from Surface Water.....	10

Tables

Table 1.0 Forms of Flooding.....	12
Table 2.0 SuDS simple index method.....	18

Appendices

Appendix A – Development Proposals

Appendix B – BGS Borehole Records

Appendix C – Flood Risk Vulnerability Tables

Appendix D – Southern Water Sewer Records

Appendix E – Previous planning application soakage tests & Applied Geology testing

Appendix F – Proposed Drainage Layout

Appendix G – Microdrainage Calculations

Appendix H – Potential Foul Discharge Locations

Appendix I – Maintenance Strategy

1.0 Introduction

- 1.1 Fairhurst have been commissioned by Frontier Estates to undertake a Flood Risk Assessment and Drainage Strategy for the construction of new care home on Coldharbour Road in Gravesend, Kent.

2.0 Site Location and Description

- 2.1 The site is located approximately 2.0km southwest of Gravesend Town Centre in northwest Kent. The site has an approximate Grid Reference of TQ636722 and a nearest post code of DA11 7JL. See figure 1 and 2
- 2.2 The site is bounded by Coldharbour Road to the southwest and New House Lane to the northwest. An open school field is situated to the northeast of the site and residential properties along the southeast boundary.
- 2.3 A topographical survey has been performed and the site generally falls from the west to east, falling from 42.28mAOD down to 39.50mAOD.
- 2.4 The development is approximately 2.2km south of the river Thames.

3.0 Development Proposals

- 3.1 The proposed development is for the construction of a care home development comprising 65 units. The new development has a total area of approximately 1543m² GEA and will include all necessary infrastructure works associated with a building of this nature. See Appendix A for development proposals.
- 3.2 The site which is approximately 0.49ha is on the former site of the Battle of Britain Public House which has been demolished, the location where the proposed buildings are to be cited is free of any buildings.

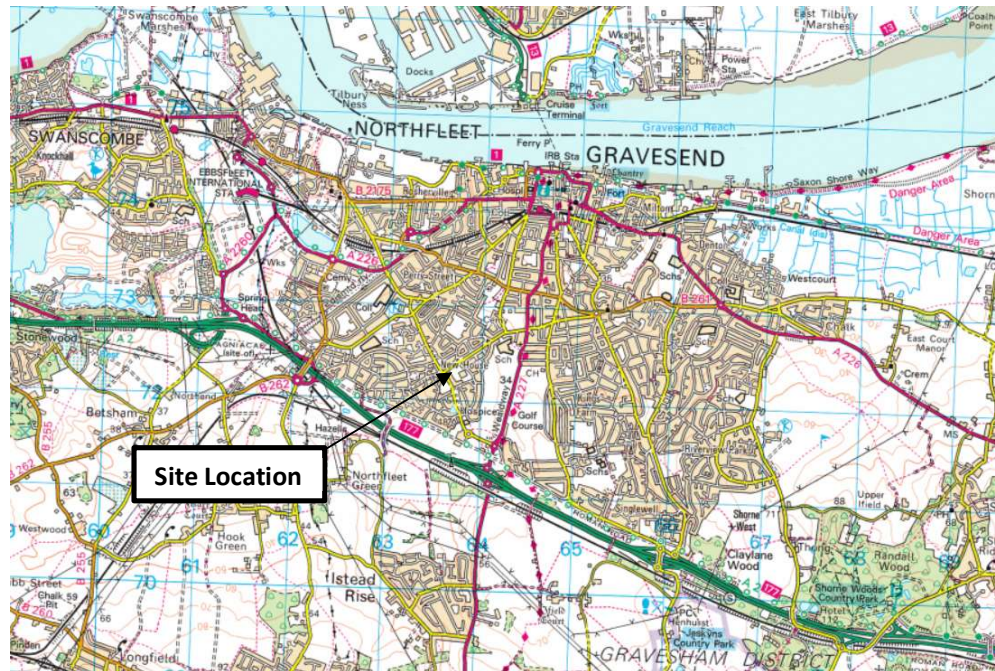


Figure 1 - OS Location Map

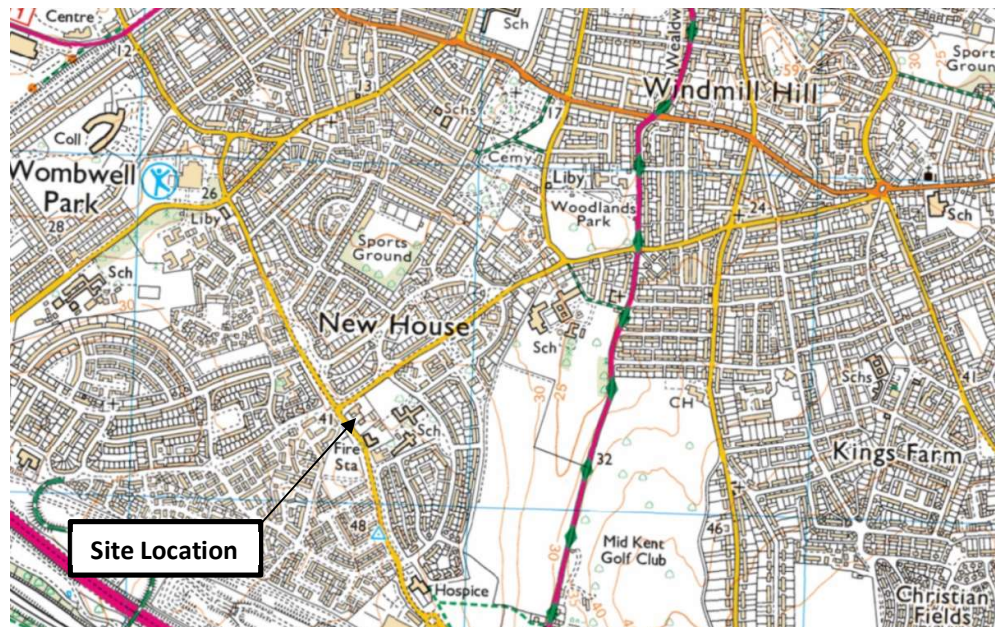


Figure 2 - OS Location Map

4.0 Geology

- 4.1 Information on the British Geological Survey (BGS) website indicates the site has no superficial deposits. The bedrock is the Thanet Formation comprising sand and sedimentary bedrock. See figure 3.
- 4.2 There are no BGS borehole records near the site, however there is a record approximately 780m north west of the site, within the same geological strata, and this indicates that beneath the Thanet Sand Formation there is a bedrock of upper chalk, beginning at a depth of approximately 14.60mbgl.
- 4.3 Site investigation has been undertaken by Applied Geology in October 2021, and this appears to agree with the BGS records. The boreholes undertaken indicate that there is a layer of made ground of varying thicknesses across the site, with Thanet Sand Formation beneath this. The only deviation from BGS records is the indication that there is potentially a layer of head deposits within the north western corner of the site.
- 4.4 Due to the characteristic of the underlying geology of sand, it would imply that infiltration may be an option subject to favourable infiltration results for the disposal of surface water for this development. However, as the Thanet Formation is described as clayey, silty and fine, it is possible these rates are lower than typically expected for a sand stratum.
- 4.5 BGS borehole records can be found in Appendix B.

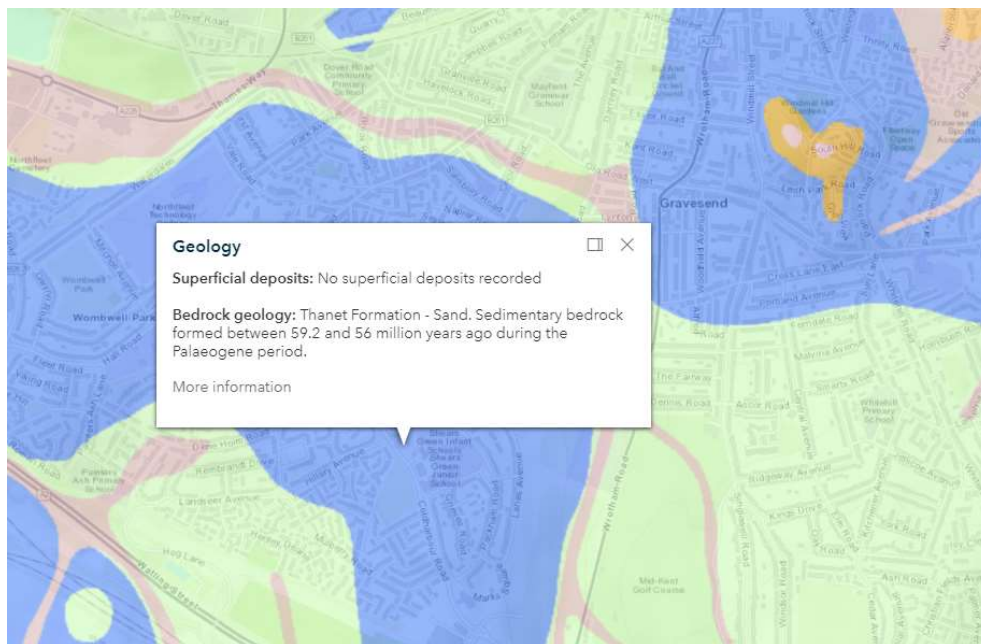


Figure 3: BGS geological mapping.

5.0 Hydrology

- 5.1 The nearest watercourse classed as a main river is a small river 2km to the west of the site, which appears to issue from a spring slightly north of the A2 Watling Street. This river then heads northwards to Sawyer's Lake, 1.8km north west of the site, before discharging into the River Thames.
- 5.2 The River Thames is located approximately 2.2km to the north of the site. The source of which is located in Gloucestershire and flows into the North Sea.
- 5.3 The Environment Agency (EA) Flood Map for Planning shows that the site is situated entirely within Flood Zone 1, and is therefore not at risk of fluvial flooding in the event of a storm event with up to a 1 in 1000 year return period (0.1% Annual Exceedance Probability). The flood mapping also shows that the site is not susceptible to surface water flooding See figures 4 and 5.

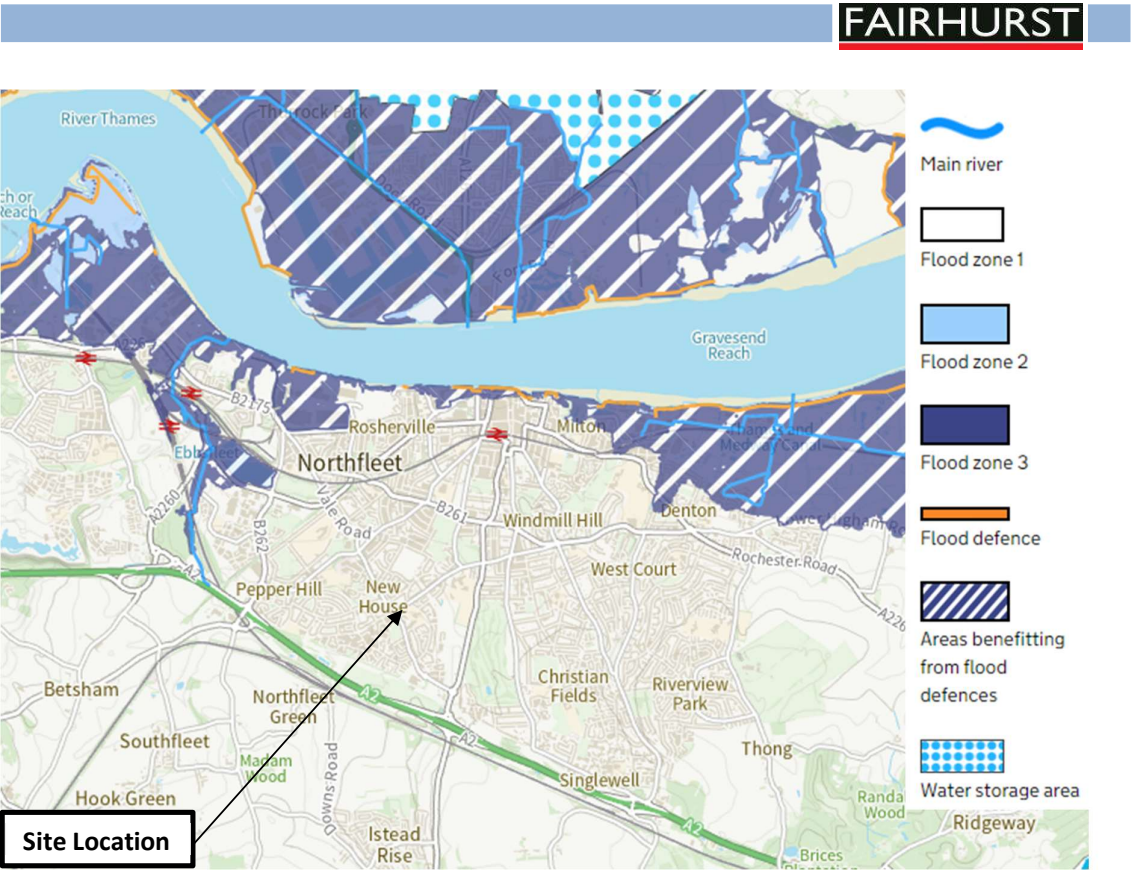


Figure 4 - Flooding form Rivers and Seas



Figure 5 - Flooding from Surface Water

6.0 Hydrogeology

- 6.1 The bedrock stratum beneath the site is designated as a Secondary A aquifer meaning that it has the potential to form supply water for the local area.
- 6.2 The groundwater has a vulnerability class of high. This is presumably due to the sandstone bedrock and its properties of permeability.
- 6.3 No evidence has been found indicating any groundwater flooding on or near to the site.
- 6.4 The boreholes undertaken as part of Applied Geology's investigations on site encountered groundwater on site at a depth of typically between 3.8mAOD to 4.3mAOD.

7.0 Flood History and Records

- 7.1 There is no evidence found of any historic flooding in these areas affecting the site within the EA historic flood map records, or within the Kent Thameside Stage 1 Surface Water Management Plan which contains all reported flood records in the area.

8.0 Sequential and Exception Tests

- 8.1 As this development is for residential accommodation, it is considered that the development has a flood risk vulnerability classification of More Vulnerable. See Appendix C.

Sequential test

- 8.2 Sequential testing is aimed at steering new developments to areas with the lowest probability of flooding. Appendix C shows the Flood Risk Vulnerability Classification as defined by Environment Agency and the type of development compatible with that particular classification.
- 8.3 As the site is located entirely within Flood Zone 1 in an area not at risk from flooding, a sequential Test will not be required.

Exception test

- 8.4 Exception testing is to demonstrate that the development provides wider sustainability benefits to the community that outweighs the flood risk if

development is to take place outside of Flood Zone 1. As the entire site is within Flood Zone 1, an exception test is not required.

9.0 Forms of Flooding

- 9.1 Flooding can originate from a number of different sources and CIRIA C624: Development and Flood Risk Guidance provides a list of those which need to be considered.
- 9.2 These are summarised in Table 1.0 below with a schedule of whether they need to be considered at this site.

Source	Requires considering for this site?
Fluvial	√
Coastal and Tidal	√
Estuarine and Tidal Affected Watercourses	√
Groundwater	√
Overland flow and surface water flooding	√
Artificial Drainage Systems e.g. reservoirs	√
Infrastructure Failure e.g. water mains and sewers.	√

Table 1.0 Forms of Flooding

- 9.3 Fluvial – As previously discussed in Section 5, the site lies entirely within Flood Zone 1, and as such is considered to not have a significant fluvial flood risk.
- 9.4 Coastal and Tidal – The development is within 2.0km of the Thames River and is affected by tidal flows. EA flood mapping indicates that the site has no risk of flooding from coastal or tidal sources.
- 9.5 Groundwater – As previously discussed in Section 6.3, the site has no recorded incidents of flooding from ground water.
- 9.6 Overland Flow and Surface Water Flooding – This can occur when the local drainage infrastructure cannot cope with the volume of rainfall in extreme

events and exceed the design capacity of the surface water system. As shown in figure 5, there is no identified risk from surface water flooding.

9.7 Artificial Drainage Systems – Artificial drainage systems are manmade structures that are designed and have the capability to hold water such as reservoirs or canals, and if they failed would cause catastrophic flooding downstream. EA mapping shows that the site is not susceptible to reservoir flooding or other man made water features.

9.8 Infrastructure Failure – This can be caused if a high pressure water main bursts or a sewer blocks and floods. Whilst these types of events occur they are very uncommon, therefore not considered to be an issue at this site.

10.0 Flood Risk, Flood Compensation and Mitigation Measures

10.1 As the site is situated entirely within Flood Zone 1, and is not at risk of flooding from rivers, the sea or surface water, no flood risk mitigation or compensation measures will be required.

11.0 Climate Change

11.1 Climate change is a well-documented occurrence which needs to be taken into account when looking at flooding. Based on the fact that the area of site proposed for development lies within Flood Zone 1 it is considered that the effects of climate change over the accepted lifetime of the development with regard to flood risk will not be an issue.

11.2 The proposed drainage infrastructure will be designed to take climate change into account therefore mitigating its' effects. The drainage infrastructure will be designed so as not to cause flooding offsite in the 1 in 100 plus 40% climate change rainfall event.

12.0 Existing Drainage

- 12.1 The sewer records which can be found in Appendix D shows that there is an adopted foul water sewer within the gardens of the properties to the north east of the site and another adjacent to the Ambulance Station which is located south east along Coldharbour Road.
- 12.2 There are no adopted surface water sewers in the area, and as such it is assumed that the site currently drains via infiltration.

13.0 Proposed Surface Water Drainage Strategy

- 13.1 Building Regulations Part H3 states that storm water should discharge (in descending order of priority) to:
1. An adequate soakaway or some other adequate infiltration system: or where that is not reasonably practicable,
 2. A watercourse or where that is not reasonably practicable,
 3. A segregated drainage system for storm and foul or if that is not possible,
- 13.2 As the site has been identified to be underlain by sand, it may be suitable for infiltration structures.
- 13.3 Infiltration testing was carried out in two locations by Your Environment to support a prior planning application at the site, the results of which can be found in Appendix E. Test 1 returned infiltration test results of 3.8×10^{-6} m/s. Test 2 did not return any reliable result due to localised clay found in the bottom of the hole, and no infiltration results were obtained.
- 13.4 Further infiltration testing has been undertaken by Applied Geology in 2021, with tests being undertaken in the south and centre of the site. These gave a rate of 1.1×10^{-5} m/s in TP6 to the south, and 4.7×10^{-6} m/s in TP7 in the centre of the site. Subject to targeted testing in the proposed infiltration areas, it is likely that soakaways will be feasible on site, but may need to be oversized in order to account for the relatively low rates. The location of these tests and results can be found in Appendix E.
- 13.5 British Standards require that soakaways should be located at a minimum of 5m from any building. Within the Groundsure report included in the Site

Investigation report, it is stated that the site has a significant risk of soluble rocks. Typically this would mean soakaways would need to be placed a minimum of 10m from the building, however, as chalk or karstic rocks haven't been encountered to a depth of 12m in the boreholes, it is unlikely that this is required, as soakaways will not discharge directly into the soluble strata.

- 13.6 The site is located within a Source Protection Zone 2, Outer Protection Zone. This is due to the likely permeability of the bedrock, and the nearby Licenced Potable Water abstractions nearby. There are two Southern Water abstraction points nearby, both abstracting a maximum of 92000m³ of water a day. One is located 1126m south west of the site, and the other 1596m to the north east. Because of this, the EA have stated that "No infiltration of surface water drainage into the ground is permitted other than with the written consent of the Local Planning Authority". The LLFA have not made any objection to this method of surface water disposal so far, and as such it is proposed to continue utilising infiltration.
- 13.7 The Kent Thameside Water Cycle Strategy provides Table 2 below, stating what impermeable areas can be discharged to groundwater in each zone. As the site only contains roof drainage and a small car park, it is likely that this will be deemed acceptable. However, it is important to include sufficient SuDS features to reduce the risk of pollution to groundwater.

Table 6.1 Acceptability for discharges to SPZs

Impermeable Area	Zone I	Zone II	Zone III
Roof Drainage	No objection (provided for sole use of roof drainage)	No objection	No objection
Public/Amenity	Not acceptable	Acceptable	Acceptable
Large Car Parks	Not acceptable	Acceptable (with interceptor)	Acceptable (with interceptor)
Lorry Parks	Not acceptable	Presumption Against	Acceptable (with interceptor)
Garage Forecourts	Not acceptable	Presumption Against	Acceptable (with interceptor)
Major Roads	Not acceptable	Presumption Against. Acceptable only in exceptional circumstances	Acceptable only if investigation favourable and with adequate precautions
Industrial Sites	Not acceptable	Presumption Against	Acceptable only if investigation favourable and with adequate precautions

Table 2.0 – Acceptability for discharges to SPZs, Kent Thameside Water Cycle Strategy

- 13.8 The permeable soil and assumed use of soakaways nearby means there is a lack of adopted surface water infrastructure in the area. As such, in the event that infiltration is deemed to not be feasible on site, it may be necessary to negotiate with Southern Water to discharge surface water into the nearby adopted foul network at a greatly restricted rate.
- 13.9 It is proposed to provide permeable parking spaces in order to provide an increase in water quality of runoff from the car parking and access road areas. Beneath these, geocellular infiltration blankets are proposed to drain the car park and roof areas.
- 13.10 The infiltration blankets have been designed to meet a 24hr half drain time for a 1 in 30 year storm. In a 1 in 30 year storm the north infiltration blanket has a half drain time of 22.9 hours, and the southern has a half drain time of 23.9 hours. In the event that there are two consecutive 1 in 100 +climate change storms the exceedance flows will largely remain within the southern portion of the car park, eventually making their way offsite out of the northern access, not posing a risk to the building or occupants.
- 13.11 Drawing 144828-2000 in Appendix F shows the proposed drainage layout.
- 13.12 Supporting drainage calculations can be found in Appendix G.

14.0 Proposed Foul Drainage

- 14.1 There are no foul sewers present on site or within the roads immediately adjacent to the site, with all nearby sewers located within 3rd party land. The response to the developer enquiry sent to Southern Water to enquire about the capacity within the network to take the required flows has been received. After a capacity review Southern Water have confirmed that there is currently sufficient capacity in the works to accommodate a foul flow of 0.72 l/s. Appendix H shows the 3 different locations of the manholes with confirmed sufficient capacities; the preferred option being located on Coldharbour Road within the boundary of the Ambulance Station.
- 14.2 The intention is to connect to an existing foul connection that historically served the pub. A drainage trace will be required in order to discover the connection and route. If this is not possible, a new foul connection will be required and will pass through 3rd party land. In this scenario, it will be necessary to requisition a sewer to be constructed by Southern Water. This could take the form of a small section of foul sewer into the adopted highway, which will open up the possibility of constructing a foul sewer in the highway by the developer, or a sewer can be requisitioned right up to the site boundary.

15.0 Sustainable Drainage System (SuDS)

- 15.1 SuDS are a way to improve the existing drainage situation in terms of quantity, quality, biodiversity and amenity. SuDS aim to manage rainfall ideally at source to improve runoff in a way that best suits its proposed surroundings. The main SuDS components are infiltration, retention/detention, control devices and source controls (i.e. green roofs, rain water harvesting etc). At detailed design stage, the health and safety concerns of the end user/residents must be taken into account when incorporating and designing any SuDS features.
- 15.2 The impermeable areas on the site include roof drainage and parking area, and as such don't pose a significant pollution risk. As such the Simple Index Approach to water quality management can be used to assess the risk of pollution to groundwater. As shown below, the use of permeable pavements on site mitigates the risk of pollution, however further SuDS measures may be considered at detailed design stage. This can include rain gardens and water butts that will be driven by the landscape design.

	Land Usage	TSS*	Metals	Hydrocarbons
Pollution Hazard	Roof drainage	0.2	0.2	0.05
	Residential Car Park	0.5	0.4	0.4
	Pollution Indices Total	0.7	0.6	0.45
SuDS Mitigation method	Permeable Pavement	0.7	0.6	0.7
	Soakaway	0.4	0.3	0.3
	Mitigation Indices Total (n.b secondary indices x0.5)	0.9	0.75	0.85
	Total betterment	0.2	0.15	0.4

* = Total Suspended Solids

Table 2.0: Simple Index Approach to water quality management.

16.0 Maintenance

- 16.1 The Maintenance Strategy found in Appendix I contains the following components:-
- Person / organisation etc. responsible for the maintenance.
 - Type of Maintenance – Nature of task and frequency of activity.
 - Ad-hoc maintenance – Details of what action will be taken in an emergency and who will be responsible.
 - Details of response time for emergency and non-emergency works
- 16.2 The frequency of maintenance tasks outlined in the strategy will be conducted for the first annual maintenance assessment period and reviewed accordingly to determine a more effective long term strategy tailored to suit the specific needs of the site.
- 16.2 As the site is privately owned, it is assumed that all drainage will also remain private.
- 16.3 If offsite drainage is required this will be within the adopted highway, and as such will likely be built under a Section 104 agreement, thus eventually passing it over to Southern Water for adoption and maintenance.

17.0 Conclusion

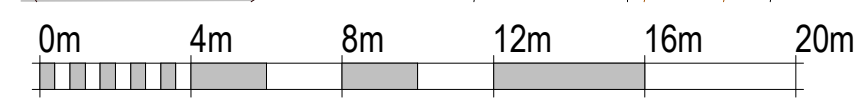
- 17.1 The site is located approximately 2.0km south west of the town of Gravesend in northwest Kent. The nearest post code is DA11 7JL.
- 17.2 The care home is to be constructed on the former site of the now demolished Battle of Britain public house and will include all associated infrastructure.
- 17.3 Environment Agency mapping shows that the site is not affected by fluvial or surface water flooding.
- 17.4 The British Geological Society mapping identifies the area as having an underlying bedrock geology of the Thanet Formation with no superficial deposits. The geotechnical assessment shows that there is sand and sandstone to at least 12m depth, with made ground present across the site.
- 17.5 Infiltration testing undertaken in 2021 indicates that soakaways are likely feasible on site.
- 17.6 Foul drainage will discharge to the existing adopted foul drainage network, the nearest manhole to connect into is located south along Coldharbour Road adjacent to the Ambulance station. It will be necessary to requisition a foul sewer across 3rd party land in order to make this connection.
- 17.7 The soakaways will be designed not to flood for the 1 in 100 year plus 40% climate change storm event. They will also be located a minimum of 5m from any proposed or existing building.
- 17.8 Based on the above it is deemed that there is no reason why the development should not proceed from a flood risk and drainage standpoint.

References:-

- CIRIA C753 The SUDS Manual
- CIRIA C624: Development and Flood Risk Guidance.
- The Building Regulations 2010 (last updated April 2017) – Drainage and Waste Disposal Part H
- www.bgs.co.uk
- Sewerage Sector Guidance
- BS8582 2013 Code Of Practice For Surface Water Management For Development Sites.
- <https://www.gov.uk/government/organisations/environment-agency>
- <https://www.gov.uk/government/organisations/department-for-environment-food-rural-affairs>
- <https://www.gov.uk/guidance/flood-risk-and-coastal-change#Table-2-Flood-Risk-Vulnerability-Classification>
- Environment agency document - Delivering Benefits Through Evidence Report SC030219
- Kent County Council – Thameside Surface Water Management Plan
- Kent County Council – Thameside Water Cycle Management Strategy

Appendix A

Development Proposals



SCALE 1:200 @ A1

NOTES
All dimensions are in millimetres unless stated otherwise.
Drawings are not to be scaled for Construction purposes.
This drawing is to be read in conjunction with all other relevant drawings and specifications.
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PH	15/11/22	Ambulance Bay adjusted	SL	AP
PS	14/11/22	Ambulance bay footpath	SL	AP
PS	18/10/22	Parking adjusted	SL	AP
PT	20/08/22	Bin store and cycle stands added	SL	AP
PE	19/08/22	Red Line Amended	SL	AP
Rev	Date	Description	Drawn By	Checked By

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Project:
Project Name
Former Battle of Britain Site,
Coldharbour Road,
Gravesend, DA11 8NT
Client: Frontier Estates

Drawing Title:
Proposed Site Plan

For Planning Submission

Site Project Number: 3172
Scale: 1:200
Building: S3

Project: 3172 - HIA - ZZ - XX - DR - A - 0102

Appendix B

BGS Borehole Records

KEY

- Disturbed Sample
- ↑ Bulk Disturbed Sample
- ↓ Bulk Disturbed Sample
- 105 mm Undisturbed Sample
- | Standard Penetration Test
- △ Water Sample

KENT COUNTY COUNCIL

HIGHWAYS LABORATORY

Sheet 1 of 2

BOREHOLE LOG TQ 67SW 320

Date started 16. 5. 1984. Date completed 18. 5. 1984.

Scheme PROPOSED SOAKAWAYS, HALL ROAD, NORTHFLEET.
(see drawing No. L/SD.2/17/1)

Location TQ 6320 7287

Borehole No. 740 Ground Level 28.37m. A.O.D.

Sample			Section	Depth about O.D. or below Ground Level	Thickness of Stratum m.	Description of Soil	Penetration Test	
No.	Type	Depth m.					Pen't'n mm.	No. of Blows
				0.10	0.10	TOPSOIL		
1	●	0.50	x x	0.80	0.70	Dark orange brown silty fine SAND with a trace of clay and some rounded coarse flint gravel and cobbles.		
2	●	1.00	x			Brown silty fine SAND.		
3	●	2.00	x	3.50				
4	●	3.00	x					
5	●	4.00	x	4.30				
6	●	5.00	x			Orange brown mottled yellow and grey, very silty fine SAND.		
7	●	6.00	x	5.50				
8	●	7.00	x					
9	●	8.00	x	9.80				
10	●	9.00	x					
11	●	10.00	x x x			As next sheet.		

Appendix C

Flood Risk Vulnerability Tables

Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Risk Vulnerability Classification see table D2	Essential Infrastructure	Water compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	√	√	√	√	√
Zone 2	√	√	Exception test required	√	√
Zone 3a	Exception test required	√	X	Exception test required	√
Zone 3b 'Functional Flood plain'	Exception test required	√	X	X	X

Key:

√ Development is appropriate

X Development should not be permitted**Table D.2: Flood Risk Vulnerability Classification**

Essential Infrastructure	- Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. - Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. - Wind turbines.
Highly Vulnerable	- Police stations, Ambulance stations and Fire stations and Command Centres and telecommunications installations required to be operational during flooding. - Emergency dispersal points. - Basement dwellings. - Caravans, mobile homes and park homes intended for permanent residential use. - Installations requiring hazardous substances consent.¹⁹ (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure'²⁰).
More Vulnerable	- Hospitals. - Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. - Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels. - Non-residential uses for health services, nurseries and educational establishments.

	- Landfill and sites used for waste management facilities for hazardous waste.²¹ - Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less Vulnerable	- Police, ambulance and fire stations which are not required to be operational during flooding. - Buildings used for: shops; financial, professional and other services; restaurants and cafes; hot food takeaways; offices; general industry; storage and distribution; non-residential institutions not included in 'more vulnerable'; and assembly and leisure. - Land and buildings used for agriculture and forestry. - Waste treatment (except landfill and hazardous waste facilities). - Minerals working and processing (except for sand and gravel working). - Water treatment works which do not need to remain operational during times of flood. - Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).
Water-compatible development	- Flood control infrastructure. - Water transmission infrastructure and pumping stations. - Sewage transmission infrastructure and pumping stations. - Sand and gravel workings. - Docks, marinas and wharves. - Navigation facilities. - MOD defence installations. - Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. - Water-based recreation (excluding sleeping accommodation). - Lifeguard and coastguard stations. - Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. - Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

Appendix D

Southern Water Sewer Records



Head of Planning & Regeneration Services
Gravesham Borough Council
Civic Centre
Windmill Street
Gravesend
Kent
DA12 1AU

Your ref
20221251

Our ref
DSA000019720

Date
24/01/2023

Contact
Tel 0330 303 0119

Dear Sir/Madam,

Proposal: Construction of a care home (within Class C2) associated parking, access, drainage, boundary treatments, landscape and other associated works.

Site: 20221251: - Former Site of Battle of Britain, Coldharbour Road, Northfleet, Gravesend, Kent.

Further to our response dated 20/12/2022 regarding the above planning consultation and further information provided by the developer.

Southern Water have reviewed this planning application and it is located inside our Gravesend South SPZ2, 1.1km from the abstraction source. The proposed development includes surface water discharge to ground. Southern Water do not object to this planning application based on the following conditions.

- Deep bore soakaways are not permitted.
- The final drainage design be shared and approved by Southern Water.

All other comments in our response dated 20/12/2022 remain unchanged and valid.

For further advice, please contact Southern Water, Southern House, Yeoman Road, Worthing, West Sussex, BN13 3NX (Tel: 0330 303 0119).

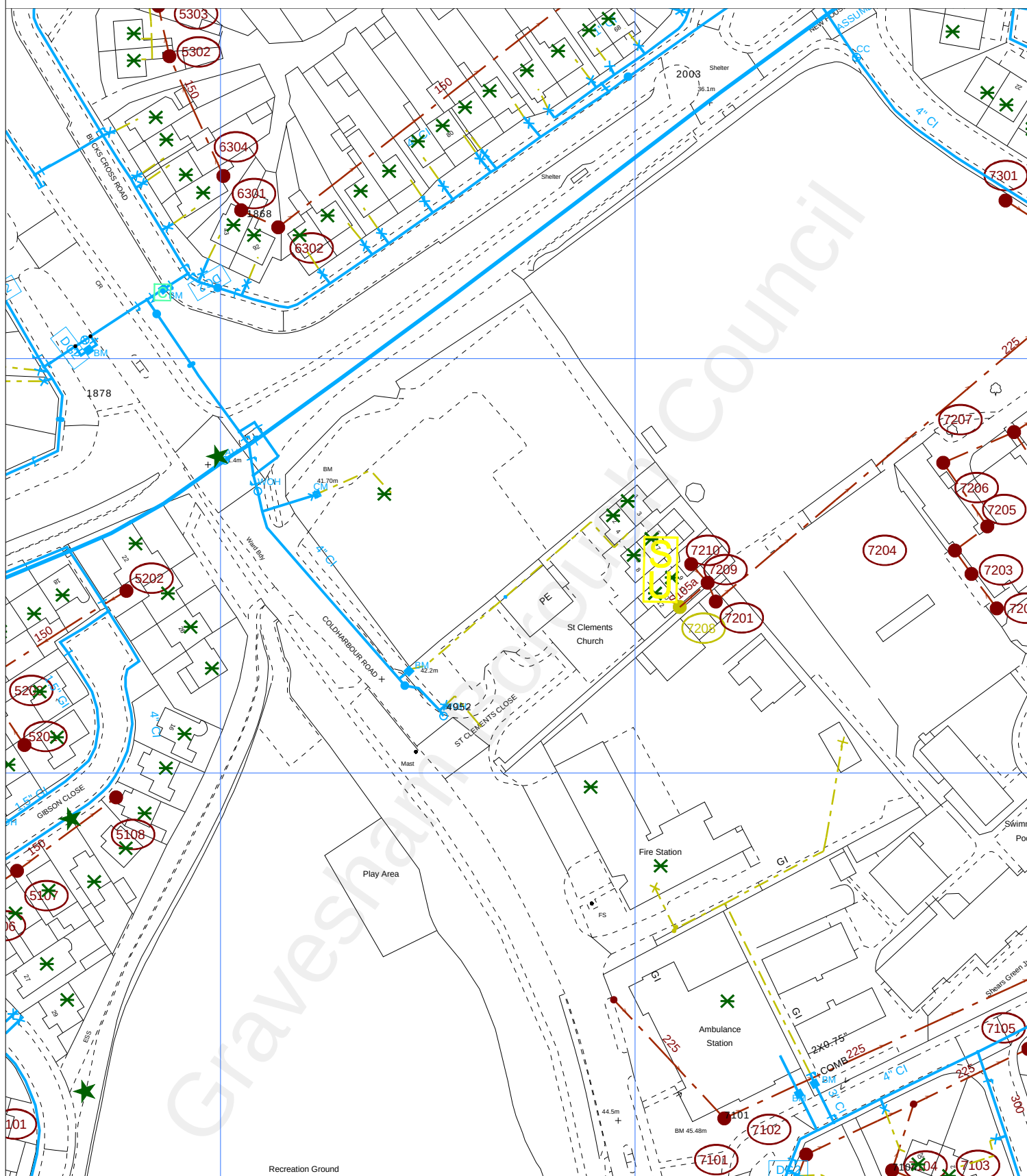
Website: southernwater.co.uk or by email at: SouthernWaterPlanning@southernwater.co.uk

Yours faithfully,

Future Growth Planning Team
Developer Services

southernwater.co.uk/developing-building/planning-your-development

SOUTHERN WATER



The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site.

Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530

O.S. REF: TQ6372SE

Scale: 1:1250

Screen Print

WARNING: BAC pipes are constructed of Bonded Asbestos Cement

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement



Printed By: BoregoS

Date: 20-12-2022

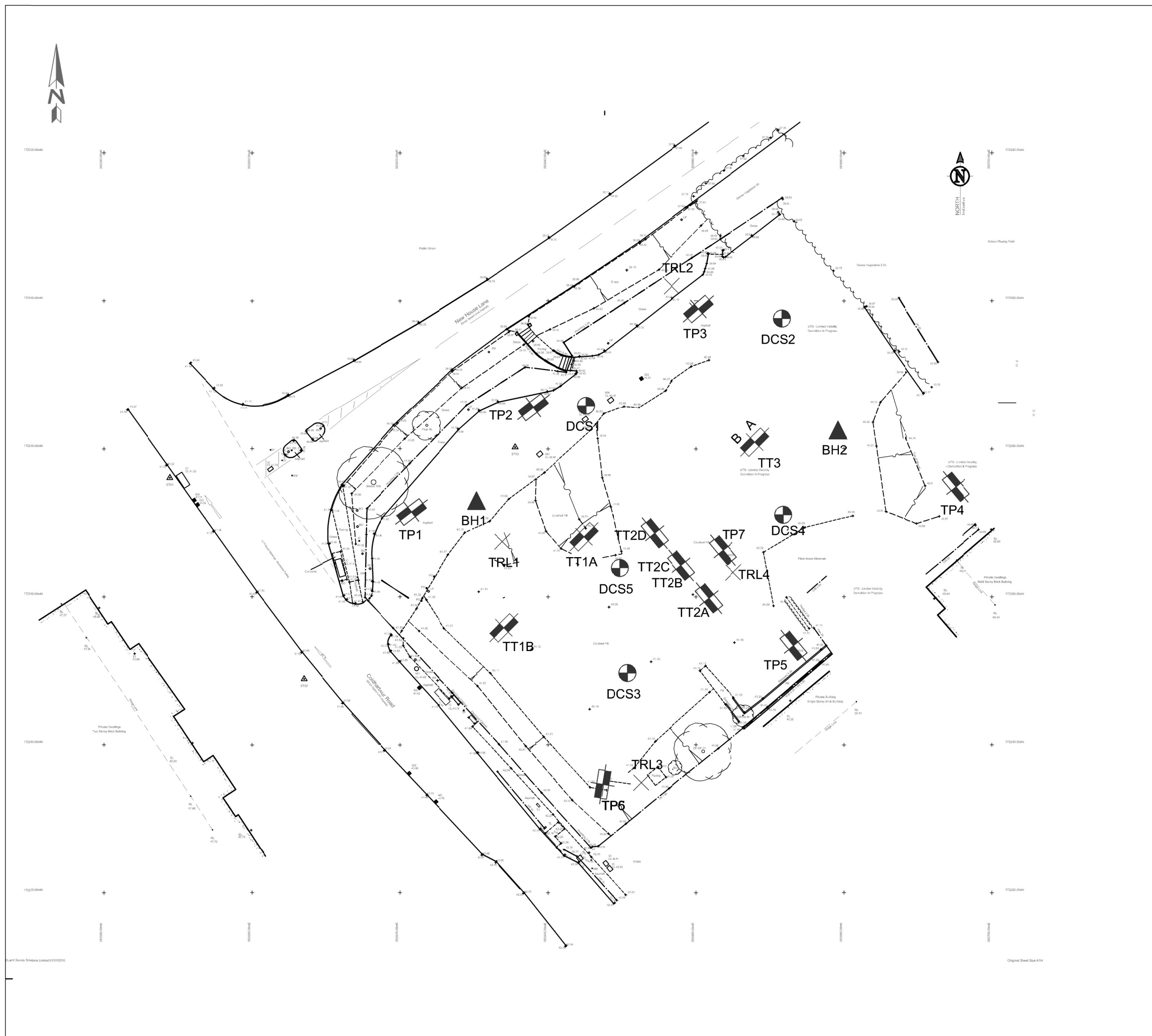
Southern Water MapGuide Browser

Requested By:



Appendix E

Previous planning application soakage tests & Applied Geology testing

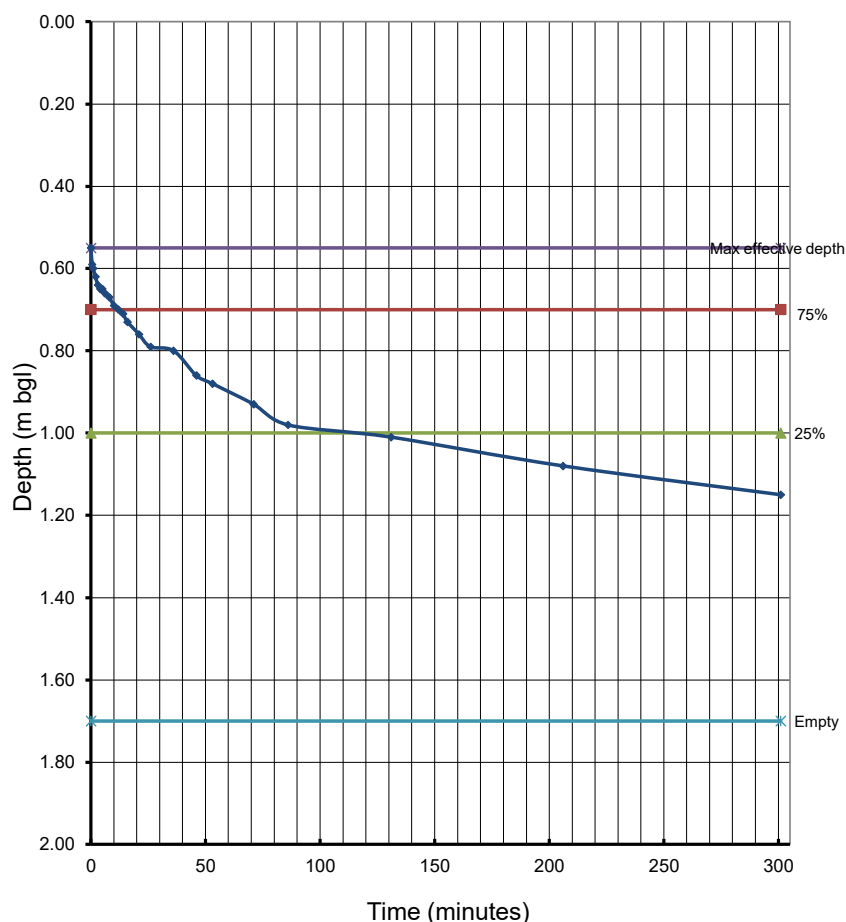


Drawing No: AG3309-21-02	Revision: 0
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IN SITU SOAKAWAY TEST RESULT

Trial Pit No.	TP6
Date	06/08/2021
Operator	DH
Test Strata	Thanet Sand
Stability of pit	Stable
Backfill used	None

Filling	1 of 1
Trial Pit Length (m)	2.40
Trial Pit Width (m)	0.60
Trial Pit Depth (m)	1.70
Amount of Backfill placed (m)	0
Assumed Backfill Void Ratio	N/A

[illegible]

Initial Water Level (m)	0.55	Total internal surface area of pit (m ²)	11.64
Final Water Level (m)	1.15	Effective area of loss (m ²)	6.54
Change in Water Level (m)	0.60	Volume outflowing between 75% and 25% effective depth (m ³)	0.43
Effective Depth at 25% (tp25) (m)	1.00	Time at 25% (tp25) (minutes)	115
Effective Depth at 75% (tp75) (m)	0.70	Time at 75% (tp75) (minutes)	12

Soil Infiltration Rate (m/s)	1.1E-05
------------------------------	---------

Notes: 1. Undertaken in general accordance with BRE DG 365 method
2. Based on extrapolated data NO

* Based on actual drop in water level recorded

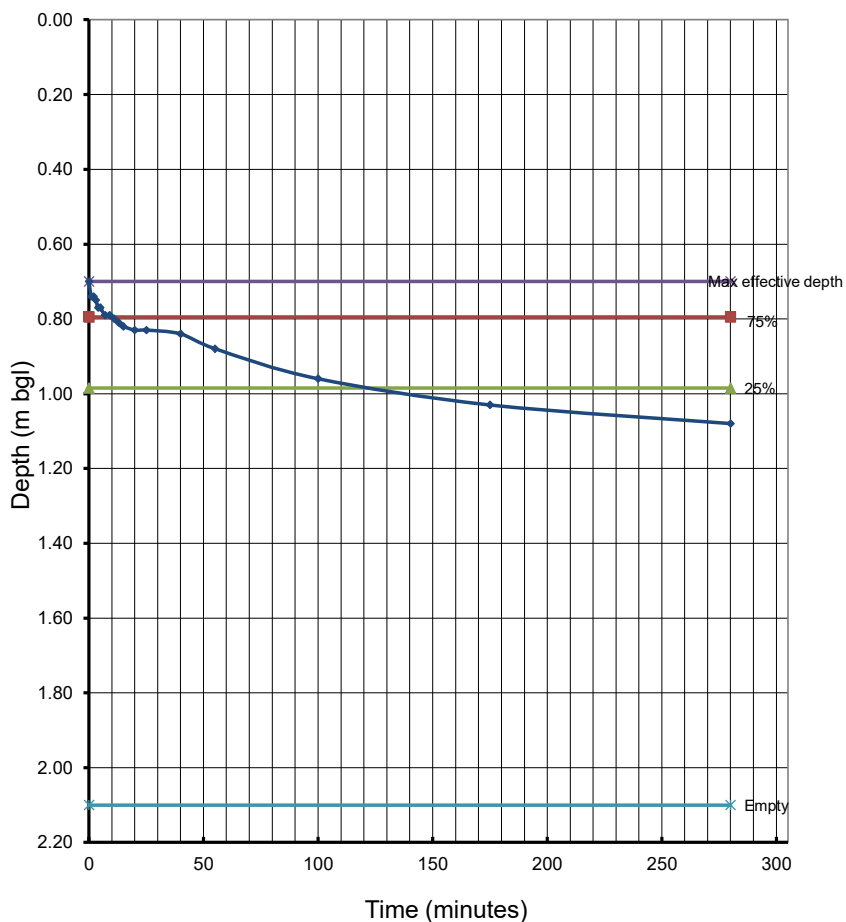
Client:	Frontier Estates Ltd
Project:	Coldharbour Road, Gravesend
Project No.	AG3309-21

APPLiED GEOLOGY

IN SITU SOAKAWAY TEST RESULT

Trial Pit No.	TP7
Date	06/08/2021
Operator	DH
Test Strata	Thanet Sand
Stability of pit	Stable
Backfill used	None

Filling	1 of 1
Trial Pit Length (m)	2.20
Trial Pit Width (m)	0.60
Trial Pit Depth (m)	2.10
Amount of Backfill placed (m)	0
Assumed Backfill Void Ratio	N/A

[illegible]

Initial Water Level (m)	0.70	Total internal surface area of pit (m ²)	13.08
Final Water Level (m)	1.08	Effective area of loss (m ²)	8.10
Change in Water Level (m)	0.38	Volume outflowing between 75% and 25% effective depth (m ³)	0.25
Effective Depth at 25% (tp25) (m)	0.99	Time at 25% (tp25) (minutes)	120
Effective Depth at 75% (tp75) (m)	0.80	Time at 75% (tp75) (minutes)	11

Soil Infiltration Rate (m/s)	4.7E-06
------------------------------	---------

Notes: 1. Undertaken in general accordance with BRE DG 365 method
2. Based on extrapolated data NO

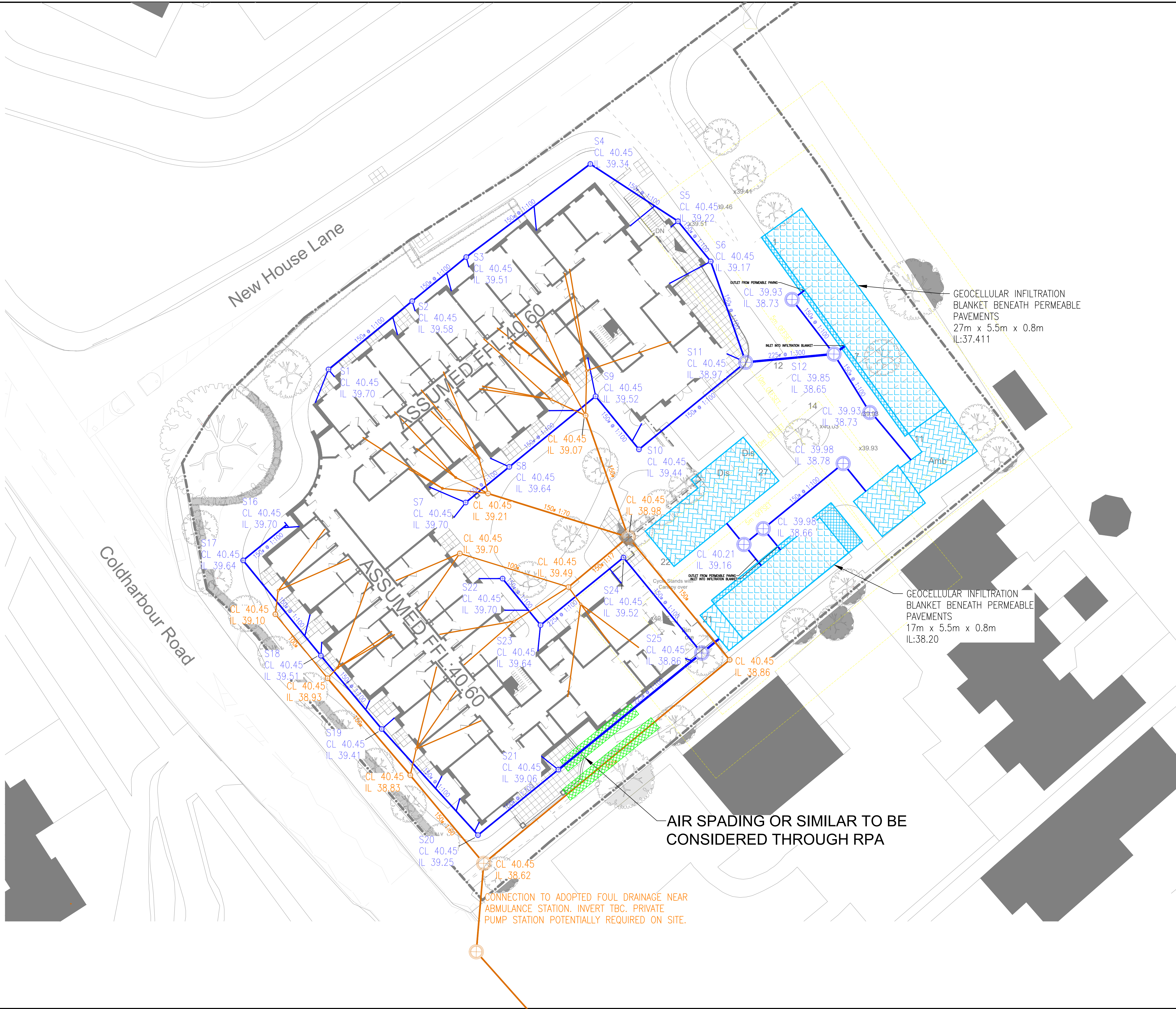
* Based on actual drop in water level recorded

Client:	Frontier Estates Ltd
Project:	Coldharbour Road, Gravesend
Project No.	AG3309-21

APPLIED GEOLOGY

Appendix F

Proposed Drainage Layout



Do not scale from this drawing.

SAFETY HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARD/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING RISKS AND INFORMATION.

RISKS LISTED HERE ARE NOT EXHAUSTIVE. REFER TO DESIGN ASSESSMENT FORM NO.

CONSTRUCTION
NONE A COMPETENT CONTRACTOR WOULD NOT ALREADY BE AWARE OF.

DEMOLITION
NONE A COMPETENT CONTRACTOR WOULD NOT ALREADY BE AWARE OF.

FOR INFORMATION RELATING TO USE, CLEANING AND MAINTENANCE
SEE THE HEALTH AND SAFETY FILE

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

KEY

PROPOSED STORM WATER SEWER

PROPOSED STORM WATER MANHOLE

PROPOSED FOUL WATER SEWER

PROPOSED FOUL WATER MANHOLE

PROPOSED PERMEABLE PAVEMENT

PROPOSED PERMEABLE PAVEMENT WITH GEOCELLULAR INFILTRATION BLANKET BENEATH

GEOCELLULAR INFILTRATION BLANKET

NOTES:

LAYOUT TAKEN FROM 3172-HIA-ZZ-XX-M3-A-9901-Site Model-SO-P1

INFILTRATION RATES BASED ON REPORT

3172-HIA-ZZ-XX-M3-A-9901-Site Model-SO-P1, DRAINAGE DESIGN IS SUBJECT TO TARGETED INFILTRATION TESTING.

FOUL DESIGN IS SUBJECT TO CONFIRMATION OF SUITABILITY OF CONNECTION AND OF INVERT LEVEL OF DOWNSTEAM FOUL NETWORK. A PRIVATE PUMPING STATION MAY BE REQUIRED.

ALL 150Ø FOUL DRAINAGE TO BE LAID AT 1:150 U.N.O.

ALL 100Ø FOUL DRAINAGE TO BE LAID AT 1:100 U.N.O.

P02	28.04.23	UPDATED TO SUIT LFA COMMENTS	MDF	MH	MH
P01	06.01.23	UPDATED TO LATEST LAYOUT, MANHOLE REFERENCES ADDED.	MDF	MH	MH
Rev.	Date	Description	Drwn.	Chkd.	Appd.

FAIRHURST

Clifton Heights
Triangle West
Clifton
BRISTOL
BS8 3AA
Tel: 0117 925 0259
Fax: 0844 381 4412

FRONTIER

Client:

Project Title:

BATTLE OF BRITAIN PUB
COLDHARBOUR ROAD
GRAVESEND

Drawing Title:

PROPOSED DRAINAGE STRATEGY

Scale of A1:	Status:		
1:200	Planning		
Drawn:	Checked:	Approved:	
MF	MH	MH	
Date:	Date:	Date:	
15/11/22	15/11/22	15/11/22	
Drawing No.:	Revision:		
144828/2000		P02	

Appendix G

Microdrainage Calculations

Fairhurst		Page 1
Cornwall Buildings 45-51 Newhall Street Birmingham, B3 3QR	Battle of Britain Pub Coldharbour Road, Gravesend Rev P02	
Date 28/04/2023 12:13 File WINDES.MDX	Designed by MDF Checked by MH	
Innovyze	Network 2020.1.3	

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)	100	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.419	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.600
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)	900

Designed with Level Soffits

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
S1.000	11.919	0.118	100.9	0.010	4.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	7.663	0.076	100.9	0.008	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.002	17.079	0.169	101.1	0.008	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.003	11.546	0.114	101.3	0.010	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.004	5.708	0.057	100.9	0.012	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.005	11.754	0.116	100.9	0.005	0.00	0.0	0.600	o	150	Pipe/Conduit	
S2.000	6.195	0.061	100.9	0.013	4.00	0.0	0.600	o	150	Pipe/Conduit	
S2.001	12.283	0.122	100.9	0.006	0.00	0.0	0.600	o	150	Pipe/Conduit	
S2.002	7.557	0.075	100.9	0.016	0.00	0.0	0.600	o	150	Pipe/Conduit	
S2.003	15.198	0.151	100.9	0.004	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.006	9.736	0.324	30.0	0.004	0.00	0.0	0.600	o	225	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	50.00	4.20	39.700	0.010	0.0	0.0	0.0	1.00	17.7	1.4
S1.001	50.00	4.33	39.582	0.018	0.0	0.0	0.0	1.00	17.7	2.5
S1.002	50.00	4.61	39.506	0.027	0.0	0.0	0.0	1.00	17.7	3.6
S1.003	50.00	4.80	39.337	0.036	0.0	0.0	0.0	1.00	17.6	4.9
S1.004	50.00	4.90	39.223	0.049	0.0	0.0	0.0	1.00	17.7	6.6
S1.005	50.00	5.09	39.166	0.053	0.0	0.0	0.0	1.00	17.7	7.2
S2.000	50.00	4.10	39.700	0.013	0.0	0.0	0.0	1.00	17.7	1.8
S2.001	50.00	4.31	39.639	0.020	0.0	0.0	0.0	1.00	17.7	2.7
S2.002	50.00	4.43	39.517	0.036	0.0	0.0	0.0	1.00	17.7	4.8
S2.003	50.00	4.69	39.442	0.039	0.0	0.0	0.0	1.00	17.7	5.3
S1.006	50.00	5.16	38.975	0.097	0.0	0.0	0.0	2.40	95.2	13.1

Fairhurst		Page 3
Cornwall Buildings 45-51 Newhall Street Birmingham, B3 3QR	Battle of Britain Pub Coldharbour Road, Gravesend Rev P02	
Date 28/04/2023 12:13 File WINDES.MDX	Designed by MDF Checked by MH	
Innovyze	Network 2020.1.3	

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall C. Level Name (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S3.008	S28 39.900	38.194	0.000	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 * 10m ³ /ha	Storage 2.000
Hot Start (mins)	0	Inlet Coefficient	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	4
Number of Online Controls	2	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)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.419		

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Fairhurst		Page 4
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Innovyze	Network 2020.1.3	
<u>Online Controls for Storm</u> <u>Orifice Manhole: S14, DS/PN: S1.009, Volume (m³): 2.4</u> Diameter (m) 0.001 Discharge Coefficient 0.600 Invert Level (m) 37.411 <u>Orifice Manhole: S27, DS/PN: S3.008, Volume (m³): 2.2</u> Diameter (m) 0.001 Discharge Coefficient 0.600 Invert Level (m) 38.200		
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Fairhurst		Page 5
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Date 28/04/2023 12:13 File WINDES.MDX	Designed by MDF Checked by MH	
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Storage Structures for Storm

Porous Car Park Manhole: S13, DS/PN: S1.008

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	32.5
Max Percolation (l/s)	45.1	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	38.810	Membrane Depth (mm)	0

Cellular Storage Manhole: S14, DS/PN: S1.009

Invert Level (m)	37.411	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.01692		

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	148.5	148.5	0.801	0.0	200.5
0.800	148.5	200.5			

Porous Car Park Manhole: S26, DS/PN: S3.007

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	34.9
Max Percolation (l/s)	48.5	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	39.300	Membrane Depth (mm)	0

Cellular Storage Manhole: S27, DS/PN: S3.008

Invert Level (m)	38.200	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.01692		

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	93.5	93.5	0.801	0.0	129.5
0.800	93.5	129.5			

Fairhurst

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45-51 Newhall Street
Birmingham, B3 3QR

Date 28/04/2023 12:13
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Battle of Britain Pub
Coldharbour Road, Gravesend
Rev P02

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Network 2020.1.3

Page 6



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

for Storm

Simulation Criteria

Areal Reduction Factor 1.000

Hot Start (mins) 0

Hot Start Level (mm) 0

Manhole Headloss Coeff (Global) 0.500

Foul Sewage per hectare (l/s) 0.000

Additional Flow - % of Total Flow 0.000

MADD Factor * 10m³/ha Storage 2.000

Inlet Coeffiecient 0.800

Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0

Number of Online Controls 2

Number of Offline Controls 0

Number of Storage Structures 4

Number of Time/Area Diagrams 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR

Region England and Wales Cv (Summer) 0.750

M5-60 (mm) 20.000

Ratio R 0.417

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 OFF

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

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	15 Winter	1	+0%	100/15 Summer			
S1.001	S2	15 Winter	1	+0%	100/15 Summer			
S1.002	S3	15 Winter	1	+0%	100/15 Summer			
S1.003	S4	15 Winter	1	+0%	30/15 Winter			
S1.004	S5	15 Winter	1	+0%	30/15 Summer			
S1.005	S6	15 Winter	1	+0%	30/15 Summer			
S2.000	S7	15 Winter	1	+0%	100/15 Summer			
S2.001	S8	15 Winter	1	+0%	100/15 Summer			
S2.002	S9	15 Winter	1	+0%	100/15 Summer			
S2.003	S10	15 Winter	1	+0%	100/15 Summer			
S1.006	S11	15 Winter	1	+0%	100/4320 Winter			
S1.007	S12	15 Winter	1	+0%	100/1440 Winter			
S1.008	S13	15 Winter	1	+0%	100/960 Winter			
S1.009	S14	7200 Winter	1	+0%	1/1440 Winter			

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Fairhurst		Page 7
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Innovyze	Network 2020.1.3	

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

PN	US/MH Name	Water	Surcharged	Flooded	Half Drain			Pipe	Status
		Level	Depth	Volume	Flow /	Overflow	Time	Flow	
		(m)	(m)	(m³)	Cap.	(l/s)	(mins)	(l/s)	
S1.000	S1	39.731	-0.119	0.000	0.09			1.5	OK
S1.001	S2	39.622	-0.109	0.000	0.16			2.5	OK
S1.002	S3	39.553	-0.103	0.000	0.21			3.5	OK
S1.003	S4	39.392	-0.095	0.000	0.29			4.6	OK
S1.004	S5	39.291	-0.082	0.000	0.42			6.1	OK
S1.005	S6	39.234	-0.082	0.000	0.42			6.7	OK
S2.000	S7	39.737	-0.113	0.000	0.14			2.0	OK
S2.001	S8	39.681	-0.108	0.000	0.17			2.8	OK
S2.002	S9	39.574	-0.093	0.000	0.31			4.7	OK
S2.003	S10	39.500	-0.092	0.000	0.31			5.1	OK
S1.006	S11	39.034	-0.166	0.000	0.16			12.3	OK
S1.007	S12	38.705	-0.171	0.000	0.13			12.2	OK
S1.008	S13	38.266	-0.170	0.000	0.14		7	17.1	OK
S1.009	S14	37.709	0.073	0.000	0.00			0.0	SURCHARGED

PN	US/MH	
	Name	Level Exceeded
S1.000	S1	
S1.001	S2	
S1.002	S3	
S1.003	S4	
S1.004	S5	
S1.005	S6	
S2.000	S7	
S2.001	S8	
S2.002	S9	
S2.003	S10	
S1.006	S11	
S1.007	S12	
S1.008	S13	
S1.009	S14	

Fairhurst

Cornwall Buildings

45-51 Newhall Street

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Coldharbour Road, Gravesend

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

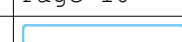
for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S3.000	S16	15 Winter	1	+0%	100/5760 Winter			
S3.001	S17	15 Summer	1	+0%	100/4320 Winter			
S3.002	S18	15 Winter	1	+0%	100/15 Summer			
S3.003	S19	15 Winter	1	+0%	100/15 Summer			
S3.004	S20	15 Winter	1	+0%	100/15 Summer			
S3.005	S21	15 Winter	1	+0%	100/480 Winter			
S4.000	S22	15 Winter	1	+0%	100/5760 Winter			
S4.001	S23	15 Winter	1	+0%	100/4320 Winter			
S4.002	S24	15 Winter	1	+0%	100/2160 Winter			
S3.006	S25	15 Winter	1	+0%	100/15 Summer			
S3.007	S26	15 Winter	1	+0%	30/15 Summer			
S3.008	S27	7200 Winter	1	+0%	1/2160 Winter			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S3.000	S16	39.728	-0.122	0.000	0.08			1.2	OK
S3.001	S17	39.671	-0.123	0.000	0.07			1.2	OK
S3.002	S18	39.547	-0.113	0.000	0.14			2.2	OK
S3.003	S19	39.453	-0.102	0.000	0.22			3.6	OK
S3.004	S20	39.304	-0.096	0.000	0.28			4.5	OK
S3.005	S21	39.110	-0.176	0.000	0.11			5.0	OK
S4.000	S22	39.728	-0.122	0.000	0.08			1.2	OK
S4.001	S23	39.673	-0.111	0.000	0.15			2.4	OK
S4.002	S24	39.559	-0.109	0.000	0.17			2.7	OK
S3.006	S25	38.912	-0.172	0.000	0.12			8.7	OK
S3.007	S26	38.734	-0.104	0.000	0.56		8	13.2	OK
S3.008	S27	38.550	0.050	0.000	0.00			0.0	SURCHARGED

PN	US/MH Name	Level Exceeded
S3.000	S16	
S3.001	S17	
S3.002	S18	
S3.003	S19	
S3.004	S20	
S3.005	S21	
S4.000	S22	
S4.001	S23	
S4.002	S24	
S3.006	S25	
S3.007	S26	
S3.008	S27	

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Fairhurst		Page 10
Cornwall Buildings 45-51 Newhall Street Birmingham, B3 3QR	Battle of Britain Pub Coldharbour Road, Gravesend Rev P02	
Date 28/04/2023 12:13 File WINDES.MDX	Designed by MDF Checked by MH	
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Water		Surcharged		Flooded		Half Drain Time (mins)	Pipe Flow (l/s)	Status
		Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)				
S1.000	S1	39.749	-0.101	0.000	0.23			3.7		OK
S1.001	S2	39.652	-0.080	0.000	0.44			6.8		OK
S1.002	S3	39.590	-0.066	0.000	0.60			9.8		OK
S1.003	S4	39.488	0.001	0.000	0.79			12.7		SURCHARGED
S1.004	S5	39.415	0.042	0.000	1.14			16.6		SURCHARGED
S1.005	S6	39.342	0.026	0.000	1.13			18.1		SURCHARGED
S2.000	S7	39.760	-0.090	0.000	0.33			5.0		OK
S2.001	S8	39.710	-0.079	0.000	0.46			7.4		OK
S2.002	S9	39.626	-0.041	0.000	0.87			13.2		OK
S2.003	S10	39.553	-0.039	0.000	0.90			14.6		OK
S1.006	S11	39.078	-0.122	0.000	0.42			33.5		OK
S1.007	S12	38.744	-0.132	0.000	0.36			33.7		OK
S1.008	S13	38.308	-0.128	0.000	0.38		6	47.5		OK
S1.009	S14	37.980	0.344	0.000	0.00			0.0		SURCHARGED

PN	US/MH	
	Name	Level Exceeded
S1.000	S1	
S1.001	S2	
S1.002	S3	
S1.003	S4	
S1.004	S5	
S1.005	S6	
S2.000	S7	
S2.001	S8	
S2.002	S9	
S2.003	S10	
S1.006	S11	
S1.007	S12	
S1.008	S13	
S1.009	S14	

Fairhurst

Cornwall Buildings

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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.
S3.000	S16	15 Winter	30	+0%	100/5760 Winter			
S3.001	S17	15 Summer	30	+0%	100/4320 Winter			
S3.002	S18	15 Summer	30	+0%	100/15 Summer			
S3.003	S19	15 Winter	30	+0%	100/15 Summer			
S3.004	S20	15 Winter	30	+0%	100/15 Summer			
S3.005	S21	15 Summer	30	+0%	100/480 Winter			
S4.000	S22	15 Winter	30	+0%	100/5760 Winter			
S4.001	S23	15 Summer	30	+0%	100/4320 Winter			
S4.002	S24	15 Summer	30	+0%	100/2160 Winter			
S3.006	S25	15 Summer	30	+0%	100/15 Summer			
S3.007	S26	15 Winter	30	+0%	30/15 Summer			
S3.008	S27	5760 Winter	30	+0%	1/2160 Winter			

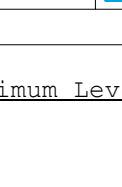
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S3.000	S16	39.745	-0.105	0.000	0.20		2.9	OK
S3.001	S17	39.687	-0.107	0.000	0.18		2.9	OK
S3.002	S18	39.575	-0.085	0.000	0.39		6.2	OK
S3.003	S19	39.492	-0.063	0.000	0.63		10.4	OK
S3.004	S20	39.353	-0.046	0.000	0.82		13.0	OK
S3.005	S21	39.147	-0.139	0.000	0.31		14.6	OK
S4.000	S22	39.745	-0.105	0.000	0.20		3.0	OK
S4.001	S23	39.702	-0.083	0.000	0.41		6.6	OK
S4.002	S24	39.591	-0.077	0.000	0.48		7.7	OK
S3.006	S25	38.953	-0.132	0.000	0.36		25.0	OK
S3.007	S26	38.882	0.044	0.000	1.65	5	38.7	SURCHARGED
S3.008	S27	38.870	0.370	0.000	0.00		0.0	SURCHARGED

PN	US/MH Name	Level Exceeded
S3.000	S16	
S3.001	S17	
S3.002	S18	
S3.003	S19	
S3.004	S20	
S3.005	S21	
S4.000	S22	
S4.001	S23	
S4.002	S24	
S3.006	S25	
S3.007	S26	
S3.008	S27	

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Page 11

Micro Drainage

Fairhurst		Page 12
Cornwall Buildings 45-51 Newhall Street Birmingham, B3 3QR	Battle of Britain Pub Coldharbour Road, Gravesend Rev P02	
Date 28/04/2023 12:13 File WINDES.MDX	Designed by MDF Checked by MH	
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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	4
Number of Online Controls	2	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	0.417
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	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	OFF

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

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	15 Winter	100	+40%	100/15 Summer			
S1.001	S2	15 Winter	100	+40%	100/15 Summer			
S1.002	S3	15 Winter	100	+40%	100/15 Summer			
S1.003	S4	15 Winter	100	+40%	30/15 Winter			
S1.004	S5	15 Winter	100	+40%	30/15 Summer			
S1.005	S6	15 Winter	100	+40%	30/15 Summer			
S2.000	S7	15 Winter	100	+40%	100/15 Summer			
S2.001	S8	15 Winter	100	+40%	100/15 Summer			
S2.002	S9	15 Winter	100	+40%	100/15 Summer			
S2.003	S10	15 Winter	100	+40%	100/15 Summer			
S1.006	S11	7200 Winter	100	+40%	100/4320 Winter			
S1.007	S12	7200 Winter	100	+40%	100/1440 Winter			
S1.008	S13	7200 Winter	100	+40%	100/960 Winter			
S1.009	S14	7200 Winter	100	+40%	1/1440 Winter			

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Fairhurst		Page 13
Cornwall Buildings 45-51 Newhall Street Birmingham, B3 3QR	Battle of Britain Pub Coldharbour Road, Gravesend Rev P02	
Date 28/04/2023 12:13 File WINDES.MDX	Designed by MDF Checked by MH	
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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water		Surcharged		Flooded		Half Drain Time (mins)	Pipe Flow (l/s)	Status
		Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)				
S1.000	S1	40.183	0.333	0.000	0.35			5.6		FLOOD RISK
S1.001	S2	40.162	0.430	0.000	0.67			10.2		FLOOD RISK
S1.002	S3	40.128	0.472	0.000	0.90			14.9		SURCHARGED
S1.003	S4	39.988	0.501	0.000	1.26			20.1		SURCHARGED
S1.004	S5	39.801	0.428	0.000	1.86			27.2		SURCHARGED
S1.005	S6	39.602	0.286	0.000	1.86			29.8		SURCHARGED
S2.000	S7	40.035	0.185	0.000	0.56			8.3		SURCHARGED
S2.001	S8	40.015	0.226	0.000	0.77			12.3		SURCHARGED
S2.002	S9	39.943	0.276	0.000	1.44			21.9		SURCHARGED
S2.003	S10	39.780	0.188	0.000	1.49			24.3		SURCHARGED
S1.006	S11	39.316	0.117	0.000	0.01			0.7		SURCHARGED
S1.007	S12	39.317	0.441	0.000	0.01			0.7		SURCHARGED
S1.008	S13	39.317	0.881	0.000	0.01		2148	1.0		FLOOD RISK
S1.009	S14	39.319	1.683	0.000	0.00			0.0		FLOOD RISK

PN	US/MH Level Exceeded	
	Name	
S1.000	S1	
S1.001	S2	
S1.002	S3	
S1.003	S4	
S1.004	S5	
S1.005	S6	
S2.000	S7	
S2.001	S8	
S2.002	S9	
S2.003	S10	
S1.006	S11	
S1.007	S12	
S1.008	S13	
S1.009	S14	

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Rev P02

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Page 14

Micro Drainage

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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) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S3.000	S16	7200 Winter	100	+40%	100/5760 Winter			
S3.001	S17	7200 Winter	100	+40%	100/4320 Winter			
S3.002	S18	7200 Winter	100	+40%	100/15 Summer			
S3.003	S19	7200 Winter	100	+40%	100/15 Summer			
S3.004	S20	7200 Winter	100	+40%	100/15 Summer			
S3.005	S21	7200 Winter	100	+40%	100/480 Winter			
S4.000	S22	7200 Winter	100	+40%	100/5760 Winter			
S4.001	S23	7200 Winter	100	+40%	100/4320 Winter			
S4.002	S24	7200 Winter	100	+40%	100/2160 Winter			
S3.006	S25	7200 Winter	100	+40%	100/15 Summer			
S3.007	S26	7200 Winter	100	+40%	30/15 Summer			
S3.008	S27	7200 Winter	100	+40%	1/2160 Winter			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S3.000	S16	39.882	0.032	0.000	0.00		0.1	SURCHARGED
S3.001	S17	39.882	0.088	0.000	0.00		0.1	SURCHARGED
S3.002	S18	39.882	0.223	0.000	0.01		0.1	SURCHARGED
S3.003	S19	39.882	0.327	0.000	0.01		0.2	SURCHARGED
S3.004	S20	39.882	0.483	0.000	0.02		0.3	SURCHARGED
S3.005	S21	39.882	0.596	0.000	0.01		0.3	SURCHARGED
S4.000	S22	39.882	0.032	0.000	0.00		0.1	SURCHARGED
S4.001	S23	39.882	0.097	0.000	0.01		0.1	SURCHARGED
S4.002	S24	39.882	0.214	0.000	0.01		0.2	SURCHARGED
S3.006	S25	39.882	0.798	0.000	0.01		0.5	SURCHARGED
S3.007	S26	39.882	1.044	0.000	0.12	3696	2.8	FLOOD RISK
S3.008	S27	39.884	1.384	0.000	0.00		0.0	FLOOD RISK

PN	US/MH Name	Level Exceeded
S3.000	S16	
S3.001	S17	
S3.002	S18	
S3.003	S19	
S3.004	S20	
S3.005	S21	
S4.000	S22	
S4.001	S23	
S4.002	S24	
S3.006	S25	
S3.007	S26	
S3.008	S27	

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Micro Drainage		Source Control 2019.1																																																																																																																																																																																																																					
<u>Summary of Results for 30 year Return Period</u> Half Drain Time : 1376 minutes. <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>37.555</td><td>0.144</td><td>0.3</td><td>18.4</td><td>O K</td></tr><tr><td>30 min Summer</td><td>37.599</td><td>0.188</td><td>0.3</td><td>24.2</td><td>O K</td></tr><tr><td>60 min Summer</td><td>37.645</td><td>0.234</td><td>0.3</td><td>30.0</td><td>O K</td></tr><tr><td>120 min Summer</td><td>37.689</td><td>0.278</td><td>0.3</td><td>35.6</td><td>O K</td></tr><tr><td>180 min Summer</td><td>37.712</td><td>0.301</td><td>0.3</td><td>38.6</td><td>O K</td></tr><tr><td>240 min Summer</td><td>37.727</td><td>0.316</td><td>0.3</td><td>40.6</td><td>O K</td></tr><tr><td>360 min Summer</td><td>37.745</td><td>0.334</td><td>0.3</td><td>42.9</td><td>O K</td></tr><tr><td>480 min Summer</td><td>37.756</td><td>0.345</td><td>0.3</td><td>44.2</td><td>O K</td></tr><tr><td>600 min Summer</td><td>37.761</td><td>0.350</td><td>0.3</td><td>44.9</td><td>O K</td></tr><tr><td>720 min Summer</td><td>37.764</td><td>0.353</td><td>0.3</td><td>45.2</td><td>O K</td></tr><tr><td>960 min Summer</td><td>37.763</td><td>0.352</td><td>0.3</td><td>45.1</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>37.751</td><td>0.340</td><td>0.3</td><td>43.7</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>37.733</td><td>0.322</td><td>0.3</td><td>41.3</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>37.715</td><td>0.304</td><td>0.3</td><td>39.0</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>37.681</td><td>0.270</td><td>0.3</td><td>34.6</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>37.648</td><td>0.237</td><td>0.3</td><td>30.4</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>37.618</td><td>0.207</td><td>0.3</td><td>26.5</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>37.591</td><td>0.180</td><td>0.3</td><td>23.0</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>37.566</td><td>0.155</td><td>0.3</td><td>19.9</td><td>O K</td></tr><tr><td>15 min Winter</td><td>37.573</td><td>0.162</td><td>0.3</td><td>20.8</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>77.173</td><td>0.0</td><td>64</td></tr><tr><td>30 min Summer</td><td>49.879</td><td>0.0</td><td>75</td></tr><tr><td>60 min Summer</td><td>30.811</td><td>0.0</td><td>100</td></tr><tr><td>120 min Summer</td><td>18.477</td><td>0.0</td><td>152</td></tr><tr><td>180 min Summer</td><td>13.560</td><td>0.0</td><td>208</td></tr><tr><td>240 min Summer</td><td>10.843</td><td>0.0</td><td>264</td></tr><tr><td>360 min Summer</td><td>7.888</td><td>0.0</td><td>380</td></tr><tr><td>480 min Summer</td><td>6.293</td><td>0.0</td><td>496</td></tr><tr><td>600 min Summer</td><td>5.278</td><td>0.0</td><td>614</td></tr><tr><td>720 min Summer</td><td>4.570</td><td>0.0</td><td>730</td></tr><tr><td>960 min Summer</td><td>3.639</td><td>0.0</td><td>966</td></tr><tr><td>1440 min Summer</td><td>2.637</td><td>0.0</td><td>1212</td></tr><tr><td>2160 min Summer</td><td>1.909</td><td>0.0</td><td>1576</td></tr><tr><td>2880 min Summer</td><td>1.517</td><td>0.0</td><td>1980</td></tr><tr><td>4320 min Summer</td><td>1.096</td><td>0.0</td><td>2788</td></tr><tr><td>5760 min Summer</td><td>0.870</td><td>0.0</td><td>3584</td></tr><tr><td>7200 min Summer</td><td>0.727</td><td>0.0</td><td>4376</td></tr><tr><td>8640 min Summer</td><td>0.628</td><td>0.0</td><td>5104</td></tr><tr><td>10080 min Summer</td><td>0.555</td><td>0.0</td><td>5856</td></tr><tr><td>15 min Winter</td><td>77.173</td><td>0.0</td><td>65</td></tr></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	37.555	0.144	0.3	18.4	O K	30 min Summer	37.599	0.188	0.3	24.2	O K	60 min Summer	37.645	0.234	0.3	30.0	O K	120 min Summer	37.689	0.278	0.3	35.6	O K	180 min Summer	37.712	0.301	0.3	38.6	O K	240 min Summer	37.727	0.316	0.3	40.6	O K	360 min Summer	37.745	0.334	0.3	42.9	O K	480 min Summer	37.756	0.345	0.3	44.2	O K	600 min Summer	37.761	0.350	0.3	44.9	O K	720 min Summer	37.764	0.353	0.3	45.2	O K	960 min Summer	37.763	0.352	0.3	45.1	O K	1440 min Summer	37.751	0.340	0.3	43.7	O K	2160 min Summer	37.733	0.322	0.3	41.3	O K	2880 min Summer	37.715	0.304	0.3	39.0	O K	4320 min Summer	37.681	0.270	0.3	34.6	O K	5760 min Summer	37.648	0.237	0.3	30.4	O K	7200 min Summer	37.618	0.207	0.3	26.5	O K	8640 min Summer	37.591	0.180	0.3	23.0	O K	10080 min Summer	37.566	0.155	0.3	19.9	O K	15 min Winter	37.573	0.162	0.3	20.8	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	77.173	0.0	64	30 min Summer	49.879	0.0	75	60 min Summer	30.811	0.0	100	120 min Summer	18.477	0.0	152	180 min Summer	13.560	0.0	208	240 min Summer	10.843	0.0	264	360 min Summer	7.888	0.0	380	480 min Summer	6.293	0.0	496	600 min Summer	5.278	0.0	614	720 min Summer	4.570	0.0	730	960 min Summer	3.639	0.0	966	1440 min Summer	2.637	0.0	1212	2160 min Summer	1.909	0.0	1576	2880 min Summer	1.517	0.0	1980	4320 min Summer	1.096	0.0	2788	5760 min Summer	0.870	0.0	3584	7200 min Summer	0.727	0.0	4376	8640 min Summer	0.628	0.0	5104	10080 min Summer	0.555	0.0	5856	15 min Winter	77.173	0.0	65
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																		
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240 min Summer	37.727	0.316	0.3	40.6	O K																																																																																																																																																																																																																		
360 min Summer	37.745	0.334	0.3	42.9	O K																																																																																																																																																																																																																		
480 min Summer	37.756	0.345	0.3	44.2	O K																																																																																																																																																																																																																		
600 min Summer	37.761	0.350	0.3	44.9	O K																																																																																																																																																																																																																		
720 min Summer	37.764	0.353	0.3	45.2	O K																																																																																																																																																																																																																		
960 min Summer	37.763	0.352	0.3	45.1	O K																																																																																																																																																																																																																		
1440 min Summer	37.751	0.340	0.3	43.7	O K																																																																																																																																																																																																																		
2160 min Summer	37.733	0.322	0.3	41.3	O K																																																																																																																																																																																																																		
2880 min Summer	37.715	0.304	0.3	39.0	O K																																																																																																																																																																																																																		
4320 min Summer	37.681	0.270	0.3	34.6	O K																																																																																																																																																																																																																		
5760 min Summer	37.648	0.237	0.3	30.4	O K																																																																																																																																																																																																																		
7200 min Summer	37.618	0.207	0.3	26.5	O K																																																																																																																																																																																																																		
8640 min Summer	37.591	0.180	0.3	23.0	O K																																																																																																																																																																																																																		
10080 min Summer	37.566	0.155	0.3	19.9	O K																																																																																																																																																																																																																		
15 min Winter	37.573	0.162	0.3	20.8	O K																																																																																																																																																																																																																		
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)																																																																																																																																																																																																																				
15 min Summer	77.173	0.0	64																																																																																																																																																																																																																				
30 min Summer	49.879	0.0	75																																																																																																																																																																																																																				
60 min Summer	30.811	0.0	100																																																																																																																																																																																																																				
120 min Summer	18.477	0.0	152																																																																																																																																																																																																																				
180 min Summer	13.560	0.0	208																																																																																																																																																																																																																				
240 min Summer	10.843	0.0	264																																																																																																																																																																																																																				
360 min Summer	7.888	0.0	380																																																																																																																																																																																																																				
480 min Summer	6.293	0.0	496																																																																																																																																																																																																																				
600 min Summer	5.278	0.0	614																																																																																																																																																																																																																				
720 min Summer	4.570	0.0	730																																																																																																																																																																																																																				
960 min Summer	3.639	0.0	966																																																																																																																																																																																																																				
1440 min Summer	2.637	0.0	1212																																																																																																																																																																																																																				
2160 min Summer	1.909	0.0	1576																																																																																																																																																																																																																				
2880 min Summer	1.517	0.0	1980																																																																																																																																																																																																																				
4320 min Summer	1.096	0.0	2788																																																																																																																																																																																																																				
5760 min Summer	0.870	0.0	3584																																																																																																																																																																																																																				
7200 min Summer	0.727	0.0	4376																																																																																																																																																																																																																				
8640 min Summer	0.628	0.0	5104																																																																																																																																																																																																																				
10080 min Summer	0.555	0.0	5856																																																																																																																																																																																																																				
15 min Winter	77.173	0.0	65																																																																																																																																																																																																																				
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11 Woodside Terrace Glasgow G3 7XQ		Battle of Britain Pub Gravesend North Soakaway 1:30 year			
Date 09/05/2022 14:50 File SOUTH SOAKAWAY 1 IN 30....		Designed by MDF Checked by MH			
Micro Drainage		Source Control 2019.1			
<u>Summary of Results for 30 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	37.623	0.212	0.3	27.2	O K
60 min Winter	37.674	0.263	0.3	33.7	O K
120 min Winter	37.724	0.313	0.3	40.1	O K
180 min Winter	37.751	0.340	0.3	43.6	O K
240 min Winter	37.769	0.358	0.3	45.9	O K
360 min Winter	37.791	0.380	0.3	48.7	O K
480 min Winter	37.804	0.393	0.3	50.4	O K
600 min Winter	37.812	0.401	0.3	51.4	O K
720 min Winter	37.817	0.406	0.3	52.0	O K
960 min Winter	37.819	0.408	0.3	52.3	O K
1440 min Winter	37.809	0.398	0.3	51.0	O K
2160 min Winter	37.784	0.373	0.3	47.9	O K
2880 min Winter	37.760	0.349	0.3	44.7	O K
4320 min Winter	37.708	0.297	0.3	38.1	O K
5760 min Winter	37.659	0.248	0.3	31.8	O K
7200 min Winter	37.613	0.202	0.3	25.9	O K
8640 min Winter	37.572	0.161	0.3	20.7	O K
10080 min Winter	37.536	0.125	0.3	16.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	49.879	0.0	76		
60 min Winter	30.811	0.0	100		
120 min Winter	18.477	0.0	152		
180 min Winter	13.560	0.0	206		
240 min Winter	10.843	0.0	262		
360 min Winter	7.888	0.0	376		
480 min Winter	6.293	0.0	490		
600 min Winter	5.278	0.0	604		
720 min Winter	4.570	0.0	720		
960 min Winter	3.639	0.0	944		
1440 min Winter	2.637	0.0	1370		
2160 min Winter	1.909	0.0	1708		
2880 min Winter	1.517	0.0	2152		
4320 min Winter	1.096	0.0	3036		
5760 min Winter	0.870	0.0	3872		
7200 min Winter	0.727	0.0	4672		
8640 min Winter	0.628	0.0	5432		
10080 min Winter	0.555	0.0	6152		
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11 Woodside Terrace Glasgow G3 7XQ	Battle of Britain Pub Gravesend North Soakaway 1:30 year	
Date 09/05/2022 14:50 File SOUTH SOAKAWAY 1 IN 30....	Designed by MDF Checked by MH	
Micro Drainage Source Control 2019.1		

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.418	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Pipe Network

Volume in Pipe Network (m³)	38	Dia of Outfall Pipe (m)	0.2
Slope of Outfall Pipe (1:X)	15	Roughness of Outfall Pipe (mm)	0.600

Time Area Diagram

Total Area (ha) 0.138

Time (mins)	Area	Time (mins)	Area
From:	To: (ha)	From:	To: (ha)
0	4 0.069	4	8 0.069

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11 Woodside Terrace Glasgow G3 7XQ	Battle of Britain Pub Gravesend North Soakaway 1:30 year																	
Date 09/05/2022 14:50 File SOUTH SOAKAWAY 1 IN 30....	Designed by MDF Checked by MH																	
Micro Drainage Source Control 2019.1																		
<u>Model Details</u> Storage is Online Cover Level (m) 39.410 <u>Infiltration Blanket Structure</u> <table style="margin-left: auto; margin-right: auto;"> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.01692</td> <td>Diameter/Width (m)</td> <td>5.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Length (m)</td> <td>27.0</td> </tr> <tr> <td>Porosity</td> <td>0.95</td> <td>Cap Volume Depth (m)</td> <td>0.800</td> </tr> <tr> <td>Invert Level (m)</td> <td>37.411</td> <td></td> <td></td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.01692	Diameter/Width (m)	5.0	Safety Factor	2.0	Length (m)	27.0	Porosity	0.95	Cap Volume Depth (m)	0.800	Invert Level (m)	37.411		
Infiltration Coefficient Base (m/hr)	0.01692	Diameter/Width (m)	5.0															
Safety Factor	2.0	Length (m)	27.0															
Porosity	0.95	Cap Volume Depth (m)	0.800															
Invert Level (m)	37.411																	
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11 Woodside Terrace Glasgow G3 7XQ		Battle of Britain Pub Gravesend South Soakaway 1:30 year																																																																																																																																																																																																																					
Date 09/05/2022 14:44 File SOUTH SOAKAWAY 1 IN 30....		Designed by MDF Checked by MH																																																																																																																																																																																																																					
Micro Drainage		Source Control 2019.1																																																																																																																																																																																																																					
<u>Summary of Results for 30 year Return Period</u> Half Drain Time : 1436 minutes. <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>38.348</td><td>0.148</td><td>0.2</td><td>14.1</td><td>O K</td></tr><tr><td>30 min Summer</td><td>38.394</td><td>0.194</td><td>0.2</td><td>18.5</td><td>O K</td></tr><tr><td>60 min Summer</td><td>38.441</td><td>0.241</td><td>0.2</td><td>22.9</td><td>O K</td></tr><tr><td>120 min Summer</td><td>38.487</td><td>0.287</td><td>0.2</td><td>27.3</td><td>O K</td></tr><tr><td>180 min Summer</td><td>38.512</td><td>0.312</td><td>0.2</td><td>29.7</td><td>O K</td></tr><tr><td>240 min Summer</td><td>38.528</td><td>0.328</td><td>0.2</td><td>31.2</td><td>O K</td></tr><tr><td>360 min Summer</td><td>38.548</td><td>0.348</td><td>0.2</td><td>33.0</td><td>O K</td></tr><tr><td>480 min Summer</td><td>38.559</td><td>0.359</td><td>0.2</td><td>34.1</td><td>O K</td></tr><tr><td>600 min Summer</td><td>38.565</td><td>0.365</td><td>0.2</td><td>34.7</td><td>O K</td></tr><tr><td>720 min Summer</td><td>38.568</td><td>0.368</td><td>0.2</td><td>35.0</td><td>O K</td></tr><tr><td>960 min Summer</td><td>38.568</td><td>0.368</td><td>0.2</td><td>34.9</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>38.557</td><td>0.357</td><td>0.2</td><td>33.9</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>38.539</td><td>0.339</td><td>0.2</td><td>32.2</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>38.520</td><td>0.320</td><td>0.2</td><td>30.4</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>38.485</td><td>0.285</td><td>0.2</td><td>27.1</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>38.452</td><td>0.252</td><td>0.2</td><td>24.0</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>38.422</td><td>0.222</td><td>0.2</td><td>21.1</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>38.393</td><td>0.193</td><td>0.2</td><td>18.4</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>38.368</td><td>0.168</td><td>0.2</td><td>15.9</td><td>O K</td></tr><tr><td>15 min Winter</td><td>38.367</td><td>0.167</td><td>0.2</td><td>15.9</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>77.173</td><td>0.0</td><td>69</td></tr><tr><td>30 min Summer</td><td>49.879</td><td>0.0</td><td>80</td></tr><tr><td>60 min Summer</td><td>30.811</td><td>0.0</td><td>104</td></tr><tr><td>120 min Summer</td><td>18.477</td><td>0.0</td><td>156</td></tr><tr><td>180 min Summer</td><td>13.560</td><td>0.0</td><td>210</td></tr><tr><td>240 min Summer</td><td>10.843</td><td>0.0</td><td>266</td></tr><tr><td>360 min Summer</td><td>7.888</td><td>0.0</td><td>382</td></tr><tr><td>480 min Summer</td><td>6.293</td><td>0.0</td><td>498</td></tr><tr><td>600 min Summer</td><td>5.278</td><td>0.0</td><td>614</td></tr><tr><td>720 min Summer</td><td>4.570</td><td>0.0</td><td>732</td></tr><tr><td>960 min Summer</td><td>3.639</td><td>0.0</td><td>966</td></tr><tr><td>1440 min Summer</td><td>2.637</td><td>0.0</td><td>1222</td></tr><tr><td>2160 min Summer</td><td>1.909</td><td>0.0</td><td>1584</td></tr><tr><td>2880 min Summer</td><td>1.517</td><td>0.0</td><td>1984</td></tr><tr><td>4320 min Summer</td><td>1.096</td><td>0.0</td><td>2796</td></tr><tr><td>5760 min Summer</td><td>0.870</td><td>0.0</td><td>3592</td></tr><tr><td>7200 min Summer</td><td>0.727</td><td>0.0</td><td>4400</td></tr><tr><td>8640 min Summer</td><td>0.628</td><td>0.0</td><td>5112</td></tr><tr><td>10080 min Summer</td><td>0.555</td><td>0.0</td><td>5856</td></tr><tr><td>15 min Winter</td><td>77.173</td><td>0.0</td><td>70</td></tr></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	38.348	0.148	0.2	14.1	O K	30 min Summer	38.394	0.194	0.2	18.5	O K	60 min Summer	38.441	0.241	0.2	22.9	O K	120 min Summer	38.487	0.287	0.2	27.3	O K	180 min Summer	38.512	0.312	0.2	29.7	O K	240 min Summer	38.528	0.328	0.2	31.2	O K	360 min Summer	38.548	0.348	0.2	33.0	O K	480 min Summer	38.559	0.359	0.2	34.1	O K	600 min Summer	38.565	0.365	0.2	34.7	O K	720 min Summer	38.568	0.368	0.2	35.0	O K	960 min Summer	38.568	0.368	0.2	34.9	O K	1440 min Summer	38.557	0.357	0.2	33.9	O K	2160 min Summer	38.539	0.339	0.2	32.2	O K	2880 min Summer	38.520	0.320	0.2	30.4	O K	4320 min Summer	38.485	0.285	0.2	27.1	O K	5760 min Summer	38.452	0.252	0.2	24.0	O K	7200 min Summer	38.422	0.222	0.2	21.1	O K	8640 min Summer	38.393	0.193	0.2	18.4	O K	10080 min Summer	38.368	0.168	0.2	15.9	O K	15 min Winter	38.367	0.167	0.2	15.9	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	77.173	0.0	69	30 min Summer	49.879	0.0	80	60 min Summer	30.811	0.0	104	120 min Summer	18.477	0.0	156	180 min Summer	13.560	0.0	210	240 min Summer	10.843	0.0	266	360 min Summer	7.888	0.0	382	480 min Summer	6.293	0.0	498	600 min Summer	5.278	0.0	614	720 min Summer	4.570	0.0	732	960 min Summer	3.639	0.0	966	1440 min Summer	2.637	0.0	1222	2160 min Summer	1.909	0.0	1584	2880 min Summer	1.517	0.0	1984	4320 min Summer	1.096	0.0	2796	5760 min Summer	0.870	0.0	3592	7200 min Summer	0.727	0.0	4400	8640 min Summer	0.628	0.0	5112	10080 min Summer	0.555	0.0	5856	15 min Winter	77.173	0.0	70
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W A Fairhurst & Partners		Page 3
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Date 09/05/2022 14:44 File SOUTH SOAKAWAY 1 IN 30....	Designed by MDF Checked by MH	
Micro Drainage Source Control 2019.1		

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.418	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Pipe Network

Volume in Pipe Network (m³)	39	Dia of Outfall Pipe (m)	0.2
Slope of Outfall Pipe (1:X)	15	Roughness of Outfall Pipe (mm)	0.600

Time Area Diagram

Total Area (ha) 0.106

Time (mins)	Area	Time (mins)	Area
From:	To: (ha)	From:	To: (ha)
0	4 0.053	4	8 0.053

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<u>Model Details</u> Storage is Online Cover Level (m) 39.900 <u>Infiltration Blanket Structure</u> <table style="margin-left: auto; margin-right: auto;"> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.01692</td> <td>Diameter/Width (m)</td> <td>5.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Length (m)</td> <td>20.0</td> </tr> <tr> <td>Porosity</td> <td>0.95</td> <td>Cap Volume Depth (m)</td> <td>0.800</td> </tr> <tr> <td>Invert Level (m)</td> <td>38.200</td> <td></td> <td></td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.01692	Diameter/Width (m)	5.0	Safety Factor	2.0	Length (m)	20.0	Porosity	0.95	Cap Volume Depth (m)	0.800	Invert Level (m)	38.200		
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Appendix H

Potential Foul Discharge Locations

SOUTHERN WATER

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site.

Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530

O.S. REF: TQ6372SEScale: 1:1250

Sewer Plot

WARNING: BAC pipes are constructed of Bonded Asbestos Cement
WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement

N

Printed By: Mercy
Site Plan
Requested By:

Date: 19-8-2021

Appendix I

Maintenance Strategy

Cellular attenuation Soakaway (Management Company)

Maintenance Frequency	Action Required	Maintenance Frequency
Regular Maintenance	Inspect/identify areas not operating correctly and take remedial action	3 months initially, every 6 months for next year, than as required.
	Inspect structure as specified by manufacturer	Monthly or as required
	Inspect and remove debris from inlet structure (catchpit)	Monthly or as required
	Check inlets and outlets	Annually or as required
Occasional Maintenance	Jetting and suction where silt has settled in structure	As required
Remedial Works	Full replacement of the structure if permanently silted or structural failure	As required
Following all significant event	Inspect and carry out essential recovery works to return feature to full working order	As required

Permeable Paving (Independent Management Company)

Maintenance Frequency	Action Required	Maintenance Frequency
Regular Maintenance	Refer to manufacturer specification for details of specific maintenance requirements	Defined by manufacturer
	Inspect permeable paving outfalls to ensure functioning correctly	3 months as required
	Brush surface regularly remove sweepings away from paving blocks	3 months or as required
Occasional Maintenance	Vacuum surface and brush and re-grit where necessary to prevent silt blockage and enhance design life	6 month or as required
	Remove weeds and plant growth in gaps between paving	As required
Remedial Works	Monitor effectiveness i.e. note if water fails to infiltrate immediately upon contact as the reinstatement of pavement if jet washing and suction cleaning does not restore it	As required
Following all significant events	Inspect and carry out essential maintenance works as required to return feature to full working order	As required

Underground Drainage and Chambers (Management Company)

Maintenance Frequency	Action Required	Maintenance Frequency
Regular Maintenance	Cleaning gutters and any filters on downpipe	Every 6 months or as required
	Remove sediment, debris etc. from manhole chambers, catchpits and inspection chambers	Annually or as required
Occasional Maintenance	CCTV Survey to check pipe alignment, cracks, joint displacements and root ingress for repair	Every 10 years
Remedial Works	Full replacement of the structure if permanently silted or structural failure	As required
Ad-hoc	If blockage/flooding reported utilise jetting/rodding practices to remove obstruction within 24 hours of report.	As required
Following all significant events	Inspect and carry out essential maintenance works to return feature to full working order	As required

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