



DRAINAGE STRATEGY

FOR

**PROPOSED CHANGE OF USE
AND ASSOCIATED WORKS AT
BRADLEY VILLA FARM**

ON BEHALF OF

MR R KERSHAW



ARP ASSOCIATES

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Drainage Strategy for a change of use at Bradley Villa Farm, Bradley

2489/01r1a

	Initial Issue 22nd May 2025	Revision A 13th June 2025	Revision B
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1.0 INTRODUCTION

1.1 The client is proposing for a change of use of the former egg production facility to research and development or industrial uses falling within E(G)II and (III) at Bradley Villa Farm, Bradley, which is referred henceforth as “the site”. The site’s change of use and associated works requires a drainage strategy to support the discharge of relevant planning conditions.

12. *Prior to the commencement of the development hereby approved (including ground works), a scheme detailing temporary surface water drainage for the construction phase (after soil and vegetation strip) shall be submitted to and approved in writing by the Local Planning Authority. The scheme shall:*

- *Detail any phasing of the development and any phasing of temporary drainage provision;*
- *Include methods of preventing silt, debris and contaminants entering existing drainage systems and watercourses and details of how flooding of adjacent land would be prevented; and*
- *Include methods of preventing contamination of watercourses once the new drainage has been installed.*

The temporary works shall be implemented in accordance with the approved scheme and phasing. No part of the development shall be commenced until the temporary works approved have been completed. The approved temporary drainage scheme shall be retained until the approved permanent surface water drainage system is in place and functioning in accordance with written notification to the Local Planning Authority.

13. *Prior to the commencement of the development hereby approved (including ground works), a scheme detailing foul, surface water and land drainage (including off-site works, outfalls, balancing works, plans and longitudinal sections and hydraulic calculations) shall be submitted to and approved in writing by the Local Planning Authority. The scheme shall include a detailed maintenance and management plan for surface water infrastructure. No part of the development hereby approved shall be first occupied until such approved drainage scheme has been provided on the site to serve the development. The approved drainage scheme shall be retained thereafter.*

14. *Prior to the commencement of the development hereby approved (including ground works), an assessment of the effects of 1 in 100 year storm events (with an additional allowance for climate change, blockage scenarios and exceedance events) on drainage infrastructure and surface water run-off pre- and post-development between the development and the surrounding area, in both directions, shall be submitted to and approved in writing by the Local Planning Authority. No part of the development hereby approved shall be first occupied until the works comprising the approved scheme have been completed. The approved scheme shall be retained thereafter.*

- 1.2 ARP Associates have been appointed to prepare a Drainage Strategy for the development, undertaking appropriate assessments, and preparing a report to satisfy the requirements of the Planning Authority.
- 1.3 The site appraisal for this assessment was carried out between January and June 2025.
- 1.4 The report has been initially prepared for the use and reliance of the Client only. The report shall not be relied upon or transferred to any other parties without the written agreement of ARP Associates. For the avoidance of any doubt, where ARP Associates enters into a letter of reliance for the benefit of a third party, that third party will be permitted to rely on the report. No responsibility will be accepted where this report is used, either in its entirety or in part, by any other party without ARP Associates consent.
- 1.5 Attention is drawn to the requirements of the Construction Design and Management Regulations 2015, and in particular, the duties and obligations of the Client.

2.0 SITE DESCRIPTION

General

- 2.1 The site, which is centred on Ordnance Survey Grid Reference 415019, 420452 and is located to the east of Bradford Road and to the north of Bradley Road, Bradley (HD2 2JS).
- 2.2 The site is a roughly rectangular shaped piece of land extending to an area of approximately 2.28 hectares (ha), with overall dimensions of approximately 160m (north - south) by 140m (east - west).
- 2.3 A site location plan is presented in **Appendix A**, which shows the application site to which this report refers and the surrounding development for reference.

Current Use

- 2.4 The existing site comprises of a former egg production facility building within the northern extent of the site. The middle of the site comprises of a number of agricultural units and barns, whilst the southern extent includes a residential dwelling and farm shop. The site contains a limited number of mature bushes, shrubs and is predominantly hard surfaced with concrete, tarmac and compacted gravel tracks.

Topography

- 2.5 A topographical survey of the site has been provided by the architect (Stott Thompson Architects Limited) in February 2025 (**Appendix B**). The site falls from the northwestern boundary where levels are of the order of 166.76 metres Above Ordnance Datum (m AOD), towards the southeast where levels fall to of 160.57m AOD. Levels around the existing change of use unit are typically 162.60m AOD.
- 2.6 EA LiDAR data has been used to create a digital terrain model (DTM) of the site and surrounding topography. As shown within **Appendix C**, site levels are indicated to predominantly fall from the northwest towards the southeast of the site.

Development Proposals

- 2.7 The development proposals are for the change of use of one former egg production unit into four sub divided units research and development or industrial use. Vehicular access will be provided from a new access point off the new estate road serving the adjacent residential development to the north of the site. The proposed development proposals are shown in the site layout plan within **Appendix D**.

Boundaries

- 2.8 The western and southeastern boundaries of the site are formed by residential development off Bradford Road and Bradley Road respectively. The southern boundary of the site consists of the farm shop.
- 2.9 The northern and eastern boundary of the site was previously undefined as it formed part of a wider agricultural field. However, a new residential estate road has been subsequently formed along the northern boundary of the site. The eastern boundary of the site will be formed by new residential development.

Hydrology

- 2.10 The nearest major watercourse to the site is the River Calder, which is approximately 1.6km at its nearest point to the northeast of the site. The River Calder is classified as an Environment Agency (EA) Main River. This main river flows in a meandering easterly direction past the north of the site. The EA are responsible for any maintenance and construction work on main rivers and flood storage areas.
- 2.11 The nearest watercourse to the site is Bradley Park Dike which is approximately 600 metres to the north of the site. However, this drains land to the north of the proposed development. The land surrounding the proposed change of use and associated works drains towards Bradley Road to the south and east of the development. There is no watercourse within the proposed site boundary or in the immediate vicinity of the site.

Ground Conditions

- 2.12 A Stage 1 Geo-Environmental Assessment report was undertaken by Lithos Consulting dated February 2024 for the proposed change of use and associated works at the site. Lithos Consulting Stage 1 report did not deem a Stage 2 investigation necessary.
- 2.13 The Lithos Consulting report determined that the natural superficial geology comprises of a thin veneer of made ground consisting of gravel over firm clays and or clayey sands. The underlying bedrock geology comprises of sandstone bedrock (Pennine Lower Coal Measures) expected around 2.0m below ground level (bgl). The bedrock geology is designated 'Secondary A'. The site is not situated within a Source Protection Zone (SPZ).
- 2.14 An intrusive ground investigation was undertaken by ARP Geotechnical Ltd in December 2024 on behalf of the client. The site investigation consisted of six trial pits to further clarify soil sampling to determine contamination levels, if any. No groundwater ingress was encountered within any of the trial pits up to a depth of 1.40 metres below ground level (bgl).

Existing Drainage

- 2.15 A drainage survey of the site was undertaken by Jet Aire during April 2025 to determine the existing drainage arrangements of the site. Anecdotal information advised there are approximately three outfalls to the public combined sewer from Bradley Villa Farm. The drainage survey verified these outfalls as shown within **Appendix E**.
- 2.16 The drainage survey demonstrated that there are two main drainage networks through the wider site which outfall to the public combined sewer adjacent to the southern boundary of the site. The westernmost connection, referred to as Network A predominantly serves the Bradley Villa Farm shop, domestic dwelling and several agricultural buildings and hard landscaped areas.

- 2.17 Network B is the main drainage network through the site and outfalls to the public combined in the southeast of the site. Network B drains the proposed changed of use building and hardstanding areas and agricultural buildings within the central and southeastern regions of the site.
- 2.18 The 3rd outfall to the public combined sewer referred to as Network C is a series of land drains which currently takes exceedance flows from the northern area of the site and land to east and north of the site. A ditch along the eastern boundary ensures overland runoff does not drain through the adjacent residential development. As shown on the Jet Aire drainage survey, the land drain flows through the residential properties whereby plot drainage also outfall into this network before outfalling to the 300mm public combined sewer within Torcote crescent.
- 2.19 Yorkshire Water public sewer records (**Appendix F**) indicate there are no public sewer assets within the site. The 300mm public combined sewer runs along the public footpath adjacent to the southern boundary of the site. An additional 300mm public combined sewer within Torcote Crescent drops into the 300mm combined sewer within Bradley Road to the southeast of the site.
- 2.20 The proposed estate road to north of the site is served by its own separate drainage systems. As such, the development only needs to drain the extent of access formed at the proposed junction to the estate road.

Climate Change

- 2.21 NPPF requires that the projected impacts of climate change are taken into account over the lifetime of a development. Studies have projected that the Global Sea level will continue to rise and there will be an increase in river flows and rainfall intensity across the country, with the degree of change depending on greenhouse gas emissions and the sensitivity of the climate system.
- 2.22 Recommended allowances for assessment are set out in Environment Agency publication 'Flood risk assessments: climate change allowances' (published February 2016; last updated

May 2022). Within this guidance, a regionalised approach is adopted to climate change impacts based upon the river Management Catchment within which the proposed development site falls, and the intended design life of the development.

- 2.23 The site is situated within the 'Aire and Calder' Management Catchment of the Humber River Basin District. For residential development, climate change impacts over a design life of at least 100 years should be considered.
- 2.24 Impact on Rainfall Intensity - In accordance with the current guidance, for a design life of at least 100 years the impacts of the "upper" climate change scenario (90th percentile of potential scenarios) should be considered with respect rainfall intensity. Within this Management Catchment, this is predicted to lead to an increase in rainfall intensity of up to 40% in the 1 in 30 year (3.33% annual exceedance probability) rainfall event, and up to 45% in the 1 in 100 year (1% annual exceedance probability) rainfall event.

4.0 SURFACE WATER DRAINAGE STRATEGY

4.1 This section sets out the proposed means of managing surface water discharge from the proposed development of the site. This section should be read in conjunction with the ARP Drainage Strategy plan (drawing 2489/01/SK01.02) which has been prepared to illustrate the proposals and is shown within **Appendix L**.

Existing Surface Water Runoff

- 4.2 As set out in **Section 2**, roof runoff and adjacent hardstanding area is positively drained within the site. Runoff from compacted gravel tracks, hardstanding and roof runoff are directed to Network B of the site which outfalls to the public combined sewer in the southeast of the site. Any exceedance from the existing drainage network around the proposed development is intercepted by the land drainage along the eastern boundary of the site through Network C.
- 4.3 An existing catchment plan (**Appendix G**) and existing drainage plan (**Appendix H**) have been prepared to show how the site is generally drained across the site. In addition to the rainwater downpipe, gullies and channel drains the site has a number of perforated pipes collected runoff from compacted gravel areas. It has been assumed that for the purposes of the existing network calculations that these areas of concrete, tarmac and compacted gravel areas are assumed to capture approximately 50% of the hardstanding area to be conservative. Whilst roof areas are assumed to be 100% positively drained to the existing drainage network.
- 4.4 The existing network capacities for Network A and B have been modelled to demonstrate the 1 in 1, 2, 30 and 100 year storm events which are shown in **Appendix I** and **Appendix J** respectively. The network modelling indicates the existing drainage within the site is undersized for Network B and there is potentially extensive flooding in the higher return period rainfall events. The peak discharge rate from Network A and B are approximately 59.2 l/s and 53.8 l/s respectively. Refer to **Table 1** for further details.

Table 1: Existing Drainage Network Discharge Rates

Storm Event	Network A (l/s)	Network A Flooding (m ³)	Network B (l/s)	Network B Flooding (m ³)
1yr	24.9	0.0	29.7	35.0
2yr	32.3	0.0	34.2	59.0
30yr	53.8	0.0	47.2	185.5
100yr	59.2	0.0	53.8	278.2

4.5 The greenfield runoff rate for Network C has been calculated using the Source Control module of Micro Drainage. Network C is approximately draining an estimated 0.639 ha in area and the greenfield runoff rates are outlined below in **Table 2** and within **Appendix K**.

Table 2: Existing Runoff Rates

Return Period	Runoff Rates	
	Greenfield (l/s/ha)	Development Platform (0.639 ha)
1 in 1	5.4	3.5
QBAR	6.3	4.0
1 in 30	11.1	7.1
1 in 100	13.2	8.4

Proposed Surface Water Runoff Destination

4.6 The proposed means of managing surface water runoff from the proposed development has been considered with respect to the hierarchy set out in Building Regulations Part H (2010) as follows.

4.7 Consideration of the proposed means of surface water drainage should firstly be given to infiltration techniques (to ground). The potential for use of infiltration has been considered as part of the intrusive ground investigation was undertaken by ARP Geotechnical Ltd in December 2024 on behalf of the client. The results of these investigations reaffirm the underlying ground conditions preclude the use of soakaways. The Stage 1 Geo Environmental report undertaken by Lithos Consulting mentioned that bedrock was encountered at the base

of all trial puts but did not report the outcome of the soakaway results. It is assumed that infiltration was not viable.

- 4.8 As infiltration is unfeasible, discharge to a watercourse is considered to be the next option. As detailed in **Section 2**, there are no neighbouring watercourses or ditches in the vicinity of the site. It is therefore determined that surface water from the change of use and associated works are to be directed to the existing on site drainage Network B. Network B will continue to outfall to the 300mm public combined sewer in Bradley Road from the site as per existing arrangements.

Proposed Surface Water Discharge Limit

- 4.9 In order to minimise the increase in flood volumes and flood risk elsewhere, it is proposed that the maximum post development surface water discharge rate will be based on a review of the existing drainage network capacity.
- 4.10 The capacity of the pipe EX MH9 to EXMH11 is shown to be approximately 35.3 l/s during the 1 in 100 year event as shown in **Appendix J**. It is proposed that a 30% reduction on this existing on this rate to ensure that flood risk across the site is significantly reduced and ensure that the flows from the proposed development do not exceed existing discharge rates from the site including an allowance for climate change.
- 4.11 Following a review of the proposed drainage modelling explained further below, the peak discharge from the site along Network B is reduced during the 1 in 2, 30 and 100 year events between 5, 15 and 18% respectively on the existing scenarios. The 1 in 100 year plus 45% climate change scenario event also does not exceed the existing 1 in 100 year discharge rate from site and as such provides betterment on the existing scenario.

Proposed Surface Water Attenuation Storage

- 4.12 All new proposed surface water drainage systems shall be designed to accommodate a 1 in 30 year storm event without flooding and, to accord with the requirements of the Lead Local Flood Authority, will need to accommodate the 1 in 100 year plus 45% climate change allowance event without causing flooding of property or third-party land.

- 4.13 It is proposed that a new flow control is built on the alignment of existing pipe between EXMH9 to EXMH11. The proposed flow control will be restricted to 25.0 l/s to ensure that there is a 30% reduction on the existing 1 in 100 year flow rate so there is minimal flooding following implementation of the new surface water drainage along Network B following up to and including the 1 in 100 year rainfall event. It also ensures existing discharge rates are not exceeded following development.
- 4.14 Although there is no increase in extent of hardstanding, the associated works will include new formalised surfacing to serve the proposed change of use building. As such, it has been assumed this area will all be positively drained, i.e. not the 50% currently assumed in the existing modelled scenario. As such, the proposed model has allowed for an increase of 0.129 ha in impermeable area for the proposed associated works within the red line boundary.
- 4.15 The model also includes an additional 0.155ha of area to the attenuation tank as a sensitivity check should the central areas of hardstanding and roof area be changed in future. This is to ensure any future redevelopment is captured upstream of the flow control and ensure flood risk elsewhere is not increased. It is expected only minor changes to the proposed drainage network would be required in this scenario.
- 4.16 In order to accommodate the 1 in 100 year plus 45% climate change event, approximately 588m³ of storage would be required, which is provided by two above ground attenuation basins. Basin 1 and Basin 2 provide approximately 222m³ and 366m³ respectively. It is proposed that the majority of attenuation storage will be provided within the private attenuation basins. The attenuation basins would both be approximately 1.00 metres in depth. The attenuation basins will be located within current landscape area to the east and southeast of the proposed development. The rest of the storage would be within the pipe and manhole network. The preliminary proposed attenuation storage calculations are provided within **Appendix L**.
- 4.17 There is some minor flooding approximately 20.6m³ at existing manhole (EX MH15), which is to remain unchanged. However, this can be retained on site during the 1 in 100 year plus climate

change event. There is no flooding across the site up to and including the 1 in 100 year rainfall event. This provides an estimated 269 m³ flood reduction during the proposed 1 in 100 year rainfall event over the current situation and provides significant betterment.

- 4.18 The surface water drainage strategy is illustrated in the ARP Drainage Strategy drawings 2489/01/SK01.02 which are included in **Appendix M** for reference. The strategy is subject to agreement with the LLFA and Yorkshire Water, and basins subject to detailed design.

Exceedance Flow Routes

- 4.19 For rainfall events in excess of the design standard (i.e. greater than 1 in 100 year plus climate change event) the capacity of the drainage system is likely to be exceeded. There also remains a residual risk of flows leaving the surface water drainage system in the event of a blockage.
- 4.20 So that exceedance flows do not adversely affect properties on or off site, site levels should be designed to direct flows from hard-paved areas away from building entrances where possible, so that any flooding remains in areas such as landscaped areas, car parks, or roads, where the consequences of surface water flooding would be less significant.
- 4.21 In the unlikely event, exceedance flow will continue to flow towards the existing ditch and away from the site via the existing land drain as per existing arrangements. The formalised drainage around the proposed change of use unit will significantly reduce the exceedance flows compared to the existing scenario. It is envisaged that any exceedance flows will likely be limited to shallow flow along roads.

Construction Stage Surface Water Management

- 4.22 During the construction stage, before the permanent drainage systems are installed, measures will need to be taken to mitigate the potential environmental risks posed by runoff from the development site. A detailed Temporary Surface Water Management Plan will be required to address these risks. Key issues which require consideration will include the potential for silt-laden or contaminated runoff to adversely affected flood risk and water quality, and the potential for uncontrolled runoff to cause flooding on or off site.

4.23 A Temporary Surface Water Management Plan to manage the risk is shown within **Appendix N**. It is proposed that a silt fence and dirtbag arrangement will follow the natural topography and along the southern boundary of the proposed works and will outfall to the existing land drainage via Network C. The plan is subject to approval by the LLFA prior to implementation.

5.0 FOUL WATER DRAINAGE STRATEGY

- 5.1 This section sets out the proposed means of managing foul water discharge from the proposed development of the site. This section should be read in conjunction with the ARP Drainage Strategy plan (drawing 2489/01/SK01.02) which has been prepared to illustrate the proposals and is shown within **Appendix M**.

Existing Foul Drainage

- 5.2 The existing site is served by two foul outfalls to the public combined sewer as shown within (**Appendix H**). Network A and B are combined drainage systems and discharge foul waste to the 300mm public combined sewer within Bradley Road as shown on the Yorkshire Water sewer records (**Appendix F**).

Proposed Foul Drainage

- 5.3 In accordance with the hierarchy of foul drainage options set out in Building Regulations (2010) Part H, foul drainage should be disposed to a public sewer if available. It is proposed that a new separate foul water network from the proposed 4 units will be directed to the last manhole on Network B in order to drain via the existing connection to the adjacent public combined sewer network. This is in order to provide separate systems as far as reasonably practicable and ensure the foul network does not undergo any surcharging in the interests of flood risk.
- 5.5 It is estimated the proposed development would generate a peak foul loading of approximately 0.3 l/s. This is based on an estimated use in accordance with British Flows and Loads and UK Employment Density Guide 3rd Edition.
- 5.6 The proposals for foul drainage are subject to the approval of the relevant Regulatory Authorities and adoption requirements for the adjacent residential development.

6.0 SUMMARY

- 6.1 This report details the drainage strategy for the proposed change of use of the former egg production unit into four research and development or industrial units at Bradley Villa Farm, Bradley. The proposed change of use building and associated works will be served by a separate surface and foul water drainage system.
- 6.2 A sustainable surface water drainage system shall be provided to manage surface water run-off from the site itself up to the 1 in 100 year plus 45% climate change event.
- 6.3 It is proposed in accordance with the drainage hierarchy that surface water runoff will continue to drain to the existing public combined sewer situated within Bradley Road to the southeast of the site as per existing arrangements.
- 6.4 Surface water runoff generated from the change of use building and associated works will be restricted by 30% on existing flows up to the extent of development in order to provide a reduction in flood risk elsewhere across the network through the site. Surface water runoff from the proposed change of use will be controlled via two appropriately sized flow control devices and drain via gravity.
- 6.5 It is proposed that surface water drainage will remain private as per existing arrangements and be maintained by the existing landowner. The attenuation storage will be provided within two online attenuation basins, pipe and manhole network.
- 6.6 It is proposed that foul water drainage will be remain private and be maintained by the existing landowner. It is proposed that foul water will discharge via gravity to the existing combined sewer via the final manhole connection (EX MH11) situated within the southeastern boundary of the site.
- 6.7 A detailed temporary surface water management plan has been prepared for approval to demonstrate how surface water will be managed during construction.

- 6.8 The findings of this report are subject to the approval of the Regulatory Authorities. The drainage design and calculations shall be submitted to the Planning Authority for approval prior to construction on the development site.
- 6.9 Subject to compliance with the above, and subject to the further approvals of Regulatory Authorities, it is anticipated that the proposed development can satisfy the requirements of the National Planning Policy Framework and the Planning Practice Guidance in relation to flood risk and drainage.

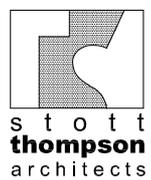
APPENDIX A

SITE LOCATION PLAN



Rimani House, Hall Street
 Halifax, HX1 5BD
 telephone 01422 323911
 fax 01422 323912

169 High Steet, Boston Spa
 West Yorkshire LS23 0BH
 telephone 01937 845142
 fax 01937 844235



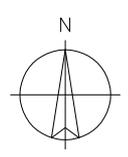
client:
Villa Farm

scale:
1:1250

date:
06.09.23

detail:
Location plan

detail no **1365-01 LP**



A P P E N D I X B

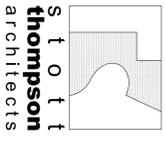
T O P O G R A P H I C S U R V E Y



All work to be carried out in accordance with the requirements of the Building Regulations, Water Authority and the Construction (Design and Management) Regulations Surveyed in Town.
Do not scale from this drawing. Architect to be notified of any discrepancies.
Verify relevant dimensions on site before commencing work or preparing shop drawings. This drawing is copyright.

Rev: Date: Action: Inhs:

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Stott
Thompson
architects

scale: 1:500
 drawn by: G.S.
 date: April 2023

Client: **Villa Farm**

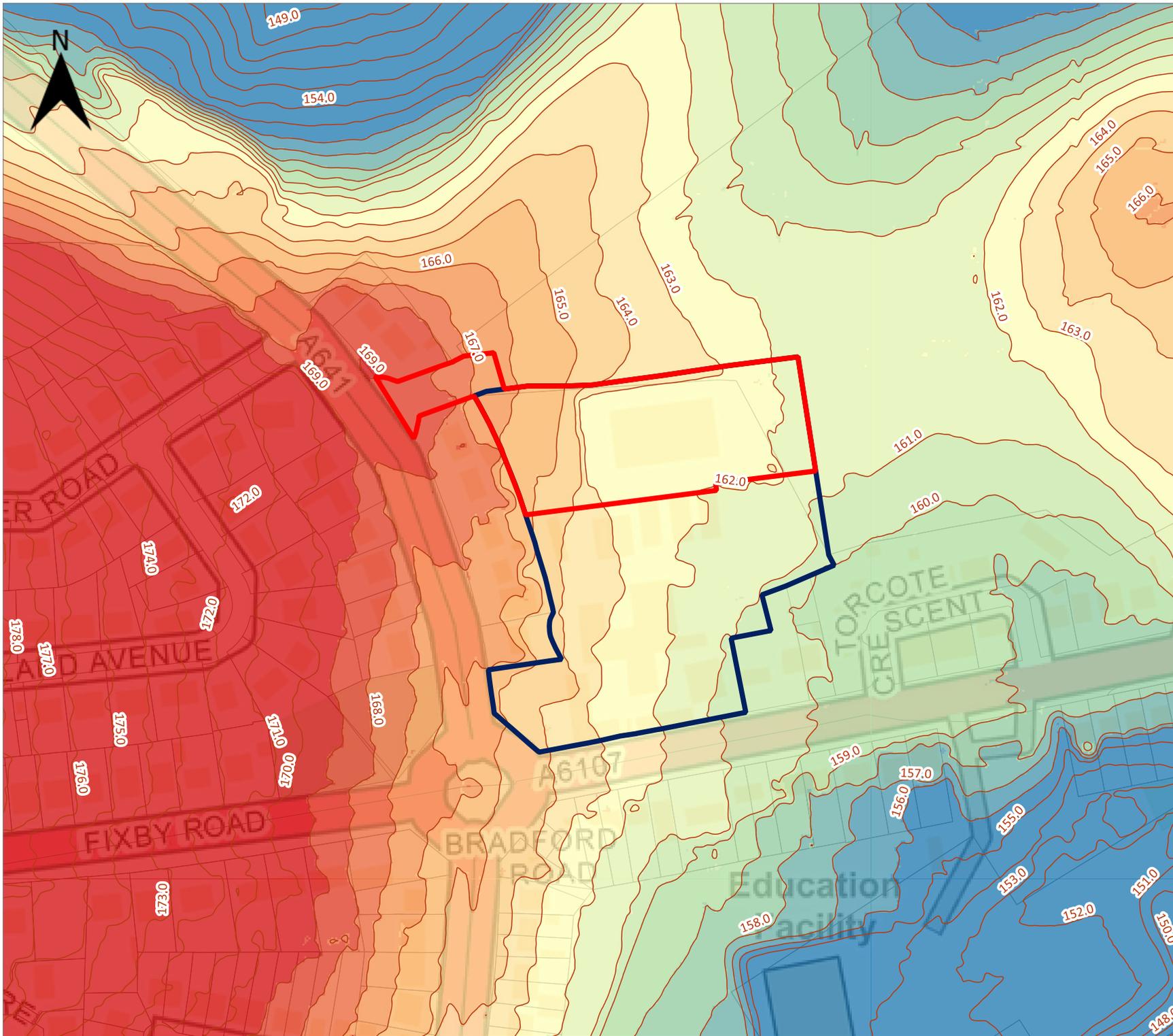
Project: **Conversion of Chicken unit to
General Industrial units**

Drawing: **Existing site survey**

Drawing Number: **1365-01** **SK-00**

APPENDIX C

DIGITAL TERRAIN MODEL



NOTES:

- 1) This drawing to be read in conjunction with all relevant ARP drawings and reports.
- 2) Do not scale from this drawing.

KEY:

- Site Boundary
- Wider Site Boundary
- Contour 1m

LiDAR Levels (mAOD)

- <= 156
- 156 - 157
- 157 - 158
- 158 - 159
- 159 - 160
- 160 - 161
- 161 - 162
- 162 - 163
- 163 - 164
- 164 - 165
- 165 - 166
- 166 - 167
- 167 - 168
- 168 - 169
- > 169



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TITLE:
DTM CONTOUR PLAN

PROJECT:
BRADLEY VILLA FARM

CLIENT:
MR R KERSHAW

DRAWING STATUS:
PRELIMINARY

SCALE: 1:2,500 @ A4	DATE: MAY 25	DRAWN: MD CHECK: MD
------------------------	-----------------	------------------------

DRG NO: 2489-01-DTM Contour Map	REV A
------------------------------------	----------

APPENDIX D

PROPOSED SITE PLAN

All work to be carried out in accordance with the requirements of the Building Regulations, Water Authority and the Construction (Design and Management) Regulations (CDM) only in force.

Do not scale from this drawing. Architect to be notified of any discrepancies. Verify relevant dimensions on site before commencing work or producing shop drawings. This drawing is copyright.

Revised: A
Date: Nov 2023
Action: Electric charging point (as added)
Initials: GS



Key
 Electric vehicle charging point

169 High Street Boston Spa
 Wetherby
 telephone 01937 845142
 fax 01937 844235

S t o r t
thompson
 architects

scale: 1:200
 drawn by: G.S.
 date: June 2023

Client: **Villa Farm**
 Project: **Conversion of Chicken unit to General industrial units**
 Drawing: **Proposed site layout**

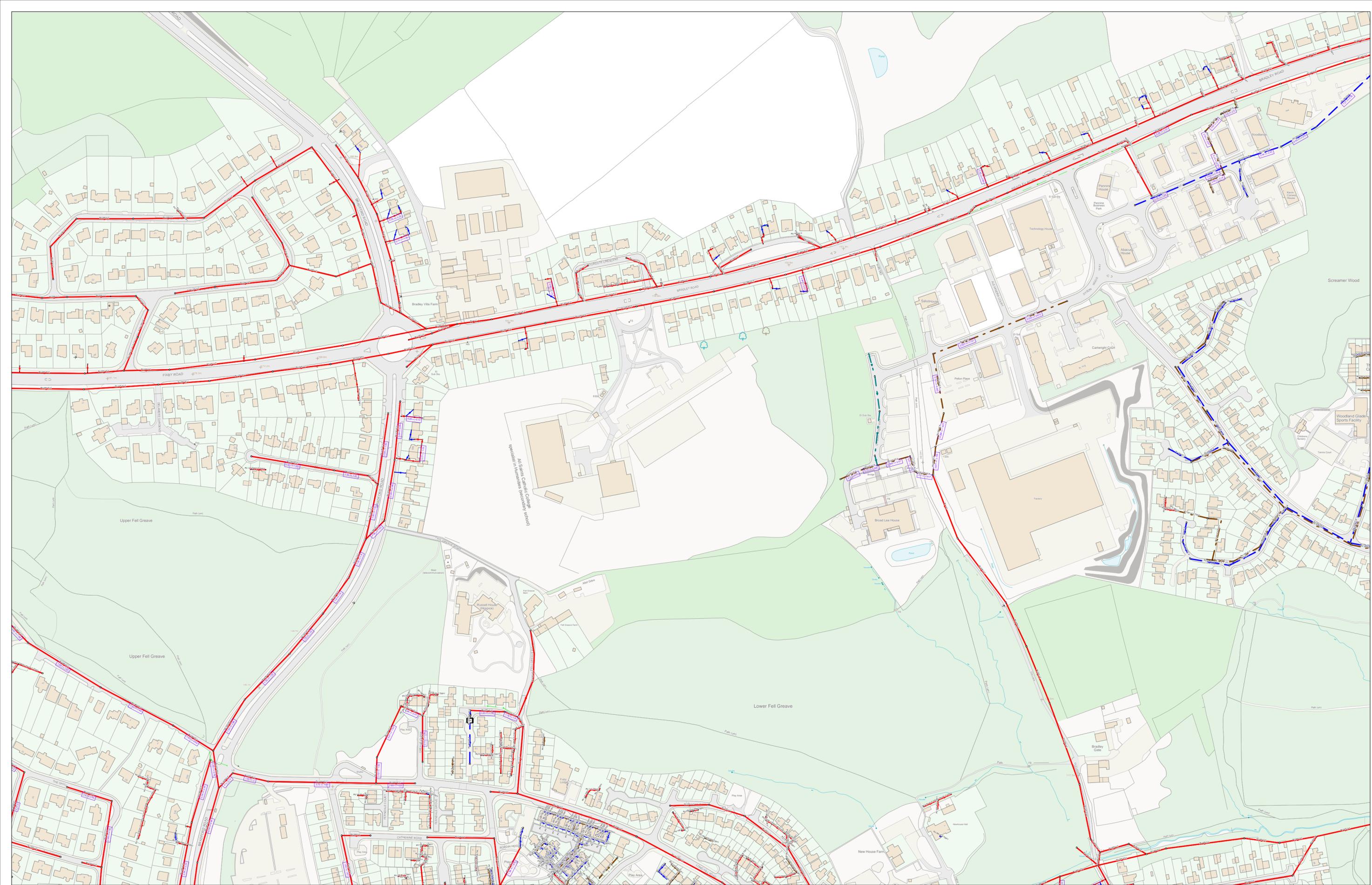
Drawing Number: **1365 01 SK-07 A**

APPENDIX E

JET AIRE DRAINAGE SURVEY

A P P E N D I X F

YORKSHIRE WATER SEWER RECORDS



415047 : 420038



Map Name : SE1419NE

Yorkshire Water,
 PO Box 500,
 Halifax Road,
 Bradford BD6 2LZ
 Contact Name :
 Search Advisor L Flesher
 Contact Tel : 75 4506

Title

Notes

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Partial Key

Foul Sewer = F
 Combined Sewer = C
 Surface Water Sewer = SW
 Trade Sewer = TD
 Partially Separate = PS

Date Req : 05/02/2025, 09:02:32

Source : Sewer Network Enquiry

This plan is furnished as a general guide only and no warranty as to its correctness is given or implied. This plan must not be relied upon in the event of excavations or other works made in the vicinity of public sewers. No house or property connections are shown.

Date Gen : 05/02/2025, 09:03:45

APPENDIX G

EXISTING CATCHMENT PLAN

NETWORK B

	Manhole Ref Pipe Code	Drainage Area (m ²)	PIMP %	Drainage Area Total (ha)
	IC2-IC1 S1.000	747	100	0.075
	IC2-IC1 S1.000	-	50	-
	C1-MH14 S1.001	747	100	0.075
	C1-MH14 S1.001	4121	50	0.206
	MH14-MH10 S1.002	1017	100	0.102
	MH14-MH10 S1.002	1,222	50	0.061
	MH15-MH15A S2.000	342	100	0.034
	MH15-MH15A S2.000	2,113	50	0.106
	MH15A-MH12 S2.001	-	100	-
	MH15A-MH12 S2.001	658	50	0.033
	MH12-MH10 S2.002	613	100	0.061
	MH12-MH10 S2.002	890	50	0.045
	MH7-MH8 S3.001	245	100	0.025
	MH7-MH8 S3.001	339	50	0.017
	MH8-MH9 S3.002	172	100	0.017
	MH8-MH9 S3.002	404	50	0.020
	MH11-OUTB S1.005	141	100	0.014
	MH11-OUTB S1.005	722	50	0.036
	TOTAL	14,493	-	1.002

Areas do not include any allowance for climatic change.
 Handstanding areas and compacted gravel handstanding drained via perforated drains and gullies assumed to only drain 50% of area for conservatism based on old drainage network.

MD	16.05.25	Issued for approval	
Rev	By	Date	Revision

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TITLE
 EXISTING CATCHMENT PLAN
 SHEET 1 OF 1

PROJECT
 BRADLEY VILLA FARM
 HUDDERSFIELD

CLIENT
 MR R KERSHAW

DRAWING STATUS
 PRELIMINARY

Scale	Date	Drawn	MD
1:500 @ A1	MAY 25	Chk.	MI

Org. No. 2489/01/SK02.01



NETWORK A

	Manhole Ref Pipe Code	Drainage Area (m ²)	PIMP %	Drainage Area Total (ha)
	MH1-MH4 S1.000	714	100	0.071
	MH1-MH4 S1.000	666	50	0.033
	MH2-MH3 S2.000	125	100	0.013
	MH2-MH3 S2.000	214	50	0.011
	MH3-MH4 S2.001	-	100	-
	MH3-MH4 S2.001	153	50	0.077
	MH4-MH5A S1.001	174	100	0.017
	MH4-MH5A S1.001	238	50	0.012
	MH5-MH5A S3.000	112	100	0.011
	MH5-MH5A S3.000	144	50	0.007
	MH5A-OUTA S1.002	189	100	0.019
	MH5A-OUTA S1.002	-	50	-
	TOTAL	2,729	-	0.259

Areas do not include any allowance for climatic change.
 Handstanding areas and compacted gravel handstanding drained via perforated drains and gullies assumed to only drain 50% of area for conservatism based on old drainage network.

APPENDIX H

EXISTING DRAINAGE PLAN

APPENDIX I

EXISTING NETWORK CALCULATIONS – NETWORK A



Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	19.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.335	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	x
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Width (mm)	Easting (m)	Northing (m)	Depth (m)
EX MH1	0.104	5.00	163.120	675	450	414985.530	420330.754	0.570
EX MH2	0.024	5.00	162.710	700	500	414995.619	420328.428	0.700
EX MH3	0.008	5.00	162.720	800	650	414996.898	420318.508	0.850
EX MH4	0.029	5.00	162.680	1000	700	414995.000	420317.091	1.100
EX MH5	0.018	5.00	161.990	800	490	415012.459	420312.428	0.530
EX MH5A	0.019	5.00	162.470			414996.250	420310.400	1.390
OUT_A			162.530			415002.530	420299.002	2.410

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	EX MH1	EX MH4	16.624	0.600	162.550	161.580	0.970	17.1	150	5.11	50.0
2.000	EX MH2	EX MH3	10.002	0.600	162.010	161.870	0.140	71.4	150	5.14	50.0
2.001	EX MH3	EX MH4	2.369	0.600	161.870	161.580	0.290	8.2	150	5.15	50.0
1.001	EX MH4	EX MH5A	6.807	0.600	161.580	161.080	0.500	13.6	150	5.19	50.0
3.000	EX MH5	EX MH5A	16.335	0.600	161.460	161.080	0.380	43.0	150	5.18	50.0
1.002	EX MH5A	OUT_A	13.014	0.600	161.080	160.120	0.960	13.6	150	5.27	50.0

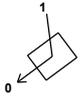
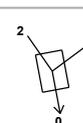
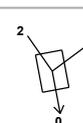
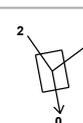
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	2.445	43.2	14.1	0.420	0.950	0.104	0.0	59	2.191
2.000	1.191	21.0	3.3	0.550	0.700	0.024	0.0	40	0.863
2.001	3.547	62.7	4.3	0.700	0.950	0.032	0.0	27	2.045
1.001	2.746	48.5	22.4	0.950	1.240	0.165	0.0	72	2.695
3.000	1.539	27.2	2.4	0.380	1.240	0.018	0.0	30	0.953
1.002	2.750	48.6	27.4	1.240	2.260	0.202	0.0	81	2.830

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	16.624	17.1	150	Circular	163.120	162.550	0.420	162.680	161.580	0.950
2.000	10.002	71.4	150	Circular	162.710	162.010	0.550	162.720	161.870	0.700
2.001	2.369	8.2	150	Circular	162.720	161.870	0.700	162.680	161.580	0.950
1.001	6.807	13.6	150	Circular	162.680	161.580	0.950	162.470	161.080	1.240
3.000	16.335	43.0	150	Circular	161.990	161.460	0.380	162.470	161.080	1.240
1.002	13.014	13.6	150	Circular	162.470	161.080	1.240	162.530	160.120	2.260

Link	US Node	Dia (mm)	Width (mm)	Node Type	MH Type	DS Node	Dia (mm)	Width (mm)	Node Type	MH Type
1.000	EX MH1	675	450	Manhole	Adoptable	EX MH4	1000	700	Manhole	Adoptable
2.000	EX MH2	700	500	Manhole	Adoptable	EX MH3	800	650	Manhole	Adoptable
2.001	EX MH3	800	650	Manhole	Adoptable	EX MH4	1000	700	Manhole	Adoptable
1.001	EX MH4	1000	700	Manhole	Adoptable	EX MH5A			Junction	
3.000	EX MH5	800	490	Manhole	Adoptable	EX MH5A			Junction	
1.002	EX MH5A			Junction		OUT_A			Junction	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Width (mm)	Connections	Link	IL (m)	Dia (mm)	
EX MH1	414985.530	420330.754	163.120	0.570	675	450		0	1.000	162.550	150
EX MH2	414995.619	420328.428	162.710	0.700	700	500		0	2.000	162.010	150
EX MH3	414996.898	420318.508	162.720	0.850	800	650		1	2.000	161.870	150
EX MH4	414995.000	420317.091	162.680	1.100	1000	700		1	2.001	161.870	150
EX MH4	414995.000	420317.091	162.680	1.100	1000	700		2	1.000	161.580	150
EX MH4	414995.000	420317.091	162.680	1.100	1000	700		0	1.001	161.580	150
EX MH5	415012.459	420312.428	161.990	0.530	800	490		0	3.000	161.460	150
EX MH5A	414996.250	420310.400	162.470	1.390				1	3.000	161.080	150
EX MH5A	414996.250	420310.400	162.470	1.390				2	1.001	161.080	150
EX MH5A	414996.250	420310.400	162.470	1.390				0	1.002	161.080	150
OUT_A	415002.530	420299.002	162.530	2.410				1	1.002	160.120	150

**Results for 1 year Critical Storm Duration. Lowest mass balance: 99.63%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	EX MH1	10	162.606	0.056	13.1	0.2227	0.0000	OK
15 minute winter	EX MH2	10	162.052	0.041	3.0	0.0430	0.0000	OK
15 minute winter	EX MH3	10	161.896	0.026	4.0	0.0181	0.0000	OK
15 minute winter	EX MH4	10	161.651	0.071	20.6	0.0869	0.0000	OK
15 minute winter	EX MH5	10	161.489	0.029	2.3	0.0313	0.0000	OK
15 minute winter	EX MH5A	10	161.156	0.076	25.1	0.0208	0.0000	OK
15 minute winter	OUT_A	10	160.196	0.076	24.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	EX MH1	1.000	EX MH4	12.9	1.822	0.300	0.1182	
15 minute winter	EX MH2	2.000	EX MH3	3.0	1.011	0.141	0.0297	
15 minute winter	EX MH3	2.001	EX MH4	3.9	0.806	0.063	0.0120	
15 minute winter	EX MH4	1.001	EX MH5A	20.4	2.377	0.421	0.0585	
15 minute winter	EX MH5	3.000	EX MH5A	2.3	0.408	0.083	0.0932	
15 minute winter	EX MH5A	1.002	OUT_A	24.9	2.770	0.512	0.1169	11.7

**Results for 2 year Critical Storm Duration. Lowest mass balance: 99.63%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	EX MH1	10	162.615	0.065	17.0	0.2571	0.0000	OK
15 minute winter	EX MH2	10	162.058	0.048	3.9	0.0494	0.0000	OK
15 minute winter	EX MH3	10	161.899	0.029	5.2	0.0206	0.0000	OK
15 minute winter	EX MH4	10	161.663	0.083	26.7	0.1023	0.0000	OK
15 minute winter	EX MH5	10	161.493	0.033	2.9	0.0353	0.0000	OK
15 minute winter	EX MH5A	10	161.170	0.090	32.5	0.0245	0.0000	OK
15 minute winter	OUT_A	10	160.209	0.089	32.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	EX MH1	1.000	EX MH4	16.8	1.936	0.389	0.1444	
15 minute winter	EX MH2	2.000	EX MH3	3.9	1.088	0.184	0.0360	
15 minute winter	EX MH3	2.001	EX MH4	5.1	0.853	0.082	0.0147	
15 minute winter	EX MH4	1.001	EX MH5A	26.5	2.519	0.546	0.0716	
15 minute winter	EX MH5	3.000	EX MH5A	2.9	0.427	0.106	0.1130	
15 minute winter	EX MH5A	1.002	OUT_A	32.3	2.946	0.664	0.1426	15.2

**Results for 30 year Critical Storm Duration. Lowest mass balance: 99.63%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	EX MH1	11	162.655	0.105	32.1	0.4132	0.0000	OK
15 minute winter	EX MH2	10	162.078	0.068	7.4	0.0700	0.0000	OK
15 minute winter	EX MH3	12	162.028	0.158	9.9	0.1117	0.0000	SURCHARGED
15 minute winter	EX MH4	12	162.014	0.434	48.5	0.5330	0.0000	SURCHARGED
15 minute winter	EX MH5	10	161.506	0.046	5.6	0.0492	0.0000	OK
15 minute winter	EX MH5A	12	161.486	0.406	55.8	0.1108	0.0000	SURCHARGED
30 minute winter	OUT_A	17	160.272	0.152	49.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	EX MH1	1.000	EX MH4	30.7	2.098	0.711	0.2553	
15 minute winter	EX MH2	2.000	EX MH3	7.4	1.262	0.351	0.1177	
15 minute winter	EX MH3	2.001	EX MH4	9.8	0.894	0.156	0.0417	
15 minute winter	EX MH4	1.001	EX MH5A	45.3	2.667	0.933	0.1198	
15 minute winter	EX MH5	3.000	EX MH5A	5.5	0.455	0.204	0.1811	
15 minute winter	EX MH5A	1.002	OUT_A	53.8	3.104	1.107	0.2290	28.6

**Results for 100 year Critical Storm Duration. Lowest mass balance: 99.63%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	EX MH1	12	163.009	0.459	41.4	1.8133	0.0000	FLOOD RISK
15 minute winter	EX MH2	12	162.419	0.409	9.6	0.4238	0.0000	FLOOD RISK
15 minute winter	EX MH3	12	162.399	0.529	12.5	0.3743	0.0000	SURCHARGED
15 minute winter	EX MH4	12	162.386	0.806	54.0	0.9884	0.0000	FLOOD RISK
15 minute winter	EX MH5	12	161.765	0.305	7.2	0.3263	0.0000	FLOOD RISK
15 minute winter	EX MH5A	12	161.748	0.668	59.7	0.1823	0.0000	SURCHARGED
15 minute winter	OUT_A	8	160.272	0.152	59.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	EX MH1	1.000	EX MH4	35.4	2.087	0.818	0.2927	
15 minute winter	EX MH2	2.000	EX MH3	9.5	1.270	0.454	0.1761	
15 minute winter	EX MH3	2.001	EX MH4	12.6	0.891	0.201	0.0417	
15 minute winter	EX MH4	1.001	EX MH5A	48.4	2.748	0.997	0.1198	
15 minute winter	EX MH5	3.000	EX MH5A	6.6	0.490	0.244	0.2876	
15 minute winter	EX MH5A	1.002	OUT_A	59.2	3.366	1.219	0.2291	37.7

APPENDIX J

EXISTING NETWORK CALCULATIONS – NETWORK B



Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	19.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.335	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	x
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Width (mm)	Easting (m)	Northing (m)	Depth (m)
EX IC2	0.075	5.00	162.600	450		415033.617	420466.125	0.860
EX IC1	0.281	5.00	162.790	600		415037.422	420436.143	1.450
EX MH14	0.163	5.00	161.520	620	470	415046.700	420397.334	0.740
EX MH15	0.140	5.00	162.770	620	470	415006.128	420387.481	0.460
EX MH15A	0.033	5.00	162.150			415021.937	420378.353	0.409
EX MH12	0.106	5.00	161.900	700	450	415023.618	420364.928	0.580
EX MH10			160.840	570	300	415049.183	420348.433	0.600
EX MH6	0.025	5.00	161.750	620	470	415026.576	420344.124	0.700
EX MH7	0.017	5.00	161.450	600	450	415034.351	420341.075	0.600
EX MH8	0.037	5.00	161.200	1200		415040.595	420337.446	0.700
EX MH9			160.840			415051.883	420335.162	0.909
EX MH11	0.050	5.00	160.570	820	470	415055.932	420315.266	1.100
OUT_B			160.500			415062.055	420310.167	2.000

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	EX IC2	EX IC1	30.222	0.600	161.740	161.340	0.400	75.6	150	5.44	50.0
1.001	EX IC1	EX MH14	39.903	0.600	161.340	160.780	0.560	71.3	150	5.99	50.0
1.002	EX MH14	EX MH10	48.964	0.600	160.780	160.240	0.540	90.7	100	7.00	50.0
2.000	EX MH15	EX MH15A	18.255	0.600	162.310	161.741	0.569	32.1	100	5.22	50.0
2.001	EX MH15A	EX MH12	13.530	0.600	161.741	161.320	0.421	32.1	100	5.39	50.0
2.002	EX MH12	EX MH10	30.425	0.600	161.320	160.240	1.080	28.2	100	5.74	50.0
1.003	EX MH10	EX MH9	13.543	0.600	160.240	159.981	0.259	52.3	100	7.21	50.0
3.000	EX MH6	EX MH7	8.351	0.600	161.050	160.900	0.150	55.7	100	5.13	50.0
3.001	EX MH7	EX MH8	7.222	0.600	160.850	160.500	0.350	20.6	150	5.19	50.0
3.002	EX MH8	EX MH9	11.517	0.600	160.500	159.931	0.569	20.2	150	5.27	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.158	20.5	10.2	0.710	1.300	0.075	0.0	75	1.156
1.001	1.192	21.1	48.2	1.300	0.590	0.356	0.0	150	1.215
1.002	0.808	6.3	70.3	0.640	0.500	0.519	0.0	100	0.830
2.000	1.366	10.7	19.0	0.360	0.309	0.140	0.0	100	1.403
2.001	1.366	10.7	23.4	0.309	0.480	0.173	0.0	100	1.403
2.002	1.459	11.5	37.8	0.480	0.500	0.279	0.0	100	1.499
1.003	1.068	8.4	108.1	0.500	0.759	0.798	0.0	100	1.097
3.000	1.034	8.1	3.4	0.600	0.450	0.025	0.0	45	0.987
3.001	2.227	39.4	5.7	0.450	0.550	0.042	0.0	38	1.589
3.002	2.248	39.7	10.7	0.550	0.759	0.079	0.0	53	1.912



Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.004	EX MH9	EX MH11	20.304	0.600	159.931	159.470	0.461	44.0	150	7.44	50.0
1.005	EX MH11	OUT_B	7.968	0.600	159.470	158.500	0.970	8.2	150	7.47	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.004	1.520	26.9	118.9	0.759	0.950	0.877	0.0	150	1.549
1.005	3.537	62.5	125.6	0.950	1.850	0.927	0.0	150	3.603

Pipeline Schedule

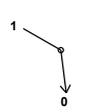
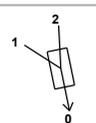
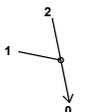
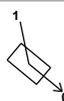
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	30.222	75.6	150	Circular	162.600	161.740	0.710	162.790	161.340	1.300
1.001	39.903	71.3	150	Circular	162.790	161.340	1.300	161.520	160.780	0.590
1.002	48.964	90.7	100	Circular	161.520	160.780	0.640	160.840	160.240	0.500
2.000	18.255	32.1	100	Circular	162.770	162.310	0.360	162.150	161.741	0.309
2.001	13.530	32.1	100	Circular	162.150	161.741	0.309	161.900	161.320	0.480
2.002	30.425	28.2	100	Circular	161.900	161.320	0.480	160.840	160.240	0.500
1.003	13.543	52.3	100	Circular	160.840	160.240	0.500	160.840	159.981	0.759
3.000	8.351	55.7	100	Circular	161.750	161.050	0.600	161.450	160.900	0.450
3.001	7.222	20.6	150	Circular	161.450	160.850	0.450	161.200	160.500	0.550
3.002	11.517	20.2	150	Circular	161.200	160.500	0.550	160.840	159.931	0.759
1.004	20.304	44.0	150	Circular	160.840	159.931	0.759	160.570	159.470	0.950
1.005	7.968	8.2	150	Circular	160.570	159.470	0.950	160.500	158.500	1.850

Link	US Node	Dia (mm)	Width (mm)	Node Type	MH Type	DS Node	Dia (mm)	Width (mm)	Node Type	MH Type
1.000	EX IC2	450		Manhole	Adoptable	EX IC1	600		Manhole	Adoptable
1.001	EX IC1	600		Manhole	Adoptable	EX MH14	620	470	Manhole	Adoptable
1.002	EX MH14	620	470	Manhole	Adoptable	EX MH10	570	300	Manhole	Adoptable
2.000	EX MH15	620	470	Manhole	Adoptable	EX MH15A			Junction	
2.001	EX MH15A			Junction		EX MH12	700	450	Manhole	Adoptable
2.002	EX MH12	700	450	Manhole	Adoptable	EX MH10	570	300	Manhole	Adoptable
1.003	EX MH10	570	300	Manhole	Adoptable	EX MH9			Junction	
3.000	EX MH6	620	470	Manhole	Adoptable	EX MH7	600	450	Manhole	Adoptable
3.001	EX MH7	600	450	Manhole	Adoptable	EX MH8	1200		Manhole	Adoptable
3.002	EX MH8	1200		Manhole	Adoptable	EX MH9			Junction	
1.004	EX MH9			Junction		EX MH11	820	470	Manhole	Adoptable
1.005	EX MH11	820	470	Manhole	Adoptable	OUT_B			Junction	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Width (mm)	Connections	Link	IL (m)	Dia (mm)
EX IC2	415033.617	420466.125	162.600	0.860	450					
EX IC1	415037.422	420436.143	162.790	1.450	600			1.000	161.740	150
								1.001	161.340	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Width (mm)	Connections	Link	IL (m)	Dia (mm)
EX MH14	415046.700	420397.334	161.520	0.740	620	470		1 1.001	160.780	150
								0 1.002	160.780	100
EX MH15	415006.128	420387.481	162.770	0.460	620	470		0 2.000	162.310	100
EX MH15A	415021.937	420378.353	162.150	0.409				1 2.000	161.741	100
								0 2.001	161.741	100
EX MH12	415023.618	420364.928	161.900	0.580	700	450		1 2.001	161.320	100
								0 2.002	161.320	100
EX MH10	415049.183	420348.433	160.840	0.600	570	300		1 2.002	160.240	100
								2 1.002	160.240	100
								0 1.003	160.240	100
EX MH6	415026.576	420344.124	161.750	0.700	620	470		0 3.000	161.050	100
EX MH7	415034.351	420341.075	161.450	0.600	600	450		1 3.000	160.900	100
								0 3.001	160.850	150
EX MH8	415040.595	420337.446	161.200	0.700	1200			1 3.001	160.500	150
								0 3.002	160.500	150
EX MH9	415051.883	420335.162	160.840	0.909				1 3.002	159.931	150
								2 1.003	159.981	100
								0 1.004	159.931	150
EX MH11	415055.932	420315.266	160.570	1.100	820	470		1 1.004	159.470	150
								0 1.005	159.470	150
OUT_B	415062.055	420310.167	160.500	2.000				1 1.005	158.500	150



Results for 1 year Critical Storm Duration. Lowest mass balance: 98.07%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	EX IC2	13	162.553	0.813	10.5	1.5479	0.0000	FLOOD RISK
15 minute winter	EX IC1	13	162.518	1.178	40.0	4.9000	0.0000	FLOOD RISK
60 minute winter	EX MH14	26	161.520	0.740	31.6	3.4758	25.7109	FLOOD
15 minute winter	EX MH15	14	162.737	0.427	17.6	2.7227	0.0000	FLOOD RISK
15 minute summer	EX MH15A	11	162.150	0.409	13.1	0.9432	0.0000	FLOOD RISK
30 minute winter	EX MH12	17	161.900	0.580	19.7	2.3026	3.5569	FLOOD
120 minute winter	EX MH10	52	160.840	0.600	17.3	0.1026	5.7055	FLOOD
15 minute winter	EX MH6	10	161.096	0.045	3.2	0.0457	0.0000	OK
15 minute winter	EX MH7	10	160.887	0.037	5.2	0.0310	0.0000	OK
15 minute winter	EX MH8	10	160.551	0.051	9.9	0.1114	0.0000	OK
15 minute winter	EX MH9	10	160.051	0.120	23.6	0.0000	0.0000	OK
15 minute winter	EX MH11	10	159.547	0.077	29.8	0.0996	0.0000	OK
15 minute winter	OUT_B	10	158.573	0.073	29.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	EX IC2	1.000	EX IC1	6.8	0.478	0.330	0.5321	
15 minute winter	EX IC1	1.001	EX MH14	26.3	1.495	1.249	0.7025	
60 minute winter	EX MH14	1.002	EX MH10	7.8	1.001	1.234	0.3831	
15 minute winter	EX MH15	2.000	EX MH15A	10.4	1.390	0.974	0.1428	
15 minute summer	EX MH15A	2.001	EX MH12	10.0	1.284	0.936	0.1059	
30 minute winter	EX MH12	2.002	EX MH10	10.6	1.355	0.925	0.2381	
120 minute winter	EX MH10	1.003	EX MH9	13.8	1.765	1.647	0.1049	
15 minute winter	EX MH6	3.000	EX MH7	3.1	0.939	0.387	0.0280	
15 minute winter	EX MH7	3.001	EX MH8	5.2	1.217	0.133	0.0312	
15 minute winter	EX MH8	3.002	EX MH9	9.8	0.947	0.247	0.1174	
15 minute winter	EX MH9	1.004	EX MH11	23.5	1.926	0.875	0.2459	
15 minute winter	EX MH11	1.005	OUT_B	29.7	3.380	0.475	0.0700	31.6

Results for 2 year Critical Storm Duration. Lowest mass balance: 98.07%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	EX IC2	11	162.600	0.860	20.0	1.6366	3.1873	FLOOD
15 minute winter	EX IC1	12	162.716	1.376	46.7	5.7210	0.0000	FLOOD RISK
60 minute winter	EX MH14	24	161.520	0.740	39.3	3.4758	39.1987	FLOOD
15 minute winter	EX MH15	11	162.770	0.460	22.8	2.9339	1.8467	FLOOD
15 minute summer	EX MH15A	10	162.150	0.409	13.5	1.1194	0.0000	FLOOD RISK
60 minute winter	EX MH12	30	161.900	0.580	19.0	2.3026	6.6113	FLOOD
120 minute winter	EX MH10	48	160.840	0.600	17.4	0.1026	8.1234	FLOOD
15 minute winter	EX MH6	10	161.103	0.053	4.1	0.0531	0.0000	OK
15 minute winter	EX MH7	10	160.892	0.042	6.8	0.0354	0.0000	OK
15 minute winter	EX MH8	10	160.558	0.058	12.8	0.1275	0.0000	OK
15 minute winter	EX MH9	11	160.070	0.138	26.5	0.0000	0.0000	OK
15 minute winter	EX MH11	10	159.554	0.084	34.3	0.1090	0.0000	OK
15 minute winter	OUT_B	10	158.579	0.079	34.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	EX IC2	1.000	EX IC1	-10.4	-0.591	-0.509	0.5321	
15 minute winter	EX IC1	1.001	EX MH14	28.8	1.637	1.368	0.7025	
60 minute winter	EX MH14	1.002	EX MH10	7.8	0.996	1.229	0.3831	
15 minute winter	EX MH15	2.000	EX MH15A	10.4	1.366	0.970	0.1428	
15 minute summer	EX MH15A	2.001	EX MH12	11.3	1.438	1.049	0.1059	
60 minute winter	EX MH12	2.002	EX MH10	10.6	1.355	0.925	0.2381	
120 minute winter	EX MH10	1.003	EX MH9	13.8	1.765	1.647	0.1049	
15 minute winter	EX MH6	3.000	EX MH7	4.0	0.996	0.495	0.0337	
15 minute winter	EX MH7	3.001	EX MH8	6.8	1.312	0.172	0.0375	
15 minute winter	EX MH8	3.002	EX MH9	12.7	1.049	0.319	0.1335	
15 minute winter	EX MH9	1.004	EX MH11	26.3	1.933	0.981	0.2754	
15 minute winter	EX MH11	1.005	OUT_B	34.2	3.491	0.547	0.0781	34.8

Results for 30 year Critical Storm Duration. Lowest mass balance: 98.07%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	EX IC2	27	162.600	0.860	25.7	1.6366	18.9377	FLOOD
15 minute winter	EX IC1	9	162.790	1.450	86.7	6.0306	9.2130	FLOOD
180 minute winter	EX MH14	56	161.520	0.740	39.7	3.4758	105.0924	FLOOD
30 minute winter	EX MH15	15	162.770	0.460	34.2	2.9339	12.3740	FLOOD
15 minute summer	EX MH15A	8	162.150	0.409	16.6	1.4693	0.0000	FLOOD RISK
120 minute winter	EX MH12	48	161.900	0.580	22.4	2.3026	21.0861	FLOOD
360 minute winter	EX MH10	136	160.840	0.600	17.4	0.1026	18.7495	FLOOD
15 minute winter	EX MH6	10	161.135	0.085	7.7	0.0858	0.0000	OK
15 minute winter	EX MH7	10	160.909	0.059	12.8	0.0491	0.0000	OK
15 minute winter	EX MH8	11	160.615	0.115	24.1	0.2511	0.0000	OK
15 minute winter	EX MH9	11	160.411	0.480	33.7	0.0000	0.0000	SURCHARGED
15 minute winter	EX MH11	11	159.576	0.106	47.1	0.1366	0.0000	OK
15 minute winter	OUT_B	11	158.597	0.097	47.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	EX IC2	1.000	EX IC1	-13.1	-0.743	-0.639	0.5321	
15 minute winter	EX IC1	1.001	EX MH14	29.7	1.686	1.408	0.7025	
180 minute winter	EX MH14	1.002	EX MH10	7.7	0.984	1.213	0.3831	
30 minute winter	EX MH15	2.000	EX MH15A	9.0	1.331	0.841	0.1428	
15 minute summer	EX MH15A	2.001	EX MH12	13.3	1.706	1.244	0.1059	
120 minute winter	EX MH12	2.002	EX MH10	10.6	1.355	0.925	0.2381	
360 minute winter	EX MH10	1.003	EX MH9	13.8	1.765	1.647	0.1049	
15 minute winter	EX MH6	3.000	EX MH7	7.6	1.118	0.930	0.0565	
15 minute winter	EX MH7	3.001	EX MH8	12.7	1.418	0.323	0.0748	
15 minute winter	EX MH8	3.002	EX MH9	23.1	1.371	0.580	0.1847	
15 minute winter	EX MH9	1.004	EX MH11	32.6	1.956	1.215	0.3132	
15 minute winter	EX MH11	1.005	OUT_B	47.2	3.722	0.755	0.1010	44.1

Results for 100 year Critical Storm Duration. Lowest mass balance: 98.07%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	EX IC2	25	162.600	0.860	29.6	1.6366	28.8940	FLOOD
15 minute winter	EX IC1	8	162.790	1.450	112.0	6.0306	18.4601	FLOOD
240 minute winter	EX MH14	68	161.520	0.740	41.0	3.4758	151.4416	FLOOD
30 minute winter	EX MH15	14	162.770	0.460	44.6	2.9339	21.2252	FLOOD
15 minute summer	EX MH15A	7	162.150	0.409	17.9	1.6192	0.0000	FLOOD RISK
120 minute winter	EX MH12	44	161.900	0.580	26.5	2.3026	31.9189	FLOOD
480 minute winter	EX MH10	176	160.840	0.600	17.4	0.1026	26.2692	FLOOD
15 minute winter	EX MH6	11	161.245	0.195	10.0	0.1960	0.0000	SURCHARGED
15 minute winter	EX MH7	11	160.935	0.085	16.0	0.0708	0.0000	OK
15 minute winter	EX MH8	12	160.851	0.351	30.4	0.7677	0.0000	SURCHARGED
15 minute winter	EX MH9	12	160.538	0.607	35.9	0.0000	0.0000	SURCHARGED
15 minute winter	EX MH11	11	159.588	0.118	53.8	0.1532	0.0000	OK
15 minute winter	OUT_B	11	158.607	0.107	53.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	EX IC2	1.000	EX IC1	-13.1	-0.743	-0.639	0.5321	
15 minute winter	EX IC1	1.001	EX MH14	29.7	1.686	1.408	0.7025	
240 minute winter	EX MH14	1.002	EX MH10	7.7	0.985	1.215	0.3831	
30 minute winter	EX MH15	2.000	EX MH15A	9.1	1.362	0.851	0.1428	
15 minute summer	EX MH15A	2.001	EX MH12	14.2	1.809	1.319	0.1059	
120 minute winter	EX MH12	2.002	EX MH10	10.6	1.355	0.925	0.2381	
480 minute winter	EX MH10	1.003	EX MH9	13.8	1.765	1.647	0.1049	
15 minute winter	EX MH6	3.000	EX MH7	9.5	1.216	1.171	0.0644	
15 minute winter	EX MH7	3.001	EX MH8	15.7	1.422	0.398	0.1005	
15 minute winter	EX MH8	3.002	EX MH9	27.1	1.541	0.683	0.2028	
15 minute winter	EX MH9	1.004	EX MH11	35.3	2.083	1.314	0.3301	
15 minute winter	EX MH11	1.005	OUT_B	53.8	3.785	0.860	0.1131	49.2

APPENDIX K

GREENFIELD RUNOFF CALCULATIONS

ARP Associates		Page 1
Northwest House Servia Hill Leeds LS6 2QH		
Date 15/01/2025 10:02am File	Designed by ARPCivils3D Checked by	
Innovyze	Source Control 2020.1.3	

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	1.000	Urban	0.000
SAAR (mm)	956	Region Number	Region 3

Results l/s

QBAR Rural	6.3
QBAR Urban	6.3

Q100 years 13.2

Q1 year	5.4
Q30 years	11.1
Q100 years	13.2

APPENDIX L

PROPOSED NETWORK CALCULATIONS – NETWORK B



Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	19.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.335	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	x
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Width (mm)	Easting (m)	Northing (m)	Depth (m)
EX IC1	0.075	5.00	162.790	600		415037.422	420436.143	1.215
EX MH14	0.072	5.00	161.520	620	470	415046.700	420397.334	0.740
EX MH15	0.096	5.00	162.770	620	470	415006.128	420387.481	0.460
EX MH15A	0.033	5.00	162.150			415021.937	420378.353	0.409
EX MH12	0.106	5.00	161.900	1200		415023.618	420364.928	1.400
EX MH6	0.025	5.00	161.750	620	470	415026.576	420344.124	0.700
EX MH7	0.017	5.00	161.450	600	450	415034.351	420341.075	0.600
EX MH8	0.037	5.00	161.200	1200		415040.595	420337.446	0.700
EX MH11	0.050	5.00	160.570	820	470	415055.932	420315.266	1.100
OUT_B			160.500			415062.055	420310.167	2.000
1	0.095	5.00	165.500			414949.103	420438.363	1.700
2	0.221	5.00	164.900	1500		414959.580	420416.931	2.525
3			162.600	1500		415039.428	420427.751	1.250
4	0.075	5.00	162.600	1200		415033.617	420466.125	1.050
5			162.300	1200		415065.482	420470.606	0.950
J1			162.100			415073.043	420471.588	1.000
BASIN_2		5.00	162.100			415082.462	420443.041	1.000
6_FC2	0.154	5.00	162.300	1500		415076.907	420432.540	1.650
7_IN			161.000			415084.267	420416.296	1.080
8_CP	0.155	5.00	161.300	1200		415074.149	420400.741	1.600
J2			160.920			415083.573	420401.940	1.000
BASIN_1		5.00	160.920			415085.259	420391.012	1.000
9			161.300	1500		415074.901	420384.928	1.700
10			160.850	1200		415049.183	420348.433	1.145
11			160.850	1200		415051.883	420335.162	1.200
12_FC1			160.750	1800		415054.436	420322.615	1.200



Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
4.000	EX MH15	EX MH15A	18.255	0.600	162.310	161.741	0.569	32.1	100	5.22	50.0
4.001	EX MH15A	EX MH12	13.530	0.600	161.741	161.320	0.421	32.1	100	5.39	50.0
4.002	EX MH12	10	30.425	0.600	160.500	160.150	0.350	86.9	225	5.75	50.0
6.000	EX MH6	EX MH7	8.351	0.600	161.050	160.900	0.150	55.7	100	5.13	50.0
6.001	EX MH7	EX MH8	7.222	0.600	160.850	160.500	0.350	20.6	150	5.19	50.0
6.002	EX MH8	11	11.517	0.600	160.500	159.800	0.700	16.5	150	5.27	50.0
1.000	1	2	23.856	0.600	163.800	162.525	1.275	18.7	225	5.13	50.0
1.001	2	3	80.578	0.600	162.375	161.425	0.950	84.8	300	5.92	50.0
2.000	EX IC1	3	8.628	0.600	161.575	161.500	0.075	115.0	225	5.12	50.0
1.002	3	6_FC2	37.784	0.600	161.350	161.000	0.350	108.0	375	6.28	50.0
7.000	4	5	32.179	0.600	161.550	161.350	0.200	160.9	225	5.52	50.0
7.001	5	J1	7.625	0.600	161.350	161.275	0.075	101.7	225	5.62	50.0
3.000	BASIN_2	6_FC2	11.880	0.600	161.100	161.000	0.100	118.8	375	5.12	50.0
1.003	6_FC2	7_IN	17.834	0.600	160.950	160.000	0.950	18.8	300	6.36	50.0
8.000	EX MH14	8_CP	27.660	0.600	160.780	160.000	0.780	35.5	300	5.17	50.0
8.001	8_CP	J2	9.500	0.600	160.000	159.920	0.080	118.7	300	5.28	50.0
5.000	BASIN_1	9	12.013	0.600	159.920	159.900	0.020	600.6	300	5.32	50.0
5.001	9	10	44.646	0.600	159.900	159.705	0.195	229.0	300	6.03	50.0
4.003	10	11	13.543	0.600	159.705	159.650	0.055	246.2	300	6.26	50.0
4.004	11	12_FC1	12.804	0.600	159.650	159.600	0.050	256.1	300	6.48	50.0
4.005	12_FC1	EX MH11	7.500	0.600	159.550	159.470	0.080	93.7	300	6.56	50.0
4.006	EX MH11	OUT_B	7.968	0.600	159.470	158.500	0.970	8.2	150	6.59	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
4.000	1.366	10.7	13.0	0.360	0.309	0.096	0.0	100	1.403
4.001	1.366	10.7	17.5	0.309	0.480	0.129	0.0	100	1.403
4.002	1.403	55.8	31.8	1.175	0.475	0.235	0.0	122	1.447
6.000	1.034	8.1	3.4	0.600	0.450	0.025	0.0	45	0.987
6.001	2.227	39.4	5.7	0.450	0.550	0.042	0.0	38	1.589
6.002	2.495	44.1	10.7	0.550	0.900	0.079	0.0	50	2.060
1.000	3.039	120.8	12.9	1.475	2.150	0.095	0.0	50	2.005
1.001	1.708	120.7	42.8	2.225	0.875	0.316	0.0	123	1.567
2.000	1.218	48.4	10.2	0.990	0.875	0.075	0.0	70	0.969
1.002	1.743	192.5	53.0	0.875	0.925	0.391	0.0	134	1.494
7.000	1.028	40.9	10.2	0.825	0.725	0.075	0.0	76	0.855
7.001	1.296	51.5	10.2	0.725	0.600	0.075	0.0	67	1.011
3.000	1.661	183.5	0.0	0.625	0.925	0.000	0.0	0	0.000
1.003	3.645	257.6	73.9	1.050	0.700	0.545	0.0	109	3.158
8.000	2.648	187.2	9.8	0.440	1.000	0.072	0.0	46	1.414
8.001	1.441	101.9	30.8	1.000	0.700	0.227	0.0	113	1.267
5.000	0.634	44.8	0.0	0.700	1.100	0.000	0.0	0	0.000
5.001	1.035	73.1	0.0	1.100	0.845	0.000	0.0	0	0.000
4.003	0.997	70.5	31.8	0.845	0.900	0.235	0.0	142	0.973
4.004	0.978	69.1	42.6	0.900	0.850	0.314	0.0	170	1.026
4.005	1.624	114.8	42.6	0.900	0.800	0.314	0.0	126	1.507
4.006	3.537	62.5	49.3	0.950	1.850	0.364	0.0	100	3.908

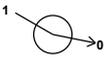
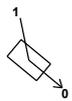
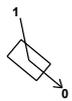
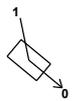
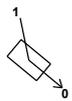
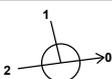
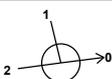


Pipeline Schedule

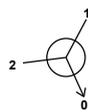
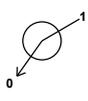
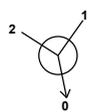
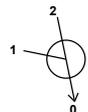
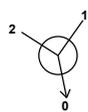
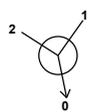
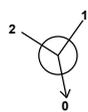
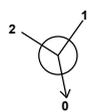
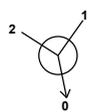
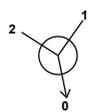
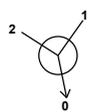
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
4.000	18.255	32.1	100	Circular	162.770	162.310	0.360	162.150	161.741	0.309
4.001	13.530	32.1	100	Circular	162.150	161.741	0.309	161.900	161.320	0.480
4.002	30.425	86.9	225	Circular	161.900	160.500	1.175	160.850	160.150	0.475
6.000	8.351	55.7	100	Circular	161.750	161.050	0.600	161.450	160.900	0.450
6.001	7.222	20.6	150	Circular	161.450	160.850	0.450	161.200	160.500	0.550
6.002	11.517	16.5	150	Circular	161.200	160.500	0.550	160.850	159.800	0.900
1.000	23.856	18.7	225	Circular	165.500	163.800	1.475	164.900	162.525	2.150
1.001	80.578	84.8	300	Circular	164.900	162.375	2.225	162.600	161.425	0.875
2.000	8.628	115.0	225	Circular	162.790	161.575	0.990	162.600	161.500	0.875
1.002	37.784	108.0	375	Circular	162.600	161.350	0.875	162.300	161.000	0.925
7.000	32.179	160.9	225	Circular	162.600	161.550	0.825	162.300	161.350	0.725
7.001	7.625	101.7	225	Circular	162.300	161.350	0.725	162.100	161.275	0.600
3.000	11.880	118.8	375	Circular	162.100	161.100	0.625	162.300	161.000	0.925
1.003	17.834	18.8	300	Circular	162.300	160.950	1.050	161.000	160.000	0.700
8.000	27.660	35.5	300	Circular	161.520	160.780	0.440	161.300	160.000	1.000
8.001	9.500	118.7	300	Circular	161.300	160.000	1.000	160.920	159.920	0.700
5.000	12.013	600.6	300	Circular	160.920	159.920	0.700	161.300	159.900	1.100
5.001	44.646	229.0	300	Circular	161.300	159.900	1.100	160.850	159.705	0.845
4.003	13.543	246.2	300	Circular	160.850	159.705	0.845	160.850	159.650	0.900
4.004	12.804	256.1	300	Circular	160.850	159.650	0.900	160.750	159.600	0.850
4.005	7.500	93.7	300	Circular	160.750	159.550	0.900	160.570	159.470	0.800
4.006	7.968	8.2	150	Circular	160.570	159.470	0.950	160.500	158.500	1.850

Link	US Node	Dia (mm)	Width (mm)	Node Type	MH Type	DS Node	Dia (mm)	Width (mm)	Node Type	MH Type
4.000	EX MH15	620	470	Manhole	Adoptable	EX MH15A			Junction	
4.001	EX MH15A			Junction		EX MH12	1200		Manhole	Adoptable
4.002	EX MH12	1200		Manhole	Adoptable	10	1200		Manhole	Adoptable
6.000	EX MH6	620	470	Manhole	Adoptable	EX MH7	600	450	Manhole	Adoptable
6.001	EX MH7	600	450	Manhole	Adoptable	EX MH8	1200		Manhole	Adoptable
6.002	EX MH8	1200		Manhole	Adoptable	11	1200		Manhole	Adoptable
1.000	1			Junction		2	1500		Manhole	Adoptable
1.001	2	1500		Manhole	Adoptable	3	1500		Manhole	Adoptable
2.000	EX IC1	600		Manhole	Adoptable	3	1500		Manhole	Adoptable
1.002	3	1500		Manhole	Adoptable	6_FC2	1500		Manhole	Adoptable
7.000	4	1200		Manhole	Adoptable	5	1200		Manhole	Adoptable
7.001	5	1200		Manhole	Adoptable	J1			Junction	
3.000	BASIN_2			Junction		6_FC2	1500		Manhole	Adoptable
1.003	6_FC2	1500		Manhole	Adoptable	7_IN			Junction	
8.000	EX MH14	620	470	Manhole	Adoptable	8_CP	1200		Manhole	Adoptable
8.001	8_CP	1200		Manhole	Adoptable	J2			Junction	
5.000	BASIN_1			Junction		9	1500		Manhole	Adoptable
5.001	9	1500		Manhole	Adoptable	10	1200		Manhole	Adoptable
4.003	10	1200		Manhole	Adoptable	11	1200		Manhole	Adoptable
4.004	11	1200		Manhole	Adoptable	12_FC1	1800		Manhole	Adoptable
4.005	12_FC1	1800		Manhole	Adoptable	EX MH11	820	470	Manhole	Adoptable
4.006	EX MH11	820	470	Manhole	Adoptable	OUT_B			Junction	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Width (mm)	Connections	Link	IL (m)	Dia (mm)	
EX IC1	415037.422	420436.143	162.790	1.215	600			0	2.000	161.575	225
EX MH14	415046.700	420397.334	161.520	0.740	620	470		0	8.000	160.780	300
EX MH15	415006.128	420387.481	162.770	0.460	620	470		0	4.000	162.310	100
EX MH15A	415021.937	420378.353	162.150	0.409				1	4.000	161.741	100
EX MH12	415023.618	420364.928	161.900	1.400	1200			0	4.001	161.741	100
EX MH6	415026.576	420344.124	161.750	0.700	620	470		1	4.001	161.320	100
EX MH7	415034.351	420341.075	161.450	0.600	600	450		0	6.000	161.050	100
EX MH8	415040.595	420337.446	161.200	0.700	1200			1	6.000	160.900	100
EX MH11	415055.932	420315.266	160.570	1.100	820	470		0	6.001	160.850	150
EX MH11	415055.932	420315.266	160.570	1.100	820	470		1	6.001	160.500	150
EX MH11	415055.932	420315.266	160.570	1.100	820	470		0	6.002	160.500	150
EX MH11	415055.932	420315.266	160.570	1.100	820	470		1	4.005	159.470	300
OUT_B	415062.055	420310.167	160.500	2.000				0	4.006	159.470	150
OUT_B	415062.055	420310.167	160.500	2.000				1	4.006	158.500	150
1	414949.103	420438.363	165.500	1.700				0	1.000	163.800	225
2	414959.580	420416.931	164.900	2.525	1500			1	1.000	162.525	225
2	414959.580	420416.931	164.900	2.525	1500			0	1.001	162.375	300
3	415039.428	420427.751	162.600	1.250	1500			1	2.000	161.500	225
3	415039.428	420427.751	162.600	1.250	1500			2	1.001	161.425	300
3	415039.428	420427.751	162.600	1.250	1500			0	1.002	161.350	375

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Width (mm)	Connections	Link	IL (m)	Dia (mm)	
4	415033.617	420466.125	162.600	1.050	1200			0	7.000	161.550	225
5	415065.482	420470.606	162.300	0.950	1200			1	7.000	161.350	225
J1	415073.043	420471.588	162.100	1.000				0	7.001	161.350	225
BASIN_2	415082.462	420443.041	162.100	1.000				1	7.001	161.275	225
6_FC2	415076.907	420432.540	162.300	1.650	1500			0	3.000	161.100	375
7_IN	415084.267	420416.296	161.000	1.080				1	3.000	161.000	375
8_CP	415074.149	420400.741	161.300	1.600	1200			2	1.002	161.000	375
J2	415083.573	420401.940	160.920	1.000				0	1.003	160.950	300
BASIN_1	415085.259	420391.012	160.920	1.000				1	1.003	160.000	300
9	415074.901	420384.928	161.300	1.700	1500			0	8.000	160.000	300
10	415049.183	420348.433	160.850	1.145	1200			1	8.001	160.000	300
11	415051.883	420335.162	160.850	1.200	1200			2	8.001	159.920	300
12_FC1	415054.436	420322.615	160.750	1.200	1800			0	5.000	159.920	300
								1	5.000	159.900	300
								0	5.001	159.900	300
								1	5.001	159.705	300
								2	4.002	160.150	225
								0	4.003	159.705	300
								1	6.002	159.800	150
								2	4.003	159.650	300
								0	4.004	159.650	300
								1	4.004	159.600	300
								0	4.005	159.550	300



Node 12_FC1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	159.550	Product Number	CTL-SHE-0216-2500-1200-2500
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.300
Design Flow (l/s)	25.0	Min Node Diameter (mm)	1800

Node 6_FC2 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	160.950	Product Number	CTL-SHE-0106-5000-1000-5000
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.0	Min Node Diameter (mm)	1200

Node BASIN_1 Pond Storage Structure

Invert Level (m) 159.920 | Time to half empty (mins) 120 | Analyse flow through structure x

Inlets

7_IN | J2

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	127.0	1.000	333.0	1.001	0.0

Node BASIN_2 Pond Storage Structure

Invert Level (m) 161.100 | Time to half empty (mins) | Analyse flow through structure x

Inlets

J1

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	235.0	1.000	515.0	1.001	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.74%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	EX IC1	10	161.647	0.072	9.5	0.1088	0.0000	OK
15 minute winter	EX MH14	10	160.824	0.044	9.1	0.0994	0.0000	OK
15 minute winter	EX MH15	12	162.473	0.163	12.1	0.7259	0.0000	FLOOD RISK
15 minute winter	EX MH15A	12	162.018	0.277	14.0	0.4467	0.0000	FLOOD RISK
15 minute winter	EX MH12	11	160.609	0.109	25.2	0.2885	0.0000	OK
15 minute winter	EX MH6	10	161.096	0.045	3.2	0.0457	0.0000	OK
15 minute winter	EX MH7	10	160.887	0.037	5.2	0.0310	0.0000	OK
15 minute summer	EX MH8	10	160.549	0.049	9.4	0.1062	0.0000	OK
15 minute winter	EX MH11	11	159.548	0.077	30.0	0.1003	0.0000	OK
15 minute winter	OUT_B	11	158.573	0.073	30.0	0.0000	0.0000	OK
15 minute winter	1	10	163.848	0.048	12.0	0.0538	0.0000	OK
15 minute winter	2	11	162.492	0.117	39.8	0.4129	0.0000	OK
15 minute winter	3	11	161.475	0.125	47.5	0.2214	0.0000	OK
15 minute winter	4	10	161.625	0.075	9.5	0.1922	0.0000	OK
15 minute winter	5	11	161.417	0.067	9.3	0.0755	0.0000	OK
180 minute winter	J1	148	161.279	0.179	7.9	0.0000	0.0000	OK
180 minute winter	BASIN_2	140	161.278	0.178	16.9	46.2135	0.0000	OK
180 minute winter	6_FC2	140	161.278	0.328	21.2	1.3265	0.0000	SURCHARGED
60 minute winter	7_IN	43	160.048	0.127	5.0	0.0000	0.0000	OK
15 minute winter	8_CP	10	160.108	0.108	28.5	0.3790	0.0000	OK
60 minute winter	J2	43	160.049	0.129	15.6	0.0000	0.0000	OK
60 minute winter	BASIN_1	43	160.042	0.122	14.8	17.6612	0.0000	OK
60 minute summer	9	37	160.036	0.136	15.2	0.2408	0.0000	OK
60 minute summer	10	36	160.032	0.327	29.9	0.3695	0.0000	SURCHARGED
60 minute summer	11	36	160.025	0.375	29.0	0.4237	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	EX IC1	2.000	3	9.4	0.906	0.193	0.0892	
15 minute winter	EX MH14	8.000	8_CP	9.0	0.639	0.048	0.4044	
15 minute winter	EX MH15	4.000	EX MH15A	10.1	1.330	0.944	0.1428	
15 minute winter	EX MH15A	4.001	EX MH12	12.3	1.568	1.143	0.1059	
15 minute winter	EX MH12	4.002	10	24.9	1.344	0.447	0.5648	
15 minute winter	EX MH6	6.000	EX MH7	3.1	0.939	0.387	0.0280	
15 minute winter	EX MH7	6.001	EX MH8	5.2	1.266	0.133	0.0299	
15 minute summer	EX MH8	6.002	11	9.5	1.868	0.215	0.1198	
15 minute winter	EX MH11	4.006	OUT_B	30.0	3.391	0.481	0.0706	66.9
15 minute winter	1	1.000	2	11.9	1.933	0.098	0.1465	
15 minute winter	2	1.001	3	38.5	1.525	0.319	2.0316	
15 minute winter	3	1.002	6_FC2	47.6	0.854	0.247	2.1048	
15 minute winter	4	7.000	5	9.3	0.874	0.226	0.3411	
15 minute winter	5	7.001	J1	9.3	0.969	0.180	0.0731	
180 minute winter	BASIN_2	3.000	6_FC2	21.2	0.573	0.116	0.8248	
180 minute winter	6_FC2	1.003	7_IN	5.0	1.437	0.019	0.0617	
15 minute winter	8_CP	8.001	J2	28.0	1.886	0.275	0.1728	
60 minute winter	BASIN_1	5.000	9	15.4	0.714	0.343	0.3373	
60 minute summer	9	5.001	10	16.4	0.648	0.225	2.2667	
60 minute summer	10	4.003	11	22.5	0.608	0.320	0.9537	
60 minute summer	11	4.004	12_FC1	27.1	0.485	0.392	0.9016	

**Results for 1 year Critical Storm Duration. Lowest mass balance: 99.74%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
60 minute summer	12_FC1	36	160.014	0.464	27.1	1.1813	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
60 minute summer	12_FC1	4.005	EX MH11	24.9	1.458	0.217	0.1333	

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.74%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	EX IC1	10	161.657	0.082	12.2	0.1251	0.0000	OK
15 minute winter	EX MH14	10	160.830	0.050	11.7	0.1125	0.0000	OK
15 minute winter	EX MH15	13	162.670	0.360	15.7	1.6068	0.0000	FLOOD RISK
15 minute winter	EX MH15A	12	162.142	0.401	14.5	0.6471	0.0000	FLOOD RISK
15 minute winter	EX MH12	11	160.621	0.121	29.9	0.3211	0.0000	OK
15 minute winter	EX MH6	10	161.103	0.053	4.1	0.0531	0.0000	OK
15 minute winter	EX MH7	10	160.893	0.043	6.8	0.0357	0.0000	OK
15 minute winter	EX MH8	10	160.555	0.055	12.8	0.1206	0.0000	OK
15 minute winter	EX MH11	11	159.552	0.082	32.6	0.1056	0.0000	OK
15 minute winter	OUT_B	11	158.577	0.077	32.6	0.0000	0.0000	OK
15 minute winter	1	10	163.855	0.055	15.5	0.0613	0.0000	OK
15 minute winter	2	11	162.511	0.136	51.3	0.4777	0.0000	OK
15 minute winter	3	11	161.494	0.144	61.5	0.2539	0.0000	OK
15 minute winter	4	10	161.636	0.086	12.2	0.2202	0.0000	OK
15 minute winter	5	11	161.426	0.076	11.9	0.0864	0.0000	OK
180 minute winter	J1	156	161.339	0.239	10.3	0.0000	0.0000	OK
180 minute winter	BASIN_2	148	161.338	0.238	17.6	63.8846	0.0000	OK
180 minute winter	6_FC2	148	161.338	0.388	23.4	1.5697	0.0000	SURCHARGED
60 minute winter	7_IN	45	160.097	0.177	7.9	0.0000	0.0000	OK
15 minute winter	8_CP	10	160.123	0.123	36.9	0.4330	0.0000	OK
60 minute winter	J2	43	160.099	0.179	19.9	0.0000	0.0000	OK
60 minute winter	BASIN_1	44	160.091	0.171	15.9	25.4640	0.0000	OK
60 minute winter	9	43	160.087	0.187	18.4	0.3312	0.0000	OK
60 minute winter	10	42	160.083	0.378	30.3	0.4272	0.0000	SURCHARGED
60 minute winter	11	42	160.075	0.425	29.0	0.4811	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	EX IC1	2.000	3	12.0	0.967	0.249	0.1075	
15 minute winter	EX MH14	8.000	8_CP	11.6	0.687	0.062	0.4838	
15 minute winter	EX MH15	4.000	EX MH15A	10.3	1.341	0.961	0.1428	
15 minute winter	EX MH15A	4.001	EX MH12	13.5	1.721	1.255	0.1059	
15 minute winter	EX MH12	4.002	10	29.7	1.400	0.532	0.6451	
15 minute winter	EX MH6	6.000	EX MH7	4.0	0.996	0.495	0.0337	
15 minute winter	EX MH7	6.001	EX MH8	6.8	1.362	0.172	0.0361	
15 minute winter	EX MH8	6.002	11	12.7	1.908	0.287	0.1344	
15 minute winter	EX MH11	4.006	OUT_B	32.6	3.456	0.522	0.0752	87.2
15 minute winter	1	1.000	2	15.3	2.080	0.127	0.1760	
15 minute winter	2	1.001	3	49.8	1.632	0.413	2.4601	
15 minute winter	3	1.002	6_FC2	61.6	0.959	0.320	2.4058	
15 minute winter	4	7.000	5	11.9	0.933	0.292	0.4121	
15 minute winter	5	7.001	J1	12.0	1.037	0.232	0.0879	
180 minute winter	BASIN_2	3.000	6_FC2	21.7	0.578	0.118	1.0585	
180 minute winter	6_FC2	1.003	7_IN	5.0	1.437	0.019	0.0708	
15 minute winter	8_CP	8.001	J2	36.2	1.970	0.356	0.2300	
60 minute winter	BASIN_1	5.000	9	18.4	0.736	0.411	0.5259	
60 minute winter	9	5.001	10	19.2	0.690	0.263	2.6054	
60 minute winter	10	4.003	11	23.4	0.609	0.332	0.9537	
60 minute winter	11	4.004	12_FC1	27.1	0.532	0.393	0.9016	

**Results for 2 year Critical Storm Duration. Lowest mass balance: 99.74%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
60 minute winter	12_FC1	42	160.066	0.516	27.1	1.3122	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
60 minute winter	12_FC1	4.005	EX MH11	25.0	1.469	0.218	0.1347	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.74%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	EX IC1	10	161.695	0.120	23.1	0.1822	0.0000	OK
15 minute winter	EX MH14	10	160.849	0.069	22.2	0.1543	0.0000	OK
15 minute winter	EX MH15	9	162.770	0.460	29.6	2.0539	5.2861	FLOOD
15 minute summer	EX MH15A	9	162.150	0.409	18.7	1.1176	0.0000	FLOOD RISK
15 minute winter	EX MH12	10	160.669	0.169	48.4	0.4480	0.0000	OK
15 minute winter	EX MH6	10	161.135	0.085	7.7	0.0858	0.0000	OK
15 minute winter	EX MH7	10	160.910	0.060	12.8	0.0502	0.0000	OK
15 minute winter	EX MH8	11	160.592	0.092	24.1	0.2006	0.0000	OK
15 minute winter	EX MH11	10	159.564	0.094	40.1	0.1210	0.0000	OK
15 minute winter	OUT_B	10	158.587	0.087	40.0	0.0000	0.0000	OK
15 minute winter	1	10	163.877	0.076	29.3	0.0855	0.0000	OK
15 minute winter	2	11	162.579	0.204	97.2	0.7192	0.0000	OK
240 minute winter	3	232	161.613	0.263	25.4	0.4650	0.0000	OK
15 minute winter	4	10	161.675	0.124	23.1	0.3187	0.0000	OK
240 minute winter	5	240	161.613	0.263	4.9	0.2974	0.0000	SURCHARGED
240 minute winter	J1	240	161.613	0.513	21.3	0.0000	0.0000	OK
240 minute winter	BASIN_2	236	161.613	0.513	29.6	157.3381	0.0000	SURCHARGED
240 minute winter	6_FC2	236	161.613	0.663	35.4	2.6851	0.0000	SURCHARGED
60 minute winter	7_IN	52	160.318	0.398	18.9	0.0000	0.0000	OK
60 minute winter	8_CP	51	160.322	0.322	38.0	1.1312	0.0000	SURCHARGED
60 minute winter	J2	51	160.321	0.401	36.6	0.0000	0.0000	OK
60 minute winter	BASIN_1	51	160.312	0.392	33.1	66.6196	0.0000	SURCHARGED
60 minute winter	9	50	160.311	0.411	23.9	0.7257	0.0000	SURCHARGED
60 minute winter	10	49	160.307	0.602	32.1	0.6809	0.0000	SURCHARGED
60 minute winter	11	50	160.300	0.650	30.1	0.7346	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	EX IC1	2.000	3	22.9	1.133	0.472	0.1740	
15 minute winter	EX MH14	8.000	8_CP	22.0	0.804	0.117	0.7953	
15 minute winter	EX MH15	4.000	EX MH15A	9.9	1.337	0.923	0.1428	
15 minute summer	EX MH15A	4.001	EX MH12	15.9	2.038	1.486	0.1059	
15 minute winter	EX MH12	4.002	10	47.6	1.538	0.853	0.9407	
15 minute winter	EX MH6	6.000	EX MH7	7.6	1.118	0.930	0.0565	
15 minute winter	EX MH7	6.001	EX MH8	12.7	1.532	0.323	0.0637	
15 minute winter	EX MH8	6.002	11	23.4	2.068	0.531	0.1663	
15 minute winter	EX MH11	4.006	OUT_B	40.0	3.610	0.640	0.0883	160.5
15 minute winter	1	1.000	2	29.1	2.483	0.240	0.2792	
15 minute winter	2	1.001	3	94.5	1.887	0.783	4.0369	
240 minute winter	3	1.002	6_FC2	25.4	0.522	0.132	3.6448	
15 minute winter	4	7.000	5	22.7	1.092	0.555	0.6684	
240 minute winter	5	7.001	J1	10.6	0.784	0.206	0.3033	
240 minute winter	BASIN_2	3.000	6_FC2	-29.6	-0.336	-0.162	1.3103	
240 minute winter	6_FC2	1.003	7_IN	5.0	1.436	0.019	0.4762	
60 minute winter	8_CP	8.001	J2	36.6	1.470	0.359	0.6690	
60 minute winter	BASIN_1	5.000	9	23.9	0.776	0.532	0.8459	
60 minute winter	9	5.001	10	24.4	0.694	0.333	3.1439	
60 minute winter	10	4.003	11	24.5	0.608	0.348	0.9537	
60 minute winter	11	4.004	12_FC1	27.7	0.556	0.401	0.9016	

**Results for 30 year Critical Storm Duration. Lowest mass balance: 99.74%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
60 minute winter	12_FC1	49	160.290	0.740	27.7	1.8839	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
60 minute winter	12_FC1	4.005	EX MH11	25.0	1.477	0.218	0.1405	



Results for 100 year Critical Storm Duration. Lowest mass balance: 99.74%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	EX IC1	344	161.776	0.201	4.7	0.3048	0.0000	OK
15 minute winter	EX MH14	10	160.859	0.079	28.7	0.1756	0.0000	OK
30 minute winter	EX MH15	15	162.770	0.460	30.6	2.0539	9.5744	FLOOD
15 minute summer	EX MH15A	9	162.150	0.409	20.6	1.3420	0.0000	FLOOD RISK
15 minute winter	EX MH12	11	160.730	0.230	59.1	0.6094	0.0000	SURCHARGED
15 minute winter	EX MH6	11	161.245	0.195	10.0	0.1960	0.0000	SURCHARGED
15 minute winter	EX MH7	11	160.918	0.068	16.0	0.0572	0.0000	OK
15 minute winter	EX MH8	12	160.692	0.192	30.7	0.4195	0.0000	SURCHARGED
15 minute winter	EX MH11	10	159.570	0.100	44.1	0.1297	0.0000	OK
15 minute winter	OUT_B	10	158.593	0.093	44.1	0.0000	0.0000	OK
15 minute winter	1	10	163.886	0.086	37.9	0.0961	0.0000	OK
15 minute winter	2	11	162.632	0.257	125.9	0.9026	0.0000	OK
360 minute winter	3	344	161.776	0.426	24.5	0.7526	0.0000	SURCHARGED
360 minute winter	4	352	161.776	0.226	4.7	0.5792	0.0000	SURCHARGED
360 minute winter	5	352	161.776	0.426	5.7	0.4821	0.0000	SURCHARGED
360 minute winter	J1	352	161.776	0.676	15.1	0.0000	0.0000	OK
360 minute winter	BASIN_2	344	161.776	0.676	28.0	222.7936	0.0000	SURCHARGED
360 minute winter	6_FC2	344	161.776	0.826	33.5	3.3438	0.0000	SURCHARGED
120 minute winter	7_IN	96	160.478	0.558	16.2	0.0000	0.0000	OK
120 minute winter	8_CP	92	160.482	0.482	31.6	1.6930	0.0000	SURCHARGED
120 minute winter	J2	92	160.481	0.561	29.7	0.0000	0.0000	OK
120 minute winter	BASIN_1	94	160.471	0.551	27.4	102.5035	0.0000	SURCHARGED
120 minute winter	9	94	160.469	0.569	23.9	1.0050	0.0000	SURCHARGED
120 minute winter	10	88	160.464	0.759	29.0	0.8583	0.0000	SURCHARGED
120 minute winter	11	88	160.458	0.808	28.0	0.9139	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	EX IC1	2.000	3	4.7	0.754	0.097	0.3331	
15 minute winter	EX MH14	8.000	8_CP	28.5	0.839	0.152	1.0202	
30 minute winter	EX MH15	4.000	EX MH15A	10.1	1.312	0.937	0.1428	
15 minute summer	EX MH15A	4.001	EX MH12	17.0	2.171	1.583	0.1058	
15 minute winter	EX MH12	4.002	10	56.4	1.537	1.010	1.1616	
15 minute winter	EX MH6	6.000	EX MH7	9.5	1.216	1.171	0.0644	
15 minute winter	EX MH7	6.001	EX MH8	15.9	1.557	0.404	0.0918	
15 minute winter	EX MH8	6.002	11	29.5	2.012	0.669	0.2028	
15 minute winter	EX MH11	4.006	OUT_B	44.1	3.677	0.705	0.0955	197.6
15 minute winter	1	1.000	2	37.7	2.602	0.312	0.3807	
15 minute winter	2	1.001	3	121.6	1.919	1.008	5.2423	
360 minute winter	3	1.002	6_FC2	23.8	0.504	0.123	4.1675	
360 minute winter	4	7.000	5	4.7	0.714	0.115	1.2795	
360 minute winter	5	7.001	J1	4.3	0.738	0.083	0.3033	
360 minute winter	BASIN_2	3.000	6_FC2	-28.0	-0.254	-0.153	1.3103	
360 minute winter	6_FC2	1.003	7_IN	5.0	1.437	0.019	0.5955	
120 minute winter	8_CP	8.001	J2	29.7	1.287	0.291	0.6690	
120 minute winter	BASIN_1	5.000	9	23.9	0.774	0.533	0.8459	
120 minute winter	9	5.001	10	24.4	0.691	0.333	3.1439	
120 minute winter	10	4.003	11	24.5	0.606	0.348	0.9537	
120 minute winter	11	4.004	12_FC1	26.5	0.534	0.384	0.9016	

**Results for 100 year Critical Storm Duration. Lowest mass balance: 99.74%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
120 minute winter	12_FC1	88	160.450	0.900	26.5	2.2906	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
120 minute winter	12_FC1	4.005	EX MH11	25.0	1.477	0.218	0.1370	

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.74%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	EX IC1	12	162.166	0.591	43.4	0.8970	0.0000	SURCHARGED
15 minute winter	EX MH14	10	160.875	0.095	41.6	0.2126	0.0000	OK
30 minute winter	EX MH15	13	162.770	0.460	44.4	2.0539	20.4146	FLOOD
15 minute summer	EX MH15A	8	162.150	0.409	22.9	1.6572	0.0000	FLOOD RISK
15 minute winter	EX MH12	11	161.256	0.756	79.8	2.0004	0.0000	SURCHARGED
15 minute winter	EX MH6	12	161.683	0.633	14.5	0.6370	0.0000	FLOOD RISK
15 minute winter	EX MH7	12	161.309	0.459	21.5	0.3839	0.0000	FLOOD RISK
15 minute winter	EX MH8	12	161.193	0.693	39.8	1.5154	0.0000	FLOOD RISK
15 minute winter	EX MH11	10	159.584	0.114	51.6	0.1474	0.0000	OK
15 minute winter	OUT_B	10	158.604	0.104	51.6	0.0000	0.0000	OK
15 minute winter	1	12	164.026	0.226	54.9	0.2528	0.0000	SURCHARGED
15 minute winter	2	12	163.815	1.440	179.6	5.0650	0.0000	SURCHARGED
15 minute winter	3	12	162.111	0.761	192.4	1.3448	0.0000	SURCHARGED
480 minute winter	4	472	162.080	0.530	5.5	1.3563	0.0000	SURCHARGED
480 minute winter	5	472	162.080	0.730	5.8	0.8254	0.0000	FLOOD RISK
480 minute winter	J1	472	162.080	0.980	19.2	0.0000	0.0000	OK
480 minute winter	BASIN_2	464	162.079	0.979	33.9	364.2397	0.0000	FLOOD RISK
480 minute winter	6_FC2	464	162.079	1.129	38.6	4.5710	0.0000	FLOOD RISK
180 minute winter	7_IN	144	160.735	0.815	18.2	0.0000	0.0000	OK
180 minute winter	8_CP	140	160.738	0.738	34.3	2.5963	0.0000	SURCHARGED
180 minute winter	J2	140	160.738	0.818	33.0	0.0000	0.0000	OK
180 minute winter	BASIN_1	144	160.727	0.806	32.3	171.3684	0.0000	FLOOD RISK
180 minute winter	9	140	160.725	0.824	23.9	1.4569	0.0000	SURCHARGED
180 minute winter	10	136	160.718	1.013	30.5	1.1460	0.0000	FLOOD RISK
180 minute winter	11	136	160.712	1.062	26.2	1.2006	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	EX IC1	2.000	3	38.9	1.217	0.804	0.3431	
15 minute winter	EX MH14	8.000	8_CP	41.3	0.875	0.221	1.2386	
30 minute winter	EX MH15	4.000	EX MH15A	10.1	1.302	0.943	0.1428	
15 minute summer	EX MH15A	4.001	EX MH12	18.4	2.349	1.712	0.1049	
15 minute winter	EX MH12	4.002	10	72.2	1.817	1.295	1.2100	
15 minute winter	EX MH6	6.000	EX MH7	11.7	1.498	1.443	0.0653	
15 minute winter	EX MH7	6.001	EX MH8	19.6	1.568	0.498	0.1271	
15 minute winter	EX MH8	6.002	11	34.8	1.992	0.788	0.2028	
15 minute winter	EX MH11	4.006	OUT_B	51.6	3.769	0.826	0.1090	234.0
15 minute winter	1	1.000	2	51.8	2.606	0.429	0.9485	
15 minute winter	2	1.001	3	153.5	2.180	1.271	5.6742	
15 minute winter	3	1.002	6_FC2	190.1	1.724	0.987	4.1675	
480 minute winter	4	7.000	5	5.3	0.689	0.129	1.2798	
480 minute winter	5	7.001	J1	6.9	0.707	0.134	0.3033	
480 minute winter	BASIN_2	3.000	6_FC2	-33.9	-0.307	-0.185	1.3103	
480 minute winter	6_FC2	1.003	7_IN	5.2	1.455	0.020	0.6596	
180 minute winter	8_CP	8.001	J2	33.0	1.200	0.324	0.6690	
180 minute winter	BASIN_1	5.000	9	23.9	0.733	0.533	0.8459	
180 minute winter	9	5.001	10	24.4	0.693	0.333	3.1439	
180 minute winter	10	4.003	11	24.5	0.608	0.348	0.9537	
180 minute winter	11	4.004	12_FC1	25.7	0.518	0.372	0.9016	

**Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.74%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
180 minute winter	12_FC1	136	160.703	1.153	25.7	2.9337	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
180 minute winter	12_FC1	4.005	EX MH11	25.0	1.477	0.218	0.1360	

A P P E N D I X M

PROPOSED DRAINAGE STRATEGY PLAN – NETWORK B

APPENDIX N

TSWMP



SURFACE WATER MANAGEMENT PLAN NOTES

- Control areas should be continuously reviewed by the site manager. Additional locations/relocation may be required subject to phasing and works required on site.
- Topsail strip should be kept to a minimum to suit the programme of works.
- Stockpiles of topsail should be seeded if intended to be in place for longer than 3 months.
- To prevent the deposition of silt into newly constructed or existing drainage systems, silt socks shall be inserted into all gully pots. The gully's should be inspected weekly and after each rainfall event. Repairs/replacement should be undertaken as necessary.
- After each rainfall event temporary control areas shall be drained and de-silted to ensure they are ready to accommodate the next rainfall event and reduce the chance of overtopping.
- After periods of heavy rainfall when the control areas are full then it may be necessary to tanker the water away to a suitable facility if there is a risk of overtopping.
- Dirty bags/silt socks to be emptied periodically and after each rainfall event. Sediment/silt shall be taken to a suitable facility or disposed of in a suitable location on site.
- Dirty bags/silt socks to be replaced as necessary in accordance with the manufacturers guidance.
- Once roads and gullies are constructed, all gullies are to have gully bags inserted which are to be inspected weekly and changed when necessary.
- This drawing assumes that permits will not be required. Responsibility falls to the contractor to confirm that permits to discharge are not required and that all silt prevention measures are always in place.

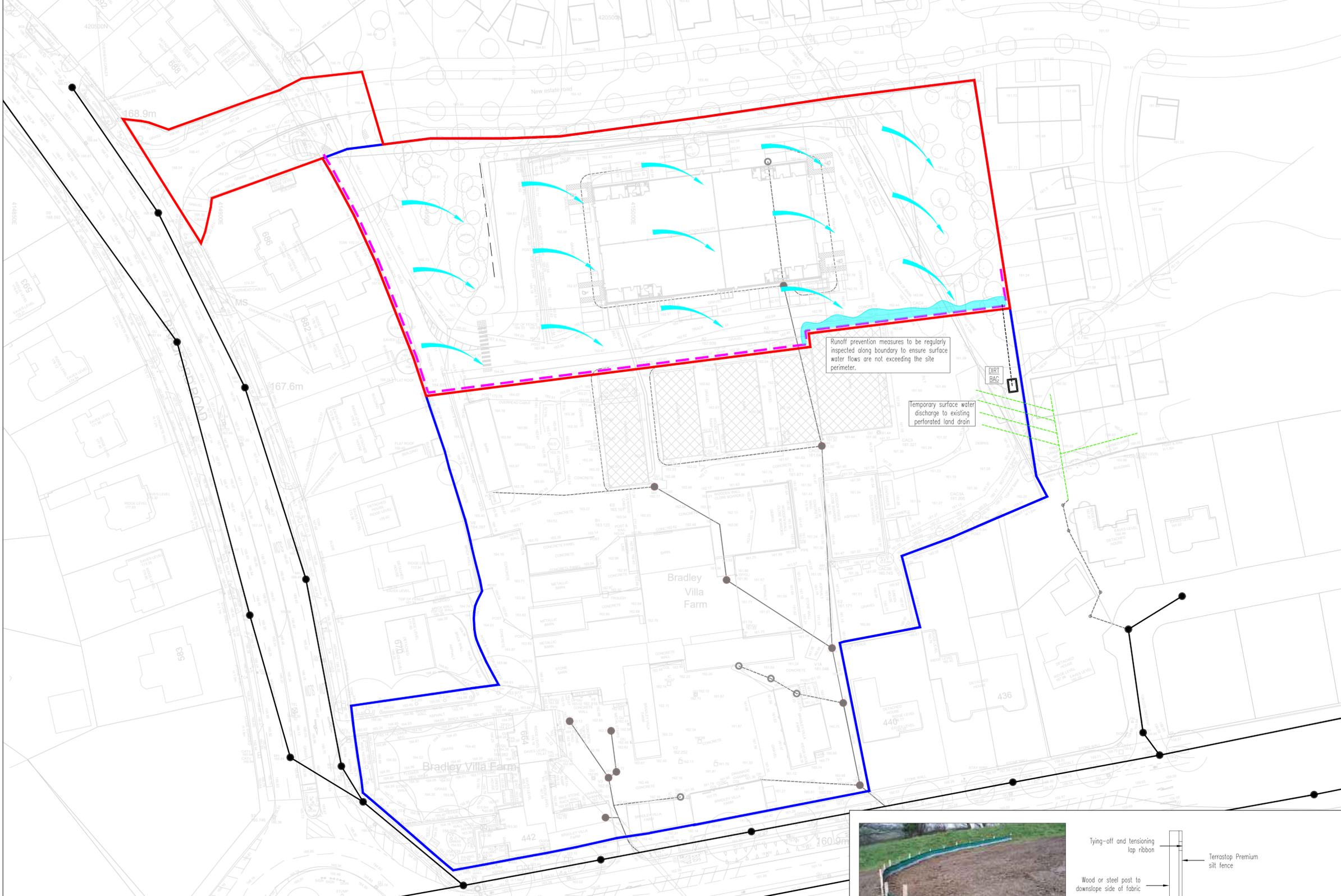
KEY

- Site Boundary
- Silt protection fence
- General Fall Direction
- Existing Perforated Land Drain

ALL SILT MANAGEMENT SYSTEMS TO BE MONITORED ON A WEEKLY BASIS

IT IS INEVITABLE THAT AS WORKS PROGRESS FURTHER MEASURES MAY BE NECESSARY. THIS SHOULD BE ASSESSED WITH THE WEEKLY MONITORING

SUBJECT TO THE APPROVAL OF ALL RELEVANT AUTHORITIES



Rev	By	Date	Revision	MD
/	JC	22.05.25	Issued for approval	MD

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TITLE
TEMPORARY SURFACE WATER MANAGEMENT PLAN

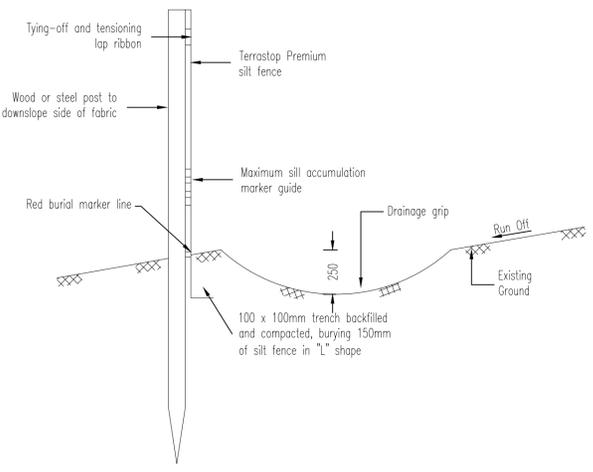
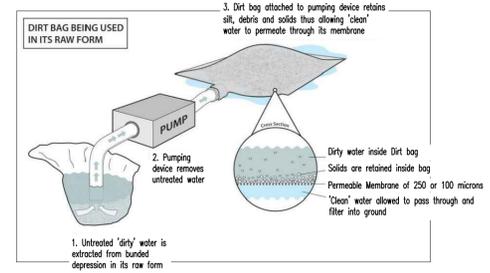
PROJECT
BRADLEY VILLA FARM

CLIENT
MR R KERSHAW

DRAWING STATUS
PRELIMINARY

Scale	Date	Drawn
1:500 @ A1	MAY 25	JC
	Chk.	MD

Drg. No. 2489/01/SK03



TYPICAL SECTION THROUGH HY-TEX TERRASTOP PREMIUM SILT FENCE (1:NTS)