FLOOD RISK AND DRAINAGE ASSESSMENT FOR AGRICULTURAL DEVELOPMENT AT PEAR TREE HILL ROAD, WHAPLODE DROVE, SPALDING

FINAL REPORT

ECL1427/ACORUS RURAL PROPERTY CONSULTANTS

DATE MARCH 2025

ELLINGHAM CONSULTING LTD
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CONTENTS

1.0 INTRODUCTION

This Flood Risk Assessment has been prepared in accordance with National Planning Policy Framework (NPPF) and supporting planning practice guidance (PPG) on Flood Risk and Coastal Change. In areas at risk of flooding or for sites of 1 hectare or more, developers are required to undertake a site-specific Flood Risk Assessment to accompany an application for planning permission.

Where a development consists of the provision of a building or buildings where the floor space to be created is more than 1,000m^2 a drainage strategy is required.

This Flood Risk Assessment and Drainage Strategy has been produced on behalf of Holbeach Farm Limited in respect of a development that comprises twelve poultry houses and two residential dwellings at Pear Tree Hill Road, Whaplode Drove.

A planning application for the proposed development is to be submitted by Acorus Rural Property Services.

2.0 SITE LOCATION AND DESCRIPTION

2.1 Site Location

The site is situated at Pear Tree Hill Road, Whaplode Drove, Spalding, Lincolnshire, PE12 0SL. The National Grid Reference of the site is 53242/31727.

The location of the site is shown in Figure 1.

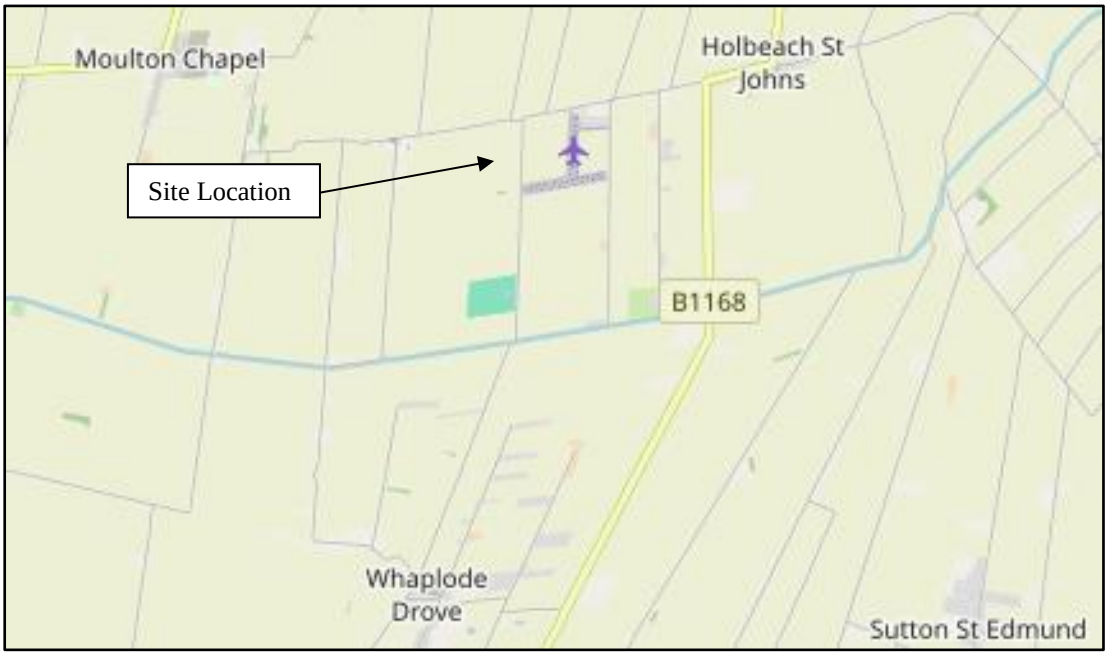


Figure 1 – Location Plan (© OpenStreetMap contributors)

2.2 Existing Site

The site is on the western side of Pear Tree Hill Road. The site comprises agricultural land and is surrounded by agricultural land. The area of the site is 9.2 hectares.

A topographic survey of the site has been undertaken and is shown in Attachment 1. The western half of the site has ground levels between +1.8m OD and +2.4m OD with a typical level of +2.0m OD. The eastern half of the site has ground levels between +1.4m OD and +2.2m OD with a typical level of +1.9m OD.

The site is in the South Holland Internal Drainage Board (IDB) District. Surface water at the site would naturally drain through soakaway and hence to the IDB drain system. There are riparian drains on the northern and western boundaries of the site and also a drain running centrally through the majority of the site. There is an IDB Ordinary Watercourse on the eastern boundary of the site.

The online British Geological Survey maps indicate that the site is likely to be underlain by West Walton Formation Mudstone and Siltstone. The bedrock is shown to be overlain with superficial deposits of clay and silt.

2.3 Proposed Development

The development comprises twelve poultry houses and two residential dwellings. The dwellings will be single storey. The proposed development is shown in Attachment 2.

2.4 Local Development Documents

The South East Lincolnshire Local Plan 2011 – 2036, adopted in March 2019, is the Local Plan for the district. Policy 4: Approach to Flood Risk states the requirements for flood risk reduction.

The South East Lincolnshire Level 1 and Level 2 Strategic Flood Risk Assessment (SFRA) was prepared in June 2017.

The Joint Lincolnshire Flood Risk and Drainage Management Strategy has been prepared by Lincolnshire County Council as the Lead Local Flood Authority. The purpose of the Strategy is to increase the safety of people across Lincolnshire by reducing the number of people at risk of flooding, increasing the resilience of local communities, and reducing the impact of flooding.

2.5 Available Flood Risk and Drainage Information

An extract from the Environment Agency Flood Map for Planning is shown in Figure 2. The site is partly located within Flood Zone 3, an area with a high probability of flooding.

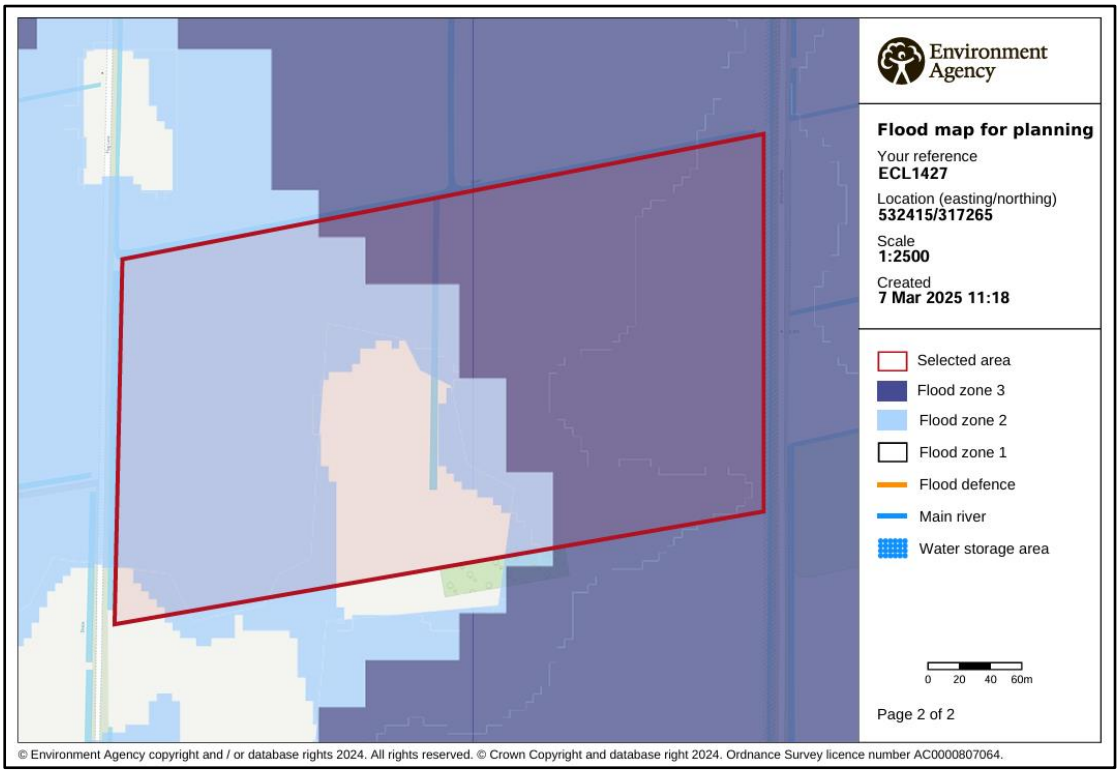


Figure 2 – Environment Agency Flood Map for Planning

The Environment Agency Long Term Flood Risk maps provide an indication of the risk from the primary sources of flooding. The details provided with these maps are summarised in Table 1. The fluvial design flood to be considered within a Flood Risk Assessment is the 1% annual probability event. As such the depths of flooding identified is the maximum depth that occurs during a low chance (between 0.1% and 1% chance each year) event.

	Present Day		2050 Epoch	
	Risk of Flooding	**Depth (Low chance)**	**Risk of Flooding**	**Depth (Low chance)**
Rivers and the Sea	The site has a low chance (between 0.1% and 1% chance each year)	No data available	No data available	No data available
Surface Water	Isolated areas of the site have between a low chance (between 0.1% and 1% chance each year) and a high chance (more than 3.3% chance each year) of flooding.	During low risk events depths are up to 0.2m	Isolated areas of the site have between a low chance (between 0.1% and 1% chance each year) and a high chance (more than 3.3% chance each year) of flooding.	During low risk events depths are up to 0.2m
Reservoir	Outside of the area at risk.			

Table 1 – Environment Agency Long Term Flood Risk Maps

Table 2 shows the level of risk at the site within the South East Lincolnshire SFRA.

SFRA Map	Present Day	2116
Residual Flood Hazard Map for the 1% fluvial and 0.5% tidal event	The site is outside the 'Low Hazard' area	The site is outside the 'Low Hazard' area
Residual Peak Depth Map for the 1% fluvial and 0.5% tidal	The site is outside the area at risk	The site is outside the area at risk

Table 2 – Flood Risk within SFRA Maps

3.0 FLOOD RISK VULNERABILITY

3.1 The Sequential and Exception Test

The NPPF requires the application of a Sequential Test to ensure that new development is in areas with the lowest probability of flooding.

The Exception Test is a method to demonstrate and help ensure that flood risk to people and property will be managed, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available.

3.2 Vulnerability Classification

Table 2 of the PPG Flood Risk and Coastal Change categorises different types of uses and development according to their vulnerability to flood risk. The proposals include development that is covered by the description of buildings used for dwellings and is classified as 'More vulnerable'.

Table 3 of the PPG Flood Risk and Coastal Change sets out Flood Risk Vulnerability and flood zone 'compatibility'. The site is in Flood Zone 3 and the development is 'More vulnerable' therefore it is necessary to complete the Exception Test.

PPG Flood Risk and Coastal Change defines that the lifetime of the development in terms of flood risk and coastal change is 100 years.

3.3 Application of the Sequential Test and Exception Test

It is for the Local Planning Authority, using the evidence provided and taking advice from the Environment Agency as appropriate, to consider whether an application passes the Sequential Test.

Large parts of the South Holland district close lie within Flood Zone 3. As such, opportunities to undertake the development at an alternative site with a lower flood risk are limited. In this context it is noted that SE Lincolnshire Local Plan residential allocations are within flood risk areas due to the lack of availability of sites within areas of lower flood risk.

The SFRA states that as it is necessary to use the refined flood risk information (hazard and depth maps) to assist with the application of the Sequential Test. The refined flood risk information contained within the SFRA demonstrates the site is not at risk during the 1% fluvial or 0.5% tidal event. The site therefore has a low probability of flooding and is considered to pass the Sequential Test.

The Exception Test requires consideration of the wider sustainability benefits of a development and that the development would be safe and residual risks managed.

Section 5 of this Flood Risk Assessment describes the flood mitigation measures and the management of the residual risks, demonstrating that this development will be

safe and not increase flood risk elsewhere. The development is considered to pass the Exception Test.

4.0 SITE SPECIFIC FLOOD RISK

4.1 Local Flood Assets

The site is 6.8km east of the River Welland. Cowbit Wash is the floodplain to the River Welland and the land to the east is protected from the River Welland by the Cowbit Wash Barrier Bank.

The site is 8.0km south east of the Coronation Channel, a bypass channel of the River Welland. The embankments of the Coronation Channel were constructed in the 1950's to convey river flows around Spalding. The Coronation Channel together with the Crowland and Cowbit Washes offer flood reduction to Spalding and the surrounding district. The Cowbit Wash Barrier Bank and the Coronation Channel are the responsibility of the Environment Agency.

There is a long-term strategy for the maintenance of the Environment Agency defences which is reviewed and updated periodically.

There is an extensive local drainage network managed by South Holland IDB. There is an IDB Ordinary Watercourse on the eastern boundary of the site. The site and surrounding land are within the Peartree Hill catchment and drains to the Peartree Hill Pumping Station which discharges to the South Holland Main. The South Holland Main Drain discharges to the tidal River Nene at the Sutton Bridge Tidal Sluice.

During the operation and maintenance of its pumping stations, associated structures, and channel systems, the IDB seeks to maintain a general standard capable of providing flood protection to its district. A routine maintenance programme is in place to ensure that the Boards assets are commensurate with the standard of protection that is sought.

Current maintenance standards of the South Holland Internal Drainage Board and the Environment Agency are generally good.

4.2 Sources of Flooding

A summary of the sources of flooding is provided in Table 3.

Source of Flooding	Level of Risk
Drainage Network Flooding	The risk is assessed in Section 4.3.
Surface Water Flooding	Based upon the EA maps isolated areas of the site are at risk.
Fluvial Flooding	The risk is assessed in Section 4.3 and 4.5.
Tidal Flooding	The site is not at risk of tidal flooding.
Reservoir Flooding	Based upon the EA maps the site is not at risk of flooding from reservoirs.
Groundwater Flooding	There is no evidence to suggest the site is at risk of groundwater flooding.

Table 3 – Sources of Flooding

4.3 Probability of Flooding

The probability of flooding associated with blockages in the South Holland IDB drainage system is low due to the maintenance standards achieved and managed by the IDB. Failure of Peartree Hill Pumping Station would lead to an increased level of risk in the catchment.

Through the operation and maintenance of the pumping stations and the channel system the Board seek to maintain a general standard capable to providing flood protection to agricultural land and developed areas of 1 in 20 years and 1 in 100 years, respectively. The risk associated with flood events that exceed the standard of protection provided is lowered due to the South Holland IDB main drains incorporating freeboard. This freeboard provides storage during the exceedance events.

The Coronation Channel earth embankment has a minimum crest level of +6.0m OD. The 1% annual probability (1 in 100 chance each year) peak flood level inclusive of climate change during the next 100 years in the River Welland is +5.45m OD. The Coronation Channel embankment provides a standard of protection of 1% annual probability (1 in 100 chance each year) with a minimum 0.55m freeboard.

The Cowbit Wash Barrier Bank is at a level of +5.90m OD and therefore provides 0.45m of freeboard above the flood level during the 1% annual probability (1 in 100 chance each year) event with climate change. The Cowbit Wash Barrier Bank falls within the Reservoirs Act 1975 legislation. As such it is regularly inspected by a Supervising Engineer who will assess its structural integrity to provide protection to people and property.

4.4 Historic Flooding

During the preparation of this assessment, no evidence was discovered of the site being flooded.

4.5 Climate Change

Climate change is likely to impact the site through increased rainfall intensity and duration affecting the local drainage network and increased flood levels in the River Nene.

The River Welland defences have been designed to include an allowance for climate change.

In summary the existing systems and defences are appropriate for the design life of the development (i.e., 100 years).

4.6 Residual Risk

There is a residual risk of flooding in the vicinity of the site should a breach of the tidal defences occur. The South East Lincolnshire SFRA includes maps demonstrating the residual peak depth in 2116. When climate change allowances are applied to the 1% annual probability (1 in 100 chance each year) fluvial event and 0.5% annual probability (1 in 200 chance each year) tidal event the site is not at risk during a breach.

5.0 FLOOD RISK MITIGATION

5.1 Summary of Risks

The probability of this development flooding from localised drainage systems is low. Failure of Peartree Hill Pumping Station could lead to an increased level of risk at the site.

The probability of the site flooding from any Environment Agency system is less than 1% annual probability (1 in 100 chance each year) because of the standards of the existing flood defences. Over time there will be a gradual increase in risk to the site due to climate change. During the design life of the development, it is not anticipated that the site would flood.

The SFRA considers the residual risk associated with overtopping and a breach in the defences in 2115. The maps show that the site is not at risk.

The development increases the impermeable area and therefore has the potential to increase flood risk elsewhere.

5.2 Mitigation Measures

The site has a low 'actual risk' of flooding. Based upon the information available during the preparation of this flood risk assessment, it is recommended that the floor level of the dwellings is 0.3m above surrounding ground level. Furthermore, there should be 0.3m of flood resilient construction above finished floor level.

Considering the actual risk of flooding and the type of development there are no specific mitigation measures proposed associated with the design of the poultry units.

The developer should ensure that the eventual occupiers of the dwellings are sufficiently aware of the risk of flooding, and the standard of the existing defences. The Environment Agency operates a flood warning system for properties at risk of flooding to enable householders to protect life or take actions to manage the effect of flooding on property. Floodline Warnings Service is a national system run by the Environment Agency for broadcasting flooding warnings. The occupiers of the dwellings should register to receive flood warnings.

Should there be a failure of Peartree Hill Pumping Station and conditions were such to put properties and land at risk of flooding, the Internal Drainage Board would take emergency action to maintain the drainage level of service by using temporary pumping equipment.

The potential for an increased level of surface water runoff from the site is described in Section 6.

6.0 SURFACE WATER STRATEGY

6.1 Existing Drainage and Runoff Rates

The existing site is undeveloped. It is anticipated that the surface water will infiltrate into the ground or during an exceedance event flow overland to one of the watercourses within or on the boundary of the site.

Greenfield runoff rates have been estimate based upon a site area that is 9.2ha. The rates within Table 4 have been estimated using the IH124 method within HR Wallingford's Greenfield Runoff Rate Estimation tool.

Event	QBar	1 in 1 Year	1 in 30 Year	1 in 100 Year
Flow	12.86 l/s	11.19 l/s	31.51 l/s	45.78 l/s

Table 4 – Greenfield Runoff Rates

6.2 Proposed Approach to SuDS

The SuDS Manual states that where not collected for re-use, surface water runoff should be as discharged as high up the hierarchy of discharge solutions as is practicable:

- into the ground;
- to a surface water body;
- to a surface water sewer, highway drain or another drainage system; and
- to a combined sewer.

Infiltration testing at the site was undertaken in September 2024. The results, which are provided in Attachment 3, show that the test pit did not drain and the tests were not completed. The testing concluded that the site is not suitable for the use of soakaways.

Based upon the test results it is proposed that surface water runoff is attenuated on site before being discharged to a watercourse at a reduced rate.

The proposed poultry units will each have a roof area of 2,675m^2. The total impermeable roof area associated with the poultry units is 16,050m^2.

The key components of the drainage arrangement and the proposed SuDS system are:

- earthworks will be undertaken in the vicinity of the proposed poultry units and detention basin such that the ground is level;
- the finished floor level of the buildings will be +2.0m (west) and +1.9m OD (east);
- detention basin is in an area with ground levels that are typically +1.9m AOD;

- the invert level of the detention basin will be +0.65m AOD (1.25m below ground level);
- the detention basin will have a surface plan area of 220m x 20m and will have 1 in 3 slopes;
- ground levels / bund levels around the detention basin will be +2.0m AOD providing a minimum of 0.3m of freeboard during the design event including climate change;
- the outlet from the detention basin will be controlled by a Hydrobrake limiting flows to the 1 in 1 years greenfield runoff rate of 11.2l/s; and
- the flow from the detention basin will discharge to the riparian drain that runs along the eastern boundary of the site.

A conceptual model of the preliminary drainage and SuDS features was developed in Causeway Flow. The modelled arrangement including details of the impermeable area, attenuation and flow control are shown in Figure 3.

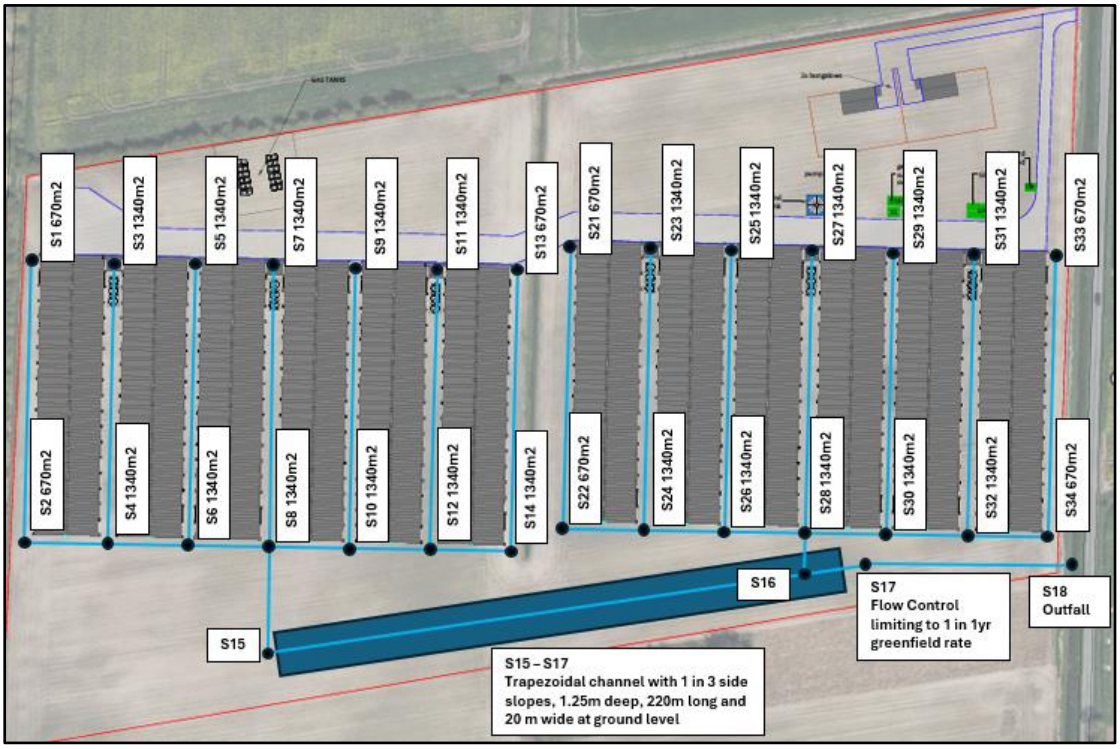


Figure 3 – Modelled Arrangement

Within the conceptual modelling:

- the rainfall methodology uses the Flood Estimation handbook;
- the attenuation has been modelled as a trapezoidal channel; and
- the depth of the trapezoidal channel is relatively shallow (1.25m) to reduce the risk of the capacity being reduced by ground water.

6.3 Present Day Hydraulic Performance

The modelling undertaken has been for all flood event durations between 1 hour and 24 hours. The results for return periods up to 1 in 100-year (1% AEP) event are provided in Attachment 4 and maximum flow rates in Table 5.

Event	1 in 1 Year	1 in 30 Year	1 in 100 Year
Flow	10.9 l/s	11.2 l/s	11.2 l/s

Table 5 – Proposed Discharge Rates

The proposed discharge rates do not exceed the 1 in 1 year greenfield runoff rate.

For the 1 in 100-year return period, the 12-hour duration winter event is critical in terms of storage. The maximum depth in the detention basin during this event is 0.77m with 1299m^3 of runoff stored.

The non-statutory technical standards for sustainable drainage systems states the runoff volume from the development in the 1% AEP (1 in 100-year), 6-hour rainfall event should not exceed the runoff volume for the same event from the pre-developed site. Where this is not possible the runoff volume must be discharged at a rate that does not adversely affect flood risk. Based upon the discharge rates in Table 3 there will not be an adverse impact upon flood risk.

6.4 Climate Change Hydraulic Performance

Over the life of the development, it is anticipated that there will be increases in rainfall intensity associated with climate change.

Climate change allowances of 20% and 40% have been considered during the runs of the conceptual model for the 1 in 100-year event. The results are summarised in Table 6.

Event Return Period	Present Day 1 in 100 year	1 in 100 year with 35% climate change	1 in 100 year with 50% climate change
Stored Level	1.42m AOD	1.55m AOD	1.68m AOD
Discharge	11.2l/s	11.2l/s	11.2l/s

Table 6 – Climate Change Flood Levels and Discharge Rates

During the 1 in 100 year with climate change events:

- there is no flooding from the attenuation area for the 40% climate change event and there is 0.3m freeboard above the flood level;
- there is no flooding within the pipe network for the 20% climate change event; and
- the discharge rate does not exceed the present day green field runoff rate.

6.5 Discharge and System Exceedance

It is proposed that the runoff from the development is discharged to the watercourse on the eastern boundary of the site. The outlet will discharge through a headwall structure, it is recommended that there is scour protection downstream of this structure.

It is noted that during the 1 in 100 year event with 40% climate change there is some flooding from the pipe network. Should there be an exceedance event it is anticipated that overland flows will discharge to the existing drainage network within or on the boundary of the site.

7.0 CONCLUSIONS

As a result of the assessment, the following conclusions have been reached.

- The development will comprises twelve poultry houses and two residential dwellings at Pear Tree Hill Road, Whaplode Drove, Spalding.

- The site is located within an Internal Drainage Board catchment and through the operation and maintenance of the pumping stations and the channel system the Board seek to maintain a general standard capable to providing flood protection to agricultural land and developed areas of 1 in 20 and 1 in 100 years, respectively.

- The proposed development is in Flood Zone 3. The site benefits from defences on the tidal River Welland that provide protection during the 1% annual probability (1 in 100 chance each year) fluvial event including an allowance for climate change. The site is not at risk during a breach of the tidal defences.

- It is recommended that the floor level of the dwellings is 0.3m above surrounding ground level and there should be 0.3m of flood resilient construction above finished floor level. There are no specific recommendations associated with the poultry houses to reduce the risk of flooding.

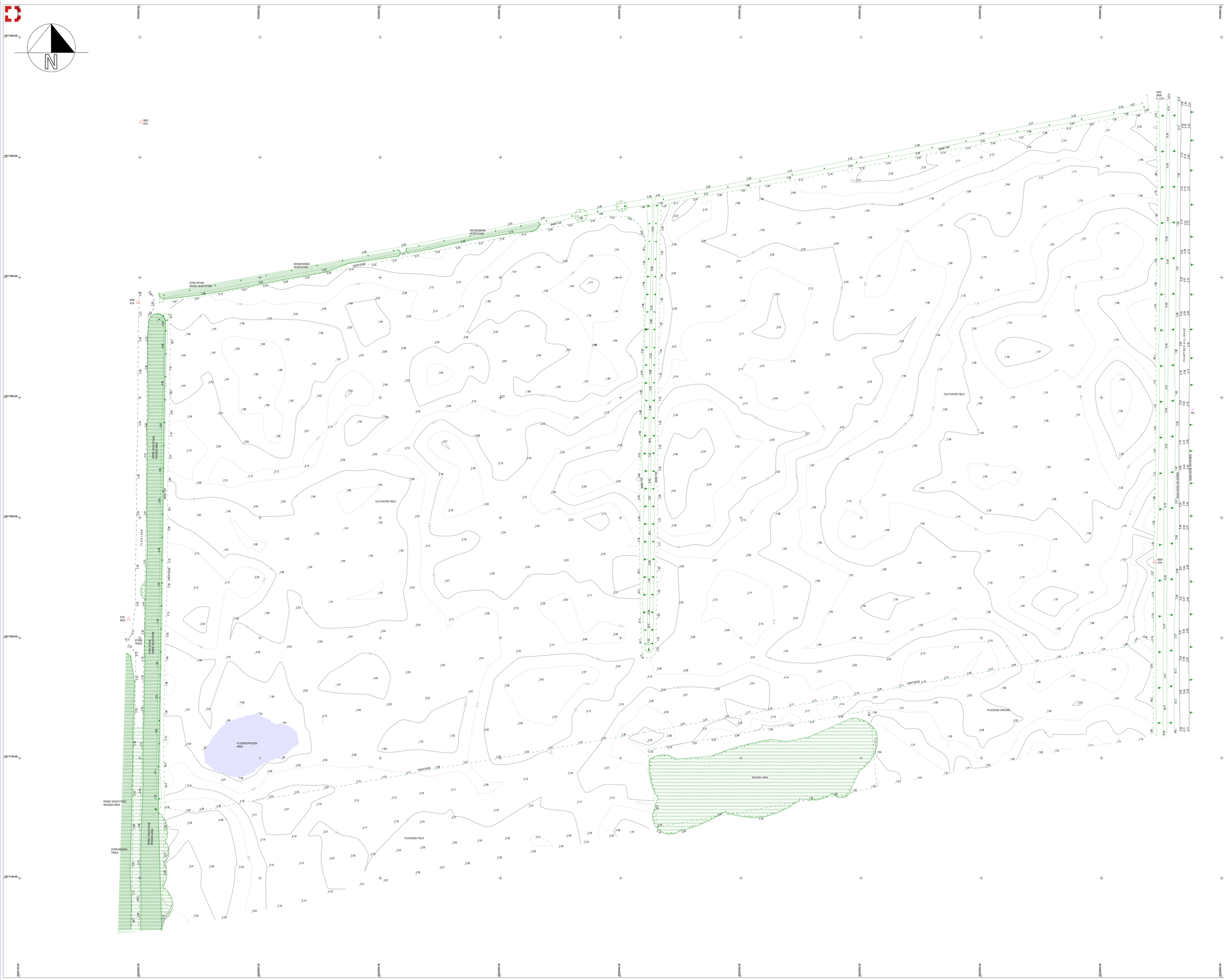
- The modelling has demonstrated that a drainage scheme can be implemented so that surface water runoff is attenuated within a bason to the south of the poultry units and discharged at greenfield runoff rates to the IDB Watercourse to the east of the site.

- The hydraulic modelling shows that there is no flooding within the site during the 1% annual probability (1 in 100 chance each year) event with 20% climate change and no flooding from the detention basin during the 1% annual probability (1 in 100 chance each year) event with 40% climate change.

- The development passes the Sequential Test and Exception Test and is therefore suitable for the proposed location.

ATTACHMENT 1

TOPOGRAPHIC SURVEY



NOTES

ABBREVIATIONS & SYMBOLS

AV	AIR VALVE	OHC	OVERHEAD CABLE
BH	BORE HOLE	PB	POST BOX
BOL	BOLLARD	PINV	PIPE INVERT LEVEL
CATV	CABLE TV MH	PM	PARKING METER
CCTV	SECURITY CAM	PO	POST
CL	CABLE LEVEL	PTL	POST TOP LEVEL
CH	CHANNEL	P/R	POST & RAIL FENCE
COL	COLUMN	P/W	POST & WIRE FENCE
CVO	CABLE TV I/O	RAMP	RAMP INCLUDING KERB
DP	DOWN PIPE	RE	RIDGING EVE/POINT
DR	DRAIN	RL	RIDGE LEVEL
EL	EAVES LEVEL	RP	REFLECTIVE POST
EP	ELECTRIC POLE	RS	ROAD SIGN
FB	FLOWER BED	SL	SOFFIT LEVEL
FB	FLOWER BED	SOFF	SOFFIT LEVEL
FH	FIRE HYDRANT	SV	VALVE
FFL	FINISHED FLOOR LEVEL	TW	TRADICE WATER
FP	FLAG POLE	TAC	TACTILE PAVING
FW	FOUL WATER	TH	TRIAL HOLE
GV	GAS VALVE	TL	TRAFFIC LIGHTS
HW	HEADWALL	TLVL	TARMAC LEVEL
IC	INSPECTION COVER	TOP	TOP OF KERB LEVEL
IL	INVERT LEVEL	TP	TELEGRAPH POLE
KB	KERB BOTTOM	TRK	TRACK
KO	KERB OFFLET	UO	UNABLE TO LIFT
LP	LAMP POST	UPVC	UPVC PIPE
LT	LAMP POST	WL	WATER LEVEL
LC	LIGHT COLUMN	WLVL	WATER LEVEL
MH	MANHOLE	WM	WATER METER
MP	MARKER POST	WO	WASH-OUT POINT

FENCE, HEDGE, ELECTRIC, BANK EDGE, STORM LINE, FOUL LINE, TELECOM LINE, GAS LINE, LARSON PILES, CHANNELS, WATER MAIN, TREE, BOREHOLE, STATION, TRIM, MANHOLE, GULLY, BATTER, WATER LVL, GATE

1. THE POSITION OF THIS SURVEY IS BASED ON GPS OSTN15 GRID.

2. ALL LEVELS RELATE TO GPS DATA ACQUIRED WITH TRIMBLE VRS.

3. TREES SPREADS ARE DRAWN TO SCALE AND SHOW THE GENERAL AVERAGE CANOPY SPREAD.

4. ALL BELOW GROUND LEVEL INFORMATION INCLUDING VOIDS, DRAINAGE & SERVICES HAVE BEEN IDENTIFIED FROM THE SURFACE LEVEL ONLY. THEREFORE PIPE SIZES ETC ARE APPROXIMATE AND ALL INFORMATION SHOULD BE CHECKED PRIOR TO THE COMMENCEMENT OF ANY SITE WORKS

5. EVERY EFFORT HAS BEEN MADE TO LOCATE AND SURVEY ALL VISIBLE FEATURES. IT SHOULD BE NOTED THAT SOME ITEMS MAY HAVE BEEN OBSCURED AT THE TIME OF THE SURVEY AND THEREFORE NOT SHOWN ON THIS DRAWING.

6. PHYSICAL BOUNDARY FEATURES SHOWN ON THIS DRAWING DO NOT NECESSARILY REPRESENT THE ACTUAL LEGAL BOUNDARIES. THIS INFORMATION SHOULD BE CONFIRMED WITH THE RELEVANT DOCUMENTATION.

7. THE CONTRACTOR MUST CHECK AND VERIFY ALL SITE LEVELS, SERVICES AND BOUNDARIES BEFORE ANY WORKS COMMENCE. THE COMMENCEMENT OF ANY SITE WORKS ANY DISCREPANCIES MUST BE NOTIFIED TO DANIEL CHARLES SURVEYS LTD.

8. ALL SURVEY STATION CONTROL POINTS MUST BE CHECKED BY THE CONTRACTOR PRIOR TO STARTING ANY SITE WORKS.

SURVEY CONTROL POINT INFORMATION

Point	Easting	Northing	Elevation
9000	532199.217	317339.645	2.315
9001	532200.509	317414.653	2.601
9002	532195.396	317207.887	2.373
9004	532622.140	317231.663	2.340

SURVEY DATE: JAN 2025 | INITIALS: MDH

Rev.	Amendments	Drn.	Date

Client:
CLARKE CONSTRUCTION

Project Title:
PEARTREE HILL ROAD - SPALDING

Drawing Title:
TOPOGRAPHICAL SURVEY

Scale @ A0: 1:500	Date: 16/01/2025
Drawing No: 25-03-01	Rev:
C.A.D. File: jobs\clarke - peartree hill road - spalding\1 magnet master files\masterdtm (25-03-01).mpj	
Drawn By: MDH/ASH/V	Checked By: MJW

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ATTACHMENT 2

PROPOSED SITE PLAN

80x360ft Sheds - floor area - 2675m² (28800.4ft²)
6 sheds on each site with a total floor area of 16050m² (172800ft²)
12 sheds total with a overall floor area of 32100m² (345600ft²)

Development Area

REV	DATE	DESCRIPTION	DRAWN	CHKD
F01	12.09.24	1st issue.	JF	

NOTES

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The Workshop, Slippery Gowt Lane
Wyberton, Boston, LincolnshirePE21 7AA
Tel: 01205 354629
info@clarkegroup.co.uk
www.clarkegroup.co.uk

DRAWING TITLE
Holbeach, Proposed Site with 12 sheds 80x360ft

JOB NO. CGXXXXX - PROJECT TRUE - SHEET SK.03
STATUS: FEASIBILITY

DATE	SCALE	REV	DRAWN	CHECKED
12-Sep-24	1:750@A1	F01	JF	

ATTACHMENT 3

INFILTRATION TEST RESULTS

INFILTRATION REPORT

PROPOSED DEVELOPMENT
PEAR TREE HILL ROAD,
HOLBEACH ST JOHN,

PROJECT No: SW25-106
DOCUMENT REF: SW25-106-IT-01

FOR CLARKE GROUP CONSTRUCTION LTD.

CONTENTS

Revision	Date	Description		
-	Feb. '25	First Issue	Prepared	Jack Lawrence
			Approved	A.Wilson CEng MIStructE

1. Location & Description of Site

1.1. Site Location

The site is situated to the West of Pear Tree Hill Road, Holbeach St John, Lincolnshire.

Figure 1: Site Location from Google Eart

1.2. Site Description

The site currently lies as a clear grass field with no signs of any existing development.

1.3. Geological Description

Desktop study of the area has been undertaken using the British Geological Society Maps.

The maps indicate the site to be underlain by superficial tidal flat deposits of Clay and Silt, with a bedrock geology of Mudstone, which is in line with what we would expect to see in this area.

This information is based upon publicly available records.

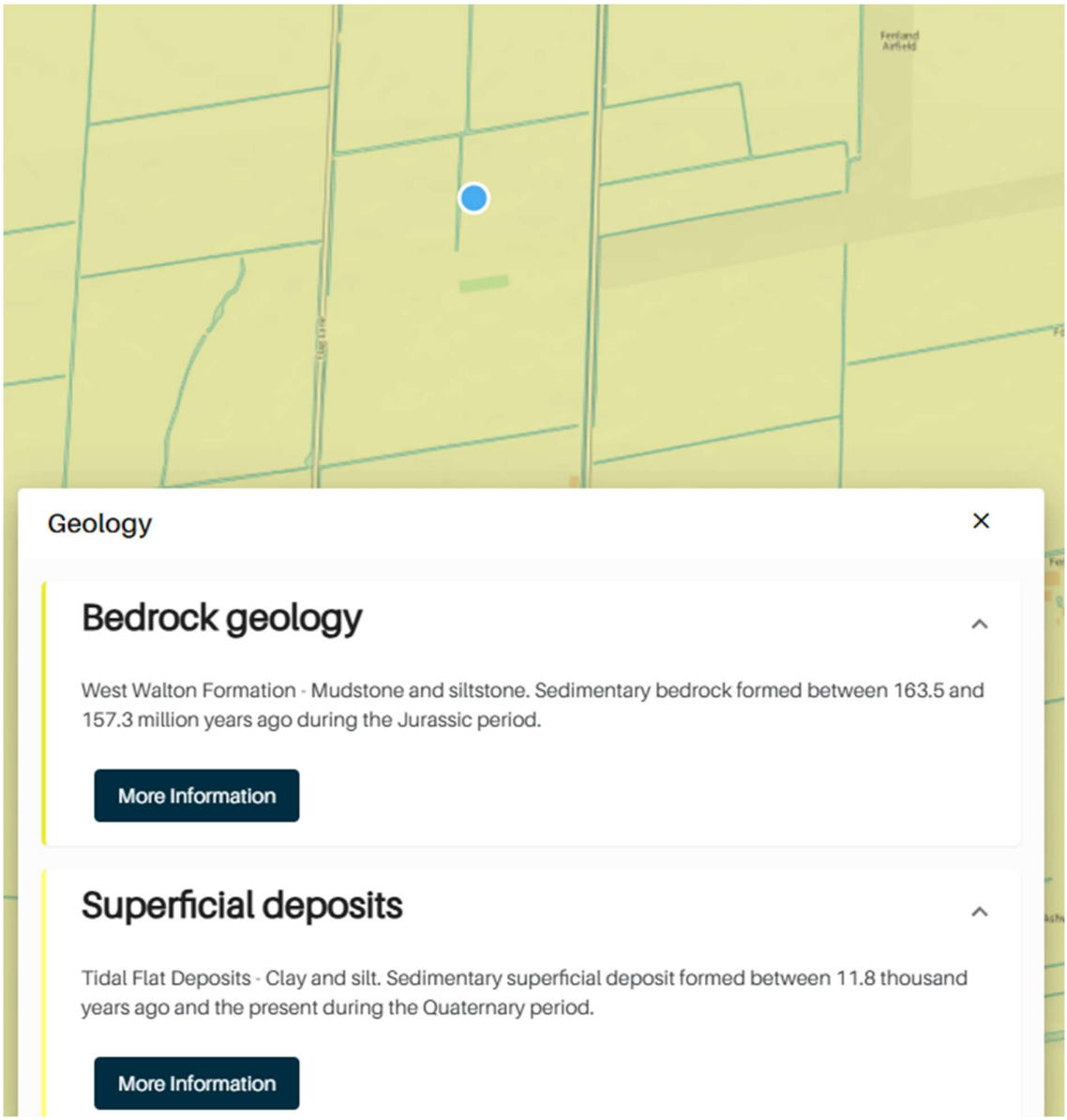


Figure 2: Data from BGS Geology Viewer

3. Site Works

1 No. Trial Pits were excavated over the site with use of a mechanical excavator, local to the site entrance.

Photographic records of the trial pits being excavated can be found at the rear of this report.

4. Percolation Tests

One No. percolation tests were undertaken in TP01 on the proposed site.

SA01 was undertaken in TP01 in proximity to the entrance to the entrance to the field.

5. Infiltration Test Results

Results from the infiltration testing are tabulated below:

Test Pit	Test 1	Test 2
SA01 – Site Entrance	0.00x 10^{-6} m/s	0.00x 10^{-6} m/s

6. Conclusions & Recommendations

Following our site visit on 29th January to undertake infiltration testing, arriving at site the fields had a significant amount of water perched on the surface.

Once the trail pit was excavated, 1.8m long x 1.3m wide x 1.0m deep, the bottom of the pit was a stiff clay, it could be seen that water was running into the excavation from the top of this clay layer.

The trial pit was filled with water to a level of 550mm from the top and recordings were taken as per the attached testing sheet, the results returned demonstrated that the ground conditions are not suitable for the use of soakaways.

With the results returned proving soakaways unfeasible, surface water discharge to a watercourse should be pursued in line with the next level of the SUDs hierarchy. It would be required to obtain permission from the local IDB to discharge in the surrounding dyke network.

This would need to be a designed system with an attenuation lagoon that would be able to store surface water prior to the discharge into the watercourse via the flow control device.

We trust that the above is clear, however, should you have any queries, please do not hesitate to get in contact.

Appendix A

SHIELDS WILSON
e: info@shieldswilson.co.uk t: 01775 729252
STRUCTURAL AND CIVIL ENGINEERING

PEAR TREE HILL ROAD. INFILTRATION TEST

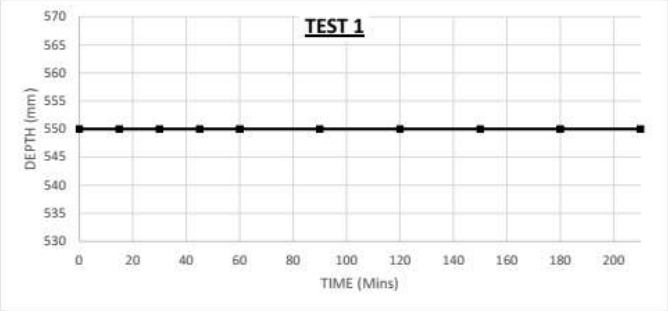
SA01	TEST 1
TIME (Mins)	DEPTH mm (d)
0	550
15	550
30	550
45	550
60	550
90	550
120	550
150	550
180	550
210	550

INFILTRATION TEST - HOLE SA01

PROJECT NO. 25-106

SITE VISIT: 29/01/2025

TRIAL PIT DIMENSIONS (m)	
A [L]	1.80
B [W]	1.30
C [D]	1.00



SOIL INFILTRATION RATE, f
TEST 1
0 m/s
0 m/h

Appendix B

ATTACHMENT 4

HYDRAULIC DESIGN REPORT

Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Inverts
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	0.000
Time of Entry (mins)	10.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
S1	0.067	10.00	2.000	1350	0.400
S2	0.067	10.00	2.000	1350	0.800
S3	0.134	10.00	2.000	1350	0.400
S4	0.134	10.00	2.000	1350	0.930
S5	0.134	10.00	2.000	1350	0.400
S6	0.134	10.00	2.000	1350	1.060
S7	0.134	10.00	2.000	1350	0.400
S8	0.134	10.00	2.000	1350	1.200
S9	0.134	10.00	2.000	1350	0.400
S10	0.134	10.00	2.000	1350	1.060
S11	0.134	10.00	2.000	1350	0.400
S12	0.134	10.00	2.000	1350	0.930
S13	0.067	10.00	2.000	1350	0.400
S14	0.067	10.00	2.000	1350	0.800
S15	0.000		1.900		1.150
S16	0.000		1.900		1.240
S17	0.000		1.900		1.250
S18	0.000		1.900	1500	1.550
S21	0.067	10.00	1.900	1200	0.400
S22	0.067	10.00	1.900	1350	0.800
S23	0.134	10.00	1.900	1350	0.400
S24	0.134	10.00	1.900	1350	0.930
S25	0.134	10.00	1.900	1350	0.400
S26	0.134	10.00	1.900	1350	1.060
S27	0.134	10.00	1.900	1350	0.400
S28	0.134	10.00	1.900	1500	1.200
S29	0.134	10.00	1.900	1350	0.400
S30	0.134	10.00	1.900	1350	1.060
S31	0.134	10.00	1.900	1350	0.400
S32	0.134	10.00	1.900	1350	0.930
S33	0.067	10.00	1.900	1350	0.400
S34	0.067	10.00	1.900	1350	0.800

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	S1	S2	115.000	0.600	1.600	1.200	0.400	287.5	375	11.80	50.0
1.001	S2	S4	32.000	0.600	1.200	1.070	0.130	246.2	375	12.27	50.0
2.000	S3	S4	115.000	0.600	1.600	1.070	0.530	217.0	375	11.56	50.0
1.002	S4	S6	32.000	0.600	1.070	0.940	0.130	246.2	375	12.73	50.0
3.000	S5	S6	115.000	0.600	1.600	0.940	0.660	174.2	375	11.40	50.0
1.003	S6	S8	32.000	0.600	0.940	0.800	0.140	228.6	375	13.18	50.0
7.000	S7	S8	115.000	0.600	1.600	0.800	0.800	143.8	375	11.27	50.0
4.000	S13	S14	115.000	0.600	1.600	1.200	0.400	287.5	375	11.80	50.0
4.001	S14	S12	32.000	0.600	1.200	1.070	0.130	246.2	375	12.27	50.0
5.000	S11	S12	115.000	0.600	1.600	1.070	0.530	217.0	375	11.56	50.0
4.002	S12	S10	32.000	0.600	1.070	0.940	0.130	246.2	375	12.73	50.0
6.000	S9	S10	115.000	0.600	1.600	0.940	0.660	174.2	375	11.40	50.0
4.003	S10	S8	32.000	0.600	0.940	0.800	0.140	228.6	375	13.18	50.0
1.004	S8	S15	10.000	0.600	0.800	0.750	0.050	200.0	450	13.29	50.0
1.005	S15	S16	200.000	0.600	0.750	0.660	0.090	2222.2	1250	15.33	50.0
1.006	S16	S17	20.000	0.600	0.660	0.650	0.010	2000.0	1250	15.53	50.0
1.007	S17	S18	70.000	0.600	0.650	0.350	0.300	233.3	600	16.26	50.0
8.000	S21	S22	115.000	0.600	1.500	1.100	0.400	287.5	375	11.80	50.0
8.001	S22	S24	32.000	0.600	1.100	0.970	0.130	246.2	375	12.27	50.0
9.000	S23	S24	115.000	0.600	1.500	0.970	0.530	217.0	375	11.56	50.0
8.002	S24	S26	32.000	0.600	0.970	0.840	0.130	246.2	375	12.73	50.0
10.000	S25	S26	115.000	0.600	1.500	0.840	0.660	174.2	375	11.40	50.0
8.003	S26	S28	32.000	0.600	0.840	0.700	0.140	228.6	375	13.18	50.0
14.000	S27	S28	115.000	0.600	1.500	0.700	0.800	143.8	375	11.27	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	1.063	117.4	9.1	0.025	0.425	0.067	0.0	70	0.638
1.001	1.150	127.0	18.2	0.425	0.555	0.134	0.0	95	0.822
2.000	1.226	135.4	18.2	0.025	0.555	0.134	0.0	92	0.861
1.002	1.150	127.0	54.5	0.555	0.685	0.402	0.0	172	1.108
3.000	1.369	151.2	18.2	0.025	0.685	0.134	0.0	87	0.932
1.003	1.194	131.9	90.8	0.685	0.825	0.670	0.0	229	1.283
7.000	1.509	166.6	18.2	0.025	0.825	0.134	0.0	83	1.002
4.000	1.063	117.4	9.1	0.025	0.425	0.067	0.0	70	0.638
4.001	1.150	127.0	18.2	0.425	0.555	0.134	0.0	95	0.822
5.000	1.226	135.4	18.2	0.025	0.555	0.134	0.0	92	0.861
4.002	1.150	127.0	54.5	0.555	0.685	0.402	0.0	172	1.108
6.000	1.369	151.2	18.2	0.025	0.685	0.134	0.0	87	0.932
4.003	1.194	131.9	90.8	0.685	0.825	0.670	0.0	229	1.283
1.004	1.434	228.0	217.9	0.750	0.700	1.608	0.0	355	1.621
1.005	1.633	33170.5	217.9	-0.100	-0.010	1.608	0.0	61	0.281
1.006	1.722	34978.5	435.8	-0.010	0.000	3.216	0.0	90	0.380
1.007	1.590	449.5	435.8	0.650	0.950	3.216	0.0	480	1.797
8.000	1.063	117.4	9.1	0.025	0.425	0.067	0.0	70	0.638
8.001	1.150	127.0	18.2	0.425	0.555	0.134	0.0	95	0.822
9.000	1.226	135.4	18.2	0.025	0.555	0.134	0.0	92	0.861
8.002	1.150	127.0	54.5	0.555	0.685	0.402	0.0	172	1.108
10.000	1.369	151.2	18.2	0.025	0.685	0.134	0.0	87	0.932
8.003	1.194	131.9	90.8	0.685	0.825	0.670	0.0	229	1.283
14.000	1.509	166.6	18.2	0.025	0.825	0.134	0.0	83	1.002

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)
11.000	S33	S34	115.000	0.600	1.500	1.100	0.400	287.5	375	11.80	50.0
11.001	S34	S32	32.000	0.600	1.100	0.970	0.130	246.2	375	12.27	50.0
12.000	S31	S32	115.000	0.600	1.500	0.970	0.530	217.0	375	11.56	50.0
11.002	S32	S30	32.000	0.600	0.970	0.840	0.130	246.2	375	12.73	50.0
13.000	S29	S30	115.000	0.600	1.500	0.840	0.660	174.2	375	11.40	50.0
11.003	S30	S28	32.000	0.600	0.840	0.700	0.140	228.6	375	13.18	50.0
8.004	S28	S16	10.000	0.600	0.700	0.660	0.040	250.0	525	13.29	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)
11.000	1.063	117.4	9.1	0.025	0.425	0.067	0.0	70	0.638
11.001	1.150	127.0	18.2	0.425	0.555	0.134	0.0	95	0.822
12.000	1.226	135.4	18.2	0.025	0.555	0.134	0.0	92	0.861
11.002	1.150	127.0	54.5	0.555	0.685	0.402	0.0	172	1.108
13.000	1.369	151.2	18.2	0.025	0.685	0.134	0.0	87	0.932
11.003	1.194	131.9	90.8	0.685	0.825	0.670	0.0	229	1.283
8.004	1.412	305.6	217.9	0.675	0.715	1.608	0.0	329	1.528

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	115.000	287.5	375	Circular	2.000	1.600	0.025	2.000	1.200	0.425
1.001	32.000	246.2	375	Circular	2.000	1.200	0.425	2.000	1.070	0.555
2.000	115.000	217.0	375	Circular	2.000	1.600	0.025	2.000	1.070	0.555
1.002	32.000	246.2	375	Circular	2.000	1.070	0.555	2.000	0.940	0.685
3.000	115.000	174.2	375	Circular	2.000	1.600	0.025	2.000	0.940	0.685
1.003	32.000	228.6	375	Circular	2.000	0.940	0.685	2.000	0.800	0.825
7.000	115.000	143.8	375	Circular	2.000	1.600	0.025	2.000	0.800	0.825
4.000	115.000	287.5	375	Circular	2.000	1.600	0.025	2.000	1.200	0.425
4.001	32.000	246.2	375	Circular	2.000	1.200	0.425	2.000	1.070	0.555
5.000	115.000	217.0	375	Circular	2.000	1.600	0.025	2.000	1.070	0.555
4.002	32.000	246.2	375	Circular	2.000	1.070	0.555	2.000	0.940	0.685
6.000	115.000	174.2	375	Circular	2.000	1.600	0.025	2.000	0.940	0.685
4.003	32.000	228.6	375	Circular	2.000	0.940	0.685	2.000	0.800	0.825

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	1350	Manhole	Adoptable	S2	1350	Manhole	Adoptable
1.001	S2	1350	Manhole	Adoptable	S4	1350	Manhole	Adoptable
2.000	S3	1350	Manhole	Adoptable	S4	1350	Manhole	Adoptable
1.002	S4	1350	Manhole	Adoptable	S6	1350	Manhole	Adoptable
3.000	S5	1350	Manhole	Adoptable	S6	1350	Manhole	Adoptable
1.003	S6	1350	Manhole	Adoptable	S8	1350	Manhole	Adoptable
7.000	S7	1350	Manhole	Adoptable	S8	1350	Manhole	Adoptable
4.000	S13	1350	Manhole	Adoptable	S14	1350	Manhole	Adoptable
4.001	S14	1350	Manhole	Adoptable	S12	1350	Manhole	Adoptable
5.000	S11	1350	Manhole	Adoptable	S12	1350	Manhole	Adoptable
4.002	S12	1350	Manhole	Adoptable	S10	1350	Manhole	Adoptable
6.000	S9	1350	Manhole	Adoptable	S10	1350	Manhole	Adoptable
4.003	S10	1350	Manhole	Adoptable	S8	1350	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.004	10.000	200.0	450	Circular	2.000	0.800	0.750	1.900	0.750	0.700
1.005	200.000	2222.2	1250	Drain (D/S)	1.900	0.750	-0.100	1.900	0.660	-0.010
1.006	20.000	2000.0	1250	Drain (D/S)	1.900	0.660	-0.010	1.900	0.650	0.000
1.007	70.000	233.3	600	Circular	1.900	0.650	0.650	1.900	0.350	0.950
8.000	115.000	287.5	375	Circular	1.900	1.500	0.025	1.900	1.100	0.425
8.001	32.000	246.2	375	Circular	1.900	1.100	0.425	1.900	0.970	0.555
9.000	115.000	217.0	375	Circular	1.900	1.500	0.025	1.900	0.970	0.555
8.002	32.000	246.2	375	Circular	1.900	0.970	0.555	1.900	0.840	0.685
10.000	115.000	174.2	375	Circular	1.900	1.500	0.025	1.900	0.840	0.685
8.003	32.000	228.6	375	Circular	1.900	0.840	0.685	1.900	0.700	0.825
14.000	115.000	143.8	375	Circular	1.900	1.500	0.025	1.900	0.700	0.825
11.000	115.000	287.5	375	Circular	1.900	1.500	0.025	1.900	1.100	0.425
11.001	32.000	246.2	375	Circular	1.900	1.100	0.425	1.900	0.970	0.555
12.000	115.000	217.0	375	Circular	1.900	1.500	0.025	1.900	0.970	0.555
11.002	32.000	246.2	375	Circular	1.900	0.970	0.555	1.900	0.840	0.685
13.000	115.000	174.2	375	Circular	1.900	1.500	0.025	1.900	0.840	0.685
11.003	32.000	228.6	375	Circular	1.900	0.840	0.685	1.900	0.700	0.825
8.004	10.000	250.0	525	Circular	1.900	0.700	0.675	1.900	0.660	0.715

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.004	S8	1350	Manhole	Adoptable	S15		Junction	
1.005	S15		Junction		S16		Junction	
1.006	S16		Junction		S17		Junction	
1.007	S17		Junction		S18	1500	Manhole	Adoptable
8.000	S21	1200	Manhole	Adoptable	S22	1350	Manhole	Adoptable
8.001	S22	1350	Manhole	Adoptable	S24	1350	Manhole	Adoptable
9.000	S23	1350	Manhole	Adoptable	S24	1350	Manhole	Adoptable
8.002	S24	1350	Manhole	Adoptable	S26	1350	Manhole	Adoptable
10.000	S25	1350	Manhole	Adoptable	S26	1350	Manhole	Adoptable
8.003	S26	1350	Manhole	Adoptable	S28	1500	Manhole	Adoptable
14.000	S27	1350	Manhole	Adoptable	S28	1500	Manhole	Adoptable
11.000	S33	1350	Manhole	Adoptable	S34	1350	Manhole	Adoptable
11.001	S34	1350	Manhole	Adoptable	S32	1350	Manhole	Adoptable
12.000	S31	1350	Manhole	Adoptable	S32	1350	Manhole	Adoptable
11.002	S32	1350	Manhole	Adoptable	S30	1350	Manhole	Adoptable
13.000	S29	1350	Manhole	Adoptable	S30	1350	Manhole	Adoptable
11.003	S30	1350	Manhole	Adoptable	S28	1500	Manhole	Adoptable
8.004	S28	1500	Manhole	Adoptable	S16		Junction	

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1	2.000	0.400	1350	0	1.000	1.600	375
S2	2.000	0.800	1350	1	1.000	1.200	375
				0	1.001	1.200	375

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S3	2.000	0.400	1350	0	2.000	1.600	375
S4	2.000	0.930	1350	1	2.000	1.070	375
				2	1.001	1.070	375
				0	1.002	1.070	375
S5	2.000	0.400	1350	0	3.000	1.600	375
S6	2.000	1.060	1350	1	3.000	0.940	375
				2	1.002	0.940	375
				0	1.003	0.940	375
S7	2.000	0.400	1350	0	7.000	1.600	375
S8	2.000	1.200	1350	1	7.000	0.800	375
				2	4.003	0.800	375
				3	1.003	0.800	375
				0	1.004	0.800	450
S9	2.000	0.400	1350	0	6.000	1.600	375
S10	2.000	1.060	1350	1	6.000	0.940	375
				2	4.002	0.940	375
				0	4.003	0.940	375
S11	2.000	0.400	1350	0	5.000	1.600	375
S12	2.000	0.930	1350	1	5.000	1.070	375
				2	4.001	1.070	375
				0	4.002	1.070	375
S13	2.000	0.400	1350	0	4.000	1.600	375
S14	2.000	0.800	1350	1	4.000	1.200	375
				0	4.001	1.200	375
S15	1.900	1.150		1	1.004	0.750	450
				0	1.005	0.750	1250

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S16	1.900	1.240		1	8.004	0.660	525
				2	1.005	0.660	1250
				0	1.006	0.660	1250
S17	1.900	1.250		1	1.006	0.650	1250
				0	1.007	0.650	600
S18	1.900	1.550	1500	1	1.007	0.350	600
S21	1.900	0.400	1200	0	8.000	1.500	375
S22	1.900	0.800	1350	1	8.000	1.100	375
				0	8.001	1.100	375
S23	1.900	0.400	1350	0	9.000	1.500	375
S24	1.900	0.930	1350	1	9.000	0.970	375
				2	8.001	0.970	375
				0	8.002	0.970	375
S25	1.900	0.400	1350	0	10.000	1.500	375
S26	1.900	1.060	1350	1	10.000	0.840	375
				2	8.002	0.840	375
				0	8.003	0.840	375
S27	1.900	0.400	1350	0	14.000	1.500	375
S28	1.900	1.200	1500	1	14.000	0.700	375
				2	11.003	0.700	375
				3	8.003	0.700	375
				0	8.004	0.700	525
S29	1.900	0.400	1350	0	13.000	1.500	375
S30	1.900	1.060	1350	1	13.000	0.840	375
				2	11.002	0.840	375
				0	11.003	0.840	375

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S31	1.900	0.400	1350	0	12.000	1.500	375
S32	1.900	0.930	1350	1	12.000	0.970	375
				2	11.001	0.970	375
				0	11.002	0.970	375
S33	1.900	0.400	1350	0	11.000	1.500	375
S34	1.900	0.800	1350	1	11.000	1.100	375
				0	11.001	1.100	375

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	1920	Check Discharge Volume	x

Storm Durations

60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	0	0	0
100	20	0	0
100	40	0	0

Node S17 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	0.650	Product Number	CTL-SHE-0152-1120-1100-1120
Design Depth (m)	1.100	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	11.2	Min Node Diameter (mm)	1200

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	S1	36	1.651	0.051	4.9	0.0727	0.0000	OK
60 minute summer	S2	37	1.268	0.068	9.5	0.0972	0.0000	OK
60 minute summer	S3	36	1.667	0.067	9.7	0.0954	0.0000	OK
60 minute summer	S4	37	1.189	0.119	28.4	0.1704	0.0000	OK
60 minute summer	S5	36	1.663	0.063	9.7	0.0904	0.0000	OK
60 minute summer	S6	38	1.096	0.156	46.8	0.2228	0.0000	OK
60 minute summer	S7	36	1.660	0.060	9.7	0.0863	0.0000	OK
60 minute summer	S8	38	1.016	0.216	110.6	0.3092	0.0000	OK
60 minute summer	S9	36	1.663	0.063	9.7	0.0904	0.0000	OK
60 minute summer	S10	38	1.096	0.156	46.8	0.2228	0.0000	OK
60 minute summer	S11	36	1.667	0.067	9.7	0.0954	0.0000	OK
60 minute summer	S12	37	1.189	0.119	28.4	0.1704	0.0000	OK
60 minute summer	S13	36	1.651	0.051	4.9	0.0727	0.0000	OK
60 minute summer	S14	37	1.268	0.068	9.5	0.0972	0.0000	OK
480 minute winter	S15	416	0.882	0.132	32.5	0.0000	0.0000	OK
480 minute winter	S16	448	0.882	0.222	49.9	0.0000	0.0000	OK
480 minute winter	S17	448	0.882	0.232	13.5	0.0000	0.0000	OK
60 minute summer	S18	1	0.350	0.000	9.2	0.0000	0.0000	OK
60 minute summer	S21	36	1.551	0.051	4.9	0.0575	0.0000	OK
60 minute summer	S22	37	1.168	0.068	9.5	0.0972	0.0000	OK
60 minute summer	S23	36	1.567	0.067	9.7	0.0954	0.0000	OK
60 minute summer	S24	37	1.089	0.119	28.4	0.1703	0.0000	OK
60 minute summer	S25	36	1.563	0.063	9.7	0.0904	0.0000	OK
60 minute summer	S26	38	0.996	0.156	46.8	0.2234	0.0000	OK
60 minute summer	S27	36	1.560	0.060	9.7	0.0863	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	S1	1.000	S2	4.7	0.427	0.040	1.2891	
60 minute summer	S2	1.001	S4	9.3	0.436	0.074	0.6975	
60 minute summer	S3	2.000	S4	9.6	0.460	0.071	2.4807	
60 minute summer	S4	1.002	S6	28.0	0.769	0.221	1.1699	
60 minute summer	S5	3.000	S6	9.6	0.385	0.063	3.1754	
60 minute summer	S6	1.003	S8	46.3	0.849	0.351	1.7430	
60 minute summer	S7	7.000	S8	9.6	0.285	0.057	4.4139	
60 minute summer	S8	1.004	S15	110.2	3.157	0.483	0.3991	
60 minute summer	S9	6.000	S10	9.6	0.385	0.063	3.1754	
60 minute summer	S10	4.003	S8	46.3	0.849	0.351	1.7430	
60 minute summer	S11	5.000	S12	9.6	0.460	0.071	2.4807	
60 minute summer	S12	4.002	S10	28.0	0.769	0.221	1.1699	
60 minute summer	S13	4.000	S14	4.7	0.427	0.040	1.2891	
60 minute summer	S14	4.001	S12	9.3	0.436	0.074	0.6975	
60 minute summer	S15	1.005	S16	88.9	0.127	0.003	231.4926	
60 minute winter	S16	1.006	S17	23.7	0.075	0.001	39.8825	
480 minute winter	S17	Hydro-Brake®	S18	10.9				697.0
60 minute summer	S21	8.000	S22	4.7	0.427	0.040	1.2896	
60 minute summer	S22	8.001	S24	9.3	0.437	0.074	0.6974	
60 minute summer	S23	9.000	S24	9.6	0.460	0.071	2.4798	
60 minute summer	S24	8.002	S26	28.1	0.768	0.221	1.1720	
60 minute summer	S25	10.000	S26	9.6	0.384	0.063	3.1837	
60 minute summer	S26	8.003	S28	46.3	0.858	0.351	1.7272	
60 minute summer	S27	14.000	S28	9.6	0.287	0.057	4.3485	

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	S28	38	0.913	0.213	110.6	0.3763	0.0000	OK
60 minute summer	S29	36	1.563	0.063	9.7	0.0904	0.0000	OK
60 minute summer	S30	38	0.996	0.156	46.8	0.2233	0.0000	OK
60 minute summer	S31	36	1.567	0.067	9.7	0.0954	0.0000	OK
60 minute summer	S32	37	1.089	0.119	28.4	0.1703	0.0000	OK
60 minute summer	S33	36	1.551	0.051	4.9	0.0727	0.0000	OK
60 minute summer	S34	37	1.168	0.068	9.5	0.0972	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	S28	8.004	S16	110.3	2.648	0.361	0.4897	
60 minute summer	S29	13.000	S30	9.6	0.384	0.063	3.1830	
60 minute summer	S30	11.003	S28	46.3	0.857	0.351	1.7270	
60 minute summer	S31	12.000	S32	9.6	0.460	0.071	2.4793	
60 minute summer	S32	11.002	S30	28.0	0.768	0.221	1.1717	
60 minute summer	S33	11.000	S34	4.7	0.427	0.040	1.2891	
60 minute summer	S34	11.001	S32	9.3	0.436	0.074	0.6972	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	S1	36	1.689	0.089	15.1	0.1271	0.0000	OK
60 minute summer	S2	39	1.440	0.240	29.8	0.3435	0.0000	OK
60 minute summer	S3	36	1.718	0.118	30.1	0.1686	0.0000	OK
60 minute summer	S4	39	1.433	0.363	81.5	0.5188	0.0000	OK
60 minute summer	S5	36	1.711	0.111	30.1	0.1594	0.0000	OK
60 minute summer	S6	38	1.376	0.436	127.2	0.6242	0.0000	SURCHARGED
60 minute summer	S7	36	1.706	0.106	30.1	0.1517	0.0000	OK
60 minute summer	S8	38	1.213	0.413	307.0	0.5917	0.0000	OK
60 minute summer	S9	36	1.711	0.111	30.1	0.1594	0.0000	OK
60 minute summer	S10	38	1.376	0.436	127.2	0.6242	0.0000	SURCHARGED
60 minute summer	S11	36	1.718	0.118	30.1	0.1686	0.0000	OK
60 minute summer	S12	39	1.433	0.363	81.5	0.5188	0.0000	OK
60 minute summer	S13	36	1.689	0.089	15.1	0.1271	0.0000	OK
60 minute summer	S14	39	1.440	0.240	29.8	0.3435	0.0000	OK
600 minute winter	S15	600	1.201	0.451	66.4	0.0000	0.0000	OK
600 minute winter	S16	600	1.201	0.541	81.3	0.0000	0.0000	OK
600 minute winter	S17	600	1.201	0.551	17.1	0.0000	0.0000	OK
60 minute summer	S18	1	0.350	0.000	11.2	0.0000	0.0000	OK
60 minute summer	S21	36	1.589	0.089	15.1	0.1005	0.0000	OK
60 minute summer	S22	39	1.321	0.221	29.8	0.3156	0.0000	OK
60 minute summer	S23	36	1.618	0.118	30.1	0.1686	0.0000	OK
60 minute summer	S24	39	1.311	0.341	83.5	0.4877	0.0000	OK
60 minute summer	S25	36	1.611	0.111	30.1	0.1594	0.0000	OK
60 minute summer	S26	38	1.260	0.420	128.2	0.6017	0.0000	SURCHARGED
60 minute summer	S27	36	1.606	0.106	30.1	0.1517	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	S1	1.000	S2	14.9	0.582	0.127	5.3473	
60 minute summer	S2	1.001	S4	32.1	0.530	0.252	2.9385	
60 minute summer	S3	2.000	S4	29.9	0.578	0.221	7.8407	
60 minute summer	S4	1.002	S6	81.0	0.844	0.638	3.5114	
60 minute summer	S5	3.000	S6	29.9	0.450	0.198	7.9157	
60 minute summer	S6	1.003	S8	126.1	1.143	0.956	3.5295	
60 minute summer	S7	7.000	S8	29.9	0.377	0.179	7.8112	
60 minute summer	S8	1.004	S15	337.5	3.904	1.480	0.9693	
60 minute summer	S9	6.000	S10	29.9	0.450	0.198	7.9157	
60 minute summer	S10	4.003	S8	126.1	1.143	0.956	3.5295	
60 minute summer	S11	5.000	S12	29.9	0.578	0.221	7.8407	
60 minute summer	S12	4.002	S10	81.0	0.844	0.638	3.5114	
60 minute summer	S13	4.000	S14	14.9	0.582	0.127	5.3473	
60 minute summer	S14	4.001	S12	32.1	0.530	0.252	2.9385	
60 minute winter	S15	1.005	S16	246.3	0.146	0.007	849.4091	
60 minute winter	S16	1.006	S17	66.6	0.105	0.002	100.8343	
240 minute summer	S17	Hydro-Brake®	S18	11.2				1288.9
60 minute summer	S21	8.000	S22	14.9	0.584	0.127	4.9370	
60 minute summer	S22	8.001	S24	31.2	0.530	0.246	2.7617	
60 minute summer	S23	9.000	S24	29.9	0.578	0.221	7.6597	
60 minute summer	S24	8.002	S26	81.3	0.846	0.640	3.4486	
60 minute summer	S25	10.000	S26	29.9	0.452	0.198	7.9157	
60 minute summer	S26	8.003	S28	127.6	1.157	0.967	3.5295	
60 minute summer	S27	14.000	S28	29.9	0.387	0.179	7.8112	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	S28	600	1.201	0.501	65.0	0.8848	0.0000	OK
60 minute summer	S29	36	1.611	0.111	30.1	0.1594	0.0000	OK
60 minute summer	S30	38	1.260	0.420	128.2	0.6017	0.0000	SURCHARGED
60 minute summer	S31	36	1.618	0.118	30.1	0.1686	0.0000	OK
60 minute summer	S32	39	1.311	0.341	83.5	0.4876	0.0000	OK
60 minute summer	S33	36	1.589	0.089	15.1	0.1271	0.0000	OK
60 minute summer	S34	39	1.320	0.220	29.8	0.3155	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	S28	8.004	S16	312.8	2.741	1.024	1.3451	
60 minute summer	S29	13.000	S30	29.9	0.452	0.198	7.9157	
60 minute summer	S30	11.003	S28	127.6	1.157	0.967	3.5295	
60 minute summer	S31	12.000	S32	29.9	0.578	0.221	7.6592	
60 minute summer	S32	11.002	S30	81.3	0.846	0.640	3.4485	
60 minute summer	S33	11.000	S34	14.9	0.584	0.127	4.9369	
60 minute summer	S34	11.001	S32	31.2	0.530	0.246	2.7615	

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	S1	39	1.735	0.135	20.7	0.1927	0.0000	OK
60 minute summer	S2	37	1.719	0.519	46.2	0.7424	0.0000	FLOOD RISK
60 minute summer	S3	38	1.743	0.143	41.4	0.2040	0.0000	OK
60 minute summer	S4	38	1.708	0.638	111.2	0.9131	0.0000	FLOOD RISK
60 minute summer	S5	36	1.731	0.131	41.4	0.1881	0.0000	OK
60 minute summer	S6	38	1.589	0.649	187.3	0.9293	0.0000	SURCHARGED
60 minute summer	S7	36	1.725	0.125	41.4	0.1789	0.0000	OK
720 minute winter	S8	720	1.416	0.616	78.8	0.8812	0.0000	SURCHARGED
60 minute summer	S9	36	1.731	0.131	41.4	0.1881	0.0000	OK
60 minute summer	S10	38	1.589	0.649	187.3	0.9293	0.0000	SURCHARGED
60 minute summer	S11	38	1.743	0.143	41.4	0.2040	0.0000	OK
60 minute summer	S12	38	1.708	0.638	111.2	0.9131	0.0000	FLOOD RISK
60 minute summer	S13	39	1.735	0.135	20.7	0.1927	0.0000	OK
60 minute summer	S14	37	1.719	0.519	46.2	0.7424	0.0000	FLOOD RISK
720 minute winter	S15	720	1.416	0.666	77.5	0.0000	0.0000	OK
720 minute winter	S16	720	1.416	0.756	92.4	0.0000	0.0000	OK
720 minute winter	S17	720	1.416	0.766	18.0	0.0000	0.0000	SURCHARGED
60 minute summer	S18	1	0.350	0.000	11.2	0.0000	0.0000	OK
60 minute summer	S21	39	1.647	0.147	20.7	0.1659	0.0000	OK
60 minute summer	S22	38	1.627	0.527	46.6	0.7547	0.0000	FLOOD RISK
60 minute summer	S23	39	1.650	0.150	41.4	0.2153	0.0000	OK
60 minute summer	S24	38	1.619	0.649	109.0	0.9284	0.0000	FLOOD RISK
60 minute summer	S25	36	1.631	0.131	41.4	0.1881	0.0000	OK
60 minute summer	S26	38	1.512	0.672	182.6	0.9610	0.0000	SURCHARGED
60 minute summer	S27	36	1.625	0.125	41.4	0.1789	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	S1	1.000	S2	22.5	0.604	0.192	8.3864	
60 minute summer	S2	1.001	S4	43.5	0.534	0.342	3.5295	
60 minute summer	S3	2.000	S4	41.1	0.591	0.303	8.5508	
60 minute summer	S4	1.002	S6	110.4	1.001	0.869	3.5295	
60 minute summer	S5	3.000	S6	41.1	0.479	0.272	8.3204	
60 minute summer	S6	1.003	S8	186.2	1.688	1.412	3.5295	
60 minute summer	S7	7.000	S8	41.1	0.485	0.246	8.1885	
60 minute summer	S8	1.004	S15	455.5	4.300	1.998	1.2002	
60 minute summer	S9	6.000	S10	41.1	0.479	0.272	8.3204	
60 minute summer	S10	4.003	S8	186.2	1.688	1.412	3.5295	
60 minute summer	S11	5.000	S12	41.1	0.591	0.303	8.5508	
60 minute summer	S12	4.002	S10	110.4	1.001	0.869	3.5295	
60 minute summer	S13	4.000	S14	22.5	0.604	0.192	8.3864	
60 minute summer	S14	4.001	S12	43.5	0.534	0.342	3.5295	
60 minute winter	S15	1.005	S16	257.9	0.148	0.008	1165.5652	
60 minute winter	S16	1.006	S17	110.1	0.114	0.003	133.0622	
60 minute winter	S17	Hydro-Brake®	S18	11.2				1231.7
60 minute summer	S21	8.000	S22	23.3	0.605	0.198	8.6363	
60 minute summer	S22	8.001	S24	45.4	0.535	0.357	3.5295	
60 minute summer	S23	9.000	S24	41.1	0.591	0.303	8.7158	
60 minute summer	S24	8.002	S26	108.5	0.983	0.854	3.5295	
60 minute summer	S25	10.000	S26	41.1	0.479	0.272	8.3204	
60 minute summer	S26	8.003	S28	180.1	1.633	1.365	3.5295	
60 minute summer	S27	14.000	S28	41.1	0.485	0.246	8.1885	

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	S28	720	1.416	0.716	76.1	1.2648	0.0000	SURCHARGED
60 minute summer	S29	36	1.631	0.131	41.4	0.1881	0.0000	OK
60 minute summer	S30	38	1.512	0.672	182.6	0.9610	0.0000	SURCHARGED
60 minute summer	S31	39	1.650	0.150	41.4	0.2152	0.0000	OK
60 minute summer	S32	38	1.619	0.649	109.0	0.9284	0.0000	FLOOD RISK
60 minute summer	S33	39	1.646	0.146	20.7	0.2094	0.0000	OK
60 minute summer	S34	38	1.627	0.527	46.6	0.7546	0.0000	FLOOD RISK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	S28	8.004	S16	490.1	3.265	1.604	1.7981	
60 minute summer	S29	13.000	S30	41.1	0.479	0.272	8.3204	
60 minute summer	S30	11.003	S28	180.1	1.633	1.365	3.5295	
60 minute summer	S31	12.000	S32	41.1	0.591	0.303	8.7145	
60 minute summer	S32	11.002	S30	108.4	0.983	0.853	3.5295	
60 minute summer	S33	11.000	S34	23.4	0.604	0.199	8.6295	
60 minute summer	S34	11.001	S32	45.4	0.534	0.357	3.5295	

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	S1	39	1.919	0.319	25.0	0.4572	0.0000	OK
60 minute summer	S2	39	1.904	0.704	48.9	1.0081	0.0000	FLOOD RISK
60 minute summer	S3	39	1.937	0.337	49.7	0.4826	0.0000	OK
60 minute summer	S4	39	1.888	0.818	120.0	1.1698	0.0000	FLOOD RISK
60 minute summer	S5	39	1.781	0.181	49.7	0.2591	0.0000	OK
60 minute summer	S6	39	1.741	0.801	202.5	1.1465	0.0000	FLOOD RISK
60 minute summer	S7	36	1.738	0.138	49.7	0.1970	0.0000	OK
720 minute winter	S8	720	1.554	0.754	94.4	1.0791	0.0000	SURCHARGED
60 minute summer	S9	39	1.781	0.181	49.7	0.2591	0.0000	OK
60 minute summer	S10	39	1.741	0.801	202.5	1.1465	0.0000	FLOOD RISK
60 minute summer	S11	39	1.937	0.337	49.7	0.4826	0.0000	OK
60 minute summer	S12	39	1.888	0.818	120.0	1.1698	0.0000	FLOOD RISK
60 minute summer	S13	39	1.919	0.319	25.0	0.4572	0.0000	OK
60 minute summer	S14	39	1.904	0.704	48.9	1.0081	0.0000	FLOOD RISK
720 minute winter	S15	720	1.554	0.804	93.0	0.0000	0.0000	OK
720 minute winter	S16	720	1.554	0.894	107.5	0.0000	0.0000	OK
720 minute winter	S17	720	1.554	0.904	19.1	0.0000	0.0000	SURCHARGED
60 minute summer	S18	1	0.350	0.000	11.2	0.0000	0.0000	OK
60 minute summer	S21	39	1.812	0.312	26.9	0.3531	0.0000	OK
60 minute summer	S22	39	1.795	0.695	54.7	0.9950	0.0000	FLOOD RISK
60 minute summer	S23	39	1.830	0.330	49.7	0.4718	0.0000	OK
60 minute summer	S24	39	1.777	0.807	121.8	1.1547	0.0000	FLOOD RISK
60 minute summer	S25	39	1.671	0.171	49.7	0.2441	0.0000	OK
60 minute summer	S26	38	1.630	0.790	203.7	1.1311	0.0000	FLOOD RISK
60 minute summer	S27	36	1.638	0.138	49.7	0.1970	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	S1	1.000	S2	29.4	0.609	0.250	12.0951	
60 minute summer	S2	1.001	S4	52.3	0.534	0.412	3.5295	
60 minute summer	S3	2.000	S4	46.0	0.590	0.339	12.3486	
60 minute summer	S4	1.002	S6	119.5	1.083	0.941	3.5295	
60 minute summer	S5	3.000	S6	49.2	0.560	0.326	9.3706	
60 minute summer	S6	1.003	S8	198.0	1.796	1.502	3.5295	
60 minute summer	S7	7.000	S8	49.3	0.569	0.296	8.4484	
60 minute summer	S8	1.004	S15	484.1	4.635	2.123	1.4308	
60 minute summer	S9	6.000	S10	49.2	0.560	0.326	9.3706	
60 minute summer	S10	4.003	S8	198.0	1.796	1.502	3.5295	
60 minute summer	S11	5.000	S12	46.0	0.590	0.339	12.3486	
60 minute summer	S12	4.002	S10	119.5	1.083	0.941	3.5295	
60 minute summer	S13	4.000	S14	29.4	0.609	0.250	12.0951	
60 minute summer	S14	4.001	S12	52.3	0.534	0.412	3.5295	
60 minute winter	S15	1.005	S16	313.4	0.150	0.009	1395.2549	
60 minute winter	S16	1.006	S17	139.3	0.122	0.004	156.8219	
60 minute summer	S17	Hydro-Brake®	S18	11.2				1268.2
60 minute summer	S21	8.000	S22	30.1	0.611	0.257	11.9817	
60 minute summer	S22	8.001	S24	50.7	0.535	0.399	3.5295	
60 minute summer	S23	9.000	S24	46.9	0.590	0.346	12.2462	
60 minute summer	S24	8.002	S26	122.8	1.114	0.967	3.5295	
60 minute summer	S25	10.000	S26	49.0	0.558	0.324	9.1448	
60 minute summer	S26	8.003	S28	203.5	1.845	1.543	3.5295	
60 minute summer	S27	14.000	S28	49.3	0.569	0.296	8.4484	

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	S28	720	1.554	0.854	91.0	1.5092	0.0000	SURCHARGED
60 minute summer	S29	39	1.670	0.170	49.7	0.2434	0.0000	OK
60 minute summer	S30	38	1.630	0.790	203.6	1.1304	0.0000	FLOOD RISK
60 minute summer	S31	39	1.828	0.328	49.7	0.4699	0.0000	OK
60 minute summer	S32	39	1.776	0.806	121.6	1.1535	0.0000	FLOOD RISK
60 minute summer	S33	39	1.812	0.312	27.3	0.4459	0.0000	OK
60 minute summer	S34	39	1.794	0.694	54.7	0.9938	0.0000	FLOOD RISK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	S28	8.004	S16	540.1	3.304	1.767	2.1489	
60 minute summer	S29	13.000	S30	49.1	0.558	0.324	9.1345	
60 minute summer	S30	11.003	S28	203.4	1.844	1.542	3.5295	
60 minute summer	S31	12.000	S32	46.9	0.591	0.346	12.2266	
60 minute summer	S32	11.002	S30	122.8	1.113	0.967	3.5295	
60 minute summer	S33	11.000	S34	30.3	0.610	0.258	11.9718	
60 minute summer	S34	11.001	S32	50.9	0.535	0.400	3.5295	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	S1	36	2.000	0.400	37.8	0.5724	5.2717	FLOOD
60 minute summer	S2	36	2.000	0.800	54.1	1.1448	0.2317	FLOOD
60 minute summer	S3	36	2.000	0.400	57.9	0.5724	7.3671	FLOOD
60 minute summer	S4	36	1.990	0.920	121.7	1.3161	0.0000	FLOOD RISK
60 minute summer	S5	38	1.972	0.372	57.9	0.5317	0.0000	OK
60 minute summer	S6	38	1.881	0.941	214.5	1.3465	0.0000	FLOOD RISK
60 minute summer	S7	36	1.750	0.150	57.9	0.2140	0.0000	OK
960 minute winter	S8	945	1.682	0.882	82.4	1.2626	0.0000	SURCHARGED
60 minute summer	S9	38	1.972	0.372	57.9	0.5317	0.0000	OK
60 minute summer	S10	38	1.881	0.941	214.5	1.3465	0.0000	FLOOD RISK
60 minute summer	S11	36	2.000	0.400	57.9	0.5724	7.3671	FLOOD
60 minute summer	S12	36	1.990	0.920	121.7	1.3161	0.0000	FLOOD RISK
60 minute summer	S13	36	2.000	0.400	37.8	0.5724	5.2717	FLOOD
60 minute summer	S14	36	2.000	0.800	54.1	1.1448	0.2317	FLOOD
960 minute winter	S15	945	1.682	0.932	81.8	0.0000	0.0000	OK
960 minute winter	S16	945	1.682	1.022	95.4	0.0000	0.0000	OK
960 minute winter	S17	945	1.682	1.032	17.8	0.0000	0.0000	FLOOD RISK
60 minute summer	S18	1	0.350	0.000	11.2	0.0000	0.0000	OK
60 minute summer	S21	36	1.900	0.400	39.6	0.4524	3.3577	FLOOD
60 minute summer	S22	36	1.900	0.800	59.7	1.1448	0.0957	FLOOD
60 minute summer	S23	36	1.900	0.400	57.9	0.5724	5.6799	FLOOD
60 minute summer	S24	36	1.887	0.917	125.0	1.3129	0.0000	FLOOD RISK
60 minute summer	S25	38	1.802	0.302	57.9	0.4319	0.0000	OK
60 minute summer	S26	36	1.727	0.887	227.0	1.2699	0.0000	FLOOD RISK
960 minute winter	S27	945	1.682	0.182	7.4	0.2608	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	S1	1.000	S2	29.6	0.608	0.252	12.6842	
60 minute summer	S2	1.001	S4	48.6	0.533	0.382	3.5295	
60 minute summer	S3	2.000	S4	49.2	0.587	0.363	12.6842	
60 minute winter	S4	1.002	S6	125.6	1.139	0.989	3.5295	
60 minute summer	S5	3.000	S6	55.4	0.601	0.366	12.6736	
60 minute summer	S6	1.003	S8	211.2	1.915	1.601	3.5295	
60 minute summer	S7	7.000	S8	57.5	0.648	0.345	8.6978	
60 minute summer	S8	1.004	S15	529.0	4.784	2.320	1.5521	
60 minute summer	S9	6.000	S10	55.4	0.601	0.366	12.6736	
60 minute summer	S10	4.003	S8	211.2	1.915	1.601	3.5295	
60 minute summer	S11	5.000	S12	49.2	0.587	0.363	12.6842	
60 minute winter	S12	4.002	S10	125.6	1.139	0.989	3.5295	
60 minute summer	S13	4.000	S14	29.6	0.608	0.252	12.6842	
60 minute summer	S14	4.001	S12	48.6	0.533	0.382	3.5295	
60 minute winter	S15	1.005	S16	341.7	0.152	0.010	1600.3890	
60 minute summer	S16	1.006	S17	123.7	0.119	0.004	158.0163	
60 minute summer	S17	Hydro-Brake®	S18	11.2				1292.4
60 minute summer	S21	8.000	S22	29.1	0.610	0.248	12.6842	
60 minute summer	S22	8.001	S24	49.8	0.534	0.392	3.5295	
60 minute summer	S23	9.000	S24	49.2	0.588	0.363	12.6842	
60 minute winter	S24	8.002	S26	131.9	1.196	1.038	3.5295	
60 minute summer	S25	10.000	S26	54.8	0.601	0.362	11.8089	
60 minute summer	S26	8.003	S28	228.6	2.073	1.733	3.5295	
60 minute summer	S27	14.000	S28	57.5	0.648	0.345	8.6978	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	S28	945	1.682	0.982	82.7	1.7357	0.0000	FLOOD RISK
60 minute summer	S29	38	1.801	0.301	57.9	0.4314	0.0000	OK
60 minute summer	S30	36	1.727	0.887	226.9	1.2700	0.0000	FLOOD RISK
60 minute summer	S31	36	1.900	0.400	57.9	0.5724	5.6372	FLOOD
60 minute summer	S32	36	1.887	0.917	125.0	1.3118	0.0000	FLOOD RISK
60 minute summer	S33	36	1.900	0.400	39.7	0.5724	3.3906	FLOOD
60 minute summer	S34	36	1.900	0.800	59.7	1.1448	0.0994	FLOOD

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	S28	8.004	S16	598.2	3.747	1.957	2.1526	
60 minute summer	S29	13.000	S30	54.8	0.601	0.362	11.8025	
60 minute summer	S30	11.003	S28	228.6	2.072	1.733	3.5295	
60 minute summer	S31	12.000	S32	49.2	0.588	0.363	12.6842	
60 minute winter	S32	11.002	S30	131.3	1.191	1.034	3.5295	
60 minute summer	S33	11.000	S34	29.3	0.610	0.249	12.6842	
60 minute summer	S34	11.001	S32	50.0	0.534	0.393	3.5295	