



KAPLAN PROPERTY GROUP

LAND OFF SPALDING ROAD
PINCHBECK, SPALDING
PE11 3DT

FLOOD RISK ASSESSMENT
AUGUST 2019

FW1664/FRA/001 – v4

REVISIONS

Revision	Reason for issue	Author	Checker	Approved	Date
v1	First Issue.	JO'N	RW	BM	15.11.2018
v2	Second Issue.	BM	CB	JD	21.03.2019
v3	Third Issue.	JD	CB	BM	05.06.2019
v4	Section 3.12 and 3.17 updated to suit planning comments	JD	CB	BM	21.08.2019

EXECUTIVE SUMMARY

1. The site is at **High** risk of flooding from tidal events due to the proximity of main river systems
2. The property is identified within the Boston Borough Council Strategic Flood Risk Assessment 2010 as being at risk of flooding through over land flow.
3. The site is at a **Low – Very Low** chance of flooding from Surface Water.
4. The site is identified by the Environment Agency as being at **NO** quantifiable risk of flooding from man -made lakes within the topographical catchment of the site.
5. The escape flows from the water main within the adjacent public highways have been considered and in the unlikely event of failure of the mains, the flows will channel within Spalding Road and the private footpath and will drain in a north to south direction.
6. The site is at a negligible risk of flooding from the existing sewerage network within Spalding Road and the private footpath, and there are with no historic sewer flooding events recorded within Environment Agency records.
7. The site is at a negligible risk of flooding from its own private drainage connections and any risk can be mitigated by regular maintenance to ensure the ongoing performance of the system.

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1.0 INTRODUCTION

- 1.01 Farrow Walsh Consulting has been engaged by the Kaplan Property Group to produce a Flood Risk Assessment to accompany the planning application for a proposed residential development on land off Spalding Road, Pinchbeck, Spalding, Lincolnshire, PE11 3DT.
- 1.02 This report considers the flood risk associated with the development proposals of this type and considers mitigation measures to ensure user safety.
- 1.03 The Flood Risk Assessment (FRA) report has been informed by the guidance contained within The National Planning Framework (July 2018 Department for Communities and Local Government) (NPPF).
- 1.04 Investigation of the Environment Agency indicative flood mapping indicates that the site lies within the extents of the mapped flood plain of main river systems.
- 1.05 Therefore, in consulting the Environment Agency website this report examines the following:
- Assessment of Flood Risk and the likely sources of flooding
 - Managing Residual Flood Risk
 - Managing surface water
 - Remedial Measures
- 1.06 This FRA examines the flood implications of the proposed development based on the following objectives, set out within the NPPF.
- Appraising risk
 - Managing risk
 - Reducing risk
 - A partnership approach

2.0 EXISTING SITUATION

2.1 SITE LOCATION

2.1.1 The proposed development site is located on the northern edge of Spalding, a town in Lincolnshire situated approximately 21km south of Boston. The site is located immediately south of the village of Pinchbeck.

2.1.2 The site is bounded to the north by residential dwellings, to the north and east by industrial units, to the south by the Johnson Community Hospital, and to the west by the B1356 Spalding Road and agricultural land.

2.1.3 The site is classified as brownfield and is currently occupied by the Spalding Lifestyle and Garden Centre, a car park and by buildings used by a fencing Contractor.

2.2 SITE DESCRIPTION

2.2.1 The site is located approximately 1.6 km north of Spalding town centre.

2.2.2 The site area is 1.700 hectares.

2.2.3 The site is currently occupied and is accessed via a roundabout, which also provides access to the Johnson Community Hospital.

2.2.4 The nearest watercourse to the site is Vernatt's Drain, an artificial waterway used as a flood defence measure, which passes the site running in an east to west direction at a position of approximately 150m south of the site. Vernatt's Drain continues east before bearing north east and joining with the River Welland. To the west of the site, Vernatt's Drain bears south west before connecting with other flood defence measures in the area close to the village of Pode Hole.

2.2.5 The topographical survey shows the existing levels on site being recorded from 3.76 mAOD to 2.88 mAOD. The site slopes very gradually in a west to east direction. Although, towards the northern boundary of the site, areas were obscured by very dense vegetation and for this reason were not surveyed. A copy of the topographical survey can be found within Appendix A.

2.2.6 The site lies within the Anglian River Basin in the River Welland Catchment, a main river as classified by the Environment Agency.

2.3 SOURCE OF REFERENCE

2.3.1 This report has been prepared using the following guidance documentation:

- National Planning Policy Guidance (NPPG) March 2014
- Ciria C753 – The SUDs Manual
- Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities (EA - February 2016)
- South Holland Strategic Flood Risk Assessment Update February 2017 Royal Haskoning DHV.
- South East Lincolnshire Strategic Flood Risk Assessment March 2017.



2.4 CAUSES OF FLOODING

2.4.1 TIDAL OR COASTAL

2.4.1.1 The site has an elevational range between 3.78 to 2.88 metres above sea level as shown within the topographical survey within Appendix A.

2.4.1.2 The site is located approximately 20.8 km from the nearest coastline. The site lies within the Anglian river basin and the catchment of the River Welland classified by the Environment Agency as a main river.

2.4.1.3 The site itself is indicated by mapping as being at risk of tidal flooding with the existing coastal defences intact or removed.

2.4.2 FLUVIAL

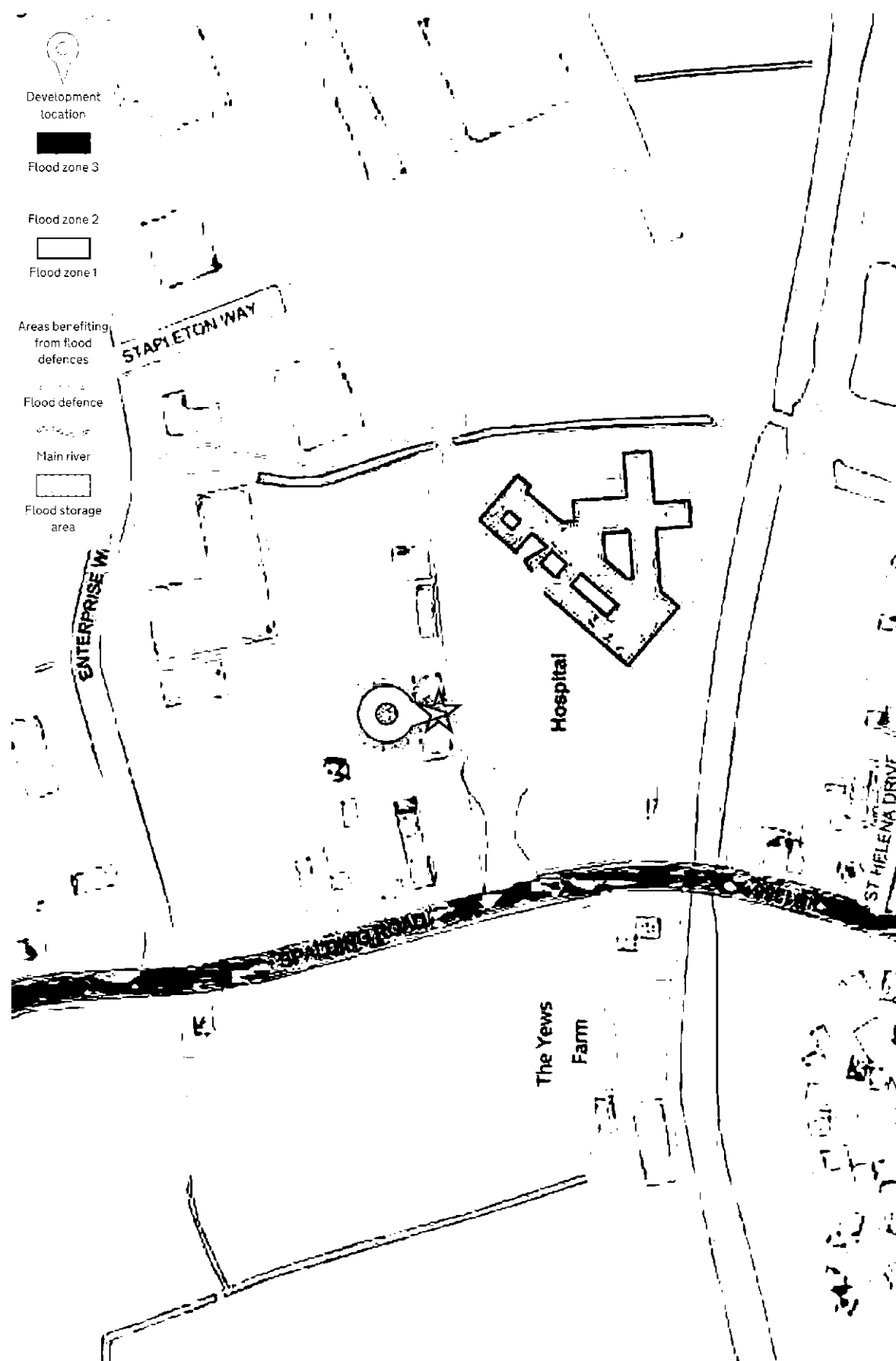
2.4.2.1 The Environment Agency have derived flood maps of England from which it is possible to initially identify whether a site is located within an area that is at risk of fluvial flooding. The maps, which are available on the Environment Agency's website, categorise land as being within Flood Zone 1, Flood Zone 2 or Flood Zone 3, with Flood Zone 1 being all land falling outside of the floodplain and Flood Zones 2 and 3 being all land within the floodplain. Flood Zone 3 is split into two further categories, namely Flood Zone 3A and Flood Zone 3B with Flood Zone 3B considered to be the functional floodplain.

2.4.2.2 The definitions of the Flood Zones extracted from the National Planning Policy Framework (NPPF) are described below:

- Flood Zone 1 – low probability. This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).
- Flood Zone 2 – medium probability. This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year
- Flood Zone 3A – high probability. This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
- Flood Zone 3B – the functional floodplain. This zone comprises land where water has to flow or be stored in times of flood. Typically, land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood.

2.4.2.3 The extent of flooding on main rivers is indicated on the Environment Agency web site and an extract from the indicative flood maps can be seen in Figure 4. The areas of medium blue identify flooding probability of between 1 percent (1 in 100 year) and 3.3 percent (1 in 30 year) probability, while the areas in light blue identify flooding probability of less than 0.1% (1 in 1000 year) probability.

2.4.2.4 Given the proximity of the site to the predicted flood outline, it is identified on the EA indicative planning flood mapping that the site lies within Flood Zone 3 (annual probability of flooding greater than 1 in 100 years).



Flood risk



High



Medium



Low



Very low



Location you
selected



- 2.4.2.5 Based on Table 1 of the NPPF and the EA extent of flood mapping, the site has a high probability of flooding due to main rivers.
- 2.4.2.6 In accordance with the Environmental Agency guidance, this generally means that an exception test is required for developments regarded as more vulnerable within this zone.
- 2.4.2.7 The information received from the Environment Agency includes a set of predicted fluvial flood levels for various Annual Event Probabilities (AEP) for the surrounding area. The nearest node points to the site are reference WELLAND 10481 and SPALDING CHANNEL 935 and are both located along course of the River Welland approximately 1km south of the site. Table 1 below lists the predicted flood levels for selected flood events at the site. The Environment Agency flood maps and level data can be found with Appendix B. It should be noted that these levels have been predicted without flood defences in place.

Table 1: EA Modelled Fluvial Flood Heights (nodes WELLAND 10481 and SPALDING CHANNEL 935)

Flood Event (yr)	Modelled Flood Level (mAOD)	
	WELLAND 10481	SPALDING CHANNEL 935
1 in 50 (2%)	4.47	4.51
1 in 100 (1%)	4.44	4.52
1 in 100 + 20% cc	5.49	4.68
1 in 1000 (0.1%)	4.42	4.55

2.4.3 GROUNDWATER

- 2.4.3.1 The bedrock stratum below the site is classified as unproductive by the Environment Agency as are the superficial deposits. In terms of vulnerability, the site is unclassified.
- 2.4.3.2 The site does not lie within a Source Protection Zone.
- 2.4.3.3 A ground investigation has been undertaken, which identifies that much of the site is made ground (made up of topsoil, crushed stone, sands, gravels and brick fragments), which is underlain by soft to very soft clay and silt. Details of the ground investigation report findings can be found within Appendix C.
- 2.4.3.4 The unproductive nature of the local ground along with the site being unclassified in terms of vulnerability indicate that flooding from groundwater is not of major concern in the Spalding area.

2.4.4 SURFACE WATER

- 2.4.4.1 The Environment Agency have modelled locations along critical flow paths and areas situated in topographic depressions, which could flood following an extreme rainfall event when drainage capacity has been exceeded. Figure 6 indicates the predicted surface water flood risk map taken from the Environment Agency's website.
- 2.4.4.2 The site is considered to be mainly at very low risk from overland flows by the EA as indicated on Figure 6, with some small patches at low risk.
- 2.4.4.3 The drainage strategy for the site should accommodate a 1 in 100 year (1.0%) + climate change storm event within the site including measures to accommodate exceedance flows within on site.

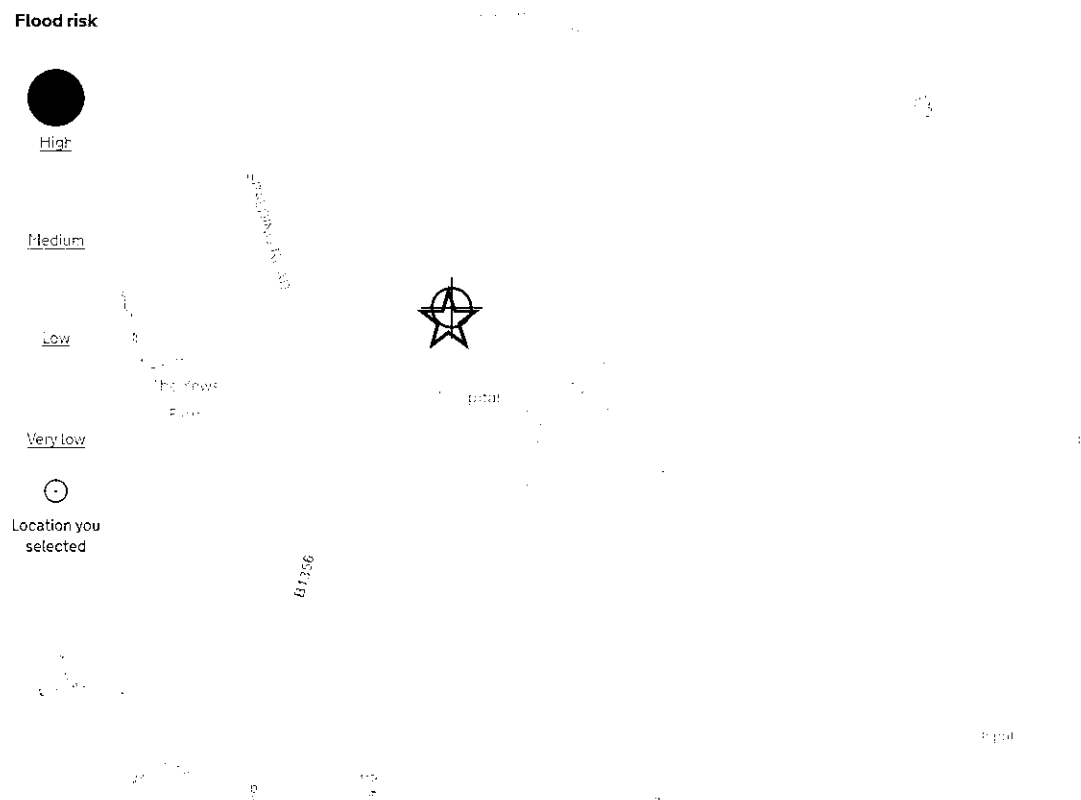


Figure 6: Extract from Environment Agency Flood Maps showing predicted Surface Water Flood Risk

2.4.5 EXISTING SEWERAGE SYSTEMS

- 2.4.5.1 The Anglian Water apparatus records have been requested and can be found within Appendix D.
- 2.4.5.2 These records indicate that at the present there is no existing surface water sewerage near the site.
- 2.4.5.3 An existing 150mm foul sewer runs north along the public footpath to the east of the site.
- 2.4.5.4 No historic flooding for the site was recorded in the South East Lincolnshire Strategic Flood Risk Assessment or the Environment Agency.
- 2.4.5.5 The topographical survey indicates that the site consists almost entirely of impermeable area as part of its former use.

2.4.6 ARTIFICIAL SOURCES

2.4.6.1 There is an existing water main running north to south in Spalding Road on the western boundary and an existing water main in a private footpath running north to south to the east of the site. The failure of the water main located adjacent to the development site is considered statistically remote.

2.4.6.2 We conclude that the risk of failure of the water mains is remote, it must however be noted that for a failure adjacent to the site the nature of the escape and probable pressurized column of water could itself cause some local flood damage, but this is beyond practical mitigation.

2.4.6.3 The site is under no risk of flooding from reservoirs.

2.4.7 CLIMATE CHANGE

2.4.7.1 National Planning Policy Guidance requires that climate change incorporated within the surface water drainage design in accordance with The Environment Agency's 'Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities' February 2016 when assessing flood risk for a development.

2.4.7.2 The design life of the development is beyond 2070, therefore in accordance with the Environment Agency guidance the development should make allowances for an increase in extreme rainfall intensity of an additional 45% when compared to the 1961-1990 baseline.

3.0 PROPOSED DEVELOPMENT

3.1 DEVELOPMENT PROPOSALS

3.1.1 The proposed residential development application is indicated on Drawing No. 4403/KP/17/002 Rev E. included in Appendix F and comprises of the following:

- 15 x 1 bed apartment
- 43 x 2 bed houses
- 14 x 3 bed houses
- Total 72 residential dwellings

3.1.2 The South East Lincolnshire SFRA (March 2017) indicates the for the 0.1% flood event in year 2115 the eastern area of the site is anticipated to have fluvial depth of 0.25-0.50m. Therefore finished floor levels are to be set to ensure that overland flows do not enter the properties. These finished floor levels will be between 300-500mm above the existing ground level as appropriate.

3.1.3 The current use of the application site is classed as brownfield use, with hardstanding evident on site.

3.1.4 The strategy for the development foul water is to connect to the foul sewer that runs to the east of the site along the footpath on an unrestricted arrangement subject to agreement with Anglian Water.

3.1.5 The developments storm water drainage with consist of two separate discharge connections. The first, which will take the majority of the site will utilise voided stone attenuation and treatment that then connects into a proposed Adoptable system that connects into an existing dyke to the east. The discharge rate is to be agreed with the Internal Drainage Board (IDB). The second system also utilises voided stone attenuation but instead connects to a private drain to the south eastern corner of the site. The reason for having two separate connections is to replicate the existing system – details of which can be found within Appendix E of this report. Furthermore, details of the proposed systems, its subsequent design and maintenance can be found within Appendices G, H and I.

3.1.6 In accordance with Table 3 of NPPG (2014), the change of use to residential will change the flood vulnerability classification for the site to ‘more vulnerable’.

Flood Zones	Flood Risk Vulnerability Classification				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test Required	✓	✓	✓
Zone 3A	Exception Test Required	✗	Exception Test Required	✓	✓
Zone 3B	Exception Test Required	✗	✗	✗	✓

✓ Denotes Development is appropriate

✗ Development should not be permitted

Figure 7: Extract from NPPG 2014 (Table 3)

3.1.7 The finished floor level for each dwelling will be between 300-500mm above existing ground level and a minimum 150mm above the proposed external ground levels. This equates to finished floor levels ranging from 3.350 mAOD to 3.800 mAOD. FFLs are to be confirmed at detailed design stage.

3.2 FLOOD SAFETY

3.2.1 In accordance with current guidance and DEFRA FD2320 safe access is to be provided for residents in the event of flooding. Where safe access cannot be provided measures are to be implemented to ensure the residents safety until the emergency services have been able to reach them.

3.2.2 The proposed site vehicle access off Spalding Road for the development will lie in Flood Zone 3 according to the EA data with this area classified as extreme flood greater than 1 percent (1 in 100) probability. In extreme flood events above the 1 in 1000-year (0.1%) storm event the development would operate a 'stay put' approach in extreme flooding events for residents categorised as more vulnerable. They would be advised to stay within the development and await assistance from emergency services.

Table 13.1 Danger to people for different combinations of depth and velocity

Velocity (m/s)	Depth of flooding (m)											
	0.05	0.10	0.20	0.30	0.40	0.50	0.60	0.80	1.00	1.50	2.00	2.50
0.00												
0.10												
0.25												
0.50												
1.00												
1.50												
2.00												
2.50												
3.00												
3.50												
4.00												
4.50												
5.00												

Key:
 Danger for some
 Danger for most
 Danger for all

Figure 8: Extract from DEFRA FD2320 showing Table 13.1

3.2.3 To ensure all residents are informed of the flood risk which may impact upon access/ egress from the site a site-specific Flood Management and Evacuation Plan should be detailed confirming where flood warning information can be found and what to do in the event that flooding affects the access / egress to the site. This document should be provided to residents prior to occupation.

3.2.4 By utilising the flood warning systems available it is anticipated that all residents will be able egress from the site in a safe manner in advance of an extreme (1.0 – 0.1 percent probability) storm event occurring.

3.2.5 Flood warnings are published by the Met Office:
<http://www.metoffice.gov.uk/public/weather/flood-warnings/#?tab=floodWarnings> or the Environment Agency: <http://apps.environment-agency.gov.uk/flood/3days/125305.aspx>

3.2.6 The Met Office Flood Forecasting Centre in conjunction with the Environment Agency publishes Flood Guidance Statements containing:

- General overview of the flood risk
- Assessment of the flood risk
- Weather warnings and flood warnings
- Specific area of concern map

3.2.7 The Met Office uses a Flood Risk Matrix (see Figure 9) to assess the likelihood against the potential impact and assigns a risk colour and level.

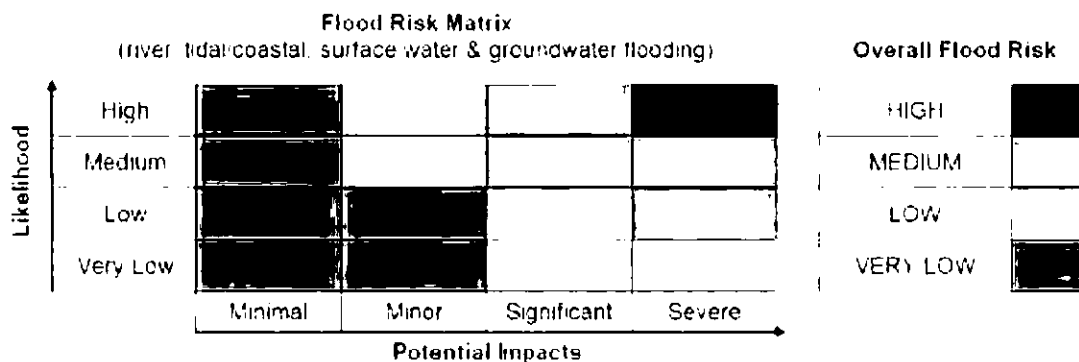


Figure 9: Flood Risk Matrix

3.2.8 Typical Examples of impacts from flooding aligned with the flood risk matrix are shown in Figure 10.

Flood Impacts Table			
Minimal Impacts	Minor Impacts	Significant Impacts	Severe Impacts
- Generally, no impact however there may still be - isolated and minor flooding of low-lying land and roads - isolated instances of spray / wave overtopping on coastal promenades - Little or no disruption to travel although wet road surfaces could lead to difficult driving conditions	- Localised flooding of land and roads – risk of aquaplaning - Localised flooding could affect individual properties - Individual properties in coastal locations affected by spray and/or wave overtopping - Localised disruption to key sites identified in flood plans (e.g. railways, utilities) - Local disruption to travel – longer journey times	- Flooding affecting properties and parts of communities - Damage to buildings/structures is possible - Possible danger to life due to fast flowing deep water / wave overtopping / wave inundation - Disruption to key sites identified in flood plans (e.g. railways, utilities, hospitals) - Disruption to travel is expected. A number of roads are likely to be closed	- Widespread flooding affecting significant numbers of properties and whole communities - Collapse of buildings/structures is possible - Danger to life due to fast flowing deep water / wave overtopping / wave inundation - Widespread disruption or loss of infrastructure identified in flood plans (e.g. railways, utilities, hospitals) - Large scale evacuation of properties may be required - Severe disruption to travel. Risk of motorists becoming stranded

Figure 10: Flood Impact Table

3.2.9 The Environment Agency constantly monitors rainfall, river levels and sea conditions to forecast the possibility of flooding. If necessary, the Environment Agency can be contacted.

Incident hotline 0800 80 70 60 (24hrs)

Floodline 0345 988 1188

3.2.10 The Environment Agency Flood Warning Levels:

Warning type		Meaning	When it is used
 FLOOD ALERT	Flood Alert	Flooding is possible. Be prepared.	Two hours to two days in advance of flooding
 FLOOD WARNING	Flood Warning	Flooding is expected. Immediate action required	Half an hour to one day in advance of flooding
 SEVERE FLOOD WARNING	Severe Flood Warning	Severe Flooding. Danger to life.	When flooding poses a significant threat to life.

Figure 11: EA Flood Warning Levels

4.0 SEQUENTIAL AND EXCEPTION TEST

4.1 SEQUENTIAL TEST

- 4.1.1 For clarity the aim of the sequential test is to steer new development to areas with the lowest probability of flooding. Furthermore, approval of the Sequential Test lies with the Local Authority Planning Authority.
- 4.1.2 The NPPF indicates that for a more vulnerable land use within Flood Zone 3A an exception test is required. The site is identified as being within Flood Zone 3A as defined by the NPPF, identified on the EA Indicative Flood Map and also within the Strategic Flood Risk Assessment.
- 4.1.3 The site is in an existing commercial area with prominent industrial area within the vicinity of the site.
- 4.1.4 In view of the facts as identified the applicant does not own other sites considered to be more suitable for residential accommodation in the immediate vicinity.
- 4.1.5 The above clearly demonstrates that the sequential test would be satisfied provided it can be demonstrated that flood water will not pose excessive risk to the development, safe ingress and egress can be created and the development will not increase risk of flooding elsewhere.
- 4.1.6 The NPPF defines what type of development is appropriate in an individual location and seeks to guide development generally away from areas of flood risk. It nevertheless accepts implicitly that some development in areas of higher potential risk may be appropriate or indeed essential, and seeks to classify zones of risks, types of development and development suitability.

4.2 EXCEPTION TEST

4.2.1 Table 3 within the NPPF indicates that the site is appropriate for use as a more vulnerable land use due to the site being within Flood Zone 3, as long as an exception test is provided.

4.2.2 Wider sustainable benefits to the community include:

- Reduced risk of flooding elsewhere by increasing exceedance flood volume within the site and reducing the site discharge by a minimum of 50% compared to the existing situation.
- The removal of derelict land use in an urban area.
- The proposal is a better use of the site in relation to the adjacent land uses.

4.2.3 The FRA demonstrates safety and flooding sustainability by:

- Maintaining floor levels above the existing land topography.
- Safe ingress and egress routes for pedestrians being available from the properties to higher ground.
- Providing a betterment to the existing flooding within the local area by reducing surface water discharge from the site by a minimum of 30% and making flood storage available at an early stage.

4.2.4 There will be no increase in the level of surface water runoff over the current land use.

4.2.5 In view of the above the exception test is deemed to have passed.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

- 5.1.1 The site proposed for development is at potential risk of flooding from tidal events.
- 5.1.2 The application site lies within the extents of the mapped flood plain of main river systems and is classified as a high-risk area.
- 5.1.3 The site is at low risk of flooding from overland flow routing from watercourses.
- 5.1.4 The site is at a low susceptibility of flooding from groundwater sources.
- 5.1.5 The site is at no quantifiable risk of flooding from manmade lakes.
- 5.1.6 The escape flow route from the strategic water mains has also been considered. In the unlikely event of failure of the mains the flows would not reach the properties.
- 5.1.7 The site is at no risk of flooding from existing sewerage systems for the same reason as the water mains issue.
- 5.1.8 The site is at a negligible risk of flooding from its own private drainage systems however this can be mitigated against by channelling of flows within the development away from the properties.
- 5.1.9 We therefore conclude that the application site lies within Flood Zone 3 as defined in the NPPF Table 1 and since the exception test for this has been passed more vulnerable development uses should be permitted.

5.2 RECOMMENDATIONS

- 5.2.1 A pre-development enquiry has been submitted to Anglian Water to confirm the capacity of the existing sewer network and that it can accommodate the proposed flows from the development.
- 5.2.2 A site-specific Flood Management and Evacuation Plan should be provided to all residents.
- 5.2.3 A private management company is instructed to maintain new drainage system and ensure residents are aware during time of flood warning.

Appendix A Topographical Survey

Appendix B Environment Agency Flood Maps and Level Data

Jon Davey
jon@farrowwalsh.co.uk

Our ref: CCN/2018/83933

Date: 4 May 2018

Dear Jon

Provision of Flood Risk Information for Spalding Road, Pinchbeck.

Thank you for your request to use our flood risk information in the development of the Flood Risk Assessment (FRA) for the above site. The information is set out below and attached. It is important you read any contextual notes on the maps provided.

We aim to review our information on a regular basis, so if you are using this data more than twelve months from the date of this letter, please contact us again to check it is still valid.

Flood Map

The attached map includes the current Flood Map for your area. The Flood Map indicates the area at risk of flooding, **assuming no flood defences exist**, for a flood with a 0.5% chance of occurring in any year for flooding from the sea, or a 1% chance of occurring for fluvial (river) flooding. It also shows the extent of the Extreme Flood Outline which represents the extent of a flood with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater.

In some locations, such as around the fens and the large coastal floodplains there are many kilometres of raised flood defences. To meet the requirements of the National Planning Policy Framework, these defences are removed in their entirety to produce the Flood Map for Planning (Rivers and Sea). The map therefore shows the full extent of areas that would be at risk of flooding if no defences existed and water could spread out across these large floodplains. This flooding could cover large areas of land but to relatively shallow depths and could leave pockets of locally slightly higher land as isolated dry islands. It is important to understand the actual risk of flooding particularly in the event of defence failure.

The Flood Map also shows the location of formal raised flood defences and flood storage reservoirs. It represents areas at risk of flooding for present day only and does not take account of climate change.

The Flood Map only indicates the extent and likelihood of flooding from rivers or the sea. It should also be remembered flooding may occur from other sources such as surface water sewers, road drainage, etc.

History of Flooding

With regards to the history of flooding I can advise we do not have any records of flooding in this area. It is possible other flooding may have occurred we do not have records for, and other organisations, such as the Local Authority or Internal Drainage Boards, may have records.

Fluvial Flood Risk Information

Fluvial Defence Information

The fluvial defences reducing the risk of flooding to this site consist of earth embankments. They are in fair condition and reduce the risk of flooding to a 1% (1 in 100) chance of occurring in any year. We inspect these defences routinely to ensure potential defects are identified.

Modelled Levels and Flows

Available modelled fluvial flood levels and flows for the model nodes shown on the attached map are set out in the data table attached. This data is taken from the model named on the data table, which is the most up-to-date model currently available.

Please note these levels are "in-channel" levels and therefore may not represent the flood level on the floodplain, particularly where the channel is embanked or has raised defences.

Modelled Hazard Mapping

Please refer to South Holland District Council's hazard mapping undertaken for their Strategic Flood Risk Assessment (SFRA). Please go to [http:// www.southeastlincslocalplan.org/2016-update-of-south-holland-strategic-flood-riskassessment-spalding-maps/](http://www.southeastlincslocalplan.org/2016-update-of-south-holland-strategic-flood-riskassessment-spalding-maps/) for the updated 2016 maps.

Development Planning

If you have requested this information to help inform a development proposal, then you should note the information on GOV.UK on the use of our information for Flood Risk Assessments. We recommend that you undertake a formal pre-application enquiry using the form available from the website.

<https://www.gov.uk/planning-applications-assessing-flood-risk>

<https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion>

Climate change will increase flood risk due to overtopping of defences. Please note the climate change data included has an allowance for 20% increase in flow. Updated guidance on how climate change could affect flood risk to new development - 'Flood risk assessments: climate change allowances' was published on GOV.UK in February 2016. The appropriate updated climate change allowance should be applied in a Flood Risk Assessment.

You should also consult the Strategic Flood Risk Assessment produced by your local planning authority.

Supporting Information

Please see the Standard Notice or licence for details of permitted use. The Standard Notice can be found at the link below.

<http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

We respond to requests for recorded information we hold under the Freedom of Information Act 2000 (FOIA) and the associated Environmental Information Regulations 2004 (EIR).

Further information on flood risk can be found on the GOV.UK website at:

<https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather>

Other Flood Risk Management Authorities

The information provided with this letter relates to flood risk from main river or the sea. Additional information may be available from your Lead Local Flood Authority (ie county council or unitary authority) or, where they exist, the Internal Drainage Board.

Further Contact

I hope we have correctly interpreted your request. If you are not satisfied with our response to your request for information, you can contact us within two calendar months to ask for our decision to be reviewed.

If you have any queries or would like to discuss the content of this letter further please contact Sarah Curl using the details below.

Yours sincerely,



FOR Alastair Windler
Partnerships and Strategic Overview Team Leader - Welland and Nene

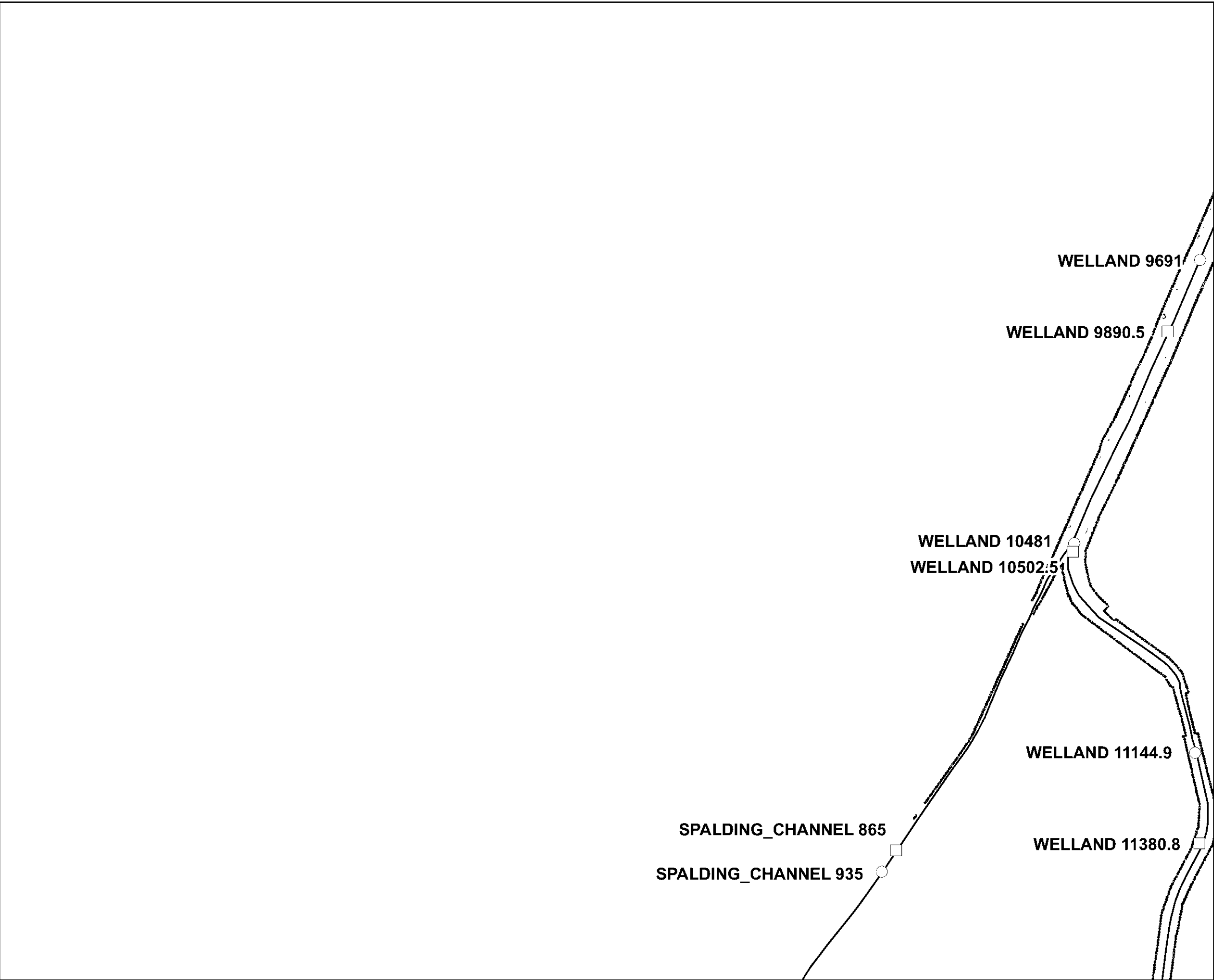
Direct dial 020 302 53535
Direct e-mail PSOWN@environment-agency.gov.uk

Enc.
Flood Map
Modelled Fluvial and Flows Data Sheet



Awarded to Lincolnshire & Northamptonshire Area

Flood Map centred on TF 24734 24383 - created May 2018 [Ref: CCN-2018-83933]



 Environment Agency

Scale 1:10,000

N

Legend

- Modelled Node - Flows
- Modelled Node - Levels
- Main River
- Raised Defences
- Flood Storage Areas
- Area at Risk of Flooding from Rivers or The Sea
- Extreme Flood Outline

Dark blue shows the area that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded:

- from the sea by a flood that has a 0.5% (1 in 200) or greater chance of happening each year.
- or from a river by a flood that has a 1% (1 in 100) or greater chance of happening each year.

Light blue shows the extent of the Extreme Flood Outline, which represents the extent of a flood event with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater.

These two colours show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements. Sites outside the two extents, but behind raised defences, may be affected by flooding if the defences are overtopped or fail.

Created by the Partnerships and Strategic Overview Team, Kettering

Datasheet [Ref: CCN-2018-83933]
Data Model – Welland - Dated 2016
Fluvial Flood Levels (mODN)

The fluvial flood levels for the model nodes shown on the attached map are set out in the table below. They are measured in metres above Ordnance Datum Newlyn (mODN).

Node Label	Easting	Northing	50% (1 in 2)	20% (1 in 5)	10% (1 in 10)	5% (1 in 20)	2% (1 in 50)	1.33% (1 in 75)	1% (1 in 100)	1% (1 in 100) inc 20% Climate Change	0.5% (1 in 200)	0.1% (1 in 1000)	0.1% (1 in 1000) inc 20% Climate Change
SPALDING_CHANNEL 935	525435	323416	3.70	4.00	4.17	4.45	4.51	4.52	4.52	4.68	4.53	4.55	4.68
WELLAND 9691	526244	324972	4.32	4.32	4.38	4.41	4.45	4.43	4.42	5.48	4.42	4.42	5.48
WELLAND 10481	525925	324251	4.33	4.33	4.40	4.42	4.47	4.45	4.44	5.49	4.43	4.42	5.50
WELLAND 11144.9	526232	323719	3.65	3.91	4.10	4.36	4.39	4.42	4.44	4.68	4.45	4.46	4.68

Fluvial Flood Flows (m³/s)

The fluvial flood flows for the model nodes shown on the attached map are set out in the table below. They are measured in metres cubed per second (m³/s).

Node Label	Easting	Northing	50% (1 in 2)	20% (1 in 5)	10% (1 in 10)	5% (1 in 20)	2% (1 in 50)	1.33% (1 in 75)	1% (1 in 100)	1% (1 in 100) inc 20% Climate Change	0.5% (1 in 200)	0.1% (1 in 1000)	0.1% (1 in 1000) inc 20% Climate Change
SPALDING_CHANNEL 865	525471	323470	1.75	2.69	2.48	2.87	2.70	3.13	3.25	4.56	3.10	2.86	5.02
WELLAND 9890.5	526162	324790	77.76	94.14	105.25	119.61	123.09	123.70	125.22	125.00	124.31	123.79	122.84
WELLAND 10502.5	525921	324229	75.79	91.81	102.75	117.33	120.69	121.46	122.98	123.89	122.08	121.74	120.76
WELLAND 11380.8	526243	323488	73.26	88.29	99.60	113.62	117.69	118.52	120.34	123.53	119.44	119.22	118.30

Appendix C Ground Investigation Report

NICHOLLS

INTERPRETIVE REPORT

On

A GROUND INVESTIGATION

For a

PROPOSED RESIDENTIAL DEVELOPMENT AT SPALDING ROAD, PINCHBECK, LINCOLNSHIRE



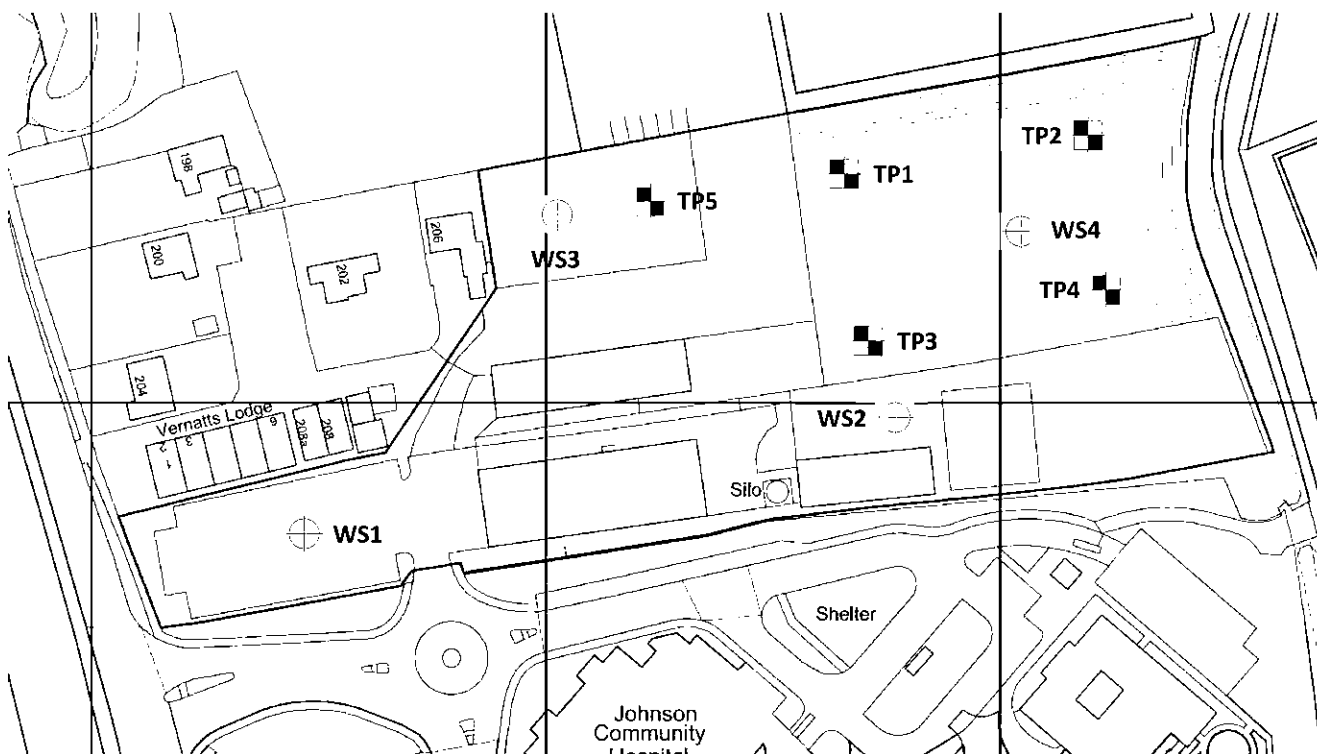
On Behalf Of

**Farrow Walsh Consulting Ltd
Second Floor
48 Cank Street
Leicester
LE1 5GW**

REPORT NO: G18204-IR

November 2018

North



Key:



- Window Sample Borehole



- Machine Dug Trial Pit

Notes: Approximate locations. Not to Scale. Based upon Client's drawings.

NICHOLLS

Client:
Farrow Walsh Consulting Ltd.

Project:
Proposed Residential Development at Spalding Road, Pinchbeck.

Drawing No:
G18204-IR/02

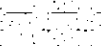
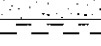
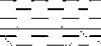
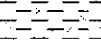
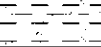
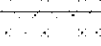
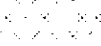
Title:
Exploratory Hole Location Plan

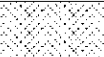
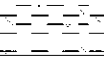
Date:
November 2018

APPENDIX D**Borehole Logs – Window Sample**

NICHOLLS						BOREHOLE RECORD - WS1					
						Window Sampler					
Client: Farrow Walsh Consulting						Boring Diameter: 100mm to 6.45m		Casing Diameter:		Project No.: G18204	
Logged by: PM		Ground Level:				Date: 15/10/18		Location: -		Scale: 1:50	
Samples and In situ Tests			Water	Level (mAOD)	Depth (m)	Strata Description	Legend	Backfill			
Ref:	Depth (m)	SPT N									
E1	0.45 - 0.70	N=6			0.05	MADE GROUND - Macadam.					
B2	0.70 - 1.20				0.45	MADE GROUND - Sub-base.					
		0.70			MADE GROUND - Soft dark brown silty sandy CLAY with occasional gravel sized fragments of brick.						
S	1.20				Soft brown mottled black clayey SILT with occasional organic matter.						
B3	1.20 - 2.00				Soft brown clayey SILT.						
S	2.00	N=12									
B4	2.30 - 3.00				Soft brown SILT.						
S	3.00	N=10									
B5	3.00 - 3.90										
S	4.00	N=2			3.90	Very soft grey SILT.					
D6	4.00 - 5.00					...poor recovery below 4.00m.					
S	5.00	N=5									
D7	5.00 - 6.00										
S	6.00	N=6				... soft below 6.00m.					
					6.45						
Remarks and Water Observations						Sheet 1 of 1					
1. Macadam surfacing broken out with hydraulic breaker. 2. Hand dug starter pit to 1.20m to check for services. 3. Groundwater seepage encountered at 3.20m, with a level formed upon completion. 4. Borehole backfilled with arisings upon completion and reinstated to ground level with macadam.											
AGS											

NICHOLLS						BOREHOLE RECORD - WS2								
						Window Sampler								
Client: Farrow Walsh Consulting						Boring Diameter: 100mm to 5.45m		Casing Diameter:		Project No.: G18204				
Logged by: PM		Ground Level:				Date: 15/10/18		Location: -		Scale: 1:50				
Samples and In situ Tests			Water	Level (mAOD)	Depth (m)	Strata Description	Legend	Backfill						
Ref:	Depth (m)	SPT N												
B2 E1	0.50 - 1.00 0.50	N=11			0.40	MADE GROUND - crushed rock.								
	0.90				MADE GROUND - crushed sandstone. ...geotextile encountered at 0.40m.									
S B3	1.20 1.20 - 2.00	1.20			Soft brown mottled grey and orangish brown slightly silty CLAY.									
	S	2.00			N=8	Soft brown clayey SILT.								
D4 S B5		2.70 - 3.00 3.00 3.00 - 4.00			N=0	2.70		Soft grey mottled black SILT with frequent pockets organic matter. ...poor recovery below 3.00m. ...very soft below 3.00m.						
	S D6	4.00 4.00 - 5.00						N=7			...soft below 4.00m.			
S		5.00			N=24	5.45		...stiff below 5.00m.						
Remarks and Water Observations									Sheet 1 of 1					
1. Hand dug starter pit to 1.20m to check for services. 2. Groundwater seepage encountered at 2.45m, with a level formed upon completion. 3. 50mm groundwater/gas monitoring standpipe installed to 4.00m depth; response zone: 1.00m to 4.00m.														
WAGS														

NICHOLLS						BOREHOLE RECORD - WS3					
						Window Sampler					
Client: Farrow Walsh Consulting						Site: Spalding Road, Pinchbeck.					
						Boring Diameter: 100mm to 5.45m		Casing Diameter:		Project No.: G18204	
Logged by: PM		Ground Level:				Date: 15/10/18		Location: -		Scale: 1:50	
Samples and In situ Tests			Water	Level (mAOD)	Depth (m)	Strata Description	Legend	Backfill			
Ref:	Depth (m)	SPT N									
E1	0.00 - 0.30				0.30	TOPSOIL					
B3	0.40 - 0.80					Brown slightly clayey fine to medium SAND.					
E2	0.40 - 0.80					Stiff brownish grey CLAY.					
S	1.20	N=5			1.20	Soft brown silty slightly sandy CLAY.					
B4	1.20 - 2.00					Soft brownish grey SILT.					
S	2.00	N=7			2.00	Soft brownish grey SILT with occasional pockets of black organic matter.					
B5	2.00 - 2.80					Soft brownish grey SILT with occasional pockets of black organic matter.					
B6	2.80 - 4.00	N=5			2.80						
S	3.00										
S	4.00	N=4			4.00						
B7	4.00 - 5.00										
S	5.00	N=7	5.45								
Remarks and Water Observations											
1. Hand dug starter pit to 1.20m to check for services.											
2. Groundwater seepage encountered at 2.30m, with a level formed upon completion.											
3. 50mm groundwater/gas monitoring standpipe installed to 4.00m depth; response zone: 1.00m to 4.00m.											
AGS											

NICHOLLS						BOREHOLE RECORD - WS4					
						Window Sampler					
Client: Farrow Walsh Consulting						Boring Diameter: 100mm to 4.45m		Casing Diameter:		Project No.: G18204	
Logged by: PM		Ground Level:				Date: 15/10/18		Location: -		Scale: 1:50	
Samples and In situ Tests			Water	Level (mAOD)	Depth (m)	Strata Description	Legend	Backfill			
Ref:	Depth (m)	SPT N									
E1	0.50				0.40	MADE GROUND - crushed stone.					
						Firm brown mottled black slightly silty CLAY.					
						Soft brown slightly clayey SILT.					
S B2	1.20 1.20 - 2.00	N=10			0.80						
S B3	2.00 2.00 - 2.80	N=7									
S B4	3.00 3.00 - 4.00	N=2									
S	4.00	N=4									
					4.45						
Remarks and Water Observations									Sheet 1 of 1		
1. Hand dug starter pit to 1.20m to check for services. 2. Groundwater seepage encountered at 2.20m, with a level formed upon completion. 3. 50mm groundwater/gas monitoring standpipe installed to 4.00m depth; response zone: 1.00m to 4.00m.											
AGS											

APPENDIX E

Trial Pit Logs

NICHOLLS						TRIAL PIT LOG - TP1					
						Site: Spalding Road, Pinchbeck.					
Client: Farrow Walsh Consulting						Method of Excavation: Mechanical Excavator		Dimensions: 2.50m x 0.60m		Project No.: G18204	
Logged by: PM		Ground Level:				Date: 16/10/2018		Location: -		Scale: 1:25	
Samples and In situ Tests			Water	Level (mAOD)	Depth (m)	Strata Description	Legend	Backfill			
Ref:	Depth (m)	Result									
B1 E1	0.00 - 0.30 0.00 - 0.30				0.30	MADE GROUND - Topsoil with occasional pockets of subangular fine to medium sandstone gravel with gravel and cobble sized fragments of brick and plastic.					
B2	0.50 - 1.00					Soft light brown slightly clayey SILT.					
						...trial pit sides collapsed back from 2.80m to 1.20m.					
						Soft brownish grey silty CLAY.					
B3	2.00 - 2.50					Soft greyish brown SILT.					
B4	2.90 - 3.20				2.80	Grey slightly clayey silty fine to medium SAND.					
					3.30						
Remarks and Water Observations									Sheet 1 of 1		
1. Trial pit excavated utilising mechanical excavator. 2. Groundwater seepage encountered at 2.80m. 3. Trial pit sides collapsed back from 2.80m to 1.20m. 4. Trial pit backfilled with arisings upon completion.											
AGS											

NICHOLLS						TRIAL PIT LOG - TP2					
						Site: Spalding Road, Pinchbeck.					
Client: Farrow Walsh Consulting						Method of Excavation: Mechanical Excavator		Dimensions: 2.50m x 0.60m		Project No.: G18204	
Logged by: PM		Ground Level:				Date: 16/10/2018		Location: -		Scale: 1:25	
Samples and In situ Tests			Water	Level (mAOD)	Depth (m)	Strata Description	Legend	Backfill			
Ref:	Depth (m)	Result									
B1	0.20					MADE GROUND - Topsoil with occasional pockets of gravel, and cobble sized fragments of brick, plastic and glass.					
E1	0.20				0.30	Firm brown SILT with frequent rootlets.					
B2	0.50 - 0.85				0.50	Soft light brown slightly sandy SILT.					
B3	0.85 - 1.50				0.85	Soft light greyish brown mottled orangish brown slightly clayey SILT.					
B4	1.60 - 2.00				1.50	Soft light grey SILT.					
						...trial pit sides collapsed back from 3.00m to 1.70m.					
B5	2.80 - 3.00				2.70	Soft grey SILT.					
					3.00						
Remarks and Water Observations									Sheet 1 of 1		
1. Trial pit excavated utilising mechanical excavator. 2. Groundwater seepage encountered at 2.20m. 3. Trial pit sides collapsed back from 3.00m to 1.70m. 4. Trial pit backfilled with arisings upon completion.											
AGS											

NICHOLLS						TRIAL PIT LOG - TP3					
						Site: Spalding Road, Pinchbeck.					
Client: Farrow Walsh Consulting						Method of Excavation: Mechanical Excavator		Dimensions: 1.50m x 0.60m		Project No.: G18204	
Logged by: PM		Ground Level:				Date: 16/10/2018		Location: -		Scale: 1:25	
Samples and In situ Tests			Water	Level (mAOD)	Depth (m)	Strata Description	Legend	Backfill			
Ref:	Depth (m)	Result									
B2	0.00 - 0.40				0.40	MADE GROUND - Orangish brown fine to coarse SAND and sub-angular to rounded fine to coarse sandstone GRAVEL with occasional gravel sized fragments of brick.					
E1	0.30					Soft brownish grey slightly clayey SILT with frequent rootlets.					
B3	0.40 - 0.70										
B4	0.70 - 1.10										
B5	1.10 - 1.50									0.70	Stiff greyish brown silty CLAY.
		1.10	Soft brownish grey slightly sandy slightly clayey SILT.								
	1.50										
Remarks and Water Observations										Sheet 1 of 1	
1. Trial pit excavated utilising mechanical excavator. 2. No groundwater seepages encountered during excavation. 3. Trial pit backfilled with nominal sized gravel from 0.50m to 1.50m with pipe to allow infiltration testing and reinstated to ground level with arisings.											
AGS											

NICHOLLS						TRIAL PIT LOG - TP4					
						Site: Spalding Road, Pinchbeck.					
Client: Farrow Walsh Consulting						Method of Excavation: Mechanical Excavator		Dimensions: 1.80m x 0.60m		Project No.: G18204	
Logged by: PM		Ground Level:				Date: 16/10/2018		Location: -		Scale: 1:25	
Samples and In situ Tests			Water	Level (mAOD)	Depth (m)	Strata Description	Legend	Backfill			
Ref:	Depth (m)	Result									
B2	0.30				0.20	MADE GROUND - Orangish brown fine to coarse SAND and sub-angular to rounded fine to coarse sandstone GRAVEL with occasional gravel sized fragments of brick.					
E1	0.30 - 0.50					Soft brown slightly clayey SILT with frequent rootlets.					
B3	0.50 - 1.10				0.50	Soft brownish grey locally mottled orange slightly clayey SILT.					
B4	1.10 - 1.50				1.10	Soft brownish grey SILT.					
					1.50						
Remarks and Water Observations										Sheet 1 of 1	
1. Trial pit excavated utilising mechanical excavator. 2. No groundwater seepages encountered during excavation. 3. Trial pit backfilled with nominal sized gravel from 0.50m to 1.50m with pipe to allow infiltration testing and reinstated to ground level with arisings.											
AGS											

NICHOLLS						TRIAL PIT LOG - TP5					
						Site: Spalding Road, Pinchbeck.					
Client: Farrow Walsh Consulting						Method of Excavation: Mechanical Excavator		Dimensions: 1.80m x 0.60m		Project No.: G18204	
Logged by: PM		Ground Level:				Date: 16/10/2018		Location: -		Scale: 1:25	
Samples and In situ Tests			Water	Level (mAOD)	Depth (m)	Strata Description	Legend	Backfill			
Ref:	Depth (m)	Result									
E1	0.15				0.20	MADE GROUND - Topsoil with occasional gravel sized fragments of sandstone, plastic, ceramic and bricks.					
B2	0.20 - 0.90					Soft brownish grey SILT with frequent rootlets.					
B3	0.90 - 1.50				0.90	Stiff grey mottled orangish brown and reddish brown silty CLAY.					
					1.50	Soft brownish grey slightly clayey SILT.					
					1.60						
Remarks and Water Observations									Sheet 1 of 1		
1. Trial pit excavated utilising mechanical excavator. 2. No groundwater seepages encountered during excavation. 3. Trial pit backfilled with nominal sized gravel from 0.60m to 1.60m with pipe to allow infiltration testing, and topped with arisings upon completion to aid for inevitable settlement.											
AGS											

Appendix D Anglian Water Apparatus records



(c) Crown copyright and database rights 2018 Ordnance Survey 100022432 Date: 11/04/18 Scale: 1:1250 Map Centre: 524721,324413 Data updated: 13/03/18 Our Ref: 260254 - 1 Clean Water Plan A4

This plan is provided by Anglian Water pursuant to its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. This plan is produced by Anglian Water Services Limited (c) Crown copyright and database rights 2018 Ordnance Survey 100022432. This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

Potable Water

Raw Water

Decommissioned Water

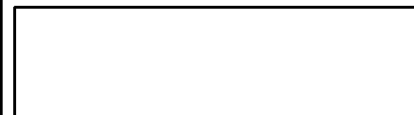
Fitting

Hydrant



dgunn@groundwise.com

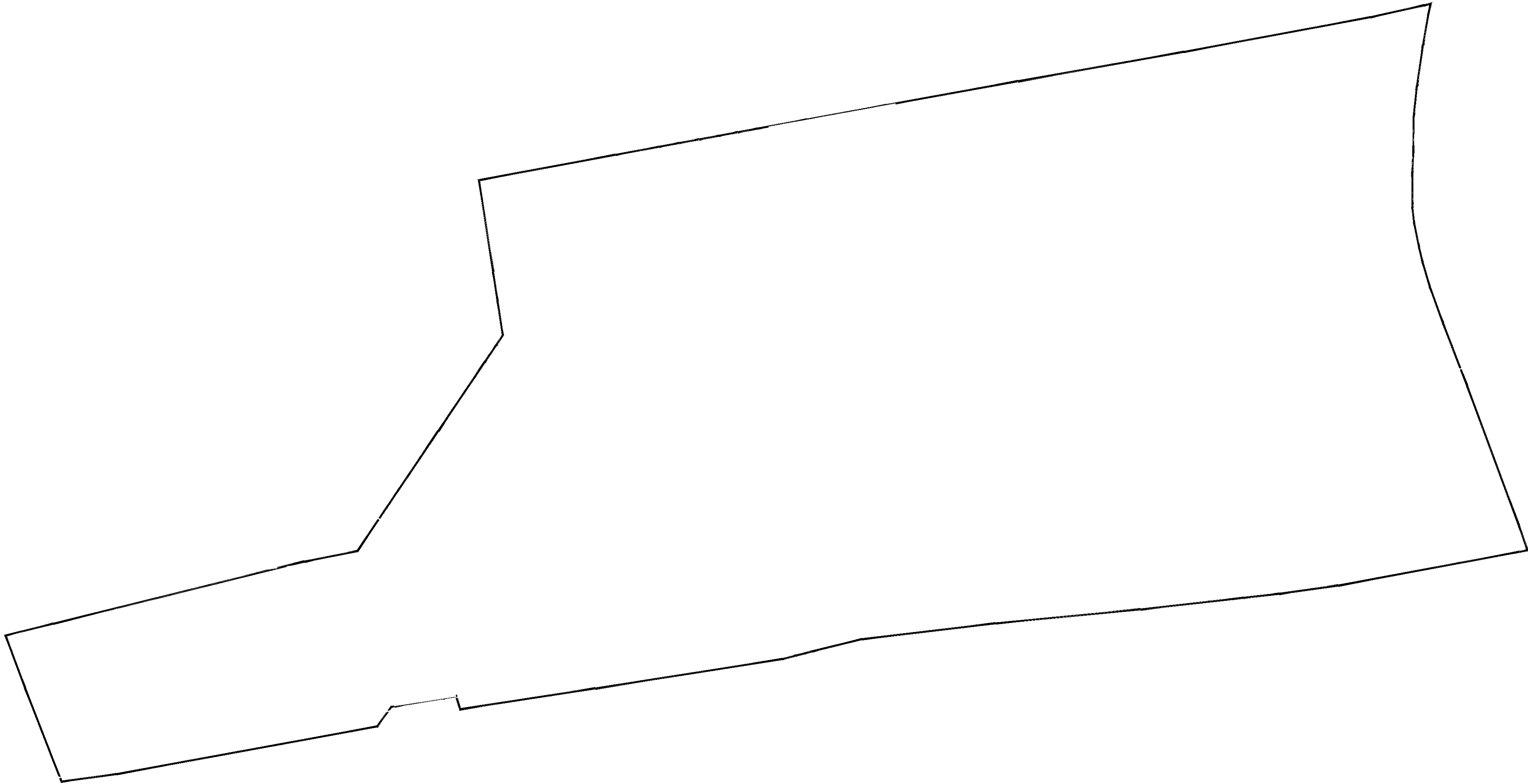
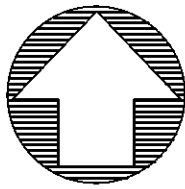
21724



love every drop
anglian

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert	Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
8300	F	-	-	-					
8400	F	-	-	-					

Appendix E Existing Impermeable Areas and Discharge Rates



- General Notes
1. DO NOT SCALE.
 2. This drawing is to be read in conjunction with all other relevant drawings and details.
 3. Should there be any conflict between the details indicated on this drawing and those on other drawings the Engineer should be informed PRIOR to construction on site.
 4. Until technical approval has been obtained from the relevant Authority, it should be understood that all drawings issued are Preliminary and NOT for construction. Should the Contractor commence site work prior to such approval being given it is entirely at their own risk.
 5. Sketch proposals are for illustrative purposes only and as such are subject to detailed site investigation including ground conditions / contaminants, drainage, design and planning / density negotiations.
 6. All dimensions are in millimetres unless otherwise stated.
 7. The Farrow Walsh Consulting Designers Risk Assessments for this project must be reviewed PRIOR to the commencement of any works on site.

LEGEND

- Site Ownership Boundary
- 5,287m²

Existing Hardstand (Adoptable Area)
Assumed outfall is the watercourse on eastern boundary.
- 1,340m²

Existing Hardstand (Private Area)
Assumed outfall is the private drain located to sout east.
- Existing Sewer

A1	Issued for Approval.	RW	BM	JD	15.11.18
Rev	Description of updates	Drawn	Checked	App'd	Date

Revision Schedule



FOR APPROVAL

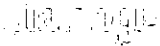
Client:
Kaplan Property Group

Project:
Spalding Road,
Pinchbeck

Title:
Existing Drainage Area Plan

Drawn: BM	Checked: RW	Approved: JD	Date: Nov 2018	Scale: 1:250 @ A1
--------------	----------------	-----------------	-------------------	----------------------

Drawing No: FW1664-D-402	Revision: A1
------------------------------------	------------------------

Farrow Walsh Consulting		Page 1
62 Highcross Street Leicester LE1 4NN	Spalding Road Pinchbeck Existing Discharge (Adoptable)	
Date 14/11/2018 File FW1664 EXISTING DISCHARGE	Designed by BM Checked by CB	
Innovyze	Network 2018.1.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes Private Manhole Sizes Private

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.508	4-8	0.021

Total Area Contributing (ha) = 0.529

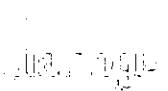
Total Pipe Volume (m³) = 1.104

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	5.000	0.017	300.0	0.529	4.00	0.0	0.600	o	375	Pipe/Conduit	
1.001	5.000	0.017	300.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	

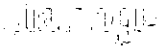
Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.08	8.500	0.529	0.0	0.0	0.0	1.04	115.0	71.6
1.001	50.00	4.16	8.483	0.529	0.0	0.0	0.0	1.04	115.0	71.6

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62 Highcross Street Leicester LE1 4NN	Spalding Road Pinchbeck Existing Discharge (Adoptable)	
Date 14/11/2018 File FW1664 EXISTING DISCHARGE	Designed by BM Checked by CB	
Innovyze		Network 2018.1.1

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN Invert Level (m)	Diameter (mm)	Pipes In PN Invert Level (m)	Diameter (mm)	Backdrop (mm)
ex1	10.000	1.500	Open Manhole	1350	1.000	8.500			
ex2	10.000	1.517	Open Manhole	1350	1.001	8.483	1.000	8.483	375
	10.000	1.533	Open Manhole	0		OUTFALL	1.001	8.467	375

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62 Highcross Street Leicester LE1 4NN	Spalding Road Pinchbeck Existing Discharge (Adoptable)	
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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	375	ex1	10.000	8.500	1.125	Open Manhole	1350
1.001	o	375	ex2	10.000	8.483	1.142	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	5.000	300.0	ex2	10.000	8.483	1.142	Open Manhole	1350
1.001	5.000	300.0		10.000	8.467	1.158	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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1.001		10.000	8.467	0.000	0	0
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Simulation Criteria for Storm

Volumetric Runoff Coeff 0.840 Additional Flow - % of Total Flow 0.000
 Areal Reduction Factor 1.000 MADD Factor * 10m³/ha Storage 2.000
 Hot Start (mins) 0 Inlet Coefficient 0.800
 Hot Start Level (mm) 0 Flow per Person per Day (l/per/day) 0.000
 Manhole Headloss Coeff (Global) 0.500 Run Time (mins) 60
 Foul Sewage per hectare (l/s) 0.000 Output Interval (mins) 1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

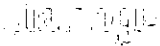
Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.400		

Volume Summary (Static)

Length Calculations based on True Length

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
1.000	ex1	2.147	0.403	0.000	2.550
1.001	ex2	2.171	0.478	0.000	2.649
Total		4.318	0.881	0.000	5.199

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Summary Wizard of 15 minute 1 year Winter I+0% for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

 Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

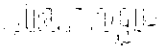
Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s) Winter
 Duration(s) (mins) 15
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 0

			Water Surcharged Flooded				Pipe	
	US/MH	Storm	Level	Depth	Volume	Flow /	Overflow	Pipe
PN	Name	Rank	(m)	(m)	(m³)	Cap.	(l/s)	Flow
								(l/s) Status
1.000	ex1	4	8.818	-0.057	0.000	1.00		76.6 OK
1.001	ex2	4	8.785	-0.073	0.000	0.99		76.2 OK

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Summary Wizard of 15 minute 2 year Winter I+0% for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

 Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

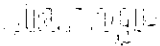
Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s) Winter
 Duration(s) (mins) 15
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 0

			Water	Surcharged	Flooded		Pipe	
	US/MH	Storm	Level	Depth	Volume	Flow / Overflow	Flow	
PN	Name	Rank	(m)	(m)	(m³)	Cap.	(l/s)	Status
1.000	ex1	3	8.895	0.020	0.000	1.33	102.1	SURCHARGED
1.001	ex2	3	8.859	0.000	0.000	1.32	101.6	SURCHARGED

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Summary Wizard of 15 minute 30 year Winter I+0% for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

 Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

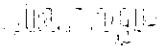
Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s) Winter
 Duration(s) (mins) 15
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 0

			Water	Surcharged	Flooded		Pipe		
PN	US/MH Name	Storm Rank	Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	ex1	2	9.296	0.421	0.000	2.42		185.9	SURCHARGED
1.001	ex2	2	9.059	0.200	0.000	2.41		184.8	SURCHARGED

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Summary Wizard of 15 minute 100 year Winter I+0% for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

 Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

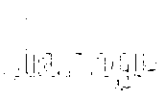
Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s) Winter
 Duration(s) (mins) 15
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 0

			Water	Surcharged	Flooded		Pipe	
	US/MH	Storm	Level	Depth	Volume	Flow / Overflow	Flow	
PN	Name	Rank	(m)	(m)	(m³)	Cap.	(l/s)	Status
1.000	ex1	1	9.596	0.721	0.000	3.08	236.2	SURCHARGED
1.001	ex2	1	9.207	0.349	0.000	3.10	238.0	SURCHARGED

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes Private Manhole Sizes Private

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.128	4-8	0.006

Total Area Contributing (ha) = 0.134

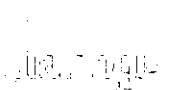
Total Pipe Volume (m³) = 0.398

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	5.000	0.022	225.0	0.134	4.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	5.000	0.022	225.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

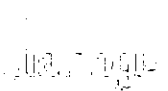
Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.10	8.500	0.134	0.0	0.0	0.0	0.87	34.5	18.1
1.001	50.00	4.19	8.478	0.134	0.0	0.0	0.0	0.87	34.5	18.1

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62 Highcross Street Leicester LE1 4NN	Spalding Road Pinchbeck Existing Discharge (Private)	
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Innovyze Network 2018.1.1		

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN Invert Level (m)	Diameter (mm)	Pipes In PN Invert Level (m)	Diameter (mm)	Backdrop (mm)
ex1	10.000	1.500	Open Manhole	1200	1.000	8.500			
ex2	10.000	1.522	Open Manhole	1200	1.001	8.478	1.000	8.478	225
	10.000	1.544	Open Manhole	0		OUTFALL	1.001	8.456	225

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	ex1	10.000	8.500	1.275	Open Manhole	1200
1.001	o	225	ex2	10.000	8.478	1.297	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	5.000	225.0	ex2	10.000	8.478	1.297	Open Manhole	1200
1.001	5.000	225.0		10.000	8.456	1.319	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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1.001		10.000	8.456	0.000	0	0
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Simulation Criteria for Storm

Volumetric Runoff Coeff 0.840 Additional Flow - % of Total Flow 0.000
 Areal Reduction Factor 1.000 MADD Factor * 10m³/ha Storage 2.000
 Hot Start (mins) 0 Inlet Coefficient 0.800
 Hot Start Level (mm) 0 Flow per Person per Day (l/per/day) 0.000
 Manhole Headloss Coeff (Global) 0.500 Run Time (mins) 60
 Foul Sewage per hectare (l/s) 0.000 Output Interval (mins) 1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

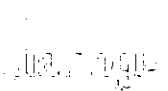
Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.400		

Volume Summary (Static)

Length Calculations based on True Length

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
1.000	ex1	1.696	0.151	0.000	1.848
1.001	ex2	1.722	0.175	0.000	1.897
Total		3.418	0.326	0.000	3.744

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Summary Wizard of 15 minute 1 year Winter I+0% for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

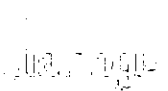
Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s) Winter
 Duration(s) (mins) 15
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 0

			Water Surcharged Flooded				Pipe	
	US/MH	Storm	Level	Depth	Volume	Flow / Overflow	Flow	
PN	Name	Rank	(m)	(m)	(m³)	Cap.	(l/s)	(l/s) Status
1.000	ex1	4	8.653	-0.072	0.000	0.80	20.0	OK
1.001	ex2	4	8.630	-0.073	0.000	0.79	19.9	OK

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Summary Wizard of 15 minute 2 year Winter I+0% for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

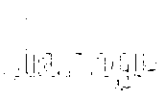
Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s) Winter
 Duration(s) (mins) 15
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 0

			Water Surcharged Flooded				Pipe	
	US/MH	Storm	Level	Depth	Volume	Flow / Overflow	Flow	
PN	Name	Rank	(m)	(m)	(m³)	Cap.	(l/s)	(l/s) Status
1.000	ex1	3	8.703	-0.022	0.000	1.00	25.1	OK
1.001	ex2	3	8.659	-0.044	0.000	1.00	25.0	OK

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Summary Wizard of 15 minute 30 year Winter I+0% for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

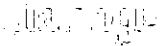
Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s) Winter
 Duration(s) (mins) 15
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 0

			Water	Surcharged	Flooded		Pipe		
PN	US/MH Name	Storm Rank	Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	ex1	2	8.910	0.185	0.000	1.92		48.3	SURCHARGED
1.001	ex2	2	8.789	0.087	0.000	1.90		47.8	SURCHARGED

Farrow Walsh Consulting		Page 7
62 Highcross Street Leicester LE1 4NN	Spalding Road Pinchbeck Existing Discharge (Private)	
Date 14/11/2018 File FW1664 Existing Discharge	Designed by BM Checked by CB	
Innovyze	Network 2018.1.1	

Summary Wizard of 15 minute 100 year Winter I+0% for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000
 Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

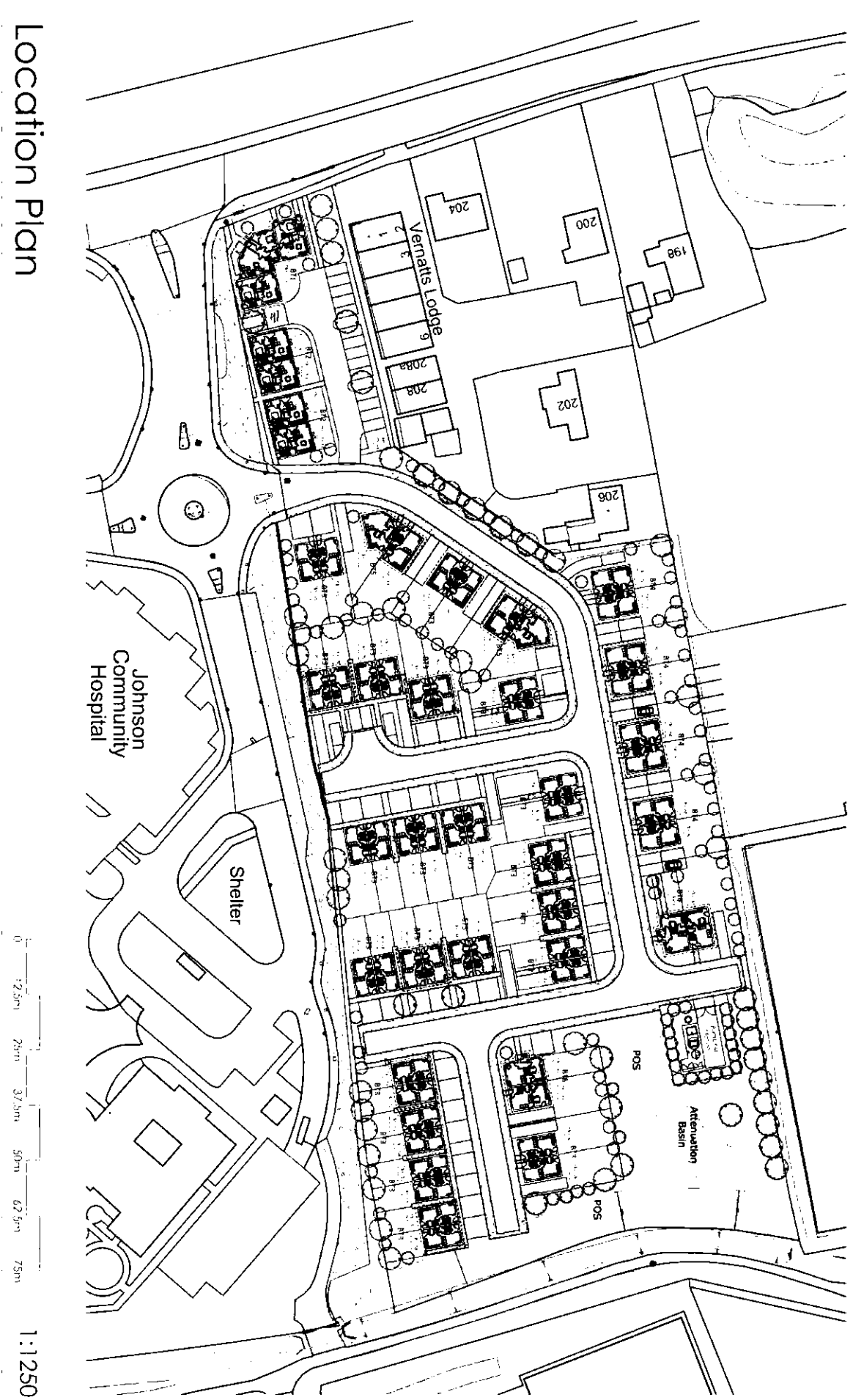
Profile(s) Winter
 Duration(s) (mins) 15
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 0

			Water	Surcharged	Flooded		Pipe		
PN	US/MH Name	Storm Rank	Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	ex1	1	9.069	0.344	0.000	2.46		61.9	SURCHARGED
1.001	ex2	1	8.868	0.166	0.000	2.43		61.1	SURCHARGED

Appendix F Proposed Site Plan

Schedule of Accommodation

72 no. Units -	6 no. units (BT1 - 1b2p, Between 46.0m ² & 62.7m ²)
	8 no. units (BT2 - 1b2p, Areas = 4 x 45.3m ² & 4 x 52.0m ²)
	42 no. units (BT3 - 2b4p, Areas = 69.0m ²)
	8 no. units (BT4 - 3b5p, Areas = 84.3m ²)
	4 no. units (BT5 - 3b5p, Areas = 85.2m ² or 93.6m ²)
	4 no. units (BT6 - 3b5p, Areas = 87.5m ² or 84.4m ²)
Total Site Area = 16,998m ² (4.2 acres).	
POS = 1,523m ² (minimum of 1,200m ² required)	



Printed or electronic copies of any drawing can be scanned for planning purposes only. Any discrepancies with this drawing to be reported and clarified prior to commencing work on site. If in doubt - Ask Corporate Architecture Ltd accept no responsibility for works not undertaken fully in accordance with this drawing and relevant specifications.

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Rev.	Description	By:	Date:
P1	Issued for Planning	JAE	Dec 18
P2	Issued for Review	JAE	Feb 19
P3	9m after approval noted in drawing	JAE	Mar 19
P4	2m after approval noted in drawing	JAE	Apr 19
P5	2m after approval noted in drawing	JAE	Apr 19
P6	2m after approval noted in drawing	JAE	Apr 19
P7	2m after approval noted in drawing	JAE	May 19

Group

checked:	Date:	Paper Size
	June 17	A1

Proposed Site Plan

PLANNING ISSUE

P/17/002

P7

**CORPORATE ARCHITECTURE LIMITED
CHARTERED ARCHITECTS**

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office@corporatearchitecture.co.uk
www.corporatearchitecture.co.uk

KILBY

Appendix G Drainage Strategy

Site Details

16,698m² / 1.700ha : Development area

Adoptable Section 104 Drainage

5,287m² / 0.529ha : Existing impermeable area

5,640m² / 0.564ha : Proposed impermeable area (7% increase)

101.6 l/s : Existing Q_{BAR} storm discharge rate to sewer

5.0 l/s : Proposed Q100+40% climate change storm discharge rate to existing watercourse (95% Betterment)

Development impermeable areas to be drained into the watercourse via voided stone storage and an attenuation basin with minimum SUDs treatment to Cria753, through gravity sewers.

Private Drainage

1,340m² / 0.134ha : Existing impermeable area

678m² / 0.068ha : Proposed impermeable area (49% reduction)

25.0 l/s : Existing Q_{BAR} storm discharge rate to sewer

17.5 l/s : Proposed Q100+40% climate change storm discharge rate to existing watercourse (30% Betterment)

Development impermeable areas to be drained into the private drains via voided stone storage with minimum SUDs treatment to Cria753, through gravity sewers.

All drainage to be constructed in accordance with Sewers for Adoption 6th Edition and Building Regulations Part H.

Layout subject to detailed level and FFL design.

A CCTV survey of the as-built drainage is to be undertaken by the Contractor and provided to the Engineer for final approval

Sewer details shown are taken from STW sewer records and are to be confirmed by Contractor prior to commencement of the works

Minimum pipe cover to soffits to be as per The Building Regulations 2010 Part H for thermoplastic pipes:

- 0.6m in pedestrian or landscaped areas
- 0.9m in vehicle accessible areas

Any pipes with cover to soffit less than those stated above are to have a Class Z concrete pipe bed & surround

Internal foul drain pipe minimum gradients:

- 1:80 from SVP & WC to IC
- 1:40 from Basin & Sink to IC

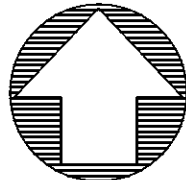
Refer to Architect's/M&E drawings for pipe sizes and setting-out information.

Adoptable Drainage Area	
Storm Event	Existing Max. Discharge Rate
1 in 2 year	101.6 l/s
1 in 30 year	184.8 l/s
1 in 100	238.0 l/s

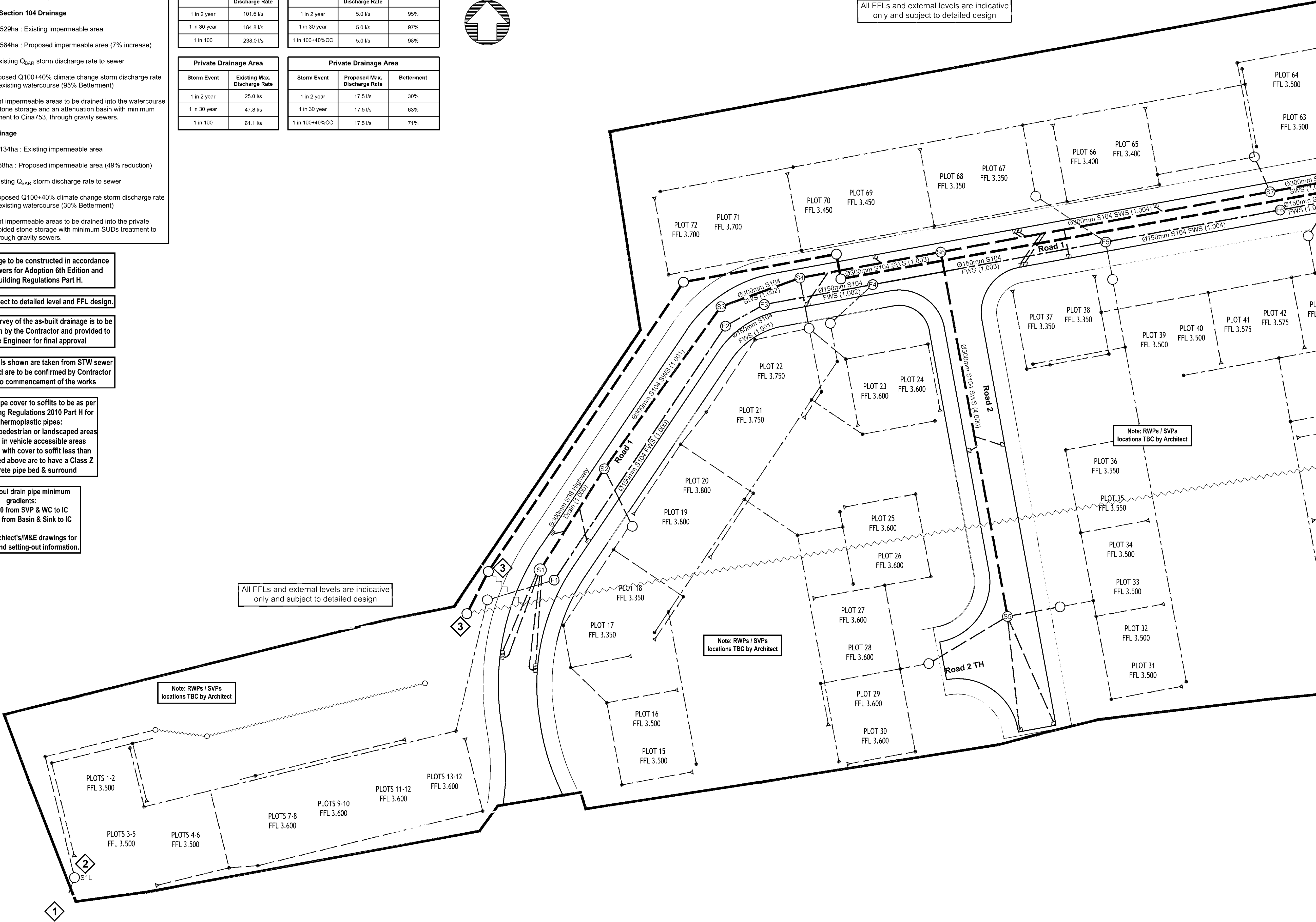
Adoptable Drainage Area		
Storm Event	Proposed Max. Discharge Rate	Betterment
1 in 2 year	5.0 l/s	95%
1 in 30 year	5.0 l/s	97%
1 in 100+40%CC	5.0 l/s	98%

Private Drainage Area	
Storm Event	Existing Max. Discharge Rate
1 in 2 year	25.0 l/s
1 in 30 year	47.8 l/s
1 in 100	61.1 l/s

Private Drainage Area		
Storm Event	Proposed Max. Discharge Rate	Betterment
1 in 2 year	17.5 l/s	30%
1 in 30 year	17.5 l/s	63%
1 in 100+40%CC	17.5 l/s	71%



All FFLs and external levels are indicative only and subject to detailed design



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 - Sketch proposals are for illustrative purposes only and as such are subject to detailed site investigation including ground conditions / contaminants, drainage, design and planning / density negotiations.
 - All dimensions are in millimetres unless otherwise stated.
 - The Farrow Walsh Consulting Designers Risk Assessments for this project must be reviewed PRIOR to the commencement of any works on site.

NOTES

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- The exact position, level, size and use of existing sewers to be confirmed on site. Any discrepancies to be reported to the engineer prior to commencement of works.
- All uncovered and shallow pipework to be protected against construction traffic as part of the contractors temporary works requirements.
- Cover levels shown are approximate only, subject to the Architect's external works and landscaping scheme.
- All connections to road gullies and channels shall be 150mm nominal bore pipework.
- All pipework to be U-PVC type in accordance with WIS 4-35-01 unless otherwise noted.
- All pipes connecting to adopted manholes up to and including 300mm dia. to be U-PVC.
- All pipes connecting to adopted manholes greater than 300mm dia. to be Concrete.
- All pipework entering and exiting manholes to be connected with pipe soffits level.

LEGEND

- Site Ownership Boundary
- 450mm dia. IC Max Depth 3.0m
- 1200mm dia. IC
- Rodding eye (storm only)
- Surface Water
- Private Sewer Diversion
- Foul Water
- Section 38 Storm Drainage
- Existing Sewer
- S104 Foul Water Rising Main
- 600mm dia. Catchpit
- Collector drain - Ø100mm Plastic plastic pipe
- Existing storm drain to be fully removed
- Sewer Easement
- Private permeable block paving parking bays
- Voided stone attenuation area (Depth shown)
- Proposed S106 Connection**
Foul connection into existing sewer subject to S106 application approval by Severn Trent Water.
- Private Drain Diversion**
New chamber onto existing private drain

A3	Site layout revised to suit current Architect layout, drainage strategy updated to suit PCP 1-3 voided stone depths increased to 300mm based on revised design.	JD	CB	BM	05.06.19	
A2			BM	CB	JD	21.03.19
A1			BM	RW	JD	14.11.18
Rev	Description of updates	Drawn	Check'd	App'd	Date	
Revision Schedule						



FOR APPROVAL

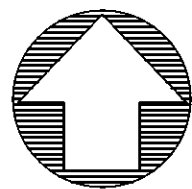
Client:
Kaplan Property Group

Project:
Spalding Road,
Pinchbeck

Title:
Drainage Strategy
Sheet 1 of 2

Drawn: BM	Checked: RW	Approved: JD	Date: Nov 2018	Scale: 1:250 @ A1
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Drawing No. FW1664-D-400	Revision: A3
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All FFLs and external levels are indicative only and subject to detailed design

Note: RWP's / SVPs locations TBC by Architect

HydroBrake Optimum Flow Control
MD-SHE-0103-5000-1200-5000
Flow Rate: 5.0l/s
Design Head: 1.200m

ADOPTABLE FOUL WATER
PUMPING STATION
FFL 3.350

All FFLs and external levels are indicative only and subject to detailed design

Note: RWP's / SVPs locations TBC by Architect

Note: RWP's / SVPs locations TBC by Architect

1

2

3

Hydrobrake Flow Control Chamber
Proposed manhole 1800Ø fitted with hydrobrake set at 5.0l/s and 500mm sump (silt trap) to restrict surface water discharge from site.

Foul Water Outfall
Sewer invert and location TBC by Contractor prior to detailed design.

Mesh Screening
Mesh screen to be placed over the outlet pipe of chambers S18 & F11 during site construction works and removed immediately prior to the first occupancy of the dwellings served by the sewers.

4

5

Proposed Adoptable Foul Water Pumping Station
Proposed Adoptable pumping station will convey pumped flows to F11 before connecting to the existing sewer using a gravity connection. Specification of the pumping station and rising main is to be agreed with Anglian Water at the detailed design stage.

Existing Watercourse Connection
Connection subject to IDB watercourse consent and discharge is subject to LLFA approval.

All drainage to be constructed in accordance with Sewers for Adoption 6th Edition and Building Regulations Part H.

Layout subject to detailed level and FFL design.

A CCTV survey of the as-built drainage is to be undertaken by the Contractor and provided to the Engineer for final approval

Sewer details shown are taken from STW sewer records and are to be confirmed by Contractor prior to commencement of the works

Internal foul drain pipe minimum gradients:
• 1:80 from SVP & WC to IC
• 1:40 from Basin & Sink to IC
Refer to Architect's/M&E drawings for pipe sizes and setting-out information.

Minimum pipe cover to soffits to be as per The Building Regulations 2010 Part H for thermoplastic pipes:
• 0.6m in pedestrian or landscaped areas
• 0.9m in vehicle accessible areas
Any pipes with cover to soffit less than those stated above are to have a Class Z concrete pipe bed & surround

Adoptable Drainage Area	
Storm Event	Existing Max. Discharge Rate
1 in 2 year	101.6 l/s
1 in 30 year	184.9 l/s
1 in 100	238.0 l/s

Adoptable Drainage Area		
Storm Event	Proposed Max. Discharge Rate	Betterment
1 in 2 year	5.0 l/s	95%
1 in 30 year	5.0 l/s	97%
1 in 100+40%CC	5.0 l/s	98%

Private Drainage Area	
Storm Event	Existing Max. Discharge Rate
1 in 2 year	25.0 l/s
1 in 30 year	47.8 l/s
1 in 100	61.1 l/s

Adoptable Drainage Area		
Storm Event	Proposed Max. Discharge Rate	Betterment
1 in 2 year	17.5 l/s	30%
1 in 30 year	17.5 l/s	63%
1 in 100+40%CC	17.5 l/s	71%

Site Details

16,698m² / 1.700ha : Development area

Adoptable Section 104 Drainage

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17.5 l/s : Proposed Q100+40% climate change storm discharge rate to existing watercourse (30% Betterment)

Development impermeable areas to be drained into the private drains via voided stone storage with minimum SUDs treatment to Ciriā753, through gravity sewers.

General Notes

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NOTES

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- All pipes connecting to adopted manholes up to and including 300mm dia. to be U-PVC.
- All pipes connecting to adopted manholes greater than 300mm dia. to be Concrete.
- All pipework entering and exiting manholes to be connected with pipe soffits level.

LEGEND

	Site Ownership Boundary
	450mm dia. IC Max Depth 3.0m
	1200mm dia. IC
	Rodding eye (storm only)
	Surface Water
	Private Sewer Diversion
	Foul Water
	Section 38 Storm Drainage
	Existing Sewer
	S104 Foul Water Rising Main
	600mm dia. Catchpit
	Collector drain - Ø100mm Plastic plastic pipe
	Existing storm drain to be fully removed

Sewer Easement

Internal Drainage Board Easement (9m from top of bank)

Private permeable block paving parking bays

Voided stone attenuation area (Depth shown)

A4	Site layout revised to suit current Architect layout, drainage strategy updated to suit	JD	CB	BM	05.06.19
A3	Stone depths increased to 300mm, IDB easement shown & adoptable drainage revised to suit layout received 26.02.2019.	BM	CB	JD	21.03.19
A2	PCP 2 stone depth increased and flow control details added to S11.	BM	RW	JD	15.11.18
A1	Issued for Approval.	BM	RW	JD	14.11.18

Rev Description of updates

Revision Schedule



FOR APPROVAL

Client:
Kaplan Property Group

Project:
Spalding Road,
Pinchbeck

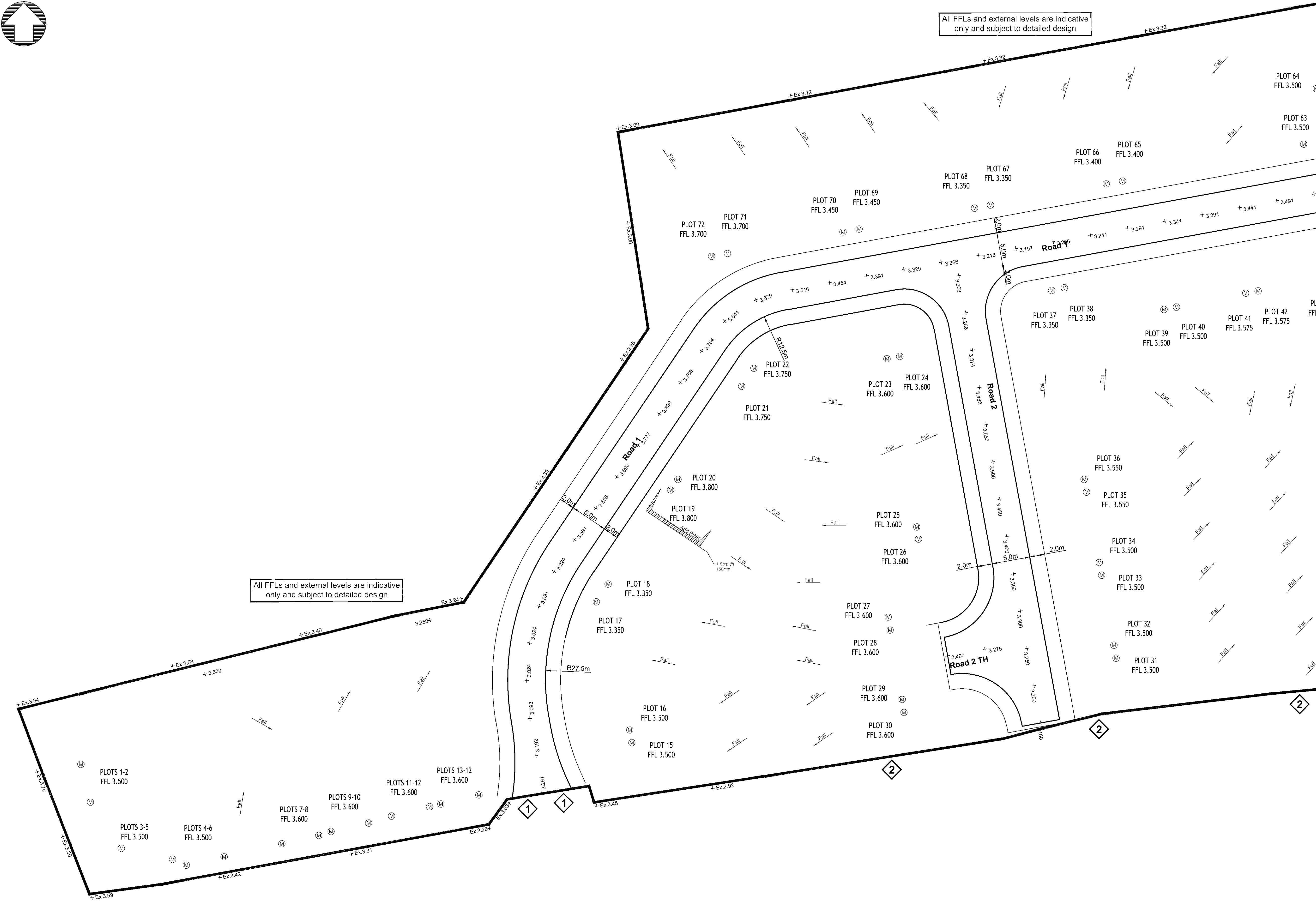
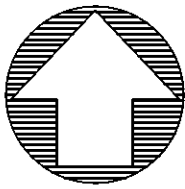
Title:
Drainage Strategy
Sheet 2 of 2

Drawn: BM	Checked: RW	Approved: JD	Date: Nov 2018	Scale: 1:250 @ A1
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Drawing No.
FW1664-D-401

Revision:

A4



- General Notes
1. DO NOT SCALE.
 2. This drawing is to be read in conjunction with all other relevant drawings and details.
 3. Should there be any conflict between the details indicated on this drawing and those on other drawings the Engineer should be informed PRIOR to construction on site.
 4. Until technical approval has been obtained from the relevant Authority, it should be understood that all drawings issued are Preliminary and NOT for construction. Should the Contractor commence site work prior to such approval being given it is entirely at their own risk.
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 6. All dimensions are in millimetres unless otherwise stated.
 7. The Farrow Waleh Consulting Designers Risk Assessments for this project must be reviewed PRIOR to the commencement of any works on site.

NOTES

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3. The design of any temporary works required shall be the responsibility of the Contractor.
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5. All work is to be to the satisfaction of the Engineer.
6. The Contractor is responsible for and must take all necessary precautions to ensure the stability of the works at all times during construction.
7. All workmanship and materials are to be to current British Standards.
8. All services are to be located and protected as necessary by the Contractor prior to the commencement of the works.
9. Any existing details which are shown on this drawing are for guidance only and are to be checked on site by the Contractor. Any variations are to be recorded and reported to the Engineer immediately.

General Road Notes

- This drawing is to be read in conjunction with the local Highway Authority design guide and the general specification for roadworks current at the time of construction.
- All works shall be in accordance with the local Highway Authority's approved documents and satisfaction. Any reference to the specification shall mean the general specification for roadworks.
1. Prior to any works being carried out within or immediately adjacent to the public highway, a scheme for the safe control of traffic and pedestrians is to be agreed with the highway authority and implemented.
 2. Working areas within the vicinity of existing trees are to be agreed with the engineer and chestnut fencing erected as directed.
 3. Special care is to be taken when excavating in the vicinity of existing trees. It is not intended that any tree roots should be severed or damaged and specialist advice should be sought when major roots present a problem. Care is to be taken to avoid damage to branches and foliage.
 4. It is the Contractor's responsibility to trace and indicate the precise location and nature of all services.
 5. The Contractor is to provide a CCTV survey of any highway sewers on completion of the 12-month maintenance period. This is to be provided in accordance with the requirements of the local water and highways authorities.
 6. Safe passage for pedestrians across the site is to be ensured at all times by means of approved fencing to both sides of any footpath route.
 7. The Health and Safety at Work Act 1981 is to be complied with at all times. Attention is drawn to the wearing of hard hats, reflectorised clothing, and the use of any other required safety equipment.
 8. The Contractor is to take account of the soils report.
 9. No completion works will be authorised until a formal certificate of conformance to relevant specification is received from the relevant water authority.
 10. Compaction control shall be achieved by air void testing for both roadbase and basecourse (maximum air void ratio 6%).
 11. Any recycled material to be used for highway construction purposes will be allowed subject to it satisfying relevant tests as instructed by this authority.
 12. The Contractor is to take CBR tests at road formation level, capping layer level, and sub-base level and the highway engineer informed before any construction works carried out on that level.
 13. All levels and dimensions are to be checked on site before any work commences.
 14. All private drives which fall towards a public highway and exceed two parking bays in area are to be provided with a suitable gully or drainage channel to prevent water discharging onto the highway.
 15. Where a driveway falls towards a dwelling it shall be provided with a suitable gully or drainage channel to prevent water damaging the building.

LEGEND

- Site Ownership Boundary
- Entrance Point
- Part M Primary Access
- Proposed Finished Floor Level
- Proposed level
- Additional brickwork (Max. number of courses shown)
- Fall Arrow
- Existing Road Levels
- Existing levels of road tie-in points to be confirmed by Contractor prior to construction
- Site Survey
- Additional survey points are required in this area

A2	Revised to suit latest site layout	JD	CB	BM	05.06.19
A1	Issued for Approval.	BM	RW	JD	14.11.18
Rev	Description of updates	Drawn	Checked	App'd	Date
Revision Schedule					



FOR APPROVAL

Client:
Kaplan Property Group

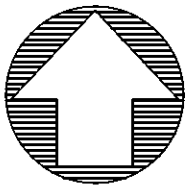
Project:
Spalding Road,
Pinchbeck

Title:
Engineering Layout
Sheet 1 of 2

Drawn: BM	Checked: RW	Approved: JD	Date: Nov 2018	Scale: 1:250 @ A1
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Drawing No.
FW1664-E-500

Revision:
A2



All FFLs and external levels are indicative only and subject to detailed design

All FFLs and external levels are indicative only and subject to detailed design

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NOTES

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- Do not scale this drawing. All dimensions are in millimetres unless noted otherwise. Any discrepancies are to be recorded and reported to the Engineers immediately.
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- Special care is to be taken when excavating in the vicinity of existing trees. It is not intended that any tree roots should be severed or damaged and specialist advice should be sought when major roots present a problem. Care is to be taken to avoid damage to branches and foliage.
- It is the Contractor's responsibility to trace and indicate the precise location and nature of all services.
- The Contractor is to provide a CCTV survey of any highway sewers on completion of the 12-month maintenance period. This is to be provided in accordance with the requirements of the local water and highways authorities.
- Safe passage for pedestrians across the site is to be ensured at all times by means of approved fencing to both sides of any footpath route.
- The Health and Safety at Work Act 1981 is to be complied with at all times. Attention is drawn to the wearing of hard hats, reflectorised clothing, and the use of any other required safety equipment.
- The Contractor is to take account of the soils report.
- No completion works will be authorised until a formal certificate of conformance to relevant specification is received from the relevant water authority.
- Compaction control shall be achieved by air void testing for both roadbase and basecourse (maximum air void ratio 6%).
- Any recycled material to be used for highway construction purposes will be allowed subject to it satisfying relevant tests as instructed by this authority.
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- All levels and dimensions are to be checked on site before any work commences.
- All private drives which fall towards a public highway and exceed two parking bays in area are to be provided with a suitable gully or drainage channel to prevent water discharging onto the highway.
- Where a driveway falls towards a dwelling it shall be provided with a suitable gully or drainage channel to prevent water damaging the building.

LEGEND

- Site Ownership Boundary
- Entrance Point
- M Primary Access
- PLOT FFL 3.500 Proposed Finished Floor Level
- + 3.500 Proposed level
- Additional brickwork (Max. number of courses shown)
- Fall Arrow

Internal Drainage Board Easement (9m from top of bank)

- Existing Road Levels**
Existing levels of road tie-in points to be confirmed by Contractor prior to construction
- Site Survey**
Additional survey points are required in this area

A3	Revised to suit latest site layout	JD	CB	BM	05.06.19
A2	Development layout updated as agreed with Internal Drainage Board 01.03.20109	BM	CB	JD	21.03.19
A1	Issued for Approval.	BM	RW	JD	14.11.18
Rev	Description of updates	Drawn	Checked	App'd	Date

Revision Schedule



FOR APPROVAL

Client:
Kaplan Property Group

Project:
Spalding Road,
Pinchbeck

Title:
Engineering Layout
Sheet 2 of 2

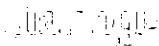
Drawn: BM	Checked: RW	Approved: JD	Date: Nov 2018	Scale: 1:250 @ A1
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Drawing No:
FW1664-E-501

Revision:

A3

Appendix H MicroDrainage Calculations

Farrow Walsh Consulting		Page 1
62 Highcross Street Leicester LE1 4NN	Spalding Road Pinchbeck Adoptable SW Network	
Date 21/03/2019	Designed by BM	
File FW1664 ADOPTABLE SW DRAINAGE.MDX	Checked by JD	
Innovyze	Network 2019.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for FW1664 ADOPTABLE SW DRAINAGE.SWS

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	0	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for FW1664 ADOPTABLE SW DRAINAGE.SWS

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.048	4-8	0.487	8-12	0.029

Total Area Contributing (ha) = 0.564

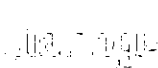
Total Pipe Volume (m³) = 28.670

Network Design Table for FW1664 ADOPTABLE SW DRAINAGE.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	15.637	0.065	240.6	0.051	4.00	0.0	0.600	o	300	Pipe/Conduit	
2.000	8.349	0.056	149.1	0.019	4.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	26.074	0.109	240.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.002	10.962	0.046	240.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.000	6.690	0.159	42.1	0.028	4.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	18.703	0.083	225.3	0.030	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL Σ (m)	I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	0.00	4.26	2.160	0.051	0.0	0.0	0.0	1.01	71.3	0.0
2.000	0.00	4.17	2.301	0.019	0.0	0.0	0.0	0.82	14.5	0.0
1.001	0.00	4.69	2.095	0.070	0.0	0.0	0.0	1.01	71.4	0.0
1.002	0.00	4.87	1.986	0.070	0.0	0.0	0.0	1.01	71.4	0.0
3.000	0.00	4.07	2.250	0.028	0.0	0.0	0.0	1.56	27.5	0.0
1.003	0.00	5.17	1.941	0.128	0.0	0.0	0.0	1.04	73.7	0.0

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62 Highcross Street Leicester LE1 4NN	Spalding Road Pinchbeck Adoptable SW Network	
Date 21/03/2019 File FW1664 ADOPTABLE SW DRAINAGE.MDX	Designed by BM Checked by JD	
Innovyze	Network 2019.1	

Network Design Table for FW1664 ADOPTABLE SW DRAINAGE.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
4.000	11.956	0.080	149.5	0.026	4.00	0.0	0.600	o	150	Pipe/Conduit	
5.000	6.983	0.047	148.6	0.025	4.00	0.0	0.600	o	150	Pipe/Conduit	
4.001	48.348	0.212	228.1	0.060	0.00	0.0	0.600	o	200	Pipe/Conduit	
1.004	43.718	0.177	247.0	0.067	0.00	0.0	0.600	o	375	Pipe/Conduit	
6.000	4.849	0.485	10.0	0.051	4.00	0.0	0.600	o	150	Pipe/Conduit	
1.005	10.000	0.042	238.1	0.038	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.006	5.794	0.026	222.8	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
7.000	12.199	0.563	21.7	0.021	4.00	0.0	0.600	o	225	Pipe/Conduit	
8.000	15.659	0.092	170.2	0.019	4.00	0.0	0.600	o	225	Pipe/Conduit	
8.001	23.904	0.100	239.0	0.070	0.00	0.0	0.600	o	200	Pipe/Conduit	
9.000	23.133	0.192	120.5	0.037	4.00	0.0	0.600	o	225	Pipe/Conduit	
8.002	39.408	0.371	106.2	0.022	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.007	16.918	0.068	248.8	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.008	11.977	0.039	307.1	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.009	16.027	0.001	16027.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.010	8.255	0.028	294.8	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL E (m)	I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
4.000	0.00	4.24	2.330	0.026	0.0	0.0	0.0	0.82	14.5	0.0
5.000	0.00	4.14	2.267	0.025	0.0	0.0	0.0	0.82	14.5	0.0
4.001	0.00	5.02	2.070	0.111	0.0	0.0	0.0	1.04	73.3	0.0
1.004	0.00	5.80	1.783	0.306	0.0	0.0	0.0	1.15	126.8	0.0
6.000	0.00	4.03	2.315	0.051	0.0	0.0	0.0	3.21	56.6	0.0
1.005	0.00	5.94	1.605	0.395	0.0	0.0	0.0	1.17	129.2	0.0
1.006	0.00	6.02	1.563	0.395	0.0	0.0	0.0	1.21	133.6	0.0
7.000	0.00	4.07	2.250	0.021	0.0	0.0	0.0	2.82	112.3	0.0
8.000	0.00	4.26	2.250	0.019	0.0	0.0	0.0	1.00	39.7	0.0
8.001	0.00	4.65	2.083	0.089	0.0	0.0	0.0	1.01	71.6	0.0
9.000	0.00	4.32	2.250	0.037	0.0	0.0	0.0	1.19	47.3	0.0
8.002	0.00	5.09	1.983	0.148	0.0	0.0	0.0	1.53	107.8	0.0
1.007	0.00	6.27	1.537	0.564	0.0	0.0	0.0	1.14	126.4	0.0
1.008	0.00	6.47	1.469	0.564	0.0	0.0	0.0	1.03	113.6	0.0
1.009	0.00	8.46	1.430	0.564	0.0	0.0	0.0	0.13	14.8	0.0
1.010	0.00	8.59	1.429	0.564	0.0	0.0	0.0	1.05	116.0	0.0

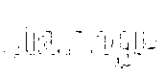
Farrow Walsh Consulting		Page 3
62 Highcross Street Leicester LE1 4NN	Spalding Road Pinchbeck Adoptable SW Network	
Date 21/03/2019	Designed by BM	
File FW1664 ADOPTABLE SW DRAINAGE.MDX	Checked by JD	
Innovyze	Network 2019.1	

Network Design Table for FW1664 ADOPTABLE SW DRAINAGE.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.011	5.000	0.029	172.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	0
1.012	9.399	0.055	170.9	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	0

Network Results Table

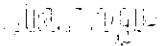
PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.011	0.00	8.67	1.407	0.564	0.0	0.0	0.0	0.99	39.5	0.0
1.012	0.00	8.83	1.372	0.564	0.0	0.0	0.0	1.00	39.7	0.0

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62 Highcross Street Leicester LE1 4NN	Spalding Road Pinchbeck Adoptable SW Network	
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File FW1664 ADOPTABLE SW DRAINAGE.MDX	Checked by JD	
Innovyze	Network 2019.1	

Manhole Schedules for FW1664 ADOPTABLE SW DRAINAGE.SWS

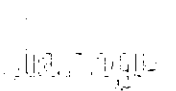
MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	3.210	1.050	Open Manhole	1800	1.000	2.160	300				
S2L	3.600	1.299	Open Manhole	1200	2.000	2.301	150				
S2	3.682	1.587	Open Manhole	1200	1.001	2.095	300	1.000	2.095	300	
								2.000	2.245	150	
S3	3.688	1.602	Open Manhole	1200	1.002	1.986	300	1.001	1.986	300	
S4L	3.600	1.350	Open Manhole	1200	3.000	2.250	150				
S4	3.488	1.517	Open Manhole	1200	1.003	1.941	300	1.002	1.941	300	
								3.000	2.091	150	
S5LA	3.400	1.100	Open Manhole	600	4.000	2.300	150				
S5LB	3.400	1.133	Open Manhole	1200	5.000	2.267	150				
S5	3.380	1.280	Open Manhole	1200	4.001	2.070	300	4.000	2.220	150	
								5.000	2.220	150	
S6	3.211	1.428	Open Manhole	1350	1.004	1.783	375	1.003	1.858	300	
								4.001	1.858	300	
S7LA	3.600	1.285	Open Manhole	1200	6.000	2.310	150				
S7	3.484	1.849	Open Manhole	1350	1.005	1.605	375	1.004	1.606	375	1
								6.000	1.830	150	
S8	3.684	1.991	Open Manhole	1350	1.006	1.563	375	1.005	1.563	375	
S13	3.225	0.975	Open Manhole	1500	7.000	2.250	225				
S9	3.400	1.150	Open Manhole	1200	8.000	2.250	225				
S10	3.400	1.317	Open Manhole	1200	8.001	2.083	300	8.000	2.158	225	
S11	3.400	1.150	Open Manhole	1200	9.000	2.250	225				
S12	3.400	1.417	Open Manhole	1200	8.002	1.983	300	8.001	1.983	300	
								9.000	2.058	225	
S14	3.601	2.064	Open Manhole	1350	1.007	1.537	375	1.006	1.537	375	
								7.000	1.687	225	
								8.002	1.612	300	
S15	3.400	1.931	Open Manhole	1800	1.008	1.469	375	1.007	1.469	375	
Pond In	2.929	1.499	Open Manhole	600	1.009	1.430	375	1.008	1.430	375	
Pond Out	2.929	1.500	Open Manhole	600	1.010	1.429	375	1.009	1.429	375	
S18	3.200	1.799	Open Manhole	1800	1.011	1.401	225	1.010	1.401	375	
S19	3.200	1.828	Open Manhole	1200	1.012	1.372	225	1.011	1.372	225	
HW3	3.200	1.883	Open Manhole	600		OUTFALL		1.012	1.317	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	524676.002	324393.840	524676.002	324393.840	Required	
S2L	524688.038	324399.540	524688.038	324399.540	Required	

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62 Highcross Street Leicester LE1 4NN	Spalding Road Pinchbeck Adoptable SW Network	
Date 21/03/2019 File FW1664 ADOPTABLE SW DRAINAGE.MDX	Designed by BM Checked by JD	
Innovyze	Network 2019.1	

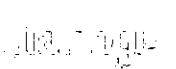
Manhole Schedules for FW1664 ADOPTABLE SW DRAINAGE.SWS

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S2	524684.378	324407.044	524684.378	324407.044	Required	
S3	524699.610	324428.206	524699.610	324428.206	Required	
S4L	524711.115	324425.379	524711.115	324425.379	Required	
S4	524709.909	324431.960	524709.909	324431.960	Required	
S5LA	524726.748	324381.618	524726.748	324381.618	Required	
S5LB	524743.869	324389.024	524743.869	324389.024	Required	
S5	524737.000	324387.769	524737.000	324387.769	Required	
S6	524728.306	324435.329	524728.306	324435.329	Required	
S7LA	524769.256	324447.757	524769.256	324447.757	Required	
S7	524771.309	324443.204	524771.309	324443.204	Required	
S8	524781.146	324445.005	524781.146	324445.005	Required	
S13	524784.652	324458.049	524784.652	324458.049	Required	
S9	524832.859	324414.412	524832.859	324414.412	Required	
S10	524817.456	324411.591	524817.456	324411.591	Required	
S11	524798.110	324384.530	524798.110	324384.530	Required	
S12	524793.943	324407.285	524793.943	324407.285	Required	
S14	524786.845	324446.049	524786.845	324446.049	Required	
S15	524803.486	324449.096	524803.486	324449.096	Required	

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62 Highcross Street Leicester LE1 4NN	Spalding Road Pinchbeck Adoptable SW Network	
Date 21/03/2019 File FW1664 ADOPTABLE SW DRAINAGE.MDX	Designed by BM Checked by JD	
Innovyze	Network 2019.1	

Manhole Schedules for FW1664 ADOPTABLE SW DRAINAGE.SWS

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
Pond In	524813.789	324455.203	524813.789	324455.203	Required	
Pond Out	524827.577	324463.374	524827.577	324463.374	Required	
S18	524832.094	324470.284	524832.094	324470.284	Required	
S19	524836.900	324471.663	524836.900	324471.663	Required	
HW3	524845.935	324474.255			No Entry	

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62 Highcross Street Leicester LE1 4NN	Spalding Road Pinchbeck Adoptable SW Network	
Date 21/03/2019 File FW1664 ADOPTABLE SW DRAINAGE.MDX	Designed by BM Checked by JD	
Innovyze	Network 2019.1	

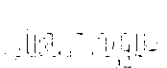
PIPELINE SCHEDULES for FW1664 ADOPTABLE SW DRAINAGE.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	300	S1	3.210	2.180	0.750	Open Manhole	1800
2.000	o	150	S2L	3.600	2.300	1.149	Open Manhole	1200
1.001	o	300	S2	3.682	2.095	1.287	Open Manhole	1200
1.002	o	300	S3	3.588	1.986	1.302	Open Manhole	1200
3.000	o	150	S4L	3.600	2.250	1.200	Open Manhole	1200
1.003	o	300	S4	3.458	1.941	1.217	Open Manhole	1200
4.000	o	150	S5LA	3.400	2.300	0.950	Open Manhole	600
5.000	o	150	S5LB	3.400	2.267	0.983	Open Manhole	1200
4.001	o	300	S5	3.350	2.070	0.980	Open Manhole	1200
1.004	o	375	S6	3.211	1.783	1.053	Open Manhole	1350
6.000	o	150	S7LA	3.600	2.315	1.135	Open Manhole	1200
1.005	o	375	S7	3.454	1.605	1.474	Open Manhole	1350
1.006	o	375	S8	3.554	1.563	1.616	Open Manhole	1350
7.000	o	225	S13	3.225	2.250	0.750	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	15.637	240.6	S2	3.682	2.095	1.287	Open Manhole	1200
2.000	8.349	149.1	S2	3.682	2.245	1.287	Open Manhole	1200
1.001	26.074	240.0	S3	3.588	1.986	1.302	Open Manhole	1200
1.002	10.962	240.0	S4	3.458	1.941	1.217	Open Manhole	1200
3.000	6.690	42.1	S4	3.458	2.091	1.217	Open Manhole	1200
1.003	18.703	225.3	S6	3.211	1.858	1.053	Open Manhole	1350
4.000	11.956	149.5	S5	3.350	2.220	0.980	Open Manhole	1200
5.000	6.983	148.6	S5	3.350	2.220	0.980	Open Manhole	1200
4.001	48.348	228.1	S6	3.211	1.858	1.053	Open Manhole	1350
1.004	43.718	247.0	S7	3.454	1.606	1.473	Open Manhole	1350
6.000	4.849	10.0	S7	3.454	1.830	1.474	Open Manhole	1350
1.005	10.000	238.1	S8	3.554	1.563	1.616	Open Manhole	1350
1.006	5.794	222.8	S14	3.600	1.537	1.689	Open Manhole	1350
7.000	12.199	21.7	S14	3.600	1.687	1.689	Open Manhole	1350

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62 Highcross Street Leicester LE1 4NN	Spalding Road Pinchbeck Adoptable SW Network	
Date 21/03/2019	Designed by BM	
File FW1664 ADOPTABLE SW DRAINAGE.MDX	Checked by JD	
Innovyze	Network 2019.1	

PIPELINE SCHEDULES for FW1664 ADOPTABLE SW DRAINAGE.SWS

Upstream Manhole

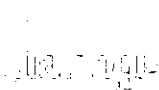
PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
8.000	o	225	S9	3.400	2.250	0.925	Open Manhole	1200
8.001	o	300	S10	3.400	2.083	1.017	Open Manhole	1200
9.000	o	225	S11	3.400	2.250	0.925	Open Manhole	1200
8.002	o	300	S12	3.400	1.983	1.117	Open Manhole	1200
1.007	o	375	S14	3.601	1.537	1.689	Open Manhole	1350
1.008	o	375	S15	3.400	1.469	1.556	Open Manhole	1800
1.009	o	375	Pond In	2.929	1.430	1.124	Open Manhole	600
1.010	o	375	Pond Out	2.929	1.429	1.125	Open Manhole	600
1.011	o	225	S18	3.200	1.401	1.574	Open Manhole	1800
1.012	o	225	S19	3.200	1.372	1.603	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
8.000	15.659	170.2	S10	3.400	2.158	1.017	Open Manhole	1200
8.001	23.904	239.0	S12	3.400	1.983	1.117	Open Manhole	1200
9.000	23.133	120.5	S12	3.400	2.058	1.117	Open Manhole	1200
8.002	39.408	106.2	S14	3.601	1.612	1.689	Open Manhole	1350
1.007	16.918	248.8	S15	3.400	1.469	1.556	Open Manhole	1800
1.008	11.977	307.1	Pond In	2.929	1.430	1.124	Open Manhole	600
1.009	16.027	16027.0	Pond Out	2.929	1.429	1.125	Open Manhole	600
1.010	8.255	294.8	S18	3.200	1.401	1.424	Open Manhole	1800
1.011	5.000	172.4	S19	3.200	1.372	1.603	Open Manhole	1200
1.012	9.399	170.9	HW3	3.200	1.317	1.658	Open Manhole	600

Free Flowing Outfall Details for FW1664 ADOPTABLE SW DRAINAGE.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.012	HW3	3.200	1.317	0.000	600	0

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Online Controls for FW1664 ADOPTABLE SW DRAINAGE.SWS

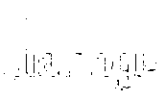
Hydro-Brake® Optimum Manhole: Pond Out, DS/PN: 1.010, Volume (m³): 2.1

Unit Reference	MD-SHE-0103-5000-1200-5000
Design Head (m)	1.200
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	103
Invert Level (m)	1.429
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	5.0	Kick-Flo®	0.745	4.0
Flush-Flo™	0.354	5.0	Mean Flow over Head Range	-	4.4

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.4	0.800	4.1	2.000	6.3	4.000	8.8	7.000	11.5
0.200	4.7	1.000	4.6	2.200	6.6	4.500	9.3	7.500	11.8
0.300	5.0	1.200	5.0	2.400	6.9	5.000	9.8	8.000	12.2
0.400	5.0	1.400	5.4	2.600	7.2	5.500	10.2	8.500	12.6
0.500	4.9	1.600	5.7	3.000	7.7	6.000	10.7	9.000	12.9
0.600	4.7	1.800	6.0	3.500	8.3	6.500	11.1	9.500	13.3

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Storage Structures for FW1664 ADOPTABLE SW DRAINAGE.SWS

Tank or Pond Manhole: Pond Out, DS/PN: 1.010

Invert Level (m) 1.429

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	113.4	1.500	372.0

Volume Summary (Static)

Length Calculations based on True Length

Pipe Number	USMH Name	Manhole Volume (m ³)	Pipe Volume (m ³)	Storage Structure Volume (m ³)	Total Volume (m ³)
1.000	S1	2.672	0.999	0.000	3.671
2.000	S2L	1.469	0.126	0.000	1.595
1.001	S2	1.795	1.758	0.000	3.553
1.002	S3	1.811	0.690	0.000	2.501
3.000	S4L	1.527	0.097	0.000	1.624
1.003	S4	1.716	1.232	0.000	2.948
4.000	S5LA	0.311	0.195	0.000	0.506
5.000	S5LB	1.281	0.102	0.000	1.384
4.001	S5	1.448	3.327	0.000	4.775
1.004	S6	2.044	4.679	0.000	6.724
6.000	S7LA	1.453	0.063	0.000	1.516
1.005	S7	2.647	0.955	0.000	3.602
1.006	S8	2.850	0.491	0.000	3.341
7.000	S13	1.723	0.428	0.000	2.151
8.000	S9	1.301	0.575	0.000	1.876
8.001	S10	1.489	1.605	0.000	3.094
9.000	S11	1.301	0.872	0.000	2.173
8.002	S12	1.603	2.695	0.000	4.298
1.007	S14	2.954	1.695	0.000	4.649
1.008	S15	4.914	1.190	0.000	6.104
1.009	Pond In	0.424	1.704	0.000	2.128
1.010	Pond Out	0.424	0.779	345.395	346.598
1.011	S18	4.578	0.139	0.000	4.717
1.012	S19	2.067	0.338	0.000	2.405
Total		45.802	26.737	345.395	417.934

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Summary Wizard of 15 minute 1 year Summer I+0% for FW1664 ADOPTABLE SW DRAINAGE.SWS

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

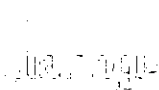
Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm Rank	Water	Surcharged	Flooded	Pipe		Status
			Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	
1.000	S1	34	2.229	-0.231	0.000	0.12	7.2	OK
2.000	S2L	31	2.348	-0.103	0.000	0.21	2.7	OK
1.001	S2	37	2.173	-0.222	0.000	0.15	9.6	OK
1.002	S3	43	2.073	-0.213	0.000	0.17	9.7	OK
3.000	S4L	31	2.291	-0.109	0.000	0.17	4.0	OK
1.003	S4	45	2.043	-0.197	0.000	0.25	16.1	OK
4.000	S5LA	32	2.354	-0.096	0.000	0.28	3.7	OK
5.000	S5LB	31	2.322	-0.095	0.000	0.29	3.5	OK
4.001	S5	37	2.160	-0.210	0.000	0.19	13.1	OK
1.004	S6	49	1.938	-0.219	0.000	0.30	34.3	OK
6.000	S7LA	32	2.356	-0.109	0.000	0.17	7.2	OK
1.005	S7	49	1.922	-0.058	0.000	0.37	35.2	OK
1.006	S8	50	1.896	-0.042	0.000	0.37	31.6	OK
7.000	S13	32	2.276	-0.199	0.000	0.03	3.0	OK
8.000	S9	32	2.291	-0.184	0.000	0.08	2.7	OK
8.001	S10	36	2.163	-0.220	0.000	0.16	9.9	OK
9.000	S11	32	2.302	-0.173	0.000	0.12	5.2	OK
8.002	S12	43	2.067	-0.216	0.000	0.17	17.3	OK
1.007	S14	51	1.877	-0.035	0.000	0.44	45.0	OK
1.008	S15	50	1.821	-0.023	0.000	0.44	37.8	OK
1.009	Pond In	50	1.778	-0.027	0.000	1.00	35.8	OK
1.010	Pond Out	70	1.632	-0.172	0.000	0.05	4.3	OK
1.011	S18	70	1.458	-0.168	0.000	0.15	4.3	OK
1.012	S19	70	1.426	-0.171	0.000	0.13	4.3	OK

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Summary Wizard of 15 minute 30 year Summer I+0% for FW1664 ADOPTABLE SW DRAINAGE.SWS

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

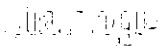
Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

			Water	Surcharged	Flooded				Pipe
	US/MH	Storm	Level	Depth	Volume	Flow /	Overflow	Flow	
PN	Name	Rank	(m)	(m)	(m³)	Cap.	(l/s)	(l/s)	Status
1.000	S1	26	2.405	-0.055	0.000	0.29		17.2	OK
2.000	S2L	26	2.406	-0.045	0.000	0.52		6.6	OK
1.001	S2	27	2.395	0.000	0.000	0.33		21.4	OK
1.002	S3	27	2.363	0.076	0.000	0.26		14.8	SURCHARGED
3.000	S4L	26	2.380	-0.020	0.000	0.41		9.6	OK
1.003	S4	27	2.357	0.116	0.000	0.45		29.0	SURCHARGED
4.000	S5LA	25	2.455	0.005	0.000	0.69		9.0	SURCHARGED
5.000	S5LB	25	2.445	0.028	0.000	0.70		8.7	SURCHARGED
4.001	S5	25	2.427	0.057	0.000	0.50		34.5	SURCHARGED
1.004	S6	26	2.337	0.179	0.000	0.49		56.9	SURCHARGED
6.000	S7LA	26	2.381	-0.084	0.000	0.41		17.7	OK
1.005	S7	26	2.232	0.252	0.000	0.76		72.7	SURCHARGED
1.006	S8	31	2.141	0.203	0.000	0.86		73.1	SURCHARGED
7.000	S13	25	2.291	-0.184	0.000	0.08		7.3	OK
8.000	S9	26	2.316	-0.159	0.000	0.19		6.6	OK
8.001	S10	26	2.230	-0.153	0.000	0.48		30.2	OK
9.000	S11	26	2.333	-0.142	0.000	0.29		12.8	OK
8.002	S12	31	2.135	-0.148	0.000	0.49		49.2	OK
1.007	S14	40	2.062	0.150	0.000	1.16		119.5	SURCHARGED
1.008	S15	45	1.970	0.126	0.000	1.38		118.8	SURCHARGED
1.009	Pond In	42	1.879	0.074	0.000	3.29		117.7	SURCHARGED
1.010	Pond Out	48	1.851	0.047	0.000	0.06		5.0	SURCHARGED
1.011	S18	48	1.464	-0.162	0.000	0.17		5.0	OK
1.012	S19	48	1.430	-0.167	0.000	0.15		5.0	OK

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Summary Wizard of 15 minute 100 year Summer I+40% for FW1664 ADOPTABLE SW DRAINAGE.SWS

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

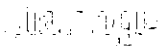
Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm Rank	Water	Surcharged	Flooded	Pipe		Status
			Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	
1.000	S1	2	3.101	0.641	0.000	0.36	21.5	FLOOD RISK
2.000	S2L	2	3.104	0.653	0.000	0.68	8.6	SURCHARGED
1.001	S2	2	3.086	0.691	0.000	0.35	22.5	SURCHARGED
1.002	S3	2	3.040	0.753	0.000	0.44	24.8	SURCHARGED
3.000	S4L	2	3.058	0.658	0.000	0.56	13.1	SURCHARGED
1.003	S4	2	3.028	0.787	0.000	0.63	40.4	SURCHARGED
4.000	S5LA	2	3.097	0.647	0.000	0.98	12.8	SURCHARGED
5.000	S5LB	2	3.064	0.647	0.000	0.87	10.7	SURCHARGED
4.001	S5	2	3.041	0.671	0.000	0.69	47.6	SURCHARGED
1.004	S6	2	2.950	0.792	0.000	0.89	102.9	FLOOD RISK
6.000	S7LA	2	2.914	0.449	0.000	0.61	26.5	SURCHARGED
1.005	S7	3	2.798	0.818	0.000	1.43	136.3	SURCHARGED
1.006	S8	6	2.666	0.728	0.000	1.60	136.1	SURCHARGED
7.000	S13	13	2.560	0.085	0.000	0.13	12.7	SURCHARGED
8.000	S9	3	2.783	0.308	0.000	0.31	11.0	SURCHARGED
8.001	S10	3	2.772	0.389	0.000	0.74	46.9	SURCHARGED
9.000	S11	3	2.715	0.240	0.000	0.50	21.5	SURCHARGED
8.002	S12	4	2.684	0.401	0.000	0.60	60.0	SURCHARGED
1.007	S14	16	2.543	0.631	0.000	1.92	198.7	SURCHARGED
1.008	S15	24	2.297	0.453	0.000	2.29	197.1	SURCHARGED
1.009	Pond In	29	2.109	0.304	0.000	0.06	5.0	SURCHARGED
1.010	Pond Out	29	2.106	0.302	0.000	0.06	5.0	SURCHARGED
1.011	S18	39	1.464	-0.162	0.000	0.17	5.0	OK
1.012	S19	43	1.430	-0.167	0.000	0.15	5.0	OK

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Summary Wizard of 15 minute 1 year Winter I+0% for FW1664 ADOPTABLE SW DRAINAGE.SWS

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

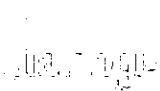
Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm Rank	Water Surcharged Flooded			Pipe		Status
			Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	
1.000	S1	33	2.229	-0.231	0.000	0.12	7.2	OK
2.000	S2L	32	2.348	-0.103	0.000	0.21	2.7	OK
1.001	S2	36	2.173	-0.222	0.000	0.15	9.7	OK
1.002	S3	42	2.074	-0.212	0.000	0.17	9.7	OK
3.000	S4L	32	2.291	-0.109	0.000	0.17	4.0	OK
1.003	S4	44	2.044	-0.196	0.000	0.26	16.5	OK
4.000	S5LA	31	2.354	-0.096	0.000	0.28	3.7	OK
5.000	S5LB	32	2.322	-0.095	0.000	0.29	3.5	OK
4.001	S5	36	2.161	-0.209	0.000	0.20	13.5	OK
1.004	S6	46	2.003	-0.155	0.000	0.30	35.0	OK
6.000	S7LA	31	2.356	-0.109	0.000	0.17	7.2	OK
1.005	S7	46	1.983	0.003	0.000	0.36	34.2	SURCHARGED
1.006	S8	47	1.938	0.000	0.000	0.39	33.2	OK
7.000	S13	31	2.276	-0.199	0.000	0.03	3.0	OK
8.000	S9	31	2.291	-0.184	0.000	0.08	2.7	OK
8.001	S10	35	2.165	-0.218	0.000	0.16	10.4	OK
9.000	S11	31	2.302	-0.173	0.000	0.12	5.2	OK
8.002	S12	42	2.069	-0.214	0.000	0.18	17.9	OK
1.007	S14	47	1.921	0.009	0.000	0.43	44.0	SURCHARGED
1.008	S15	49	1.843	-0.001	0.000	0.44	38.0	OK
1.009	Pond In	49	1.778	-0.027	0.000	1.00	35.8	OK
1.010	Pond Out	67	1.652	-0.152	0.000	0.06	4.6	OK
1.011	S18	67	1.461	-0.165	0.000	0.16	4.6	OK
1.012	S19	67	1.428	-0.169	0.000	0.14	4.6	OK

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Summary Wizard of 15 minute 30 year Winter I+0% for FW1664 ADOPTABLE SW DRAINAGE.SWS

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

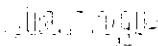
Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm Rank	Water	Surcharged	Flooded	Pipe		Status
			Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	
1.000	S1	24	2.460	0.000	0.000	0.27	16.4	OK
2.000	S2L	24	2.462	0.011	0.000	0.52	6.6	SURCHARGED
1.001	S2	24	2.448	0.053	0.000	0.30	19.4	SURCHARGED
1.002	S3	24	2.432	0.146	0.000	0.29	16.4	SURCHARGED
3.000	S4L	24	2.441	0.041	0.000	0.40	9.3	SURCHARGED
1.003	S4	24	2.423	0.182	0.000	0.44	28.2	SURCHARGED
4.000	S5LA	24	2.473	0.023	0.000	0.67	8.8	SURCHARGED
5.000	S5LB	24	2.464	0.047	0.000	0.66	8.2	SURCHARGED
4.001	S5	24	2.444	0.074	0.000	0.46	31.8	SURCHARGED
1.004	S6	25	2.355	0.198	0.000	0.53	61.9	SURCHARGED
6.000	S7LA	25	2.381	-0.084	0.000	0.41	17.7	OK
1.005	S7	25	2.259	0.279	0.000	0.86	82.1	SURCHARGED
1.006	S8	25	2.169	0.231	0.000	0.96	81.9	SURCHARGED
7.000	S13	26	2.291	-0.184	0.000	0.08	7.3	OK
8.000	S9	25	2.316	-0.159	0.000	0.19	6.6	OK
8.001	S10	25	2.230	-0.153	0.000	0.48	30.4	OK
9.000	S11	25	2.333	-0.142	0.000	0.30	12.8	OK
8.002	S12	28	2.151	-0.132	0.000	0.48	47.9	OK
1.007	S14	31	2.100	0.188	0.000	1.22	126.2	SURCHARGED
1.008	S15	43	1.996	0.160	0.000	1.46	125.9	SURCHARGED
1.009	Pond In	45	1.890	0.090	0.000	3.53	126.3	SURCHARGED
1.010	Pond Out	45	1.892	0.088	0.000	0.06	5.0	SURCHARGED
1.011	S18	45	1.464	-0.162	0.000	0.17	5.0	OK
1.012	S19	45	1.430	-0.167	0.000	0.15	5.0	OK

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62 Highcross Street Leicester LE1 4NN	Spalding Road Pinchbeck Adoptable SW Network	
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Innovyze	Network 2019.1	

Summary Wizard of 15 minute 100 year Winter I+40% for FW1664 ADOPTABLE SW DRAINAGE.SWS

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

WARNING: The analysis maybe unstable. Please see the method of analysis help for more details.

PN	US/MH Name	Storm Rank	Water Surcharged Flooded			Pipe		Status
			Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	
1.000	S1	1	3.210	0.750	0.331	0.36	21.7	FLOOD
2.000	S2L	1	3.225	0.774	0.000	0.73	9.3	SURCHARGED
1.001	S2	1	3.193	0.798	0.000	0.39	25.1	SURCHARGED
1.002	S3	1	3.171	0.884	0.000	0.48	27.5	SURCHARGED
3.000	S4L	1	3.189	0.789	0.000	0.49	11.4	SURCHARGED
1.003	S4	1	3.156	0.916	0.000	0.67	42.7	SURCHARGED
4.000	S5LA	1	3.208	0.758	0.000	0.95	12.5	FLOOD RISK
5.000	S5LB	1	3.184	0.767	0.000	0.77	9.5	FLOOD RISK
4.001	S5	1	3.160	0.790	0.000	0.69	47.7	FLOOD RISK
1.004	S6	1	3.069	0.911	0.000	0.93	108.5	FLOOD RISK
6.000	S7LA	1	3.010	0.545	0.000	0.58	25.3	SURCHARGED
1.005	S7	1	2.909	0.929	0.000	1.51	143.7	SURCHARGED
1.006	S8	1	2.775	0.837	0.000	1.68	142.8	SURCHARGED
7.000	S13	4	2.657	0.182	0.000	0.13	12.7	SURCHARGED
8.000	S9	1	2.875	0.400	0.000	0.29	10.1	SURCHARGED
8.001	S10	1	2.862	0.479	0.000	0.70	44.4	SURCHARGED
9.000	S11	1	2.809	0.334	0.000	0.49	21.4	SURCHARGED
8.002	S12	1	2.777	0.494	0.000	0.62	62.1	SURCHARGED
1.007	S14	6	2.641	0.729	0.000	2.97	298.5	SURCHARGED
1.008	S15	23	2.357	0.513	0.000	2.41	297.0	SURCHARGED
1.009	Pond In	23	2.169	0.364	0.000	5.80	297.7	SURCHARGED
1.010	Pond Out	23	2.166	0.362	0.000	0.06	5.0	SURCHARGED
1.011	S18	42	1.464	-0.162	0.000	0.17	5.0	OK
1.012	S19	44	1.430	-0.167	0.000	0.15	5.0	OK

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62 Highcross Street Leicester LE1 4NN	Spalding Road Pinchbeck Adoptable SW Network	
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Innovyze	Network 2019.1	

Summary of Critical Results by Maximum Level (Rank 1) for FW1664 ADOPTABLE SW DRAINAGE.SWS

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

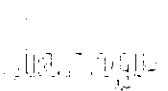
Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

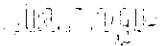
Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Surcharged	
									Level (m)	Depth (m)
1.000	S1	15 Winter	100	+40%	100/15 Summer	100/15 Winter			3.210	0.750
2.000	S2L	15 Winter	100	+40%	30/15 Winter				3.225	0.774
1.001	S2	15 Winter	100	+40%	30/15 Winter				3.193	0.798
1.002	S3	15 Winter	100	+40%	30/15 Summer				3.171	0.884
3.000	S4L	15 Winter	100	+40%	30/15 Winter				3.189	0.789
1.003	S4	15 Winter	100	+40%	30/15 Summer				3.156	0.916
4.000	S5LA	15 Winter	100	+40%	30/15 Summer				3.208	0.758
5.000	S5LB	15 Winter	100	+40%	30/15 Summer				3.184	0.767
4.001	S5	15 Winter	100	+40%	30/15 Summer				3.160	0.790
1.004	S6	15 Winter	100	+40%	30/15 Summer				3.069	0.911
6.000	S7LA	15 Winter	100	+40%	100/15 Summer				3.010	0.545
1.005	S7	15 Winter	100	+40%	1/15 Winter				2.909	0.909
1.006	S8	15 Winter	100	+40%	30/15 Summer				2.775	0.837
7.000	S13	360 Winter	100	+40%	100/15 Summer				2.682	0.207
8.000	S9	15 Winter	100	+40%	100/15 Summer				2.875	0.400
8.001	S10	15 Winter	100	+40%	100/15 Summer				2.862	0.479
9.000	S11	15 Winter	100	+40%	100/15 Summer				2.809	0.334
8.002	S12	15 Winter	100	+40%	100/15 Summer				2.777	0.494
1.007	S14	360 Winter	100	+40%	1/15 Winter				2.682	0.770
1.008	S15	360 Winter	100	+40%	30/15 Summer				2.678	0.834
1.009	Pond In	360 Winter	100	+40%	30/15 Summer				2.675	0.870
1.010	Pond Out	360 Winter	100	+40%	30/15 Summer				2.673	0.869
1.011	S18	360 Winter	100	+40%					1.464	-0.162
1.012	S19	360 Winter	100	+40%					1.430	-0.167

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62 Highcross Street Leicester LE1 4NN	Spalding Road Pinchbeck Adoptable SW Network	
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Summary of Critical Results by Maximum Level (Rank 1) for FW1664 ADOPTABLE SW DRAINAGE.SWS

PN	US/MH Name	Flooded		Pipe	Status	Level Exceeded
		Volume (m³)	Flow / Overflow Cap. (l/s)	Flow (l/s)		
1.000	S1	0.331	0.36	21.7	FLOOD	1
2.000	S2L	0.000	0.73	9.3	SURCHARGED	
1.001	S2	0.000	0.39	25.1	SURCHARGED	
1.002	S3	0.000	0.48	27.5	SURCHARGED	
3.000	S4L	0.000	0.49	11.4	SURCHARGED	
1.003	S4	0.000	0.67	42.7	SURCHARGED	
4.000	S5LA	0.000	0.95	12.5	FLOOD RISK	
5.000	S5LB	0.000	0.77	9.5	FLOOD RISK	
4.001	S5	0.000	0.69	47.7	FLOOD RISK	
1.004	S6	0.000	0.93	108.5	FLOOD RISK	
6.000	S7LA	0.000	0.58	25.3	SURCHARGED	
1.005	S7	0.000	1.51	143.7	SURCHARGED	
1.006	S8	0.000	1.88	142.8	SURCHARGED	
7.000	S13	0.000	0.02	1.7	SURCHARGED	
8.000	S9	0.000	0.29	10.1	SURCHARGED	
8.001	S10	0.000	0.70	44.4	SURCHARGED	
9.000	S11	0.000	0.49	21.4	SURCHARGED	
8.002	S12	0.000	0.62	62.1	SURCHARGED	
1.007	S14	0.000	0.38	39.1	SURCHARGED	
1.008	S15	0.000	0.45	38.7	SURCHARGED	
1.009	Pond In	0.000	1.88	38.7	FLOOD RISK	
1.010	Pond Out	0.000	0.06	5.0	FLOOD RISK	
1.011	S18	0.000	0.17	5.0	OK	
1.012	S19	0.000	0.15	5.0	OK	

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.066	4-8	0.002

Total Area Contributing (ha) = 0.068

Total Pipe Volume (m³) = 0.068

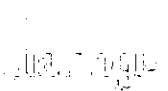
Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	2.500	0.025	100.0	0.068	4.00	0.0	0.600	o	100	Pipe/Conduit	0
1.001	2.753	0.018	152.9	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	0

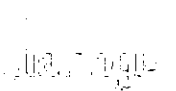
Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.05	2.475	0.068	0.0	0.0	0.0	0.77	6.0«	9.2
1.001	50.00	4.11	2.350	0.068	0.0	0.0	0.0	0.81	14.3	9.2

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Innovyze	Network 2018.1.1		

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
Null	3.700	1.275	Open Manhole	1200	1.000	2.425	100				
S1L	3.700	1.350	Open Manhole	1200	1.001	2.350	150	1.000	2.400	100	
Outfall	3.760	1.428	Open Manhole	1200		OUTFALL		1.001	2.332	100	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	100	Null	3.700	2.400	1.175	Open Manhole	1200
1.001	o	150	S1L	3.700	2.350	1.200	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	2.500	100.0	S1L	3.700	2.400	1.200	Open Manhole	1200
1.001	2.753	152.9	Outfall	3.760	2.332	1.278	Open Manhole	1200

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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1.001	Outfall	3.760	2.332	0.000	1200	0
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Simulation Criteria for Storm

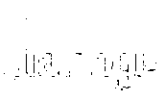
Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.400		

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<u>Online Controls for Storm</u> <u>Orifice Manhole: S1L, DS/PN: 1.001, Volume (m³): 1.5</u> Diameter (m) 0.108 Discharge Coefficient 0.600 Invert Level (m) 2.350		
©1982-2018 Innovyze		

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Storage Structures for Storm

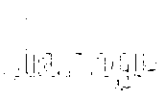
Porous Car Park Manhole: Null, DS/PN: 1.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	59.5
Max Percolation (l/s)	79.3	Slope (1:X)	250.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	3.220	Membrane Depth (mm)	255

Volume Summary (Static)

Length Calculations based on True Length

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
1.000	Null	1.442	0.010	19.278	20.730
1.001	S1L	1.527	0.027	0.000	1.554
Total		2.969	0.038	19.278	22.284

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Innovyze		Network 2018.1.1

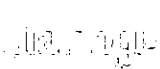
Simulation Criteria for Storm

Volumetric Runoff Coeff 0.840 Additional Flow - % of Total Flow 0.000
 Areal Reduction Factor 1.000 MADD Factor * 10m³/ha Storage 0.000
 Hot Start (mins) 0 Inlet Coefficient 0.800
 Hot Start Level (mm) 0 Flow per Person per Day (l/per/day) 0.000
 Manhole Headloss Coeff (Global) 0.500 Run Time (mins) 60
 Foul Sewage per hectare (l/s) 0.000 Output Interval (mins) 1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Profile Type Winter
 Return Period (years) 2 Cv (Summer) 0.750
 Region England and Wales Cv (Winter) 0.840
 M5-60 (mm) 19.000 Storm Duration (mins) 30
 Ratio R 0.400

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Innovyze	Network 2018.1.1	

Summary Wizard of 15 minute 1 year Summer I+0% for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

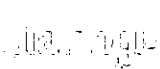
Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

			Water	Surcharged	Flooded		Pipe	
PN	US/MH Name	Storm Rank	Level (m)	Depth (m)	Volume (m ³)	Flow / Overflow Cap. (l/s)	Flow (l/s)	Status
1.000	Null	20	2.639	0.114	0.000	1.96	8.6	SURCHARGED
1.001	SIL	20	2.537	0.037	0.000	0.81	8.8	SURCHARGED

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Summary Wizard of 15 minute 30 year Summer I+0% for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

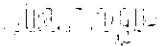
Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

			Water	Surcharged	Flooded		Pipe	
PN	US/MH Name	Storm Rank	Level (m)	Depth (m)	Volume (m ³)	Flow / Overflow Cap. (l/s)	Flow (l/s)	Status
1.000	Null	8	3.276	0.751	0.000	3.84	16.9	SURCHARGED
1.001	SIL	8	2.933	0.433	0.000	1.50	16.2	SURCHARGED

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Summary Wizard of 15 minute 100 year Summer I+40% for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

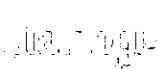
Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

			Water	Surcharged	Flooded		Pipe	
PN	US/MH Name	Storm Rank	Level (m)	Depth (m)	Volume (m³)	Flow / Overflow Cap. (l/s)	Flow (l/s)	Status
1.000	Null	2	3.386	0.861	0.000	3.95	17.4	SURCHARGED
1.001	SL	3	2.997	0.497	0.000	1.60	17.3	SURCHARGED

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Summary Wizard of 15 minute 1 year Winter I+0% for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

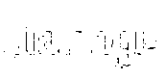
Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

			Water	Surcharged	Flooded		Pipe	
	US/MH	Storm	Level	Depth	Volume	Flow / Overflow	Flow	
PN	Name	Rank	(m)	(m)	(m ³)	Cap. (l/s)	(l/s)	Status
1.000	Null	19	2.649	0.124	0.000	2.04	2.0	SURCHARGED
1.001	SL	19	2.539	0.039	0.000	0.83	8.9	SURCHARGED

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Summary Wizard of 15 minute 30 year Winter I+0% for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

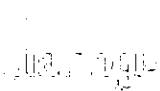
Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

			Water	Surcharged	Flooded		Pipe	
PN	US/MH Name	Storm Rank	Level (m)	Depth (m)	Volume (m³)	Flow / Overflow Cap. (l/s)	Flow (l/s)	Status
1.000	Null	7	3.283	0.758	0.000	3.79	16.7	SURCHARGED
1.001	St1	7	2.938	0.438	0.000	1.51	16.3	SURCHARGED

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Simulation Criteria for Storm

Volumetric Runoff Coeff 0.840 Additional Flow - % of Total Flow 0.000
 Areal Reduction Factor 1.000 MADD Factor * 10m³/ha Storage 0.000
 Hot Start (mins) 0 Inlet Coefficient 0.800
 Hot Start Level (mm) 0 Flow per Person per Day (l/per/day) 0.000
 Manhole Headloss Coeff (Global) 0.500 Run Time (mins) 60
 Foul Sewage per hectare (l/s) 0.000 Output Interval (mins) 1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Profile Type Winter
 Return Period (years) 2 Cv (Summer) 0.750
 Region England and Wales Cv (Winter) 0.840
 M5-60 (mm) 19.000 Storm Duration (mins) 30
 Ratio R 0.400

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water	Surcharged	Flooded
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	Level	Depth	Volume
									(m)	(m)	(m ³)
1.000	Null	15 Winter	100	-40	1/15 Summer				3.400	0.875	0.000
1.001	311	15 Winter	100	-40	1/15 Summer				3.036	0.506	0.000

	US/MH	Flow /	Overflow	Pipe	
PN	Name	Cap.	(l/s)	(l/s)	Status
					Level Exceeded
1.000	Null	3.98		17.5	FLOOD RISK
1.001	311	1.62		17.5	SURCHARGED

Appendix I Drainage Maintenance Schedule

Drainage Maintenance Schedule

Schedule	Feature	Required Action	Frequency
Regular Maintenance	Rainwater Harvesting	Inspection of the Tank for Debris and Sediment Build-Up, Inlets/ Outlets/ Withdrawal Devices, Overflow Areas, Pumps and Filters.	Annually (and following poor performance)
		Cleaning of Tank, Inlets, Outlets, Gutters, Withdrawal Devices and Roof Drain Filters of Silts and other Debris.	Annually (and following poor performance).
	Green Roofs	Remove Debris and Litter to Prevent Clogging of Inlet Drains and Interference with Plant Growth.	Six Monthly and Annually or as required
		During Establishment (i.e. year one), Replace Dead Plants as required.	Monthly (but usually responsibility of manufacturer)
		Post Establishment, Replace Dead Plants as Required (where >5% of coverage).	Annually (In autumn)
		Remove Fallen Leaves and Debris from Deciduous Plant Foliage.	Six Monthly or as required
		Remove Nuisance and Invasive Vegetation, Including Weeds.	Six Monthly or as required
		Mow Grasses, Prune Shrubs and Manage Other Planting (if appropriate) as Required – Clippings Should be Removed and not Allowed to Accumulate.	Six Monthly or as required
	Infiltration Systems	Remove Litter, Debris and Trash.	Monthly
		Cut Grass – for Landscaped Areas and Access Routes.	Monthly (during growing season) or as required
		Cut Grass – Meadow Grass in and Around Basin.	Half yearly: spring (before nesting season) and autumn
		Manage Other Vegetation and Remove Nuisance Plants.	Monthly at start, then as required
	Filter Strips	Remove Litter and Debris.	Monthly (or as required)
		Cut Grass – To Retain Grass Height Within Specified Design Range.	Monthly (during growing season), or as required
		Manage Other Vegetation and Remove Nuisance Plants.	Monthly (at start, then as required)
	Filter Drains	Remove Litter (inc leaf litter) and Debris from Filter Drain Surface, Access Chambers and Pre-Treatment Devices.	Monthly (or as required)
		Inspect Filter Drain Surface, Inlet/ Outlet Pipework and Control Systems for Blockages, Clogging, Standing Water and Structural Damage.	Monthly

Drainage Maintenance Schedule

		Inspect Pre-Treatment Systems, Inlets and Perforated Pipework for Silt Accumulation, and Establish Appropriate Silt Removal Frequencies.	Six monthly
		Remove Sediment from Pre-Treatment Devices.	Six monthly, or as required
	Swales	Remove Litter and Debris	Monthly, or as required
		Cut Grass – to Retain Grass Height Within Specified Design Range.	Monthly (during growing season), or as required
		Manage Other Vegetation and Remove Nuisance Plants.	Monthly at start, then as required
		Inspect Inlets, Outlets and Overflows for Blockages, and Clear if Required.	Monthly
		Inspect Infiltration Surfaces for Ponding, Compaction, Silt Accumulation, Record Areas Where Water is Ponding for > 48 Hours.	Monthly, or when required
		Inspect Vegetation Coverage.	Monthly for 6 months, quarterly for 2 years, then half yearly
		Inspect Inlets and Facility Surface for Silt Accumulation, Establish Appropriate Silt Removal Frequencies.	Half yearly
	Bioretention	Remove Litter and Surface Debris and Weeds.	Quarterly (or more frequently for tidiness or aesthetic reasons)
		Replace any Plants, to Maintain Planting Density.	As required
		Remove Sediment, Litter and Debris Build-Up from Around Inlets or from Forebays.	Quarterly to biannually
	Trees	Remove Litter and Debris.	Monthly (or as required)
		Manage Other Vegetation and Remove Nuisance Plants.	Monthly (at start, then as required)
		Inspect Inlets and Outlets.	Inspect monthly
	Permeable Pavements	Brushing and Vacuuming (standard cosmetic sweep over whole surface).	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturers recommendations –

Drainage Maintenance Schedule

			pay attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
	Attenuation Storage Tanks	Inspect and Identify any Areas that are not Operating Correctly. If Required, take Remedial Action.	Monthly for 3 months, then Annually
		Remove Debris from the Catchment Surface (where it may cause risks to performance).	Monthly
		For Systems Where Rainfall Infiltrates into the Tank from Above, Check Surface of Filter for Blockage by Sediment, Algae or Other Matter; Remove and Replace Surface Infiltration Medium as Necessary.	Annually
	Detention Basins	Remove Litter and Debris.	Monthly
		Cut Grass – for Spillways and Access Routes.	Monthly (during growing season), or as required
		Cut Grass – Meadow Grass in and Around Basin.	Half yearly (spring – before nesting season, and autumn)
		Manage Other Vegetation and Remove Nuisance Plants.	Monthly (at start, then as required)
		Inspect Outlets, Inlets and Overflows for Blockages and Clear if Required.	Monthly
		Inspect Banksides, Structures, Pipework etc for Evidence of Physical Damage.	Monthly
		Inspect Inlets and Facility Surface for Silt Accumulation. Establish Appropriate Silt Removal Frequencies.	Monthly (for first year), then annually or as required
		Check any Penstocks and Other Mechanical Devices.	Annually
		Tidy All Dead Growth Before Start of Growing Season.	Annually
		Remove Sediment from Inlets, Outlets and Forebay.	Annually (or as required)
		Manage Wetland Plants in Outlet Pool – Where Provided.	Annually
	Ponds and Wetlands	Remove Litter and Debris.	Monthly (or as required)

Drainage Maintenance Schedule

		Cut the Grass – Public Areas.	Monthly (during growing season)
		Cut the Meadow Grass.	Half yearly (spring, before nesting season, and autumn)
		Inspect Marginal and Bankside Vegetation and Remove Nuisance Plants (for First 3 Years).	Monthly (at start then as required)
		Inspect Inlets, Outlets, Banksides, Structures, Pipework etc for Evidence of Blockage and/ or Physical Damage.	Monthly
		Inspect Water Body for Signs of Poor Water Quality.	Monthly (May – October)
		Inspect Silt Accumulation Rates un any Forebay and in Main Body of the Pond and Establish Appropriate Removal Frequencies; Undertake Contamination Testing Once Some Build-Up Has Occurred, to Inform Management and Disposal Options.	Half yearly
		Check Any Mechanical Devices, e.g. Penstocks.	Half yearly
		Hand Cut Submerged and Emergent Aquatic Plants (at minimum of 1.0m above pond base; include max 25% of pond surface).	Annually
		Remove 25% of Bank Vegetation from Waters Edge to a Minimum of 1m Above Water Level.	Annually
		Tidy All Dead Growth (scrub clearance) Before Start of Growing Season (note: tree maintenance is usually part of overall landscape management contract).	Annually
		Remove Sediment and Planting from one Quadrant of the Main Body of Ponds Without Sediment Forebays.	Every 1 -5 years, or as required
		Remove Sediment from any Forebay.	Annually

Schedule	Feature	Required Action	Frequency
Occasional Maintenance	Rainwater Harvesting	Cleaning and/or replacement of any Filters.	Three monthly (or as required)
	Infiltration Systems	Reseed Areas of Poor Vegetation Growth.	Annually or as required
		Prune and Trim Trees and Remove Cuttings.	As required

Drainage Maintenance Schedule

		Remove Sediment from Pre-Treatment System when 50% Full.	As required
	Filter Strips	Reseed Areas of Poor Vegetation Growth; Alter Plant Types to Better Suit Conditions, if required.	As required or if bare soil is exposed over
	Filter Drains	Remove or Control Tree Roots Where They are Encroaching the Sides of the Filter Drain, Using Recommended Methods (e.g. NJUG, 2007 or BS 3998:2010).	As required
		At Locations with High Pollution Loads, Remove Surface Geotextile and Replace, and Wash or Replace Overlaying Filter Medium.	Five yearly, or as required
		Clear Perforated Pipework of Blockages.	As required
	Bioretention	Infill any Holes or Scour in the Filter Medium, Improve Erosion Protection if Required.	As required
		Repair Minor Accumulations of Silt by Raking Away Surface Mulch, Scarifying Surface of Medium and Replacing Mulch.	As required
	Trees	Check Tree Health and Manage Tree Appropriately.	Annually
		Remove Silt Build-Up from Inlets and Surface and Replace Mulch as Necessary.	Annually, or as required
		Water	As required
	Permeable Pavements	Stabilise and Mow Contributing and Adjacent Areas.	As required
		Removal of Weeds or Management Using Glyphosate Applied Directly into the Weeds by an Application Rather Than Spraying.	As required – once per year on less frequently used pavements
	Detention Basins	Reseed Areas if Poor Vegetation Growth.	As required
		Prune and Trim any Trees and Remove Cuttings.	Every 2 years, or as required
		Remove Sediment from Inlets, Outlets, Forebay and Main Basin when Required.	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided).
	Ponds and Wetlands	Remove Sediment from the Main Body of Big Ponds when Pool Volume is Reduced by 20%.	With effective pre-treatment, this will only be required rarely, e.g. every 25-50 years

Drainage Maintenance Schedule

Schedule	Feature	Required Action	Frequency
Routine Maintenance	Proprietary Treatment System	Remove Litter and Debris and Inspect for Sediment, Oil and Grease Accumulation.	Six Monthly
		Change the Filter Media.	As recommended by manufacturer
		Remove Sediment, Oil, Grease and Floatables.	As necessary – indicated by system inspections or immediately following significant spill

Schedule	Feature	Required Action	Frequency
Remedial Actions	Rainwater Harvesting	Repair of Overflow Erosion Damage or Damage to Tank.	As required
		Pump Repairs.	As required
	Green Roofs	If Erosion Channels are Evident, These Should be Stabilised with Extra Soil Substrate Similar to the Original Material, and Sources of Erosion Damage Should be Identified and Controlled.	As required
		If Drain Inlet Has Settled, Cracked or Moved Investigate and Repair as Appropriate.	As required
	Infiltration Systems	Repair Erosion or other Damage by Reseeding or Re-Turfing.	As required
		Realign the Rip-Rap.	As required
		Repair or Rehabilitate Inlets, Outlets and Overflows.	As required
		Rehabilitate Infiltration Surface using Scarifying and Spiking Techniques if Performance Deteriorates.	As required.
		Relevel Uneven Surfaces and Reinstall Design Levels.	As required
	Proprietary Treatment System	Replace Malfunctioning Parts or Structures.	As required
	Filter Strips	Repair Erosion or Other Damage by Re-Turfing or Re-Seeding.	As required
		Relevels Uneven Surfaces and Reinstall Design Levels.	As required
		Scarify and Spike Topsoil to Improve Infiltration Performance, Break Up Silt	As required

Drainage Maintenance Schedule

		Deposits and Prevent Compaction of the Soil Surface.	
		Remove Build Up of Sediment on Upstream Gravel Trench, Flow Spreader or at Top of Filter Strip.	As required
	Swales	Remove and Dispose of Oils or Petrol Residues Using Safe Standard Practices.	As required
		Repair Erosion or Other Damage by Re-Turfing or Reseeding.	As required
		Relevel Uneven Surfaces and Reinstall Design Levels.	As required
		Scarify and Spike Topsoil Layer to Improve Infiltration Performance, Break Up Silt Deposits and Prevent Compaction of the Soil Surface.	As required
		Remove Build-Up of Sediment on Upstream Gravel Trench, Flow Spreader or at Top of Filter Strip.	As required
		Remove and Dispose of Oils or Petrol Residues Using Safe Standard Practices.	As required
		Remove and Replace Filter Medium and Vegetation Above.	As required but likely to be > 20 years
	Permeable Pavements	Remediate Any Landscaping which, Through Vegetation Maintenance or Soil Slip, has been Raised to within 50mm of the Level of the Paving.	As required
		Remedial Work to any Depressions, Rutting and Cracked or Broken Blocks Considered Detrimental to the Structural Performance or a Hazard to Users, and Replace Lost Jointing Material.	As required
		Rehabilitation of Surface and Upper Substructure by Remedial Sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
	Attenuation Storage Tanks	Repair/ Rehabilitate Inlets, Outlets, Overflows and Vents.	As required
	Detention Basins	Repair Erosion or Other Damage by Reseeding or Re-Turfing.	As required
		Realignment of Rip-Rap.	As required
		Repair/ Rehabilitation of Inlets, Outlets and Overflows.	As required
		Relevel Uneven Surfaces and Reinstall Design Levels.	As required
		Repair Erosion or Other Damage.	As required

Drainage Maintenance Schedule

	Ponds and Wetlands	Replant, where necessary.	As required
		Aerate Pond When Signs of Eutrophication are Detected.	As required
		Realign Rip-Rap or Repair Other Damage.	As required
		Repair / Rehabilitate Inlets, Outlets and Overflows.	As required

Schedule	Feature	Required Action	Frequency
Regular Inspections	Green Roofs	Inspect all components including soil Substrate, Vegetation, Drains, Irrigation Systems, Membranes and Roof Structure for Proper Operation, Integrity of Waterproofing and Structural Stability.	Annually and after severe storms
		Inspect Soil Substrate for Evidence of Erosion Channels and Identify any Sediment Sources.	Annually and after severe storms
		Inspect Drain Inlets to Ensure Un-Restricted Run-off from the Drainage Layer to the Conveyance or Roof Drain System.	Annually and after severe storms
		Inspect Underside of Roof for Evidence of Leakage.	Annually and after severe storms
	Bioretention	Inspect Infiltration Surfaces for Silting and Ponding, Record De-Watering Time of the Facility and Assess Standing Water Levels in Underdrain (if appropriate) to Determine if Maintenance is Necessary.	Quarterly
		Check Operation of Underdrains by Inspection of Flows After Rain.	Annually
		Assess Plants for Disease Infection, Poor Growth, Invasive Species etc and Replace as Necessary.	Quarterly
		Inspect Inlets and Outlets for Blockages.	Quarterly

Schedule	Feature	Required Action	Frequency
Monitoring	Infiltration Systems	Inspect Inlets, Outlets and Overflows for Blockages and Clear if Required.	Monthly
		Inspect Banksides, Structures, Pipework, etc for Evidence of Physical Damage.	Monthly
		Inspect Inlets and Pre-Treatment Systems for Silt Accumulation; Establish Appropriate Silt Removal Frequencies.	Half Yearly
		Inspect Infiltration Surfaces for Compaction and Ponding.	Monthly

Drainage Maintenance Schedule

	Proprietary Treatment System	Inspect for Evidence of Poor Operation.	Six monthly
	Attenuation Storage Tanks	Survey Inside of Tank for Sediment Build-Up and Remove if Necessary.	Every 5 years or as required
		Inspect/ Check all Inlets, Outlets, Vents and Overflows to Ensure that they are in Good Condition and Operating as Designed.	Annually
	Filter Strips	Inspect Silt Accumulation Rates and Establish Appropriate Removal Frequencies.	Half yearly
	Permeable Pavements	Initial Inspection.	Monthly for three months after installation
		Inspect for Evidence of Poor Operation and/or Weed Growth – if required, take Remedial Action.	Three-monthly, 48 hours after large storms in first six months
		Inspect Silt Accumulation Rates and Establish Appropriate Brushing Frequencies.	Annually
		Monitor Inspection Chambers.	Annually