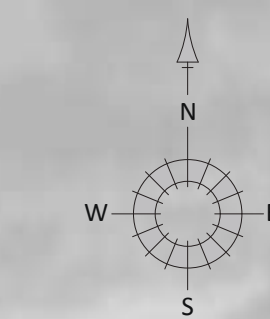


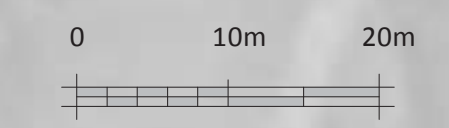
Flood Risk Assessment

Appendix 2

- Proposed Layout
- Drainage Strategy



- KEY**
- Site boundary
 - Site access
 - Affordable Homes
 - Focal Building
 - Gateway Building
 - LAP Local Area of Play
 - SS Sub Station
 - Car Barn
 - Brickwork Walls



HIGHWAY ACCESS AS PER
ITB 15098-GA-028

ACCESS TO THE HOWLANDS
RE-PROVIDED FROM THE
SITE ACCESS ROAD

LINKAGE - AS EMERGENCY ACCESS
SHARED WITH PEDESTRIAN /
CYCLE ACCESS FROM ALBION ROAD
TO COPPER LANE

LANDSCAPED
ATTENUATION
POND

SITE BOUNDARY AS PER OWNERSHIP DRAWING No 1035-L-05 ISSUED BY CLIENT 05/10/2022 AND BASED ON TOPOGRAPHICAL SURVEY



Coloured Site Layout
Land East of Albion Road
& North of Copper Lane, Marden

22037 / SK25G

Scale 1:500 @ A0 June 2023

Flood Risk Assessment

Appendix 3

- Consultation Responses
- Lead Local Flood Authority
- Sewer Records



Flood and Water Management

Invicta House
Maidstone
Kent
ME14 1XX

Website: www.kent.gov.uk/flooding

Email: flood@kent.gov.uk

Tel: 03000 41 41 41

Our Ref: NON/2022/090921

Date: 10/08/2022

Visit date/time: 20th July 2022 at 13:00

Location: Copper Lane Marden

Attendees: Rydon homes Ltd – Paul Mephram
Rydon Homes Ltd – Samuel Martin
HSP Consulting Engineers Ltd – Paul Daykin
KCC – Emma Burdett
KCC – Daniel Hoare
KCC – Emily Neale

Site Location: Land off Copper Lane Marden Tonbridge TN12 9GT

LPA REF: Ordinary watercourse Consent Pre-application site meeting

During the onsite meetings the existing channels were discussed with regards to the requirement for land drainage consent.

From the information available on our mapping system and observations onsite, I can confirm that only the southwestern pond appears to have connectivity to a local ordinary watercourse. Any works to alter these connections or any new proposed connections would require land drainage consent under S.23 of the Land Drainage Act 1991 as it is an 'inline pond'. The others appear to be waterbodies with no connections to the wider area. I have highlighted the pond referenced on the map below:



Applying for consent:

Land drainage consents should be submitted via our website which can be found here: [Land drainage consent - Kent County Council](#)

Outfalls smaller than 150mm internal diameter do not require consent as no formal headwall is required, for any other changes we would recommend contacting us in the first instance to discuss the proposal prior to application, and we can advise if an application is required.

We would also recommend that you look at the [guidance notes](#) and the [KCC Land Drainage Policy](#) prior to an application being submitted.

Applications cost £50 per structure as set by the legislation and is not subject to VAT, during periods of high demand for this service applications can take up to 60 days to process. Consents **cannot** be granted retrospectively as there is no provision within the legislation to do so. Please ensure that you allow adequate time when submitting an application.

Culverts for the purpose of access, and the renewal or replacement of end of life assets within the site can be granted at any time during the planning process with the LPA, however, new outfalls to ordinary watercourses cannot be consented until all surface water and drainage conditions have been discharged. This is to avoid problems where a change of layout is required and the location of an outfall may change, requiring a new application to be submitted.

As part of the pre-application process provided by KCC, the LLFA are open to further discussions, should this be needed.

Kind Regards

Emma Burdett
Land Drainage Engineer
Flood and Water Management Team



PRE-APPLICATION MEETING

Meeting Minutes

Date/Time : 20th of July 2022 at 1:00 PM

Location : Copper Lane, Marden

Attendees: Rydon Homes Ltd - Paul Mephram
Rydon Homes Ltd - Samuel Martin
HSP Consulting Engineers Ltd - Paul Daykin
KCC - Emma Burdett
KCC - Daniel Hoare
KCC - Emily Neale

Site Location: Land off Copper Lane Marden, Tonbridge TN12 9GT

LPA District pre-application site meeting

reference:

KCC reference: NON/2022/090921

During the onsite meeting, several items were discussed regarding future surface water management for the development. The below is a summary of those discussions for record:

HSP Consulting informed KCC that the surface water proposals as this stage would see surface water being captured and conveyed to a dedicated attenuation basin, prior to a restricted off-site discharge. To achieve an offsite discharge, it was proposed to re-use and existing outfall from the western pond (dependent upon condition/ drainage requirements). The LLFA understand that this outfall pipe currently passes under Copper Lane and reemerges as a ditch into the field to the south.

Discharge rates:

As discussed during the onsite meeting, the LLFA would seek for the off-site discharge to be limited to greenfield rates for the equivalent developable/ contributing areas, in line with policy. This is to ensure that the receiving watercourse and subsequent network does not have an increased risk of causing flooding.

Groundwater:

During the site meeting, groundwater was discussed. The LLFA understand that preliminary ground investigations have already taken place on site. The results of these have been shared with the LLFA and one location (WS1- close to proposed access road) encountered groundwater at 1.0m below ground level. The presence water within

one of these tests would confirm that groundwater is shallow in this location and therefore may impact the future drainage design.

It would be our recommendation that further monitoring takes place over the coming winter months to obtain a more accurate reflection of groundwater levels over a period of time.

Water Quality/ Treatment:

HSP Consulting raised the LLFA's requirement for water treatment. The LLFA requests for all developments to adhere to the guidance stipulated within the CIRIA SuDS Manual (2015) Part E Section 26. This section within the manual contains details of treatment levels and anticipated pollution from different land uses.

It is accepted that a further/ additional treatment of surface water is likely required and was raised that this may be in the form of proprietary treatments (interceptors or separators). The LLFA would not raise objections to this approach, provided the total treatment values as stated within the SuDS manual are met.

Attenuation Basin Design:

As noted above, an attenuation basin is proposed to hold surface water prior to an offsite discharge. The LLFA would encourage that basin design follows the recommendations contained within the CIRIA SuDS Manual (2015) Chapter 22. Some of these design recommendations include:

- Ensuring sides slopes are no greater than 1 in 3 to allow for access and maintenance of the banks.
- Total water depth of the basin should not exceed 2.0m. The LLFA would ideally seek that the total depth does not exceed 1.5m due to concerns around safety.
- A minimum 300mm freeboard should be provided between the maximum water level (100 year plus climate change events) and top of bank.
- Consideration of the inclusion of a permanent water level, sediment forebay or aquatic benches. This would allow for the additional treatment of surface water.
- Positioning of inlets and outlets to allow for maximum residence time within the feature.
- Consideration of lining the basin to mitigate against possible groundwater. This is subject to further groundwater monitoring over the coming months.

Existing onsite ponds:

In addition to the western pond to which an outfall is present, a further two ponds currently exist on the southern boundary of the site. It was confirmed during the site visit that these ponds are solitary and have no connections. HSP and Rydon stated that these ponds would remain in place and the only changes made would be in regards to any required improvements maintenance.

The LLFA were also informed that the most eastern of the ponds may currently overflow during extreme events, contributing to flooding further along Copper Lane. To improve upon this, the proposal would see the creation of a bund around the south side of the pond to increase capacity and reduce the frequency of overtopping. The LLFA agree with this approach although, accept that further details would have to be provided within the planning process.

Climate Change Guidance:

As of the 10th of May 2022, the Environment Agency's climate change allowances have been updated. As part of this update, revisions have been made to the 'Peak Rainfall Intensity Allowances' that are used in applying climate change percentages to new drainage schemes. The LLFA would now seek the 'upper end' allowance is designed for both the 30 (3.3%) and 100 (1%) year storm scenarios. The latest information on the allowances and map can be found at the following link:

<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

As part of the pre-application process provided by KCC, the LLFA are open to further discussions, should this be needed.

Kind Regards,

Daniel Hoare

Flood Risk Officer

Flood and Water Management Team

Your Search Results :
Land at The Howlands
Albion Road
Marden
Tonbridge
Kent
TN12 9EG





Searchflow
42, Kings Hill Avenue

West Malling
Kent
ME19 4AJ

Your Ref
SF23541932000 NM/RHL/10574.
Our Ref
LS/U1183274/A..
Date
1 Apr 2016
Contact
searches@southernwater.co.uk

Dear Sir/Madam

Your Search Results: Land at The Howlands, Albion Road

Please find enclosed the results of your property search request. If you have any questions arising from the results please call our helpline on 0330 303 0276, which is open from 08.00 to 17.00hrs or send your enquiry to the following email address: Searches@southernwater.co.uk.

Yours faithfully

Southern Water Land Searches

**Land at The Howlands
Albion Road
Marden
Tonbridge
Kent
TN12 9EG**



Land Search Results

Land Search: Land at The Howlands, Albion Road, Marden, Tonbridge, Kent, TN12 9EG
Ref: LS/U1183274/A..
Date: 1 Apr 2016
Contact: Southern Water Services
Tel: 0330 303 0276
Email: searches@southernwater.co.uk

MAPS

Public Sewer Map

1.1 Q: Where relevant, please include a copy of an extract from the public sewer map.

A: A copy of the statutory sewer map is provided

1. The Water Industry Act 1991 defines Public sewers as those which The Company have responsibility for. Other assets and rivers, watercourses, ponds, culverts or highway drains may be shown for information purpose only.

2. Any Private Sewers or Lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.

Map of Waterworks

1.2 Q: Where relevant, please include a copy of an extract from the map of waterworks.

A: The water supply for this area is provided by South East Water Ltd 3 Rocfort Road Snodland Kent, ME6 5AH. Tel no: 0333 000 0001 and a copy of the map of waterworks is provided.

1. Assets other than vested water mains may be shown on the plan, for information only.

2. The company is not responsible for private supply pipes connecting the property to the public water main and does not hold details of these. These may pass through land outside of the control of the seller, or may be shared with adjacent properties. The buyer may wish to investigate whether separate rights or easements are needed for their inspection, repair or renewal.

3. If an extract of the public water main record is enclosed. This will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

DRAINAGE

Foul Water

2.1 Q: Does foul drainage from the property drain to a public sewer?

A: The company's records indicate that foul water from the property does not drain to the public sewerage system.

- 1. The company is not responsible for those private drains and sewers which connect the property to the public sewerage system, and does not hold details of these. The property owner will normally have sole responsibility for private drains serving the property and may have shared responsibility, with other users, if the property is served by a private sewer which also serves other properties. These may pass through land outside of the control of the seller, the buyer may wish to investigate whether separate rights or easements are needed for their inspection, repair or renewal.*
- 2. An extract from the public sewer map is enclosed. This will show known public sewers in the vicinity of the property and it should be possible to estimate the likely length and route of any private drains and/or sewers connecting the property to the public sewerage system.*
- 3. If foul water does not drain to the public sewerage system the property may have private facilities in the form of a cesspit, septic tank or other type of treatment plant.*

Surface Water Drainage

2.2 Q: Does surface water from the property drain to a public sewer?

A: The company's records indicate that surface water from the property does not drain to the public sewerage system.

- 1. The company is not responsible for private drains and sewers that connect the property to the public sewerage system and does not hold details of these. The property owner will normally have sole responsibility for private drains serving the property and may have shared responsibility, with other users, if the property is served by a private sewer which also serves other properties. These may pass through land outside of the control of the seller, the buyer may wish to investigate whether separate rights or easements are needed for their inspection, repair or renewal.*
- 2. An extract from the public sewer map is enclosed. This will show known public sewers in the vicinity of the property and it should be possible to estimate the likely length and route of any private drains and/or sewers connecting the property to the public sewerage system.*
- 3. In some cases company records do not distinguish between foul and surface water connections to the public sewerage system. If on inspection the buyer finds that the property is not connected for surface water drainage, the property may be eligible for a rebate of the surface water drainage charge. Details can be obtained from the company.*
- 4. If surface water does not drain to the public sewerage system the property may have private facilities in the form of a soakaway or private connection to a watercourse*

Surface Water Drainage Charges

2.3 Q: Is a surface water drainage charge payable?

A: Records confirm that a surface water drainage charge is not payable for the property.

- 1. Where surface water from a property does not drain to the public sewerage system no surface water drainage charges are payable.*
- 2. Where surface water drainage charges are payable but if on inspection the buyer finds that the property is not connected for surface water drainage, the property may be eligible for rebate of the surface water drainage charge. Details can be obtained from the Sewerage Undertaker.*

Location of Sewers

2.4 Q: Does the public sewer map indicate any public sewer, disposal main or lateral drain within the boundaries of the property?

A: The public sewer map included indicates that there is a public sewer, disposal main or lateral drain within the boundaries of the property. However, from the 1st October 2011 there may be additional public sewers, disposal mains or lateral drains which are not recorded on the public sewer map but which may further prevent or restrict development of the property. For further information please go to: <http://www.southernwater.co.uk/BusinessCustomers/propertySearches/faqPropertySearches.asp>

1. The Company has a statutory right of access to carry work on its assets. Employees of The Company or its contractors may, therefore, need to enter the property to carry out work.

2. The Approximate boundary of the property has been determined by reference to the Ordnance Survey record or the map supplied.

Sewer within 100 feet

2.5 Q: Does the public sewer map indicate any public sewer within 30.48 meters (100 feet) of any buildings within the property?

A: The public sewer map indicates that there are no public sewers within 30.48 metres (100 feet) of a building within the property.

1. It is recommended that investigations are made into the drainage arrangements of the property as the owner may be liable for repairs to the drainage system.

Adoption Agreements

2.6 Q: Are any sewers or lateral drains serving or which are proposed to serve the property the subject of an existing adoption agreement or an application for such an agreement?

A: The company's records indicate that the sewers serving the development, of which this property forms part, are not the subject of an application for adoption under S104 of the Water Industry Act 1991. Where the property is part of an established development it would not normally be subject to an adoption agreement under Section 104 of the Water Industry Act 1991.

1. Where the property is part of a very recent or ongoing development and the sewers are not the subject of an adoption application, buyers should consult with the developer to ascertain the extent of private drains and sewers for which they will hold maintenance and renewal liabilities.

2. Final adoption is subject to the developer complying with the terms of the adoption agreement under Section 104 of the Water Industry Act 1991.

Building Over Agreement

2.7 Q: Has the sewerage undertaker approved or been consulted about any plans to erect a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain?

A: The company's records indicate that there is not a statutory agreement or consent in respect of building over a public sewer at this property. For historical reasons the company may not be aware of some agreements or consent's which have been entered into by the local authority.

Risk of Flooding Due to Overloading Public Sewers

2.8 Q: Is any building which is or forms part of the property at risk of internal flooding due to overloaded public sewers?

A: The property is not recorded as being at risk of internal flooding due to overloaded public sewers. From the 1st October 2011 private sewers, disposal mains and lateral drains were transferred into public ownership. It is therefore possible that a property may be at risk of internal flooding due to an overloaded public sewer which the sewerage undertaker is not aware of. For further information it is recommended that enquiries are made of the vendor.

1. A sewer is "overloaded" when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.

2. "Internal flooding" from the public sewers is defined as flooding, which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.

3. "At Risk" properties are those that the water company is required to include in the Regulatory Register that is reported annually to the Water Services Regulatory Authority. These are defined as properties that have suffered or are likely to suffer internal flooding from the public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Sewerage Undertaker's reporting procedure.

4. Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the at Risk register.

5. Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Sewerage Undertaker.

6. Public Sewers are defined as those for which the Sewerage Undertaker holds statutory responsibility under the Water Industry Act 1991.

7. It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Sewerage Undertaker. This report excludes flooding from the private sewers and drains and the Sewerage Undertaker makes no comment upon this matter.

Sewerage Treatment Works

2.9 Q: Please state the distance from the property to the nearest boundary of the nearest sewage treatment works.

A: The nearest sewage treatment works is 3.75 kilometres East of the property. The name of the sewage treatment works is STAPLEHURST WTW, which is responsibility of Southern Water Services, Southern House, Capstone Road, Chatham, Kent ME5 7QA company.

1. The nearest sewerage treatment works will not always be the sewerage treatment works serving the catchment within which the property is situated.

2. The Sewerage undertaker's records were inspected to determine the nearest sewerage treatment works.

3. It should be noted therefore that there may be private sewerage treatment works closer than the one detailed above that have not been identified.

WATER

Connection to Mains Water Supply

3.1 Q: Is the property connected to mains water supply?

A: Please contact South East Water Ltd 3 Rocfort Road Snodland Kent, ME6 5AH. Tel no: 0333 000 0001 for this information.

Location of Water Mains

3.2 Q: Are there any water mains, resource mains or discharge pipes within the boundaries of the property?

A: The water supply for this area is provided by South East Water Ltd 3 Rocfort Road Snodland Kent, ME6 5AH. Tel no: 0333 000 0001 whose records do not show any vested water mains within the boundary of the property.

1. The boundary of the property has been determined by reference to the Ordnance Survey record.

2. The presence of a vested water main within the boundary of the property may restrict further development within it. The company has a statutory right of access to carry out work on its assets, subject to notice. This may result in employees of the company or its contractors needing to enter the property to carry out work.

Adoption of Water Mains and Services Pipes

3.3 Q: Is any water main or service pipe serving or which is proposed to serve the property the subject of an existing adoption agreement or an application for such an agreement?

A: Records confirm that water mains or service pipes serving the property are not the subject of an existing adoption agreement or an application for such an agreement.

1. This enquiry is of interest to purchasers of new homes who will want to know whether or not the property will be linked to the mains water supply.

Risk of Low Water Pressure or Flow

3.4 Q: Is the property at risk of receiving low water pressure or flow?

A: Records confirm that the property is not recorded on a register kept by the water undertaker as being at risk of receiving low water pressure or flow.

1. The boundary of the property has been determined by reference to the Ordnance Survey record.

2. "Low water pressure" means water pressure below the regulatory reference level which is the minimum pressure when demand on the system is not abnormal.

3. Water Companies are required to include in the Regulatory Register that is reported annually to the Water Services Regulatory Authority properties receiving pressure below the reference level, provided that allowable exclusions do not apply (i.e. events which can cause pressure to temporarily fall below the reference level).

4. The reference level of service is a flow of 9 litres/minute at a pressure of 10metres head on the customers side of the main stop tap (mst). The reference level of service must be applied on the customers side of a meter or any other company fittings that are on the customers side of the main stop tap.

The reference level applies to a single property. Where more than one property is served by a common service pipe, the flow assumed in the reference level must be appropriately increased to take account of the total number of properties served.

For two properties, a flow of 18 litres/minute at a pressure of 10metres head on the customers' side of the mst is appropriate. For three or more properties the appropriate flow should be calculated from the standard loadings provided in BS6700 or Institute of Plumbing handbook.

5. Allowable exclusions

The Company is required to include in the Regulatory Register properties receiving pressure below the reference level, provided that allowable exclusions listed below do not apply

6. Abnormal demand:

This exclusion is intended to cover abnormal peaks in demand and not the daily, weekly or monthly peaks in demand which are normally expected.

Companies should exclude from the reported DG2 figures properties which are affected by low pressure only on those days with the highest peak demands. During the report year companies may exclude, for each property, up to five days of low pressure caused by peak demand.

7. Planned maintenance:

Companies should not report under DG2 low pressures caused by planned maintenance.

It is not intended that companies identify the number of properties affected in each instance. However, companies must maintain sufficiently accurate records to verify that low pressure incidents that are excluded from DG2 because of planned maintenance are actually caused by maintenance.

8. One-off incidents:

This exclusion covers a number of causes of low pressure; mains bursts; Failures of company equipment (such as PRVs or booster pumps);

Firefighting; and Action by a third party. However, if problems of this type affect a property frequently, they cannot be

classed as one-off events and further investigation will be required before they can be excluded.

9. Low pressure incidents of short duration:

Properties affected by low pressures which only occur for a short period, and for which there is evidence that incidents of a longer duration would not occur

during the course of the year, may be excluded from the reported DG2 figures.

Water Quality Analysis

3.5 Q: Please include details of a water quality analysis made by the water undertaker for the water supply zone in respect of the most recent calendar year.

A: The analysis confirmed that tests failed to meet the standards prescribed by the 2000 Regulations or the 2001 Regulations in relation to another substance or substances, please find a report attached.

1. Water companies have a duty to provide wholesome water that meets the standards of the Water Supply (Water Quality) Regulations 2000.

However, the householder is responsible for any deterioration in water quality that is a result of the domestic distribution system (the supply pipe and the plumbing within the property) that results in the standards not being met.

2. In England and Wales these Regulations implement the requirements of the European Drinking Directive 98/83/EC. The 2000 Regulations impose standards for a range of parameters, which are either health based to ensure the water is safe to drink or to ensure the water is aesthetically acceptable. They also require that drinking water should not contain any element, organism or substance (whether or not a parameter) at a concentration or value which would be detrimental to public health.

3. Water quality is normally tested at the tap used for domestic consumption normally the kitchen. However, the householder is responsible for any of deterioration in water quality that is a result of the domestic distribution system (the supply pipe and the plumbing within the property) that results in the standards not being met.

4. If there are concerns that lead pipes within the property may be causing high levels of lead in your drinking water please contact your water company (give contact details) for further advice.

5. The water company undertakes a monitoring programme to establish water quality that includes random sampling from domestic properties. It will notify the consumers of any failures to meet the water quality standards that are due to the condition or maintenance of the domestic distribution system.

6. The data collected by the company is subject to external review by the drinking water inspectorate (DWI) and by local and health authorities. In addition to reviewing quality data the DWI also carry out audits during which any area of the company's operational can be examined.

7. If there are concerns that lead pipes within the property may be causing high levels of lead in your drinking water please contact the company (see below) for further advice.

Water Quality Standards

3.6 Q: Please include details of any departures authorised by the Secretary of State or National Assembly for Wales under Part 6 of the 2000 Regulations from the provisions of Part 3 of those Regulations.

A: There are no such authorised departures for the water supply zone.

1. Authorised departments are not permitted if the extent of the departure from the standard is likely to constitute a potential danger to human health.

2. Please contact your water company if you require further information.

Water Meters

3.7 Q: Please include details of the location of any water meter serving the property.

A: Records indicate that the property is not served by a water meter.

*1. Where the property is not served by a water meter and the customer wishes to consider this method of charging they should contact:
South East Water Ltd 3 Rocfort Road Snodland Kent, ME6 5AH. Tel no: 0333 000 0001*

CHARGING

Sewerage And Water Undertakers

4.1 Q: Who are the sewerage and water undertakers for the area?

A: The sewerage undertaker for the area is Southern Water Services, Southern House, Yeoman Road, Worthing, Sussex BN13 3NX

South East Water Ltd 3 Rocfort Road Snodland Kent, ME6 5AH. Tel no: 0333 000 0001

Sewerage Bills

4.2 Q: Who bills the property for sewerage services?

A: The property is not billed for sewerage services.

Water Bills

4.3 Q: Who bills the property for water services?

A: The property is not billed for water services.

Current Basis for Sewerage and Water Charges

4.4 Q: What is the current basis for charging for sewerage and/or water services at the property?

A: Where no change of use is made, on change of occupation charges will be made on an unmeasured basis (please note a meter may be installed at the property upon request to SOUTH EAST WATER)

1. Measured (metered) charges can apply where the buyer makes a change of use of the property or where the buyer uses water

- where the principal use of the premises is not as a home*
- where there is garden watering other than by hand*
- which automatically replenishes a pond or swimming pool with a capacity in excess of 10,000litres*
- in a bath with a capacity in excess of 230Litres*
- in a power shower*
- in a reverse osmosis unit*

2. If a property is measured (metered) upon change of occupation this property will remain as a metered property.

3. Water and sewerage companies full charges are set out in their charges schemes which are available from the company free of charge upon request.

Trade Effluent Information

4.5 Q: Is there a Consent, on this property, to discharge Trade Effluent under S118 of the Water Industry Act (1991) into the public sewerage system?

A: The trader operating at this commercial property does not hold either a Trade Effluent Consent, or an acknowledgement of a trade effluent discharge, as issued by Southern Water.

1. Please note any existing consent is dependant on the business being carried out at the property and will not transfer automatically upon change of ownership.

Other Information

Is there a Meter fitted at the property?

Please contact South East Water Ltd 3 Rocfort Road Snodland Kent, ME6 5AH. Tel no: 0333 000 0001 for this information.

If not, Rateable Value used for charging purposes:

ADDITIONAL METER INFORMATION

Southern Water does not hold meter serial or location details for this property. This is because Southern Water does not supply the water for this property.

DISCLAIMER - These replies and information, including that shown on the enclosed plans(s), are given on the distinct understanding that neither the company nor any of its representatives is legally liable for its accuracy or for any action or omission to act whatsoever by anyone on the strength of that information, save as to obvious error. In particular, any person proposing to construct or excavate on land on the basis of information hereby provided should carry out all necessary on-site investigations.

A GUIDE TO NEW DEVELOPMENT

WASTEWATER INFORMATION

The information contained below is for general guidance only. It is recommended that Southern Water's Network Development department be contacted for further details concerning new infrastructure development.

Sewer Requisitions

It may be necessary for a developer to request that Southern Water provides a public sewer to connect a development site to the existing public system. The developer is responsible for the cost of the work, although a discount will be applied based on the future predicted income from the development served by the new sewer.

Sewer Diversions

If a public sewer crosses private land, it may be possible for the landowner/developer to request the sewer be diverted. In the majority of cases Southern Water will allow the developer to undertake this work under close supervision. Whether Southern Water or the developer undertakes the diversionary works the costs are the responsibility of the developer.

Building-over Sewers

Public sewers are afforded statutory protection and consequently there is no right to build over or in close proximity to a public sewer. If an existing public sewer either crosses a development site or is located in close proximity to a development site it is essential that a developer contact Southern Water.

Sewer Connections

A developer can serve notice on Southern Water that it wishes to make a connection to the public sewerage system. The developer must provide 21 days notice and the work will be supervised by Southern Water.

Contact Us

For specific information on Southern Water's Network Development service, including details on how to contact the right person, please visit our website on:-

FURTHER QUERIES

SOUTHERN WATER LAND SEARCH SERVICE

If you have any queries regarding this Commercial Landsearch, please do not hesitate to contact the Southern Water Land Search Service using the details below.

Mailing Address: The Land Search Service
SOUTHERN WATER
SOUTHERN House
Capstone Road
Chatham
Kent
ME5 7QA

Email Address: searches@southernwater.co.uk

Helpdesk Tel: 0330 303 0276

Helpdesk Fax: 01634 844514

DX: 400450 Chatham 5

SOUTHERN WATER NETWORK DEVELOPMENT SERVICE

Contact Us

For specific information on Southern Water's Network Development service, including details on how to contact the right person, please visit our website on:-
www.southernwater.co.uk/developers

COMMERCIAL DRAINAGE & WATER ENQUIRY

TERMS AND CONDITIONS

Customer and Clients are asked to note these terms, which govern the basis on which this commercial drainage and water report is supplied

Definitions

'Company' means the water service company operating within the Southern Water drainage area that provides information to Southern Water for this commercial search Report.

'Order' means any request completed by the Customer requesting the Report.

'Report' means the drainage and water report prepared by The Company in respect of the Property.

'Property' means the address or location supplied by the Customer in the Order.

'Customer' means the person, company, firm or other legal body placing the Order, either on their own behalf as Client, or, as an agent for a Client.

'Client' means the person, company or body who is the intended recipient of the Report with an actual or potential interest in the Property.

Agreement

1. Southern Water agrees to supply the Report subject to these terms. The scope and limitations of the Report are described in paragraph 2 of these terms. Where the Customer is acting as an agent for the Client then the Customer shall be responsible for bringing these terms to the attention of the Client.

The Customer and Client agree that the placing of an Order for a Report indicates their acceptance of these terms.

The Report

2. Whilst Southern Water will use reasonable care and skill in producing the Report, it is provided to the Client on the basis that they acknowledge and agree to the following:-

2.1 The information contained in the Report can change on a regular basis so Southern Water cannot be responsible to the Client for any change in the information contained in the Report after the date on which the Report was produced and sent to the Client.

2.2 The Report does not give details about the actual state or condition of the Property nor should it be used or taken to indicate or exclude actual suitability or unsuitability of the Property for any particular purpose, or relied upon for determining saleability or value, or used as a substitute for any physical investigation or inspection. Further advice and information from appropriate experts and professionals should always be obtained.

2.3 The information contained in the Report is based upon the accuracy of the address supplied by the Customer or Client.

2.4 The Report provides information as to the location & connection of existing services, and details of trade effluent consents. It should not be relied upon for any other purpose. The Report may contain opinions or general advice to the Customer and the Client and Southern Water cannot ensure that any such opinion or general advice is accurate, complete or valid and accepts no liability therefore.

2.5 The position and depth of apparatus shown on any maps attached to the Report are approximate, and are furnished as a general guide only, and no warranty as to its correctness is given or implied. The exact positions and depths should be obtained by excavation trial holes.

Liability

3.1 Southern Water shall not be liable to the Client for any failure defect or non-performance of its Obligations arising from any failure of or defect in any machine, processing system or transmission link or anything beyond Southern Water's reasonable control or the acts or omissions or any party for whom Southern Water is not responsible.

3.2 Where a Report is requested for an address falling within a geographical area where Southern Water and another Company separately provide Water and Sewerage Services, then it shall be deemed that liability for the information given by Southern Water or the Company as the case may be will remain with Southern Water or the Company as the case may be in respect of the accuracy of the information supplied. Where Southern Water is supplying information which has been provided to it by another Company for the purposes outlined in this agreement, Southern Water will therefore not be liable in any way for the accuracy of that information.

3.3 Where the Customer sells this Report to a Client (other than in the case of a bona fide legal adviser recharging the cost of the Report as a disbursement) Southern Water or the company as the case may be shall not in any circumstances (whether for breach of contract, negligence or any other tort, under statute or statutory duty or otherwise at all) be liable for any loss or damage whatsoever (save to the extent provided by clause 3.4) and the Customer shall indemnify Southern Water in respect of any claim (other than a claim covered by clause 3.4) by the Client.

3.4 Southern Water shall accept liability for death or personal injury arising from its negligence.

3.5 The entire liability of Southern Water or the Company as the case may be in respect of all causes of action arising under or in connection with the Report (whether for breach of contract, negligence or any other tort, under statute or statutory duty or otherwise at all) shall not exceed £2,000,000 (two million pounds); and Southern Water or the Company as the case may be shall not in any circumstances (whether for breach of contract, negligence or any other tort, under statute or statutory duty or otherwise at all) be liable for any loss of profit, loss of goodwill, loss of reputation, loss of business or any indirect, special or consequential loss, damage or other claims, costs or expenses;

Copyright and Confidentiality

4.1 The Customer and the Client acknowledge that the Report is confidential and is intended for the personal use of the Client. The copyright and any other intellectual property rights in the Report shall remain the property of Southern Water. No intellectual or other property rights are transferred or licensed to the Customer or the Client except to the extent expressly provided.

4.2 The Customer or Client is entitled to make copies of the Report (other than any maps contained in the, or attached to the Report, where no copying is permitted).

4.3 The Customer and Client agree (in respect of both the original and any copies made) to respect and not to alter any trademark, copyright notice or other property marking which appears on the Report.

4.4 The maps contained in the Report are protected by Crown Copyright and must not be used for any purpose outside the context of the Report.

4.5 The Customer and the Client agree to indemnify Southern Water or the Company as the case may be against any losses, costs, claims and damage suffered by Southern Water or the Company as the case may be, as a result of any breach by either of them of the terms of paragraphs 4.1 to 4.4 inclusive.

Payment

5.1 Unless otherwise stated all prices are inclusive of VAT. The Customer shall pay for the price of the Report specified by Southern Water, without any set off, deduction or counterclaim. Unless the Customer or Client has an account with Southern Water for payment for Reports, payments for Reports must be received in full by Southern Water before the Report is produced. For Customers or Clients with accounts, payment terms will be as agreed with Southern Water.

General

6.1 If any provision of these terms is or becomes invalid or unenforceable, it will be taken to be removed from the rest of these terms to the extent that it is invalid or unenforceable. No other provision of these terms shall be affected.

6.2 These terms shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts.

6.3 Nothing in this notice shall in any way restrict your statutory or any other rights of access to the information contained in the Report.



Complaints Procedure for the CON29DW Residential Search and the Commercial Drainage and Water Search

When we get it wrong

You deserve the highest standard of service from us, but sometimes we make mistakes. If we do, please let us know and we will investigate and review your concerns.

Whilst we always try to resolve all complaints straightaway, if this is not possible and you are not happy with the course of action taken by us, you can ask us to escalate the issue internally or take your complaint to an independent third party.

How you contact us

Firstly please call us and we will try to sort out your problem straight away. You can call us between 9am and 5pm, Monday to Friday on **0845 270 0212** or **0330 303 0276** (individual consumers);

Email us at searches@southernwater.co.uk or write to us at Southern Water LandSearch, Southern House, Capstone Road, Chatham, Kent, ME5 7QA.

What you can expect

You will receive a full, fair and courteous response from someone who can effectively deal with your problem.

If we can remedy the problem straight away we will do it but if we cannot immediately resolve your problem we will keep you informed of actions being taken.

The process

We will try to resolve any telephone contact or complaint at the time of the call, however, if that isn't possible, we will take the details of your complaint and we will investigate and get back to you within 10 working days.

We will respond to written complaints within 10 working days of the date received, but we will always aim to respond more quickly. Depending on the scale of investigation required, we will keep you informed of the progress and update you with new timescales if necessary.

If you are still not satisfied with our response or action we will refer the matter to a Senior Manager for resolution. At your request we will liaise with a third party representative acting on your behalf.

Our commitment to you

If we do not respond to your complaint within 10 working days of receipt of your contact, we will compensate you in line with Southern Water's Customer services — Guaranteed standards of service for business customers.

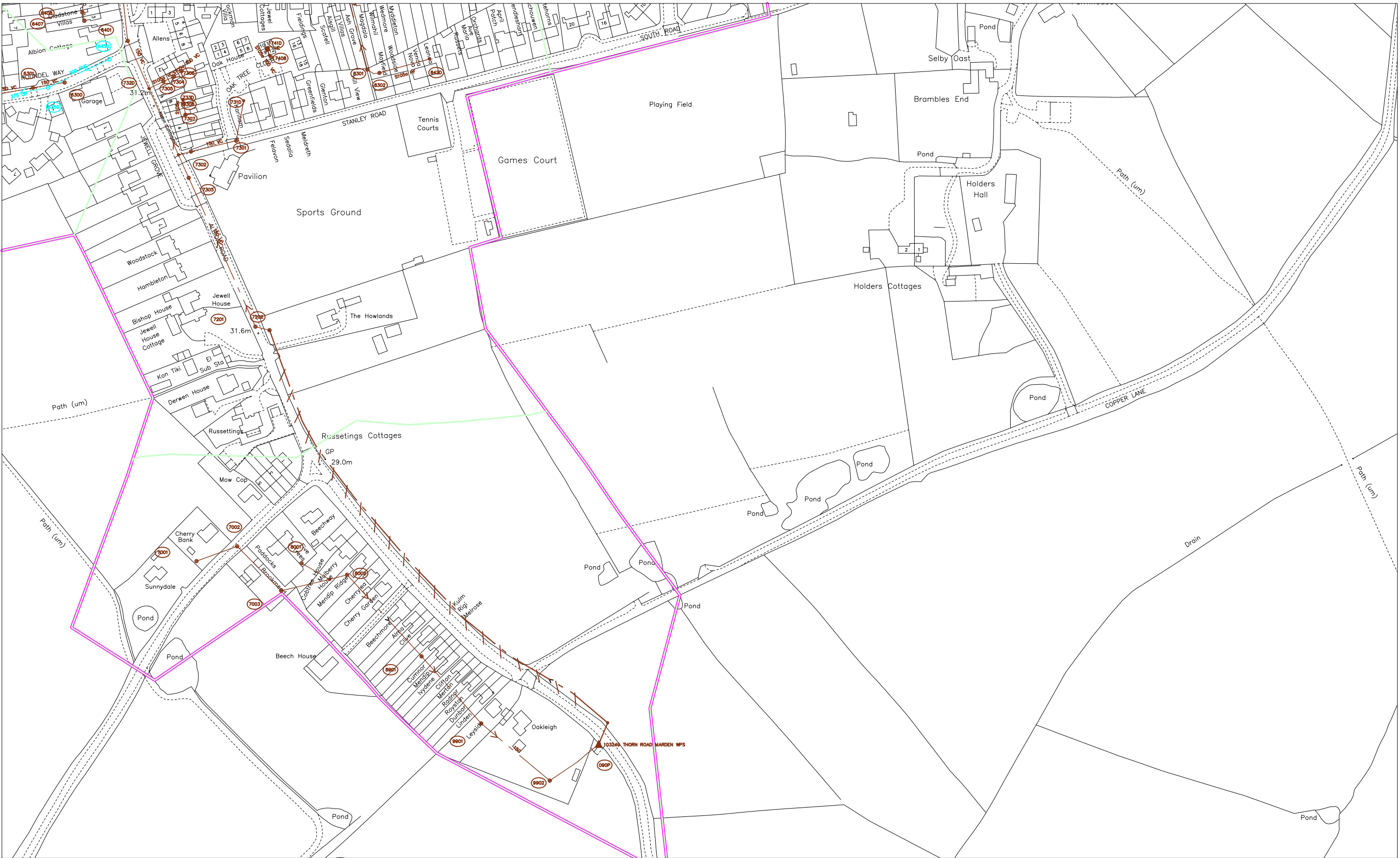
If we find your complaint to be justified, or we have made any errors that substantially change the outcome in your search result, we will refund the search fee. We will also provide you with a revised search and undertake the necessary action to put things right as soon as practically possible. You will be kept informed of the progress of any action required.

If you remain dissatisfied

While we aim to resolve your complaint first time, in the event that we are unable to resolve the issue to your satisfaction, ultimately you can contact a third party. Please make sure that you have followed the process above first, if not, your complaint will be passed back to us.

SEWER RECORDS PAGE 1 OF 2

144439



143861

574610

O.S. REF.

TQ7544SW

Title: Land at The Howlands

Drawn by: mondaln

Scale: 1:2500

Date: 01/04/2016

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

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

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Southern
Water

575552

SEWER RECORDS PAGE 2 OF 2

Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape
090DX			OTHER	PVC	CIRC																		
090PX	23.899	22.187	OTHER	PVC	CIRC																		
6300X	31.67	31.21	150	VC	CIRC																		
6301X	31.76	30.08	150	VC	CIRC																		
6350X	31.75	30.37	375	CP	CIRC																		
6401Y	31.184		150	VC	CIRC																		
6407X			100	VC	CIRC																		
6408X			100	VC	CIRC																		
6450X	31.29	30.62	300	PVC	CIRC																		
7001X	29.487	27.967	150	VC	CIRC																		
7002X	28.67	27.044	150	VC	CIRC																		
7003X	27.556	26.265	150	VC	CIRC																		
7201X	31.558	30.284	150	VC	CIRC																		
7202X	32.011	30.423	150	VC	CIRC																		
7301X	31.332	29.864	150	VC	CIRC																		
7302X	31.507	29.332	150	VC	CIRC																		
7303X	31.428	29.367	150	VC	CIRC																		
7304X			UNK	VC	CIRC																		
7305X			UNK	UNK	CIRC																		
7306X			100	VC	CIRC																		
7307X			UNK	UNK	CIRC																		
7308X			UNK	UNK	CIRC																		
730DX			150	VC	CIRC																		
731DX			UNK	UNK	CIRC																		
732DX			150	VC	CIRC																		
741DX			100	VC	CIRC																		
8001X	28.142	27.731	150	VC	CIRC																		
8002X	27.156	25.768	150	VC	CIRC																		
800DX			150	VC	CIRC																		
8301X			UNK	PF	CIRC																		
8302X			UNK	PF	CIRC																		
842DX			UNK	PF	CIRC																		
8901X	25.654	24.507	UNK	UNK	CIRC																		
9901X	24.576	23.399	150	UNK	CIRC																		
9902X	23.629	22.503	UNK	UNK	CIRC																		

LINE STYLES / COLOURS

Brown	—	Foul
	—	Foul Syphon Sewer
	—	Foul Vacuum Main
	—	Foul Rising Main
Red	—	Combined
	—	Combined Syphon Sewer
	—	Combined Rising Main
	—	Lateral Drain
Orange	—	Building Over Agreement Area
Dark Blue	—	Treated Effluent
Purple	—	Sludge
	—	Sewer Catchment
	—	Section 104 Area
Light Blue	—	Surface Water
	—	Surface Water Rising Main
Yellow	—	Private
Green	—	Access Shaft
	—	Decommissioned

MATERIALS

AK	Alkathene
BAC	Bonded Asbestos Cement
BRC	Brick (Common)
BRE	Brick (Engineering)
CC	Concrete Box Culvert
CI	Cast Iron
CO	Concrete (In-Situ)
CP	Concrete (Pre-Cast)
CSB	Concrete Segments (bolted)
CSU	Concrete Segments (unbolted)
DI	Ductile Iron
GRC	Glass Reinforced Concrete
GRP	Glass Reinforced Plastic
MAC	Masonry in regular Courses
MAR	Masonry in random Courses
PE	Polyethylene
PF	Pitch Fibre
PP	Polypropylene
PVC	Polyvinyl Chloride
RPM	Reinforced Plastic Matrix
SI	Spun Iron
ST	Steel
VC	Verified Clay
XXX	Other
ZZZ	Unknown

Manhole (SW)
Manhole (F&C)
Lamp hole (SW)
Lamp hole (F&C)
Pumping Station (SW)
Pumping Station (F&C)
Side entry manhole (SW)
Side entry Manhole (F&C)
Blind shaft (SW)
Blind shaft (F&C)
Ejector station (SW)
Ejector station (F&C)
Watertight door (SW)
Watertight door (F&C)
Flushing ch. Min-e (SW)
Flushing ch. Min-e (F&C)
Flushing ch. No-e (SW)
Flushing ch. No-e (F&C)
Demarcation Chamber

LEGEND - SEWERS

Washout (SW)
Washout (F&C)
Rodding Eye (SW)
Rodding Eye (F&C)
Gauging point (SW)
Gauging point (F&C)
Intercept chamber (SW)
Intercept chamber (F&C)
Storm Tank (SW)
Storm Tank (F&C)
Vortex chamber (SW)
Vortex chamber (F&C)
Label ellipse
Dummy/S24 manhole
Outfall
Penstock chamber
Damboards
Storm Overflow
Backdrop manhole

Other (s)
Other
Change in sewer (s)
Change in sewer
Reflex valve
Flap valve
Cascade
Anode
Valve
Closed Valve
Air Valve
Hatch box (SW)
Hatch box (F&C)
Direction arrow
Emptying valve
Catchpit
Soakaway
Inlet
Balancing Pond

SHAPES (S)

A	Arched	R	Rectangular
B	Barrel	S	Square
C	Circular	T	Trapezoidal
E	Egg	U	U Shape
H	Horseshoe	X	Other

NODE REFERENCING SYSTEM

1st digit:	hundred metre easting identifier
2nd digit:	hundred metre northing identifier
3rd digit:	sewer type identifier
4th digit:	next sequential node

Drawn by:	mondaln	
Title:	Land at The Howlands	
Date:	01/04/2016	



This plan is based upon an Ordnance Survey map.
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The position of the water mains shown on this plan should not
be relied upon as being precise.
South East Water accept no responsibility in the event of inaccuracy.

For further information about the contents of this plan please contact
South East Water Ltd. This plan (or part) may not be reproduced in any form
without the permission of South East Water Ltd.

Legend

SEW Main Abandoned Main Non SEW Main Main Fittings

SEW Main: Solid blue line
Abandoned Main: Dashed blue line
Non SEW Main: Solid green line
Main Fittings: Various symbols including AV, SV, FHS, WOS, WOH, ASIP, UK, SV, etc.

Plot Data

Plot Date: 01/04/2016
Grid Reference: 575,063.0000 144,200.0000
Scale: 1:2,500

Drawing Title: Land at The Howlands □ Albion Road □ Tonbridge □ Kent □ TN12 9EG

Reference: U1183274

South East Water

(Water Maps)
PO Box 105
Shodland, Kent
ME6 9DW
Telephone: 0333 000 0059
Email: watermaps@southeastwater.co.uk
Website: www.southeastwater.co.uk



Water Quality report for South East Water supply zone 305

The following samples failed during the calendar year ending 31/12/2014:-

Parameter tested	No. of samples taken	No. of samples failed
Total Coliforms	36	2

Please note these samples are NOT house specific. They refer to samples taken from a large water zone.

Random water sampling is carried out regularly from customer's taps & the test results accumulated for each water supply zone. The chances of this result being from the actual search property address are very low.

Southern East Water investigate all infringements of water quality standards thoroughly & take appropriate action to resolve any problems. All failures are followed up & re-tested.

If there was any risk to public health from the quality of drinking water supplied the Company would inform customers immediately & advise them not to drink the water until the risk had been removed.

Key facts on water quality

Here are some key facts on substances that customers may be concerned about. For more detailed information visit www.southeastwater.co.uk or telephone 0333 000 0001

Aluminium

Aluminium occurs naturally in the environment & can also come from cooking utensils & some treatment works.

Coliform bacteria

These bacteria are usually harmless in themselves but if present can show that there is a possibility of contamination of drinking water. Some of the bacteria we find are from dirty taps in houses but in all cases where bacteria are found we respond urgently to ensure supplies are safe.

Iron

Iron is found naturally in some underground water. Some companies install treatment to remove it where levels are high. It does not cause health problems.

Manganese

Manganese occurs naturally in rocks and soil and also in some foodstuffs.

Nickel

Nickel occurs widely in the environment & is a natural constituent of food & water. Traces found in drinking water often emanate from coatings on modern tap fittings.

Taste

A panel regularly conducts taste tests on drinking water against a standard. This may reveal a "tcp" chlorine taste, metallic taste or bitterness due to copper plumbing, a plastic taste from plastic pipework etc

Turbidity

Is a measure of the opaqueness of a liquid. Sometimes water is not entirely clear due to suspended matter or passage through pipes even though water leaving our works is clear. This test measures interference of light rays passing through the sample, and samples will generally clear if left to stand.

Flood Risk Assessment

Appendix 4

- EA Flood Map for Planning
- Long-term Flood Risk Mapping

Flood map for planning

Your reference
C3571

Location (easting/northing)
575008/144179

Created
2 Feb 2023 14:13

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following:**

- bigger than 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

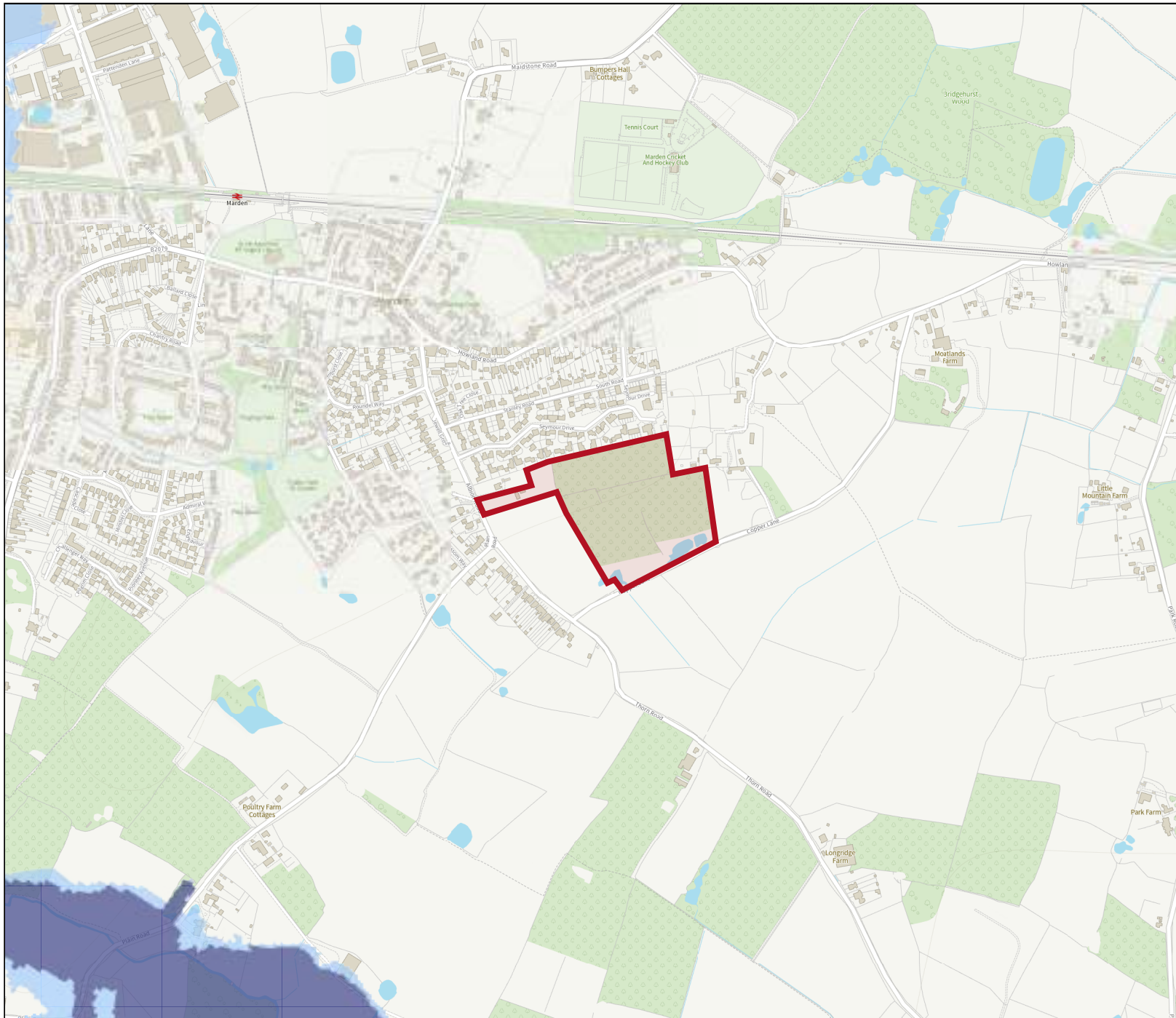
Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence **which** sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2022 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>



Flood map for planning

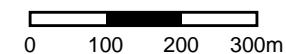
Your reference
C3571

Location (easting/northing)
575008/144179

Scale
1:10000

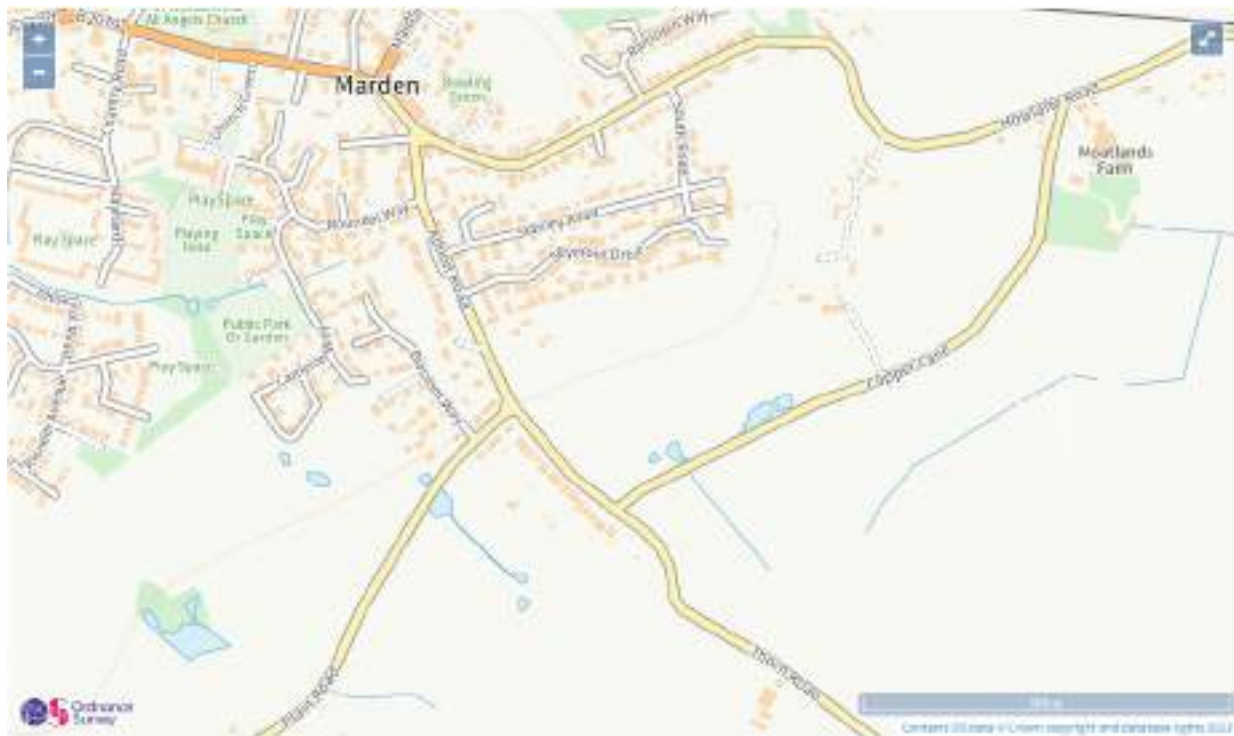
Created
2 Feb 2023 14:13

-  Selected area
-  Flood zone 3
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Water storage area



Long-Term Flood Risk Mapping

Extent of Flooding from Rivers or the Sea



Extent of flooding from rivers or the sea

- High
- Medium
- Low
- Very low

Extent of Flooding from Surface Water



Extent of flooding from surface water

- High
- Medium
- Low
- Very low

Long-Term Flood Risk Mapping

Surface Water Flood Risk – Flood Depth in a High-Risk Scenario



Surface Water Flood Risk – Flood Velocity in a High-Risk Scenario



Long-Term Flood Risk Mapping

Surface Water Flood Risk – Flood Depth in a Medium-Risk Scenario



Surface water flood risk: water depth in a medium risk scenario

Flood depth (millimetres)

Over 900mm 300 to 900mm Below 300mm

Surface Water Flood Risk – Flood Velocity in a Medium-Risk Scenario



Surface water flood risk: water velocity in a medium risk scenario

Flood velocity (metres/second)

Over 0.25 m/s Less than 0.25 m/s Direction of water flow

Long-Term Flood Risk Mapping

Surface Water Flood Risk – Flood Depth in a Low-Risk Scenario



Surface water flood risk: water depth in a low risk scenario

Flood depth (millimetres)

Over 900mm 300 to 900mm Below 300mm

Surface Water Flood Risk – Flood Velocity in a Low-Risk Scenario



Surface water flood risk: water velocity in a low risk scenario

Flood velocity (metres/second)

Over 0.25m/s Less than 0.25m/s Direction of water flow

Long-Term Flood Risk Mapping

Extent of Flooding from Reservoirs



Maximum extent of flooding from reservoirs:

- when river levels are normal
- when there is also flooding from rivers

Flood Risk Assessment

Appendix 5

- Greenfield Runoff Estimate
- Drainage Strategy Simulation Summary

Calculated by: Paul Daykin

Site name: C3571

Site location: Marden

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude: 51.16983° N

Longitude: 0.50276° E

Reference: 2561854770

Date: Jan 27 2023 17:57

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 1

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR

SPR estimation method: Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	668	668
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	4.57	4.57
1 in 1 year (l/s):	3.89	3.89
1 in 30 years (l/s):	10.51	10.51
1 in 100 year (l/s):	14.58	14.58
1 in 200 years (l/s):	17.09	17.09

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uknuts.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uknuts.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	1.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.000
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	2.00	Enforce best practice design rules	✓

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	19	18	17.346	0.600	29.300	29.000	0.300	57.8	300	2.14	5.0
1.001	18	17	56.319	0.600	29.000	28.400	0.600	93.9	300	2.72	5.0
1.002	17	16	20.235	0.600	28.325	28.025	0.300	67.5	375	2.87	5.0
1.003	16	15	34.906	0.600	28.025	27.200	0.825	42.3	375	3.08	5.0
1.004	15	14	32.562	0.600	27.200	26.600	0.600	54.3	375	3.30	5.0
1.005	14	13	15.269	0.600	26.600	26.195	0.405	37.7	375	3.39	50.0
2.000	24	23	26.731	0.600	27.400	27.250	0.150	178.2	375	2.33	5.0
2.001	23	22	42.154	0.600	27.250	26.925	0.325	129.7	375	2.77	5.0
2.002	22	21	16.494	0.600	26.925	26.775	0.150	110.0	375	2.93	5.0
2.003	21	20	49.790	0.600	26.700	26.275	0.425	117.2	450	3.37	5.0
2.004	20	13	10.127	0.600	26.275	26.140	0.135	75.0	450	3.44	5.0
1.006	13	12	27.583	0.600	26.120	25.525	0.595	46.4	450	3.60	50.0
1.007	12	11	11.964	0.600	25.525	25.280	0.245	48.8	450	3.67	50.0
3.000	32	31	17.124	0.600	28.696	27.500	1.196	14.3	150	2.11	5.0
3.001	31	30	16.046	0.600	27.500	26.475	1.025	15.7	150	2.21	50.0
3.002	30	11	17.417	0.600	26.400	25.525	0.875	19.9	225	2.31	50.0
1.008	11	10	25.935	0.600	25.280	24.725	0.555	46.7	450	3.81	50.0
1.009	10	9	10.510	0.600	24.575	24.435	0.140	75.1	600	3.87	50.0
1.010	9	8	10.739	0.600	24.360	24.285	0.075	143.2	675	3.96	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	2.071	146.4	0.5	2.198	2.318	0.039	0.0	13	0.490
1.001	1.623	114.7	1.1	2.318	2.359	0.079	0.0	20	0.511
1.002	2.209	243.9	2.8	2.359	2.796	0.208	0.0	28	0.757
1.003	2.792	308.4	3.4	2.796	3.965	0.254	0.0	27	0.943
1.004	2.464	272.1	4.5	3.965	4.210	0.334	0.0	33	0.941
1.005	2.958	326.8	55.4	4.210	4.205	0.409	0.0	104	2.224
2.000	1.354	149.5	0.5	2.440	3.109	0.035	0.0	16	0.312
2.001	1.589	175.5	1.3	3.109	3.881	0.096	0.0	23	0.475
2.002	1.727	190.7	2.6	3.881	4.149	0.193	0.0	30	0.620
2.003	1.877	298.5	3.1	4.149	4.139	0.231	0.0	32	0.624
2.004	2.349	373.6	4.7	4.139	4.185	0.345	0.0	35	0.824
1.006	2.992	475.8	105.3	4.205	4.110	0.777	0.0	143	2.422
1.007	2.914	463.5	113.8	4.110	4.035	0.840	0.0	151	2.425
3.000	2.676	47.3	0.4	1.550	2.787	0.027	0.0	10	0.797
3.001	2.558	45.2	8.9	2.787	3.614	0.066	0.0	45	2.005
3.002	2.946	117.1	14.0	3.614	4.015	0.103	0.0	52	2.002
1.008	2.980	473.9	133.2	4.035	3.949	0.983	0.0	162	2.571
1.009	2.812	795.1	141.4	3.949	3.878	1.043	0.0	170	2.147
1.010	2.188	782.9	144.6	3.878	3.841	1.067	0.0	195	1.689

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
5.000	57	56	27.200	0.600	25.105	25.000	0.105	259.0	450	2.36	50.0
5.001	56	55	13.009	0.600	25.000	24.950	0.050	260.2	450	2.53	50.0
8.000	81	80	22.393	0.600	25.250	25.100	0.150	149.3	225	2.35	50.0
8.001	80	71	48.075	0.600	25.025	24.650	0.375	128.2	300	2.93	50.0
5.002	55	54	13.042	0.600	24.950	24.900	0.050	260.8	450	2.71	50.0
5.003	54	53	22.475	0.600	24.750	24.650	0.100	224.8	600	2.94	50.0
5.004	53	52	16.930	0.600	24.650	24.575	0.075	225.7	600	3.11	50.0
7.000	73	72	24.634	0.600	25.200	24.775	0.425	58.0	225	2.24	50.0
7.001	72	71	9.840	0.600	24.700	24.650	0.050	196.8	300	2.39	50.0
7.002	71	70	35.406	0.600	24.500	24.400	0.100	354.1	450	3.48	5.0
7.003	70	4	26.722	0.600	24.400	24.320	0.080	334.0	450	3.88	5.0
5.005	52	51	9.291	0.600	24.500	24.425	0.075	123.9	675	3.18	50.0
6.000	66	65	27.036	0.600	25.600	25.400	0.200	135.2	375	2.29	5.0
6.001	65	64	13.710	0.600	25.400	25.275	0.125	109.7	375	2.42	5.0
6.002	64	63	16.850	0.600	25.275	25.125	0.150	112.3	375	2.59	5.0
6.003	63	62	28.347	0.600	25.125	24.960	0.165	171.8	375	2.93	5.0
6.004	62	61	5.981	0.600	24.960	24.925	0.035	170.9	375	3.00	5.0
6.005	61	60	23.575	0.600	24.925	24.800	0.125	188.6	375	3.30	50.0
6.006	60	51	16.397	0.600	24.725	24.650	0.075	218.6	450	3.50	50.0
5.006	51	50	31.322	0.600	24.425	24.340	0.085	368.5	675	3.88	50.0
5.007	50	8	18.624	0.600	24.340	24.285	0.055	338.6	675	4.10	50.0
1.011	8	7	12.404	0.600	24.285	24.250	0.035	354.4	675	4.25	50.0
1.012	7	6	21.607	0.600	24.250	24.190	0.060	360.1	675	4.51	50.0
1.013	6	5	21.565	0.600	24.190	24.130	0.060	359.4	675	4.77	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
5.000	1.258	200.1	3.4	1.730	2.108	0.025	0.0	40	0.480
5.001	1.255	199.7	11.8	2.108	2.281	0.087	0.0	73	0.698
8.000	1.068	42.4	4.5	1.850	0.725	0.033	0.0	49	0.694
8.001	1.387	98.0	8.5	0.725	1.035	0.063	0.0	59	0.861
5.002	1.254	199.4	27.6	2.281	2.471	0.204	0.0	112	0.890
5.003	1.620	458.0	31.7	2.471	2.786	0.234	0.0	106	0.949
5.004	1.616	457.0	38.8	2.786	3.023	0.286	0.0	117	1.003
7.000	1.721	68.4	7.7	2.372	1.840	0.057	0.0	51	1.145
7.001	1.117	79.0	10.8	1.840	1.035	0.080	0.0	75	0.789
7.002	1.074	170.9	3.0	1.035	1.185	0.224	0.0	41	0.415
7.003	1.107	176.0	3.9	1.185	1.363	0.285	0.0	45	0.456
5.005	2.353	842.1	41.6	3.023	3.209	0.307	0.0	101	1.253
6.000	1.556	171.9	0.8	2.305	3.100	0.062	0.0	19	0.404
6.001	1.729	191.0	1.3	3.100	3.490	0.093	0.0	22	0.496
6.002	1.708	188.7	1.8	3.490	3.990	0.132	0.0	25	0.543
6.003	1.379	152.3	2.7	3.990	4.565	0.197	0.0	34	0.531
6.004	1.383	152.7	2.9	4.565	4.395	0.211	0.0	36	0.547
6.005	1.316	145.3	35.9	4.395	3.575	0.265	0.0	126	1.096
6.006	1.371	218.0	41.1	3.575	3.209	0.303	0.0	131	1.061
5.006	1.359	486.3	92.4	3.209	3.604	0.682	0.0	198	1.058
5.007	1.418	507.5	98.3	3.604	3.841	0.725	0.0	200	1.110
1.011	1.386	496.0	246.7	3.841	3.270	1.820	0.0	337	1.384
1.012	1.375	492.0	253.4	3.270	2.315	1.870	0.0	344	1.385
1.013	1.376	492.5	260.1	2.315	1.719	1.919	0.0	349	1.395

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.014	5	4	12.646	0.600	24.055	24.020	0.035	361.3	750	4.92	50.0
4.000	48	47	17.276	0.600	28.446	28.100	0.346	49.9	225	2.16	5.0
4.001	47	46	22.634	0.600	28.100	27.550	0.550	41.2	225	2.34	5.0
4.002	46	45	7.629	0.600	27.550	27.350	0.200	38.1	225	2.40	5.0
4.003	45	44	14.436	0.600	27.350	26.850	0.500	28.9	225	2.50	5.0
4.004	44	43	24.352	0.600	26.850	26.075	0.775	31.4	225	2.67	5.0
4.005	43	42	15.315	0.600	26.000	25.500	0.500	30.6	300	2.76	5.0
4.006	42	41	20.108	0.600	25.500	24.900	0.600	33.5	300	2.88	5.0
4.007	41	40	18.904	0.600	24.825	24.525	0.300	63.0	375	3.02	50.0
4.008	40	4	38.349	0.600	24.450	24.320	0.130	295.0	450	3.56	50.0
1.015	4	3	21.535	0.600	24.020	23.950	0.070	307.6	750	5.14	50.0
1.016	3	2	11.001	0.600	23.950	23.920	0.030	366.7	750	5.27	50.0
1.017	2	1	13.898	0.600	23.920	23.870	0.050	278.0	600	5.43	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.014	1.466	647.7	264.0	1.719	1.363	1.948	0.0	333	1.395
4.000	1.855	73.8	0.5	1.075	1.584	0.040	0.0	14	0.538
4.001	2.045	81.3	1.2	1.584	1.952	0.092	0.0	20	0.761
4.002	2.124	84.5	1.5	1.952	1.990	0.110	0.0	21	0.814
4.003	2.444	97.2	1.9	1.990	1.894	0.143	0.0	22	0.963
4.004	2.342	93.1	2.7	1.894	1.678	0.199	0.0	26	1.040
4.005	2.851	201.5	3.2	1.678	1.589	0.234	0.0	26	1.067
4.006	2.725	192.6	3.8	1.589	1.512	0.280	0.0	29	1.092
4.007	2.285	252.4	43.8	1.512	1.321	0.323	0.0	105	1.731
4.008	1.178	187.4	55.7	1.321	1.363	0.411	0.0	167	1.032
1.015	1.590	702.4	365.0	1.363	0.809	2.693	0.0	384	1.605
1.016	1.455	642.9	368.4	0.809	0.630	2.718	0.0	408	1.502
1.017	1.455	411.5	372.7	0.780	0.075	2.750	0.0	450	1.637

Simulation Settings

Rainfall Methodology	FEH-13	Skip Steady State	✓	Check Discharge Volume	✓
Summer CV	0.750	Drain Down Time (mins)	480	100 year 360 minute (m³)	
Winter CV	0.840	Additional Storage (m³/ha)	20.0		
Analysis Speed	Detailed	Check Discharge Rate(s)	✓		

Storm Durations

60	120	180	240	360	480	600	720	960	1440
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	35	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)		Betterment (%)	0
SAAR (mm)		QBar	
Soil Index	1	Q 1 year (l/s)	
SPR	0.10	Q 30 year (l/s)	
Region	1	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)		Storm Duration (mins)	360
Soil Index	1	Betterment (%)	0
SPR	0.10	PR	
CWI		Runoff Volume (m³)	

Node 2 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	23.920	Product Number	CTL-SHE-0152-1140-1200-1140
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	11.4	Min Node Diameter (mm)	1200

Node 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	24.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	1453.6	0.0	1.200	2004.6	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	18	32	29.053	0.053	8.0	0.0758	0.0000	OK
60 minute summer	17	31	28.401	0.076	20.5	0.1575	0.0000	OK
60 minute summer	16	32	28.096	0.071	24.9	0.1010	0.0000	OK
60 minute summer	15	32	27.289	0.088	32.7	0.1327	0.0000	OK
60 minute summer	14	32	26.694	0.094	39.9	0.1375	0.0000	OK
60 minute summer	24	31	27.439	0.039	3.6	0.0540	0.0000	OK
60 minute summer	23	32	27.308	0.058	9.7	0.0862	0.0000	OK
60 minute summer	22	32	27.008	0.083	19.1	0.1318	0.0000	OK
60 minute summer	21	32	26.783	0.083	22.5	0.1069	0.0000	OK
60 minute summer	20	32	26.374	0.099	33.5	0.1611	0.0000	OK
60 minute summer	13	32	26.244	0.124	76.0	0.1526	0.0000	OK
60 minute summer	12	32	25.668	0.143	82.1	0.2007	0.0000	OK
60 minute summer	32	31	28.721	0.025	2.8	0.0358	0.0000	OK
60 minute summer	31	31	27.540	0.040	6.8	0.0559	0.0000	OK
60 minute summer	30	31	26.446	0.046	10.4	0.0614	0.0000	OK
60 minute summer	11	32	25.426	0.146	96.0	0.1908	0.0000	OK
60 minute summer	10	32	24.742	0.167	101.7	0.2324	0.0000	OK
60 minute summer	9	33	24.609	0.249	103.9	0.6610	0.0000	OK
60 minute summer	57	31	25.140	0.035	2.6	0.0474	0.0000	OK
60 minute summer	56	32	25.063	0.063	8.8	0.1023	0.0000	OK
60 minute summer	80	32	25.076	0.051	6.4	0.0880	0.0000	OK
60 minute summer	81	31	25.293	0.043	3.4	0.0621	0.0000	OK
60 minute summer	55	32	25.051	0.101	20.4	0.2005	0.0000	OK
60 minute summer	54	32	24.844	0.094	23.0	0.2573	0.0000	OK
60 minute summer	53	32	24.755	0.105	28.2	0.2993	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	18	1.001	17	0.931	0.067	0.4645	
60 minute summer	17	1.002	16	1.338	0.083	0.3065	
60 minute summer	16	1.003	15	1.448	0.080	0.5984	
60 minute summer	15	1.004	14	1.579	0.120	0.6754	
60 minute summer	14	1.005	13	1.949	0.123	0.3150	
60 minute summer	24	2.000	23	0.418	0.023	0.2248	
60 minute summer	23	2.001	22	0.653	0.053	0.6098	
60 minute summer	22	2.002	21	1.085	0.099	0.2876	
60 minute summer	21	2.003	20	0.991	0.076	1.1359	
60 minute summer	20	2.004	13	1.257	0.090	0.2707	
60 minute summer	13	1.006	12	1.938	0.160	1.0842	
60 minute summer	12	1.007	11	1.877	0.177	0.5235	
60 minute summer	32	3.000	31	0.993	0.058	0.0484	
60 minute summer	31	3.001	30	1.800	0.147	0.0592	
60 minute summer	30	3.002	11	1.792	0.088	0.1002	
60 minute summer	11	1.008	10	2.274	0.203	1.0952	
60 minute summer	10	1.009	9	1.696	0.128	0.6837	
60 minute summer	9	1.010	8	0.748	0.131	1.5414	
60 minute summer	57	5.000	56	0.270	0.012	0.2602	
60 minute summer	56	5.001	55	0.433	0.043	0.2603	
60 minute summer	80	8.001	71	0.781	0.063	0.3799	
60 minute summer	81	8.000	80	0.634	0.077	0.1160	
60 minute summer	55	5.002	54	0.792	0.101	0.3308	
60 minute summer	54	5.003	53	0.760	0.051	0.6861	
60 minute summer	53	5.004	52	0.889	0.062	0.5353	

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	19	31	29.334	0.034	4.0	0.0487	0.0000	OK
60 minute summer	73	31	25.244	0.044	5.8	0.0697	0.0000	OK
60 minute summer	72	31	24.767	0.067	8.0	0.0904	0.0000	OK
60 minute summer	71	32	24.609	0.109	21.9	0.2433	0.0000	OK
60 minute summer	70	32	24.524	0.124	27.9	0.2320	0.0000	OK
60 minute summer	52	33	24.623	0.123	30.1	0.3265	0.0000	OK
60 minute summer	66	31	25.648	0.048	6.3	0.0767	0.0000	OK
60 minute summer	65	31	25.457	0.057	9.4	0.0747	0.0000	OK
60 minute summer	64	32	25.343	0.068	13.1	0.0902	0.0000	OK
60 minute summer	63	32	25.217	0.092	19.5	0.1315	0.0000	OK
60 minute summer	62	32	25.069	0.109	20.9	0.1295	0.0000	OK
60 minute summer	61	32	25.036	0.111	26.0	0.1508	0.0000	OK
60 minute summer	60	32	24.842	0.117	29.4	0.1544	0.0000	OK
60 minute summer	51	33	24.626	0.201	64.5	0.5864	0.0000	OK
60 minute summer	50	33	24.613	0.273	66.5	0.7497	0.0000	OK
60 minute summer	8	33	24.606	0.321	168.0	0.8572	0.0000	OK
60 minute summer	7	33	24.557	0.307	171.5	0.8600	0.0000	OK
60 minute summer	6	33	24.484	0.294	175.0	0.8451	0.0000	OK
60 minute summer	5	34	24.391	0.336	176.7	0.9347	0.0000	OK
60 minute summer	48	31	28.482	0.036	4.1	0.0622	0.0000	OK
60 minute summer	47	31	28.151	0.051	9.3	0.0869	0.0000	OK
60 minute summer	46	31	27.608	0.058	11.0	0.0751	0.0000	OK
60 minute summer	45	31	27.408	0.058	14.2	0.0830	0.0000	OK
60 minute summer	44	32	26.922	0.072	19.8	0.1203	0.0000	OK
60 minute summer	43	32	26.070	0.070	23.0	0.1037	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	19	1.000	18	0.642	0.027	0.1084	
60 minute summer	73	7.000	72	1.035	0.082	0.1341	
60 minute summer	72	7.001	71	0.702	0.100	0.1109	
60 minute summer	71	7.002	70	0.680	0.129	1.1517	
60 minute summer	70	7.003	4	0.832	0.155	0.8827	
60 minute summer	52	5.005	51	0.568	0.034	0.6193	
60 minute summer	66	6.000	65	0.659	0.036	0.2535	
60 minute summer	65	6.001	64	0.768	0.048	0.1646	
60 minute summer	64	6.002	63	0.764	0.069	0.2900	
60 minute summer	63	6.003	62	0.825	0.128	0.6727	
60 minute summer	62	6.004	61	0.774	0.136	0.1610	
60 minute summer	61	6.005	60	0.982	0.178	0.6205	
60 minute summer	60	6.006	51	0.938	0.134	0.5113	
60 minute summer	51	5.006	50	0.629	0.129	3.5123	
60 minute summer	50	5.007	8	0.462	0.133	2.8172	
60 minute summer	8	1.011	7	1.029	0.338	2.0183	
60 minute summer	7	1.012	6	1.112	0.347	3.3209	
60 minute summer	6	1.013	5	1.264	0.354	2.9834	
60 minute summer	5	1.014	4	0.936	0.275	2.4157	
60 minute summer	48	4.000	47	0.756	0.055	0.0929	
60 minute summer	47	4.001	46	1.242	0.113	0.1675	
60 minute summer	46	4.002	45	1.345	0.128	0.0617	
60 minute summer	45	4.003	44	1.485	0.145	0.1378	
60 minute summer	44	4.004	43	1.833	0.212	0.2624	
60 minute summer	43	4.005	42	1.686	0.115	0.2103	

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	42	32	25.580	0.080	27.5	0.1294	0.0000	OK
60 minute summer	41	32	24.919	0.094	31.8	0.1497	0.0000	OK
60 minute summer	40	32	24.596	0.146	40.4	0.3094	0.0000	OK
60 minute summer	4	33	24.356	0.336	245.4	1.0106	0.0000	OK
360 minute winter	3	344	24.277	0.327	70.9	0.9380	0.0000	OK
360 minute winter	2	344	24.277	0.357	71.3	422.9045	0.0000	OK
60 minute summer	1	1	23.870	0.000	11.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	42	4.006	41	1.903	0.144	0.2930	
60 minute summer	41	4.007	40	1.535	0.127	0.3939	
60 minute summer	40	4.008	4	0.947	0.215	1.6336	
60 minute summer	4	1.015	3	1.355	0.347	3.8750	
360 minute winter	3	1.016	2	0.753	0.110	2.1531	
360 minute winter	2	Hydro-Brake®	1				503.5

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	18	32	29.104	0.104	29.7	0.1489	0.0000	OK
60 minute summer	17	31	28.481	0.156	76.8	0.3239	0.0000	OK
60 minute summer	16	31	28.166	0.141	93.6	0.2007	0.0000	OK
60 minute summer	15	31	27.384	0.184	122.6	0.2758	0.0000	OK
60 minute summer	14	32	26.802	0.202	149.0	0.2940	0.0000	OK
60 minute summer	24	31	27.474	0.074	13.2	0.1017	0.0000	OK
60 minute summer	23	31	27.362	0.112	36.0	0.1659	0.0000	OK
60 minute summer	22	31	27.097	0.172	71.6	0.2726	0.0000	OK
60 minute summer	21	32	26.864	0.164	83.9	0.2131	0.0000	OK
60 minute summer	20	32	26.505	0.230	125.4	0.3746	0.0000	OK
60 minute summer	13	32	26.399	0.279	283.7	0.3430	0.0000	OK
60 minute summer	12	32	25.887	0.362	307.1	0.5089	0.0000	OK
60 minute summer	32	31	28.743	0.047	10.2	0.0684	0.0000	OK
60 minute summer	31	31	27.584	0.084	24.8	0.1171	0.0000	OK
60 minute summer	30	31	26.494	0.094	38.5	0.1242	0.0000	OK
60 minute summer	11	33	25.714	0.434	355.8	0.5685	0.0000	OK
60 minute summer	10	33	25.336	0.761	371.6	1.0609	0.0000	SURCHARGED
60 minute summer	9	34	25.272	0.912	376.9	2.4179	0.0000	SURCHARGED
60 minute summer	57	33	25.329	0.224	16.4	0.3042	0.0000	OK
60 minute summer	56	34	25.318	0.318	32.6	0.5142	0.0000	OK
60 minute summer	80	31	25.124	0.099	23.4	0.1706	0.0000	OK
60 minute summer	81	31	25.335	0.085	12.5	0.1237	0.0000	OK
60 minute summer	55	34	25.313	0.363	75.2	0.7218	0.0000	OK
60 minute summer	54	34	25.305	0.555	84.8	1.5208	0.0000	OK
60 minute summer	53	34	25.303	0.653	101.9	1.8622	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	18	1.001	17	1.354	0.251	1.1968	
60 minute summer	17	1.002	16	1.879	0.312	0.8227	
60 minute summer	16	1.003	15	2.027	0.300	1.5996	
60 minute summer	15	1.004	14	2.139	0.447	1.8554	
60 minute summer	14	1.005	13	2.487	0.457	0.9280	
60 minute summer	24	2.000	23	0.612	0.087	0.5725	
60 minute summer	23	2.001	22	0.917	0.199	1.6182	
60 minute summer	22	2.002	21	1.528	0.369	0.7592	
60 minute summer	21	2.003	20	1.269	0.284	3.3333	
60 minute summer	20	2.004	13	1.459	0.338	0.8906	
60 minute summer	13	1.006	12	2.385	0.599	3.3061	
60 minute summer	12	1.007	11	2.289	0.658	1.7515	
60 minute summer	32	3.000	31	1.370	0.214	0.1273	
60 minute summer	31	3.001	30	2.516	0.542	0.1563	
60 minute summer	30	3.002	11	2.482	0.330	0.4218	
60 minute summer	11	1.008	10	2.851	0.740	4.0875	
60 minute summer	10	1.009	9	1.667	0.463	2.9604	
60 minute summer	9	1.010	8	1.043	0.476	3.8336	
60 minute summer	57	5.000	56	0.291	0.092	2.5042	
60 minute summer	56	5.001	55	0.534	0.213	1.6710	
60 minute summer	80	8.001	71	1.118	0.237	1.3760	
60 minute summer	81	8.000	80	0.909	0.286	0.2998	
60 minute summer	55	5.002	54	1.110	0.374	1.8737	
60 minute summer	54	5.003	53	0.878	0.201	6.2245	
60 minute summer	53	5.004	52	0.973	0.262	4.7688	

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	19	31	29.363	0.063	14.7	0.0916	0.0000	OK
60 minute summer	73	31	25.289	0.089	21.5	0.1401	0.0000	OK
720 minute winter	72	705	24.925	0.225	3.5	0.3025	0.0000	OK
720 minute winter	71	705	24.925	0.425	9.7	0.9437	0.0000	OK
720 minute winter	70	705	24.925	0.525	12.4	0.9849	0.0000	SURCHARGED
60 minute summer	52	34	25.297	0.797	123.7	2.1192	0.0000	SURCHARGED
60 minute summer	66	31	25.695	0.095	23.4	0.1509	0.0000	OK
60 minute summer	65	31	25.519	0.119	34.8	0.1554	0.0000	OK
60 minute summer	64	31	25.417	0.142	48.8	0.1890	0.0000	OK
60 minute summer	63	33	25.381	0.256	72.7	0.3655	0.0000	OK
60 minute summer	62	34	25.373	0.413	79.1	0.4912	0.0000	SURCHARGED
60 minute summer	61	34	25.361	0.436	94.1	0.5915	0.0000	SURCHARGED
60 minute summer	60	34	25.312	0.587	105.8	0.7755	0.0000	SURCHARGED
60 minute summer	51	34	25.294	0.869	239.6	2.5323	0.0000	SURCHARGED
60 minute summer	50	34	25.264	0.924	252.0	2.5380	0.0000	SURCHARGED
60 minute summer	8	34	25.238	0.953	558.1	2.5438	0.0000	SURCHARGED
60 minute summer	7	34	25.129	0.879	573.4	2.4602	0.0000	SURCHARGED
60 minute summer	6	33	24.989	0.799	588.9	2.2946	0.0000	SURCHARGED
720 minute winter	5	705	24.925	0.870	81.5	2.4178	0.0000	SURCHARGED
60 minute summer	48	31	28.514	0.068	15.1	0.1194	0.0000	OK
60 minute summer	47	31	28.204	0.104	34.6	0.1768	0.0000	OK
60 minute summer	46	31	27.677	0.127	40.9	0.1647	0.0000	OK
60 minute summer	45	31	27.475	0.125	53.0	0.1791	0.0000	OK
60 minute summer	44	31	27.013	0.163	73.7	0.2700	0.0000	OK
60 minute summer	43	31	26.148	0.148	85.6	0.2196	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	19	1.000	18	0.914	0.100	0.2802	
60 minute summer	73	7.000	72	1.486	0.309	0.3500	
720 minute winter	72	7.001	71	0.557	0.044	0.6111	
720 minute winter	71	7.002	70	0.550	0.057	5.5490	
720 minute winter	70	7.003	4	0.650	0.068	4.2339	
60 minute summer	52	5.005	51	0.555	0.157	3.3167	
60 minute summer	66	6.000	65	0.895	0.134	0.6988	
60 minute summer	65	6.001	64	1.064	0.179	0.4663	
60 minute summer	64	6.002	63	1.027	0.255	0.9382	
60 minute summer	63	6.003	62	1.061	0.487	2.6883	
60 minute summer	62	6.004	61	0.980	0.482	0.6597	
60 minute summer	61	6.005	60	1.302	0.630	2.6003	
60 minute summer	60	6.006	51	1.158	0.429	2.5980	
60 minute summer	51	5.006	50	0.683	0.501	11.1813	
60 minute summer	50	5.007	8	0.716	0.504	6.6484	
60 minute summer	8	1.011	7	1.570	1.130	4.4280	
60 minute summer	7	1.012	6	1.614	1.171	7.7132	
60 minute summer	6	1.013	5	1.655	1.200	7.6982	
720 minute winter	5	1.014	4	0.610	0.124	5.5658	
60 minute summer	48	4.000	47	1.073	0.203	0.2421	
60 minute summer	47	4.001	46	1.667	0.420	0.4635	
60 minute summer	46	4.002	45	1.775	0.479	0.1748	
60 minute summer	45	4.003	44	1.961	0.541	0.3858	
60 minute summer	44	4.004	43	2.491	0.780	0.7110	
60 minute summer	43	4.005	42	2.250	0.424	0.5815	

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	42	32	25.671	0.171	102.5	0.2768	0.0000	OK
60 minute summer	41	32	25.034	0.209	117.7	0.3314	0.0000	OK
720 minute winter	40	705	24.925	0.475	17.8	1.0088	0.0000	SURCHARGED
720 minute winter	4	705	24.925	0.905	112.2	2.7214	0.0000	SURCHARGED
720 minute winter	3	705	24.925	0.975	111.6	2.7925	0.0000	SURCHARGED
720 minute winter	2	705	24.925	1.005	112.2	1545.1100	0.0000	SURCHARGED
60 minute summer	1	1	23.870	0.000	11.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	42	4.006	41	2.631	0.532	0.7836	
60 minute summer	41	4.007	40	1.753	0.467	1.4914	
720 minute winter	40	4.008	4	0.740	0.095	6.0761	
720 minute winter	4	1.015	3	0.639	0.157	9.4780	
720 minute winter	3	1.016	2	0.588	0.172	4.8418	
720 minute winter	2	Hydro-Brake®	1				695.6

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	18	32	29.122	0.122	39.9	0.1755	0.0000	OK
60 minute summer	17	31	28.512	0.187	103.7	0.3883	0.0000	OK
60 minute summer	16	31	28.194	0.169	126.3	0.2396	0.0000	OK
60 minute summer	15	33	27.434	0.234	165.5	0.3510	0.0000	OK
60 minute summer	14	33	27.244	0.644	201.2	0.9396	0.0000	SURCHARGED
60 minute summer	24	31	27.486	0.086	17.8	0.1180	0.0000	OK
60 minute summer	23	31	27.381	0.131	48.5	0.1942	0.0000	OK
60 minute summer	22	34	27.164	0.239	96.6	0.3793	0.0000	OK
60 minute summer	21	33	27.149	0.449	113.4	0.5814	0.0000	OK
60 minute summer	20	33	27.109	0.834	170.5	1.3575	0.0000	SURCHARGED
60 minute summer	13	33	27.070	0.950	334.7	1.1688	0.0000	SURCHARGED
60 minute summer	12	33	26.695	1.170	346.7	1.6467	0.0000	SURCHARGED
60 minute summer	32	31	28.751	0.055	13.7	0.0799	0.0000	OK
60 minute summer	31	31	27.603	0.103	33.4	0.1442	0.0000	OK
60 minute summer	30	33	26.561	0.161	51.8	0.2130	0.0000	OK
60 minute summer	11	33	26.443	1.163	401.7	1.5221	0.0000	SURCHARGED
60 minute summer	10	34	25.898	1.323	424.2	1.8461	0.0000	SURCHARGED
60 minute summer	9	34	25.807	1.447	433.4	3.8348	0.0000	SURCHARGED
60 minute summer	57	34	25.870	0.765	12.7	1.0402	0.0000	SURCHARGED
60 minute summer	56	34	25.855	0.855	50.2	1.3820	0.0000	SURCHARGED
960 minute winter	80	945	25.296	0.271	3.0	0.4654	0.0000	OK
60 minute summer	81	31	25.351	0.101	16.8	0.1466	0.0000	OK
60 minute summer	55	34	25.848	0.898	99.5	1.7843	0.0000	SURCHARGED
60 minute summer	54	34	25.836	1.086	106.3	2.9755	0.0000	SURCHARGED
60 minute summer	53	34	25.833	1.183	123.8	3.3753	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	18	1.001	17	1.466	0.338	1.4902	
60 minute summer	17	1.002	16	2.007	0.422	1.0416	
60 minute summer	16	1.003	15	2.143	0.405	2.0618	
60 minute summer	15	1.004	14	2.181	0.600	2.9730	
60 minute summer	14	1.005	13	2.485	0.566	1.6841	
60 minute summer	24	2.000	23	0.665	0.117	0.7105	
60 minute summer	23	2.001	22	0.984	0.270	2.1595	
60 minute summer	22	2.002	21	1.639	0.497	1.4985	
60 minute summer	21	2.003	20	1.278	0.377	7.8849	
60 minute summer	20	2.004	13	1.458	0.410	1.6046	
60 minute summer	13	1.006	12	2.382	0.666	4.3703	
60 minute summer	12	1.007	11	2.288	0.732	1.8956	
60 minute summer	32	3.000	31	1.444	0.288	0.1609	
60 minute summer	31	3.001	30	2.669	0.729	0.1982	
60 minute summer	30	3.002	11	2.482	0.439	0.6109	
60 minute summer	11	1.008	10	2.853	0.837	4.1092	
60 minute summer	10	1.009	9	1.653	0.531	2.9604	
60 minute summer	9	1.010	8	1.202	0.548	3.8336	
60 minute summer	57	5.000	56	0.392	0.101	4.3097	
60 minute summer	56	5.001	55	0.599	0.254	2.0612	
960 minute winter	80	8.001	71	0.630	0.031	3.3034	
60 minute summer	81	8.000	80	0.981	0.386	0.3747	
60 minute summer	55	5.002	54	1.118	0.462	2.0664	
60 minute summer	54	5.003	53	0.881	0.253	6.3307	
60 minute summer	53	5.004	52	0.980	0.299	4.7688	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	19	31	29.374	0.074	19.8	0.1063	0.0000	OK
60 minute summer	73	31	25.302	0.102	29.0	0.1602	0.0000	OK
960 minute winter	72	945	25.296	0.596	3.8	0.8026	0.0000	SURCHARGED
960 minute winter	71	945	25.296	0.796	10.7	1.7694	0.0000	SURCHARGED
960 minute winter	70	945	25.296	0.896	12.9	1.6824	0.0000	SURCHARGED
60 minute summer	52	33	25.829	1.329	140.1	3.5330	0.0000	SURCHARGED
60 minute summer	66	33	26.064	0.464	51.9	0.7397	0.0000	SURCHARGED
60 minute summer	65	33	26.062	0.662	46.9	0.8663	0.0000	SURCHARGED
60 minute summer	64	33	26.029	0.754	60.1	1.0052	0.0000	SURCHARGED
60 minute summer	63	33	26.026	0.901	89.2	1.2868	0.0000	SURCHARGED
60 minute summer	62	33	26.002	1.042	85.2	1.2375	0.0000	SURCHARGED
60 minute summer	61	33	25.981	1.056	101.1	1.4324	0.0000	SURCHARGED
60 minute summer	60	33	25.878	1.153	118.3	1.5225	0.0000	SURCHARGED
60 minute summer	51	33	25.828	1.403	266.4	4.0904	0.0000	SURCHARGED
60 minute summer	50	34	25.786	1.446	284.2	3.9711	0.0000	SURCHARGED
60 minute summer	8	34	25.751	1.466	717.6	3.9128	0.0000	SURCHARGED
60 minute summer	7	34	25.576	1.326	734.8	3.7100	0.0000	SURCHARGED
60 minute summer	6	34	25.337	1.147	751.4	3.2929	0.0000	SURCHARGED
960 minute winter	5	945	25.296	1.241	87.3	3.4511	0.0000	SURCHARGED
60 minute summer	48	31	28.526	0.080	20.3	0.1396	0.0000	OK
60 minute summer	47	31	28.225	0.125	46.5	0.2130	0.0000	OK
60 minute summer	46	32	27.710	0.160	55.2	0.2068	0.0000	OK
60 minute summer	45	32	27.540	0.190	71.2	0.2711	0.0000	OK
60 minute summer	44	32	27.260	0.410	97.3	0.6801	0.0000	SURCHARGED
60 minute summer	43	32	26.176	0.176	111.0	0.2619	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	19	1.000	18	0.986	0.134	0.3496	
60 minute summer	73	7.000	72	1.564	0.428	0.6948	
960 minute winter	72	7.001	71	0.571	0.048	0.6929	
960 minute winter	71	7.002	70	0.530	0.059	5.6098	
960 minute winter	70	7.003	4	0.628	0.068	4.2339	
60 minute summer	52	5.005	51	0.552	0.175	3.3167	
60 minute summer	66	6.000	65	0.930	0.181	2.9820	
60 minute summer	65	6.001	64	1.033	0.236	1.5122	
60 minute summer	64	6.002	63	1.047	0.309	1.8585	
60 minute summer	63	6.003	62	1.070	0.518	3.1266	
60 minute summer	62	6.004	61	0.978	0.574	0.6597	
60 minute summer	61	6.005	60	1.299	0.707	2.6003	
60 minute summer	60	6.006	51	1.144	0.542	2.5980	
60 minute summer	51	5.006	50	0.767	0.563	11.1813	
60 minute summer	50	5.007	8	0.803	0.565	6.6484	
60 minute summer	8	1.011	7	2.009	1.446	4.4280	
60 minute summer	7	1.012	6	2.057	1.492	7.7132	
60 minute summer	6	1.013	5	2.104	1.525	7.6982	
960 minute winter	5	1.014	4	0.569	0.134	5.5658	
60 minute summer	48	4.000	47	1.146	0.273	0.3043	
60 minute summer	47	4.001	46	1.745	0.566	0.5949	
60 minute summer	46	4.002	45	1.810	0.644	0.2512	
60 minute summer	45	4.003	44	1.984	0.709	0.5450	
60 minute summer	44	4.004	43	2.509	1.014	0.9685	
60 minute summer	43	4.005	42	2.360	0.551	0.7314	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	42	32	25.709	0.209	132.8	0.3385	0.0000	OK
960 minute winter	41	945	25.296	0.471	15.6	0.7480	0.0000	SURCHARGED
960 minute winter	40	945	25.296	0.846	19.8	1.7984	0.0000	SURCHARGED
960 minute winter	4	945	25.296	1.276	119.6	3.8394	0.0000	SURCHARGED
960 minute winter	3	945	25.296	1.346	119.3	3.8573	0.0000	FLOOD RISK
960 minute winter	2	945	25.296	1.376	120.4	2274.1730	0.0000	FLOOD RISK
60 minute summer	1	1	23.870	0.000	11.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	42	4.006	41	2.704	0.671	1.2354	
960 minute winter	41	4.007	40	1.234	0.062	2.0851	
960 minute winter	40	4.008	4	0.714	0.101	6.0761	
960 minute winter	4	1.015	3	0.648	0.168	9.4780	
960 minute winter	3	1.016	2	0.603	0.185	4.8418	
960 minute winter	2	Hydro-Brake®	1				931.3

Flood Risk Assessment

Appendix 6 ■ Sample Drainage Maintenance Strategy

Manholes and Inspection Chambers

Description

Manholes providing rodding and jetting access to pipe work.

Typically manholes, in distinction to inspection chambers, are designed to allow for operatives to access. Manholes should only be accessed following a risk assessment, and the specification of the safe system of work, paying regard to confined space risks.

Maintenance Issues

Manholes are unlikely to present maintenance issues in themselves. However, they provide access to the drainage infrastructure and allow visual inspection from the surface of any major maintenance issues.

Maintenance Regime

Schedule	Action Required	Frequency
Routine/regular maintenance (including inspections and monitoring)	Lift covers and ensure that there are no blockages.	For 3 months following installation
	Inspect and identify any parts that are not operating correctly and remediate.	
	Ensure covers are in a good state of repair.	Monthly
	Inspect manholes, and inspection chambers, to ensure that the drainage is running freely.	Six Monthly and every autumn after leaf fall
Occasional maintenance	Suction sweeping and cleansing (to WRC Jetting Code of Practice) and CCTV where necessary.	Every 2 – 4 Years
Remedial maintenance	<ul style="list-style-type: none">• Silt removal.• Inlet/outlet repair.• Erosion repairs.• System rehabilitation following a pollution event.• Manhole Cover Replacement.• Repairs to brickwork or concrete.• Chancel repair.	As required (tasks to repair problems due to wear, damage or vandalism).

Catchpits

Description

Catchpits are similar to manholes but include a sump to the base which is designed to capture silt and prevent it reaching other parts of the drainage network. Catchpits provide a convenient location to remove silt from drainage networks. Catchpits should only be accessed following a risk assessment, and the specification of the safe system of work, paying regard to confined space risks.

Maintenance Issues

If the silt captured in catchpits is not removed regularly it will cause silt to migrate downstream to other part of the drainage network, some of which may be less accessible, or inaccessible.

Maintenance Regime

Schedule	Action Required	Frequency
Routine/regular maintenance (including inspections and monitoring)	Lift manhole covers and ensure that there are no blockages.	For 3 months following installation
	Inspect and identify any parts that are not operating correctly and remediate.	
	Inspect silt storage in sump. Remove silt as required using subcontractor with vacuum extraction plant.	
	Ensure covers are in a good state of repair. Repair/replace as necessary.	Monthly
	Inspect catchpits to ensure that the drainage is running freely, and free of debris.	Six Monthly and every autumn after leaf fall
	Inspect silt storage in sump. Remove silt as required using subcontractor with vacuum extraction plant.	
Occasional maintenance	Suction sweeping and cleansing (to WRC Jetting Code of Practice) and CCTV where necessary.	Every 2 – 4 Years
	Remediate any chamber structural defects, or any defects that may reduce the free flow of water.	
Remedial maintenance	<ul style="list-style-type: none">• Silt removal.• Inlet/outlet repair.• Erosion repairs.• System rehabilitation following a pollution event.• Manhole Cover Replacement.• Repairs to brickwork or concrete.	As required (tasks to repair problems due to wear, damage or vandalism).

Linear Drains

Description

Surface Water is drained over impermeable areas towards grated, or slot-type linear drains at low points and water is conveyed to below ground pipework.

Maintenance Issues

Linear drains can become blocked by silt or debris, causing flooding.

Linear drains often include silts traps at outlets which can cause siltation of downstream drainage infrastructure if not maintained adequately.

Maintenance Regime

Schedule	Action Required	Frequency
Routine/regular maintenance (including inspections and monitoring)	Inspect linear drains to ensure that there are no blockages at surface level.	For 3 months following installation
	Lift covers to outflow boxes and check for blockages or siltation.	
	Inspect and identify any parts that are not operating correctly and remediate.	
	Inspect linear drains to ensure that there are no blockages at surface level.	Monthly
	Lift covers to outflow boxes and check for blockages or siltation.	Six Monthly and every autumn after leaf fall
Occasional maintenance	Jetting of linear drains and suction vacuuming of outlet boxes (to WRC Jetting Code of Practice). CCTV where necessary.	Every 1 – 2 Years
Remedial maintenance	<ul style="list-style-type: none">• Silt removal.• Inlet/outlet repair.• Erosion repairs.• System rehabilitation following a pollution event.• Linear drain cover replacement.• Channel repair.• Ensure that impermeable surfaces surrounding linear drains have not settled below top of linear drain level, causing ponding.	As required (tasks to repair problems due to wear, damage or vandalism).

Gullies

Description

Surface Water is drained over impermeable areas towards grated gullies at low points, from where water is conveyed to below ground pipework.

Maintenance Issues

Gullies can become blocked by silt or debris, causing flooding.

Gullies include integral silt traps which can cause siltation of downstream drainage infrastructure if not adequality maintained.

Gullies often include a trapped outlet which prevents liquids lighter than water (ie oil and fuel) leaving the gully. If silt and light liquids are not removed regularly silt and oil will migrate downstream to other part of the drainage network, some of which may be less accessible, or inaccessible.

Maintenance Regime

Schedule	Action Required	Frequency
Routine/regular maintenance (including inspections and monitoring)	Inspect to ensure that there are no blockages at surface level, and that the outfall is operating effectively.	For 3 months following installation
	Inspect and identify any parts that are not operating correctly and remediate.	
	Ensure that there are no blockages at surface level.	Monthly
	Lift covers to check for blockages or siltation.	Six Monthly and every autumn after leaf fall
Occasional maintenance	Remove oil and silt using specialist vacuum extraction plant.	Every 1 – 2 Years
Remedial maintenance	<ul style="list-style-type: none">• Silt removal.• Inlet/outlet repair.• Erosion repairs.• System rehabilitation following a pollution event.• Cover replacement.• Structural failure of gully pot.• Ensure that impermeable surfaces surrounding linear drains have not settled below top of gully cover level, causing ponding.	As required (tasks to repair problems due to wear, damage or vandalism).

Pipework

Description

Below ground drainage pipework connects drainage inlets (gullies, linear drains etc) to manholes and also provides connections between manholes.

Maintenance Issues

Pipes can become blocked by silt, debris fat, grease, or suffer structural collapse. It is also possible for pipe joints to become displaced or for roots to grow from the surrounding ground into pipes.

These factors cause a reduction in, or loss of, the hydraulic capacity of the pipes which can in turn cause flooding to land and buildings.

Defects in pipes can also cause a reduction in stability to ground underlying foundations, which can cause settlement and damage to buildings and external surfaces.

The material of pipes and associated couplings can be degraded if aggressive liquids are passed through the pipes.

It is recommended that trees are not planted within 3m of pipes to minimise the risk of root ingress.

Maintenance Regime

Schedule	Action Required	Frequency
Routine/regular maintenance (including inspections and monitoring)	Inspect and identify any parts that are not operating correctly and remediate.	For 3 months following installation
	Monitor working of drainage at ground level. Evidence of damage to pipework may include localised flooding or emission of smells.	Monthly
	Lift manholes covers to check for blockages.	Six Monthly
Occasional maintenance	CCTV pipework, clean to WRC Sewer Jetting Code of Practice. Remediate as necessary.	Every 1 – 2 Years
Remedial maintenance	<ul style="list-style-type: none">• Silt removal.• Fat and Grease removal.• Erosion repairs.• Joint displacement.• Structural failure, cracking or collapse.• System rehabilitation following a pollution event.	As required (tasks to repair problems due to wear, damage or vandalism).

Vortex Controls

Description

Vortex controls, often called Hydrobrakes, are installed in some manholes to restrict the rate of flow. Vortex controls are usually constructed in steel and are installed in a manhole with a sump.

Maintenance Issues

Vortex controls can become blocked by debris, plastic bags or other sheet material. If silt is allowed build up in the sump the operation of the device can be hampered causing flooding upstream.

Maintenance Regime

Schedule	Action Required	Frequency
Routine/regular maintenance (including inspections and monitoring)	Refer to manufacturer's specification.	For 3 months following installation
	Inspect and identify any parts that are not operating correctly, consult supplier and remediate as required.	
	Monitor working of drainage at ground level.	Monthly
	If there is localised flooding check the condition of all system elements.	
	Lift manholes covers to check for blockages.	Six Monthly and every autumn after leaf fall
	Remove sediment from pre-treatment structures, gullies, catchpits etc.	
Occasional maintenance	Clean to WRC Sewer Jetting Code of Practice. Remediate as necessary.	Every 1 – 2 Years
Remedial maintenance	Inspect, and carry out remediation works to ensure that the features are in fully working order.	As required (tasks to repair problems due to wear, damage or vandalism).

Petrol Interceptors/Oil Separators

Description

Petrol interceptors, also called oil separators, separate out light liquids, such as oil or fuel, and silt and grit. The purpose of the separation is to prevent oil and silt (which may contain heavy metals) polluting watercourses downstream.

Maintenance Issues

For a separator to operate effectively, and prevent pollutants leaving a site, it is necessary to remove the contained oil and silt on a regular basis. It is recommended that maintenance is proactive, rather than waiting for any installed alarm to highlight the need for emptying. The party responsible for maintenance, usually the owner or occupier, should consult the manufacturer to determine a suitable maintenance regime. Oil and silt should only be removed by a licenced contractor.

Maintenance Regime

Activity	Action Required	Frequency
Routine/regular maintenance (including inspections and monitoring)	Refer to manufacturer's specification.	For 3 months following installation
	Inspect and identify any parts that are not operating correctly and remediate.	
	Monitor working of drainage at ground level. If there is localised flooding check the condition of all system elements.	Monthly
Routine/regular maintenance (including inspections and monitoring)	<ul style="list-style-type: none">• Check volume of sludge/silt.• Check thickness of light liquid.• Check function of automatic closure device.• Empty the separator, if required.• Check the coalescing material and clean or change if necessary (Class 1 only).• Check the function of the warning device (if fitted).	Six Monthly and every autumn after leaf fall
Occasional maintenance	<ul style="list-style-type: none">• Consult manufacturer to obtain details of an approved separator maintenance contractor.• Check watertightness of system.• Check structural condition.• Check internal coatings.• Check built-in parts• Check electrical devices and installations.• Adjust automatic closure devices.	5 Yearly Maximum
Remedial maintenance	Inspect, and carry out remediation works to ensure that the features are in fully working order.	As required

Trees

Description

Trees can benefit surface water management through transpiration, interception, increased filtration and phytoremediation (the process of a tree taking up harmful chemicals). Trees are typically an addition to a SuDS component.

Maintenance Issues

Maintenance requirements of trees will be greatest during the first few years, when the tree is becoming established. Early maintenance should involve regular inspection, removal of invasive vegetation and irrigation, if required during long dry spells. Maintenance responsibility for a tree pit or planter should be placed with an appropriate organisation.

Maintenance Regime

Activity	Action Required	Frequency
Regular maintenance	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
Occasional maintenance	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 (in periods of drought)
Monitoring	Inspect silt accumulation rates and establish appropriate removal frequencies	Half yearly

Pervious Pavements

Description

Pervious pavements, together with their associated substructures, are an efficient means of managing surface water runoff close to its source – intercepting runoff, reducing the volume and frequency of runoff and providing a treatment medium.

Maintenance Issues

Pervious pavements need to be regularly cleaned of silt and other sediments to preserve their infiltration capacity. Typically sweeping once a year should be sufficient to maintain an acceptable infiltration rate on most sites. However, the frequency should be adjusted to suit site specific circumstances and should be informed by inspection reports.

Maintenance Regime

Activity	Action Required	Frequency
Regular maintenance	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 manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	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)
Monitoring	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, 48hrs after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Detention Basins

Description

Detention basins are landscaped depressions that are normally dry except during, and immediately following, storm events. They can be on-line, where water is routed through the basin, or offline, where water is diverted into the basin on reaching a certain threshold.

Maintenance Issues

Detention basins have low maintenance requirements. They should be kept free from litter. Grass should be maintained at a length of between 75 – 150mm, where water is intended to run overland. All grass clippings should be removed from the detention basin. Sedimentation should be kept below a depth of 25mm.

Maintenance Regime

Activity	Action Required	Frequency
Regular maintenance	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 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 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, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually (as set out in Chapter 23 of the Ciria SuDS Manual C753)
Occasional maintenance	Reseed areas of 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)
Remedial actions	Repair erosion or other damage by reseedling or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

Ponds and Wetlands

Description

Ponds and wetlands are features with a permanent pool of water that provide both attenuation and treatment of surface water runoff. They can support emergent and submerged aquatic vegetation along their shoreline and in shallow marshy wetland zones.

Maintenance Issues

Ponds and wetlands will require regular maintenance to ensure continuing operation to design performance standards. Litter and debris removal should be undertaken as part of general landscape maintenance. Any invasive maintenance, such as silt or vegetation removal should be planned to be sympathetic to the requirement of wildlife.

Maintenance Regime

Activity	Action Required	Frequency
Regular maintenance	Remove litter and debris	Monthly (or as required)
	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 in 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 eg penstocks	Hal yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1m above pond base; include mas 25% of pond surface)	Annually
	Remove 25% of bank vegetation from water's 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 from any forebay	Every 1-5 years, or as required
	Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays	Every 5 years, or as required
Occasional maintenance	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, eg every 25-50 years
Remedial actions	Repair erosion or other damage	As required
	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



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