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CONSULTING ENGINEERS

Preliminary Drainage Strategy

Project:

Land Adjacent A16, Surfleet, Lincolnshire

Client:

Naylor Farms

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Introduction

Jackson consulting engineers have been appointed by Naylor Farms to undertake a drainage strategy, to support the planning submission for the proposed Protein Extraction Facility and Anaerobic Digester Plant and associated buildings, to land east of Surfleet Bank, Surfleet, Spalding, near PE11 4DP. The following document is to assist the planners and Lead Local Flood Authority (LLFA) in demonstrating that the development is acceptable in terms of sustainable drainage strategy and flood risk as a result of the development.

Existing Site

The site lies to the east of Surfleet Bank, and to the south east of the A16. An aerial location plan is shown in figure 1, please note that the red line is indicative and does not indicate the planning boundary.



Figure 1 - Site Location

Site Topography

A site survey has been carried out by MD Surveys, drawing number NN-JK 002-2. The total site area is 14.33 hectares. A copy of the topographical survey would be available by request from the developer.

The development is accessed of Surfleet Bank, which is just off the A16. The site is currently greenfield and used for growing crops.

The overall field, has a number of external irrigation land drains surrounding the site. At the southern boundary, there is an IDB drain, which is fairly shallow – this is due to it being towards the head of the ditch's catchment. The ditch is around 1m deep, and would appear to have culverts downstream of the site.

The site is relatively flat, typically having an average level of around 3.50m. The A16 is significantly higher than this, by around 1m in the locality of the site. It would be safe to say that the land encloses the field to both the north and west, so greenfield flows would typically flow to the east or south.

The proposed site is to be accessed from the existing entrance off Surfleet Bank – the current site is access via. a small length of concrete hardstanding before it turns into an informal track.

In summary, the field is generally featureless, and typically flat, with levels ranging from 3.3 to 3.7m AOD, although the levels are locally higher at Surfleet Bank Road. Land drainage serves the site predominantly to the south and east.

Ground Conditions

A phase 1 or 2 ground investigation report is not available for this site currently, and the findings of this section are based on publicly available information. A full ground investigation will be undertaken prior to detailed design and assessed by the appointed engineer.

The bedrock geology of the site is described as 'Oxford Clay Formation'. This generally indicates that deeper infiltration devices are not viable for the site to understand the full viability of infiltration.

The superficial deposits are described as 'Tidal Flat Deposits', consisting of clays and silts. This type of strata can offer some limited infiltration but is generally restricted by the underlying clay. Additionally, the soaked CBR's of the silty clay are likely to be poor and not allow the use of items such as unlined porous paving.

There is limited borehole information in close proximity of the site. The closest borehole log is approximately 500m to the east. This shows that it is very heavily silted strata, with no recorded water levels.

It is unlikely that the silty nature of the soils will be able to produce high rates of infiltration, and local knowledge suggest that the water table will likely cause additional constraint.

Both British Geological Survey definitions can be found respectively in figures 2 and 3 below.

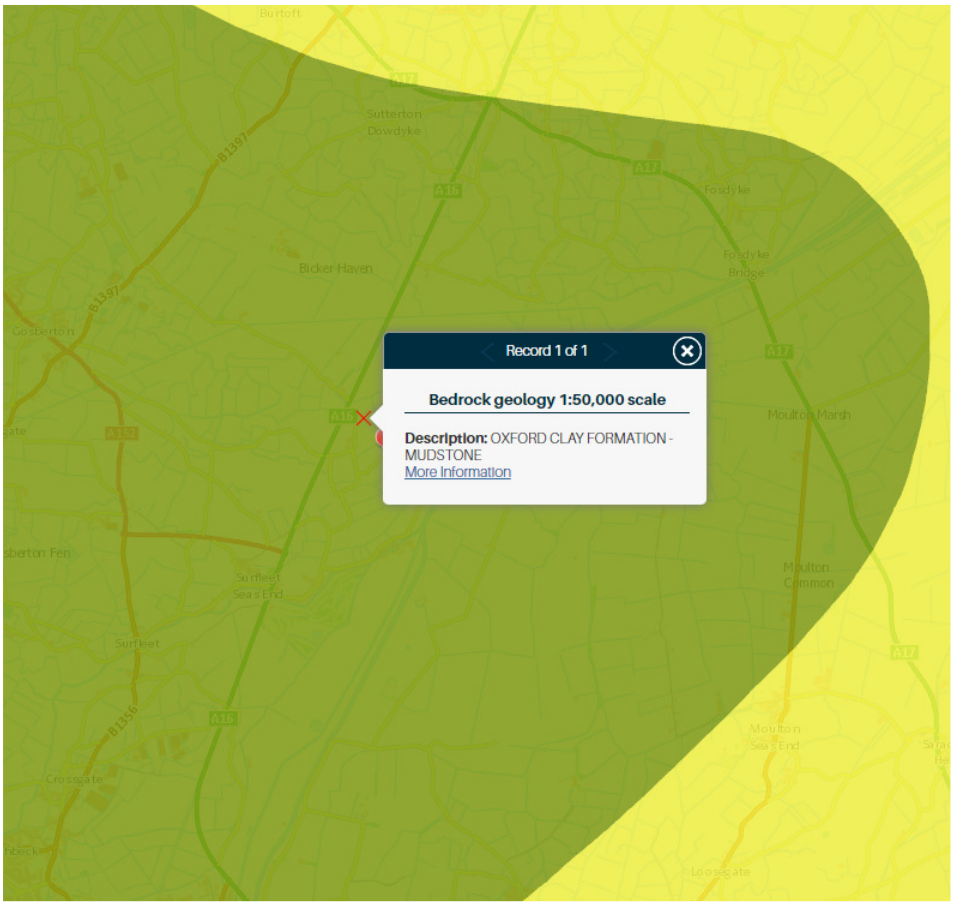


Figure 2 - BGS Bedrock Geology

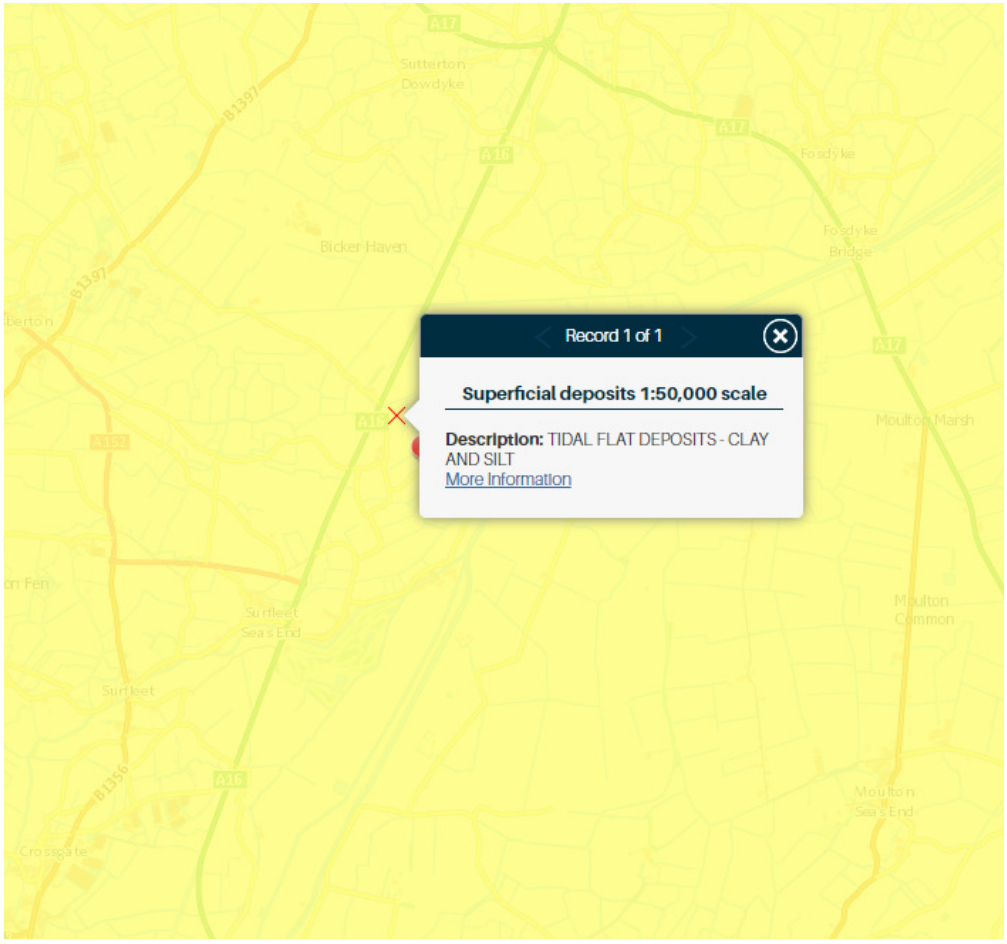


Figure 3 - BGS Superficial Deposits

Surrounding Drainage

The existing drainage for the site and adopted roads have already been described earlier in this document. No surface water sewers have been identified in close proximity of the site. Given the area of the development, the land is generally drained by land drainage and watercourses.

Overall, the development sits within Welland and Deepings Internal Drainage Boards district, specifically into Risegate Eau Catchment. The figure below shows the local assets in relation to the site. A board maintained drain is located to the southern boundary, and runs from south west to north east – this drain ID is 67, and known as Surfleet Marsh drain. The drain is relatively shallow, owing to it being towards the head of the run, and is around 1m below ground levels.

Initial discussions have been held with the IDB to identify the general principles of surface water discharge. This will be taken on board during the development of the drainage strategy, and ultimately will be commented on by the IDB's statutory consultee role through the planning process. The site is unlikely to encroach in any easements required by the IDB.

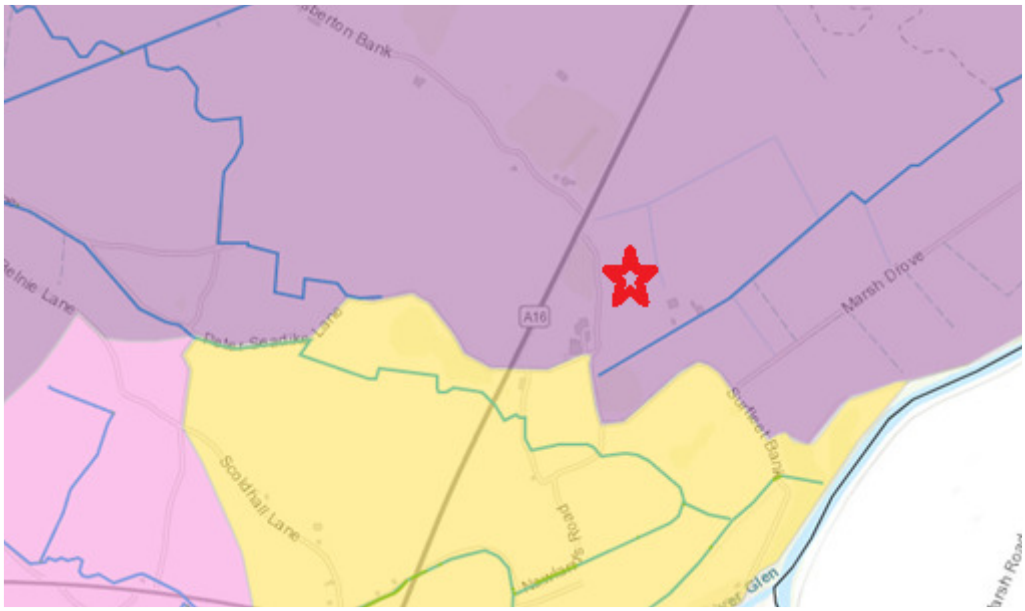


Figure 4 - IDB Assets Local to Site

In summary, the site and general area is served by land drainage, with an IDB drain located to the south of the site. Any increase to greenfield/pumpable discharge needs to be established with the LLFA and IDB.

The final discharge rates will need to be agreed with LCC/LLFA and IDB, and a development contribution may need to be made.

Surface Water Flood Risk

The existing flood risk for the site has been assessed by a different consultant and can be found within report: ECL1181/P&R. The FRA has recommendations for the site development and construction and should be fully referenced to develop the detailed drainage strategy.

The FRA should be fully referred to, but the general consensus is that there is no recommended minimum FFL as the building will be built with refuse points and flood resilient construction. Flood levels in the 1 in 100 year + CC typically range from 0 to 250mm across the general sites elevation (3.2m-3.5m). Given the limited depth to the existing ditch it is proposed that the floors are to be raised approximately 300mm above existing levels to ensure that a surface water gravity solution is feasible, this is not a recommendation for flood risk, just for ease of constructing drainage elements.

At detailed design, the cut and fill may dictate the final levels to some degree. Any FFL's shown are preliminary only, are not detriment to the flood risk, and require confirmation through full detailed design.

Development Proposals

The development consists of the construction of a new Protein Extraction Facility and Anaerobic Digester Plant and associated buildings, together with landscaping, SuDS features, car park and associated infrastructure. An indicative site plan is shown below.

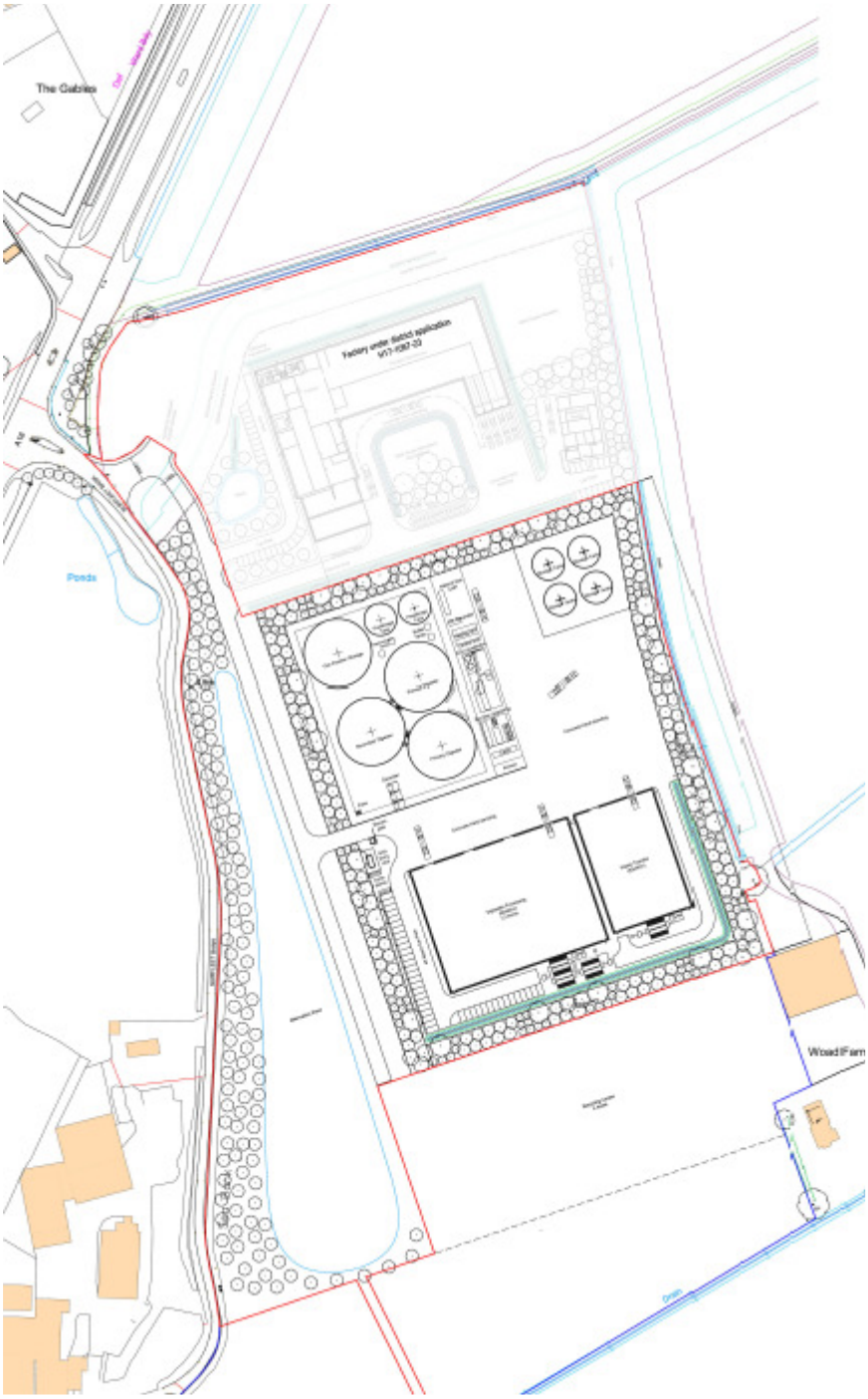


Figure 5 - Indicative Site Plan

Drainage Strategy

The following section provides narrative on the principles behind the drainage strategy and has been carried out in general accordance with Lincolnshire County Council's "Sustainable Drainage Design and Evaluation Guide" (SDDEG), and "CIRIA's C753 – the SUDS Manual", where appropriate.

Surface Water Drainage

For new developments there is a requirement to apply sustainable drainage principles (SuDS) to the disposal of surface water from the site where practicable. As required by Building Regulations and Defra's "Non-statutory Technical Standards for Sustainable Drainage Systems" (NTS), surface water must discharge to the following, listed in priority.

1. To ground – in an adequate soakaway or some other adequate infiltration system.
2. To a watercourse.
3. To a surface water sewer, highway drain or other drainage system.
4. To a combined sewer.

Infiltration

At present, only desktop info is available to determine the viability of infiltration. Local knowledge and the desk top study, suggest that it is highly unlikely that infiltration is viable, with the high silt content and possible high water table being factors.

At detailed design, it is expected that additional GI will be undertaken to determine infiltration. A large area of the site has been allocated for a basin, and it would be a simple case of adjusting the rates used in the calculations.

Another consideration that needs to be undertaken under the remit of the GI is monitored water table levels. Any infiltrating feature must have 1m of clearance to the water table. In the event that the water table level would be higher than the base of the basin, then a liner would be required.

With all things considered, and given local knowledge of the site, it is highly unlikely that infiltration would be viable to take care of all the requirements of surface water disposal, and as common in the fens, a connection into the watercourse should be considered.

If infiltration was considered viable, the layout would remain relatively unchanged. Ample area has been allowed for the attenuation basin/pond and in reality, if infiltration is so slow that a larger area is required, then it shows that infiltration is not viable. It would be expected that an overflow into the IDB drain is still required.

Watercourse

As previously described, the site benefits from an IDB drain to the south of the site. As the field is used for farming, there is a chance that a contribution is already paid in order to drain the land.

A connection into a watercourse is the most likely definitive connection, although the overall connection into the IDB system needs to be agreed through bylaw consent.

For the purpose of the drainage strategy, a connection into the watercourse is proposed, with no allowance for infiltration. As part of the IDB's role as a statutory consultee they will need to consider and comment on this.

Surface Water Sewer

There are no identified surface water sewers in the vicinity of the site. As a watercourse connection is viable, then there is no need for a surface water sewer to be considered.

Run-off Rates

Existing Drainage Arrangements

As the site is greenfield it has no current surface water drainage. The natural topography of the site directs surface runoff into the existing watercourses to the south, certainly as the underlying strata, would be considered as being very slow draining to impermeable once saturated and generate its own pathways either above ground or within the strata.

Existing greenfield run-off

The total developable area is approximately 5.7 hectares, this also allows for the pond, basin and swales. The greenfield run-off for the site is summarised in the figure below, with a full copy of the report provided in appendix A.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	8	8
1 in 1 year (l/s):	6.96	6.96
1 in 30 years (l/s):	19.6	19.6
1 in 100 year (l/s):	28.48	28.48
1 in 200 years (l/s):	33.68	33.68

Figure 6 - Existing Greenfield Runoff Rates

It should be noted that the figures are based on SOIL types, which are generally quite conservative and broad. If extended and more concise data, such as HOST classes, is used it would likely demonstrate that the greenfield run off is higher.

Regardless, the IDB have a 'pumpable catchment' rate of 1.4l/s per hectare – this is for the positively drained areas only. This would give a pumpable discharge rate of 8.0l/s, which coincidently is the same as the Q_{BAR} greenfield run off.

The final design discharge rate is subject to the drainage strategy below, but it will aim to mimic greenfield rates as much as possible. Regardless, the schemes discharge rate will not exceed the Q_{BAR} rates – which is in line with what the LLFA would expect to see as part of their policy. This means that as a result of the development, the flood risk will be lower for higher return period storms, for example the discharge from the site will be much lower for say the 1 in 30 year event (8 l/s post-development against 19.6 l/s pre-development). As the drain sits at a higher catchment, we are positive that the

IDB will welcome the slowing down of the water entering the system – overall this will help to lower overall flood risk of the entire catchment.

The HR Wallingford Greenfield runoff rate estimation for sites is an industry standard way to determine the greenfield run-off. The above calculation uses the IH124 method to determine the runoff.

Proposed Run-off

The greenfield run-off from the site should, as far as reasonably practical, not exceed the greenfield runoff rate for the Q_{BAR} event and the pumpable catchment, which in this instance is 8.0 l/s, coincidently for both. Therefore, the proposed discharge from the site will have a maximum runoff of 8.0 l/s, for all storms up to and including the 1 in 100 year + 40% climate change event, although this will be subject to further negotiation with LCC/IDB for a higher allowable discharge to lower the risk of device blockage. The post development run-off values are summarised in the table below. These figures represent the non-surcharged event.

Storm	Greenfield Rates	Post Development Critical Rates	Betterment
1 Year	6.96 l/s	6.7 l/s	4%
Q_{BAR}	8 l/s	NA	NA
2 Year	NA	7.7 l/s	NA
30 Year	19.6 l/s	8.0 l/s	60%
100 Year	28.48 l/s	8.0 l/s	72%
100 Year + 40% CC	NA	8.0 l/s	NA

Drainage Proposals

The ethos for the drainage design is to try and mimic natural drainage as far as possible, and to ensure that as a result of the development, flood risk offsite is not increased. The following section demonstrates how this will be achieved and outline the general drainage strategy.

The proposed drainage strategy can be found on JCE drawings 0360-JCE-00-SI-DR-C-3000.

Infiltration

The site is somewhat unique in its layout, in the fact that large areas of open space is being provided, with bio-diversity being included within the design. These spaces feature tree planting, swales, meadows and a basin. As a result of this, there is an opportunity to offer infiltration areas over large areas such as infiltration blankets, with any planting in these areas being specified to allow for periods of saturated ground. This option is subject to further infiltration testing and therefore is not being fully explored at this stage, although the proposed drainage layout could be easily modified to accommodate infiltration.

Regardless of the final infiltration characteristics, or if the basin is lined, the basin will offer some interception - this will be as a result of natural evapotranspiration. The extensive tree planting on the site will also reduce the discharge from site.

Watercourses

The site has direct access to an IDB drain, which eventually flows through to a pumping station, before the final discharge – most likely into the river Welland. Final agreements with the IDB will need to be made through byelaw consent, but as the site will be restricted to the pumpable catchment, it is

unlikely that the IDB will object to the connection – especially as the existing greenfield runoff for the site will be heavily moderated for higher return periods. As the site is large, the IDB should welcome the attenuation being provided for this catchment – this will increase the time taken for the water to enter the downstream IDB system and as a result reduce the flood risk downstream especially in the higher intensity storms.

Site Drainage

One of the main constraints of the site is the limited fall between the proposed/existing levels and invert level of the ditch, this is exacerbated by the scale of the development. The drainage proposals put forward bear these site constraints in mind, relying on conveyance channels through either swales or formed channels.

The main access way serving the storage warehouse, factory and the research facility will discharge to a swale located off the southern edge, or an internal swale to the 'wild flower/woodland roundabout'. As the site is very flat, and the outfall depth shallow, it is proposed that the swales will be designed as a wet swale, which reduces the need for a longitudinal fall. The runoff from the accessway will be a simple overland flow towards the swale along it's length. The swale will provide source control, water quality improvements, conveyance and amenity value – as the bed of the swale will be wet, there will be planting opportunities. This swale will eventually connect into the attenuation basin. If infiltration and the water levels are deemed suitable, then the need of the 'wet swale' can be removed, and the swale bed can rely on infiltration to fully empty.

The roof water for the storage warehouse and factory will enter a perimeter swale before discharging into a pond. The pond is being used to provide water for fire fighting facilities in the event that it is required. The swale will help to remove suspended solids and pollutants prior to entering the pond. The pond then discharges into the larger attenuation basin.

In regards to the pond, the Fire Authority have requested that a minimum of 45,000 litres of water is available at all times. There is ample parking around the pond for fire tender access.

There is some carparking which serves the storage warehouse/factory. It is intended that this will flow overland towards the planting area which eventually leads into the pond.

The research facility will drain in a similar way, into a small swale which is interlinked into the southern access road swale. At present a pipe will be provided to the eastern side, which then discharges into the swale.

The remaining access road, which provides access to the storage facility/factory/research facility, and the southern part of the site, will discharge directly towards the attenuation basin, and swale – located to the west of the road.

Given the large area of the hardstanding in front of the 'Digestate Processing' and 'Waste Transfer Buildings', the slab needs to be split into smaller catchments. The only way to realistically do this, is through the use of heavy-duty channel drainage – laid flat, although with built in internal falls. At the ends, these will be piped and discharge into the attenuation basin. It should be noted that the area of the hardstanding shows as having areas of flooding for the 1 in 100 year events. Given the size of the area, the flooding is generally minor, and it is in accordance with DEFRA's non-technical standards. The water will be safely stored in the valleys of the concrete slabs until they can discharge via. the

channel drains – which is likely to only be for short durations and will not impact the operations of the site.

The northern roof areas of the 'Digestate Processing and the Waste Transfer station will discharge directly into below ground pipework, before discharging into the attenuation basin. The southern roof areas will discharge into a swale, which will then discharge into the attenuation basin.

The road to the perimeter of the aforementioned buildings is generally drained by an edge swale, although the road area with parking is drained by a channel drain.

Some of the drainage will be laid with very limited cover. It is recommended that in very shallow instances that ductile iron pipework is used.

All of the site's surface water will ultimately discharge into the attenuation basin, which will have a flow restriction before discharging into the IDB ditch. The current proposal is for the basin to have a localised deeper areas to serve as a permanent pond and provide amenity value for the site. Given the large dimensions of the basin, the maximum water depth for the 1 in 100 year + 40% CC event is less than 450mm. The basin will discharge via. a wet swale which will then discharge into a flow control and outflow pipes.

At present, the main attenuation basin has been defined on the drawing as having a wet bed. The final design of the basin area needs to be liaised with the landscape architect to determine minimum requirements and species. It is entirely possibly for the basin to remain mostly dry during storm events – only to fill during storms. The important item is for the inlets into the basin to be linked by some form of swale with a wet bed – this swale could include larger linked ponds which sit in this area.

The site has been designed to incorporate source control as far as reasonably practical, and it is our opinion that SUDS has been fully considered for this type of development, meeting all of the appropriate standards. All of the water from these sources will pass through the appropriate levels of treatment for the types.

The site utilises a Hydrobrake, which has a provisional opening size of 137mm to control the discharge to greenfield run-off rates. Given the source control employed, and the relatively modest opening size, the risk of blockage will be fairly low. Regardless, the levels of the outlet will be such that any exceedance flows or blockages will ensure that flooding will not jeopardise the buildings. A provisional flood route is shown on the proposed drainage plans, but to summarise, flood water would flow towards the attenuation basin, utilise the freeboard, then overtop into the existing watercourse, away from any buildings, although some hardstanding flooding will be expected.

The system has been designed so that there is no above ground flooding for the 1 in 30-year event and all flooding up to and including the 1 in 100 year + 40% climate change event is contained within the site. This is in accordance with DEFRAs non-technical standards. A 3D schematic of the drainage model is shown in the figure below. A copy of the calculations can be found in appendix B.

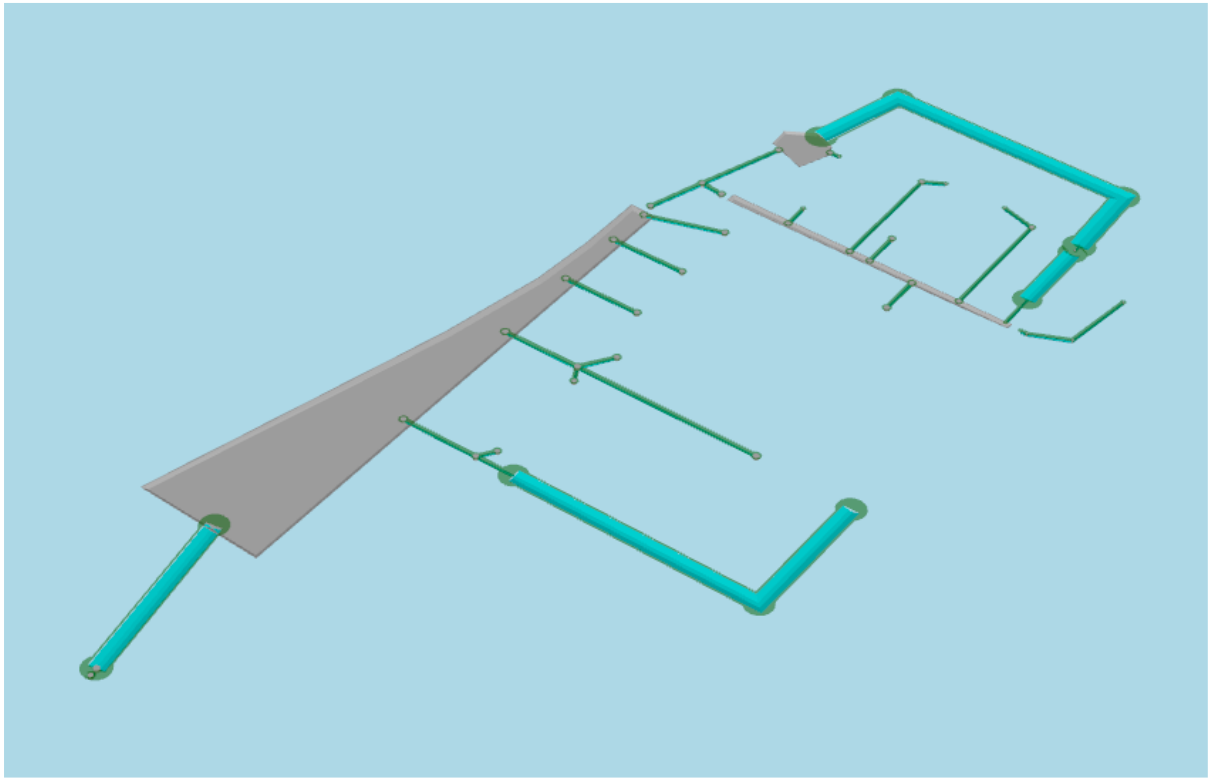


Figure 7 - 3D View of Drainage Model

An item of note within the drainage model is that given the layout there are a number of 'dummy' nodes in order to model the system accurately. In the drainage results these are typically called up as 'SW' – swale, or 'O' – outlet – these are typically modelled as node type manhole or junction.

Surcharged Outfall

During storm events, it is unknown if the water in the existing watercourse network will surcharge the outfall device. Water levels have been requested from the IDB, but at present it is not known if they have data available.

As the ditch is towards the head of the run, it is assumed that it is unlikely to be surcharged, or to limited depth, therefore as a result this has not been included in the calculations. In the event that this is proven otherwise, then the outfall should be fitted with a flap valve. Flow from the site will still be possible, but it is likely to be further moderated – this is why designed exceedance routes are important.

One item noted against the topographical survey is that although the bed of the ditch is variable, typically between levels of 2.50m AOD and 2.30m AOD, there is a downstream pipe, which has an invert level of 2.48m AOD. To ensure that the pond/basin can drain down, it is proposed that the basin outlet will be set at 2.50m AOD. It is also noted that there was no water present at the time of the survey which shows that even if the ditch is not positively drained below 2.48m AOD, it still drains down, therefore some infiltration and evapotranspiration is available.

If surcharge is present, any flooding will be to designated areas – this is essentially within the large storage basin and flow towards the ditch. Given the levels of the buildings, exceedance flooding

(including surcharge events) would not jeopardise the building and refuse would be provided. The FRA has separate comments regarding refuse areas.

Exceedance Flows

There is always the possibility that a device can become temporarily blocked or fail, resulting in the system flooding. Additionally, the site has been designed up to and including storms of 1 in 100 year + 40% climate change, any storms greater than this will cause above ground flooding. The proposed indication flood routing in storms of exceedance or device failure can be found on the drainage drawing.

In reality, if the devices fail or in an exceedance event, the flood water will general travel above ground and migrate towards the swales and eventually the basin, as ultimately this will be the low spot of the area. The outfall into the ditch would have a high level overflow to discharge the water.

Water Quality

The methods of surface water disposal mentioned above have included provisions for water quality. In accordance with CIRIA C753, the pollution hazard features for the drainage areas are:

- Other roofs - Low
- Non-residential parking - Low
- Commercial yard and delivery areas - Medium

To remove the pollution risks, CIRA have developed 'Pollution hazard indices' and the 'mitigation indices' that the SuDS components provide, further details of these are found in figures 8 and 9 below. This simple approach is considered suitable for this type of development.

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Figure 8 - Pollution hazard indices for different land use classifications

	Mitigation indices[1]		
Type of SuDS component	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Figure 9 - Indicative SuDS mitigation indices for discharging to a surface water

To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index (for each contaminant type):

Total SuDS mitigation index ≥ pollution hazard index
(for each contaminant type) (for each contaminant type)

Where the mitigation index of an individual component is insufficient, two components (or more) in series will be required where:

$$\text{Total SuDS mitigation index} = \text{mitigation index}_1 + 0.5\ (\text{mitigation index}_2)$$

Where:

$$\text{Mitigation index}_n = \text{mitigation index for component } n$$

Provided the total SuDS mitigation index exceeds the pollution hazard indices, then sufficient water quality will be provided.

For the calculations below the hazards are represented by;

Total suspended solids = Red

Metals = Blue

Hydrocarbons = Green

The figures are presented to show the actual achieved in the right-hand side column. The right-hand side's total must be higher than the left-hand side.

Roof areas

At a minimum, the roof water will always pass through the attenuation basin, therefore the mitigation for the area is:

0.3 0.5 0.05 = Detention Basin 0.7 0.7 0.5

The mitigation provided by the detention basin creates enough water quality improvement for this aspect of the development.

Access road/parking

The non-residential parking will pass overland into the pond before discharging into the detention basin. The mitigation for this area is:

0.5 0.4 0.4 = Pond 0.7 0.7 0.5 ½ Detention Basin 0.35 0.35 0.25 – Total 1.05 1.05 0.75

The mitigation provided by the swale and detention pond creates enough water quality improvement for this aspect of the development.

Commercial Yard and Delivery Areas

Parts of the commercial yard and delivery area will drain into a swale, before discharging into the attenuation basin. The mitigation for this area is:

0.7 0.6 0.7 = Swale 0.5 0.6 0.6 + ½ Detention Basin 0.35 0.35 0.25 – Total 0.85 0.95 0.85

The mitigation provided by the swale and detention pond creates enough water quality improvement for this aspect of the development.

Commercial Yard and Delivery Areas

Parts of the commercial yard and delivery area will drain into a channel, before discharging into the attenuation basin, then through an swale before the outlet. The mitigation for this area is:

0.7 0.6 0.7 = Detention Basin 0.7 0.7 0.5 + ½ Swale 0.25 0.3 0.3 – Total 0.95 1.0 0.8

All the methods above provide enough water quality in accordance with CIRIA's C753 document or a suitable compared to the existing drainage arrangements. Further evidence will need to be provided at detailed design stage. In some instances the water will also pass over a filter drain which will improve the water quality further.

It is important to note that the mitigation demonstrated above, only shows the minimum treatment provided to achieve compliance, and many of the areas achieve additional water quality improvements. At a minimum every single area will pass through the detention basin and outflow swale.

Flood Risk off-site

As the flow from site will be restricted to greenfield runoff rates, the flood risk offsite has not been increased as a result of the development. It is noted that downstream of the development are a number of culverts. These are probably the biggest areas of risk to offsite flooding. As previously discussed, and storm above the QBAR event has been reduced as a result of the development, this is effectively storms above the 1 in 2 year event plus. The low flow rates from the site for high storm return periods will vastly reduce the risk of the culverts running out of capacity.

Management/Maintenance

It is crucial that the elements mentioned in the drainage elements and water quality are maintained to a sufficient standard to ensure that the devices can still function as designed. Generally, the

maintenance requirements are either from CIRIA 753, or manufacturer guidance. It is currently assumed that the building's management will maintain the SUDS devices.

The devices outlined below are preliminary only and subject to detailed design.

Filter Strip

Operation and maintenance requirements for filter strips		
Maintenance schedule	**Required action**	**Typical frequency**
Regular maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect filter strip surface to identify evidence of erosion, poor vegetation growth, compaction, ponding, sedimentation and contamination (eg oils)	Monthly (at start, then half yearly)
	Check flow spreader and filter strip surface for even gradients	Monthly (at start, then half yearly)
	Inspect gravel flow spreader upstream of filter strip for clogging	Monthly (at start, then half yearly)
	Inspect silt accumulation rates and establish appropriate removal frequencies	Monthly (at start, then half yearly)
Occasional maintenance	Reseed areas of poor vegetation growth; alter plant types to better suit conditions, if required	As required or if bare soil is exposed over > 10% of the filter strip area.
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Hydrobrake Maintenance

Maintenance

Normally, little maintenance is required as there are no moving parts within the Flow Control. Experience has shown that if blockages occur they do so at the intake, and the cause on such occasions has been due to a lack of attention to engineering detail such as approach velocities being too low, inadequate benching, or the use of units below the minimum recommended size. The Flow Control (where applicable) is fitted with a pivoting bypass door, which allows the manhole chamber to be drained down should blockage occur. The smaller conical units, below the minimum recommended size, are also supplied with rodding facilities or vortex suppressor pipes as standard.

Following installation of the Flow Control it is vitally important that any extraneous material i.e. building materials are removed from the unit and the chamber. After the system is made live, and assuming that the chamber design is satisfactory, it is recommended that each unit be inspected monthly for three months and thereafter at six monthly intervals with hose down if required. If problems are experienced, please do not hesitate to contact the company so that an investigation may be made.

All Flow Control units are typically manufactured from grade 304 Stainless Steel, and if required they can also be manufactured in grade 316 Stainless Steel. Both materials have an estimated life span in excess of the design life of drainage systems.

Detention Pond

Maintenance schedule	Required action	Typical 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	Half yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1 m above pond base; include max 25% of pond surface)	Annually
	Remove 25% of bank vegetation from water's edge to a minimum of 1 m 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

Attenuation Basin

Maintenance schedule	Required action	Typical 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)
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 reseeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

Swale

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Catchpits and Channel Drainage

Catchpits are utilised to help prevent the ingress of heavy sediment and other debris from entering the system. Maintenance requirements are low, and it is recommended that catchpits are inspected every six months and any build-up of sediment removed.

Pipework

If sediment in the catchpits are above the incoming pipes, or if performance of the site is hampered, then the pipes are to be inspect and jetted as necessary. The condition of the pipes shall generally be checked at the catchpit inspections.

Jackson Consulting Engineers is a trading name of Ben Jackson Consulting Ltd - Brunel House, Centre Park, 340 Firecrest Court, Warrington, WA1 1RG, reg no. 11709531

Foul Proposals

Unlike surface water drainage, the preference for foul water disposal is to connect into a sewer, and only where this is not a viable option should other means of drainage be considered.

Connection to a Sewer

Extracts of the Anglian Water asset maps are shown in the figures below, with the full asset maps being provided in appendix C. The first figure shows the direct area of the site covered, to its largest extents. This shows that no foul sewer is in the direct vicinity of the site. Under the sewer transfer act, it is possible that the commercial buildings to the north have sewers which have been adopted, but are not on r records. With that being said, it would still be unlikely that this is not served by a pump. There is also a chance that these buildings rely on off mains drainage, but this should be checked by the development team and Anglian Water.



Figure 10 – Foul Sewers Local to the Site

The closest identified sewer is located to the south west of the site boundary – approximately 800m away 'as the crow flies' or approximately 1000m following road verges.

The figure below shows the location of this sewer. As noted, the area also appears to be served by a pumping station.



Figure 11 - Foul Connection into Newlands Road

In context of the site, the below aerial view shows the approximate location of the foul sewer.

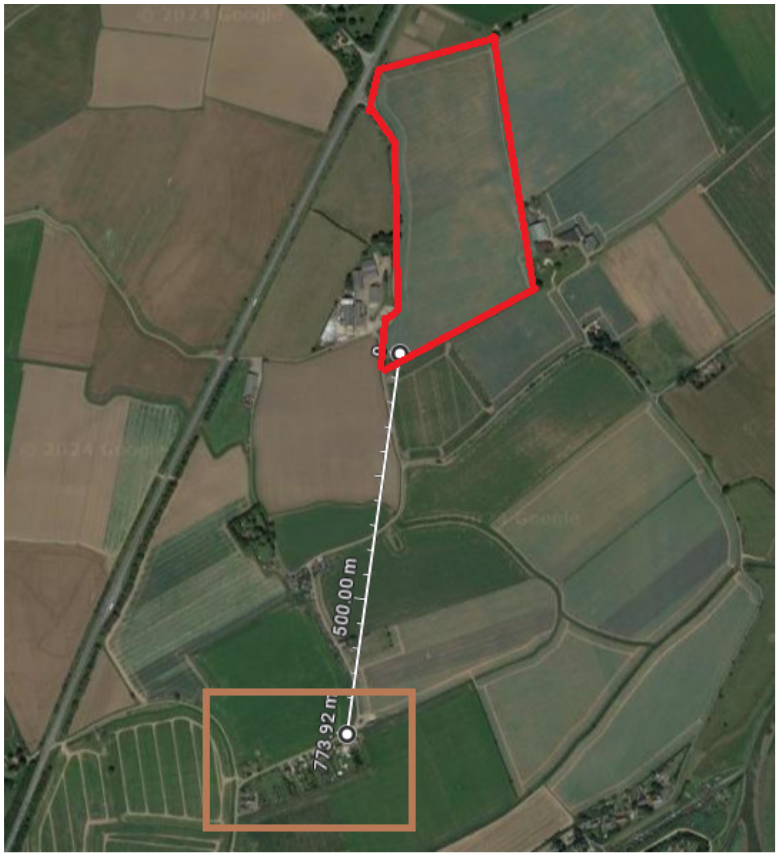


Figure 12 - Location of AW Sewers

At present, the total number of people proposed to work in this development is 103. Under 'British Water Flows and Loads', an 'office/factory without canteen' should allow for 50 litres per person per day. This means that minimum storage of 5150 litres is required for a pumping station – this is to comply with building regulations.

Additionally, as part of the processes on site, there will be waste water from cabbage washing. As these sites are innovators in the field, it is proposed that a large amount of the water used in the process is either directly recycled into the system, evaporates into the air, or is turned into a 'gel' which is then used for other industries – this is converted, stored on site and the transported away.

Through all of the processes involved, the final discharge still amounts to $10m^3$, with the domestic type waste generated from the workers, this amounts to a total of $15.15m^3$ per day. Although in the scheme of things this is a modest amount, it exceeds the amount that the EA will allow without a permit. Permits should only be granted in exception circumstances, which is detailed further below.

One of the criteria for a reasonable connection is the length of the connection. The EA consider a connection be made to the public sewer if the distance of the closest sewer falls within the following condition.

> *Divide the maximum volume in cubic metres that you want to discharge from those other premises by 0.75 (1 cubic metre is 1000 litres). Multiply the result by 30 metres. This will give you a result in metres.*

The daily volume of discharge from the site will not exceed $15.15m^3$. With the EA's formula, this gives a distance of approximately 606m (($15.15m^3$/0.75)*30). This means that the current identified sewer is not within the limit of this.

Additionally, this sewer only serves a handful of properties prior to being pumped elsewhere. This is likely to require upgrades to the system, and the disruption and cost this will cause should be a consideration as to why a connection here is not feasible.

The water will pass through wastewater treatment plants to ensure that the water quality reaches appropriate levels or treatment.

There will be seldom occasions where the site is cleaned – this is estimated to be once a month. During this process, more waste water will be generated and due to the presence of cleaning chemicals this water will not be suitable for recycling, re-use or distribution through the waste water treatment plants. On these days, the wastewater will be collected, and taken offsite for disposal – this ensures that the daily volume of water leaving the site is note exceeded and that the discharge is suitable to be cleaned to sufficient levels and discharge into the watercourse.

To rule out a connection into the existing public sewer, an application form will need to be completed at detailed design, and the EA will determine if the reason for not connecting into a public foul sewer is acceptable.

The two sets of storage tanks are set to be in a bunded enclosure, this is in the event that an accidental spillage, or rupture occurs. Given the size of the area, the surface wate will need to be drained. It is proposed that these surface water drains are independent within the bund area so that it can be closed off before it enters the overall system. It is anticipated that there will be some automation to this process.

Conclusion

- The above drainage strategy demonstrates that the site can be drained through the use of a Sustainable Drainage System at an appropriate level for the development, and although the final method has not been decided, viable options have been provided.
- The flow offsite will be restricted to a maximum of 8.0 l/s.
- The site is restricted below the greenfield Q_{BAR} and pumpable catchment for the contributing area.
- Maximum water depth in the basin is less than 0.45m – although this is subject to confirm surcharge levels, and detailed design.
- Flooding has been allowed in the 100 year events – generally this is within the valleys of the external slab.
- Existing greenfield offsite flow from the undeveloped site is reduced for all storms above the Q_{BAR} event.
- The proposed scheme does not increase the risk of flooding either on or off site as a result of the development. Furthermore, the downstream floodrisk is reduced for storms greater than the Q_{BAR} event.
- Waterquality is managed through the SUDS present on site, predominantly the large basin/pond will complete the treatment, with the swales offering significant improvements as well.
- A full maintenance strategy will be developed at the detailed design stage.
- The total foul discharge from the site is slightly more than $15m^3$ per day.
- This is more than the EA allows in the general binding rules and an EA permit will be required.
- The length of connection to the foul sewer exceeds the EA's 'reasonable' length formula, and for the viability of the project can be ruled out.
- A preliminary drainage layout can be found on JCE's Preliminary Drainage Strategy drawing: 0360-JCE-00-SI-DR-C-3000.
- The storage tanks will be in bunded areas in the event of accidental spillage.

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Appendices

Appendix A – Greenfield Runoff

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Ben Jackson
Site name:	Naylor Farms
Site location:	Surfleet

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:	52.85794° N
Longitude:	0.10574° W
Reference:	3286274928
Date:	Feb 25 2024 11:52

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 5.7

Methodology

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

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	560	560
Hydrological region:	5	5
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	2.45	2.45
Growth curve factor 100 years:	3.56	3.56
Growth curve factor 200 years:	4.21	4.21

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 ≤ 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.

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Greenfield runoff rates

Default Edited

Q_{BAR} (l/s):	8	8
1 in 1 year (l/s):	6.96	6.96
1 in 30 years (l/s):	19.6	19.6
1 in 100 year (l/s):	28.48	28.48
1 in 200 years (l/s):	33.68	33.68

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.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.uksuds.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.

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Appendix B – Proposed Drainage Calculations

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)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
PS1		5.00	3.500	500	527703.708	330809.367	0.625
PS2			3.500	500	527709.939	330773.365	0.787
HW1			3.300		527691.659	330758.768	0.700
HW9			3.500		527662.595	330819.222	0.500
SW2			3.500		527647.366	330860.280	0.504
SW3			3.500		527528.234	330821.358	0.517
PS4	0.047	5.00	3.500	500	527621.790	330809.117	0.525
PS5	0.047	5.00	3.500	1200	527639.662	330810.249	0.605
HW4			3.300	1200	527660.453	330748.875	0.700
PS6	0.040	5.00	3.500	500	527592.028	330798.149	0.570
PS7	0.040	5.00	3.500	1200	527584.596	330789.672	0.620
HW7			3.300	1200	527604.802	330730.023	0.700
PS10	0.104	5.00	3.300	500	527546.842	330769.831	0.475
HW10			3.300	1200	527542.257	330768.068	0.498
PS8		5.00	3.500	500	527568.298	330731.339	0.845
HW8			3.300	1200	527572.595	330719.065	0.700
HW12	0.160	5.00	3.300	1350	527537.576	330706.571	0.700
HW11	0.248	5.00	3.300	1350	527526.542	330749.145	0.600
PS11			3.500	1350	527526.136	330703.790	0.931
HW13			3.300	1350	527525.729	330673.956	0.811
SW6	0.192	5.00	3.300		527592.932	330397.385	0.800
Hydrobrake			3.300	1500	527636.306	330316.955	0.809
O1	0.180	5.00	3.350	1350	527561.196	330690.754	0.745
HW14			3.300	1350	527529.393	330667.443	0.800
O2	0.270	5.00	3.350	1350	527572.376	330657.796	0.754
HW15			3.300	1350	527535.886	330645.169	0.790
O3	0.254	5.00	3.350	1350	527583.797	330624.032	0.750
HW16			3.300	1350	527546.066	330611.190	0.789
PS12		5.00	3.600	1500	527689.409	330610.951	0.757
O4	0.472	5.00	3.350	1350	527603.235	330598.926	0.650
O5	0.049	5.00	3.500	1200	527605.338	330574.087	0.800
PS13			3.600	1500	527598.593	330580.641	1.023
HW17			3.300	1500	527560.676	330567.724	0.799
SW5	0.052	5.00	3.500		527759.967	330558.419	0.507
HW18			3.500		527639.997	330518.188	0.520
PS14			3.500	1350	527620.700	330511.620	0.890
06	0.049	5.00	3.500	1200	527623.381	330521.074	0.700
HW19			3.300	1350	527583.036	330498.801	0.778
PS9		5.00	3.500	500	527663.621	330815.812	0.475
PS3	0.036	5.00	3.300	500	527694.774	330759.746	0.678
HW5	0.122	5.00	3.500	1200	527609.022	330751.678	0.800

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Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
HW6			3.300	1200	527615.214	330733.399	0.775
HW2			3.500		527677.487	330774.867	0.504
HW3			3.300		527683.632	330756.727	0.701
SW1		5.00	3.500		527664.580	330813.371	0.500
SW4			3.300		527530.089	330772.135	0.498
HW20			3.300	1200	527638.378	330313.130	0.828
SW5a		5.00	3.500		527738.351	330624.245	0.500
OA	0.760	5.00	3.350	1350	527645.325	330719.114	0.700
HW4a			3.300	1350	527638.456	330739.367	0.698

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)
12.000	PS1	PS2	36.537	0.600	2.875	2.713	0.162	225.0	225	5.70	1.0
12.001	PS2	PS3	20.383	0.600	2.713	2.622	0.091	225.0	225	6.09	1.0
3.002	SW2	SW3	125.329	0.035	2.996	2.983	0.013	10000.0	1700	25.77	1.0
20.000	PS10	HW10	4.912	0.600	2.825	2.803	0.022	225.0	225	5.09	1.0
8.000	PS4	PS5	17.908	0.600	2.975	2.895	0.080	225.0	225	5.34	1.0
8.001	PS5	HW4	64.800	0.600	2.895	2.600	0.295	219.7	225	6.57	1.0
11.000	PS6	PS7	11.274	0.600	2.930	2.880	0.050	225.0	225	5.22	1.0
11.001	PS7	HW7	62.978	0.600	2.880	2.600	0.280	225.0	225	6.43	1.0
19.000	PS8	HW8	13.004	0.600	2.655	2.600	0.055	236.4	225	5.26	1.0
9.000	HW11	PS11	45.357	0.600	2.700	2.579	0.121	375.0	375	5.81	1.0
10.000	HW12	PS11	11.773	0.600	2.600	2.569	0.031	375.0	375	5.21	1.0
9.001	PS11	HW13	29.837	0.600	2.569	2.489	0.080	375.0	375	6.35	1.0
7.000	SW6	Hydrobrake	91.380	0.035	2.500	2.491	0.009	10000.0	1000	16.89	1.0
15.000	O1	HW14	39.431	0.600	2.605	2.500	0.105	375.0	375	5.71	1.0
16.000	O2	HW15	38.613	0.600	2.596	2.510	0.086	450.0	450	5.68	1.0
14.000	O3	HW16	39.857	0.600	2.600	2.511	0.089	450.0	450	5.70	1.0
4.000	PS12	PS13	95.740	0.600	2.843	2.661	0.182	525.0	525	6.64	1.0

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)
12.000	0.867	34.5	0.1	0.400	0.562	0.029	0.0	8	0.174
12.001	0.867	34.5	0.1	0.562	0.453	0.029	0.0	8	0.174
3.002	0.136	217.9	0.6	0.004	0.017	0.231	0.0	18	0.019
20.000	0.867	34.5	0.3	0.250	0.272	0.104	0.0	15	0.258
8.000	0.867	34.5	0.1	0.300	0.380	0.047	0.0	10	0.200
8.001	0.878	34.9	0.3	0.380	0.475	0.094	0.0	14	0.251
11.000	0.867	34.5	0.1	0.345	0.395	0.040	0.0	9	0.188
11.001	0.867	34.5	0.4	0.395	0.475	0.154	0.0	17	0.290
19.000	0.846	33.6	0.0	0.620	0.475	0.000	0.0	0	0.000
9.000	0.929	102.7	0.7	0.225	0.546	0.248	0.0	22	0.263
10.000	0.929	102.7	0.4	0.325	0.556	0.160	0.0	18	0.232
9.001	0.929	102.7	1.1	0.556	0.436	0.408	0.0	27	0.309
7.000	0.128	160.2	0.5	0.300	0.309	0.192	0.0	22	0.021
15.000	0.929	102.7	0.5	0.370	0.425	0.180	0.0	19	0.238
16.000	0.952	151.4	0.7	0.304	0.340	0.270	0.0	22	0.246
14.000	0.952	151.4	0.7	0.300	0.339	0.254	0.0	22	0.239
4.000	0.970	210.1	1.0	0.232	0.414	0.368	0.0	26	0.251

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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	O4	PS13	18.865	0.600	2.700	2.653	0.047	400.0	400	5.34	1.0
6.000	O5	PS13	9.405	0.600	2.700	2.669	0.031	300.0	300	5.17	1.0
4.001	PS13	HW17	40.057	0.600	2.577	2.501	0.076	525.0	525	7.33	1.0
1.001	SW5	HW18	126.536	0.035	2.993	2.980	0.013	10000.0	1000	30.00	1.0
1.002	HW18	PS14	20.384	0.035	2.980	2.610	0.370	55.1	450	30.00	1.0
2.000	06	PS14	9.827	0.600	2.800	2.767	0.033	300.0	300	5.18	1.0
1.003	PS14	HW19	39.786	0.035	2.610	2.522	0.088	450.0	450	5.00	1.0
12.002	PS3	HW1	3.265	0.600	2.622	2.600	0.022	150.0	225	6.14	1.0
3.000	PS9	HW9	3.561	0.600	3.025	3.001	0.024	150.0	150	5.07	1.0
18.000	HW5	HW6	19.299	0.600	2.700	2.525	0.175	110.3	225	5.26	1.0
13.001	HW2	HW3	19.153	0.035	2.996	2.599	0.397	48.2	150	10.97	1.0
3.003	SW3	SW4	49.258	0.035	2.983	2.978	0.005	10000.0	1700	30.00	1.0
13.000	SW1	HW2	40.610	0.035	3.000	2.996	0.004	10000.0	1000	10.28	1.0
7.001	Hydrobrake	HW20	4.350	0.035	2.491	2.472	0.019	225.0	225	5.00	1.0
3.001	HW9	SW2	43.791	0.035	3.000	2.996	0.004	10000.0	1700	10.43	1.0
1.000	SW5a	SW5	69.284	0.035	3.000	2.993	0.007	10000.0	1000	14.01	1.0
17.000	OA	HW4a	21.386	0.600	2.650	2.602	0.048	450.0	450	5.37	1.0

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	0.937	117.8	1.3	0.250	0.547	0.472	0.0	29	0.312
6.000	0.902	63.8	0.1	0.500	0.631	0.049	0.0	10	0.175
4.001	0.970	210.1	2.4	0.498	0.274	0.889	0.0	39	0.331
1.001	0.128	160.2	1.4	0.007	0.020	0.517	0.0	41	0.031
1.002	0.897	142.7	1.4	0.070	0.440	0.517	0.0	31	0.285
2.000	0.902	63.8	0.1	0.400	0.433	0.049	0.0	10	0.175
1.003	0.314	49.9	1.5	0.440	0.328	0.566	0.0	54	0.141
12.002	1.065	42.3	0.2	0.453	0.475	0.065	0.0	11	0.263
3.000	0.818	14.5	0.0	0.325	0.349	0.000	0.0	0	0.000
18.000	1.244	49.5	0.3	0.575	0.550	0.122	0.0	14	0.358
13.001	0.461	8.1	0.5	0.354	0.551	0.189	0.0	25	0.257
3.003	0.136	217.9	0.6	0.017	-0.178	0.231	0.0	18	0.019
13.000	0.128	160.2	0.2	0.000	0.004	0.059	0.0	11	0.014
7.001	0.280	11.1	0.5	0.584	0.603	0.192	0.0	33	0.142
3.001	0.136	217.9	0.1	0.000	0.004	0.049	0.0	7	0.011
1.000	0.128	160.2	0.0	0.000	0.007	0.000	0.0	0	0.000
17.000	0.952	151.4	2.1	0.250	0.248	0.760	0.0	36	0.341

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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
12.000	36.537	225.0	225	Circular	3.500	2.875	0.400	3.500	2.713	0.562
12.001	20.383	225.0	225	Circular	3.500	2.713	0.562	3.300	2.622	0.453
3.002	125.329	10000.0	1700	Swale	3.500	2.996	0.004	3.500	2.983	0.017
20.000	4.912	225.0	225	Circular	3.300	2.825	0.250	3.300	2.803	0.272
8.000	17.908	225.0	225	Circular	3.500	2.975	0.300	3.500	2.895	0.380
8.001	64.800	219.7	225	Circular	3.500	2.895	0.380	3.300	2.600	0.475
11.000	11.274	225.0	225	Circular	3.500	2.930	0.345	3.500	2.880	0.395
11.001	62.978	225.0	225	Circular	3.500	2.880	0.395	3.300	2.600	0.475
19.000	13.004	236.4	225	Circular	3.500	2.655	0.620	3.300	2.600	0.475
9.000	45.357	375.0	375	Circular	3.300	2.700	0.225	3.500	2.579	0.546
10.000	11.773	375.0	375	Circular	3.300	2.600	0.325	3.500	2.569	0.556
9.001	29.837	375.0	375	Circular	3.500	2.569	0.556	3.300	2.489	0.436
7.000	91.380	10000.0	1000	Swale	3.300	2.500	0.300	3.300	2.491	0.309
15.000	39.431	375.0	375	Circular	3.350	2.605	0.370	3.300	2.500	0.425
16.000	38.613	450.0	450	Circular	3.350	2.596	0.304	3.300	2.510	0.340
14.000	39.857	450.0	450	Circular	3.350	2.600	0.300	3.300	2.511	0.339
4.000	95.740	525.0	525	Circular	3.600	2.843	0.232	3.600	2.661	0.414
5.000	18.865	400.0	400	Circular	3.350	2.700	0.250	3.600	2.653	0.547
6.000	9.405	300.0	300	Circular	3.500	2.700	0.500	3.600	2.669	0.631
4.001	40.057	525.0	525	Circular	3.600	2.577	0.498	3.300	2.501	0.274
1.001	126.536	10000.0	1000	Swale	3.500	2.993	0.007	3.500	2.980	0.020
1.002	20.384	55.1	450	Circular	3.500	2.980	0.070	3.500	2.610	0.440
2.000	9.827	300.0	300	Circular	3.500	2.800	0.400	3.500	2.767	0.433
1.003	39.786	450.0	450	Circular	3.500	2.610	0.440	3.300	2.522	0.328
12.002	3.265	150.0	225	Circular	3.300	2.622	0.453	3.300	2.600	0.475

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
12.000	PS1	500	Manhole	1 Adoptable	PS2	500	Manhole	1 Adoptable
12.001	PS2	500	Manhole	1 Adoptable	PS3	500	Manhole	1 Adoptable
3.002	SW2		Junction		SW3		Junction	
20.000	PS10	500	Manhole	1 Adoptable	HW10	1200	Manhole	1 Adoptable
8.000	PS4	500	Manhole	1 Adoptable	PS5	1200	Manhole	1 Adoptable
8.001	PS5	1200	Manhole	1 Adoptable	HW4	1200	Manhole	1 Adoptable
11.000	PS6	500	Manhole	1 Adoptable	PS7	1200	Manhole	1 Adoptable
11.001	PS7	1200	Manhole	1 Adoptable	HW7	1200	Manhole	1 Adoptable
19.000	PS8	500	Manhole	1 Adoptable	HW8	1200	Manhole	1 Adoptable
9.000	HW11	1350	Manhole	1 Adoptable	PS11	1350	Manhole	1 Adoptable
10.000	HW12	1350	Manhole	1 Adoptable	PS11	1350	Manhole	1 Adoptable
9.001	PS11	1350	Manhole	1 Adoptable	HW13	1350	Manhole	1 Adoptable
7.000	SW6		Junction		Hydrobrake	1500	Manhole	1 Adoptable
15.000	O1	1350	Manhole	1 Adoptable	HW14	1350	Manhole	1 Adoptable
16.000	O2	1350	Manhole	1 Adoptable	HW15	1350	Manhole	1 Adoptable
14.000	O3	1350	Manhole	1 Adoptable	HW16	1350	Manhole	1 Adoptable
4.000	PS12	1500	Manhole	1 Adoptable	PS13	1500	Manhole	1 Adoptable
5.000	O4	1350	Manhole	1 Adoptable	PS13	1500	Manhole	1 Adoptable
6.000	O5	1200	Manhole	1 Adoptable	PS13	1500	Manhole	1 Adoptable
4.001	PS13	1500	Manhole	1 Adoptable	HW17	1500	Manhole	1 Adoptable
1.001	SW5		Junction		HW18		Junction	
1.002	HW18		Junction		PS14	1350	Manhole	1 Adoptable
2.000	06	1200	Manhole	1 Adoptable	PS14	1350	Manhole	1 Adoptable
1.003	PS14	1350	Manhole	1 Adoptable	HW19	1350	Manhole	1 Adoptable
12.002	PS3	500	Manhole	1 Adoptable	HW1		Junction	

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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
3.000	3.561	150.0	150	Circular	3.500	3.025	0.325	3.500	3.001	0.349
18.000	19.299	110.3	225	Circular	3.500	2.700	0.575	3.300	2.525	0.550
13.001	19.153	48.2	150	Circular	3.500	2.996	0.354	3.300	2.599	0.551
3.003	49.258	10000.0	1700	Swale	3.500	2.983	0.017	3.300	2.978	-0.178
13.000	40.610	10000.0	1000	Swale	3.500	3.000	0.000	3.500	2.996	0.004
7.001	4.350	225.0	225	Circular	3.300	2.491	0.584	3.300	2.472	0.603
3.001	43.791	10000.0	1700	Swale	3.500	3.000	0.000	3.500	2.996	0.004
1.000	69.284	10000.0	1000	Swale	3.500	3.000	0.000	3.500	2.993	0.007
17.000	21.386	450.0	450	Circular	3.350	2.650	0.250	3.300	2.602	0.248

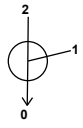
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
3.000	PS9	500	Manhole	1 Adoptable	HW9		Junction	
18.000	HW5	1200	Manhole	1 Adoptable	HW6	1200	Manhole	1 Adoptable
13.001	HW2		Junction		HW3		Junction	
3.003	SW3		Junction		SW4		Junction	
13.000	SW1		Junction		HW2		Junction	
7.001	Hydrobrake	1500	Manhole	1 Adoptable	HW20	1200	Manhole	1 Adoptable
3.001	HW9		Junction		SW2		Junction	
1.000	SW5a		Junction		SW5		Junction	
17.000	OA	1350	Manhole	1 Adoptable	HW4a	1350	Manhole	1 Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
PS1	527703.708	330809.367	3.500	0.625	500	 0	12.000	2.875	225
PS2	527709.939	330773.365	3.500	0.787	500	 1	12.000	2.713	225
						0	12.001	2.713	225
HW1	527691.659	330758.768	3.300	0.700		 1	12.002	2.600	225
HW9	527662.595	330819.222	3.500	0.500		 1	3.000	3.001	150
						0	3.001	3.000	1700
SW2	527647.366	330860.280	3.500	0.504		 1	3.001	2.996	1700
						0	3.002	2.996	1700
SW3	527528.234	330821.358	3.500	0.517		 1	3.002	2.983	1700
						0	3.003	2.983	1700

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
PS4	527621.790	330809.117	3.500	0.525	500				
						0	8.000	2.975	225
PS5	527639.662	330810.249	3.500	0.605	1200		8.000	2.895	225
									
						0	8.001	2.895	225
HW4	527660.453	330748.875	3.300	0.700	1200		8.001	2.600	225
PS6	527592.028	330798.149	3.500	0.570	500				
						0	11.000	2.930	225
PS7	527584.596	330789.672	3.500	0.620	1200		11.000	2.880	225
									
						0	11.001	2.880	225
HW7	527604.802	330730.023	3.300	0.700	1200		11.001	2.600	225
PS10	527546.842	330769.831	3.300	0.475	500				
						0	20.000	2.825	225
HW10	527542.257	330768.068	3.300	0.498	1200		20.000	2.803	225
PS8	527568.298	330731.339	3.500	0.845	500				
						0	19.000	2.655	225
HW8	527572.595	330719.065	3.300	0.700	1200		19.000	2.600	225
HW12	527537.576	330706.571	3.300	0.700	1350				
						0	10.000	2.600	375
HW11	527526.542	330749.145	3.300	0.600	1350				
						0	9.000	2.700	375
PS11	527526.136	330703.790	3.500	0.931	1350		10.000	2.569	375
							9.000	2.579	375
						0	9.001	2.569	375

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
HW13	527525.729	330673.956	3.300	0.811	1350	1	9.001	2.489	375
SW6	527592.932	330397.385	3.300	0.800		0	7.000	2.500	1000
Hydrobrake	527636.306	330316.955	3.300	0.809	1500	1	7.000	2.491	1000
						0	7.001	2.491	225
O1	527561.196	330690.754	3.350	0.745	1350	0	15.000	2.605	375
HW14	527529.393	330667.443	3.300	0.800	1350	1	15.000	2.500	375
O2	527572.376	330657.796	3.350	0.754	1350	0	16.000	2.596	450
HW15	527535.886	330645.169	3.300	0.790	1350	1	16.000	2.510	450
O3	527583.797	330624.032	3.350	0.750	1350	0	14.000	2.600	450
HW16	527546.066	330611.190	3.300	0.789	1350	1	14.000	2.511	450
PS12	527689.409	330610.951	3.600	0.757	1500	0	4.000	2.843	525
O4	527603.235	330598.926	3.350	0.650	1350	0	5.000	2.700	400
O5	527605.338	330574.087	3.500	0.800	1200	0	6.000	2.700	300
PS13	527598.593	330580.641	3.600	1.023	1500	1	6.000	2.669	300
						2	5.000	2.653	400
						3	4.000	2.661	525
						0	4.001	2.577	525

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
HW17	527560.676	330567.724	3.300	0.799	1500	1	4.001	2.501	525
SW5	527759.967	330558.419	3.500	0.507		1	1.000	2.993	1000
						0	1.001	2.993	1000
HW18	527639.997	330518.188	3.500	0.520		1	1.001	2.980	1000
						0	1.002	2.980	450
PS14	527620.700	330511.620	3.500	0.890	1350	1	2.000	2.767	300
						2	1.002	2.610	450
						0	1.003	2.610	450
06	527623.381	330521.074	3.500	0.700	1200	0	2.000	2.800	300
HW19	527583.036	330498.801	3.300	0.778	1350	1	1.003	2.522	450
PS9	527663.621	330815.812	3.500	0.475	500	0	3.000	3.025	150
PS3	527694.774	330759.746	3.300	0.678	500	1	12.001	2.622	225
						0	12.002	2.622	225
HW5	527609.022	330751.678	3.500	0.800	1200	0	18.000	2.700	225
HW6	527615.214	330733.399	3.300	0.775	1200	1	18.000	2.525	225
HW2	527677.487	330774.867	3.500	0.504		1	13.000	2.996	1000
						0	13.001	2.996	150
HW3	527683.632	330756.727	3.300	0.701		1	13.001	2.599	150
SW1	527664.580	330813.371	3.500	0.500		0	13.000	3.000	1000

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW4	527530.089	330772.135	3.300	0.498		1	3.003	2.978	1700
HW20	527638.378	330313.130	3.300	0.828	1200	1	7.001	2.472	225
SW5a	527738.351	330624.245	3.500	0.500		0	1.000	3.000	1000
OA	527645.325	330719.114	3.350	0.700	1350	0	17.000	2.650	450
HW4a	527638.456	330739.367	3.300	0.698	1350	1	17.000	2.602	450

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
2	0	0	0
10	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

Node Hydrobrake Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	2.491	Product Number	CTL-SHE-0137-8000-0600-8000
Design Depth (m)	0.600	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	8.0	Min Node Diameter (mm)	1200

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Node HW12 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	160.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.600	Main Channel Slope (1:X)	10000.0
Safety Factor	2.0	Time to half empty (mins)	0	Main Channel n	0.035

Inlets

HW1	HW4	HW6	HW7	HW8

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	162.0	0.0	0.500	660.0	0.0

Node HW11 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	23.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.800	Main Channel Slope (1:X)	10000.0
Safety Factor	2.0	Time to half empty (mins)	0	Main Channel n	0.035

Inlets

HW10	SW4

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	394.0	0.0	0.500	509.0	0.0

Node SW6 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	290.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.500	Main Channel Slope (1:X)	10000.0
Safety Factor	2.0	Time to half empty (mins)	0	Main Channel n	0.035

Inlets

HW13	HW14	HW15	HW16	HW17	HW19

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	7716.0	0.0	0.500	9580.0	0.0

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Results for 1 year Critical Storm Duration. Lowest mass balance: 99.34%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	PS1	1	2.875	0.000	0.0	0.0000	0.0000	OK
15 minute winter	12.000:50%	10	2.846	0.052	4.1	0.0000	0.0000	OK
30 minute winter	PS2	25	2.772	0.059	3.1	0.0115	0.0000	OK
60 minute winter	HW1	42	2.772	0.172	4.3	0.0000	0.0000	OK
60 minute winter	HW9	43	3.052	0.052	1.5	0.0000	0.0000	OK
60 minute winter	3.001:50%	43	3.052	0.054	4.0	0.0000	0.0000	OK
60 minute winter	SW2	43	3.051	0.055	5.4	0.0000	0.0000	OK
30 minute winter	3.002:50%	21	3.055	0.065	19.8	0.0000	0.0000	OK
120 minute winter	SW3	92	3.036	0.053	6.5	0.0000	0.0000	OK
15 minute winter	PS4	10	3.041	0.066	6.6	0.0128	0.0000	OK
15 minute winter	PS5	11	2.988	0.093	13.1	0.1050	0.0000	OK
30 minute winter	HW4	24	2.772	0.172	10.0	0.1945	0.0000	OK
15 minute winter	PS6	10	2.992	0.062	5.6	0.0121	0.0000	OK
15 minute winter	PS7	11	2.966	0.086	11.1	0.0971	0.0000	OK
15 minute winter	11.001:50%	11	2.865	0.125	21.2	0.0000	0.0000	OK
15 minute winter	HW7	12	2.786	0.186	20.9	0.2106	0.0000	OK
15 minute winter	PS10	10	2.947	0.122	14.7	0.0239	0.0000	OK
15 minute winter	HW10	10	2.923	0.121	14.6	0.1368	0.0000	OK
60 minute winter	PS8	42	2.771	0.116	0.3	0.0227	0.0000	OK
60 minute winter	HW8	42	2.771	0.171	1.5	0.1932	0.0000	OK
60 minute winter	HW12	43	2.748	0.148	27.1	0.2114	0.0000	OK
15 minute winter	HW11	14	2.822	0.122	36.6	0.1748	0.0000	OK
60 minute winter	PS11	42	2.734	0.165	37.3	0.2362	0.0000	OK
60 minute winter	HW13	43	2.679	0.190	37.2	0.2716	0.0000	OK
2160 minute winter	SW6	1680	2.605	0.105	12.0	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	PS1	12.000	12.000:50%	0.0	0.000	0.000	0.0615	
15 minute winter	PS1	12.000	PS2	4.0	0.591	0.115	0.1238	
15 minute winter	PS2	12.001	PS3	4.0	0.357	0.115	0.3290	
30 minute winter	HW1	Flow through pond	HW12	19.8	0.096	0.085	35.1016	
15 minute winter	HW9	3.001	3.001:50%	-2.6	-0.060	-0.012	1.6558	
15 minute winter	HW9	3.001	SW2	3.1	0.071	0.014	1.7306	
30 minute winter	SW2	3.002	3.002:50%	-6.7	-0.075	-0.031	6.3943	
60 minute winter	SW2	3.002	SW3	7.1	0.085	0.032	6.0913	
120 minute winter	SW3	3.003	SW4	4.8	0.085	0.022	2.8329	
15 minute winter	PS4	8.000	PS5	6.5	0.528	0.188	0.2220	
15 minute winter	PS5	8.001	HW4	12.7	0.705	0.363	1.4037	
30 minute winter	HW4	Flow through pond	HW12	19.8	0.096	0.085	35.1016	
15 minute winter	PS6	11.000	PS7	5.5	0.489	0.160	0.1281	
15 minute winter	PS7	11.001	11.001:50%	10.9	0.602	0.315	0.5744	
15 minute winter	PS7	11.001	HW7	20.9	0.759	0.605	0.8962	
30 minute winter	HW7	Flow through pond	HW12	19.8	0.096	0.085	35.1016	
15 minute winter	PS10	20.000	HW10	14.6	0.671	0.422	0.1067	
15 minute winter	HW10	Flow through pond	HW11	7.6	0.021	0.007	8.7238	
15 minute winter	PS8	19.000	HW8	-1.3	-0.135	-0.039	0.3141	
30 minute winter	HW8	Flow through pond	HW12	19.8	0.096	0.085	35.1016	
60 minute winter	HW12	10.000	PS11	23.4	0.569	0.228	0.5111	
30 minute winter	HW11	9.000	PS11	23.9	0.752	0.233	1.5966	
60 minute winter	PS11	9.001	HW13	37.2	0.729	0.362	1.5303	
180 minute winter	HW13	Flow through pond	SW6	63.7	0.050	0.017	480.2901	
2160 minute winter	SW6	7.000	Hydrobrake	5.6	0.040	0.035	12.9827	

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Results for 1 year Critical Storm Duration. Lowest mass balance: 99.34%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute winter	Hydrobrake	1680	2.601	0.110	5.6	0.1936	0.0000	OK
15 minute winter	O1	10	2.734	0.129	25.4	0.1840	0.0000	OK
15 minute winter	HW14	11	2.639	0.139	25.0	0.1986	0.0000	OK
15 minute winter	O2	10	2.753	0.157	38.1	0.2249	0.0000	OK
15 minute winter	HW15	11	2.672	0.162	37.4	0.2316	0.0000	OK
15 minute winter	O3	10	2.752	0.152	35.8	0.2170	0.0000	OK
15 minute winter	HW16	11	2.666	0.155	35.1	0.2224	0.0000	OK
15 minute winter	PS12	11	2.928	0.085	5.4	0.1510	0.0000	OK
15 minute winter	4.000:50%	11	2.921	0.169	51.9	0.0000	0.0000	OK
15 minute winter	O4	10	2.927	0.227	66.6	0.3249	0.0000	OK
15 minute winter	O5	12	2.874	0.174	6.9	0.1968	0.0000	OK
15 minute winter	PS13	11	2.875	0.298	116.0	0.5257	0.0000	OK
15 minute winter	HW17	12	2.811	0.310	112.6	0.5478	0.0000	OK
60 minute winter	SW5	42	3.112	0.119	16.3	0.0000	0.0000	OK
15 minute winter	1.001:50%	12	3.127	0.141	65.6	0.9667	0.0000	OK
30 minute winter	HW18	23	3.091	0.111	22.5	0.0000	0.0000	OK
30 minute winter	PS14	23	2.820	0.210	22.0	0.3009	0.0000	OK
15 minute winter	06	10	2.869	0.069	6.9	0.0776	0.0000	OK
30 minute winter	HW19	24	2.695	0.173	21.7	0.2471	0.0000	OK
60 minute winter	PS9	43	3.052	0.027	0.1	0.0053	0.0000	OK
60 minute winter	PS3	42	2.772	0.150	4.7	0.0293	0.0000	OK
15 minute winter	HW5	10	2.790	0.090	17.2	0.1023	0.0000	OK
60 minute winter	HW6	41	2.772	0.247	8.9	0.2795	0.0000	OK
15 minute winter	HW2	14	3.079	0.083	6.2	0.0000	0.0000	OK
15 minute winter	13.001:50%	11	3.156	0.358	18.3	0.0000	0.0000	SURCHARGED

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2160 minute winter	Hydrobrake	Hydro-Brake®	HW20	5.6				429.3
15 minute winter	O1	15.000	HW14	25.0	0.727	0.243	1.3669	
180 minute winter	HW14	Flow through pond	SW6	63.7	0.050	0.017	480.2901	
15 minute winter	O2	16.000	HW15	37.4	0.757	0.247	1.9149	
180 minute winter	HW15	Flow through pond	SW6	63.7	0.050	0.017	480.2901	
15 minute winter	O3	14.000	HW16	35.1	0.752	0.232	1.8758	
180 minute winter	HW16	Flow through pond	SW6	63.7	0.050	0.017	480.2901	
15 minute summer	PS12	4.000	4.000:50%	-5.5	-0.216	-0.026	1.8799	
15 minute winter	PS12	4.000	PS13	47.2	0.690	0.225	3.4078	
15 minute winter	O4	5.000	PS13	65.2	0.999	0.553	1.3631	
15 minute winter	O5	6.000	PS13	6.5	0.398	0.102	0.4409	
15 minute winter	PS13	4.001	HW17	112.6	0.880	0.536	5.1685	
180 minute winter	HW17	Flow through pond	SW6	63.7	0.050	0.017	480.2901	
15 minute winter	SW5	1.001	1.001:50%	-24.2	-0.171	-0.151	9.9997	
15 minute winter	SW5	1.001	HW18	26.9	0.185	0.168	10.2927	
30 minute winter	HW18	1.002	PS14	18.8	0.371	0.132	1.0492	
30 minute winter	PS14	1.003	HW19	21.7	0.345	0.435	2.5408	
15 minute winter	06	2.000	PS14	6.8	0.604	0.106	0.1104	
180 minute winter	HW19	Flow through pond	SW6	63.7	0.050	0.017	480.2901	
30 minute winter	PS9	3.000	HW9	-0.1	-0.063	-0.006	0.0119	
15 minute winter	PS3	12.002	HW1	7.9	0.551	0.187	0.0915	
15 minute winter	HW5	18.000	HW6	17.0	0.691	0.345	0.5031	
30 minute winter	HW6	Flow through pond	HW12	19.8	0.096	0.085	35.1016	
15 minute winter	HW2	13.001	13.001:50%	-5.0	0.393	-0.617	0.1320	
15 minute winter	HW2	13.001	HW3	12.6	0.758	1.552	0.1469	12.1

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Results for 1 year Critical Storm Duration. Lowest mass balance: 99.34%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	HW3	11	2.703	0.104	12.6	0.0000	0.0000	OK
15 minute winter	SW1	14	3.080	0.080	5.2	0.0000	0.0000	OK
15 minute winter	13.000:50%	14	3.080	0.082	10.3	0.0000	0.0000	OK
120 minute winter	SW4	92	2.842	0.040	4.8	0.0000	0.0000	OK
15 minute summer	HW20	1	2.472	0.000	1.1	0.0000	0.0000	OK
60 minute winter	SW5a	42	3.112	0.112	8.9	0.0000	0.0000	OK
15 minute winter	OA	10	2.927	0.277	107.1	0.3966	0.0000	OK
15 minute winter	HW4a	10	2.829	0.227	106.2	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SW1	13.000	13.000:50%	-5.2	-0.080	-0.032	2.0312	
30 minute winter	SW1	13.000	HW2	3.9	0.058	0.024	2.0559	
15 minute winter	SW4	Flow through pond	HW11	7.6	0.021	0.007	8.7238	
30 minute winter	SW5a	1.000	SW5	-12.9	-0.122	-0.081	10.2871	
15 minute winter	OA	17.000	HW4a	106.2	1.163	0.702	1.9514	49.4

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.34%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	PS1	1	2.875	0.000	0.0	0.0000	0.0000	OK
15 minute winter	12.000:50%	10	2.854	0.060	5.3	0.0000	0.0000	OK
30 minute winter	PS2	25	2.798	0.085	4.0	0.0167	0.0000	OK
30 minute winter	HW1	24	2.799	0.199	8.1	0.0000	0.0000	OK
60 minute winter	HW9	42	3.062	0.062	1.9	0.0000	0.0000	OK
60 minute winter	3.001:50%	42	3.062	0.064	5.0	0.0000	0.0000	OK
60 minute winter	SW2	43	3.062	0.066	6.1	0.0000	0.0000	OK
15 minute winter	3.002:50%	13	3.066	0.077	33.2	0.0000	0.0000	OK
120 minute winter	SW3	88	3.045	0.062	8.5	0.0000	0.0000	OK
15 minute winter	PS4	10	3.050	0.075	8.6	0.0148	0.0000	OK
15 minute winter	PS5	11	3.003	0.108	17.1	0.1220	0.0000	OK
30 minute winter	HW4	23	2.800	0.200	13.0	0.2259	0.0000	OK
15 minute winter	PS6	10	3.003	0.073	7.3	0.0143	0.0000	OK
15 minute winter	PS7	10	2.979	0.099	14.5	0.1123	0.0000	OK
15 minute winter	11.001:50%	11	2.890	0.150	27.6	0.0000	0.0000	OK
15 minute winter	HW7	12	2.824	0.224	27.0	0.2528	0.0000	OK
15 minute winter	PS10	10	2.971	0.146	19.0	0.0285	0.0000	OK
15 minute winter	HW10	10	2.946	0.144	18.8	0.1629	0.0000	OK
30 minute winter	PS8	24	2.797	0.142	0.7	0.0279	0.0000	OK
30 minute winter	HW8	24	2.797	0.197	1.4	0.2230	0.0000	OK
30 minute winter	HW12	27	2.778	0.178	42.6	0.2541	0.0000	OK
15 minute winter	HW11	14	2.833	0.133	45.2	0.1906	0.0000	OK
30 minute winter	PS11	26	2.769	0.200	49.8	0.2856	0.0000	OK
30 minute winter	HW13	26	2.714	0.225	49.4	0.3217	0.0000	OK
2160 minute winter	SW6	1680	2.620	0.120	14.1	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	PS1	12.000	12.000:50%	0.0	0.000	0.000	0.0738	
15 minute winter	PS1	12.000	PS2	5.2	0.636	0.150	0.1497	
15 minute winter	PS2	12.001	PS3	5.2	0.371	0.150	0.4344	
30 minute winter	HW1	Flow through pond	HW12	27.5	0.108	0.118	44.6993	
15 minute winter	HW9	3.001	3.001:50%	-3.5	-0.068	-0.016	2.1784	
15 minute winter	HW9	3.001	SW2	4.2	0.081	0.019	2.2534	
15 minute winter	SW2	3.002	3.002:50%	-9.8	-0.095	-0.045	7.2028	
60 minute winter	SW2	3.002	SW3	10.0	0.096	0.046	7.3937	
120 minute winter	SW3	3.003	SW4	6.6	0.100	0.030	3.3488	
15 minute winter	PS4	8.000	PS5	8.5	0.567	0.246	0.2698	
15 minute winter	PS5	8.001	HW4	16.6	0.728	0.474	1.7007	
30 minute winter	HW4	Flow through pond	HW12	27.5	0.108	0.118	44.6993	
15 minute winter	PS6	11.000	PS7	7.2	0.515	0.209	0.1580	
15 minute winter	PS7	11.001	11.001:50%	14.1	0.639	0.410	0.7073	
15 minute winter	PS7	11.001	HW7	27.0	0.801	0.782	1.0622	
30 minute winter	HW7	Flow through pond	HW12	27.5	0.108	0.118	44.6993	
15 minute winter	PS10	20.000	HW10	18.8	0.700	0.546	0.1321	
15 minute winter	HW10	Flow through pond	HW11	11.4	0.024	0.011	12.9667	
15 minute summer	PS8	19.000	HW8	-1.6	-0.142	-0.048	0.3542	
30 minute winter	HW8	Flow through pond	HW12	27.5	0.108	0.118	44.6993	
60 minute winter	HW12	10.000	PS11	29.3	0.565	0.285	0.6452	
15 minute winter	HW11	9.000	PS11	28.3	0.779	0.275	1.8695	
30 minute winter	PS11	9.001	HW13	49.4	0.769	0.481	1.9176	
180 minute winter	HW13	Flow through pond	SW6	85.1	0.057	0.023	593.4859	
2160 minute winter	SW6	7.000	Hydrobrake	6.6	0.040	0.041	15.3866	

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.34%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute winter	Hydrobrake	1680	2.616	0.125	6.6	0.2217	0.0000	OK
15 minute winter	O1	10	2.753	0.148	32.8	0.2119	0.0000	OK
15 minute winter	HW14	11	2.664	0.164	32.2	0.2342	0.0000	OK
15 minute winter	O2	10	2.778	0.182	49.2	0.2600	0.0000	OK
15 minute winter	HW15	11	2.701	0.191	48.2	0.2739	0.0000	OK
15 minute winter	O3	10	2.775	0.175	46.3	0.2504	0.0000	OK
15 minute winter	HW16	11	2.695	0.184	45.4	0.2633	0.0000	OK
15 minute winter	PS12	12	2.958	0.115	6.7	0.2035	0.0000	OK
15 minute winter	4.000:50%	11	2.955	0.203	67.1	0.0000	0.0000	OK
15 minute winter	O4	11	2.978	0.278	85.9	0.3976	0.0000	OK
15 minute winter	O5	11	2.932	0.232	8.9	0.2620	0.0000	OK
15 minute winter	PS13	11	2.930	0.353	148.3	0.6235	0.0000	OK
15 minute winter	HW17	12	2.864	0.363	143.2	0.6407	0.0000	OK
60 minute winter	SW5	42	3.131	0.138	20.6	0.0000	0.0000	OK
15 minute winter	1.001:50%	12	3.147	0.160	84.7	1.2454	0.0000	OK
30 minute winter	HW18	22	3.108	0.128	29.1	0.0000	0.0000	OK
30 minute winter	PS14	23	2.853	0.243	29.4	0.3483	0.0000	OK
15 minute winter	06	10	2.878	0.078	8.9	0.0886	0.0000	OK
30 minute winter	HW19	24	2.731	0.209	28.8	0.2988	0.0000	OK
60 minute winter	PS9	42	3.062	0.037	0.1	0.0073	0.0000	OK
30 minute winter	PS3	24	2.798	0.176	8.9	0.0346	0.0000	OK
15 minute winter	HW5	10	2.804	0.104	22.2	0.1180	0.0000	OK
30 minute winter	HW6	24	2.799	0.274	17.0	0.3103	0.0000	OK
30 minute winter	HW2	24	3.115	0.119	5.2	0.0000	0.0000	OK
15 minute winter	13.001:50%	11	3.299	0.502	23.7	0.0000	0.0000	SURCHARGED

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2160 minute winter	Hydrobrake	Hydro-Brake®	HW20	6.6				516.7
15 minute winter	O1	15.000	HW14	32.2	0.761	0.314	1.6826	
180 minute winter	HW14	Flow through pond	SW6	85.1	0.057	0.023	593.4859	
15 minute winter	O2	16.000	HW15	48.2	0.791	0.318	2.3688	
180 minute winter	HW15	Flow through pond	SW6	85.1	0.057	0.023	593.4859	
15 minute winter	O3	14.000	HW16	45.4	0.785	0.300	2.3211	
180 minute winter	HW16	Flow through pond	SW6	85.1	0.057	0.023	593.4859	
15 minute summer	PS12	4.000	4.000:50%	-8.0	-0.230	-0.038	2.5132	
15 minute winter	PS12	4.000	PS13	58.7	0.696	0.279	4.5114	
15 minute winter	O4	5.000	PS13	84.3	1.013	0.716	1.7485	
15 minute winter	O5	6.000	PS13	8.3	0.406	0.130	0.5804	
15 minute winter	PS13	4.001	HW17	143.2	0.919	0.682	6.2525	
180 minute winter	HW17	Flow through pond	SW6	85.1	0.057	0.023	593.4859	
15 minute winter	SW5	1.001	1.001:50%	-32.3	-0.190	-0.202	12.2509	
15 minute winter	SW5	1.001	HW18	35.8	0.204	0.224	12.5439	
30 minute winter	HW18	1.002	PS14	25.1	0.407	0.176	1.2696	
30 minute winter	PS14	1.003	HW19	28.8	0.368	0.576	3.1650	
15 minute winter	06	2.000	PS14	8.8	0.647	0.137	0.1332	
180 minute winter	HW19	Flow through pond	SW6	85.1	0.057	0.023	593.4859	
15 minute winter	PS9	3.000	HW9	-0.2	-0.092	-0.011	0.0135	
15 minute winter	PS3	12.002	HW1	10.2	0.566	0.242	0.1088	
15 minute winter	HW5	18.000	HW6	22.0	0.762	0.445	0.5517	
30 minute winter	HW6	Flow through pond	HW12	27.5	0.108	0.118	44.6993	
15 minute winter	HW2	13.001	13.001:50%	-8.4	-0.533	-1.028	0.1539	
15 minute winter	HW2	13.001	HW3	14.5	0.854	1.782	0.1518	15.7

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.34%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	HW3	11	2.711	0.112	14.5	0.0000	0.0000	OK
30 minute winter	SW1	23	3.115	0.115	3.6	0.0000	0.0000	OK
30 minute winter	13.000:50%	24	3.115	0.117	10.0	0.0000	0.0000	OK
120 minute winter	SW4	88	2.852	0.049	6.6	0.0000	0.0000	OK
15 minute summer	HW20	1	2.472	0.000	1.4	0.0000	0.0000	OK
30 minute winter	SW5a	26	3.132	0.132	17.7	0.0000	0.0000	OK
15 minute winter	OA	10	2.975	0.325	138.4	0.4646	0.0000	OK
15 minute winter	HW4a	10	2.862	0.260	137.3	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SW1	13.000	13.000:50%	-6.9	-0.099	-0.043	3.0804	
15 minute summer	SW1	13.000	HW2	5.3	0.075	0.033	2.6998	
15 minute winter	SW4	Flow through pond	HW11	11.4	0.024	0.011	12.9667	
15 minute winter	SW5a	1.000	SW5	-18.1	-0.149	-0.113	11.1419	
15 minute winter	OA	17.000	HW4a	137.3	1.261	0.907	2.3222	63.9

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Results for 10 year Critical Storm Duration. Lowest mass balance: 99.34%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	PS1	1	2.875	0.000	0.0	0.0000	0.0000	OK
15 minute winter	12.000:50%	10	2.867	0.073	7.9	0.0000	0.0000	OK
30 minute winter	PS2	24	2.854	0.141	6.0	0.0277	0.0000	OK
30 minute winter	HW1	25	2.856	0.256	11.3	0.0000	0.0000	OK
30 minute winter	HW9	24	3.085	0.085	4.7	0.0000	0.0000	OK
30 minute winter	3.001:50%	25	3.085	0.087	11.6	0.0000	0.0000	OK
30 minute winter	SW2	24	3.084	0.088	16.2	0.0000	0.0000	OK
15 minute winter	3.002:50%	13	3.087	0.098	49.6	0.0000	0.0000	OK
60 minute winter	SW3	50	3.063	0.080	17.1	0.0000	0.0000	OK
15 minute winter	PS4	10	3.071	0.096	12.8	0.0188	0.0000	OK
15 minute winter	PS5	11	3.033	0.138	25.4	0.1561	0.0000	OK
30 minute winter	HW4	22	2.857	0.257	19.4	0.2910	0.0000	OK
15 minute winter	PS6	12	3.082	0.152	10.9	0.0299	0.0000	OK
15 minute winter	PS7	12	3.079	0.199	21.5	0.2255	0.0000	OK
15 minute winter	11.001:50%	12	3.044	0.304	37.8	0.0000	0.0000	SURCHARGED
15 minute winter	HW7	13	2.899	0.299	35.6	0.3380	0.0000	OK
15 minute winter	PS10	10	3.023	0.198	28.4	0.0387	0.0000	OK
15 minute winter	HW10	10	2.992	0.190	28.2	0.2148	0.0000	OK
30 minute winter	PS8	25	2.849	0.194	0.9	0.0380	0.0000	OK
30 minute winter	HW8	26	2.849	0.249	2.7	0.2812	0.0000	OK
30 minute winter	HW12	27	2.836	0.236	69.3	0.3381	0.0000	OK
15 minute winter	HW11	14	2.857	0.157	67.6	0.2244	0.0000	OK
30 minute winter	PS11	27	2.827	0.258	69.5	0.3685	0.0000	OK
60 minute winter	HW13	45	2.772	0.283	67.9	0.4048	0.0000	OK
2160 minute winter	SW6	1680	2.659	0.159	19.7	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	PS1	12.000	12.000:50%	0.0	0.000	0.000	0.0991	
15 minute winter	PS1	12.000	PS2	7.7	0.707	0.224	0.2661	
15 minute winter	PS2	12.001	PS3	7.2	0.385	0.209	0.6304	
15 minute winter	HW1	Flow through pond	HW12	45.4	0.138	0.196	58.0002	
15 minute winter	HW9	3.001	3.001:50%	-5.1	-0.078	-0.024	3.2738	
15 minute winter	HW9	3.001	SW2	6.5	0.097	0.030	3.3538	
15 minute winter	SW2	3.002	3.002:50%	-16.9	-0.121	-0.077	10.0002	
60 minute winter	SW2	3.002	SW3	17.1	0.117	0.078	10.2134	
60 minute winter	SW3	3.003	SW4	11.6	0.130	0.053	4.5158	
15 minute winter	PS4	8.000	PS5	12.6	0.617	0.366	0.3688	
15 minute winter	PS5	8.001	HW4	24.7	0.781	0.709	2.1158	
15 minute winter	HW4	Flow through pond	HW12	45.4	0.138	0.196	58.0002	
15 minute winter	PS6	11.000	PS7	10.6	0.551	0.307	0.3713	
15 minute summer	PS7	11.001	11.001:50%	19.4	0.663	0.562	1.1154	
15 minute winter	PS7	11.001	HW7	35.6	0.895	1.032	1.2524	
15 minute winter	HW7	Flow through pond	HW12	45.4	0.138	0.196	58.0002	
15 minute winter	PS10	20.000	HW10	28.2	0.776	0.817	0.1782	
30 minute winter	HW10	Flow through pond	HW11	18.8	0.029	0.018	22.2980	
15 minute summer	PS8	19.000	HW8	-2.0	-0.164	-0.058	0.4652	
15 minute winter	HW8	Flow through pond	HW12	45.4	0.138	0.196	58.0002	
60 minute winter	HW12	10.000	PS11	37.3	0.562	0.364	0.8988	
15 minute winter	HW11	9.000	PS11	38.0	0.788	0.370	2.5364	
30 minute winter	PS11	9.001	HW13	69.2	0.817	0.674	2.5327	
120 minute winter	HW13	Flow through pond	SW6	146.2	0.075	0.040	782.2388	
960 minute winter	SW6	7.000	Hydrobrake	8.0	0.043	0.050	21.6836	

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Results for 10 year Critical Storm Duration. Lowest mass balance: 99.34%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute winter	Hydrobrake	1680	2.657	0.166	8.0	0.2939	0.0000	OK
15 minute winter	O1	10	2.794	0.189	49.1	0.2699	0.0000	OK
15 minute winter	HW14	11	2.712	0.212	48.1	0.3040	0.0000	OK
15 minute winter	O2	10	2.829	0.233	73.6	0.3333	0.0000	OK
15 minute winter	HW15	11	2.759	0.249	71.9	0.3569	0.0000	OK
15 minute winter	O3	10	2.823	0.223	69.3	0.3193	0.0000	OK
15 minute winter	HW16	11	2.751	0.240	67.7	0.3431	0.0000	OK
15 minute winter	PS12	12	3.075	0.232	12.7	0.4094	0.0000	OK
15 minute winter	4.000:50%	12	3.071	0.319	100.3	0.0000	0.0000	OK
15 minute winter	O4	11	3.109	0.409	128.6	0.5849	0.0000	FLOOD RISK
15 minute winter	O5	12	3.047	0.347	13.4	0.3920	0.0000	SURCHARGED
15 minute winter	PS13	12	3.045	0.468	208.2	0.8275	0.0000	OK
15 minute winter	HW17	12	2.960	0.459	203.4	0.8119	0.0000	OK
30 minute winter	SW5	24	3.171	0.178	48.0	0.0000	0.0000	OK
15 minute winter	1.001:50%	12	3.181	0.194	126.7	1.8338	0.0000	OK
15 minute winter	HW18	14	3.145	0.165	54.3	0.0000	0.0000	OK
30 minute winter	PS14	23	2.932	0.322	45.6	0.4608	0.0000	OK
30 minute winter	06	23	2.932	0.132	10.2	0.1495	0.0000	OK
30 minute winter	HW19	24	2.838	0.316	43.6	0.4517	0.0000	OK
30 minute winter	PS9	24	3.085	0.060	0.2	0.0118	0.0000	OK
30 minute winter	PS3	24	2.852	0.230	12.2	0.0452	0.0000	SURCHARGED
15 minute winter	HW5	11	2.866	0.166	33.3	0.1876	0.0000	OK
30 minute winter	HW6	23	2.851	0.326	24.5	0.3687	0.0000	OK
30 minute winter	HW2	25	3.188	0.192	10.2	0.0000	0.0000	SURCHARGED
15 minute winter	13.001:50%	12	3.405	0.608	35.5	1.5297	0.0000	PONDING

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2160 minute winter	Hydrobrake	Hydro-Brake®	HW20	7.9				672.1
15 minute winter	O1	15.000	HW14	48.1	0.816	0.468	2.3364	
120 minute winter	HW14	Flow through pond	SW6	146.2	0.075	0.040	782.2388	
15 minute winter	O2	16.000	HW15	71.9	0.845	0.475	3.3120	
120 minute winter	HW15	Flow through pond	SW6	146.2	0.075	0.040	782.2388	
15 minute winter	O3	14.000	HW16	67.7	0.839	0.447	3.2442	
120 minute winter	HW16	Flow through pond	SW6	146.2	0.075	0.040	782.2388	
15 minute winter	PS12	4.000	4.000:50%	-12.7	-0.232	-0.061	5.4823	
15 minute winter	PS12	4.000	PS13	88.8	0.701	0.423	7.3398	
15 minute winter	O4	5.000	PS13	126.7	1.081	1.075	2.3533	
15 minute winter	O5	6.000	PS13	12.5	0.424	0.196	0.6623	
15 minute winter	PS13	4.001	HW17	203.4	1.015	0.968	8.0881	
120 minute winter	HW17	Flow through pond	SW6	146.2	0.075	0.040	782.2388	
15 minute winter	SW5	1.001	1.001:50%	-49.7	-0.222	-0.311	16.8023	
15 minute winter	SW5	1.001	HW18	54.3	0.236	0.339	17.0842	
15 minute winter	HW18	1.002	PS14	40.7	0.480	0.285	1.7361	
15 minute winter	PS14	1.003	HW19	43.8	0.419	0.877	4.6214	
15 minute winter	06	2.000	PS14	13.2	0.722	0.207	0.3243	
120 minute winter	HW19	Flow through pond	SW6	146.2	0.075	0.040	782.2388	
15 minute summer	PS9	3.000	HW9	-0.3	-0.125	-0.023	0.0213	
15 minute winter	PS3	12.002	HW1	15.5	0.584	0.365	0.1290	
15 minute winter	HW5	18.000	HW6	31.8	0.879	0.644	0.6866	
15 minute winter	HW6	Flow through pond	HW12	45.4	0.138	0.196	58.0002	
15 minute summer	HW2	13.001	13.001:50%	-10.5	-0.656	-1.289	0.1686	
15 minute winter	HW2	13.001	HW3	15.7	0.917	1.931	0.1544	23.5

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Results for 10 year Critical Storm Duration. Lowest mass balance: 99.34%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	HW3	12	2.715	0.116	15.7	0.0000	0.0000	OK
30 minute winter	SW1	25	3.187	0.187	5.7	0.0000	0.0000	OK
30 minute winter	13.000:50%	25	3.188	0.190	16.8	0.0000	0.0000	OK
60 minute winter	SW4	49	2.878	0.076	11.6	0.0000	0.0000	OK
15 minute summer	HW20	1	2.472	0.000	2.4	0.0000	0.0000	OK
30 minute winter	SW5a	24	3.174	0.174	27.7	0.0000	0.0000	OK
15 minute winter	OA	10	3.086	0.436	207.2	0.6244	0.0000	OK
15 minute winter	HW4a	10	2.922	0.320	205.7	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SW1	13.000	13.000:50%	-9.8	-0.113	-0.061	4.8269	
15 minute winter	SW1	13.000	HW2	8.9	0.075	0.055	5.6244	
30 minute winter	SW4	Flow through pond	HW11	18.8	0.029	0.018	22.2980	
15 minute winter	SW5a	1.000	SW5	-32.3	-0.187	-0.202	16.7979	
15 minute winter	OA	17.000	HW4a	205.7	1.447	1.359	2.9684	95.7

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.34%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	PS1	23	2.891	0.016	0.5	0.0031	0.0000	OK
30 minute winter	12.000:50%	25	2.890	0.096	7.7	0.0000	0.0000	OK
30 minute winter	PS2	24	2.890	0.177	7.7	0.0347	0.0000	OK
30 minute winter	HW1	27	2.892	0.292	14.9	0.0000	0.0000	OK
30 minute winter	HW9	24	3.102	0.102	6.2	0.0000	0.0000	OK
30 minute winter	3.001:50%	24	3.102	0.104	15.4	0.0000	0.0000	OK
30 minute winter	SW2	23	3.101	0.105	19.3	0.0000	0.0000	OK
15 minute winter	3.002:50%	12	3.102	0.113	63.0	0.0000	0.0000	OK
60 minute winter	SW3	48	3.078	0.095	23.6	0.0000	0.0000	OK
15 minute winter	PS4	10	3.089	0.114	16.3	0.0224	0.0000	OK
15 minute winter	PS5	11	3.062	0.167	32.3	0.1886	0.0000	OK
15 minute winter	HW4	13	2.908	0.308	30.6	0.3481	0.0000	OK
15 minute winter	PS6	11	3.354	0.424	13.8	0.0831	0.0000	FLOOD RISK
15 minute winter	PS7	11	3.343	0.463	25.5	0.5241	0.0000	FLOOD RISK
15 minute winter	11.001:50%	11	3.269	0.529	47.9	0.0000	0.0000	SURCHARGED
15 minute winter	HW7	12	2.999	0.399	47.0	0.4514	0.0000	OK
15 minute winter	PS10	10	3.070	0.245	36.0	0.0481	0.0000	FLOOD RISK
15 minute winter	HW10	10	3.026	0.224	35.7	0.2535	0.0000	OK
30 minute winter	PS8	25	2.888	0.233	1.0	0.0457	0.0000	SURCHARGED
30 minute winter	HW8	26	2.889	0.289	2.1	0.3264	0.0000	OK
30 minute winter	HW12	26	2.878	0.278	92.1	0.3974	0.0000	OK
60 minute winter	HW11	47	2.884	0.184	50.8	0.2635	0.0000	OK
30 minute winter	PS11	26	2.865	0.296	81.6	0.4235	0.0000	OK
60 minute winter	HW13	46	2.807	0.318	80.1	0.4544	0.0000	OK
1440 minute winter	SW6	1380	2.697	0.197	31.9	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	PS1	12.000	12.000:50%	-0.5	-0.067	-0.013	0.1573	
15 minute winter	PS1	12.000	PS2	9.9	0.742	0.287	0.3978	
15 minute winter	PS2	12.001	PS3	8.0	0.394	0.232	0.7178	
15 minute winter	HW1	Flow through pond	HW12	62.3	0.155	0.268	73.0060	
30 minute summer	HW9	3.001	3.001:50%	-6.3	-0.051	-0.029	4.2138	
15 minute winter	HW9	3.001	SW2	8.1	0.105	0.037	4.2077	
15 minute winter	SW2	3.002	3.002:50%	-23.3	-0.138	-0.107	12.1796	
30 minute winter	SW2	3.002	SW3	23.9	0.157	0.110	11.6950	
60 minute winter	SW3	3.003	SW4	17.0	0.156	0.078	5.5531	
15 minute winter	PS4	8.000	PS5	16.0	0.640	0.463	0.4601	
15 minute winter	PS5	8.001	HW4	30.6	0.812	0.877	2.3109	
15 minute winter	HW4	Flow through pond	HW12	62.3	0.155	0.268	73.0060	
15 minute summer	PS6	11.000	PS7	12.1	0.561	0.351	0.4484	
15 minute winter	PS7	11.001	11.001:50%	24.1	0.668	0.700	1.2524	
15 minute winter	PS7	11.001	HW7	47.0	1.181	1.361	1.2524	
15 minute winter	HW7	Flow through pond	HW12	62.3	0.155	0.268	73.0060	
15 minute winter	PS10	20.000	HW10	35.7	0.899	1.036	0.1952	
30 minute winter	HW10	Flow through pond	HW11	24.6	0.029	0.024	32.7696	
15 minute winter	PS8	19.000	HW8	-2.1	-0.171	-0.062	0.5139	
15 minute winter	HW8	Flow through pond	HW12	62.3	0.155	0.268	73.0060	
30 minute winter	HW12	10.000	PS11	48.1	0.551	0.469	1.0645	
15 minute winter	HW11	9.000	PS11	45.0	0.804	0.438	3.0197	
30 minute winter	PS11	9.001	HW13	81.3	0.848	0.792	2.8693	
120 minute winter	HW13	Flow through pond	SW6	199.3	0.085	0.054	1004.6227	
120 minute winter	SW6	7.000	Hydrobrake	9.8	0.084	0.061	18.8024	

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.34%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	Hydrobrake	1380	2.696	0.205	8.3	0.3616	0.0000	OK
15 minute winter	O1	10	2.826	0.221	62.3	0.3167	0.0000	OK
15 minute winter	HW14	11	2.748	0.248	60.8	0.3549	0.0000	OK
15 minute winter	O2	10	2.870	0.274	93.3	0.3921	0.0000	OK
15 minute winter	HW15	11	2.802	0.292	91.0	0.4174	0.0000	OK
15 minute winter	O3	10	2.861	0.261	87.8	0.3741	0.0000	OK
15 minute winter	HW16	11	2.791	0.280	85.7	0.4012	0.0000	OK
15 minute winter	PS12	12	3.250	0.407	25.3	0.7186	0.0000	OK
15 minute winter	4.000:50%	12	3.238	0.486	127.2	0.0000	0.0000	OK
15 minute winter	O4	11	3.303	0.603	163.2	0.8625	0.0000	FLOOD RISK
15 minute winter	O5	12	3.206	0.506	17.0	0.5725	0.0000	FLOOD RISK
15 minute winter	PS13	12	3.205	0.628	249.4	1.1094	0.0000	SURCHARGED
15 minute winter	HW17	12	3.068	0.567	246.5	1.0027	0.0000	OK
30 minute winter	SW5	24	3.202	0.209	61.6	0.0000	0.0000	OK
15 minute winter	1.001:50%	12	3.204	0.218	160.8	2.3063	0.0000	OK
15 minute winter	HW18	14	3.170	0.190	69.8	0.0000	0.0000	OK
30 minute winter	PS14	26	3.090	0.480	58.9	0.6873	0.0000	SURCHARGED
30 minute winter	06	26	3.090	0.290	13.0	0.3284	0.0000	OK
30 minute winter	HW19	27	2.976	0.454	54.9	0.6496	0.0000	OK
30 minute winter	PS9	24	3.103	0.078	0.3	0.0152	0.0000	OK
30 minute winter	PS3	25	2.890	0.268	15.5	0.0526	0.0000	SURCHARGED
15 minute winter	HW5	11	2.991	0.291	42.2	0.3295	0.0000	SURCHARGED
30 minute winter	HW6	24	2.891	0.366	31.6	0.4136	0.0000	OK
30 minute winter	HW2	27	3.244	0.248	10.4	0.0000	0.0000	FLOOD RISK
15 minute winter	13.001:50%	13	3.409	0.611	45.0	4.3045	0.0000	PONDING

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	Hydrobrake	Hydro-Brake®	HW20	8.0				505.3
15 minute winter	O1	15.000	HW14	60.8	0.851	0.592	2.8343	
120 minute winter	HW14	Flow through pond	SW6	199.3	0.085	0.054	1004.6227	
15 minute winter	O2	16.000	HW15	91.0	0.879	0.602	4.0257	
120 minute winter	HW15	Flow through pond	SW6	199.3	0.085	0.054	1004.6227	
15 minute winter	O3	14.000	HW16	85.7	0.872	0.566	3.9467	
120 minute winter	HW16	Flow through pond	SW6	199.3	0.085	0.054	1004.6227	
15 minute winter	PS12	4.000	4.000:50%	-25.3	0.242	-0.120	9.2925	
15 minute winter	PS12	4.000	PS13	115.0	0.702	0.547	10.1668	
15 minute winter	O4	5.000	PS13	160.8	1.284	1.365	2.3617	
15 minute winter	O5	6.000	PS13	15.6	0.399	0.244	0.6623	
15 minute winter	PS13	4.001	HW17	246.5	1.141	1.174	8.6536	
120 minute winter	HW17	Flow through pond	SW6	199.3	0.085	0.054	1004.6227	
15 minute winter	SW5	1.001	1.001:50%	-64.2	-0.241	-0.401	20.2088	
15 minute winter	SW5	1.001	HW18	69.8	0.255	0.436	20.5136	
15 minute winter	HW18	1.002	PS14	52.8	0.510	0.370	2.1757	
30 minute winter	PS14	1.003	HW19	54.9	0.417	1.100	6.3032	
15 minute winter	06	2.000	PS14	16.8	0.771	0.263	0.5893	
120 minute winter	HW19	Flow through pond	SW6	199.3	0.085	0.054	1004.6227	
15 minute summer	PS9	3.000	HW9	-0.5	-0.173	-0.032	0.0298	
15 minute winter	PS3	12.002	HW1	17.9	0.597	0.424	0.1299	
15 minute winter	HW5	18.000	HW6	41.4	1.041	0.837	0.7675	
15 minute winter	HW6	Flow through pond	HW12	62.3	0.155	0.268	73.0060	
15 minute summer	HW2	13.001	13.001:50%	-10.5	-0.653	-1.292	0.1686	
15 minute winter	HW2	13.001	HW3	15.8	0.919	1.936	0.1545	29.7

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Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	HW3	13	2.715	0.116	15.8	0.0000	0.0000	OK
30 minute winter	SW1	27	3.246	0.246	6.6	0.0000	0.0000	OK
30 minute winter	13.000:50%	27	3.245	0.247	19.0	0.0000	0.0000	OK
60 minute winter	SW4	48	2.912	0.110	17.0	0.0000	0.0000	OK
15 minute summer	HW20	1	2.472	0.000	3.2	0.0000	0.0000	OK
30 minute winter	SW5a	24	3.204	0.204	34.6	0.0000	0.0000	OK
15 minute winter	OA	10	3.194	0.544	262.8	0.7778	0.0000	FLOOD RISK
15 minute winter	HW4a	10	2.961	0.359	261.7	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SW1	13.000	13.000:50%	-11.0	-0.125	-0.069	6.4947	
15 minute summer	SW1	13.000	HW2	10.0	0.077	0.063	6.5487	
30 minute winter	SW4	Flow through pond	HW11	24.6	0.029	0.024	32.7696	
15 minute winter	SW5a	1.000	SW5	-43.7	-0.209	-0.273	21.1573	
15 minute winter	OA	17.000	HW4a	261.7	1.683	1.729	3.1453	121.4

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.34%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	PS1	24	2.943	0.068	1.5	0.0133	0.0000	OK
30 minute winter	12.000:50%	25	2.943	0.149	10.1	0.0000	0.0000	OK
30 minute winter	PS2	24	2.943	0.230	9.8	0.0450	0.0000	SURCHARGED
30 minute winter	HW1	26	2.943	0.343	19.4	0.0000	0.0000	OK
30 minute winter	HW9	23	3.124	0.124	7.8	0.0000	0.0000	OK
30 minute winter	3.001:50%	23	3.124	0.126	19.7	0.0000	0.0000	OK
30 minute winter	SW2	23	3.123	0.127	23.7	0.0000	0.0000	OK
15 minute winter	3.002:50%	12	3.120	0.130	81.6	0.0000	0.0000	OK
60 minute winter	SW3	46	3.096	0.113	33.0	0.0000	0.0000	OK
15 minute winter	PS4	11	3.365	0.390	21.1	0.0764	0.0000	FLOOD RISK
15 minute winter	PS5	11	3.335	0.440	38.8	0.4979	0.0000	FLOOD RISK
15 minute winter	HW4	12	2.978	0.378	37.5	0.4271	0.0000	OK
15 minute winter	PS6	10	3.500	0.570	18.0	0.1117	1.1454	FLOOD
15 minute summer	PS7	10	3.499	0.619	29.5	0.7000	0.1938	FLOOD
15 minute winter	11.001:50%	12	3.404	0.664	60.3	0.7420	0.0000	PONDING
30 minute winter	HW7	20	3.086	0.486	50.0	0.5499	0.0000	OK
15 minute winter	PS10	10	3.154	0.329	46.6	0.0645	0.0000	FLOOD RISK
15 minute winter	HW10	10	3.078	0.276	46.2	0.3123	0.0000	OK
30 minute winter	PS8	25	2.939	0.284	1.0	0.0557	0.0000	SURCHARGED
30 minute winter	HW8	25	2.938	0.338	2.3	0.3827	0.0000	OK
60 minute winter	HW12	45	2.932	0.332	92.2	0.4757	0.0000	OK
60 minute winter	HW11	48	2.941	0.241	63.6	0.3453	0.0000	OK
60 minute winter	PS11	46	2.918	0.349	99.8	0.4998	0.0000	OK
60 minute winter	HW13	46	2.837	0.348	99.7	0.4980	0.0000	OK
1440 minute winter	SW6	1410	2.751	0.251	39.8	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	PS1	12.000	12.000:50%	-1.5	-0.133	-0.044	0.3463	
15 minute winter	PS1	12.000	PS2	12.5	0.759	0.364	0.5602	
15 minute winter	PS2	12.001	PS3	10.1	0.406	0.294	0.7962	
15 minute winter	HW1	Flow through pond	HW12	80.6	0.165	0.347	93.3555	
30 minute summer	HW9	3.001	3.001:50%	-8.6	-0.050	-0.040	5.3417	
15 minute winter	HW9	3.001	SW2	10.3	0.115	0.047	5.3117	
15 minute winter	SW2	3.002	3.002:50%	-31.4	-0.155	-0.144	15.1571	
30 minute winter	SW2	3.002	SW3	35.7	0.179	0.164	14.6798	
60 minute winter	SW3	3.003	SW4	25.5	0.189	0.117	6.9246	
15 minute winter	PS4	8.000	PS5	18.9	0.654	0.547	0.7122	
15 minute winter	PS5	8.001	HW4	37.5	0.942	1.074	2.5772	
15 minute winter	HW4	Flow through pond	HW12	80.6	0.165	0.347	93.3555	
15 minute winter	PS6	11.000	PS7	13.1	0.557	0.380	0.4484	
15 minute winter	PS7	11.001	11.001:50%	27.2	0.683	0.787	1.2524	
15 minute summer	PS7	11.001	HW7	54.1	1.360	1.569	1.2524	
15 minute winter	HW7	Flow through pond	HW12	80.6	0.165	0.347	93.3555	
15 minute winter	PS10	20.000	HW10	46.2	1.162	1.340	0.1954	
30 minute winter	HW10	Flow through pond	HW11	32.6	0.029	0.032	54.0566	
15 minute winter	PS8	19.000	HW8	-2.1	-0.190	-0.062	0.5172	
15 minute winter	HW8	Flow through pond	HW12	80.6	0.165	0.347	93.3555	
30 minute winter	HW12	10.000	PS11	63.0	0.601	0.613	1.2323	
15 minute winter	HW11	9.000	PS11	53.0	0.803	0.516	3.6120	
60 minute winter	PS11	9.001	HW13	99.7	0.931	0.971	3.1925	
120 minute winter	HW13	Flow through pond	SW6	268.8	0.097	0.073	1324.9286	
120 minute winter	SW6	7.000	Hydrobrake	13.5	0.096	0.084	25.9924	

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.34%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	Hydrobrake	1410	2.750	0.259	8.6	0.4581	0.0000	SURCHARGED
15 minute winter	O1	10	2.875	0.270	80.7	0.3861	0.0000	OK
15 minute winter	HW14	11	2.794	0.294	78.6	0.4207	0.0000	OK
15 minute winter	O2	10	2.930	0.334	121.1	0.4777	0.0000	OK
15 minute winter	HW15	11	2.856	0.346	118.1	0.4957	0.0000	OK
15 minute winter	O3	10	2.917	0.317	113.9	0.4529	0.0000	OK
15 minute winter	HW16	11	2.844	0.333	111.0	0.4763	0.0000	OK
15 minute winter	PS12	10	3.588	0.745	44.3	1.3157	0.0000	FLOOD RISK
15 minute winter	4.000:50%	10	3.540	0.788	175.6	0.0000	0.0000	SURCHARGED
15 minute winter	O4	9	3.350	0.650	211.7	0.9302	16.1136	FLOOD
15 minute winter	O5	10	3.345	0.645	22.0	0.7295	0.0000	FLOOD RISK
15 minute winter	PS13	10	3.349	0.772	292.7	1.3648	0.0000	FLOOD RISK
15 minute winter	HW17	10	3.145	0.644	277.8	1.1383	0.0000	OK
30 minute winter	SW5	25	3.247	0.254	81.2	0.0000	0.0000	OK
30 minute winter	1.001:50%	25	3.245	0.259	161.8	3.2525	0.0000	OK
30 minute winter	HW18	26	3.234	0.254	74.5	0.0000	0.0000	OK
60 minute winter	PS14	43	3.186	0.576	67.0	0.8245	0.0000	SURCHARGED
60 minute winter	06	43	3.186	0.386	11.4	0.4370	0.0000	SURCHARGED
60 minute winter	HW19	44	3.048	0.526	59.1	0.7532	0.0000	OK
30 minute winter	PS9	23	3.124	0.099	0.4	0.0195	0.0000	OK
30 minute winter	PS3	24	2.942	0.320	20.2	0.0627	0.0000	SURCHARGED
15 minute winter	HW5	11	3.155	0.455	54.7	0.5145	0.0000	SURCHARGED
30 minute winter	HW6	24	2.944	0.419	42.0	0.4738	0.0000	OK
60 minute winter	HW2	47	3.320	0.324	9.0	0.0000	0.0000	FLOOD RISK
15 minute winter	13.001:50%	14	3.413	0.615	58.3	8.8603	0.0000	PONDING

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
480 minute winter	Hydrobrake	Hydro-Brake®	HW20	8.0				237.0
15 minute winter	O1	15.000	HW14	78.6	0.894	0.766	3.4835	
120 minute winter	HW14	Flow through pond	SW6	268.8	0.097	0.073	1324.9286	
15 minute winter	O2	16.000	HW15	118.1	0.925	0.780	4.9400	
120 minute winter	HW15	Flow through pond	SW6	268.8	0.097	0.073	1324.9286	
15 minute winter	O3	14.000	HW16	111.0	0.914	0.733	4.8582	
120 minute winter	HW16	Flow through pond	SW6	268.8	0.097	0.073	1324.9286	
15 minute summer	PS12	4.000	4.000:50%	-47.5	-0.289	-0.226	10.0442	
15 minute winter	PS12	4.000	PS13	165.0	0.764	0.785	10.3415	
15 minute winter	O4	5.000	PS13	191.3	1.528	1.624	2.3617	
15 minute winter	O5	6.000	PS13	22.0	0.426	0.345	0.6623	
15 minute winter	PS13	4.001	HW17	277.8	1.286	1.322	8.6536	
120 minute winter	HW17	Flow through pond	SW6	268.8	0.097	0.073	1324.9286	
15 minute winter	SW5	1.001	1.001:50%	-83.7	-0.259	-0.522	25.2212	
15 minute winter	SW5	1.001	HW18	90.6	0.273	0.566	25.8933	
15 minute winter	HW18	1.002	PS14	64.9	0.531	0.455	2.4828	
15 minute winter	PS14	1.003	HW19	62.8	0.460	1.258	6.3038	
15 minute winter	06	2.000	PS14	21.0	0.803	0.329	0.6920	
120 minute winter	HW19	Flow through pond	SW6	268.8	0.097	0.073	1324.9286	
15 minute winter	PS9	3.000	HW9	-0.7	-0.191	-0.046	0.0458	
15 minute winter	PS3	12.002	HW1	24.1	0.609	0.568	0.1299	
15 minute winter	HW5	18.000	HW6	53.3	1.340	1.077	0.7675	
15 minute winter	HW6	Flow through pond	HW12	80.6	0.165	0.347	93.3555	
15 minute winter	HW2	13.001	13.001:50%	-10.5	-0.658	-1.294	0.1686	
15 minute winter	HW2	13.001	HW3	15.8	0.922	1.942	0.1546	38.6

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.34%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	HW3	14	2.715	0.116	15.8	0.0000	0.0000	OK
60 minute winter	SW1	46	3.319	0.319	5.6	0.0000	0.0000	OK
60 minute winter	13.000:50%	47	3.320	0.322	16.3	0.0000	0.0000	OK
60 minute winter	SW4	47	2.965	0.163	25.5	0.0000	0.0000	OK
15 minute summer	HW20	1	2.472	0.000	4.4	0.0000	0.0000	OK
30 minute winter	SW5a	24	3.248	0.248	42.6	0.0000	0.0000	OK
15 minute winter	OA	10	3.350	0.700	340.8	1.0017	0.2969	FLOOD
15 minute winter	HW4a	10	3.001	0.399	335.9	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SW1	13.000	13.000:50%	-12.2	-0.127	-0.076	9.7452	
30 minute winter	SW1	13.000	HW2	12.4	0.069	0.077	12.3632	
30 minute winter	SW4	Flow through pond	HW11	32.6	0.029	0.032	54.0566	
15 minute winter	SW5a	1.000	SW5	-60.4	-0.234	-0.377	27.7048	
15 minute winter	OA	17.000	HW4a	335.9	2.122	2.219	3.2819	157.4

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Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.34%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	PS1	45	3.032	0.157	1.4	0.0308	0.0000	OK
60 minute winter	12.000:50%	45	3.032	0.238	9.4	0.0000	0.0000	SURCHARGED
60 minute winter	PS2	45	3.032	0.319	7.7	0.0625	0.0000	SURCHARGED
60 minute winter	HW1	45	3.031	0.431	18.6	0.0000	0.0000	OK
30 minute winter	HW9	22	3.155	0.155	9.2	0.0000	0.0000	OK
30 minute winter	3.001:50%	22	3.155	0.157	24.6	0.0000	0.0000	OK
30 minute winter	SW2	22	3.154	0.158	30.9	0.0000	0.0000	OK
30 minute winter	3.002:50%	23	3.152	0.162	88.7	0.0000	0.0000	OK
60 minute winter	SW3	42	3.122	0.139	49.0	0.0000	0.0000	OK
15 minute winter	PS4	10	3.500	0.525	29.5	0.1029	2.1435	FLOOD
15 minute winter	PS5	10	3.490	0.595	46.6	0.6733	0.0000	FLOOD RISK
30 minute winter	HW4	21	3.074	0.474	40.8	0.5365	0.0000	OK
15 minute winter	PS6	9	3.500	0.570	25.1	0.1117	4.6610	FLOOD
15 minute summer	PS7	9	3.500	0.620	31.9	0.7012	0.3603	FLOOD
15 minute winter	11.001:50%	13	3.410	0.670	73.4	4.7039	0.0000	PONDING
30 minute winter	HW7	26	3.158	0.558	51.1	0.6305	0.0000	OK
15 minute winter	PS10	10	3.300	0.475	65.3	0.0931	0.6805	FLOOD
15 minute summer	HW10	10	3.179	0.377	58.7	0.4262	0.0000	OK
60 minute winter	PS8	46	3.027	0.372	0.6	0.0729	0.0000	SURCHARGED
60 minute winter	HW8	46	3.026	0.426	2.6	0.4824	0.0000	OK
60 minute winter	HW12	47	3.025	0.425	127.8	0.6089	0.0000	FLOOD RISK
60 minute winter	HW11	51	3.048	0.348	83.4	0.4973	0.0000	OK
60 minute winter	PS11	48	3.007	0.438	113.9	0.6269	0.0000	SURCHARGED
60 minute winter	HW13	47	2.883	0.394	114.0	0.5645	0.0000	OK
2160 minute winter	SW6	2100	2.852	0.352	39.6	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	PS1	12.000	12.000:50%	-2.9	-0.178	-0.084	0.6042	
15 minute winter	PS1	12.000	PS2	15.6	0.763	0.452	0.7255	
15 minute winter	PS2	12.001	PS3	13.0	0.412	0.376	0.8107	
15 minute winter	HW1	Flow through pond	HW12	96.8	0.168	0.416	124.7501	
15 minute winter	HW9	3.001	3.001:50%	-14.0	-0.100	-0.064	7.0744	
15 minute winter	HW9	3.001	SW2	17.1	0.125	0.078	7.1279	
15 minute winter	SW2	3.002	3.002:50%	-45.7	-0.179	-0.210	20.1355	
30 minute winter	SW2	3.002	SW3	57.4	0.209	0.264	19.6677	
60 minute winter	SW3	3.003	SW4	45.0	0.226	0.207	10.9234	
15 minute summer	PS4	8.000	PS5	21.7	0.689	0.629	0.7122	
15 minute summer	PS5	8.001	HW4	43.3	1.089	1.241	2.5772	
15 minute winter	HW4	Flow through pond	HW12	96.8	0.168	0.416	124.7501	
15 minute winter	PS6	11.000	PS7	13.5	0.560	0.391	0.4484	
15 minute winter	PS7	11.001	11.001:50%	27.2	0.684	0.789	1.2524	
15 minute summer	PS7	11.001	HW7	54.6	1.373	1.583	1.2524	
15 minute winter	HW7	Flow through pond	HW12	96.8	0.168	0.416	124.7501	
15 minute winter	PS10	20.000	HW10	59.3	1.492	1.720	0.1954	
30 minute winter	HW10	Flow through pond	HW11	46.7	0.028	0.046	92.8307	
15 minute winter	PS8	19.000	HW8	-2.6	-0.173	-0.079	0.5172	
15 minute winter	HW8	Flow through pond	HW12	96.8	0.168	0.416	124.7501	
60 minute summer	HW12	10.000	PS11	70.5	0.640	0.687	1.2985	
15 minute winter	HW11	9.000	PS11	62.9	0.804	0.612	4.3781	
60 minute winter	PS11	9.001	HW13	114.0	1.033	1.110	3.2909	
60 minute winter	HW13	Flow through pond	SW6	396.4	0.124	0.108	1536.8358	
60 minute winter	SW6	7.000	Hydrobrake	19.0	0.118	0.119	31.0799	

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Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.34%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute winter	Hydrobrake	2100	2.852	0.361	8.8	0.6375	0.0000	SURCHARGED
15 minute winter	O1	10	3.002	0.397	113.0	0.5686	0.0000	SURCHARGED
15 minute winter	HW14	10	2.862	0.362	110.2	0.5184	0.0000	OK
15 minute winter	O2	10	3.098	0.502	169.5	0.7186	0.0000	FLOOD RISK
15 minute winter	HW15	10	2.958	0.448	167.9	0.6411	0.0000	OK
15 minute winter	O3	10	3.030	0.430	159.5	0.6148	0.0000	OK
15 minute winter	HW16	11	2.926	0.415	156.7	0.5933	0.0000	OK
15 minute summer	PS12	9	3.600	0.757	65.7	1.3376	3.7596	FLOOD
15 minute winter	4.000:50%	9	3.565	0.813	231.1	0.0000	0.0000	SURCHARGED
15 minute winter	O4	8	3.350	0.650	296.4	0.9302	61.9485	FLOOD
15 minute winter	O5	9	3.393	0.693	30.8	0.7838	0.0000	FLOOD RISK
15 minute winter	PS13	9	3.385	0.808	289.8	1.4279	0.0000	FLOOD RISK
15 minute winter	HW17	9	3.205	0.704	290.0	1.2447	0.0000	OK
60 minute winter	SW5	46	3.332	0.339	56.6	0.0000	0.0000	OK
60 minute winter	1.001:50%	45	3.331	0.345	151.0	5.7793	0.0000	OK
60 minute winter	HW18	46	3.328	0.348	78.3	0.0000	0.0000	OK
60 minute winter	PS14	44	3.278	0.668	68.9	0.9565	0.0000	FLOOD RISK
60 minute winter	06	44	3.279	0.479	15.9	0.5415	0.0000	FLOOD RISK
60 minute winter	HW19	45	3.125	0.603	62.2	0.8623	0.0000	OK
30 minute winter	PS9	22	3.155	0.130	0.4	0.0255	0.0000	OK
60 minute winter	PS3	45	3.031	0.409	18.8	0.0802	0.0000	FLOOD RISK
15 minute winter	HW5	11	3.496	0.796	76.6	0.8999	0.0000	FLOOD RISK
60 minute winter	HW6	45	3.032	0.507	39.3	0.5729	0.0000	OK
60 minute winter	HW2	62	3.411	0.415	9.5	0.0000	0.0000	FLOOD RISK
15 minute winter	13.001:50%	15	3.418	0.621	81.6	17.8835	0.0000	PONDING

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	Hydrobrake	Hydro-Brake®	HW20	8.0				207.5
15 minute winter	O1	15.000	HW14	110.2	0.999	1.073	4.3259	
60 minute winter	HW14	Flow through pond	SW6	396.4	0.124	0.108	1536.8358	
15 minute winter	O2	16.000	HW15	167.9	1.060	1.110	6.1148	
60 minute winter	HW15	Flow through pond	SW6	396.4	0.124	0.108	1536.8358	
15 minute winter	O3	14.000	HW16	156.7	1.016	1.035	6.1453	
60 minute winter	HW16	Flow through pond	SW6	396.4	0.124	0.108	1536.8358	
30 minute summer	PS12	4.000	4.000:50%	-72.4	-0.341	-0.344	10.3415	
15 minute winter	PS12	4.000	PS13	224.7	1.040	1.070	10.3415	
15 minute summer	O4	5.000	PS13	209.4	1.673	1.778	2.3617	
15 minute winter	O5	6.000	PS13	33.1	0.470	0.519	0.6623	
15 minute winter	PS13	4.001	HW17	290.0	1.343	1.380	8.6536	
60 minute winter	HW17	Flow through pond	SW6	396.4	0.124	0.108	1536.8358	
15 minute winter	SW5	1.001	1.001:50%	-116.7	-0.286	-0.728	37.1423	
15 minute winter	SW5	1.001	HW18	124.5	0.301	0.777	37.4438	
15 minute summer	HW18	1.002	PS14	72.6	0.539	0.509	2.7105	
15 minute summer	PS14	1.003	HW19	70.3	0.487	1.408	6.3038	
15 minute winter	06	2.000	PS14	28.7	0.831	0.449	0.6920	
60 minute winter	HW19	Flow through pond	SW6	396.4	0.124	0.108	1536.8358	
15 minute winter	PS9	3.000	HW9	-0.8	-0.221	-0.052	0.0591	
15 minute summer	PS3	12.002	HW1	32.2	0.811	0.761	0.1299	
15 minute winter	HW5	18.000	HW6	74.4	1.872	1.505	0.7675	
15 minute winter	HW6	Flow through pond	HW12	96.8	0.168	0.416	124.7501	
60 minute winter	HW2	13.001	13.001:50%	10.6	0.601	1.300	0.1686	
15 minute winter	HW2	13.001	HW3	15.9	0.925	1.949	0.1547	54.3

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Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.34%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	HW3	15	2.716	0.117	15.9	0.0000	0.0000	OK
60 minute winter	SW1	62	3.411	0.411	6.7	0.0000	0.0000	OK
60 minute winter	13.000:50%	62	3.411	0.413	19.6	0.0000	0.0000	OK
60 minute winter	SW4	49	3.064	0.262	45.0	0.0000	0.0000	OK
15 minute summer	HW20	1	2.472	0.000	6.2	0.0000	0.0000	OK
60 minute winter	SW5a	45	3.332	0.332	20.1	0.0000	0.0000	OK
15 minute winter	OA	8	3.350	0.700	477.2	1.0017	26.4331	FLOOD
15 minute summer	HW4a	10	3.001	0.399	336.0	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SW1	13.000	13.000:50%	-13.4	-0.122	-0.083	11.9479	
30 minute summer	SW1	13.000	HW2	12.6	0.070	0.079	14.9629	
30 minute winter	SW4	Flow through pond	HW11	46.7	0.028	0.046	92.8307	
15 minute winter	SW5a	1.000	SW5	-89.4	-0.268	-0.558	40.4811	
15 minute summer	OA	17.000	HW4a	336.0	2.123	2.220	3.2820	175.8

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Appendix C – Anglian Water Asset Maps



digdat
Ordnance Survey © Crown Copyright, 100018507
There are no assets within this map area

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Date: 08/02/24

Scale: 1:1250

Map Centre: 527394,330909

Data updated: 31/01/24

Our Ref: 1391293 - 1

Wastewater Plan A0

This plan is provided by Anglian Water pursuant to obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water in respect of any error or inaccuracy or omission in the information provided including the following: the position of any public sewer, lateral drain, sewer or lateral drain or any other apparatus shown on the plan. This information is valid for the date printed. This plan is produced by Anglian Water from Ordnance Survey Limited (c) Crown copyright and database rights 2024 Ordnance Survey 100022432. This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

Foul Sewer		Outfall*	Sewage Treatment Works
Surface Sewer		Inlet*	Public Pumping Station
Combined Sewer		Manhole*	Decommissioned Pumping Station
Final Effluent			
Rising Main*			
Private Sewer*			
Decommissioned Sewer*			

*(Colour denotes effluent type)

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love every drop
anglianwater

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert



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Date: 10/02/24 | Scale: 1:1250 | Map Centre: 527352,329615 | Data updated: 31/01/24 | Our Ref: 1392406 - 1 | Wastewater Plan A0

This plan is provided by Anglian Water pursuant its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. This plan is produced by Anglian Water Services Limited (c) Crown copyright and database rights 2024 Ordnance Survey 100022432.This map is to be used for the purposes of viewing the location of Anglian Water plc assets only. Reproduction or modification of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

Foul Sewer	Outfall*	Sewage Treatment Works	
Surface Sewer			
Combined Sewer			
Final Effluent	Inlet*	Public Pumping Station	
Rising Main*			
Private Sewer*	Manhole*	Decommissioned Pumping Station	
Decommissioned Sewer*			

*(Colour denotes effluent type)

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Naylor Surfleet

love every drop
anglianwater

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert
2301	527272	329370	F	-	-	-
2302	527300	329387	F	-	-	-
2401	527260	329455	F	-	-	-
2402	527270	329433	F	-	-	-
2403	527280	329418	F	-	-	-
3400	527337	329421	F	-	-	-
3401	527350	329428	F	-	-	-
3402	527367	329435	F	-	-	-
3403	527392	329447	F	-	-	-
4400	527443	329469	F	-	-	-
4401	527455	329476	F	-	-	-

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert