LAND WEST OF FALCONER ROAD, HAVERHILL, CB9 7GB

FLOOD RISK ASSESSMENT & DRAINAGE STRATEGY

11/08/2023

Version 1.0

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Disclaimer

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Quality Control

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Revision History

Version	Date	Amendments	Issued to
1.0	11/08/2023		Mark Leivers

Contents

1.0 Introduction

RAB Consultants has prepared this Flood Risk Assessment (FRA) & Drainage Strategy (DS) in support of the proposed development located at Land West of Falconer Road, Haverhill, CB9 7GB.

The development site is located in Flood Zone 1 according to the Environment Agency's Flood Map for Planning (Rivers and Sea). A Flood Risk Assessment for this site is required under the Planning Practice Guidance for the National Planning Policy Framework (NPPF) as it is >1ha of area. The site-specific FRA is required to ensure that the development is safe from flooding and will not increase the risk of flooding elsewhere.

The Secretary of State for Communities and Local Government laid a Written Ministerial Statement in the House of Commons on 18th December 2014 setting out changes to planning that will apply for major development from 6 April 2015. Therefore, from 6 April 2015 local planning policies and decisions on planning applications relating to major development are required to ensure that sustainable drainage systems (SuDS) are used for the management of surface water. As the Lead Local Flood Authority, Suffolk County Council is required under Article 18 of the Town and Country Planning (Development Management Procedure) (England) Order 2015 (the Development Management Procedure Order) to provide consultation response on the surface water drainage provisions associated with major development.

Major development is defined within the Development Management Procedure Order as development that involves any one or more of the following:

1. the winning and working of minerals or the use of land for mineral working deposits;
2. waste development;
3. the provision of dwelling houses where:

3.1. the number of dwelling houses to be provided is 10 or more; or

3.2. the development is to be carried out on a site having an area of 0.5 hectares or more and it is not known whether the development falls within sub-paragraph 3.1;

4. the provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more; or
5. development carried out on a site having an area of 1 hectare or more.

The proposed development falls within the above criteria and as such, a drainage strategy is required.

2.0 Site details

2.1 Site location

TABLE 1: SITE LOCATION

Site address:	Land West of Falconer Road, Haverhill, CB9 7GB
Site area:	Approximately 1.26ha
Existing land use:	Commercial
OS NGR:	TL680445
Local Planning Authority:	West Suffolk District Council

2.2 Site description

The proposed site is located at Land West of Falconer Road, Haverhill, CB9 7GB and is bounded by other commercial development to the north and east, and greenfield land to the west and south. There are no watercourses in close proximity of the site. For context, the Stour Brook flows through Haverhill, joining the River Stour just downstream of the urban area.

2.3 Development proposal

The proposed development is for a new Waste Transfer Station which will include a large (90m x 35m) shed at the eastern part of the site. It is also understood that the yard will be concreted.

3.0 Flood Risk

3.1 Sequential test

According to the Environment Agency's Flood Map for Planning the site lies in Flood Zone 1, which is described in the NPPF as land having a less than 1 in 1,000 annual probability of river or sea flooding (less than 0.1% AEP).

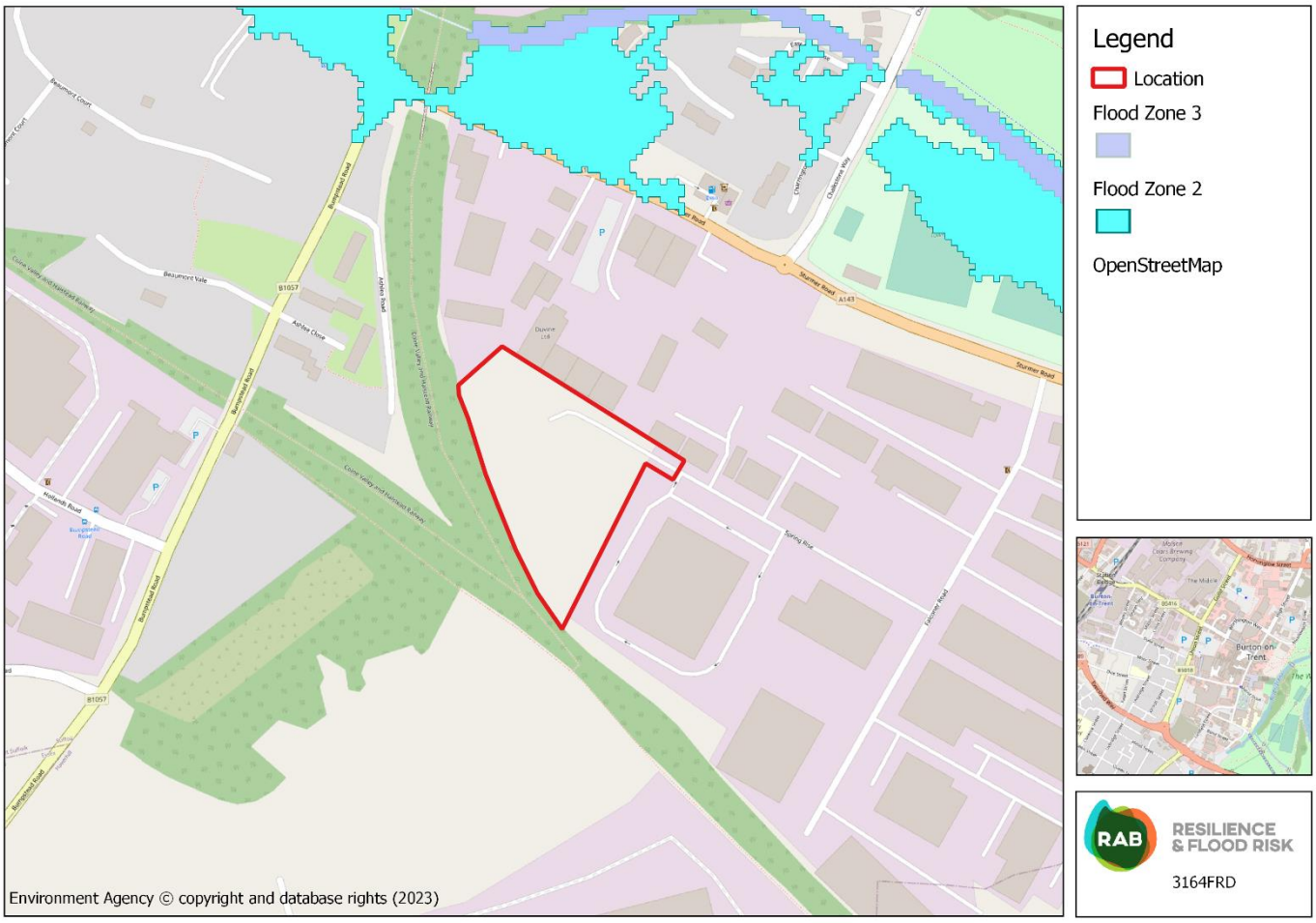


FIGURE 1: ENVIRONMENT AGENCY FLOOD MAP FOR PLANNING

The NPPF follows a sequential risk-based approach in determining the suitability of land for development in flood risk areas, with the intention of steering all new development to the lowest flood risk areas. NPPF Planning Practice Guidance (PPG) Table 2 confirms the 'Flood risk vulnerability classification' of a site, depending upon the proposed usage. This classification is subsequently applied to Table 3 'Flood risk vulnerability and flood zone compatibility' to determine whether:

- The proposed development is suitable for the flood zone in which it is located; and
- Whether an Exception Test is required for the proposed development

Both sequential & exceptions tests are not required in this instance.

3.2 Flooding history

On the basis of the 2021 West Suffolk District Council Strategic Flood Risk Assessment (SFRA), Haverhill has suffered flooding from various sources (sewer, surface water, etc.). However, there is no evidence suggesting that the site itself has suffered historic flooding. Internet searches also did not reveal any news items indicating that the site has suffered from historic flooding.

3.3 Fluvial (Rivers)

The site is located within Flood Zone 1 and as such, it is at very low risk of flooding from this source.

3.3.1 Climate Change Impact on Fluvial Risk

The Environment Agency guidance document 'Flood risk assessments: climate change allowances' was released in February 2016 and updated in July 2021 and includes statistical increases in peak fluvial flows by river basin district and allowance categories based on epochs and development vulnerability classification. The site is located in Flood Zone 1 and as such, climate change will not have a significant impact in terms of fluvial flooding potential.

3.4 Flood defence breach or overtopping

3.4.1 Breach risk

The site does not benefit from flood defences and as such, it is at low risk of flooding from this source.

3.4.2 Overtopping risk

The site does not benefit from flood defences and as such, it is at low risk of flooding from this source.

3.5 Coastal/tidal

The site is located at a considerable distance from the sea and as such, it is at low risk of flooding from this source.

3.6 Pluvial (Surface water)

When the infiltration capacity of land or the drainage capacity of a local sewer network is exceeded, excess rainwater flows overland. This water will collect in topographic depressions and at obstructions, which can inundate development in low lying areas. The severity of the rainfall event, the degree of saturation of the soil before the event, the permeability of soils and geology, and the gradient of the surrounding land and it's use; all contribute to and affect the severity of overland flow.

The Environment Agency Flood Map for Surface Water (Figure 2), can be used to see the approximate areas that would experience surface water flooding from a range of AEPs, which is used to categorise the risk (Table 2).

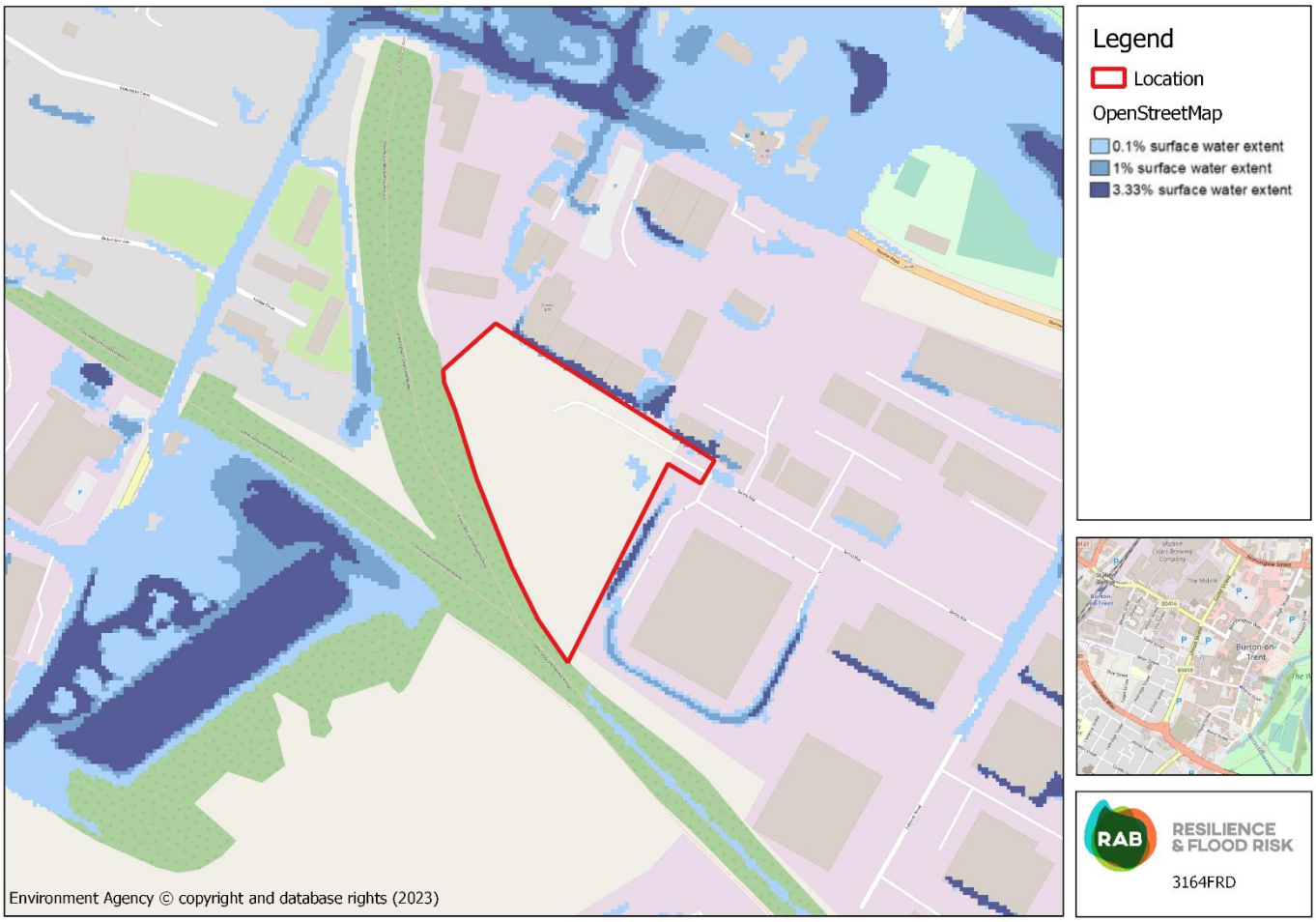


FIGURE 2: ENVIRONMENT AGENCY FLOOD RISK FROM SURFACE WATER

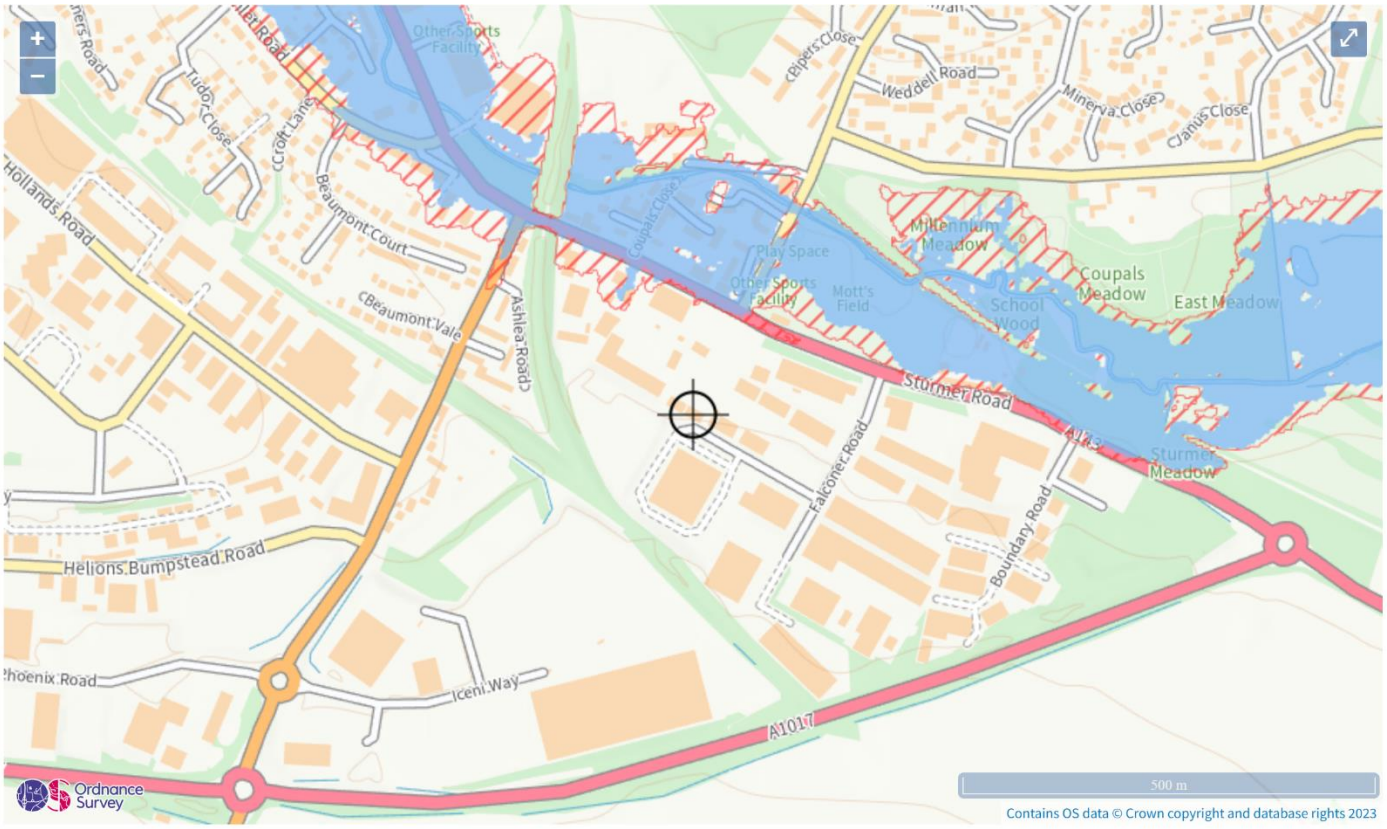
TABLE 2: ENVIRONMENT AGENCY SURFACE WATER RISK CATEGORIES

Surface Water Risk Category	Surface water flooding Annual Exceedance Probability
Very Low	< 0.1%
Low	Between 1% and 0.1% (1 in 100 years and 1 in 1000 years)
Medium	Between 1% and 3.3% (1 in 100 years and 1 in 30 years)
High	> 3.3% (1 in 30 years)

The Surface Water map identifies that there is a very low risk of surface water flooding for the site. There is minor patch of flooding shown within the site during the 0.1% AEP but this can be attributed to a local depression encouraging runoff to pond. This will be better managed through the implementation of SuDS across the site.

3.7 Artificial water bodies

On the basis of the Environment Agency Reservoir Flood Risk Map, the site is not at risk of flooding from this source.



Maximum extent of flooding from reservoirs:

when river levels are normal | when there is also flooding from rivers | Location you selected

FIGURE 3: ENVIRONMENT AGENCY RESERVOIR FLOOD MAP

3.8 Groundwater

Groundwater flooding is water originating from sub-surface permeable strata which emerges from the ground, either at a specific point or over a wide diffuse location and inundates low lying areas. A groundwater flood event results from a rise in groundwater level sufficient for the water table to intersect the ground surface and inundate low lying land.

British Geological Survey (BGS) records indicate that the proposed development site overlies bedrock composed of Lewes Nodular Chalk Formation and Seaford Chalk Formation - Chalk. This is overlain (superficial deposits) by Lowestoft Formation - Diamicton.

The bedrock suggests that groundwater may emerge at the surface however, the superficial deposits will most likely act as a barrier to rising groundwater. In addition, the 2021 SFRA does not suggest that the site is within an area of groundwater emergence issues.

Finally, the Soilscapes website suggests that the site overlays lime-rich loamy and clayey soils with impeded drainage.

As there is a high degree of variability when considering groundwater flooding, using historic flooding is not a robust measure of the risk of flooding in future years.

3.9 Sewers

Anglian Water is responsible for the adopted surface and foul sewer networks within the District and maintain a DG5 register of sites affected by sewer flood incidents on a post code basis. Based on the 2021 SFRA, the site has not experienced sewer related flooding.

It is important to note that previous sewer flood incidents, or the lack thereof, do not indicate the current or future risk to the site. Upgrade work could have been carried out to alleviate any issues or conversely, in areas that have not experienced sewer flooding incidents, the local drainage infrastructure could deteriorate leading to future flooding.

4.0 Mitigation measures

4.1 Risk to buildings

4.1.1 Finished floor levels

In accordance with BS8533:2017 'Assessing and managing flood risk in development – code of practice', in order to afford a level of protection against flooding it is recommended that finished floor levels should be set at a nominal 300mm above either the 1% AEP of fluvial flooding or the 0.5% AEP of tidal flooding depending on which is greater (both including climate change).

The site is located outside the 1% AEP plus climate change fluvial extent and at very low risk of surface water flooding. As such, there is no need for raised finished floor levels. Nevertheless, it is recommended to raise the finished floor level 150mm above local ground level to mitigate the unpredictable risk from infrastructure failure.

4.1.2 Flood resistance

Flood resistance is a strategy of temporary or permanent measures taken to reduce the amount of flood water that will enter buildings. It is not considered appropriate to adopt a water exclusion (or 'resistance') strategy given the assessed likelihood of flooding to the building.

4.1.3 Flood recoverability

It is not considered appropriate to adopt a flood recoverability strategy given the assessed likelihood of flooding to the building.

4.2 Risk to occupiers

4.2.1 Safe access/egress

Safe access and egress are viable as the access road is not within a fluvial flood zone. However, depths of up to 300mm can be observed on Falcone Road and Sturmer Road during a 1% AEP surface water event. Assuming a velocity of 0.5 m/s, there is still safe access and egress based on the DEFRA FD2320 hazard classification.

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

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

Key:
- Danger for some
- Danger for most
- Danger for all

FIGURE 4: EXTRACT FROM DEFRA FD2320 REPORT

4.2.2 Flood warning and evacuation plan

The proposed site is not included in an Environment Agency Flood Warning or Flood Alert area.

Nevertheless, site users should be aware of water levels near the Stour Brook, River Stour and adjacent roads, and maintain visual observations of the surroundings to check for flooding. In an emergency, if evacuation is not possible, users should seek refuge at the site as it will remain dry, based on freely available data.

TABLE 3: USEFUL WEBSITE LINKS

USEFUL WEBSITE LINKS	
Description	**Website Link**
Weather Warning Guide	https://www.metoffice.gov.uk/weather/guides/warnings
EA Live Flood Alert information	https://flood-warning-information.service.gov.uk/
Flood Guidance Statement User Guide	http://www.ffc-environment-agency.metoffice.gov.uk/services/FGS_User_Guide.pdf
Guide to email alert service	https://www.metoffice.gov.uk/about-us/guide-to-emails
5-day flood risk for England and Wales	https://flood-warning-information.service.gov.uk/5-day-flood-risk

USEFUL WEBSITE LINKS	
Description	**Website Link**
5-day flood risk for England and Wales – What the Risk Types Mean	https://flood-warning-information.service.gov.uk/5-day-flood-risk/things-you-should-do
Severe Weather Warning Service including weather warning impacts and what they mean	https://www.metoffice.gov.uk/weather/guides/severe-weather-advice
Met Office Live Severe Weather Warnings	https://www.metoffice.gov.uk/weather/warnings-and-advice/uk-warnings#?date=2020-10-02
BBC Weather	https://www.bbc.co.uk/weather

4.3 Risk to others

4.3.1 Floodplain compensation

The site is located in Flood Zone 1 and as such, floodplain compensation is not applicable in this instance.

4.3.2 Surface water run-off

Information surrounding potential methods to further reduce surface water run-off, such as through the incorporation of incorporate Sustainable Drainage Systems (SuDS), can be found within section 5.0 below.

5.0 Drainage Strategy

5.1 Existing runoff condition

5.1.1 Existing drainage arrangements

It is our understanding that there is no formal drainage system managing runoff at the existing site although, this could not be confirmed by the topographic survey (Appendix B).

5.1.2 Natural flow path

On the basis of the topographic survey, the site generally slopes from south to north suggesting that runoff will naturally follow this profile during rainfall events. Figure 5 below shows the expected natural flow path at site level.

FIGURE 5: NATURAL FLOW PATH

5.1.3 Greenfield runoff

The greenfield runoff rate was calculated using the IH124 method for determining Greenfield runoff rate built into Microdrainage WinDes:

- SAAR (mm) = 600

- Area (ha) = 1.17
- Soil = 0.400
- Region = 5

The QBAR was calculated at 2.8 l/s/ha (see Appendix C). The greenfield runoff rate was calculated on the basis of the proposed hardstanding area of 1.17ha.

TABLE 4: GREENFIELD RUNOFF RATES

AEP (%)	Greenfield peak flow rate (l/s/ha)	Greenfield peak flow rate (l/s)
100	2.5	2.9
QBAR	2.8	3.3
3.33	6.8	8.1
1	10.1	12.0
1 +25% Climate Change*	12.6	14.3

* Combined Essex Management Catchment central peak river flow allowance

5.2 SuDS feasibility

The SuDS Manual (2015) discusses the SuDS approach to managing surface water runoff which is intended to mimic the natural catchment process as closely as is possible. The approach sets out the design objectives in respect of SuDS:

- Use of surface water runoff as a resource;
- Manage rainwater close to where it falls (at source);
- Manage runoff on the surface (above ground);
- Allow rainwater to soak into the ground (infiltration);
- Promote evapotranspiration;
- Slow and store runoff to mimic natural runoff rates and volumes;
- Reduce contamination of runoff through pollution prevention and by controlling the runoff at source; and
- Treat runoff to reduce the risk of urban contaminants causing environmental pollution.

Depending on the characteristics of the site and local requirements, these may be used in conjunction and varying degrees. Table 6 presents the functions of the SuDS components (from which a management train can be created) and their feasibility in respect of the site.

TABLE 5: FEASIBILITY OF SUDS TECHNIQUES AT THE DEVELOPMENT SITE

Technique	Description	Feasibility Y / N / M (Maybe)
Good building design and rainwater harvesting	Components that capture rainwater and facilitate its use within the building or local environment.	**Y**: The client is keen on using harvested rainwater on site thereby, a rainwater harvesting tank can be incorporated into the design.
Porous and pervious surface materials	Structural surfaces that allow water to penetrate, thus offering attenuation potential, while reducing the rate of runoff (green roofs, pervious paving).	**N**: There is no scope to include porous surfacing give the associated maintenance cost (site is prone to siltation which would block the porous features quite often).
Infiltration Systems	Components that facilitate the infiltration of water into the ground. These often include temporary storage zones to accommodate runoff volumes before slow release to the soil.	**N**: Site geology in combination with the pollution potential to the bedrock suggest that infiltration is not viable at the site.
Conveyance Systems	Components that convey flows to downstream storage systems (e.g. swales, watercourses).	**N**: Conveyance systems such as filter drains are not viable at site level given the risk of frequent surface siltation given the site activities, which would highly increase maintenance costs.
Storage Systems	Components that control the flows and, where possible, volumes of runoff being discharged from the site, by storing water and releasing it slowly (attenuation). These systems may also provide further treatment of the runoff (e.g. ponds, wetlands, and detention basins).	**Y**: Storage systems can be used to store surface water runoff.
Treatment Systems	Components that remove or facilitate the degradation of contaminants present in the runoff.	**Y:** The above SuDS features in combination with proprietary treatment devices can provide treatment benefits to the surface water.

The site has the potential to incorporate a number of SuDS options to manage surface water. These are discussed in more detail below.

5.3 Proposed discharge

The 2015 SuDS Manual recommends a specific hierarchy in terms of surface water discharge destinations:

1. Discharge into the ground.
2. Discharge into a surface water body.
3. Discharge to a surface water sewer.
4. Discharge to a combined sewer.

On the basis of Soilscapes, the site geology is not suitable for infiltration. In addition, the high suspended solids loading potential of the development site would increase the risk of contaminating the aquifer. As such, infiltration SuDS are not a viable solution in this instance.

There is no watercourse in the vicinity of the site.

There is an Anglian Water surface water sewer running close to the north boundary of the site (see Appendix C). Anglian Water has confirmed[1] that a rate of up to 2.1 l/s would be acceptable for the surface water sewer network (see Appendix C). The site will therefore discharge surface water runoff from the proposed shed (roof runoff) at a rate of up to 2.1 l/s for all events up to and including the 1% AEP +40% CC.

In addition, the proposed development will result in the creation of a concrete yard. Runoff from the yard will most likely contain a high concentration of silt-related contaminants and as such, it is being proposed to discharge this runoff to the Anglian Water foul sewer (see Appendix C), at a control rate of 2 l/s for all events up to and including the 1% AEP +40% CC, in order to reduce the pollution potential and ensure that this runoff will receive appropriate treatment[2] downstream.

5.4 Proposed surface water management

The proposed drainage scheme has been modelled in Microdrainage Network to understand the evolving flow regime under flood conditions and the potential for flooding. The discharge rate has been limited to the rates mentioned above.

The proposed scheme (see Appendix C) will integrate a range of features, in line with the SuDS Manual philosophy, taking into consideration site constraints.

In detail:

- Roof runoff from the proposed shed will be collected via rainwater pipes and conveyed to a rainwater harvesting tank located to the south of the proposed shed building. The tank must have a minimum volume of storage of 217m^3 and a control rate of up to 2 l/s; a flow control chamber will regulate the runoff rate. A Klargester Aqua Harvest Commercial (or similar) tank will store the collected runoff for re-use on site. A piped network will then convey the runoff to the Anglian Water surface water sewer and discharge to Anglian Water manhole 0551 (subject to a S106).

[1] Anglian Water has identified manhole 1552 however, the proposal is for discharge to manhole 0551. Nevertheless, the recommended rate of 2 l/s has been utilised and as such, this change is inconsequential to the sewer capacity.
[2] We have not been made aware that a trade effluent is required as it is our understanding that no such activities will take place.

- Surface water runoff from the proposed concrete yard will be collected via the use of ACO Qmax700 (or similar) channel drainage (see Appendix C for details). The channel drainage features will convey the runoff to an underground storage tank, as shown in Appendix C. Proprietary treatment devices will be installed upstream of the tank to reduce the concentration of solids in the water column, which would reduce the tank's storage capacity long-term, if not installed. The tank must have a storage volume of 798m^3 in order to be able to control the rate of runoff to 2 l/s for all events up to and including the 1% AEP +40% CC. A flow control chamber will regulate the flow rate accordingly. A private piped network will then convey the runoff to the Anglian Water foul sewer network and discharge to Anglian Water manhole 2502[3] (subject to a S106). It is our understanding that the client has relative permission to install the proposed foul piped network.

5.4.1 Water quantity benefits

The scheme will offer significant reductions in runoff rates, compared to the corresponding greenfield runoff rate, in the order of 7% - 71% as shown in Table 6. This is to counterbalance the increased volume of runoff as a result of the development. As such, the proposed scheme provides water quantity benefits, in line with the 2015 SuDS Manual, and achieves greenfield runoff rates.

As such, the proposed scheme provides water quantity benefits, in line with the 2015 SuDS Manual.

TABLE 6: EXISTING AND PROPOSED PEAK FLOW RUNOFF RATES

AEP (%)	Greenfield peak flow rate (l/s)	Proposed peak flow rate (l/s)[4]	Change (%)
50 (QBAR)	2.8	2.6	7
3.33	6.8	2.8	58
1	10.1	2.9	71
1 +40%CC*	12.0**	3.7	69

*Upper End peak rainfall allowance ** Combined Essex Management Catchment central peak river flow allowance

5.4.2 Water quality benefits

In line with the SuDS Manual, the water must receive a certain degree of treatment. There are no significant risks of pollution as a result of the shed development as it is classed as industrial roof with no major risks.

According to Table 26.2 of the SuDS Manual and based on the land use, the site (proposed shed) has a low pollution hazard level. In detail, the pollution hazard indices are:

- Total Suspended Solids=0.3
- Heavy Metals=0.2
- Hydrocarbons=0.05

[3] Anglian Water has identified another foul water manhole as the connection point, the proposal is for discharge to manhole 2502. This is to achieve a shorter length of new pipe construction and reduce cost. Nevertheless, the recommended rate of 2 l/s has been utilised and as such, this change is inconsequential to the sewer capacity.

[4] Combined surface water and foul water control rates = total rate of runoff leaving the site < greenfield rates, in line with local planning policy.

Consequently, the proposed SuDS feature(s) must have a higher mitigation index. Mitigation indices for various SuDS components can be found in Table 26.3 of the SuDS Manual (2015).

Total SuDS Mitigation Index = mitigation index$_1$ + (0.5 x mitigation index$_n$)

Where mitigation index$_n$ = mitigation index for component n.

The proposed drainage scheme for the proposed roof utilises a rainwater harvesting tank. Such tanks include relevant filters to provide some degree of rainwater treatment. Exact mitigation indices are not available but nevertheless, given the drained surface (roof), the likelihood of significant pollution is low.

The remainder of the site (concreting of the yard) will include proprietary treatment devices upstream of the proposed cellular storage. In addition, runoff from this part of the site will be discharged to the foul water network (at a control rate) in order to ensure that contaminants can be treated downstream, rather than enter the river network, where surface water runoff usually discharges into.

Consequently, the proposed scheme is in line with the water quality requirements of the SuDS Manual (2015).

5.5 Future resilience

5.5.1 Designing for exceedance

It is inevitable that as a result of heavy or extreme rainfall, the capacities of sewers and other drainage systems will be exceeded on occasion. Drainage exceedance will occur when the rate of surface water runoff exceeds the inlet capacity of the drainage system, when the receiving water or pipe system becomes overloaded, when the outfall becomes restricted due to flood levels in the receiving water, or due to poor maintenance of the SuDS features.

The scheme has been designed to manage surface water runoff from events up to and including the 1% AEP + 40% CC with no flooding. Should a blockage occur on site, exceeded runoff would follow the natural topography and flow northeast.

The half drain time of the tank managing the runoff from the proposed concrete yard is shown to exceed the recommended 1440-minute threshold however, this is expected as the final discharge rate is extremely low (2 l/s) comparatively to the significant drained area of the concrete yard. It should also be noted that half drain time within MicroDrainage is referred to as the time it takes the volume within a structure to reach 50% of the maximum water level recorded. As such, a structure may have only used 10% of its available volume during a storm scenario but the half drain time could be shown as over 1440 minutes, if the final discharge is too low comparative to the drained area, and it takes a long time to drain the utilised volume. Even though the volume of the tank is utilised in this instance, a lower half drain time could realistically be achieved through a higher discharge rate, which would need not be accepted by Anglian Water/Local Authority. Developing a larger tank could potentially reduce the half-drain time however, it would need to be of significant size (>2000m^2 based on preliminary simulation, assuming a cell depth of 1.05m) to meet the threshold. Such a tank would make the scheme financially unsustainable.

In light of the foregoing, it is considered that the drainage system will be able to manage exceedance efficiently.

5.6 Amenity and biodiversity

Primary consideration should be given to locally native species, and plants that benefit wildlife through their nectar, fruit, or berries. Generally, the choice of plant species should reflect the usual design decisions relating to their location in terms of aspect, sun or shade, height, from, colour, whether evergreen or deciduous, native or ornamental, and soil factors such as pH, depth, nutrient status and organic content. However, the consideration has to be their ability to withstand the fluctuations in soil moisture that will occur.

6.0 Maintenance and Management Plan

The following maintenance and management plan has been formed to assist with ensuring the longevity of the surface water scheme to provide multiple benefits throughout its lifetime. The plan will also aim to prevent any blockages or damage occurring to each component of the scheme to minimise the risk of flooding as much as possible.

The level of inspection and maintenance will vary depending on the type of SuDS component and scheme, the land use, and the type of vegetation. It is vital that SuDS construction is supervised and inspected on completion if owners are to avoid taking on liabilities and to ensure the specified materials are being used and placed correctly. Incorrect materials or installation should be rejected as they will adversely affect the performance, maintenance costs and ultimately the design life of the SuDS components.

The site manager must maintain maintenance logs for all elements.

The SuDS features incorporated to this particular design have to be maintained in order to ensure efficient water treatment and water management. It is understood that the client will manage maintenance on site, with respect to drainage.

6.1 SuDS features checklist

- **Rainwater harvesting** is the collection of rainwater runoff for use. Runoff can be collected from roofs and other impermeable areas, stored, treated (where required) and then used as a supply of water for domestic, commercial, industrial and/or institutional properties.
- **Proprietary treatments systems** are manufactured products that remove specified pollutants from surface water runoff. they are often (but not always) subsurface structures and can often be complementary to landscaped features, reducing pollutant levels in the runoff and protecting the amenity and/or biodiversity functionality of downstream SuDS components.
- **Attenuation tanks** are used to create a below-ground void space for the temporary storage of surface water before infiltration, controlled release or use.
- **Channel drainage features** are used to capture overland surface water runoff from hardstanding areas.
- **Inlet and outlet structures** are often conveyance pipes protected with mesh guards. They must be free from obstruction at all times to allow free flow through the SuDS.
- **SuDS flow control structures** are usually small orifices in control chamber, slots or V notches in weirs. They are usually near the surface so are accessible and easy to maintain. They may be in baskets, in small chambers or in the open.
- **Inspection Chambers** and rodding eyes are used on bends or where pipes come together. They allow cleaning of the system if necessary.

6.2 Sustainable Drainage Maintenance Specification

6.2.1 General requirements

Maintenance	Frequency	Owner
Maintenance activities comprise: • Regular maintenance • Occasional tasks • Remedial Work	Will vary depending on activity	(Private or adopted)

Regular maintenance (including inspections and monitoring). Consists of basic tasks done on a frequent and predictable schedule, including vegetation management, litter and debris removal, and inspections.

Occasional maintenance Comprises tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the routine tasks (sediment removal is an example).

Remedial maintenance Comprises intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised by good design.

Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and as such timings are difficult to predict.

Avoid use of weedkillers and pesticides to prevent chemical pollution.

6.2.2 Landscape maintenance

TABLE 7: MAINTENANCE SCHEDULE FOR SURROUNDING LANDSCAPE

Maintenance	Frequency	Owner
Regular maintenance Litter management: • Pick up all litter in SuDS and Landscape areas and remove from site.	Monthly	Widdington Recycling Ltd
Grass Maintenance: • Mow all grass verges, paths and amenity at 35-50mm with 75mm max. Leaving grass *in situ*. • Wildflower areas trimmed to 50mm on 3 year rotation	As required or monthly	
Occasional tasks • Prune (trim) tree branches to allow for sunlight to reach ground level flora.	Annually or as required	

6.2.1 Rainwater Harvesting

TABLE 8: MAINTENANCE SCHEDULE FOR THE RAINWATER HARVESTING SYSTEM, ADAPTED FROM CIRIA RP992/23 AND C753[5]

Maintenance	Frequency	Owner
Regular Monitoring • Inspection of the tank for debris and sediment build-up. • Inspection and cleaning of the tank, inlet/outlets, gutters, withdrawal devices and roof drain filters of silt and other debris.	Annually (and following poor performance)	Widdington Recycling Ltd
Occasional Tasks • Cleaning and/or replacement of any filters.	Three monthlies (or as required)	
Remedial Work • Pump repairs. • Overflow erosion damage and damage to tank repairs.	As required	

6.2.2 Cellular storage

TABLE 9: MAINTENANCE SCHEDULE FOR THE CELLULAR STORAGE TANK, ADAPTED FROM CIRIA RP992/23 AND C753[6]

Maintenance	Frequency	Owner
Regular Cleaning • Inspect and identify any areas that are not operating correctly and ensure free flow is viable. If required, take remedial action. • Remove litter and debris from the catchment surface.	Monthly for 3 months, then annually. Monthly	Widdington Recycling Ltd
Regular Monitoring • Inspect/check all rainwater pipe inlets, pump chamber and vent to ensure that they are in good condition and operating as designed; repair/rehabilitate inlets, outlet, and vent if required following advice from manufacturer. • Make visual inspection of exceedance route and check route is not blocked by new fences, walls, bollards, etc. Remove as necessary.	Annually	
Occasional Tasks • Survey inside of tank for sediment build-up and remove if necessary*. • Replace cellular storage tank at the end of design life**	Every 5 years or as required* Every 25 to 50 years**	

*Silt disposal to be undertaken in line with the Environment Agency Regulatory Position Statement 055 and by a qualified professional.

**Assuming maintenance schedule is followed, and remedial action is taken when required.

[5] Confirm with manufacturer.
[6] Confirm with manufacturer.

It is imperative that the management company maintains record logs, including dated images, of the cellular storage access chamber, all inlets, outlet flow control chamber, and silt traps. These records should be shared with the site owner.

Following 25 years from the installation of the proposed cellular storage tank, the tank manufacturer must review the records from the last 5 years and identify whether there is a requirement for replacement of the feature. Should a tank replacement be required, a qualified contractor must be appointed and develop a construction phase plan taking into consideration the piled foundations while clearly identifying the required temporary works to enable the tank replacement.

6.2.3 Controls and inspection chambers

Please note that the flow control chambers will require regular maintenance. The maintenance schedule for the chamber must be specified by the manufacturer as different features have different requirements.

TABLE 10: MAINTENANCE SCHEDULE FOR THE INLETS, OUTLETS, CONTROL STRUCTURES, AND INSPECTION CHAMBERS/MANHOLES

Maintenance	Frequency	Owner
Regular maintenance • Inspection chambers/manholes and below ground flow control chambers: • Remove cover and inspect ensuring water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt. • Undertake inspection after leaf fall in autumn.	Monthly for 12 months, then annually.	Widdington Recycling Ltd
Occasional tasks • Empty built-up silt and sediment from manholes	As necessary	
Remedial Work • Repair physical damage if necessary.	As required	

6.2.4 Drainage network

TABLE 11: MAINTENANCE SCHEDULE FOR PIPED DRAINAGE NETWORK

Drainage Element	Maintenance	Frequency	Owner
Downpipes and gullies	**Regular maintenance** • Open any covers, inspect integrity of gullies and repair as necessary.	Monthly	Widdington Recycling Ltd

Drainage Element	Maintenance	Frequency	Owner
	• Remove silt / debris by suction.	Annually or as required	
Pipe network	**Regular maintenance** • Remove any sediment within the network and inspection chambers.	Every 3 years or as required	
	• Open covers inspect integrity of chambers and repair as necessary. • Remove silt / debris by suction.	Annually	

6.2.5 Proprietary treatment device

The proprietary treatment devices maintenance schedule will have to be specified by the manufacturer as again different features will have different maintenance requirements.

TABLE 12: MAINTENANCE SCHEDULE FOR THE PROPRIETARY TREATMENT DEVICES[7]

Maintenance	Frequency	Owner
Regular maintenance • Remove litter and debris and inspect sediment, oil and grease accumulation	Monthly	Widdington Recycling Ltd
• Change filter media	As recommended by manufacturer	
Remedial actions • Replace malfunctioning parts or structures	As required	
Monitoring • Inspect for evidence of poor operation • Inspect filter media and establish appropriate replacement frequencies	Six monthly	
• Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months	

6.3 Maintenance during construction

Normally traditional drainage is one of the first elements of infrastructure constructed on site. For SuDS, although the form of the drainage will be constructed during the earthworks phase, final construction of the proposed SuDS features should not take place until the end of the development programme. It is highly recommended that the proposed SuDS features do not receive runoff from the site during construction and

[7] Confirm with manufacturer.

other means of disposing surface water runoff, in a controlled manner, should be investigated by the contractor.

7.0 Conclusion

The proposed development at Land West of Falconer Road, Haverhill, CB9 7GB is located in Flood Zone 1, as defined in the NPPF. The proposal includes the construction of a shed (Appendix A) along with a concrete yard.

On the basis of the available information from the Environment Agency and West Suffolk District Council, the site is at low risk from all sources of flooding.

The proposed development must incorporate SuDS as described in Chapter 5 of this report and in the relevant drawings in Appendix C

The proposed development can be deemed appropriate, provided that the recommendations in this report are adhered to, it will not increase the flood risk to other people, and it will provide multiple benefits with respect to the sustainable management of surface water runoff.

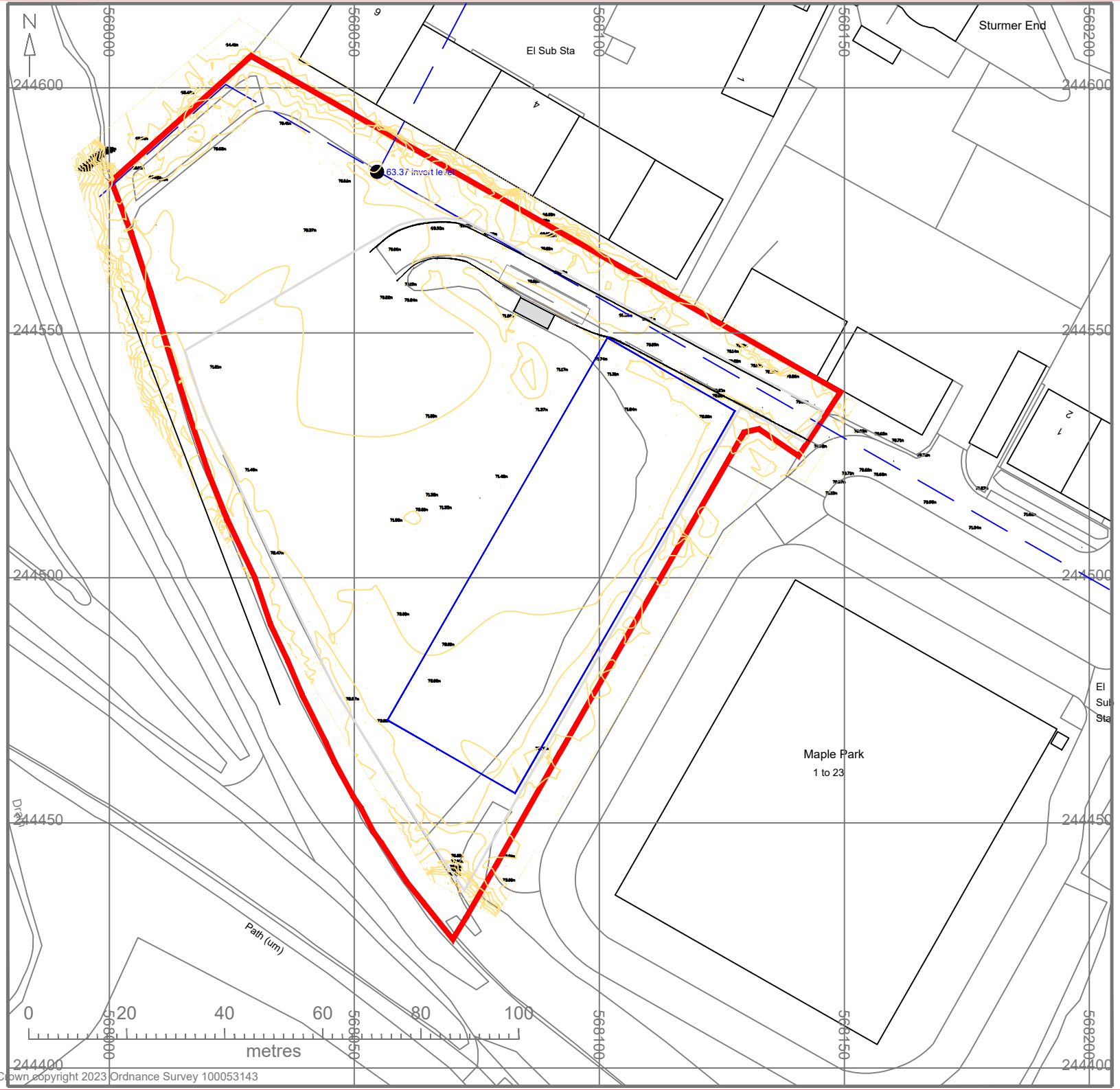
8.0 Recommendations

- Finished floor level of the proposed building should be set 150mm above local ground level to mitigate against a potential infrastructure failure.
- The site should manage surface water through the use of SuDS, as detailed in Chapter 5 of this report.
- Contractor to submit a S106 to Anglian Water prior to connecting to the public sewer.
- All SuDS features must be constructed in line with recommendations made in the Water UK's Design and Construction Guidance (2020), and the CIRIA Guidance on the Construction of SuDS (2017) for each relevant drainage element.
- All SuDS features should be maintained in line with Table 7, Table 8, Table 9, Table 10, Table 11, and Table 12.
- Contractor must liaise with manufacturers to confirm structural configuration and installation method for proposed SuDS and channel drainage features, prior to installation.
- Construction (Design and Management) Regulations 2015:
    - The revised CDM Regulations came into force in April 2015, which defines the duties for all parties involved in a construction project, including those promoting the development. One of the designer's responsibilities is to ensure that the client organisation, in this instance Widdington Recycling Ltd, is made aware of their duties (please see link for Commercial Client) under the CDM Regulations.

Appendix A – Development proposals

To be provided by the client.

Appendix B – Topographic Survey



Appendix C – Drainage

- Microdrainage Calculations:
  - 1% AEP + 40% CC
  - 1% AEP
  - 3.33% AEP
  - 50% AEP
  - QBAR
- Drawings
- Asset location search
- Confirmation of capacity
- Design risk register

Time Area Diagram for Existing at outfall E (pipe E1.002)

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.133	4-8	0.137

Total Area Contributing (ha) = 0.270

Total Pipe Volume (m³) = 2.047

Time Area Diagram at outfall E (pipe E2.007)

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.000	4-8	0.662	8-12	0.238

Total Area Contributing (ha) = 0.900

Total Pipe Volume (m³) = 68.299

Existing Network Details for Existing

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type
E1.000	3.497	0.100	35.0	0.270	5.00	0.0	0.600	o	150	Pipe/Conduit
E1.001	56.011	0.500	112.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit
E1.002	56.346	1.800	31.3	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit
E2.000	81.454	0.680	119.8	0.150	5.00	0.0	0.600	o	700	Pipe/Conduit
E2.001	7.576	0.020	378.8	0.150	0.00	0.0	0.600	o	700	Pipe/Conduit
E2.002	17.093	0.000	0.0	0.150	0.00	0.0	0.600	o	700	Pipe/Conduit
E3.000	29.735	0.030	991.2	0.150	5.00	0.0	0.600	o	700	Pipe/Conduit
E3.001	23.901	0.170	140.6	0.150	0.00	0.0	0.600	o	700	Pipe/Conduit
E2.003	9.483	1.230	7.7	0.150	0.00	0.0	0.600	o	675	Pipe/Conduit
E2.004	20.953	0.200	104.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit
E2.005	63.027	0.300	210.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit
E2.006	38.313	0.300	127.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit
E2.007	71.428	0.300	238.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
E1.000	70.100	0.270	0.0	1.71	30.2
E1.001	70.000	0.270	0.0	0.95	16.8
E1.002	68.500	0.270	0.0	1.81	31.9
E2.000	69.430	0.150	0.0	2.45	942.3
E2.001	68.750	0.300	0.0	1.37	527.8
E2.002	68.730	0.450	0.0	0.00	0.0
E3.000	68.930	0.150	0.0	0.84	324.5
E3.001	68.900	0.300	0.0	2.26	869.4
E2.003	68.730	0.900	0.0	9.47	3390.2
E2.004	67.500	0.900	0.0	0.98	17.3
E2.005	67.300	0.900	0.0	0.69	12.2
E2.006	67.000	0.900	0.0	0.89	15.7
E2.007	66.700	0.900	0.0	0.65	11.4

Manhole Schedules for Existing

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
E1	73.000	2.900	Open Manhole	1200	E1.000	70.100	150				
E2	72.970	2.970	Open Manhole	1200	E1.001	70.000	150	E1.000	70.000	150	
E3	71.400	2.900	Open Manhole	1200	E1.002	68.500	150	E1.001	69.500	150	1000
E	70.000	3.300	Open Manhole	1200		OUTFALL		E1.002	66.700	150	
E4	70.500	1.070	Open Manhole	1200	E2.000	69.430	700				
E5	69.820	1.070	Open Manhole	1200	E2.001	68.750	700	E2.000	68.750	700	
E6	69.800	1.070	Open Manhole	1200	E2.002	68.730	700	E2.001	68.730	700	
E7	70.000	1.070	Open Manhole	1200	E3.000	68.930	700				
E8	69.970	1.070	Open Manhole	1200	E3.001	68.900	700	E3.000	68.900	700	
E9	69.800	1.070	Open Manhole	1200	E2.003	68.730	675	E2.002	68.730	700	
								E3.001	68.730	700	
E10	70.370	2.870	Open Manhole	1200	E2.004	67.500	150	E2.003	67.500	675	
E11	69.900	2.600	Open Manhole	1200	E2.005	67.300	150	E2.004	67.300	150	
E12	70.050	3.050	Open Manhole	1200	E2.006	67.000	150	E2.005	67.000	150	
E13	71.500	4.800	Open Manhole	1200	E2.007	66.700	150	E2.006	66.700	150	
E	71.900	5.500	Open Manhole	1200		OUTFALL		E2.007	66.400	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
E1	568079204.055	244509957.484	568079204.055	244509957.484	Required	
E2	568079202.164	244509960.426	568079202.164	244509960.426	Required	
E3	568079202.445	244510016.436	568079202.445	244510016.436	Required	
E	568079202.693	244510072.781			No Entry	
E4	568079291.918	244510023.844	568079291.918	244510023.844	Required	

Manhole Schedules for Existing

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
E5	568079219.921	244510061.938	568079219.921	244510061.938	Required	
E6	568079212.346	244510062.085	568079212.346	244510062.085	Required	
E7	568079154.396	244510065.542	568079154.396	244510065.542	Required	
E8	568079177.709	244510084.000	568079177.709	244510084.000	Required	
E9	568079198.079	244510071.498	568079198.079	244510071.498	Required	
E10	568079194.255	244510062.821	568079194.255	244510062.821	Required	
E11	568079213.024	244510072.135	568079213.024	244510072.135	Required	
E12	568079267.750	244510040.869	568079267.750	244510040.869	Required	
E13	568079286.536	244510074.260	568079286.536	244510074.260	Required	
E	568079357.926	244510071.920			No Entry	

PIPELINE SCHEDULES for Existing

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
E1.000	o	150	E1	73.000	70.100	2.750	Open Manhole	1200
E1.001	o	150	E2	72.970	70.000	2.820	Open Manhole	1200
E1.002	o	150	E3	71.400	68.500	2.750	Open Manhole	1200
E2.000	o	700	E4	70.500	69.430	0.370	Open Manhole	1200
E2.001	o	700	E5	69.820	68.750	0.370	Open Manhole	1200
E2.002	o	700	E6	69.800	68.730	0.370	Open Manhole	1200
E3.000	o	700	E7	70.000	68.930	0.370	Open Manhole	1200
E3.001	o	700	E8	69.970	68.900	0.370	Open Manhole	1200
E2.003	o	675	E9	69.800	68.730	0.395	Open Manhole	1200
E2.004	o	150	E10	70.370	67.500	2.720	Open Manhole	1200
E2.005	o	150	E11	69.900	67.300	2.450	Open Manhole	1200
E2.006	o	150	E12	70.050	67.000	2.900	Open Manhole	1200
E2.007	o	150	E13	71.500	66.700	4.650	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
E1.000	3.497	35.0	E2	72.970	70.000	2.820	Open Manhole	1200
E1.001	56.011	112.0	E3	71.400	69.500	1.750	Open Manhole	1200
E1.002	56.346	31.3	E	70.000	66.700	3.150	Open Manhole	1200
E2.000	81.454	119.8	E5	69.820	68.750	0.370	Open Manhole	1200
E2.001	7.576	378.8	E6	69.800	68.730	0.370	Open Manhole	1200
E2.002	17.093	0.0	E9	69.800	68.730	0.370	Open Manhole	1200
E3.000	29.735	991.2	E8	69.970	68.900	0.370	Open Manhole	1200
E3.001	23.901	140.6	E9	69.800	68.730	0.370	Open Manhole	1200
E2.003	9.483	7.7	E10	70.370	67.500	2.195	Open Manhole	1200
E2.004	20.953	104.8	E11	69.900	67.300	2.450	Open Manhole	1200
E2.005	63.027	210.1	E12	70.050	67.000	2.900	Open Manhole	1200
E2.006	38.313	127.7	E13	71.500	66.700	4.650	Open Manhole	1200
E2.007	71.428	238.1	E	71.900	66.400	5.350	Open Manhole	1200

Area Summary for Existing

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.270	0.270	0.270
1.001	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.150	0.150	0.150
2.001	-	-	100	0.150	0.150	0.150
2.002	-	-	100	0.150	0.150	0.150
3.000	-	-	100	0.150	0.150	0.150
3.001	-	-	100	0.150	0.150	0.150
2.003	-	-	100	0.150	0.150	0.150
2.004	-	-	100	0.000	0.000	0.000
2.005	-	-	100	0.000	0.000	0.000
2.006	-	-	100	0.000	0.000	0.000
2.007	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.170	1.170	1.170

Free Flowing Outfall Details for Existing

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
E1.002	E	70.000	66.700	0.000	1200	0

Free Flowing Outfall Details for Existing

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
E2.007	E	71.900	66.400	0.000	1200	0

Online Controls for Existing

Hydro-Brake® Optimum Manhole: E2, DS/PN: E1.001, Volume (m³): 3.4

Unit Reference	MD-SHE-0053-2100-2900-2100
Design Head (m)	2.900
Design Flow (l/s)	2.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	53
Invert Level (m)	70.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.900	2.1	Kick-Flo®	0.475	0.9
Flush-Flo™	0.235	1.1	Mean Flow over Head Range	-	1.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.0	1.200	1.4	3.000	2.1	7.000	3.2
0.200	1.1	1.400	1.5	3.500	2.3	7.500	3.3
0.300	1.1	1.600	1.6	4.000	2.4	8.000	3.4
0.400	1.1	1.800	1.7	4.500	2.6	8.500	3.5
0.500	0.9	2.000	1.8	5.000	2.7	9.000	3.5
0.600	1.0	2.200	1.8	5.500	2.8	9.500	3.6
0.800	1.2	2.400	1.9	6.000	2.9		
1.000	1.3	2.600	2.0	6.500	3.0		

Hydro-Brake® Optimum Manhole: E10, DS/PN: E2.004, Volume (m³): 6.2

Unit Reference	MD-SHE-0061-2500-2500-2500
Design Head (m)	2.500
Design Flow (l/s)	2.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	61

Hydro-Brake® Optimum Manhole: E10, DS/PN: E2.004, Volume (m³): 6.2

Invert Level (m) 67.500
Minimum Outlet Pipe Diameter (mm) 75
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.500	2.5	Kick-Flo®	0.543	1.3
Flush-Flo™	0.269	1.5	Mean Flow over Head Range	-	1.8

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.3	1.200	1.8	3.000	2.7	7.000	4.0
0.200	1.5	1.400	1.9	3.500	2.9	7.500	4.2
0.300	1.5	1.600	2.0	4.000	3.1	8.000	4.3
0.400	1.5	1.800	2.1	4.500	3.3	8.500	4.4
0.500	1.4	2.000	2.3	5.000	3.4	9.000	4.5
0.600	1.3	2.200	2.4	5.500	3.6	9.500	4.7
0.800	1.5	2.400	2.4	6.000	3.7		
1.000	1.6	2.600	2.5	6.500	3.9		

Offline Controls for Existing

Pipe Manhole: E7, DS/PN: E3.000, Loop to PN: E2.003

Diameter (m)	0.300	Roughness k (mm)	0.600
Section Type	Pipe/Conduit	Entry Loss Coefficient	0.500
Slope (1:X)	20.0	Coefficient of Contraction	0.600
Length (m)	2.430	Upstream Invert Level (m)	68.930

Storage Structures for Existing

Tank or Pond Manhole: E1, DS/PN: E1.000

Invert Level (m) 70.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	118.0	1.830	118.0	1.831	0.0

Cellular Storage Manhole: E10, DS/PN: E2.004

Invert Level (m) 67.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	800.0	800.0	1.051	0.0	800.0
1.050	800.0	800.0			

Manhole Headloss for Existing

PN	US/MH Name	US/MH Headloss
E1.000	E1	0.500
E1.001	E2	0.500
E1.002	E3	0.500
E2.000	E4	0.500
E2.001	E5	0.500
E2.002	E6	0.500
E3.000	E7	0.500
E3.001	E8	0.500
E2.003	E9	0.500
E2.004	E10	0.500
E2.005	E11	0.500
E2.006	E12	0.500
E2.007	E13	0.500

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 568063 244524 TL 68063 44524
Data Type	Point
Cv (Summer)	0.900
Cv (Winter)	0.900

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	100
Climate Change (%)	40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
E1.000	E1	600 Winter	100	+40%	100/15 Summer			
E1.001	E2	600 Winter	100	+40%	100/15 Summer			
E1.002	E3	600 Winter	100	+40%				
E2.000	E4	15 Summer	100	+40%				
E2.001	E5	15 Summer	100	+40%	100/15 Summer			
E2.002	E6	15 Summer	100	+40%	100/15 Summer			
E3.000	E7	15 Summer	100	+40%			100/15 Summer	38
E3.001	E8	15 Summer	100	+40%				
E2.003	E9	1440 Winter	100	+40%				
E2.004	E10	1440 Winter	100	+40%	100/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
E1.000	E1	71.743	1.493	0.000	0.16			3.3	SURCHARGED	
E1.001	E2	71.744	1.594	0.000	0.10			1.7	SURCHARGED	
E1.002	E3	68.522	-0.128	0.000	0.05			1.7	OK	
E2.000	E4	69.601	-0.529	0.000	0.12			102.6	OK	
E2.001	E5	69.456	0.006	0.000	0.82			207.7	SURCHARGED	
E2.002	E6	69.439	0.009	0.000	2.04			313.2	SURCHARGED	
E3.000	E7	69.160	-0.470	0.000	0.12	82.0		22.9	OK	
E3.001	E8	69.135	-0.465	0.000	0.24			137.4	OK	
E2.003	E9	69.067	-0.338	0.000	0.02			27.3	OK	
E2.004	E10	69.072	1.422	0.000	0.12		4722	2.0	SURCHARGED	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
E2.005	E11	1440 Winter	100	+40%					67.341
E2.006	E12	1440 Winter	100	+40%					67.036
E2.007	E13	1440 Winter	100	+40%					66.743

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
E2.005	E11	-0.109	0.000	0.17			2.0	OK	
E2.006	E12	-0.114	0.000	0.13			2.0	OK	
E2.007	E13	-0.107	0.000	0.18			2.0	OK	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 568063 244524 TL 68063 44524
Data Type	Point
Cv (Summer)	0.900
Cv (Winter)	0.900

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	100
Climate Change (%)	0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
E1.000	E1	480 Winter	100	+0%	100/15 Summer			
E1.001	E2	480 Winter	100	+0%	100/15 Summer			
E1.002	E3	480 Winter	100	+0%				
E2.000	E4	15 Summer	100	+0%				
E2.001	E5	15 Summer	100	+0%				
E2.002	E6	15 Summer	100	+0%				
E3.000	E7	15 Summer	100	+0%			100/15 Summer	38
E3.001	E8	15 Summer	100	+0%				
E2.003	E9	15 Summer	100	+0%				
E2.004	E10	1440 Winter	100	+0%	100/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
E1.000	E1	71.220	0.970	0.000	0.08			1.7	SURCHARGED	
E1.001	E2	71.220	1.070	0.000	0.09			1.4	SURCHARGED	
E1.002	E3	68.520	-0.130	0.000	0.05			1.4	OK	
E2.000	E4	69.570	-0.560	0.000	0.09			73.4	OK	
E2.001	E5	69.374	-0.076	0.000	0.56			140.7	OK	
E2.002	E6	69.361	-0.069	0.000	1.24			190.3	OK	
E3.000	E7	69.115	-0.515	0.000	0.07	60.9		14.4	OK	
E3.001	E8	69.095	-0.505	0.000	0.17			96.4	OK	
E2.003	E9	68.984	-0.421	0.000	0.29			414.5	OK	
E2.004	E10	68.244	0.594	0.000	0.09		3510	1.5	SURCHARGED	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
E2.005	E11	5760 Summer	100	+0%					67.335
E2.006	E12	8640 Winter	100	+0%					67.032
E2.007	E13	10080 Summer	100	+0%					66.737

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
E2.005	E11	-0.115	0.000	0.13			1.5	OK	
E2.006	E12	-0.118	0.000	0.10			1.5	OK	
E2.007	E13	-0.113	0.000	0.14			1.5	OK	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 568063 244524 TL 68063 44524
Data Type	Point
Cv (Summer)	0.900
Cv (Winter)	0.900

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	30
Climate Change (%)	0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
E1.000	E1	360 Winter	30	+0%	30/15 Summer				70.935
E1.001	E2	360 Winter	30	+0%	30/15 Summer				70.936
E1.002	E3	360 Winter	30	+0%					68.519
E2.000	E4	15 Summer	30	+0%					69.550
E2.001	E5	15 Summer	30	+0%					69.267
E2.002	E6	15 Summer	30	+0%					69.258
E3.000	E7	15 Summer	30	+0%			30/15 Summer	38	69.089
E3.001	E8	15 Summer	30	+0%					69.069
E2.003	E9	15 Summer	30	+0%					68.955
E2.004	E10	1440 Winter	30	+0%	30/15 Summer				68.066

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
E1.000	E1	0.685	0.000	0.12			2.4	SURCHARGED	
E1.001	E2	0.786	0.000	0.08			1.3	SURCHARGED	
E1.002	E3	-0.131	0.000	0.04			1.3	OK	
E2.000	E4	-0.580	0.000	0.07			57.2	OK	
E2.001	E5	-0.183	0.000	0.44			111.6	OK	
E2.002	E6	-0.172	0.000	1.04			159.6	OK	
E3.000	E7	-0.541	0.000	0.05	48.1		10.5	OK	
E3.001	E8	-0.531	0.000	0.13			74.6	OK	
E2.003	E9	-0.450	0.000	0.24			333.2	OK	
E2.004	E10	0.416	0.000	0.09		2634	1.5	SURCHARGED	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
E2.005	E11	7200 Summer	30	+0%					67.335
E2.006	E12	10080 Winter	30	+0%					67.032
E2.007	E13	8640 Winter	30	+0%					66.737

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
E2.005	E11	-0.115	0.000	0.13			1.5	OK	
E2.006	E12	-0.118	0.000	0.10			1.5	OK	
E2.007	E13	-0.113	0.000	0.14			1.5	OK	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 568063 244524 TL 68063 44524
Data Type	Point
Cv (Summer)	0.900
Cv (Winter)	0.900

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	2
Climate Change (%)	0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
E1.000	E1	360 Winter	2	+0%	2/15 Summer				70.488
E1.001	E2	360 Winter	2	+0%	2/15 Summer				70.504
E1.002	E3	180 Summer	2	+0%					68.518
E2.000	E4	15 Summer	2	+0%					69.510
E2.001	E5	15 Summer	2	+0%					69.048
E2.002	E6	15 Summer	2	+0%					69.042
E3.000	E7	15 Summer	2	+0%			2/15 Summer	38	69.029
E3.001	E8	15 Summer	2	+0%					68.999
E2.003	E9	15 Summer	2	+0%					68.867
E2.004	E10	720 Winter	2	+0%	2/120 Summer				67.784

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
E1.000	E1	0.238	0.000	0.16			3.2	SURCHARGED	
E1.001	E2	0.354	0.000	0.07			1.1	SURCHARGED	
E1.002	E3	-0.132	0.000	0.04			1.1	OK	
E2.000	E4	-0.620	0.000	0.03			25.5	OK	
E2.001	E5	-0.402	0.000	0.17			43.5	OK	
E2.002	E6	-0.388	0.000	0.41			62.4	OK	
E3.000	E7	-0.601	0.000	0.03	20.7		5.2	OK	
E3.001	E8	-0.601	0.000	0.05			26.7	OK	
E2.003	E9	-0.538	0.000	0.09			125.9	OK	
E2.004	E10	0.134	0.000	0.09		1217	1.5	SURCHARGED	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
E2.005	E11	4320 Summer	2	+0%					67.335
E2.006	E12	2880 Winter	2	+0%					67.032
E2.007	E13	4320 Summer	2	+0%					66.737

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
E2.005	E11	-0.115	0.000	0.13			1.5	OK	
E2.006	E12	-0.118	0.000	0.10			1.5	OK	
E2.007	E13	-0.113	0.000	0.14			1.5	OK	

LEGEND

- Cellular Storage Device (to be confirmed by manufacturer).
- SWP — Surface Water pipes
- FWP — Foul Water pipes
- Exceedance flow routes
- Pipe flow direction
- Surface Water Manhole
- Hydrobrake (or similar) flow control chamber
- Polystorm Xtra Manifold (to be confirmed by manufacturer).
- SDS Aqua Swirl AS-5/XC-5 (or similar) treatment device (to be confirmed by manufacturer).
- Anglian Water infrastructure
- Foul Water Manhole

Notes:

1. All setting out to be in accordance with the Architects drawings. Any discrepancies between the Engineers and the Architects drawings to be referred to the Architect before proceeding. Dimensions must not be scaled.
2. This drawing must be read in conjunction with all relevant drawings and with the drainage report (RAB3164).
3. A construction phase plan, in line with CDM 2015, must be prepared by the principal contractor prior to any work taking place. The Contractor must comply with all current legislation relating to health and safety.
4. Connections to Public sewers to be agreed and inspected by Water Authority.
5. Until technical approval has been obtained from the relevant Authority, it should be understood that all drawings issued are Preliminary and not for construction. Should the contractor commence the work prior to such approval being given, it is entirely at his own risk.
6. Drainage to be in accordance with BS 7533-13:2009, Building Regulations Part H: Drainage and Waste Disposal, *Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England,* CIRIA Guidance on the Construction of (C768) SuDS and CIRIA SuDS Manual (C735).
7. The minimum depth of cover to the crown of gravity pipes without protection should be 0.35m for domestic gardens and pathways without any possibility of vehicular access; 0.5m in domestic driveways, parking areas and yards with height restrictions to prevent entry by vehicles weighing >7.5 tonnes; 0.9m in domestic driveways, parking areas and narrow streets without footways with limited access for vehicles with a gross vehicle weight in excess of 7.5 tonnes; 1.2m in highways and parking areas with unrestricted access to vehicles with a gross vehicle weight in excess of 7.5 tonnes.
8. All pipes not meeting the criteria 7 MUST include a minimum 150mm thick Class GEN3 Concrete surround in line with the 2020 Design And Construction Guidance document.
9. Where pipes are bedded and surrounded in concrete, flexible joints should be provided. Compressible boards (fibreboard or polystyrene) shall be provided at a maximum of 8m centres (coinciding with pipe joints). The boards shall be pre-cut to pipe diameter and to a height and width equal to the concrete cross section. A board thickness of 18mm for pipes up to 450mm nominal diameter and 36mm for pipes over 450mm nominal diameter.
10. The Contractor shall make allowance for raising / lowering all access covers & frames to suit finished levels.
11. Cover Class to manholes/inspection chambers are to suit anticipated vehicular loadings in accordance with BSEN 124:2015 (D400 where potential for HGV loading, C250/B125/A15 in footway trafficked areas not accessible by vehicles.
12. All soft / hard paved areas affected by the works shall be fully reinstated upon completion of the works. All surface markings damaged by the works shall be fully reinstated.
13. Qmax feature to be installed strictly to manufacturer's instructions. Contractor must liaise with supplier prior to installation.
14. Structural integrity of cellular storage tank to be confirmed by manufacturer prior to installation.
15. Before handover, all manholes shall be inspected, all rubble removed, and the whole system shall be thoroughly flushed and cleaned.
16. All levels are in Ordnance datum unless otherwise specified.
17. All pipe runs near buildings to comply with the Building Regulations 2002 Part H1. where a pipe is within 1m of a foundation the trench shall be filled with class GEN3 Concrete up to the lowest level of the foundation. Where the trench is further than 1m from the foundation, the trench shall be filled with class GEN3 Concrete to a level below the lowest level for the foundation equal to the distance from the foundation less 150mm. In both cases, the pipe shall be bedded and surrounded in 150mm thick class GEN3 Concrete.
18. All materials delivered to the site associated to the sub-base storage of the permeable pavement must be tested to obtain their porosity and permeability; in line with BS 1377-2:1990 and BS 1377-4:1990.
19. The drainage pipes are to be coordinated with the foundation levels from the structural engineer, subject to detailed design.
20. Structural integrity of pipes running internally through the proposed building must be confirmed by the structural engineer.
21. For setting out dimensions of SVPs, RWPs, etc., refer to the Architect's or Mechanical Engineer's drawing. Positions shown are indicative only.
22. Cover levels shown are approximate only and are to be adjusted to suit finished ground levels.
23. At least one soil pipe at the head of each foul run shall vent to the atmosphere.
24. All gradients on drainage runs are indicative. Runs to be laid soffit to soffit.
25. All drain runs from SVPs, stub stacks, or FW gullies to be laid at 1:40 gradient. All RWPs to be laid at minimum 1:60 gradient.
26. Rodding eyes to be laid strictly to manufacturer's instructions.
27. Backfill material to drainage trenches under carriageways to be DOT Type 1 sub-base material, elsewhere backfill to be free draining readily compacted material, free from rubbish and organic matter, frozen soil clay lumps and large stones. To be compacted in layers of not exceeding 150mm thick.
28. Contractor to liaise with Klargester to confirm configuration and installation method for the proposed rainwater harvesting tank.
29. Joints specification to be provided by manufacturers.
30. Typical pipe bedding to drainage for pipes up to D=525mm is to be Class S (i.e. 10-14mm).
31. Extra care must be taken once the permeable pavement(s) has been installed so that construction traffic does not impact the porosity due to compaction.
32. **Trench temporary formwork is required to all excavations exceeding 1.2m depth to provide adequate support and stability at all times.**
33. Sewers are to be constructed in single sections between manholes only. Trenches to be backfilled prior to excavating the succeeding sewer run.
34. All concrete products to be in accordance with BRE 363 for sulphates.
35. The requirement or not for a capping layer under the porous pavement(s) must be assessed by the highways engineer.
36. No SuDS features should receive construction-related runoff. Alternative methods of surface water disposal must be employed.
37. Where sewer or drains are to be abandoned they shall be removed or infilled by grouting in accordance with the Civil Engineer Specification for the Water Industry 7th edition, Clause S.23.
38. All manholes shall be watertight.
39. The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such utilities plant or apparatus may also be present but not shown. The Contractor must therefore undertake their own investigation where the presence of any existing sewers, services, plant or apparatus may affect the design installation and/or their operations, prior to the commencement of any works and inform the designer should there be any clashes. Should the contractor commence the work prior to such an investigation, it is entirely at his own risk. RAB Consultants accepts no liability should existing utilities clash with the proposed design.
40. This drawing is for planning purposes only, not construction.
41. RAB Consultants accepts no liability should the proposed drainage not be installed and maintained in line with report RAB3164, and structural/functional failure occurs.
42. Client must fulfill their relevant duties, under CDM (2015) and regulations 4, 5, 6, 7 & 8.
43. We have not been made aware that the site utilises siphonic roof drainage. Should siphonic roof drainage be used without our prior knowledge, we accept no liability associated with a failure of the drainage system.

RESILIENCE & FLOOD RISK
Bedford Heights,
Brickhill Drive,
Bedford,
MK41 7PH

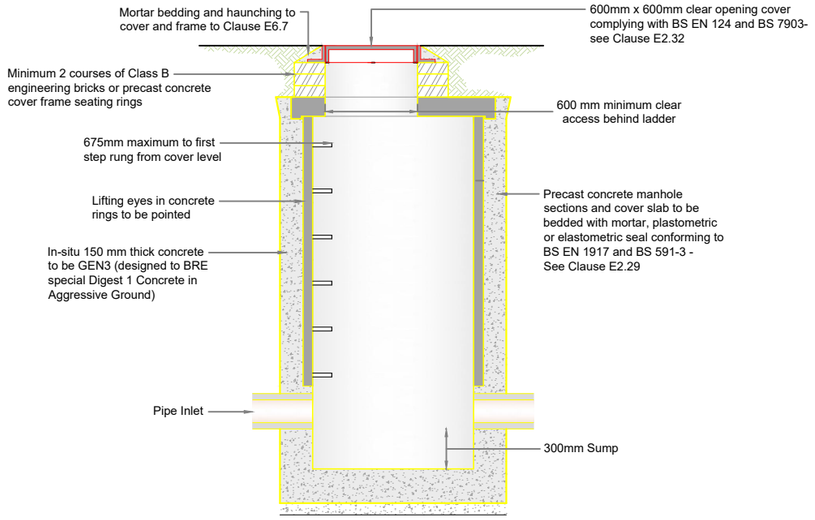
Client: Widdington Recycling Ltd

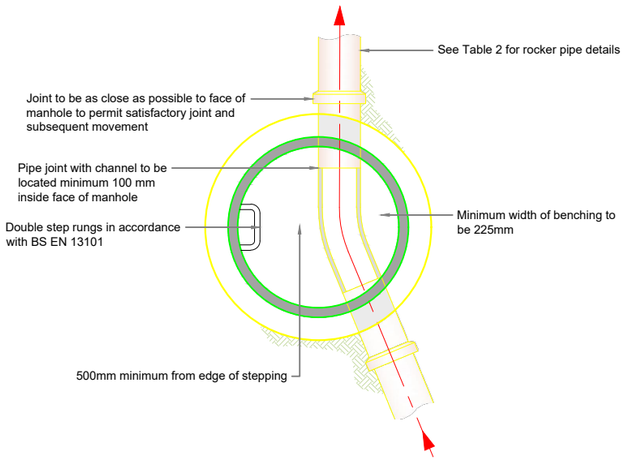
Project: Land West of Falconer Road, Haverhill

Drawing: Plan View of SW Drainage

Checked by FG	Approved by AT	
Drawn by AT	Date: 11/08/2023	Scale: 1:250@ A0

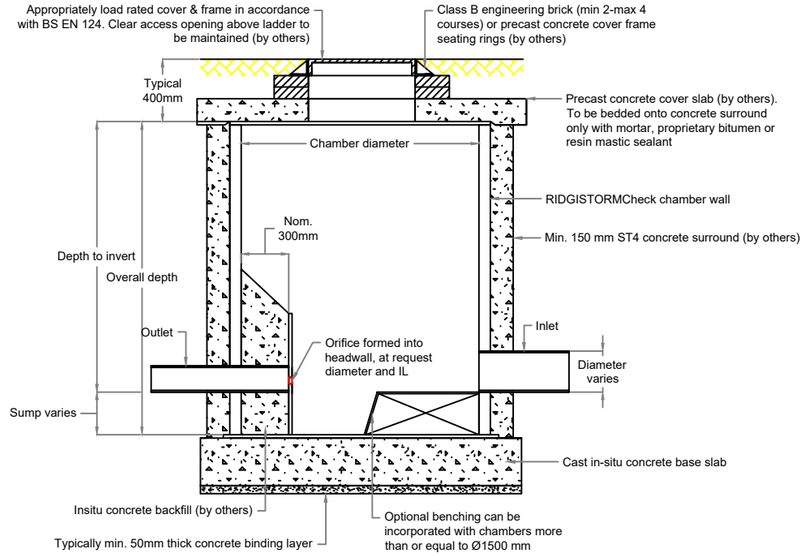
Drawing No.	Revision
RAB3164_001	-

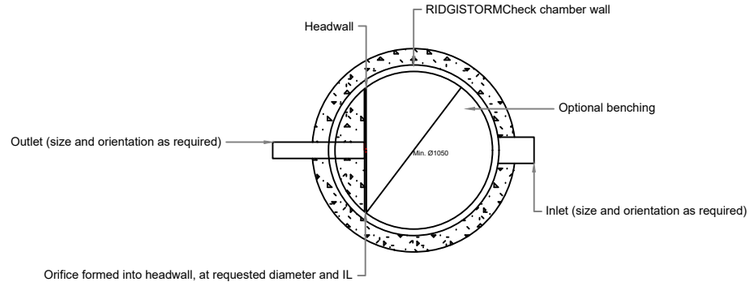




Typical Manhole Detail - Type B with Sump

Max depth from cover level to soffit of pipe 3.0m





RIDGISTORM Orifice Flow Control Chamber Typical Details

Notes:

This drawing mus tbe read in cinjuntion with report RAB3164.

RESILIENCE & FLOOD RISK

Bedford Heights,
Brickhill Drive,
Bedford,
MK41 7PH

Client

Mark Leivers

Project

Widdington Recycling, Haverhill

Drawing

Typical Details

Checked by FG	Approved by AT	
Drawn by AT	Date: 07/08/2023	Scale: NOT TO SCALE

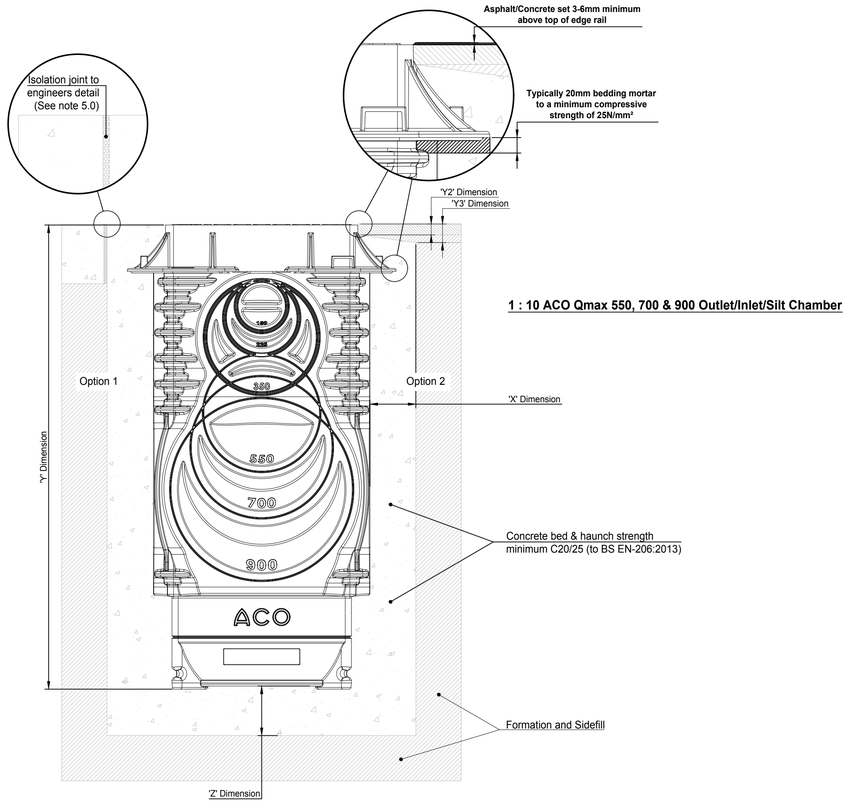
Drawing No.

RAB3164_002

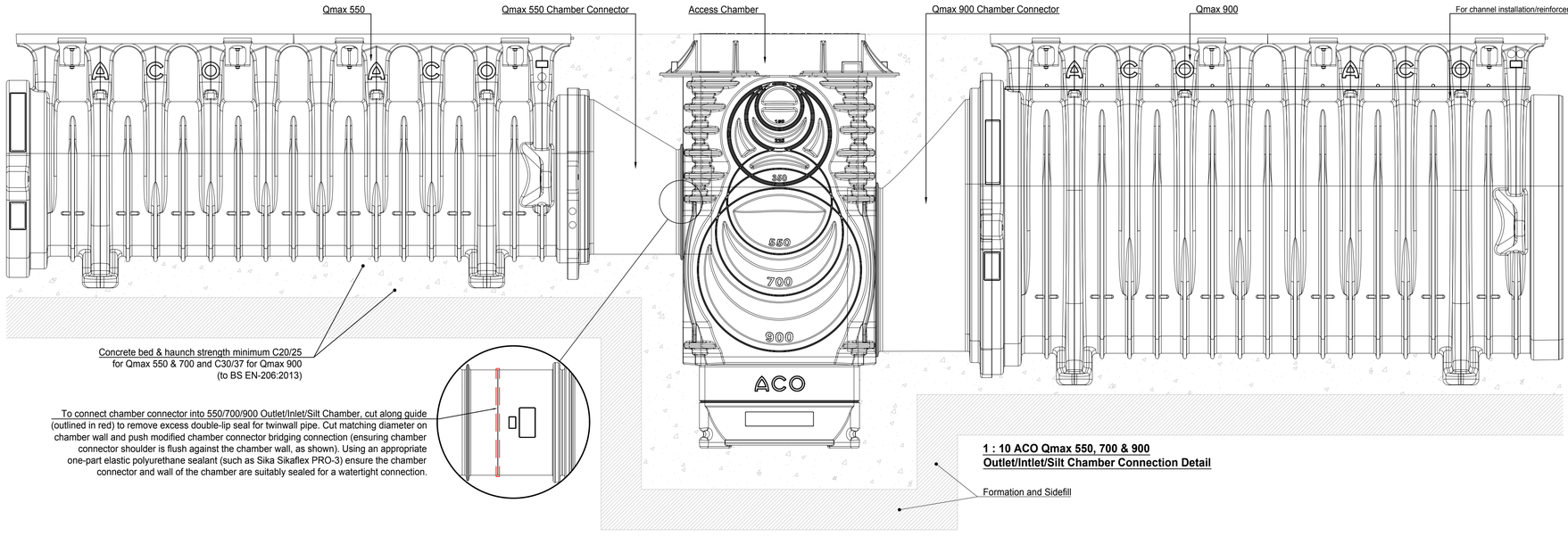
Revision

-

Load Class - D400		Qmax 550	Qmax 700	Qmax 900
Minimum Dimensions (mm)	X	150	150	150
	Y	Full Chamber Height (Less Y2 where applicable)		
	Z	150	150	150
Maximum Dimensions (mm)	Y2	35	35	35
	Y3	60	60	60
Reinforcement		NO	NO	YES
Load Class concrete		C20/25	C20/25	C30/37



1 : 10 ACO Qmax 550, 700 & 900 Outlet/Inlet/Silt Chamber



1 : 10 ACO Qmax 550, 700 & 900
Outlet/Intlet/Silt Chamber Connection Detail

1.0 Load Class
Installation recommendations shown are ACO minimum recommendations for BS EN 1433:2002 load class requirements.

2.0 Ground Conditions
The long term performance of a channel installation to sustain vertical and lateral loads depends upon A) ground conditions B) stability of the adjacent pavement and C) a durable concrete bed and surround. The recommended installation detail may require the minimum dimensions to be revised to achieve site specific load class requirements (referred to in 1.0 above).

3.0 Location and Connection with Sub Surface Drainage Guidance
The sump or gully should be positioned at the lowest channel invert point. With the base level, connect pipework, locate gully top if required and concrete the complete assembly in position. Any channels knockouts should remain until channel connection. The channels should then be selected (in numerical order from deepest to shallowest) starting from the outlet, to make up the length of channel required and lay out. Install channels in order from the outlet with the arrow on each unit pointing to the outlet (flow direction) and ensure the channels are butt together so that the male and female details locate positively.
Note: For any channel system, sump/gully unit end plates will need to be cut to match the invert depth of adjacent channel units.

4.0 Cutting and Jointing
The 2000mm long channels may be cut to a shorter length of 400mm, 1000mm and 1400mm. Where possible 90° joints and T's should be formed so that rails do not have to be cut utilising ACO Qmax access/inlet/outlet/silt chambers. Angles can be formed by connecting them using proprietary pipework attached to ACO inlet/outlet endcaps. For further details please contact ACO Design Services Team. Where requested ACO can custom manufacture special connections to order.

5.0 Isolation Joints
The channel must be isolated from the surrounding environment. An isolation joint must be positioned up to 1500mm from the channel wall. Any dowel bars must be located no nearer than 150mm from the channel wall. Other isolation joints in surrounding slab must be continued through the channel. Additional crack control may be required to comply with specifier requirements.

6.0 Concrete Surround and Reinforcement
Ensure that the channels do not float while pouring the concrete.
The reinforcement required in the concrete surround varies with the installation group (load class) and channel size.
The combined depth of the asphalt pavement must not exceed the Y2 and Y3 dimensions given in the table. Ensure the edge rail anchors are well embedded into the concrete.

7.0 Temporary Installation
A channel installation is not complete until the final surfacing is laid. In any temporary condition, i.e. with the channel walls projecting above adjacent ground, site traffic should not cross channels. Loose boards, stone fill or cover plates will not protect the channel walls or grating. A temporary channel crossing should be formed by raising the ground level locally, to 3 - 6mm above top of edge rail, either side of a channel for a distance of 750 to 1000mm, to form ramps. Note that the channel load class should be adequate to carry the site traffic.

8.0 Block Pavements
The channel must be supported laterally. Blocks laid directly against a channel must be laid as a soldier course and restrained from movement by bedding securely on the concrete haunch e.g. by using a polymer modified mortar for bed and perpendicular joints (e.g. RONAFIX mortar mix C or similar). Blocks or slabs bedded on sand remote from the channel should be set at a higher level to compensate for possible settlement of the paving in service.

9.0 Channel Protection
Avoid contact between compaction equipment and top of ACO channel edge rail. The installer must ensure that the finished surface level lies above the top of the edge rail (by at least 3-6mm). Covering or protecting the rails, before concreting the haunch or laying blocks, removes the time and cost associated with cleaning the channel and grating of cement material and embedded stones. During site work ensure that the plastic protective strip (supplied with the galvanised steel edge rails) or the ductile iron edge rail protector (supplied separately) is not damaged or displaced, in order to prevent debris entering the channel during construction. Ensure the edge rail anchors are well embedded into the concrete.

10.0 Watertight Installation to BS EN 1433:2002
Where ACO Qmax channels are to be installed with watertight joints, the seal between channel units must be checked for cleanliness and then smeared with lubricant jelly such as proprietary pipe joining lubricant. Guidance on the preparation should be sought from the lubricant manufacturer. ACO Qmax channels are tested to confirm compliance with the watertightness requirements of BS EN 1433 when filled with water to the top of the channel bore (below the inlet arches). Installation must be in accordance with ACO's recommendations and the recommendations of the lubricant manufacturer. It is envisaged that the channel joints would not be subject to movement, but any movement of the joint might compromise the watertightness.

Note: Galvanised steel and iron products have good corrosion resistance to concrete and mortar products but may experience corrosion if high chloride and/or sulphate content is present. Use only good quality concrete and consider using corrosion inhibitors where necessary. The use of protective coatings, such as paint, can minimise the risk of corrosion.

NBS Specification:
ACO Qmax® should be specified in section Q10:170. Assistance in completing this clause can be found in ACO Technologies product entries in NBS Plus, or a model specification can be downloaded from www.aco.co.uk. For further assistance, contact the ACO Water Management Design Services Team.

Best Practice and Workmanship:
ACO can give guidance with respect to the most suitable methods of installation for each of the products in the ACO Qmax® range. ACO Qmax® should be installed using levels of workmanship that accord with the National Code of Practice (UK: BS8000-0:2014) and in keeping with BS EN 1433:2002 (Drainage channels for vehicular and pedestrian areas).

Detailed installation statements and methodologies will vary for all sites as each will have different aspects deserving particular consideration, consequently the relevant approvals should be sought from the consulting engineer and/or the installer.

Version	Date	Description	Name
B	19.8.2016	Revised to comments 15/03/16	TS

ACO Technologies plc
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Hitchin Road
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Tel: 01462 816666
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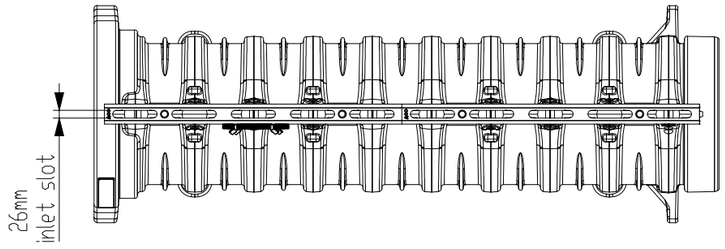
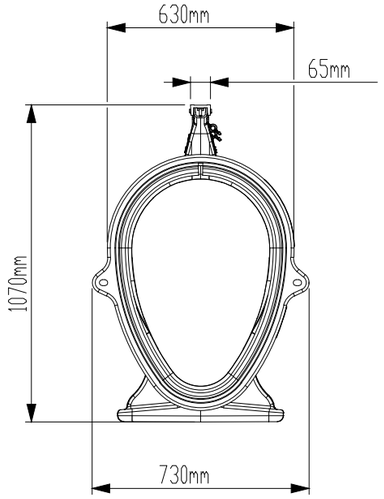
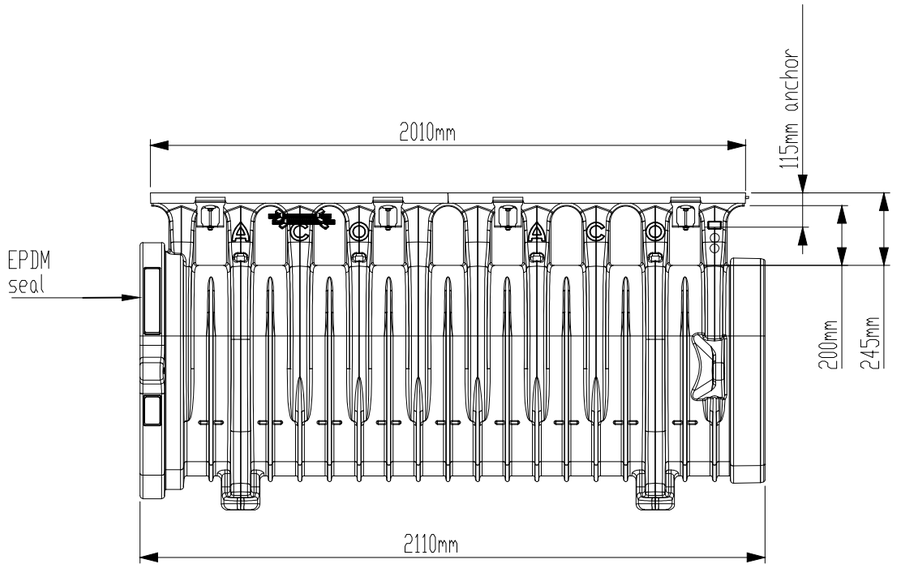
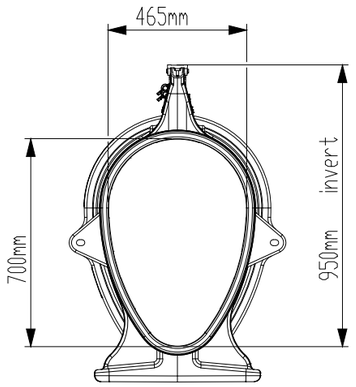
Drawing Number: 21994
Revision: B
Title: ACO QMAX 550/700/900 ACCESS CHAMBER D400 INSTALLATION DETAIL DRAWING

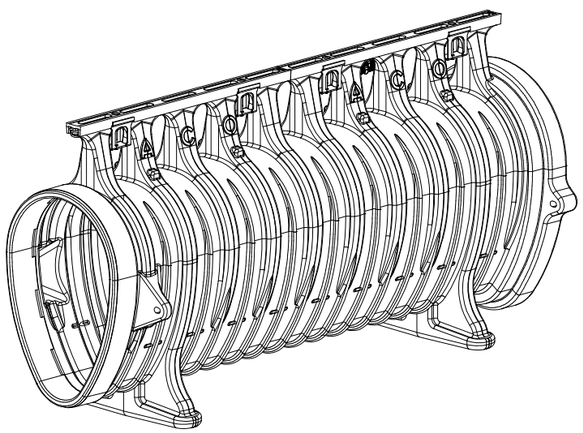
Created by: IM	Released by: TS	Projection: ISO-A	Units: mm / Format: A3
Created at: 14.1.2016	Released at: 19.8.2016		Scale: 1 : 10
Replacement for: E1-E01-069-1	Replaced by:		Sheet: 1 of 1





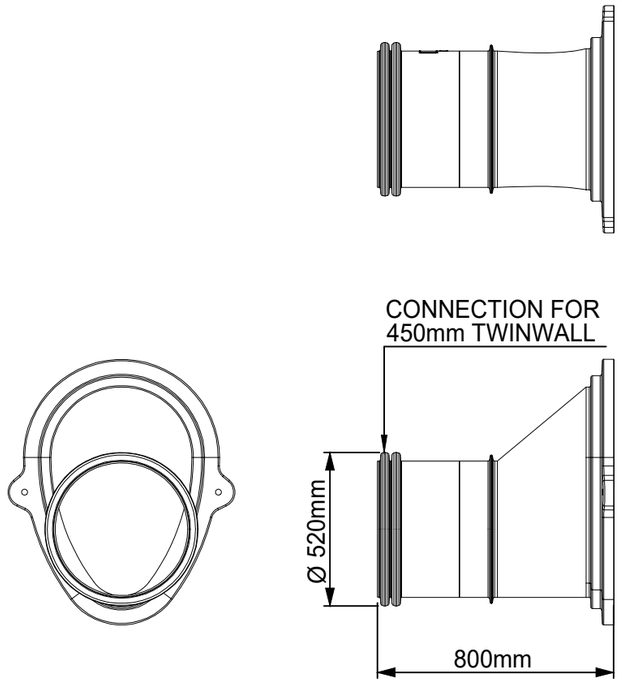




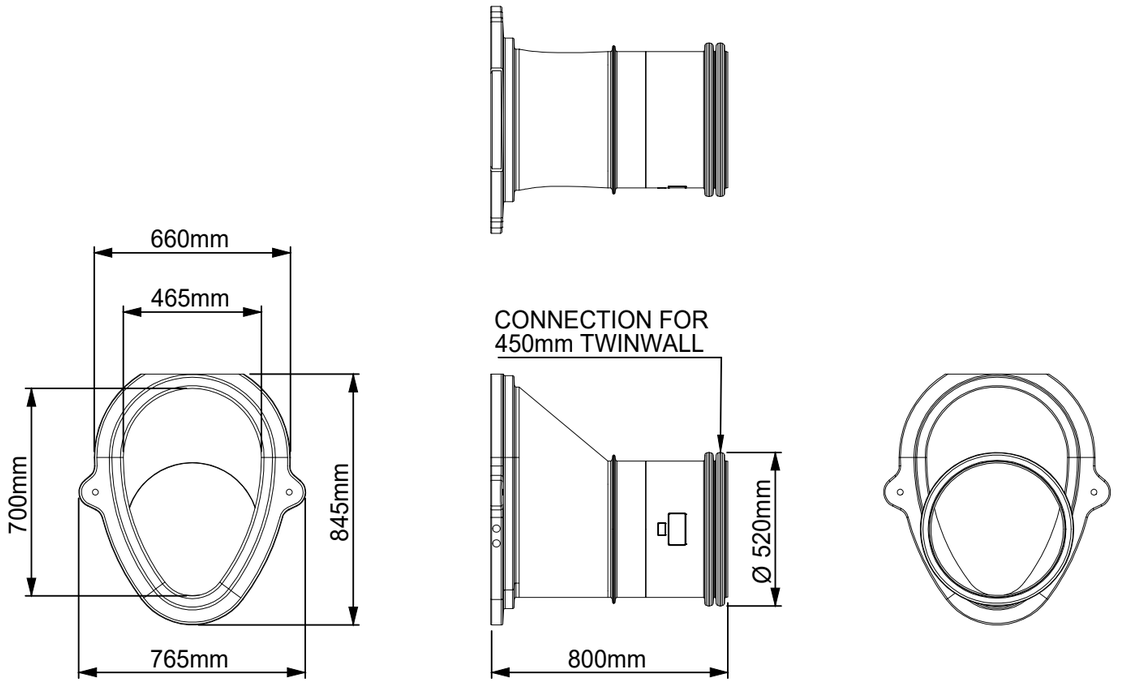


NOTES:
* DIMENSIONS ARE FOR INDICATION ONLY AND MAY VARY DUE TO PART MANUFACTURING TOLERANCES AND INSTALLATION DETAILS

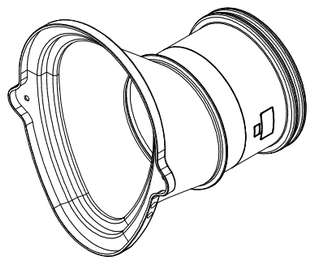
Version	Date	Description		Name
ACO Technologies plc ACO Business Park Hitchin Road Shefford Bedfordshire SG17 5TE, UK Tel: 01462 816666 www.aco.co.uk		Drawing Number: E1-M01-234-1	Part Number: 32830	Revision: A
		Title: Qmax 700 CHANNEL ASSEMBLY Q-FLOW CAST IRON EDGE RAIL		
Created by: AJ	Released by: AJ	Projection: ISO-A	Units: mm	Format: A3
Created at: 14.12.2015	Released at: 14.12.2015		Protection note: DIN ISO 16016	Scale: 1:20
Replacement for:	Replaced by:			Sheet: 1 of 1



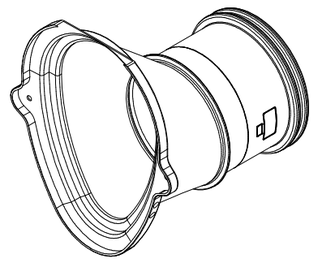
ACO Qmax 700 FEMALE END CHAMBER CONNECTOR



ACO Qmax 700 MALE END CHAMBER CONNECTOR



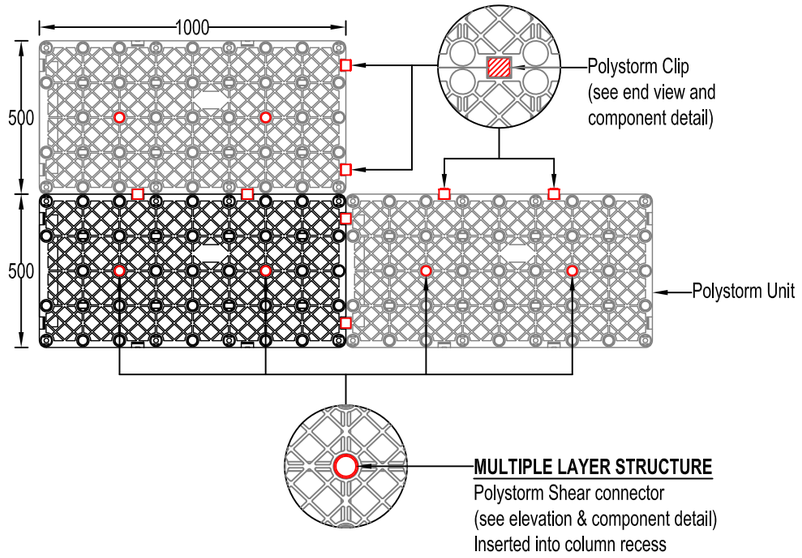
ISOMETRIC VIEW
FEMALE END CHAMBER CONNECTOR



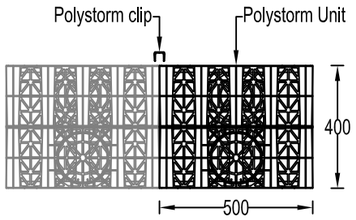
ISOMETRIC VIEW
MALE END CHAMBER CONNECTOR

NOTES:
- DIMENSIONS ARE FOR INDICATION ONLY AND MAY VARY DUE TO PART MANUFACTURING TOLERANCES AND INSTALLATION DETAILS
- * CLEAR OPENING

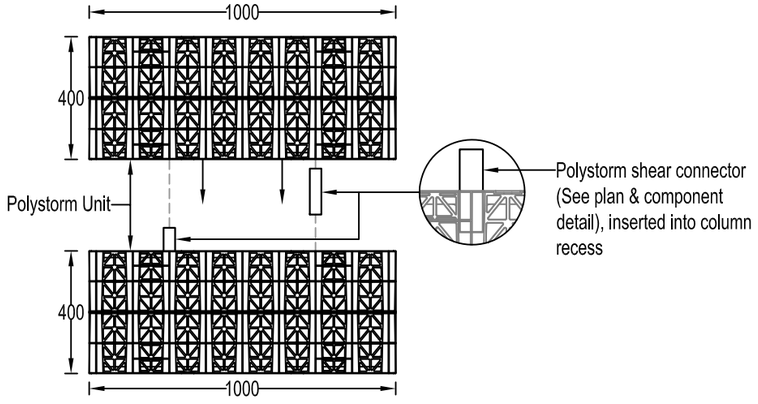
Version	Date	Description		Name
ACO Technologies plc ACO Business Park Hitchin Road Shefford Bedfordshire SG17 5TE, UK Tel: 01462 816666 www.aco.co.uk		Drawing Number: E1-M01-206-1	Part Number: 32836	Revision: A
		Title: QMAX 700 CHAMBER CONNECTOR ASSEMBLY (PAIR)		
Created by: DEN	Released by: DEN	Projection: ISO-A	Units: mm	Format: A3
Created at: 13.10.2015	Released at: 14.10.2015		Protection note: DIN ISO 16016	Scale: 1:20
Replacement for:	Replaced by:			Sheet: 1 of 1



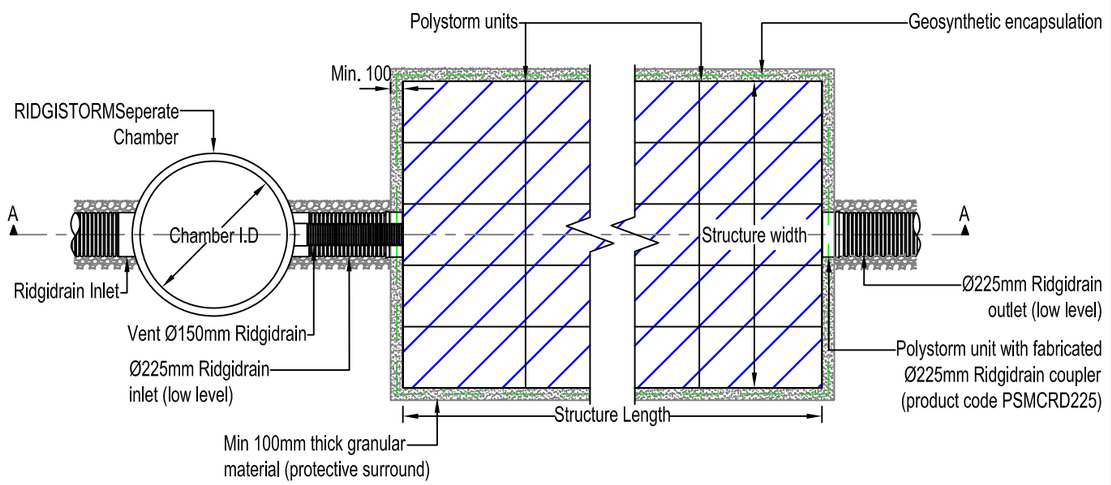
POLYSTORM CONNECTORS - PLAN VIEW
Scale 1:20



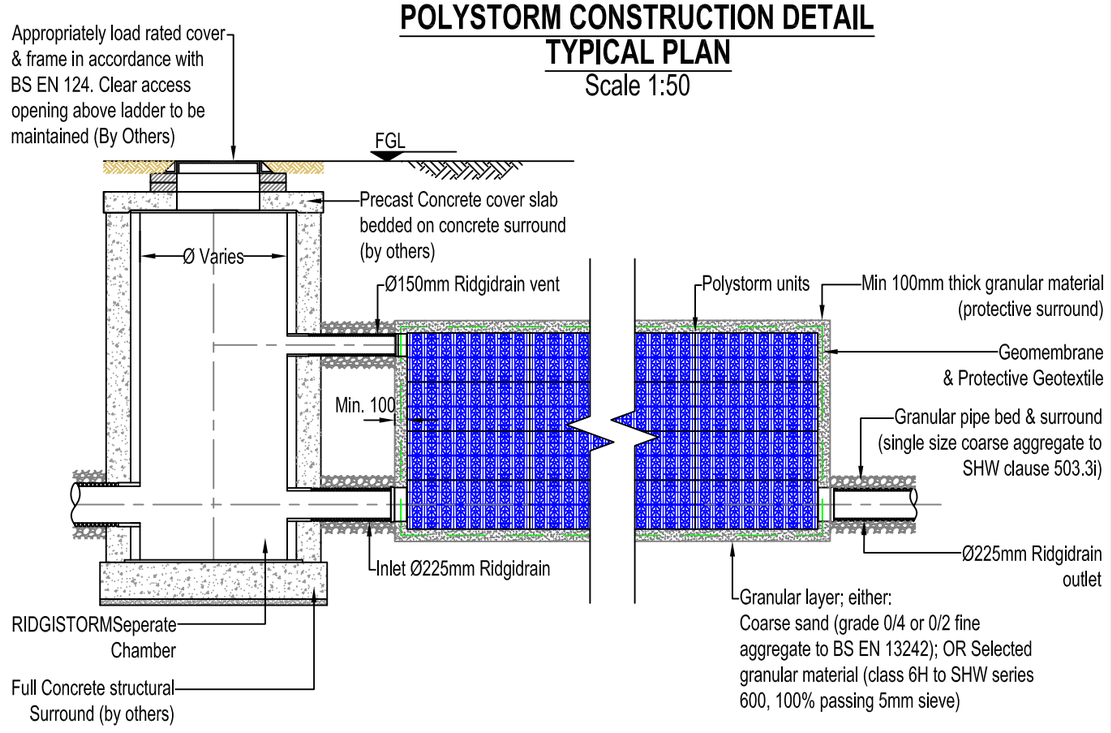
POLYSTORM LATERAL CONNECTIONS - END VIEW
Scale 1:20



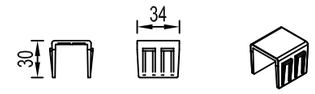
POLYSTORM SHEAR CONNECTIONS ELEVATION
Scale 1:20



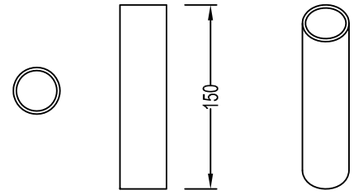
POLYSTORM CONSTRUCTION DETAIL
TYPICAL PLAN
Scale 1:50



POLYSTORM CONSTRUCTION DETAIL
TYPICAL SECTION
Scale 1:50



POLYSTORM CLIP
Scale 1:5



POLYSTORM SHEAR CONNECTOR
Scale 1:5

POLYSTORM SYSTEM NOTES

1. Standard Polystorm units have a Ø160mm BS EN 1401-1 connection. Polystorm units can be fabricated with either a Ø225mm or Ø300mm Ridgidrain connection please refer to relevant details.

NOTES

1. All dimensions in millimetres, unless otherwise stated.
2. All dimensions are nominal and may vary within manufacturing or construction tolerances.
3. All site temporary and enabling works by others.
4. Polypipe products to be installed in accordance with Polypipe civils recommendations (refer to Polypipe technical guidance for further information), giving due consideration to the requirements of the organisation who will be taking ultimate owner ship of the installation.
5. This drawing is intended for guidance only. Confirmation of the information contained within this document should be sought from the consulting engineers before final design or construction activities commence.

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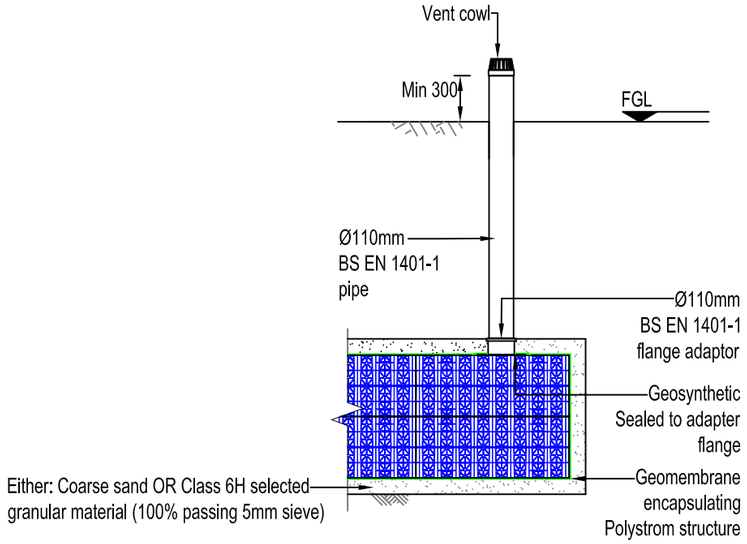
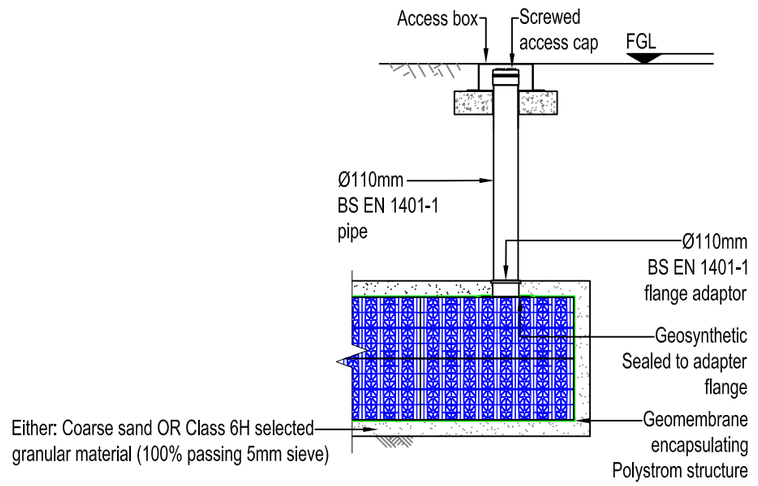
www.polypipe.com/wms

PROJECT	POLYSTORM STANDARD DETAILS
TITLE	POLYSTORM TANK ASSEMBLY DETAIL
STATUS	FOR INFORMATION
DATE	17/03/16
DRAWN BY	JL
ORIGINAL SIZE	A3
SCALE	AS SHOWN
DRAWING No.	PSM_SD_009
REV.	



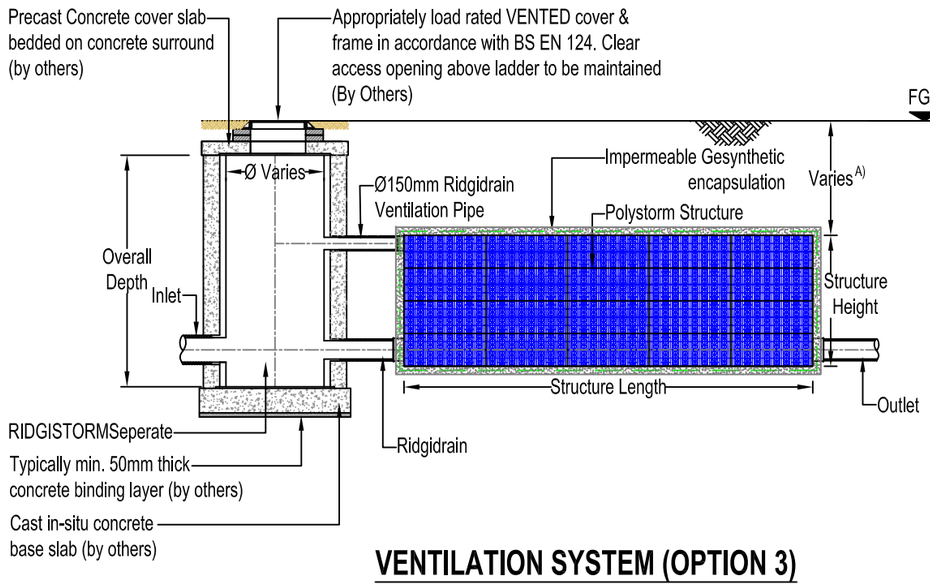
VENTILATION SYSTEM (OPTION 1)

Scale (1:40)



VENTILATION SYSTEM (OPTION 2)

Scale (1:40)



VENTILATION SYSTEM (OPTION 3)

Scale (1:75)

NOTE A

For information on tank cover depths, please contact the Technical Team:- 01509 61500

NOTES

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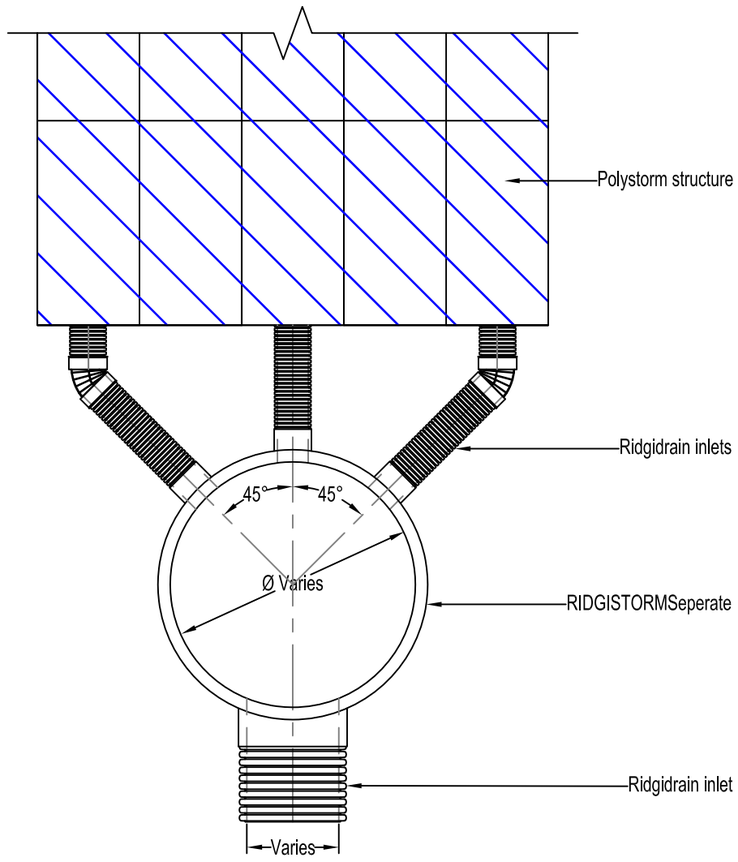
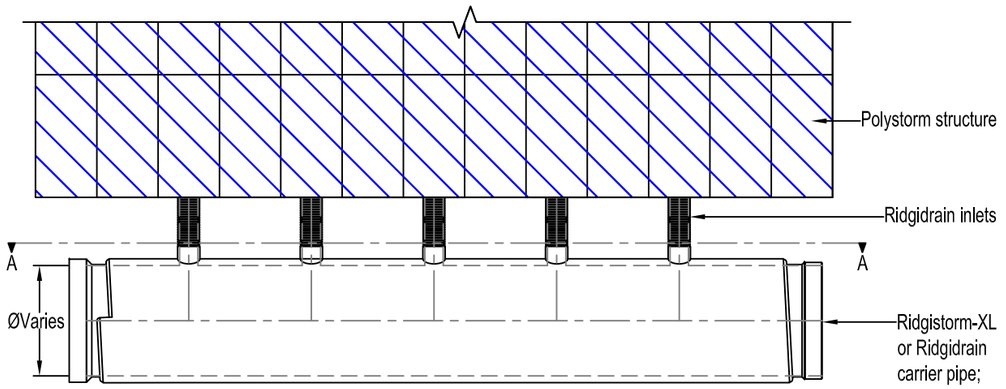
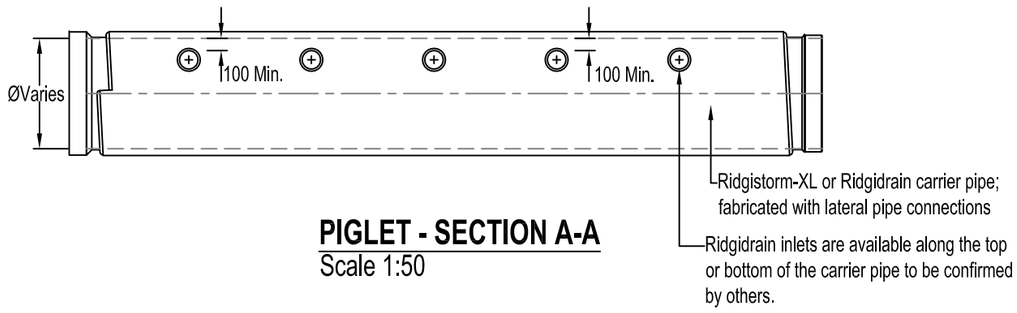
PROJECT	POLYSTORM STANDARD DETAILS
TITLE	POLYSTORM VENTILATION DETAIL
STATUS	FOR INFORMATION
DATE	11/12/18
DRAWN BY	KT
ORIGINAL SIZE	A3
SCALE	AS SHOWN
DRAWING No.	PSM_SD_PSM_002
REV.	A



TYPICAL MANIFOLD - PLAN VIEW
Scale 1:30



PIGLET - PLAN VIEW
Scale 1:50



PIGLET - SECTION A-A
Scale 1:50

POLYSTORM SYSTEM NOTES

1. Standard Polystorm units have a Ø160mm BS EN 1401-1 connection. Polystorm units can be fabricated with either a Ø225mm or Ø300mm Ridgidrain connection please refer to relevant details.

NOTES

1. All dimensions in millimetres, unless otherwise stated.
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4. Polypipe products to be installed in accordance with Polypipe civils recommendations (refer to Polypipe technical guidance for further information), giving due consideration to the requirements of the organisation who will be taking ultimate owner ship of the installation.
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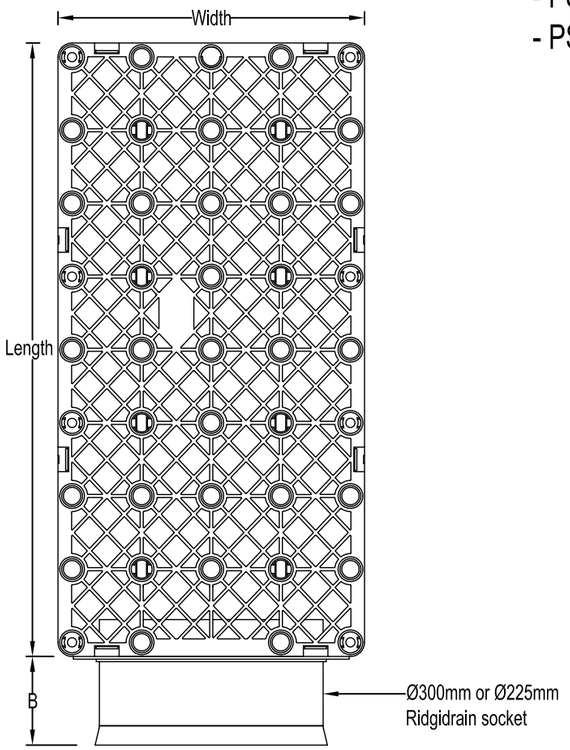
PROJECT	POLYSTORM STANDARD DETAILS
TITLE	POLYSTORM MANIFOLD CONNECTIONS
STATUS	FOR INFORMATION
DATE	17/03/16
DRAWN BY	JL
ORIGINAL SIZE	A3
SCALE	AS SHOWN
DRAWING No.	PSM_SD_008
REV.	

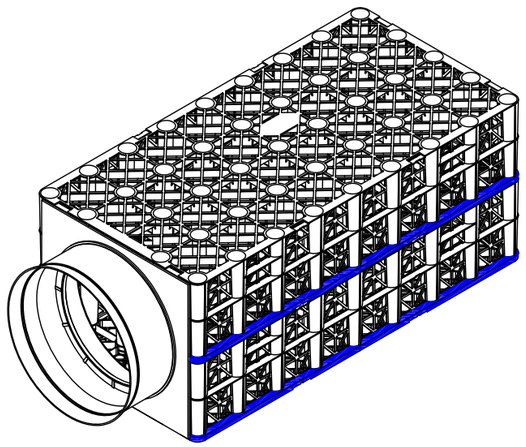
POLYSTORM XTRA CELLS COMPLETE WITH COUPLER

- PSM3CRD225
- PSM3CRD300

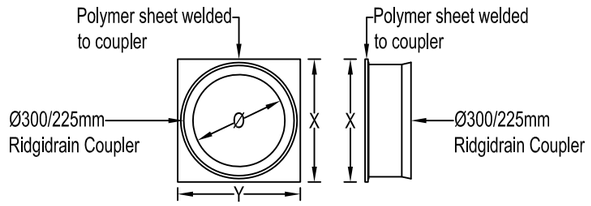


PLAN VIEW
Scale 1:10

POLYSTORM TABLE - CELL COMPLETE WITH COUPLER										
NAME	CODE	LENGTH (mm)	WIDTH (mm)	HEIGHT (mm)	A (mm)	B (mm)	VERTICAL STRENGTH (kN/m²)	LATERAL STRENGTH (kN/m²)	COLOUR	MATERIAL
Polystorm Xtra	PSM3CRD225	1000	500	420	60	136	834	93	Grey	Prime Polypropylene
Polystorm Xtra	PSM3CRD300	1000	500	420	60	145	834	93	Grey	Prime Polypropylene



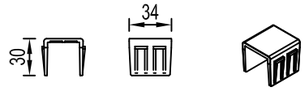
ISOMETRIC VIEW
Scale 1:10



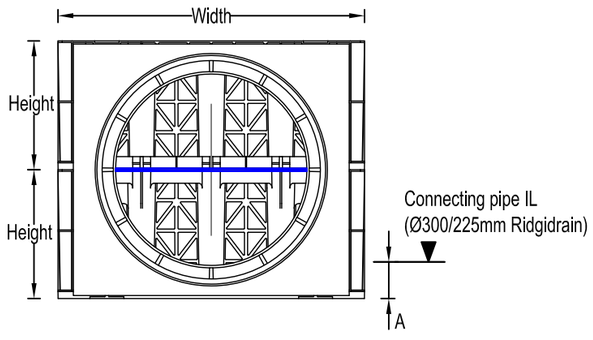
POLYSTORM FLANGE ADAPTER DETAIL
Scale 1:20

POLYSTORM FLANGE ADAPTER TABLE			
FLANGE CODE	Ø (mm)	X (mm)	Y (mm)
PSMFA225	225	385	450
PSMFA300	300	385	450

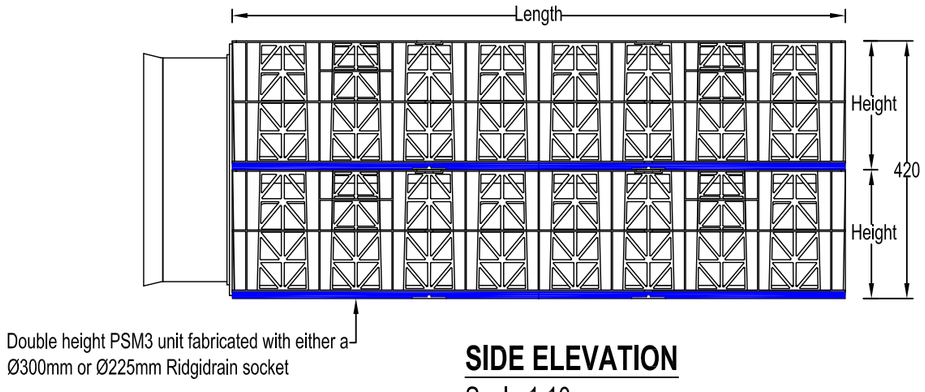
* Flange adapters are compatible with the PSM1, PSM1A & PSM2 cells.
* Consideration to hydraulic performance should be taken when using a flange adapter



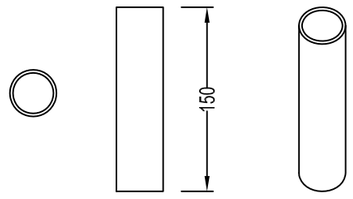
POLYSTORM CLIP
Scale 1:5



END ELEVATION
Scale 1:10



SIDE ELEVATION
Scale 1:10



POLYSTORM SHEAR CONNECTOR
Scale 1:5

POLYSTORM SYSTEM NOTES

1. PSMCRD units may be used in place of Polystorm Xtra units where a larger connection is required compared to the standard unit.

NOTES

1. All dimensions in millimetres, unless otherwise stated.
2. All dimensions are nominal and may vary within manufacturing or construction tolerances.
3. All site temporary and enabling works by others.
4. Polypipe products to be installed in accordance with Polypipe civils recommendations (refer to Polypipe technical guidance for further information), giving due consideration to the requirements of the organisation who will be taking ultimate owner ship of the installation.
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PROJECT: POLYSTORM STANDARD DETAILS

TITLE: POLYSTORM XTRA CONNECTION DETAIL

STATUS: FOR INFORMATION

DATE: 17/03/16

DRAWN BY: JL

ORIGINAL SIZE: A3

SCALE: AS SHOWN

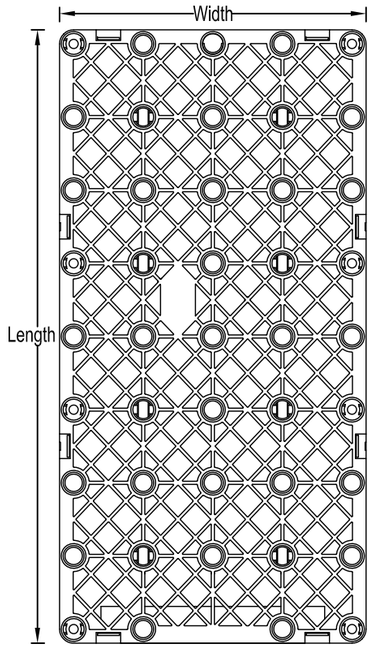
DRAWING No.: PSM_SD_005

REV.:

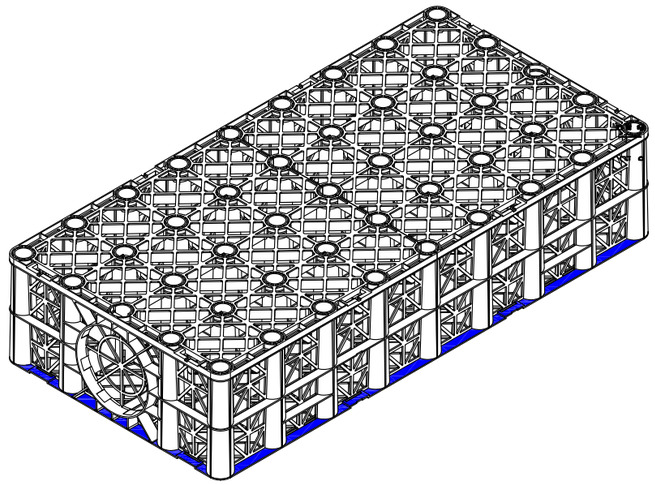
POLYSTORM CELL

Product Code: PSM3

POLYSTORM TABLE									
NAME	CODE	LENGTH (mm)	WIDTH (mm)	HEIGHT (mm)	A (mm)	VERTICAL STRENGTH (kN/m²)	LATERAL STRENGTH (kN/m²)	COLOUR	MATERIAL
Polystorm Xtra	PSM3	1000	500	210	36	834	93	Grey	Prime Polypropylene

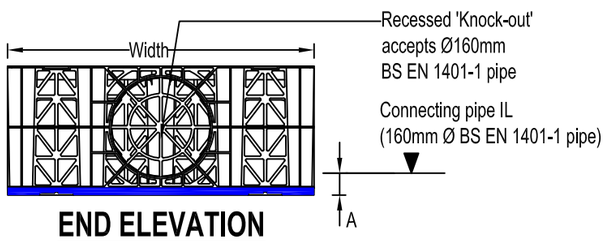


PLAN VIEW
Scale 1:10

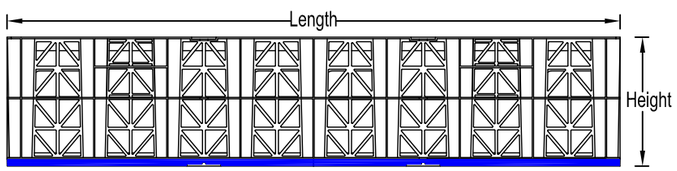


ISOMETRIC VIEW
Scale 1:10

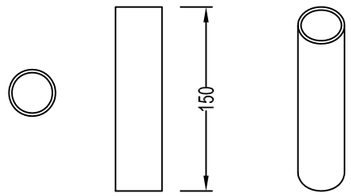
POLYSTORM CLIP
Scale 1:5



END ELEVATION
Scale 1:10



SIDE ELEVATION
Scale 1:10



POLYSTORM SHEAR CONNECTOR
Scale 1:5

POLYSTORM SYSTEM NOTES

1. Polystorm units are available with either a Ø225mm or Ø300mm Ridgidrain socket upon request. Please refer to:- PSM_SD_005

NOTES

1. All dimensions in millimetres, unless otherwise stated.
2. All dimensions are nominal and may vary within manufacturing or construction tolerances.
3. All site temporary and enabling works by others.
4. Polypipe products to be installed in accordance with Polypipe civils recommendations (refer to Polypipe technical guidance for further information), giving due consideration to the requirements of the organisation who will be taking ultimate owner ship of the installation.
5. This drawing is intended for guidance only. Confirmation of the information contained within this document should be sought from the consulting engineers before final design or construction activities commence.

Polypipe Civils
Charnwood Business Park,
North Road, Loughborough,
Leicestershire. LE11 1LE
Tel: 01509 615100
Fax: 01509 615215
www.polypipe.com/civils
www.polypipe.com/wms

PROJECT: POLYSTORM STANDARD DETAILS

STATUS: FOR INFORMATION

DATE: 17/03/16 | DRAWN BY: JL

TITLE: POLYSTORM XTRA GEOCELLULAR COMPONENT

ORIGINAL SIZE: A3 | SCALE: AS SHOWN

DRAWING No.: PSM_SD_002 | REV.:

SDS
Water Infrastructure Systems

SDS Aqua-Swirl®

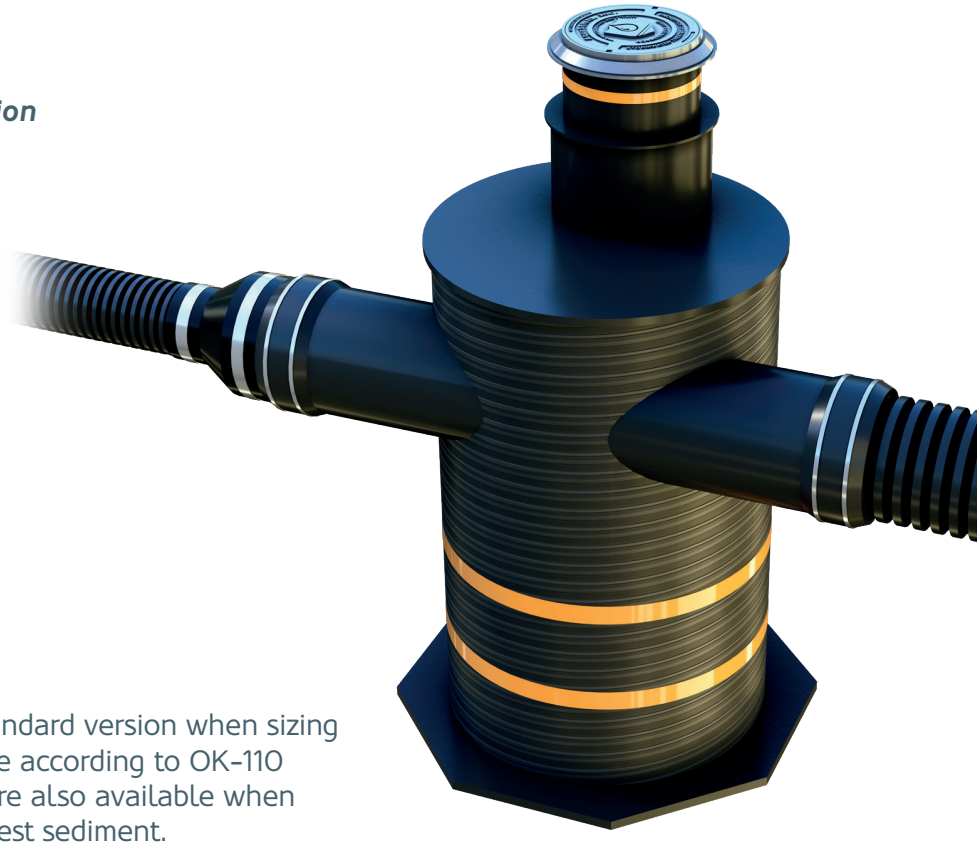
Hydrodynamic Vortex Separator

SDS Aqua-Swirl® is a custom engineered, flow-through water quality device that utilises hydrodynamic separation technology to maximise the removal of coarse sediment, debris and free-floating oil from surface water runoff.

SYMBiotIC™

When connected to a SDS SYMBiotIC™ system, SDS Aqua-Swirl® provides real time data on a broad range of key operating factors such as pollutant loads and silt capture level.

- *BBA HAPAS approved*
- *HDPE plastic modular construction*
- *No moving parts*
- *Sealed baffle*
- *Large debris storage chamber*
- *Lifting supports*
- *Compact dimensions*
- *Available in 9 different sizes*
- *Bespoke sizing available*



SDS Aqua-Swirl® is supplied in the standard version when sizing to its water quality treatment flow rate according to OK-110 (coarse) test sediment. 'XC' versions are also available when sizing according to the NJDEP (finer) test sediment.

SDS Aqua-Swirl® is sized according to water quality treatment flow rates which are based on the initial movement of pollutants into the storm drainage system. This flow rate typically represents approximately 90% to 95% of the total pollutants in the runoff volume.

The treatment flow rate of the SDS Aqua-Swirl® system is engineered to meet or exceed the local water quality treatment criteria and form an intrinsic part of the SuDS solution.

SDS Ltd, Clearwater House, Castlemills, Biddisham, Somerset, BS26 2RE
T: +44 (0)1934 751303
E: info@sdslimited.com

Features	Benefits
Performance monitoring available via SDS SYMBiotIC™.	Provides bespoke suite of operating data, such as silt levels and pollutants, viewable via a secure web portal dashboard with live notifications via email and text.
BBA HAPAS certified.	Approved for installation under roads and pavements; adoptable by National Highways.
NJCAT/NJDEP-verified performance for sediment removal and retention.	Verification accepted by the Environment Agency (as cited in the CIRIA C753 SuDS Manual).
'XC' models meet NJDEP testing protocol.	Ensures that particulates and adhered pollutants are not mobilised during major storm events, maximising the capture of floating debris, oil and hydrocarbons.
Manufactured from HDPE high strength plastic Weholite.	Offers a durable, light weight and low-cost alternative to concrete. Easy and quick to install resulting in substantial cost savings.
Bespoke construction.	No on-site assembly required.
Specialised sealed baffle.	Prevents captured floatables from escaping.
Internal bypass with pollution retention.	Able to treat localised rain and larger storm events while retaining captured pollutants.
Single easy-access chamber for pollutant removal and storage.	Simplifies inspection and maintenance facilities with no special equipment required.
Compact dimensions.	Reduces ground excavation and product installation costs.
Small footprint design.	Can be retro-fitted with minimal disruption to existing infrastructure utilities or surface features, extending the ability to meet new regulations.
Certified installation lifting supports.	Easy installation without the need for large, expensive cranes.
Suitable for use during site construction programme.	Can be put into operation prior to completion of the site build, with the inclusion of a planned maintenance schedule.
Available in 9 different standard sizes and also bespoke.	Provides greater design flexibility and assists the removal of sediments at a greater rate than comparable systems.

SPECIFICATIONS

Aqua-Swirl® Model No.	Maximum ID Pipe Connection (mm) BYP[1]	Chamber Internal Diameter (mm)	Water Quality Treatment Flow Rate OK-110 Coarse (l/s) Model AS-[2]	Water Quality Treatment Flow Rate NJDEP Fine (l/s) Model XC-	Oil/ Debris Storage Capacity (litres)	Sediment Storage Capacity (m^3)	Aqua-Swirl® Weight (kg)
AS-2/XC-2	375	750	30	16	136	0.3	300
AS-3/XC-3	500	1050	53	31	416	0.6	700
AS-4/XC-4	600	1200	77	40	644	0.8	1000
AS-5/XC-5	750	1500	120	63	1382	1.3	1100
AS-6/XC-6	900	1800	173	91	1439	1.8	1400
AS-7/XC-7	1050	2100	235	123	1987	2.5	1700
AS-8/XC-8	1200	2400	307	161	2612	3.3	2200
AS-9/XC-9	1350	2800	418	220	3596	4.4	2600
AS-10/XC-10	1500	3000	480	252	4164	5.1	3100

[1] BYP (Internal Bypass) provides full treatment of the first flush of water while the peak design storm is diverted and channelled through the main conveyance pipe.
[2] Based on the Tennessee Tech University 'Laboratory Evaluation of TSS Removal Efficiency for the Aqua-Swirl® Concentrator Stormwater Treatment System'.

Notes:
Details of pollution mitigation indices, head loss and CAD details, standard drawings and Installation Guides available upon request.
The sediment storage capacity has been calculated in accordance with the relevant test protocol and is not a physical maximum; any additional sediment capacity required is achieved with bespoke deeper units.
For assistance in design and specific sizing using historical rainfall data, please contact SDS.

A-S DS/0822

SDS Ltd, Clearwater House, Castlemills, Biddisham, Somerset, BS26 2RE
T: +44 (0)1934 751303
E: info@sdslimited.com

Design Risk Register

Updated: Monday 07 August 2023

RESILIENCE & FLOOD RISK

Project Name: Haverhill
Project Number: 3164_FRD
Client: Avison Young

Notes:

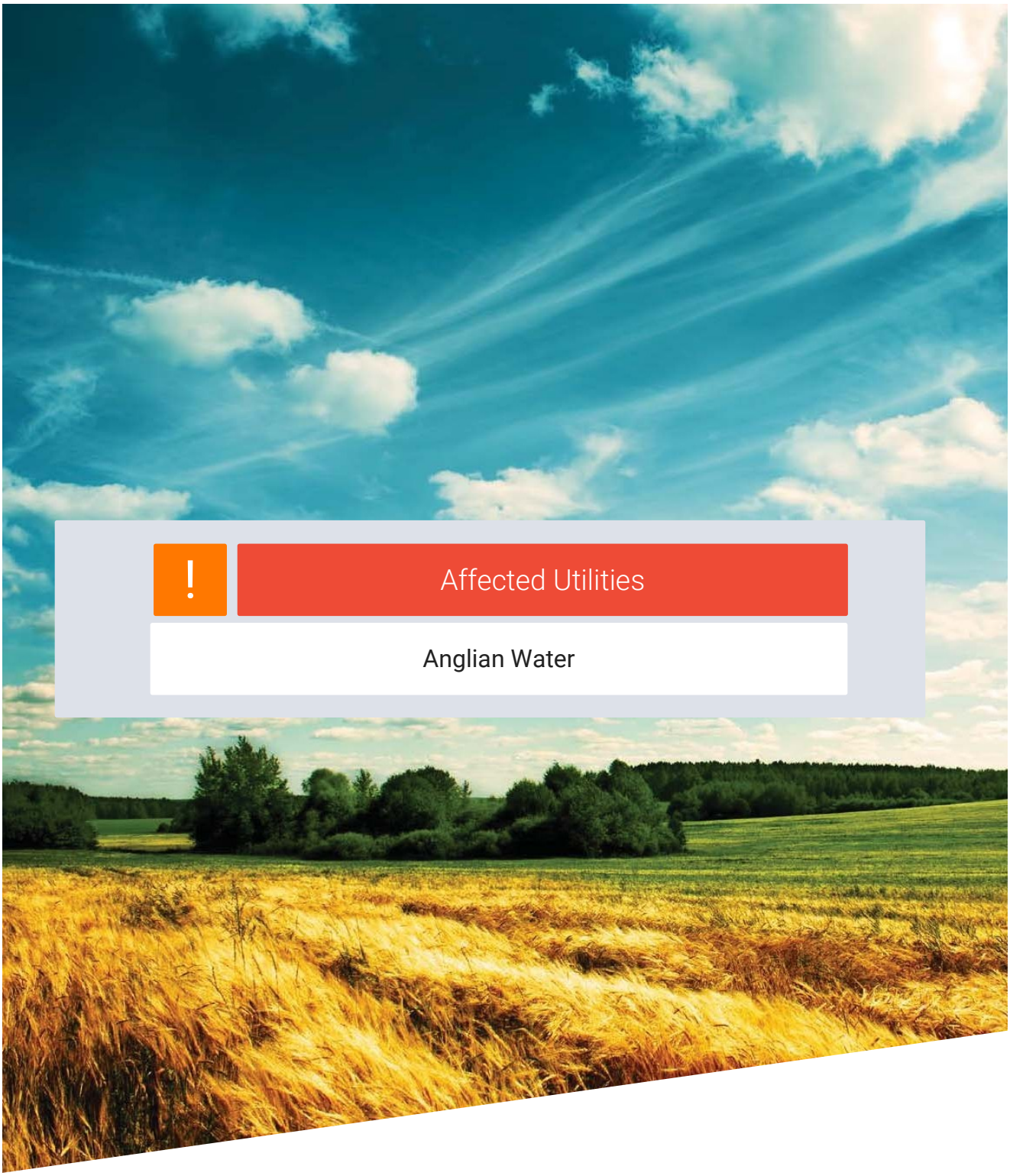
Risk Rating - Likelihood
5 = Almost Certain
4 = Probable
3 = Possible
2 = Possible (under unfortunate circumstances)
1 = Rare

Risk Rating - Consequences
5 = Fatality
4 = Major Injury, resulting in disability
3 = Injury requires GP's or Hospital attendance
2 = Minor Injury, 1st Aid required
1 = Minor Injury, 1st Aid required

Risk	RAG
Low	G
Medium	A
High	R

Risk ID	Risk Description & Impact	Risk Owner	Persons at risk	Risk Category	Risk Rating			Mitigation	Mitigation Risk Rating			Residual Risk	Comments	GENERAL ADVICE	CONTRACTOR AND CLIENT TO COMPLY WITH THE RELEVANT LEGISLATION (WHERE APPLICABLE) BELOW (NOT LIMITED TO)
					Likelihood	Severity	RAG		Likelihood	Severity	RAG				
1	**Design** Cellular storage collapse under high loading capacity from vehicle movement.	Designer (RAB)	Gen. Public	Safety	4	4	16	High load resistant product to be used with sign-off from manufacturer. Suitable minimum cover depth has been used in design based on product technical data.	2	4	8	Incorrect product specification by contractor may cause failure.		PPE to be worn at all times during construction where necessary and informed by risk assessments and method statements.	CDM 2015
2	**Constuction** Contractor may use heavy plant in construction phase causing structural failure of the drainage network.	Lead Contractor	Construction	Safety	4	4	16	Construction Phase Plan must include suitable mitigation measures and should be developed by qualified contractor.	2	4	8			Site should be cleared and remain tidy during construction process.	Confined Spaces Regulations 1997
3	**Site Conditions** Poor soil stability.	Client	Construction	Safety	3	4	12	A CBR value of 5% has been assumed. Client must instruct a detailed soil investigation and inform designer ASAP should there be any discrepancies.	2	4	8	Lack of communication between parties on CBR value.			Control of Vibration at Work Regulations 2005
4	**Design** Cellular storage device is hit by consecutive high intensity storms resulting in a flood.	Designer (RAB)	Gen. Public	Safety	4	4	16	An overflow has been included on the cellular storage final manhole.	2	4	8	Poor maintenance and sediment build-up in tank will increase the probability of flooding.			Reporting of Injuries, Diseases and Dangerous Occurences Regulations 2013
5	**Maintenance** Drainage system becomes blocked causing flooding to occur across the site.	Asset owner	Gen. Public	Safety	4	4	16	Flow control devices have been designed with *minimise blockage risk* preference. Maintenance schedule has been included in the report. Client to consult manufacturer for further maintenance input.	1	4	4	Asset owner does not follow maintenance schedule and system becomes blocked.			The Health and Safety at Work Act 1974
6	**Site Conditions** High groundwater level on-site causing drainage system to lose capacity or cellular storage hydrostatic uplift.	Designer (RAB)	Gen. Public	Safety	3	4	12	Soil investigation and online sources do not indicate high groundwater levels on site. Contractor to inform designer & tank manufacturer of any change to groundwater level occurance at the site.	2	4	8	Long term groundwater level could change post construction due to future development and climate change.			Working at Height Regulations 2005
7	**Maintenance** Build up of solids due to flat gradients causing the system to discharge water of low quality and block.	Asset owner	Gen. Public	Safety	4	3	12	Maintenance schedule of proposed drainage system has been provided in report RAB:3072_FRD and should be followed by client.	2	3	6	Maintenance schedule is not followed resulting in blockages in system.			The Noise at Work Regulations 2005
8	**Trees** Tree roots grow into and affect performance of drainage system.	Designer (RAB)	Gen. Public	Safety	4	3	12	A sewer or lateral drain should not be located closer to trees/bushes/shrubs than the canopy width at mature height. Drainage has been designed not to interfere with trees (based on data provided by others). Client to ensure that no trees are planted within close proximity to drainage features.	1	3	3	Future landscaping work could alter plant and tree locations within the site, which may directly impact the drainage system.			The Management of Health and Safety at Work Regulations 1999
9	**Design** Pollutants entering drainage system and discharge to public sewer.	Designer (RAB)	Gen. Public	Environmental	4	3	12	Roof runoff expected to be of low potential potential. Runoff from concrete yard to go through proprietary treatment devices and discharge to foul sewer to ensure no polliution downstream.	2	2	4	Poor maintenance would cause a reduction in treatment potential of SuDS features.			
10	**Excavations** Deep excavations during decomission causing collapse of trench.	Designer (RAB)	Construction	Safety	4	4	16	Drainage system has been designed as close to the surface water as possible to reduce the need for deep excavtions. Trench boxes or preferable side slopes should also be used. Contractor to follow HSE protocol regarding deep excavations. Decomission process to be signed off by qualified contractor. Spoil heap to be placed away from excavation edges.	2	4	8	Risk of workers falling in excavations remains despite signage and barriers.			
11	**Excavations** Deep excavations during construction causing collapse of trench.	Lead Contractor	Construction	Safety	4	4	16	Trench boxes or preferable side slopes should also be used. Contractor to follow HSE protocol regarding deep excavations. Construction Phase Plan must include suitable mitigation measures.	2	4	8	Risk of workers falling in excavations remains despite signage and barriers.			
12	***In-situ* work** Constructing manholes on site causing delays, poor quality work and risk to health and safety.	Designer (RAB)	Construction	Safety	4	3	12	The use of pre-fabricated manholes is advised and should be explored by client and contractor.	2	3	6	Pre-fabricated manholes require the use and operation of a mobile crane which may introduce additional risks. CPP shpuld address such risks.			
13	**Services** Underground services (gas,water main, electric etc.) are struck during excavation.	Lead Contractor	Construction	Safety	4	5	20	Contractor to map out exisitng utilities prior to excavation work using utilities surveys and their own investigative work after site clearance commences.	2	4	8	Deep utilities will be difficult to locate - additional checks should be made in stages for deep excavation points.			
14	**Overhead services** Collision with overhead services (telephone lines etc.) during construction or maintenance.	Lead Contractor	Construction & Maintenance	Safety	4	5	20	Contractor to assess utilities surveys and provide risk assessments of working near overhead services. Maintenance contractor must undertake own risk assessments prior to commencing maintenance work.	2	4	8				
15	**Decomission** Surface water features including cellular storage and harvesting tank fail due to exceeding design life.	Asset owner	Gen. Public	Safety	5	4	20	Ensure there is a replacement strategy in place, at least 5 years prior to the end of the design life of the system. Most storage features and oil interceptors have 25-50 years design life.	1	4	4	Production line error and inadequate maintenance may cause failure before design life is reached.			
16	**Design** Failure of products used including geotextiles, liners, cellular storage crates etc.	Lead Contractor	Construction	Physical	2	4	8	Contractor must liaise with manufacturers to confirm spec of products is in line with site constraints.	1	4	4				
17	**Design** Tank, pipe and chamber failure due to close proximity to building foundations.	Designer (RAB)	Construction	Safety	4	5	20	Designer has adopted methods used within DCG for design of lateral surface and foul water sewers. Contractor to inform Designer if there are discrepancies on site. Rainwater harvesting tank manufacturer must be involved in the construction process by the contractor to ensure installation methid is acceptable.	2	5	10	Contractor fails to liaise with manufacturers and does not comply with recommendations made in the DCG.			
18	**Design** Differential settlement and/or structural failure in paving sub base.	Designer (RAB)	Gen. Public	Safety	4	3	12	Contractor to liaise with tank manufacturer to ensure mitigation measures have been applied, taking into account the geotechncial investigation report.	1	3	3	Contractor fails to liaise with manufacturers.			
19	**Maintenance Access** Access to undertake maintenance activities presents health and safety hazards.	Designer (RAB)	Maintenance	Safety	3	4	12	SuDS and drainage system maintenance access has been designed to be easily accesible. Maintenance contractor must undertake own assessment prior to undertaking any works.	1	4	4				
20	**Construction Site Access** Transport of materials and machinery into the site - causing disruption to local area	Lead Contractor	Gen. Public	Safety	4	3	12	Construction Phase Plan must include suitable mitigation measures and should be developed by qualified contractor.	2	3	6				
21	**Design** Risk of falling and trip due to the introduction of a drainage design element (for example, open manhole cover in a public space, outfall into a watercourse,	Designer (RAB)	Gen. Public	Safety	4	4	16	Standard manhole covers have been introduced, in line with adoptable standards. No outfall into a watercourse present.	3	4	12				
22	**Construction** Construction process enables the spreading of invasive species throught the site and surrounding ecosystem.	Lead Contractor	Gen. Public	Environmental	4	3	12	Client must provide a site-specific ecological survey of planting species and provide to contractor. Contractor must adopt site-specific methods of work to reduce the risk of invasive species spreading across the local ecosystem.	2	3	6	Client fails to provide relevant survey and contractor fails to adopt suitable method of work relevant to protecting the local environment from invasive species.			

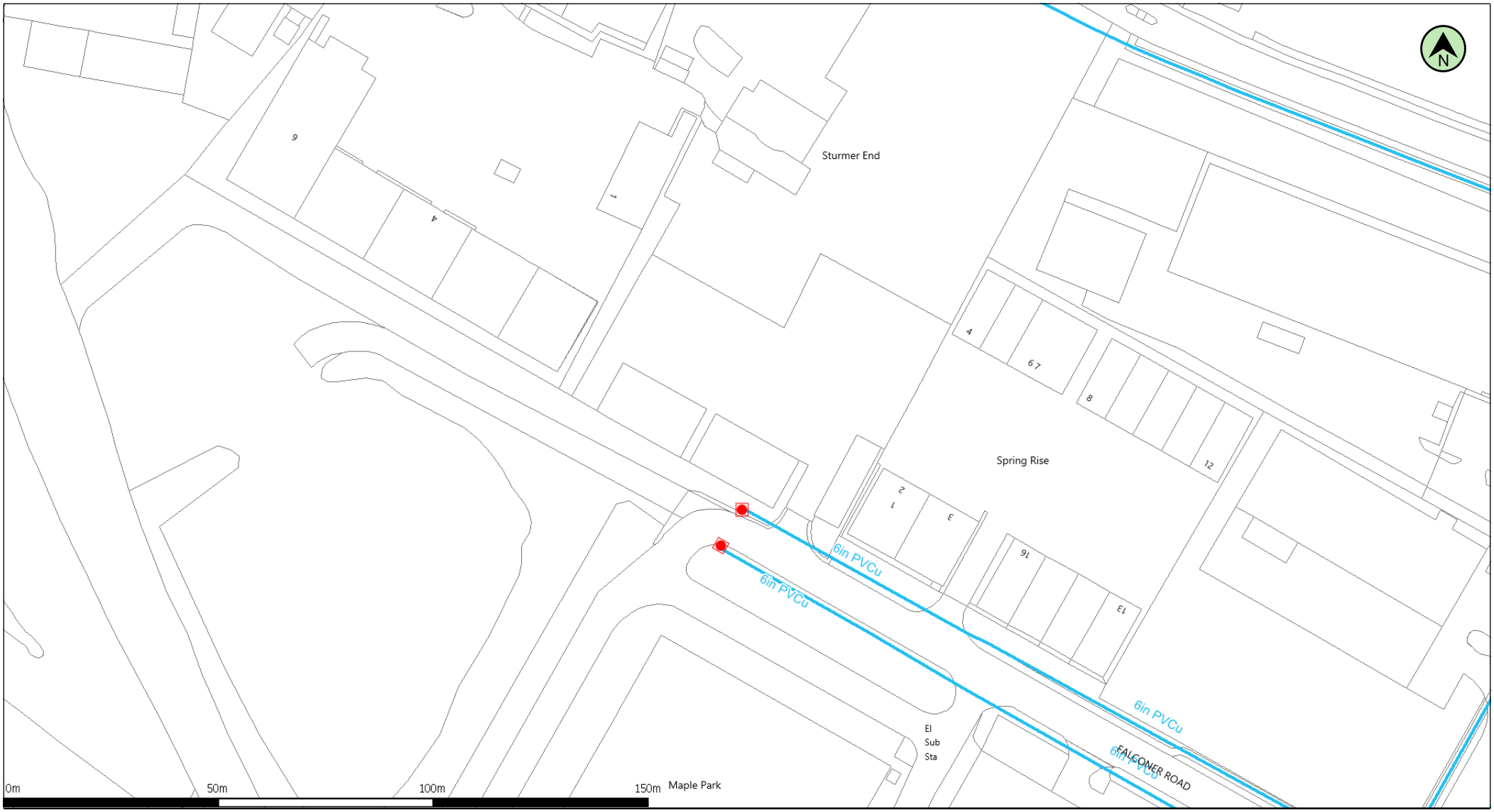
CONTRACTOR MUST PROVIDE A CONSTRUCTION PHASE PLAN (CPP), IN LINE WITH CDM 2015, PRIOR TO ANY WORKS TAKING PLACE. CPP SHOULD BE REVIEWED BY PRINCIPAL DESIGNER AND CLIENT.



Affected Utilities

Anglian Water

Landmark Information



Date: 21/12/22 | Scale: 1:1250 | Map Centre: 568160,244553 | Data updated: 30/11/22 | Our Ref: 1033521 - 4 | Clean Water Plan A4

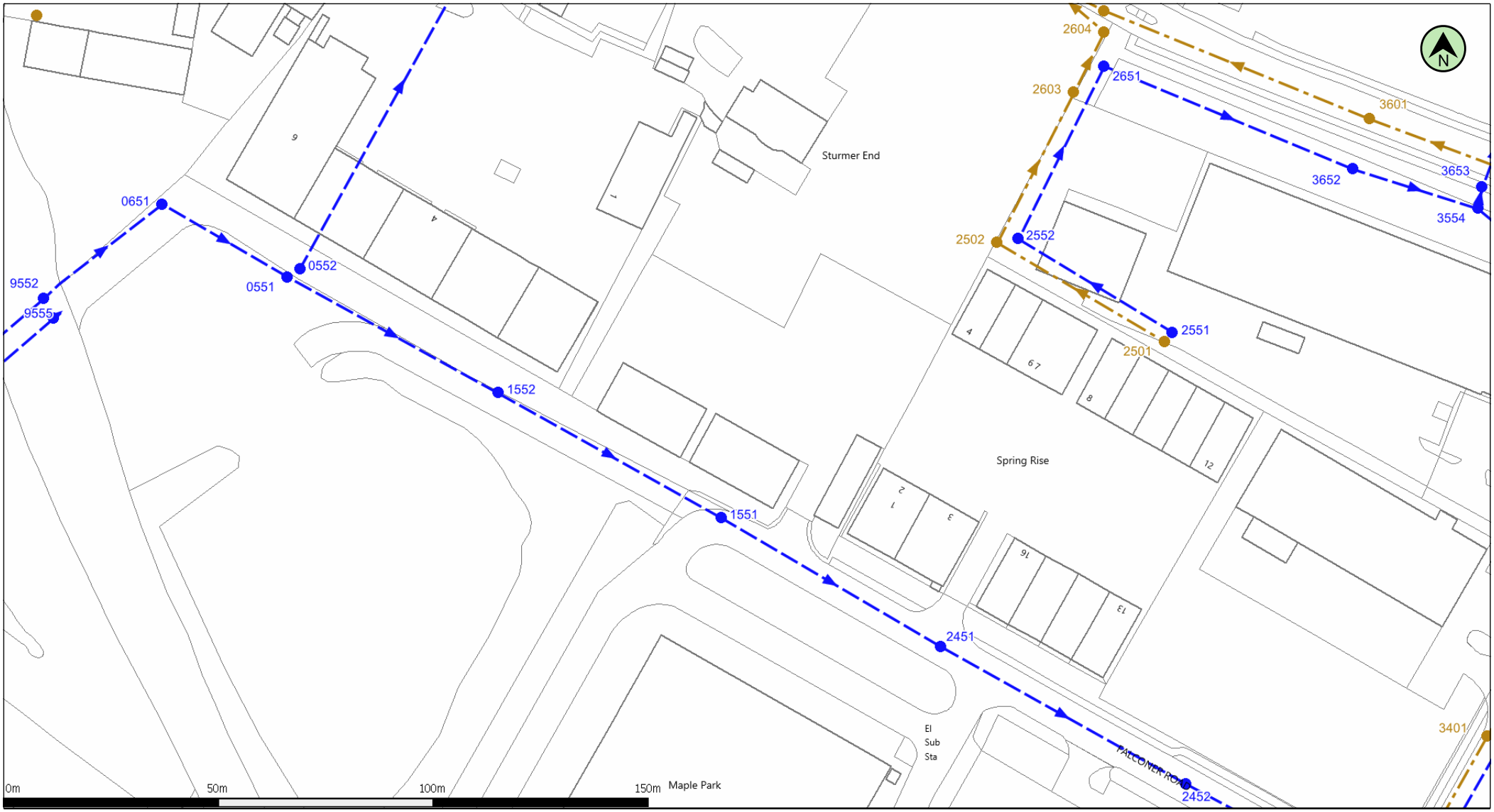
Potable Water
Raw Water
Decommissioned Water
Fitting
Hydrant

payments.utilitysolutions@atkinsglobal.c

115960

CHECKED

love every drop
anglianwater



Date: 21/12/22 | Scale: 1:1250 | Map Centre: 568160,244553 | Data updated: 30/11/22 | Our Ref: 1033521 - 5 | Wastewater Plan A4

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

*(Colour denotes effluent type)

payments.utilitysolutions@atkinsglobal.com

115960

love every drop anglianwater

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
2501	F	-	-	-
2502	F	-	-	-
2602	F	-	60.54	-
2603	F	-	-	-
2604	F	-	-	-
3401	F	-	-	-
3601	F	-	60.7	-
9611	F	-	-	-
0551	S	-	-	-
0552	S	-	63.37	-
0651	S	-	-	-
1551	S	-	-	-
1552	S	-	-	-
2451	S	-	-	-
2452	S	-	-	-
2551	S	-	-	-
2552	S	-	-	-
2651	S	-	-	-
3554	S	-	60.08	-
3652	S	-	-	-
3653	S	-	-	-
9552	S	-	-	-
9555	S	-	-	-

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Pre-Planning Assessment Report

Land west of Falconer Road

InFlow Reference: PPE-0183674

Assessment Type: Used Water

Report published: 07/08/2023

Thank you for submitting a pre-planning enquiry.

This has been produced for RAB Consultants.

Your reference number is **PPE-0183674**.

This report can be submitted as a drainage strategy for the development should it seek planning permission.

If you have any questions upon receipt of this report, you can submit a further question via InFlow. Alternatively, please contact the Planning & Capacity team on **07929 786 955** or email planningliaison@anglianwater.co.uk

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Section 1 - Proposed development

The response within this report has been based on the following information which was submitted as part of your application:

List of planned developments	
Type of development	**No. Of units**
Storage or distribution	1

The anticipated residential build rate is:

Year	Y1
Build rate	1

Development type: Brownfield

Planning application status: Unknown

Site grid reference number: TL6807044512

The comments contained within this report relate to the public water mains and sewers indicated on our records.

Your attention is drawn to the disclaimer in the useful information section of this report.

Section 2 - Assets affected

Our records indicate that we have the following types of assets within or overlapping the boundary of your development site as listed in the table below.

Additionally, it is highly recommended that you carry out a thorough investigation of your proposed working area to establish whether any unmapped public or private sewers and lateral drains are in existence. We are unable to permit development either over or within the easement strip without our prior consent. The extent of the easement is provided in the table below. Please be aware that the existing water mains/public sewers should be located in highway or open space and not in private gardens. This is to ensure available access for any future maintenance and repair and this should be taken into consideration when planning your site layout.

Water and Used water easement information		
Asset type	Pipe size (mm)	Total easement required (m)
Sewer mains	Unknown	3.00 m either side of the centre line

If it is not possible to avoid our assets then these may need to be diverted in accordance with Section 185 of the Water Industry Act (1991). You will need to make a formal application if you would like a diversion to be considered.

Water Recycling Centre

Some areas within this development site will be exposed to odour emissions and noise emanating from the Water Recycling Centre (WRC). It is not practicable to mitigate these emissions at source. As the anticipated level of exposure would restrict the full amenity of this development it may not be compatible with the essential operation of the WRC.

A detailed assessment is recommended, to establish the extent to which this exposure may be mitigated by the layout and design of the development

Due to the size of this development and its proximity to the WRC, there is insufficient scope to effectively mitigate the exposure to the WRC operations.

Due to the private sewer transfer in October 2011 many newly adopted public used water assets and their history are not indicated on our records. You also need to be aware that your development site may contain private water mains, drains or other assets not shown on our records. These are private assets and not the responsibility of Anglian Water but that of the landowner.

Section 3 - Water recycling services

In examining the used water system we assess the ability for your site to connect to the public sewerage network without causing a detriment to the operation of the system. We also assess the receiving water recycling centre and determine whether the water recycling centre can cope with the increased flow and effluent quality arising from your development.

Water recycling centre

The foul drainage from the proposed development is in the catchment of Haverhill Water Recycling Centre, which currently has capacity to treat the flows from your development site. Anglian Water cannot reserve capacity and the available capacity at the water recycling centre can be reduced at any time due to growth, environmental and regulation driven changes.

Used water network

Our assessment has been based on development flows connecting to the nearest foul water sewer of the same size or greater pipe diameter to that required to drain the site. The infrastructure to convey foul water flows to the receiving sewerage network is assumed to be the responsibility of the developer. Conveyance to the connection point is considered as Onsite Work and includes all work carried out upstream from of the point of connection, including making the connection to our existing network. This connection point has been determined in reference to the calculated discharge flow and on this basis, a 150mm internal diameter pipe is required to drain the development site. The nearest practicable connection is to the 150mm diameter sewer a new manhole in Falconer Road at National Grid Reference NGR TL 68311 44441. Anglian water has assessed the impact of gravity flows from the planned development to the public foul sewerage network. We can confirm that this is acceptable as the foul sewerage system, at present, has available capacity for your site. Please note that Anglian Water will request a suitably worded condition at planning application stage to ensure this strategy is implemented to mitigate the risk of flooding.

It is assumed that the developer will provide the necessary infrastructure to convey flows from the site to the network. Consequently, this report does not include any costs for the conveyance of flows.

Surface water disposal

The surface water drainage strategy to connect to 1552 at NGR TL 68102 44557 is acceptable to Anglian Water. Our assessment has been based on development flows connecting to the nearest surface water sewer of the same size or greater pipe diameter. However, the proposed discharge rate of 5 litres per second (l/s) cannot be accommodated as it is not in line with Anglian Waters policy. Anglian Water only allow the 1 in 1 year greenfield rate into the public network. 5l/s is larger than that which has been calculated by Anglian Water. Flows can be discharged at a rate of 2.1l/s in all storm events up to and including the 1 in 30 year storm event. This is subject to satisfactory evidence which shows the surface water management hierarchy as outlined in Building Regulations Part H has been explored. This would encompass the results from the site specific infiltration testing and/or confirmation that the flows cannot be discharged to a watercourse.

As you may be aware, Anglian Water will consider the adoption of SuDs provided that they meet the criteria outline in our SuDs adoption manual. This can be found on our website. We will adopt features located in public open space that are designed and constructed, in conjunction with the Local Authority and Lead Local Flood Authority (LLFA), to the criteria within our SuDs adoption manual. Specifically, developers must be able to demonstrate:

1. Effective upstream source control,
2. Effective exceedance design, and
3. Effective maintenance schedule demonstrating than the assets can be maintained both now and in the future with adequate access.

If you wish to look at the adoption of any SuDs then an expression of interest form can be found on our website

Trade Effluent

We note that you do not have any trade effluent requirements. Should this be required in the future you will need our written formal consent. This is in accordance with Section 118 of the Water Industry Act (1991).

Used Water Budget Costs

Your development site will be required to pay an Infrastructure charge for each new property connecting to the public water and sewerage network that benefits from Full planning permission. The infrastructure charge replaces the zonal charge as previously identified.

You will be required to pay an infrastructure charge upon connection for each new plot on your development site. The infrastructure charge are types of charges set out in Section 146(2) of the Water Industry Act 1991.

The charge should be paid by anyone who wishes to build or develop a property and is payable upon request of connection.

• The Infrastructure Charge is based on the cost of any reinforcement and upgrades to our existing network ("Network Reinforcements"), whether designed to address strategic or local capacity issues. For more information on our Infrastructure Charge, please see the 'Useful Information' section of this report.

Infrastructure charges are raised on a standard basis of one charge per new connection (one for water and one for sewerage).

The Water Recycling Infrastructure charge for your dwellings is:

Infrastructure charge	Number of units	Total
£ 400	0	To be confirmed at formal application stage

Please note that you should also budget for infrastructure charges on non-household premises where applicable and these will be calculated according to the number and type of water fittings in the premises. This is called the "relevant multiplier" method of calculating the charge and the relevant multiplier will be applied to the figures set out in our 2023-24 Developer Charging Arrangements to arrive at the amount payable. Details of the relevant multiplier for each fitting can be found on our website.

Section 4 - Map of Proposed Point of Connection(s)

Figure 1:Showing your water recycling foul point of connection

Figure 2:Showing your water recycling surface water point of connection

Section 5 - Useful information

Water Industry Act – Key used water sections

Section 98:

This provides you with the right to requisition a new public sewer. The new public sewer can be constructed by Anglian Water on your behalf. Alternatively, you can construct the sewer yourself under section 30 of the Anglian Water Authority Act 1977.

Section 102:

This provides you with the right to have an existing sewerage asset vested by us. It is your responsibility to bring the infrastructure to an adoptable condition ahead of the asset being vested.

Section 104:

This provides you with the right to have a design technically vetted and an agreement reached that will see us adopt your assets following their satisfactory construction and connection to the public sewer.

Section 106:

This provides you with the right to have your constructed sewer connected to the public sewer.

Section 185

This provides you with the right to have a public sewerage asset diverted.

Details on how to make a formal application for a new sewer, new connection or diversion are available on our website or via our Development Services team on **0345 60 66 087**.

Sustainable drainage systems

Many existing urban drainage systems can cause problems of flooding, pollution or damage to the environment and are not resilient to climate change in the long term. .

Our preferred method of surface water disposal is through the use of Sustainable Drainage Systems or SuDS.

SuDS are a range of techniques that aim to mimic the way surface water drains in natural systems within urban areas. For more information on SuDS, please visit our website

We recommend that you contact the Local Authority and Lead Local Flood Authority (LLFA) for your site to discuss your application.

Private sewer transfers

Sewers and lateral drains connected to the public sewer on the 1 July 2011 transferred into Water Company ownership on the 1 October 2011. This follows the implementation of the Floods and Water Management Act (FWMA). This included sewers and lateral drains that were subject to an existing Section 104 Adoption Agreement and those that were not. There were exemptions and the main non-transferable assets were as follows:

Surface water sewers and lateral drains that do not discharge to the public sewer, e.g. those that discharged to a watercourse.

Foul sewers and lateral drains that discharged to a privately owned sewage treatment/collection facility.

Pumping stations and rising mains will transfer between 1 October 2011 and 1 October 2016.

The implementation of Section 42 of the FWMA will ensure that future private sewers will not be created. It is anticipated that all new sewer applications will need to have an approved section 104 application ahead of a section 106 connection.

It is anticipated that all new sewer applications will need to have an approved Section104 application ahead of a Section 106 connection

Encroachment

Anglian Water operates a risk based approach to development encroaching close to our used water infrastructure. We assess the issue of encroachment if you are planning to build within 400 metres of a water recycling centre or, within 15 metres to 100 metres of a pumping station. We have more information available on our website

Locating our assets

Maps detailing the location of our water and used water infrastructure including both underground assets and above ground assets such as pumping stations and recycling centres are available from digdat

All requests from members of the public or non-statutory bodies for maps showing the location of our assets will be subject to an appropriate administrative charge.

We have more information on our website

Charging arrangements

Our charging arrangements and summary for this year's water and used water connection and infrastructure charges can be found on our website

Section 6 - Disclaimer

The information provided in this report is based on data currently held by Anglian Water Services Limited ('Anglian Water') or provided by a third party. Accordingly, the information in this report is provided with no guarantee of accuracy, timeliness, completeness and is without indemnity or warranty of any kind (express or implied).

This report should not be considered in isolation and does not nullify the need for the enquirer to make additional appropriate searches, inspections and enquiries. Anglian Water supports the plan led approach to sustainable development that is set out in the National Planning Policy Framework ('NPPF') and any infrastructure needs identified in this report must be considered in the context of current, adopted and/or emerging local plans. Where local plans are absent, silent or have expired these needs should be considered against the definition of sustainability holistically as set out in the NPPF.

Whilst the information in this report is based on the presumption that proposed development obtains planning permission, nothing in this report confirms that planning permission will be granted or that Anglian Water will be bound to carry out the works/proposals contained within this report.

No liability whatsoever, including liability for negligence is accepted by Anglian Water or its partners, employees or agents, for any error or omission, or for the results obtained from the use of this report and/or its content.

Furthermore, in no event will any of those parties be liable to the applicant or any third party for any decision made or action taken as a result of reliance on this report.

This report is valid from the date issued and the enquirer is advised to resubmit their request for an up to date report should there be a delay in submitting any subsequent application for water supply/sewer connection(s). Our pre-planning reports are valid for 12 months, however please note Anglian Water cannot reserve capacity and available capacity in our network can be reduced at any time due to increased requirements from existing businesses and houses as well as from new housing and new commercial developments.