*Robinwood Activity Centre Ltd*

# Residential Activity Centre Development Cross Lanes, Wrexham

## Proposed Foul & Surface Water Management Plan

**June 2017**

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# 1 Introduction

## 1.1 Commission

OPUS International Consultants (UK) Ltd (Opus) were appointed by Robinwood Activity Centre Ltd (RWAC) to undertake a Drainage Strategy and Detail Design of the foul and surface water drainage system, for the new Activity Centre at Cross Lanes, Wrexham. The development includes the extension to the existing hotel building, modifications to the existing outbuildings, along with the construction of 3no. new outbuildings and equipment for children's activities, the creation of a lake for water sports activities and the expansion of the site's car/coach parking areas.

This report provides guidance and information for the following:

- the recommended maintenance that the foul and surface water drainage systems will require to operate efficiently
- to provide guidance for the owners and maintainer of the Activity Centre
- to support the variation of an existing discharge consent application for the proposed package treatment plant.

It is recommended that this document is used and contained within the Activity Centre's health and safety report and is transferred to a new owner, where necessary, ensuring that all relevant documents are supplied in order that the new owner can be acquainted with the functioning of the equipment and ensure that the required maintenance is carried out in a timely manner.

## 1.2 Limitations

The findings and opinions conveyed in this report are based on information obtained from a variety of sources, as detailed, which OPUS believes are reliable. Nevertheless, OPUS cannot and does not guarantee the authenticity or reliability of the information it has relied upon from these sources.

This report has been written on behalf of the Client and no responsibility is accepted to any Third Party for all or any part. This report should not be relied upon or transferred to any other parties without the express written authorisation of OPUS. If any unauthorised third party comes into possession of this report, they rely on it at their own risk and the authors owe them no duty of care or skill. OPUS disclaims any responsibility to the Client and others in respect of any matters outside the scope of the above contract.

This report has been prepared by OPUS with all reasonable skill and care within the terms of the Contract with the Client, and taking into account of the information made available by the Client, as the manpower and resources devoted to it by agreement with the Client.

This report is based on data available at the time of the study and on the review of available information that has been undertaken to date, and only relate to the current development proposals as outlined.

## 1.3 Proposed Drainage Strategy

The site is currently connected to a package treatment plant, with an existing drainage system which connects the package treatment plant to the Bedwell Brook located approximately 70m to the west of the site, on land owned by third party. There is an existing easement arrangement with the third party and the previous owner of the former Cross Lanes Hotel for the siting of the existing package treatment plant and related pipework and outfall to the Bedwell Brook

The new owner (Robinwood Activity Centre Ltd) of the former Cross Lanes Hotel, Wrexham, wishes to apply for a variation of the existing discharge consent for treated foul effluent from the hotel building. The variation will include the following changes:

- Change in location of the existing treatment works from the adjacent landowner's farmland SJ37303, 47001 (existing location) to the Client's own land SJ37378, 47057 (proposed location).
- Change in outfall position to the Bedwell Brook from SJ37247, 47073 (existing location) to SJ37327 47147 (proposed location).
- Change in location of treated effluent sampling point location from near SJ37247 47073 (existing location) to SJ37378 47062 (proposed location) on Client's land.
- Change in the capacity of the daily discharge volume from the existing approx. 26.54m$^3$/day to 40.46m$^3$/day (during school term time activity only).

The reasons for the above proposed changes are as follows:

- The existing plant is no longer able to accommodate the estimated daily discharge volume from the proposed use of the building as a residential activity centre.
- The existing system has been found to have numerous cross connections, with surface water connected to the foul drainage system identified following a detailed drainage survey.
- The owner of the adjacent agricultural land, will not entertain the idea of a new plant on his land, and going forward the owner has other development plans for the existing plot of land, and would require the existing plant to be moved. (see section 3.1)
- The existing plant is already around 13 years old (or more) and the new owner is keen to replace it with a more modern, higher performance and higher reliability unit.
- The proposed plant will be sited on the Client's own land and will be easily accessible for monitoring, operation and maintenance purposes.

On the basis of the existing drainage system above which has been proven to work since its installation in 2004, it is proposed to drain foul flows from the proposed development would be to a new package treatment plant similar to the existing foul drainage arrangement. The treated effluent can be discharged using an improved pipework arrangement, to a new outfall structure into Bedwell Brook.

Soakaway testing was undertaken on the site, in accordance with BRE365 guidance. Testing failed as water level did not reach the 25% or 75% level required for testing. This indicated limited infiltration potential at the site and that the use of soakaways for partial or complete drainage of the site would not be feasible. It is proposed to drain the surface water drainage for the proposed development into the Bedwell Brook via a new outfall structure at a controlled rate.

The proposed Foul and Surface water drainage design drawings or the proposed Activity Centre are in Appendix A.

# 2 Outline Development Proposals

## 2.1 Features and Description

The proposed development consists the extension to the existing hotel building, modifications to the existing outbuildings, along with the construction of 3no. buildings and equipment for children's activities, the creation of a lake for water sports activities and the expansion of the site's car/coach parking areas. The proposed development plan is included in Appendix B.

### 2.1.1 Existing Hotel Building

The existing hotel building is to be reused, following extensive alterations to the existing building structures and drainage with the addition of toilets showers and kitchen upgrades.

The foul drainage is required for the building, to collect both the new and existing foul connections from the toilets and showers. The existing kitchen is proposed to be renovated, to accommodate the kitchen drainage a grease separator is proposed to be installed within the courtyard area to enable the access for cleaning (for further details see the foul section).

A new surface water system has been designed, to collect the existing roof drainage, car park, and surface water runoff. The system consists of the existing slot drainage channels, sump gullies and catchpit manholes, to enable silt to be collected at the source to improve the water quality.

### 2.1.2 Former Hotel Building Extension

The extension to the hotel is to increase the available accommodation for the 13no. groups of visiting children and staff. New drainage has been designed to cater for the new foul connections from the toilets and showers. A manhole connection has been provided for every existing foul connection from the buildings, this will allow easy cleaning of the foul connection.

The new surface water drainage is designed to collect the new rainwater connections and surface water gullies from the hotel extension. All the surface water connections are provided via direct connections and sump highway gullies, to enable silt to be collected at source.

### 2.1.3 Outbuilding

#### 2.1.3.1 Existing Lodge

The existing lodge building is to be used as an office and administration building, with the foul drainage and surface water drainage flows unchanged. The existing surface water slot channel drainage will be connected to the new system (for details of maintenance and cleansing, refer to section 4: surface water drainage).

#### 2.1.3.2 High Activity Building

The high activity building is proposed to be constructed with a floor level 2m below the existing ground level. The proposed drainage is required to cater for roof water and runoff from the access ramps and steps.

#### 2.1.3.3 Showers and Toilets Buildings (old garage block)

To provide showers and toilets outside of the main building, two of the existing outbuildings are to be reused or rebuilt, both new foul and surface water connections are being provided to serve these two buildings.

# 3 Foul Drainage

## 3.1 Existing Package Plant

A survey of the existing site drainage layout drawing is attached in Appendix C, which indicated the presence of an existing package treatment plant, a packaged type pumping station located in the field to the west of the site. This treatment facility was installed in 2004 to replace a previous septic tank treatment facility also located in the field to the west of the site. The foul drainage from the site is currently connected to this package treatment plant and pumping station arrangement. There is an existing 100mm diameter drain that runs from the treatment facility through the field and discharges into the Bedwell Brook approximately 50m away. Further investigations are required to trace the connectivity of the foul drainage network, assess the condition and performance of the sewage treatment facility and also to assess the condition of the outlet drain and headwall.

The hotel maintenance records and construction details of the package treatment works indicate the installation of a Condor M200 package sewage treatment system, a SCC 27,000 litre tank and a CK type final PS, 601NE CK package pumping station. This model of treatment plant has now been discontinued and there was no further information available on the treatment capacity or performance of this plant from the manufacturer.

The above foul treatment system is subject to a discharge consent reference CG0417501 dated May 2004 with a consented discharge volume of **26.54m³/day**.

It is also understood that there is an existing easement agreement between the third party owner of the field and the development site owner for the use of the field to the west of the site, for the siting and operation of the existing package treatment plant, pumps and pipework including the outfall to the Bedwell Brook for the former use of the site as a hotel. The easement does not allow for upgrading and replacing of the package plant, required for the proposed development.

A copy of the existing foul drainage system is included in Appendix C of this report for reference.

### 3.1.1 Proposed Foul Flows from Proposed Development

Further to a review of the information provided by the Client, the previous site usage as a hotel was estimated to generate 13.84m³ of foul water on a daily basis. In addition to the planned expansion of the hotel activities, including an increase in the number of rooms, allowed for an additional 12.7m³ of foul water. Further to consultation with Natural Resources Wales, it was noted that the current package treatment plant, which is believed to have been installed in 2004, has a capacity of 27m³ and is subject to a daily discharge consent of 26.54m³.

It is understood that up to 13No. residential groups of children and adults are expected on a daily basis, and on average, each group comprises of a total of 10.6 children and 1.7 adults. The maximum number of staff members are 40No. (daytime only) and there would be 3No. staff members staying overnight.

The following guidance has been used to estimate the daily foul flows from the proposed development:

- Code of Practice Flows and Loads – 4, Sizing Criteria, Treatment Capacity for Sewage Treatment Systems

The proposed foul flows have been calculated as summarised in Table 1 below:

| User Type | Number of users (daily) | Flow rate (Using Flows and Loads 4) | Total Daily flow |
|---|---|---|---|
| Residential Groups (13 groups) | **160** | **227 l/day** (Holiday Camp Resident) | 36320 l/day **36.32 m³ /day** |
| Staff members day time (only) | **40** | **90 l/day** (Full Time Day Staff) | 3600 **3.6m³ /day** |
| Staff members residential | **3** | **180 l/day** (Resident Staff) | 540 l/day **0.54 m³ /day** |
| | | **Total Flow rate** | 40460 l/day **40.46 m³ /day** |

Table 1: Flow Rates for Sewage Treatment Systems, number of persons on site is based on the information provided by the Client (Robinwood Activity Centre Ltd)

## 3.2 New Package Treatment Plant

The foul water drainage from the development is proposed to be connected to a new package treatment plant located near the northern boundary of the site, and this will make the existing treatment plant that is currently located on third party land redundant and will be decommissioned in due course. The treated effluent from the package plant is proposed to discharge in a new outfall together with the attenuated surface water flows, into the Bedwell Brook via a new drainage pipe and concrete headwall approximately 70m to the west of the site where the A525 crosses the watercourse.

An Ordinary Watercourse Consent (OWC) is being sought from Wrexham County Borough Council for the new headwall.

The proposed package treatment plant specified is a Bioficient model 55 supplied by Kingspan Environmental (Klargester - refer to Appendix D for details), taking a maximum foul flow of 41.0m³/day, from the site, this being based on the information provided by the Client.

### 3.2.1 Treatment Process

The treatment plant is a gravity feed system, with the sewage flowing to the plant arriving at the primary settlement compartment. The unit is separated into a series of compartments / zones: primary settlement zone, bio treatment zone and a final settlement tank, with the sewage traveling through each department before discharging. A prolonged power failure would result in the sewage effectively bypassing the treatment process, so it is therefore necessary to have a backup system for electrical supply. Short term power failure is not likely to impact adversely on the quality of the effluent from the package treatment plant.

Within each compartment, the volume and liquid levels are controlled using a mixture of air lift transfers and pumped recycling. The plant design incorporates flow management to smooth out the volume and load variations and create the optimum conditions for bacterial growth.

The biological process requires the addition of power and air. Blowers, pumps, air lifts and diffusers are used to control the process; movement /recycling of liquids and solids and provide oxygen for the biological process. The air supply is provided from an external blower unit, mounted adjacent to the electrical control panel.

## 3.2.2 Operation

### 3.2.2.1 General

Due to the Activity Centre operating on a school term time basis only, with limited usage of the administrative buildings during the shutdown periods, Kingspan recommend that the unit is NOT turned off during the holidays / closed periods.

The reasoning behind this if the treatment plant is switched off for more than a two month period, the bacteria that treats the effluent will start to die off due to no air aerating the system so if the air supply is shut down the bacteria levels drop. A 4 week period would be required to build up the bacteria levels before the activity centre reopens. During this shutdown period, it is important that constant feed is introduced for the bacteria to live on by the maintenance team to the package treatment plant. The use of the administrative building and offices may even provide adequate feed to the plant during the low activity periods. It is recommended that the plant is monitored during planned shutdown periods and the recommendations of the manurfactuer are adhered to during this period.

### 3.2.2.2 Activities to Avoid

Users of the activity centre, should be made aware that their sewage enters a biological wastewater treatment system so that they can dispose of their waste considerately. Not everything is suitable for disposal into the system, for example where the unit serves premises with a catering function, special arrangements should be made to prevent the oils, fats and grease from entering the unit. Below is a list of the know product / activities that would affect the running of the treatment plant.

THE FOLLOWING MUST NOT BE DISCHARGED INTO THE FOUL DRAINS:

- Cooking oil and fat,
- Chemical Toilet Waste,
- Motor oil, grease, anti-freeze, brake fluid etc.
- Weed-killers, insecticides, fungicides and other gardening chemicals,
- Paint, thinners, white spirit, turpentine, creosote etc.
- Medicines,
- Photographic developing fluids and chemicals,
- Strong commercial cleansing chemicals, e.g., products for cleaning beer lines, drain products,
- Nappies, nappy liners, sanitary items, fabric wipes, cotton wool bugs, rags, soft toys, tennis balls etc.

The following is a list of knows products / activities that would affect the running of the treatment plant

1. Washing Machine and dishwasher detergents, washing up liquids

   These are generally acceptable to use in the normal concentrations and usage found in domestic housing applications. All commercial applications should be individually assessed before installation for their laundry load.

2. Floor cleaners, disinfectants and bleaches:

   These are safe to use in accordance with the manufacturer's recommendations and in the minimum necessary quantity and concentration. Do not pour neat disinfectant or bleach down sinks or outside gullies.

3. Nappy disinfectants and bottle sterilising fluids, e.g Milton

   When disposing of the used fluid, ensure that it is well diluted with water, (The easiest way of doing this is usually to flush it away down the toilet).

4. Waste disposal units: These should not be used.

   They do not inhibit the biomass, but, depending on their use, they can present the treatment plant with considerable extra load and solids. This can result in the treatment process becoming unbalanced, leading to problems.

5. Home beer and wine making.

   This presents a similar problem to waste disposal units. The unit has to work as hard to treat one pint of beer tipped down the drain as it does to treat all the normal waste produced by one person in 24 hours. See also the notes above regarding sterilising fluids.

The use and disposal of any of the above should be controlled on site.

### 3.2.3 Maintenance

It is recommend that ongoing consultations are undertaken with the manufacturer, with regards maintenance intervals. Due to the nature of the site usage and operational periods of the Activity Centre (closed for periods including school holidays), it is recommended that the treatment plant is checked on a weekly basis for the first couple of years, to refine the maintenance schedule for this specific package treatment plant.

#### 3.2.3.1 Visual Checks

It is recommended that the owners and maintainer of the Activity Centre, undertakes a regular weekly visual check of the treatment plant, as outlined in Table 2 below. Please refer to the Health and Safety guidance notes, in Section 3.2.4 further below.

| | |
|---|---|
| Sounds | Learn what is normal and abnormal from a sound point of view, i.e. normal blower noises and bubbling. |
| Looks | Visually check the general condition of the plant, checking the bubble pattern. Check the control panel for warning messages. |
| Levels | The front section is usually lower than the final tank, but this level fluctuates. |
| Biomass Development | Look within the biozones. There should be even turbulence with bubbles all over. The liquor may appear light grey to dark brown. The second biozone may appear a little browner. |
| Mechanics | Visually check that the all the forward feed air lifts are operating. (Clear any debris from pipes if there is a lack of flow).<br>Clean the Blower filters and replace as required |
| Timing | Check that the pumps operate at their prescribed times and durations. Each time the power is turned on the pumps will initiate the run cycle. |
| Alarms | Check the alarms operate, by switch off the blower but not the power to the control panel, to check that the alarm activates. |

Table 2 Kingspan Bioficient visual checks

For further details / information on the above visual checks, refer to the frequently asked questions Section 15 of the Kingspan Installation and Maintenance guideline (in Appendix D), If none of the above is correct or any aspect is of concern, then contact the manufacturer's maintenance engineer.

#### 3.2.3.2 Desludging

The system requires regular desludging from the primary and final compartments only. There is no need or requirement to empty either of the biozones. This is to enable the treatment process to run efficiently and to stop a build-up of solids within the system.

Kingspan recommends that under normal daily load the desludging would be required at 90 day (3 months) intervals, due to the Activity Centre operating only during school term time, it is recommended that the sludge volumes are monitored for the first two years to enable a schedule to be produced for future usage.

The two stage primary zone needs to be de-sludged to remove the floating scum and approximately 60% of the volume (refer to Kingspan's maintenance and operational manual for desludging procedure in Appendix D).

The desludging operation must be emptied by a qualified and licenced contractor and carrier and the waste is correctly disposed e.g. licenced Waste recycling centre. It is important that the contractor provides a copy of there up to date licence, before the unit is emptied at every visit. The unit is to be only emptied using a suitable vacuum tanker.

### 3.2.4 Health and Safety

The following section is taken from the Kingspan Environmental – Installation and Maintenance Guidance, so the risks highlighted are specific to the package treatment plant – Commercial Bioficient unit 55 only.

These warnings are provided in the interest of safety, and should be read though carefully before installing or using the equipment, site specific risk need to be consider separately.

- Installation should only be carried out by a suitably experienced contractor, following the manufactures installation guidelines.
- Electrical work should be carried out by only by a qualified electrician.
- Sewage and sewage effluent, contaminated surface water can contain micro-organisms and substances harmful to human health. Any person carrying out maintenance on the equipment should wear suitable protective clothing, including gloves and eye protection. Good hygiene practice should also be observed.
- Access covers should be kept locked, suitable covers should be provide considering the loading requirements and surrounding land usage.
- When covers are removed, precautions must be taken against personnel falling into the unit, e.g. suitable temporary barriers erected including warning notices.

The precautions below, should be observed when carrying out maintenance procedures:

- Ensure that you are wearing suitable personal protective clothing, including gloves, eye protection and suitable footwear.
- Ensure that you are familiar with the safe working areas and accesses. Ensure that the working area is adequately lit and no other activities pose a risk.
- Take care to maintain correct posture, particularly when lifting. Use appropriate lifting equipment when necessary and within manual handling guidance. Keep proper footing and balance at all times, be aware of site conditions e.g. wet ground.

- Avoid any sharp edges.
- Observe all hazard label and take appropriate action to avoid exposure to the risks indicated. The units contain electrical items, pumps, and air lifts.
- The power supply to the equipment must be isolated at the control panel(s) before lifting the covers. Where a specific maintenance procedure requires the equipment to be running with the covers off, all care must be taken to avoid contact with moving parts and electrical components or conductors.
- Once power has been isolated, the control panel must be kept locked shut to avoid accidental re-connection whilst work or inspection is being carried out.
- The correct ongoing maintenance is essential for the proper operation of the equipment.
- The removal of sludge and liquid from the unit must be carried out by a contractor holding the relevant permits to transport and dispose of such waste. The contractor should refer to the guidelines in this document.

## 3.3 Grease Separator

### 3.3.1 General

The grease separator is provided to collect the fats and greases, discharged from the Activity Centre's onsite catering facilities. The separator allows fats and grease to naturally separate out from water, allowing their removal prior to entering the drainage system, and more importantly not to enter the package treatment unit. The grease trap is also provided with a biological dosing unit / fat decomposition system before the effluent enters the package treatment plant.

The separator is to be located within the courtyard area of the exiting hotel building, next to the centres main catering facilities. Only the kitchen drainage is to be connected to the unit, no foul waste (human waste) should enter the Separator.

The proposed Grease Separator unit specified is the Kingspan Environmental (Klargester) model number NSG06, with a capacity of 3000 litres and a flow rate of 6 litres/second, the data sheet is attached in Appendix E for information.

The Grease / oil separator unit, is to be supplemented by a compatible biological dosing system, installed within the kitchen to keep the system working efficiently.

### 3.3.2 Maintenance

The grease/oil separator needs to be monitored weekly and emptied a minimum of 4 times a year, to stop the oil and fats being flushed downstream to the package treatment plant.

As the demand of the system is not fully known, it is advised that the separator is monitored on a weekly basic to record the amount of the extracted oil, grease or other light liquid retained. Along with the monitoring, it is important that after every unexpected event, such as spills or accidents in the kitchen, the unit is inspected to check the operation has not been affected by the event.

The unit should be emptied and cleaned in accordance with the manufacturer's instructions, and must be undertaken by a qualified and licenced contractor and carrier and that waste is correctly disposed e.g. at a licenced waste recycling centre. It is important that the contractor provides a copy of their up to date licence, before the unit is emptied at every visit. The unit is to be only emptied using a suitable vacuum tanker.

For guidance the below is an extract for illustration only

- The unit should be emptied taking care to "balance" the chambers to prevent buckling of internal baffles.
- Removal of the coalesce – recommended to allow to drain before removal – to prevent losing the foam insert and to reduce the weight for manual handling,
- Coalescer to be cleaned / replaced as necessary,
- Clean and test the alarm probe and level sensors,
- Check that the alarm is work correctly,
- Refill the unit with clean water.

The following MUST NOT be discharged into the unit:

- Foul wastewater (human waste).
- Materials which can obstruct the operation of the oil separator, e.g. chemical drying agents and substances with a lot of sediment or impurities,
- Strong commercial cleansing chemicals, e.g., products for cleaning beer lines, drain products.
- Surface water runoff.
- Pumped discharges of kitchen wastewater.

## 3.4 Foul Manholes

Foul drainage manholes are to be provided, at every new and existing connection discharging from the buildings, to enable clearance of the drains as and when required. To facilitate easy cleaning and blockage removal, it is recommended that every soil stack is connected directly to an external manhole, this allows pipework located underneath the building to be unblocked.

All the foul manholes around the activity centre, have been designed in accordance with sewers for adoption and building regulations, with regards to the size and depth. All the manholes sized and designed to drains to be cleanable by rodding or high pressure jetting.

### 3.4.1 Maintenance

It is recommended that a 5 yearly inspection, of the foul manholes is undertaken to enable the identification of blockage. With the full drainage system inspected by CCTV and any remedial works are carried out.

THE FOLLOWING MUST NOT BE DISCHARGED INTO THE FOUL DRAINS:

- Cooking oil and fat,
- Chemical Toilet Waste,
- Motor oil, grease, anti-freeze, brake fluid etc.
- Weed-killers, insecticides, fungicides and other gardening chemicals,
- Paint, thinners, white spirit, turpentine, creosote etc.
- Medicines,
- Photographic developing fluids and chemicals,
- Strong commercial cleansing chemicals, e.g., products for cleaning beer lines, drain products,
- Nappies, nappy liners, sanitary items, fabric wipes, cotton wool bugs, rags, soft toys, tennis balls etc.

It is important to note that the foul manholes are connected to the treatment plant, so the advice in section 3.2.2.2 must be followed.

# 4 Surface Water Drainage

The surface water drainage system, has been designed as a gravity system with no infiltration to the ground. This is due to the site located within an area with low infiltration potential, as shown by recent ground investigations and BRE 365 soakaway tests. Gullies and slot channels have been provided to collect the surface water, from the carpark, footpaths and impervious areas, with the gullies and slot channels discharged into a surface water system.

The roof water connections, for the new and existing buildings, connect into the surface water drainage system. Due to the woodland surroundings of the proposed Activity Centre, the roof water down pipes connect directly into the surface water drainage system, to reduce the risk of leaves blocking the roof gullies and causing surface water flooding. Catchpit manholes have been provided, at access locations within the carpark areas to facilitate safe emptying and cleaning via a gully sucker type tanker.

## 4.1 Maintenance / Operation

### 4.1.1 Catchpit manholes and sump gullies

The surface water drainage proposals for this site should include the following regular maintenance measures:

- A monthly visual inspection of the carpark gullies, slot channels, roof water connections and Bedwell Brook outfall.
- The catchpit manholes and hydrobrake control manhole, to be visually checked, every other month, with additional fortnightly checks during the winter months.
- Cleaning of gulley's and catchpits within the car parking and hardstanding areas, should be undertaken a minimum of four times a year.
- Inspection, cleaning and maintenance of the below ground attenuation systems to remove any silt and debris in accordance with the manufacturer's instructions, a minimum of 4 times a year.
- Cleaning and maintenance of the hydrobrake flow control system and its sump to maintain effective drainage, a minimum of 4 times a year.

The surface water drainage system, must also be visually inspected following a unusual storm events, and any clearance or reactive maintenance undertaken accordingly.

Any man-entry into manholes should be by trained personnel with adequate personal protective equipment. Approved safety procedures must be followed.

A surface water maintenance inspection checklist is included in Appendix F for guidance.

### 4.1.2 Surface Water Attenuation

A surface water attenuation geocellular system has been specified to provide an onsite water storage, required to allow the surface water to discharge at a controlled rate. The attenuation is formed from plastic cells designed by Wavin – AquaCell system Prime and Plus cells (the information sheets are in Appendix G).

The AquaCell Plus units allow end to end CCTV inspection, of the cells and subsequent clearance (via high pressure jetting). It is recommend that the attenuation system is internally inspected every 2 years. Catchpits have been specified at inlet and outlet connections to minimise debris reaching the tank, and facilitate clearance of the tank. If a build-up of silt has been identified within the outlet catchpit, it is recommended that an internal tank CCTV inspection and clearance by jetting is undertaken as a precaution.

The attenuation tank has not been designed to allow heavy vehicles to drive over the top of the tank. If any accidently loading occurs, the tank must be inspected for signs of damage and a CCTV inspection undertaken.

### 4.1.3 Bedwell Brook Headwall Structure

The combined surface water and treated foul water, discharges approximately 70m from the Activity Centre boundary into the Bedwell Brook. The pipework terminates at a proposed precast concrete headwall structure, specified as a "Althon Headwall H3C". The unit should be installed in accordance with the contract drawings (see Appendix A).

The precast concrete headwall unit, requires no specific maintenance, it is recommended that the headwall structure is visually inspected on a bimonthly basis, to check that the surface water is free to discharge into the watercourse e.g. no blockages have occurred in front of the structure and within the pipework.

To protect the headwall structure and the adjacent bridges, stone filled mattresses have been specified to be installed within the watercourse.

A detailed inspection should be undertaken, on an annual basis to check for movement of the headwall structure and the sour protection, along with the annual inspection of the headwall and scour mattress must be checked following all extreme rainfall events to check for blockages, movement and if the scour mattress has not been displaced or damaged.

## 4.2 Fuel and Oil Separator Full Retention

To protect the Bedwell Brook from pollution, an oil and fuel Full retention Class 1 separator is proposed to be installed within the carpark.

The proposed fuel oil separator specified is supplied by Kingspan Environmental (Klargester) model number NSFA065 (see Appendix H for details).

The unit has been sized by measuring the proposed car parking areas, flood paths and areas that are at risk of collecting contaminations e.g. the location of the grease separator. The specified units drainage area is 3600m² and can store up to 650liters of oil / fuel.

### 4.2.1 Closure Devices

If too much oil is allowed to accumulate inside a separator, it will not work effectively and oil may escape. To avoid this, full retention separators must be provided with an automatic closure device that will prevent flow passing through the separator when the quantity of oil in the separator exceeds the oil storage volume (V).

When emptying/ maintaining, the separator should be isolated to prevent the escape of waste oil. Open all isolation valves when the operation is complete.

If the automatic closure device is activated the operator will be alerted by a high level alarm so that immediate maintenance can be carried out.

### 4.2.2 Optional Automatic Warning devices/Alarm systems

The following two systems may be considered:

- Separators must be provided with a robust device to provide visual and audible warning, when the level of oil reaches 90 per cent of the oil storage volume (V) under static liquid level conditions. This automatic warning device indicate that the separator is in need of immediate emptying for it to continue to work effectively.

- Also, as the build-up of silt will prevent the separator from working effectively, a silt level alarm will alert to the build-up of excessive levels of silt.

The above two warning systems or devices may not be necessary if the regular visual inspections and corrective actions are undertaken. A good practice guide has been provide in Section 7 - Recommendations.

### 4.2.3 Maintenance & Operation

The following measures are recommended by the manufacturer:

- The separator should be installed and vented in accordance with Health and Safety Guidance Note HS(G)41 for filling stations, subject to Local Authority requirements
- Keep a detailed log of when the separator is inspected, maintained, emptied and serviced. Also record specific events relating to the separator system such as cleaning, repairs, accidents and incidents.

It is recommended that every six months the separator is inspected:

- Physically inspect the integrity of the separator and all mechanical parts
- Assess the depth of accumulated oil and silt
- Service all electrical equipment such as alarms and separator management systems
- Check the condition of any coalescing device and replace it if necessary

All sites should empty their separator as soon as a significant quantity of oil and/or silt has built-up. The retained waste, including the silt, must be removed and the separator must be refilled with clean water before being put back in to service to prevent damage and to prevent oil passing through it.

In addition to normal emptying of the separator, it will also need to be emptied right away if oil or silt levels exceed 90 per cent of the storage volume of the separator and the alarm is activated (see Section 5b).

When the oil or silt reaches this level or after a spillage, the unit must be emptied and cleaned in accordance with the manufacturer's instructions, and must be undertaken by a qualified and licenced contractor and carrier and the waste is correctly disposed e.g. at a licenced waste recycling centre. It is important that the contractor provides a copy of there up to date licence, before the unit is emptied at every visit. The unit is to be only emptied using a suitable vacuum tanker, and that no contents are allowed to escape from the outlet during emptying. It is recommended to visually inspect the downstream drainage system during and after the tank is emptied.

Every five years it is recommended that separators be emptied and given a general inspection to test the integrity and performance of the system. The separator must be refilled with clean water following such an inspection.

# 5 Environmental Considerations

The proposed package treatment plant is intended to replace the existing plant which served the former Cross Lanes Hotel. Following a detailed survey of the former site drainage, it was found that there were numerous cross connections which allowed surface water and roof drainage to drain to the old package treatment plant, thereby possibly causing sewage to pass through the treatment plant untreated. The proposed drainage system for the new Residential Activity centre will include separate systems draining foul water to the package treatment plant and surface water to the attenuation system on site. There will be a sampling chamber downstream of the package plant which will allow access and samples to be taken at any time. The use of the proposed package treatment works to treat the effluent from the new activity centre will improve the quality of the effluent discharged into the Bedwell Brook when compared to the current situation and ensure compliance with current discharge standards.

The proposed package treatment plant is designed to produce an effluent design standard of **20mg/l BOD/ 30mg/l SS/ 5mg/l NH3N** which will comply with discharge standards likely to be implemented by Natural Resources Wales.

From the above, it can be seen that the use of the proposed package plant will represent a significant improvement in the quality of the final effluent from the proposed activity centre. On this basis the option of using a new package treatment plant compared to a package plant which is already 13 or more years old would be environmentally preferable in comparison to the existing set up for the site. The new package plant will ensure that the water quality in the Bedwell Brook does not get worse and is therefore considered to be more sustainable.

The site does not lie within the following:

- National Nature Reserves
- Ramsar Sites
- Sites of Special Scientific Interest
- Special Areas of Conservation
- Special Protection Areas

There are no known surface water or groundwater abstraction licences within 1000m of the site and the new relocated package treatment plant is unlikely to impact on the surface water quality further downstream.

On the basis of the above, the impact of the improved quality of the treated effluent on the environment and downstream ecology is unlikely to be significant.

The proposed package plant will be sited outside of the fluvial floodplain of the Bedwell Brook and this will reduce the risk of pollution in a flood event.

Further to the assessment of the above environmental impacts, the proposed package treatment plant would comply with the requirements of "WO Circular 10/99 – Planning requirement in respect of the use of Non-Mains Sewerage incorporating Septic Tanks in New Development".

On the basis of the above, it is considered that the proposed package treatment plant to replace the existing plant will provide an improvement when compared to the previous foul drainage arrangement on site and therefore more be sustainable.

There is a stack pipe /vent fitted to the unit for the release of air from the Unit. This has been carefully sited in accordance with the requirements of Building Regulations, Part H, so as to be within the site boundary and in excess of 7m from any habitable room. Therefore there is no releases to air that are intended to cause air pollution.

There are no planned releases to the groundwater on site.

Other than the sludge from the treatment plant, there are no hazardous or non hazardous wastes that are planned from the treatment plant. This activity will only be undertaken by licensed operators and the sludge disposed of at licensed facilities. At this stage, it is difficult to quantify the volume of the sludge and frequency of desludging, but the maximum estimated volume of treated foul effluent will not exceed 41m3/day during the school term time operation.

Whilst there is no noise level information provided by the manufacturer, the noises can come from the blower, and two recirculation pumps. The proposed package treatment plant and blower unit have carefully been sited well within the site boundary and far enough away from the habitable rooms on site and away from the A525 highway.

On this basis, any noises from the unit will be restricted to the site only. In accordance with the manufacturer's guidance, any unusual noises will indicate that there is an issue with the package treatment plant and this will need to be investigated.

The proposed package treatment unit is fitted with a blower for oxygen supply and an air vent/stack pipe to direct any by-product gases from the treatment unit. This stack pipe is located within the ground of the proposed development, in compliance with Building Regulation Part H requirements. On this basis there will no odour impact either on the site or elsewhere. Any indication of odours will be investigated by the site maintenance team for issues with the running of the package treatment plant.

A sampling chamber is provided for collection of treated effluent samples just downstream of the package treatment plant ad NGR SJ37379 47062.

It is recommended that Robinwood Activity Centre Ltd arrange the testing of a sample of the treated effluent by an independent accredited laboratory on a monthly basis and record the findings of the results in maintenance files for the treatment plant. This will enable the site owner to understand if the plant is being run efficiently and the treated effluent is of an acceptable standard before discharging into the brook. This information can also be shared with the Natural Resources Wales if/when required.

A checklist containing the aspect considered under "Low Impact Installations" is included in Appendix I of this report.

# 6 Maintenance Responsibility

Robinwood Activity Centre Ltd would be solely responsible and liable for the operation and maintenance of the foul package treatment plant. This will include the day to day running and inspection and ensuring that the right conditions exist for optimum performance of the plant.

Activities such as maintenance of the plant and desludging will be subcontracted out to specialists package treatment plant operators. Some information on package treatment plant specialists and their own procedures has been sought from Kingspan/Klargester for Robinwood Activity Centre Ltd, and this or a similar maintenance plan with a suitable contractor is recommended to be adopted by the site owner. A copy of the proposals from Kingspan is included in Appendix J of this report.

It is Robinwood Activity Centre Ltd's responsibility to ensure that the maintenance of the plant is undertaken at the required intervals by the appropriate specialists.

Robinwood Activity Centre Ltd currently operate similar Activity Centres in the northwest of UK at Dobroyd Castle, Barhaugh Hall and The Old School including a package treatment plant. Robinwood Activity Centre Ltd are familiar with the requirements and maintenance operations for package treatment plants and will be able to manage this plant effectively.

# 7 Recommendations

The following section summarises good practice guidelines with regards to regular inspections and maintenance of the site's foul and surface water drainage systems.

## 7.1 Foul Water Drainage System

| Ref | Maintenance Item | Required Action | Frequency |
|---|---|---|---|
| **01** | Package Treatment Plant | A weekly visual inspection should be undertaken, in accordance with table 2 section 3.2.3.1 and manufacturer's instructions.<br><br>Desludging operation undertaken as per manufacture's guidance, every 3 -4 months depending on operation of the activity centre.<br><br>The package treatment plant should be operated under a maintenance/ emergency call out contract with a suitably experienced and resourced maintenance contractor. | Annual with Alarm system, Bimonthly otherwise.<br><br>Emergency Maintenance as necessary.<br><br>Yearly Inspection by facilities management or after extreme storm events |
| **02** | Grease Separator | If warning device / alarm system is installed, the separator only needs to be inspected Annually. If no alarm system is installed a bimonthly inspection should be carried out, to check for debris, silts, oils and general condition.<br><br>Interceptors should be operated under a maintenance/ emergency call out contract with a suitably experienced and resourced maintenance contractor.<br><br>The maintenance programme must align with the relevant equipment manufacturer's O&M manual.<br><br>Every 2 years a full inspection and cleaning is required by a specialist to ensure the alarms and controls are operating correctly and any worn out equipment is replaced. | Annual with alarm system, Bimonthly otherwise.<br><br>Emergency Maintenance as necessary.<br><br>Yearly inspection by facilities management or after extreme storm events<br><br>2 yearly inspection, clearance and report by specialist. |
| **03** | Manholes generally | To be inspected, every 5 years for debris and integrity of chambers and covers.<br><br>Any man-entry into manholes should be by trained personnel with adequate personal protective equipment. Approved safety procedures must be followed. | 5 yearly details inspection |
| **04** | Below Ground Drainage pipework | The full drainage system is to be inspected for integrity and debris by CCTV, cleaning and repairs to be undertaken. | 10 yearly |

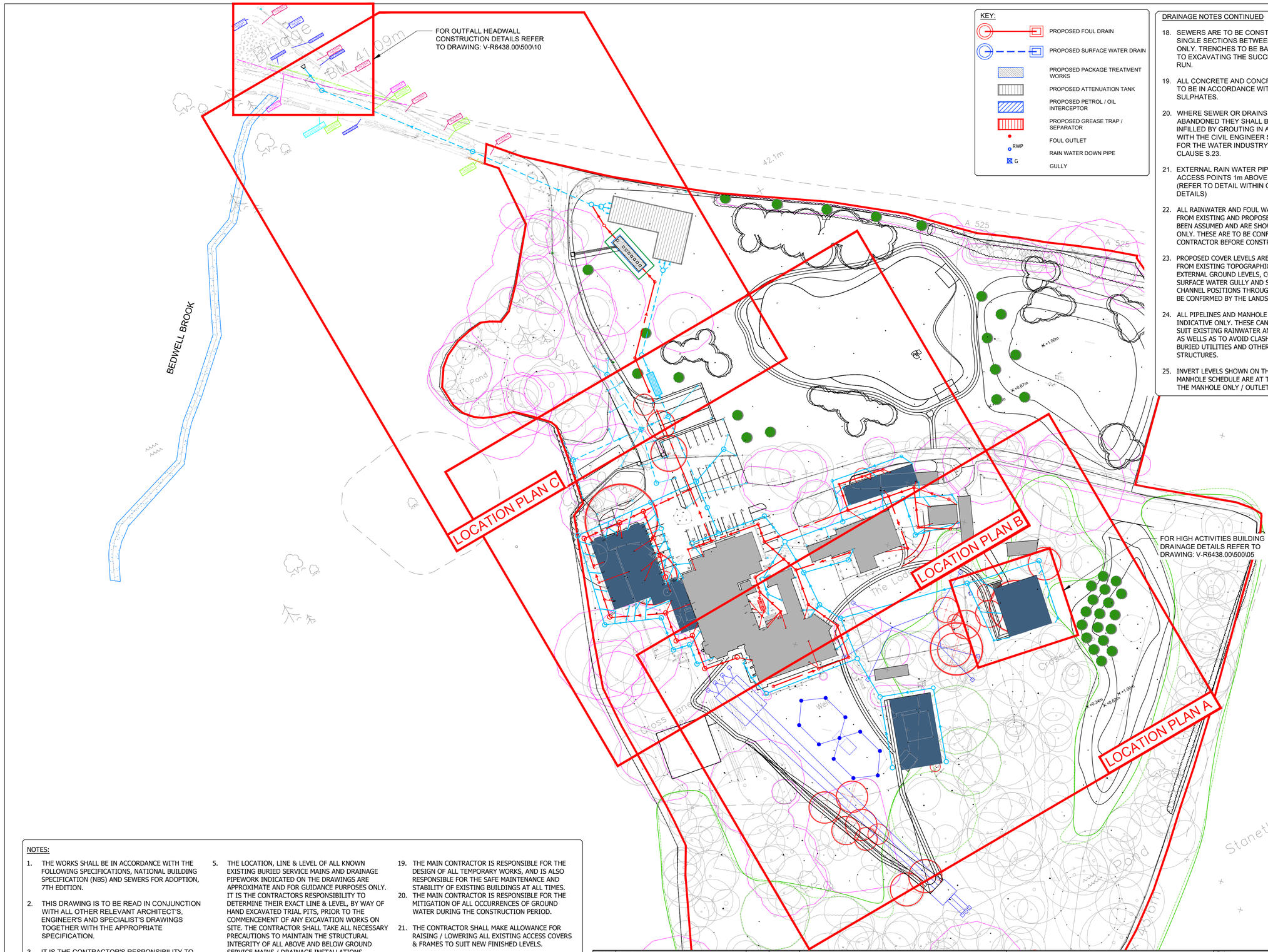
## 7.2 Surface Water Drainage System

| Ref | Maintenance Item | Required Action | Frequency |
|---|---|---|---|
| **01** | Slot drainage channels | To be monthly inspected for debris,<br><br>Cleaned via jetting when any debris/ silt reduces the cross sectional area by 25% or more.<br><br>Inspection to include both the channel and silt trap/ gully outlets. | Monthly weekly visual inspection.<br><br>Detailed inspection Annually,<br><br>Before & after extreme storm events |
| **02** | Carpark Gullies, including rainwater outlets. | To be monthly inspected for debris,<br><br>Cleaned with a gully sucker when required. | Monthly weekly visual inspection.<br><br>Detailed inspection Annually,<br><br>Before & after extreme storm events |
| **03** | Catchpit Manholes Generally | To be inspected monthly for debris and integrity of chambers and covers.<br><br>Cleaned with a gully sucker, annually and as when required.<br><br>Any man-entry into manholes should be by trained personnel with adequate personal protective equipment. Approved safety procedures must be followed. | Bimonthly visual inspection<br><br>Cleaned and inspected annually<br><br>Before & after extreme storm events |
| **04** | Hydrobrake control manhole | To be inspected bimonthly for debris.<br><br>Hydrobrake to be removed, cleaned, checked and reinstalled on an Annual basis.<br><br>Any man-entry into manholes should be by trained personnel with adequate personal protective equipment. Approved safety procedures must be followed. | Bimonthly visual inspection<br><br>Cleaned and inspected Annually<br><br>Before & after extreme storm events |
| **05** | Manholes Generally | To be inspected, every 5 years for debris and integrity of chambers and covers. | 5 yearly details inspection |
| **06** | Surface water Attenuation System | Inlet and outlet catchpit manholes inspected bimonthly, for silt build up and cleaned as required.<br><br>CCTV internal inspection and cleaned by jetting every 2 years, or if silt build up has been identified in the outlet catchpit manhole.<br><br>The tank is not designed for vehicle loading, so following accidentally loading the tank must be inspected. | Catchpit manholes to be inspect bimonthly and after extreme storm events<br><br>2 yearly inspection and report by specialist. |

| | | | |
|---|---|---|---|
| **07** | Fuel & Oil Separator – Full Retention. | If warning device / alarm system is installed, the separator only needs to be inspected Annually. If no alarm system is installed a bimonthly inspection should be carried out, to check for debris, silts, oils and general condition.<br><br>Interceptors should be operated under a maintenance/ emergency call out contract with a suitably experienced and resourced maintenance contractor.<br><br>The maintenance programme must align with the relevant equipment manufacturer's O&M manual.<br><br>Every 2 years a full inspection and cleaning is required by a specialist to ensure the alarms and controls are operating correctly and any worn out equipment is replaced. | Annual with Alarm system, Bimonthly otherwise.<br><br>Emergency Maintenance as necessary.<br><br>Yearly Inspection by facilities management or after extreme storm events<br><br>2 yearly inspection, clearance and report by specialist. |
| **08** | Bedwell Brook Headwall Structure | To be inspected bimonthly for debris, build up within the watercourse.<br><br>Annual inspection of the headwall stability and scour mattress. | Yearly inspection, and following storm events. |
| **09** | Below Ground Drainage pipework | The full drainage system is to be inspected for integrity and debris by CCTV, cleaning and repairs to be undertaken. | 10 yearly |

# Appendix A – Foul and Surface Water Design Drawings

V-R6438.00-500-01,
V-R6438.00-500-02,
V-R6438.00-500-03,
V-R6438.00-500-04,
V-R6438.00-500-10,




KEY:

- PROPOSED FOUL DRAIN
- PROPOSED SURFACE WATER DRAIN
- PROPOSED PACKAGE TREATMENT WORKS
- PROPOSED ATTENUATION TANK
- PROPOSED PETROL / OIL INTERCEPTOR
- PROPOSED GREASE TRAP / SEPARATOR
- FOUL OUTLET
- RWP — RAIN WATER DOWN PIPE
- G — GULLY

DRAINAGE NOTES CONTINUED

18. SEWERS ARE TO BE CONSTRUCTED IN SINGLE SECTIONS BETWEEN MANHOLES ONLY. TRENCHES TO BE BACKFILLED PRIOR TO EXCAVATING THE SUCCEEDING SEWER RUN.
19. ALL CONCRETE AND CONCRETE PRODUCTS TO BE IN ACCORDANCE WITH BRE 363 FOR SULPHATES.
20. 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.
21. EXTERNAL RAIN WATER PIPES TO HAVE ACCESS POINTS 1m ABOVE GROUND LEVEL. (REFER TO DETAIL WITHIN CONSTRUCTION DETAILS)
22. ALL RAINWATER AND FOUL WATER OUTLETS FROM EXISTING AND PROPOSED BUILDINGS HAVE BEEN ASSUMED AND ARE SHOWN INDICATIVELY ONLY. THESE ARE TO BE CONFIRMED BY THE CONTRACTOR BEFORE CONSTRUCTION.
23. PROPOSED COVER LEVELS ARE BASED ON LEVELS FROM EXISTING TOPOGRAPHICAL SURVEY, THE EXTERNAL GROUND LEVELS, COVER LEVELS AND SURFACE WATER GULLY AND SLOT DRAINAGE CHANNEL POSITIONS THROUGHOUT THE SITE TO BE CONFIRMED BY THE LANDSCAPE ARCHITECT.
24. ALL PIPELINES AND MANHOLE POSITIONS ARE INDICATIVE ONLY. THESE CAN BE ALTERED TO SUIT EXISTING RAINWATER AND FOUL OUTLETS AS WELLS AS TO AVOID CLASHES WITH EXISTING BURIED UTILITIES AND OTHER PROPOSED STRUCTURES.
25. INVERT LEVELS SHOWN ON THIS DRAWING AND MANHOLE SCHEDULE ARE AT THE CENTER OF THE MANHOLE ONLY / OUTLET PIPE.

DRAWING BACKGROUND IS BASED UPON AHR TOPOGRAPHIC SURVEY © 22.07.17 ALL RIGHTS RESERVED.

DRAINAGE NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES, UNLESS NOTED OTHERWISE. ALL LEVELS ARE IN METRES, UNLESS NOTED OTHERWISE.ALL WORKS TO BE CONDUCTED IN STRICT ACCORDANCE WITH SPECIFICATION OF THE LOCAL AUTHORITY, BS8301 1985 & BSEN.752-1.
2. 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.
3. WHERE PIPES, EXTERNAL TO THE STRUCTURES, HAVE A DEPTH TO SOFFIT FROM GROUND LEVEL OF LESS THAN 600mm THEY SHALL HAVE A CLASS GEN3 CONCRETE ENCASEMENT (150mm THICK).
4. WHERE A PIPE, UNDER A CARRIAGEWAY, HAS A DEPTH OF COVER OF LESS THAN 1.2m THE PIPE SHALL BE LAID IN A CLASS Z BEDDING.
5. 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.
6. ALL PRIVATE BUILDING DRAINAGE SHALL BE CONSTRUCTED IN STRICT ACCORDANCE WITH BSEN.752-1.
7. UNLESS OTHERWISE SPECIFIED, BUILDING DRAINAGE TO BE 100mm INTERNAL DIAMETER.
8. MINIMUM GRADIENT FOR Ø100mm SURFACE DRAINAGE PIPES IS 1:60, AND Ø150mm IS 1:100.
9. MINIMUM GRADIENTS FOR FOUL DRAINAGE PIPES:
   Ø100mm: 1:40 WHERE FLOW IS LESS THAN 1L/S, OR WHERE NO WCS ARE CONNECTED.
   Ø100mm: 1:78 WHERE FLOW IS 1L/S OR GREATER, OR WHERE AT LEAST 1NO. WC IS CONNECTED.
   Ø150mm: 1:135 WHERE FLOW IS LESS THAN 5L/S, OR WHERE UP TO 5NO. WCS ARE CONNECTED.
   Ø150mm: 1:150 WHERE FLOW IS 5L/S OR GREATER, OR WHERE 5NO. OR MORE WCS ARE CONNECTED
10. ALL GULLIES NOT CONNECTED TO INSPECTION CHAMBERS ARE TO BE RODDABLE.
11. ALL GULLY CONNECTIONS OTHER THAN THOSE AT MANHOLES TO BE MADE VIA 'Y' JUNCTIONS.
12. GULLIES COINCIDENT WITH PEDESTRIAN/DRIVE CROSSINGS TO HAVE PEDESTRIAN TYPE GULLY COVERS.
13. ALL ROAD GULLY CONNECTIONS TO BE 150mm DIAMETER AND ANY GULLY CONNECTIONS SUBJECT TO TRAFFIC LOADING TO HAVE CLASS Z BEDDING & SURROUND
14. ALL STUB STACKS TO BE FITTED WITH AIR ADMITTANCE VALVES WHERE BRANCH DRAIN EXCEEDS 12m EXCEPT AT THE HEAD OF THE RUN. SOIL VENT PIPES LOCATED AT THE HEAD OF A RUN TO BE INSTALLED WITH ROOF TILE VENT.
15. ALL CONNECTIONS TO BE MADE FROM SOFFIT TO SOFFIT UNLESS WERE NOTED OTHERWISE
16. TRENCH TEMPORARY FORMWORK IS REQUIRED TO ALL EXCAVATIONS EXCEEDING 1.2m DEPTH TO PROVIDE ADEQUATE SUPPORT AND STABILITY AT ALL TIMES.

NOTES:

1. THE WORKS SHALL BE IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS, NATIONAL BUILDING SPECIFICATION (NBS) AND SEWERS FOR ADOPTION, 7TH EDITION.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECT'S, ENGINEER'S AND SPECIALIST'S DRAWINGS TOGETHER WITH THE APPROPRIATE SPECIFICATION.
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4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS DRAWINGS, ARCHITECTS DRAWINGS, MECHANICAL AND ELECTRICAL DRAWINGS AND SPECIFICATIONS.
5. THE LOCATION, LINE & LEVEL OF ALL KNOWN EXISTING BURIED SERVICE MAINS AND DRAINAGE PIPEWORK INDICATED ON THE DRAWINGS ARE APPROXIMATE AND FOR GUIDANCE PURPOSES ONLY. IT IS THE CONTRACTORS RESPONSIBILITY TO DETERMINE THEIR EXACT LINE & LEVEL, BY WAY OF HAND EXCAVATED TRIAL PITS, PRIOR TO THE COMMENCEMENT OF ANY EXCAVATION WORKS ON SITE. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO MAINTAIN THE STRUCTURAL INTEGRITY OF ALL ABOVE AND BELOW GROUND SERVICE MAINS / DRAINAGE INSTALLATIONS.
6. THE CONTRACTOR MUST COMPLY WITH ALL CURRENT LEGISLATION RELATING TO HEALTH & SAFETY.
12. ALL LEVELS ARE TO ORDNANCE DATUM
18. ALL SURPLUS EXCAVATED MATERIAL SHALL BE DISPOSED OF OFF SITE.
19. THE MAIN CONTRACTOR IS RESPONSIBLE FOR THE DESIGN OF ALL TEMPORARY WORKS, AND IS ALSO RESPONSIBLE FOR THE SAFE MAINTENANCE AND STABILITY OF EXISTING BUILDINGS AT ALL TIMES.
20. THE MAIN CONTRACTOR IS RESPONSIBLE FOR THE MITIGATION OF ALL OCCURRENCES OF GROUND WATER DURING THE CONSTRUCTION PERIOD.
21. THE CONTRACTOR SHALL MAKE ALLOWANCE FOR RAISING / LOWERING ALL EXISTING ACCESS COVERS & FRAMES TO SUIT NEW FINISHED LEVELS.
22. 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.

1:1@ A1
1:2@ A3
0 10 20 30 40 50 60 70 80 90 100 mm

TENDER

| Revision | Amendment | Approved | Revision Date |
|---|---|---|---|
| A | ISSUED FOR TENDER | VM | 23.05.17 |
| B | CHANGES FOLLOWING COMMENTS | VM | 07.06.17 |
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ROBINWOOD ACTIVITY CENTRE LTD

OPUS
Wrexham Office
+44 1978 368100
Opus House, Yale Business Village, Wrexham Tech. Park, Wrexham LL13 7YL

| Drawn | Designed | Approved | Revision Date |
|---|---|---|---|
| JP | VM | MW | 22/05/17 |

Project
PROPOSED ROBINWOOD ACTIVITY CENTRE
CROSS LANES, WREXHAM
LL13 0TF

Sheet
PROPOSED DRAINAGE LAYOUT
OVERALL PLAN

| Project No. | Scale | Drawing No. | Sheet. No. | Revision |
|---|---|---|---|---|
| V-R6438.00 | 1:2000 | V-R6438-00-500 | 01 | B |

Original Sheet Size A1 [841x594] Plot Date 07 Jun 2017 @ 2:43 PM Path G:\live\rc\rc6400s\rc6438-cross-lanes-wrexham\4-Technical\Drawings\Outgoing\01-WORKING DRAWINGS\Civils\V-R6438.00-500-01-B - Proposed Drainage Layout_New Outfall.dwg A1 - Plan (Overview)

MATCH LINE A

MATCH LINE B

S32
CL: 42.100
IL: 40.750

F2
CL: 42.210
IL:41.028

F1
CL: 42.230
IL: 41.105

S1
CL: 42.230
IL: 41.080

S2
CL: 42.200
IL: 41.033

S3
CL: 42.280
IL: 40.970

F27
CL: 42.340
IL: 41.078

F33
CL: 42.330
IL: 40.980

F34
CL: 42.300
IL: 41.085

F30
CL: 42.740
IL: 40.744

S14
CL: 42.770
IL: 39.680

F29
CL: 42.700
IL: 40.823

S13
CL: 42.290
IL: 39.723

NON RETURN VALVE TO PREVENT BACKFLOW TOWARDS HIGH ACTIVITY BUILDING

F28
CL: 42.880
IL: 40.898

S8
CL: 42.930
IL: 40.687

S7
CL: 42.910
IL: 41.462

S5
CL: 43.210
IL: 41.633

S6
CL: 43.000
IL: 41.850

S4
CL: 43.000
IL: 41.850

S12
CL: 43.300
IL: 40.086

S10
CL: 43.300
IL: 40.334

S11
CL: 43.300
IL: 40.400

S9
CL: 43.300
IL: 40.523

FOR DRAINAGE DETAILS REFER TO DRAWING: V-R6438.00\500\05

+0.34m
+0.67m
+1.00m

Lane
tel
The Lodge
Well
Cross Lanes

300 mm
200
100
50
10 mm
0

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1:1@ A1
1:2@ A3
0 10 20 30 40 50 60 70 80 90 100 mm

DRAINAGE NOTES CONTINUED

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23. PROPOSED COVER LEVELS ARE BASED ON LEVELS FROM EXISTING TOPOGRAPHICAL SURVEY, THE EXTERNAL GROUND LEVELS, COVER LEVELS AND SURFACE WATER GULLY AND SLOT DRAINAGE CHANNEL POSITIONS THROUGHOUT THE SITE TO BE CONFIRMED BY THE LANDSCAPE ARCHITECT.
24. ALL PIPELINES AND MANHOLE POSITIONS ARE INDICATIVE ONLY. THESE CAN BE ALTERED TO SUIT EXISTING RAINWATER AND FOUL OUTLETS AS WELLS AS TO AVOID CLASHES WITH EXISTING BURIED UTILITIES AND OTHER PROPOSED STRUCTURES.
25. INVERT LEVELS SHOWN ON THIS DRAWING AND MANHOLE SCHEDULE ARE AT THE CENTER OF THE MANHOLE ONLY / OUTLET PIPE.

KEY:

- PROPOSED FOUL DRAIN
- PROPOSED SURFACE WATER DRAIN
- PROPOSED PACKAGE TREATMENT WORKS
- PROPOSED ATTENUATION TANK
- PROPOSED PETROL / OIL INTERCEPTOR
- PROPOSED GREASE TRAP / SEPARATOR
- FOUL OUTLET
- RWP — RAIN WATER DOWN PIPE
- G — GULLY

DRAWING BACKGROUND IS BASED UPON AHR TOPOGRAPHIC SURVEY © 22.07.17
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2. 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.
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TENDER

| Revision | Amendment | Approved | Revision Date |
|---|---|---|---|
| A | ISSUED FOR TENDER | VM | 23.05.17 |
| B | CHANGES FOLLOWING COMMENTS | VM | 07.06.17 |

ROBINWOOD ACTIVITY CENTRE LTD

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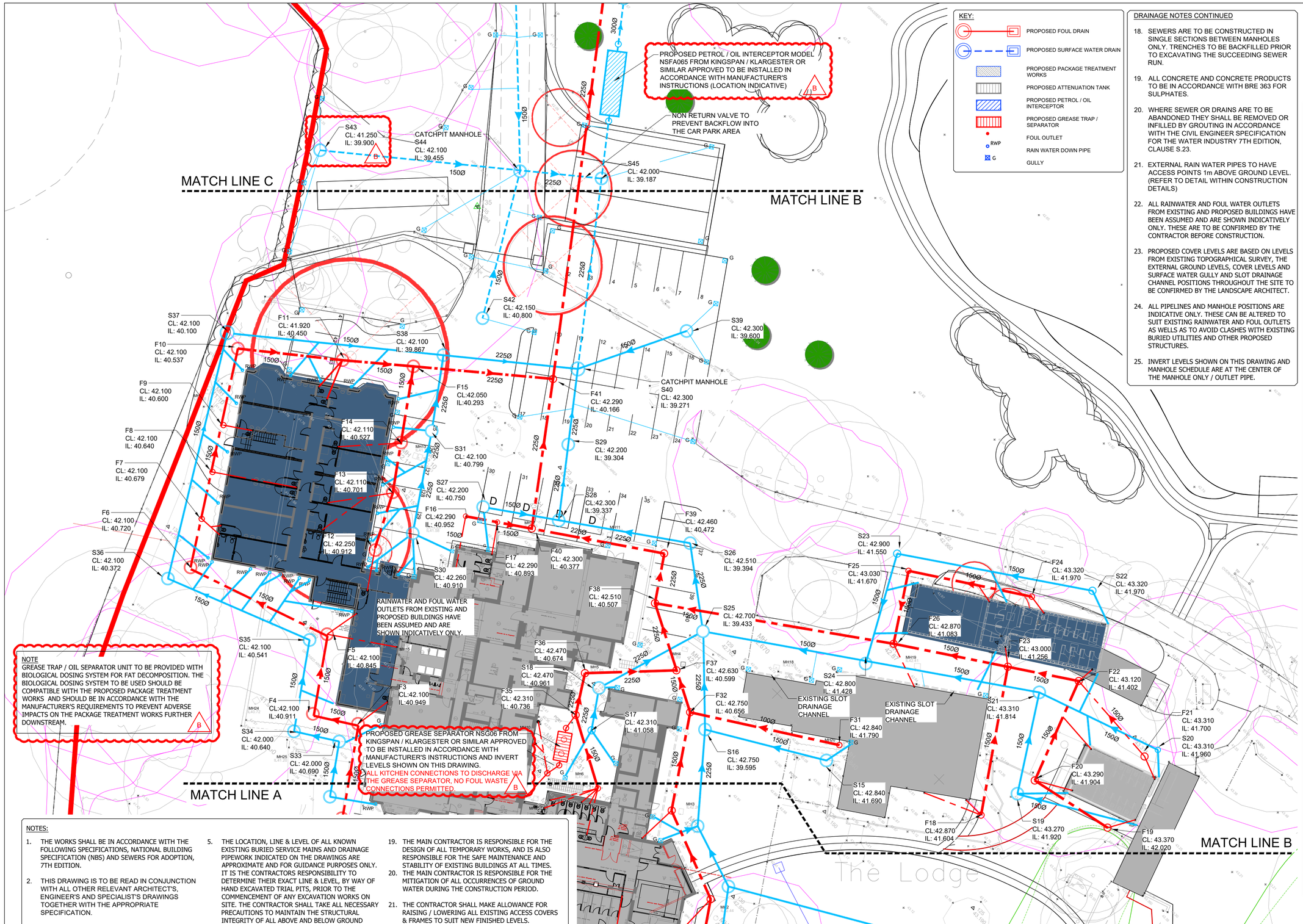
| Drawn | Designed | Approved | Revision Date |
|---|---|---|---|
| JP | VM | MW | 22/05/17 |

Project
PROPOSED ROBINWOOD ACTIVITY CENTRE
CROSS LANES, WREXHAM
LL13 0TF

Sheet
PROPOSED DRAINAGE LAYOUT - PLAN A
SHEET 1 OF 3

| Project No. | Scale | Drawing No. | Sheet. No. | Revision |
|---|---|---|---|---|
| V-R6438.00 | 1:200 | V-R6438-00-500 | 02 | B |

Original Sheet Size A1 [841x594] Plot Date 07 Jun 2017 @ 2:44 PM Path G:\live\rc\rc6400s\rc6438-cross-lanes-wrexham\4-Technical\Drawings\Outgoing\01-WORKING DRAWINGS\Civils\V-R6438.00-500-01-B - Proposed Drainage Layout_New Outfall.dwg A1 - Plan A




KEY:

- PROPOSED FOUL DRAIN
- PROPOSED SURFACE WATER DRAIN
- PROPOSED PACKAGE TREATMENT WORKS
- PROPOSED ATTENUATION TANK
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DRAINAGE NOTES CONTINUED

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16. TRENCH TEMPORARY FORMWORK IS REQUIRED TO ALL EXCAVATIONS EXCEEDING 1.2m DEPTH TO PROVIDE ADEQUATE SUPPORT AND STABILITY AT ALL TIMES.

NOTES:

1. THE WORKS SHALL BE IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS, NATIONAL BUILDING SPECIFICATION (NBS) AND SEWERS FOR ADOPTION, 7TH EDITION.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECT'S, ENGINEER'S AND SPECIALIST'S DRAWINGS TOGETHER WITH THE APPROPRIATE SPECIFICATION.
3. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CHECK ALL DIMENSIONS ON SITE. DIMENSIONS MUST NOT BE SCALED FROM THIS DRAWING. ANY DISCREPANCIES TO BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE ARCHITECT IN WRITING.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS DRAWINGS, ARCHITECTS DRAWINGS, MECHANICAL AND ELECTRICAL DRAWINGS AND SPECIFICATIONS.
5. THE LOCATION, LINE & LEVEL OF ALL KNOWN EXISTING BURIED SERVICE MAINS AND DRAINAGE PIPEWORK INDICATED ON THE DRAWINGS ARE APPROXIMATE AND FOR GUIDANCE PURPOSES ONLY. IT IS THE CONTRACTORS RESPONSIBILITY TO DETERMINE THEIR EXACT LINE & LEVEL, BY WAY OF HAND EXCAVATED TRIAL PITS, PRIOR TO THE COMMENCEMENT OF ANY EXCAVATION WORKS ON SITE. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO MAINTAIN THE STRUCTURAL INTEGRITY OF ALL ABOVE AND BELOW GROUND SERVICE MAINS / DRAINAGE INSTALLATIONS.
6. THE CONTRACTOR MUST COMPLY WITH ALL CURRENT LEGISLATION RELATING TO HEALTH & SAFETY.
12. ALL LEVELS ARE TO ORDNANCE DATUM
18. ALL SURPLUS EXCAVATED MATERIAL SHALL BE DISPOSED OF OFF SITE.
19. THE MAIN CONTRACTOR IS RESPONSIBLE FOR THE DESIGN OF ALL TEMPORARY WORKS, AND IS ALSO RESPONSIBLE FOR THE SAFE MAINTENANCE AND STABILITY OF EXISTING BUILDINGS AT ALL TIMES.
20. THE MAIN CONTRACTOR IS RESPONSIBLE FOR THE MITIGATION OF ALL OCCURRENCES OF GROUND WATER DURING THE CONSTRUCTION PERIOD.
21. THE CONTRACTOR SHALL MAKE ALLOWANCE FOR RAISING / LOWERING ALL EXISTING ACCESS COVERS & FRAMES TO SUIT NEW FINISHED LEVELS.
22. 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.

1:1@ A1
1:2@ A3
0 10 20 30 40 50 60 70 80 90 100 mm

| Revision | Amendment | Approved | Revision Date |
|---|---|---|---|
| A | ISSUED FOR TENDER | VM | 23.05.17 |
| B | CORRECTIONS AND DETAILS ADDED | VM | 07.06.17 |

ROBINWOOD ACTIVITY CENTRE LTD

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Opus House, Yale Business Village, Wrexham Tech. Park, Wrexham LL13 7YL

| Drawn | Designed | Approved | Revision Date |
|---|---|---|---|
| JP | VM | MW | 22/05/17 |

Project
PROPOSED ROBINWOOD ACTIVITY CENTRE
CROSS LANES, WREXHAM
LL13 0TF

Sheet
PROPOSED DRAINAGE LAYOUT - PLAN B
SHEET 2 OF 3

| Project No. | Scale | Drawing No. | Sheet. No. | Revision |
|---|---|---|---|---|
| V-R6438.00 | 1:200 | V-R6438-00-500 | 03 | B |

TENDER

Original Sheet Size A1 [841x594] Plot Date 07 Jun 2017 @ 2:44 PM Path G:\live\rc\rc6400s\rc6438-cross-lanes-wrexham\4-Technical\Drawings\Outgoing\01-WORKING DRAWINGS\Civils\V-R6438.00-500-01-B - Proposed Drainage Layout_New Outfall.dwg A1 - Plan B

NEW HEADWALL
SEE MANHOLE SCHEDULE
CL: 41.300mAOD
IL: 38.220mAOD

150Ø

MH104

SW53
CL: 40.570
IL: 38.360

FOR OUTFALL DETAILS REFER TO DRAWING: V-R6438.00\500\10

BM 41.09m

225Ø

SW52
CL: 40.960
IL: 38.637

MH1
MH26

MIXING CHAMBER, TREATED EFFLUENT AND ATTENUATED STORM FLOW
S51
CL: 41.500
IL: 38.859

PROPOSED HYDROBRAKE FLOW CONTROL MANHOLE
SEE STANDARD DETAIL V-R6438.00-500-07-A
DESIGN HEAD: 2.0m
DESIGN FLOW RATE: 16.3 l/s
S50
CL: 41.600
IL: 38.876 (Outlet)

PROPOSED ATTENUATION TANK
240m² X 0.8m DEEP.
IL: 38.992 (INCOMMING)
IL: 38.892 (OUTGOING)
SEE STANDARD DETAIL DRAWING
V-R6438.00-500-09

3x DUCTING FOR ELECTRICAL, TELEMETRY LIGHTING AND AIRLINES

INDICATIVE LOCATION OF TELEMETRY KIOSK AND CONTROL PANEL TO BE AGREED WITH LANDSCAPE ARCHITECT

INDICATIVE LOCATION OF VENTILATION STACK TO BE AGREED WITH LANDSCAPE ARCHITECT

F44 TREATED EFFLUENT SAMPLING CHAMBER
CL: 41.700
IL: 39.550

PROPOSED PACKAGE TREATMENT WORKS BIOFICIENT MODEL 55 FROM KINGSPAN / KLARGESTER OR SIMILAR APPROVED TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND INVERT LEVELS SHOWN ON THIS DRAWING. ACCESS COVERS TO BE INFILLED / RECESSED TO MATCH THE LANDSCAPE ARCHITECTS REQUIREMENTS.

F43
CL: 41.700
IL: 39.800

CATCHPIT MANHOLE
S47
CL: 41.700
IL: 39.001

F42
CL: 41.670
IL: 39.930

S46
CL: 42.000
IL: 39.108

PROPOSED PETROL / OIL INTERCEPTOR MODEL NSFA065 FROM KINGSPAN / KLARGESTER OR SIMILAR APPROVED TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS (LOCATION INDICATIVE)

NON RETURN VALVE TO PREVENT BACKFLOW INTO THE CAR PARK AREA

S41
CL: 41.270
IL: 40.210

S43
CL: 41.250
IL: 40.800

CATCHPIT MANHOLE
S44
CL: 42.100
IL: 39.455

S45
CL: 42.000
IL: 39.187

NOTE
LOCATION AND NUMBER OF GULLY'S INDICATIVE ONLY. TO BE CONFIRMED BY LANDSCAPE ARCHITECT FOLLOWING DESIGN OF EXTERNAL GROUND PROFILE

MATCH LINE C

MATCH LINE B

TENDER

KEY:

- PROPOSED FOUL DRAIN
- PROPOSED SURFACE WATER DRAIN
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300 mm
200
100
50
0
10 mm

| Revision | Amendment | Approved | Revision Date |
|---|---|---|---|
| A | ISSUED FOR TENDER | VM | 23.05.17 |
| B | CORRECTIONS AND DETAILS ADDED | VM | 07.06.17 |

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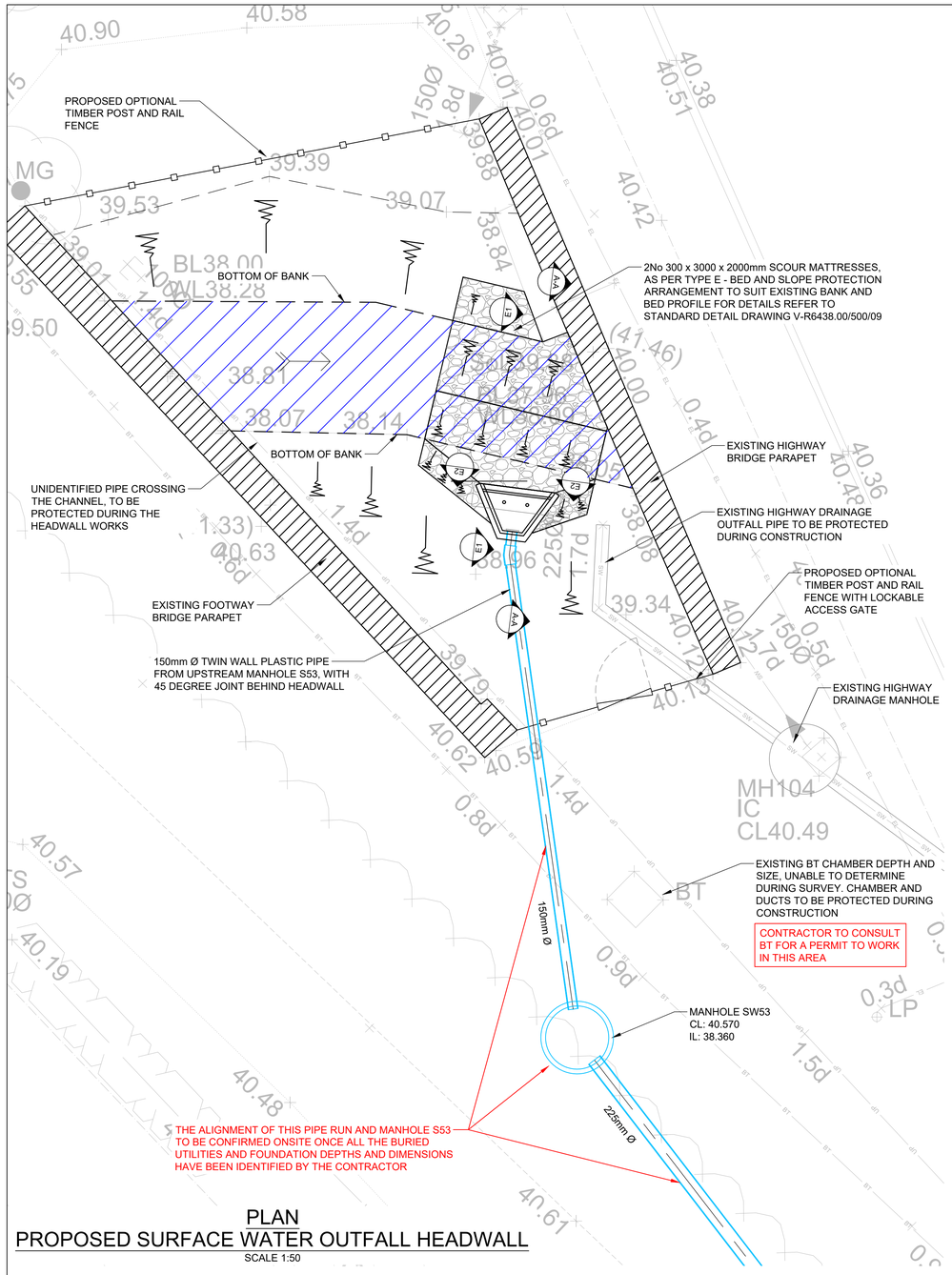
| Drawn | Designed | Approved | Revision Date |
|---|---|---|---|
| TI | VM | MW | 22/05/17 |

Project
PROPOSED ROBINWOOD ACTIVITY CENTRE
CROSS LANES, WREXHAM
LL13 0TF

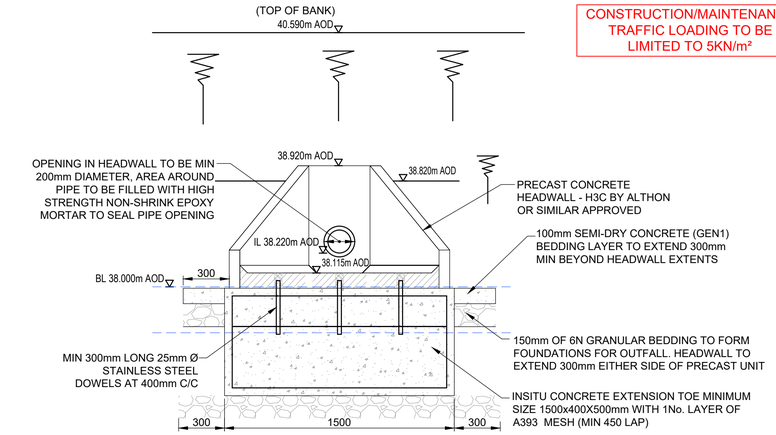
Sheet
PROPOSED DRAINAGE LAYOUT - PLAN C
SHEET 3 OF 3

| Project No. | Scale | Drawing No. | Sheet. No. | Revision |
|---|---|---|---|---|
| V-R6438.00 | 1:200 | V-R6438-00-500 | 04 | B |

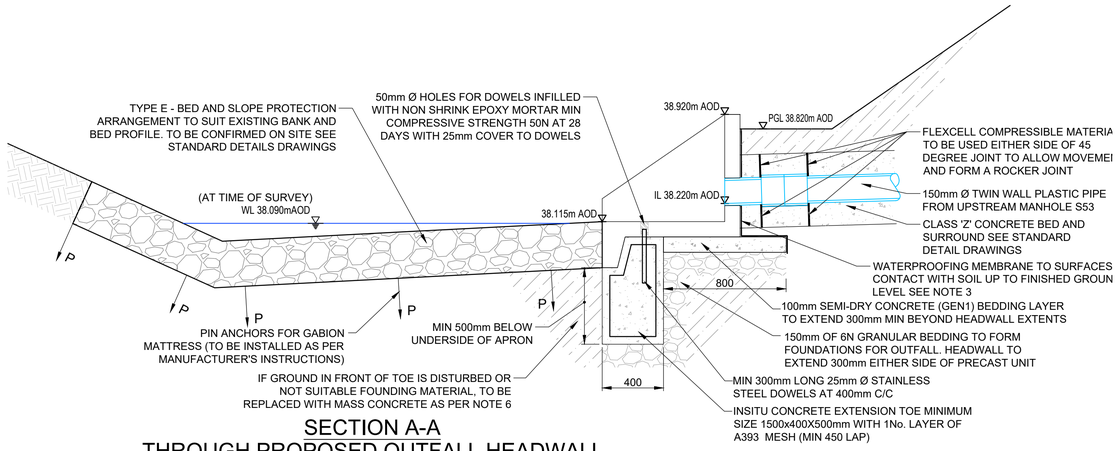
Original Sheet Size A1 [594x841]Plot Date 07 Jun 2017 @ 2:45 PM Path G:\live\rc\rc6400s\rc6438-cross-lanes-wrexham\4-Technical\Drawings\Outgoing\01-WORKING DRAWINGS\Civils\V-R6438.00-500-01-B - Proposed Drainage Layout_New Outfall.dwg A1 - Plan C



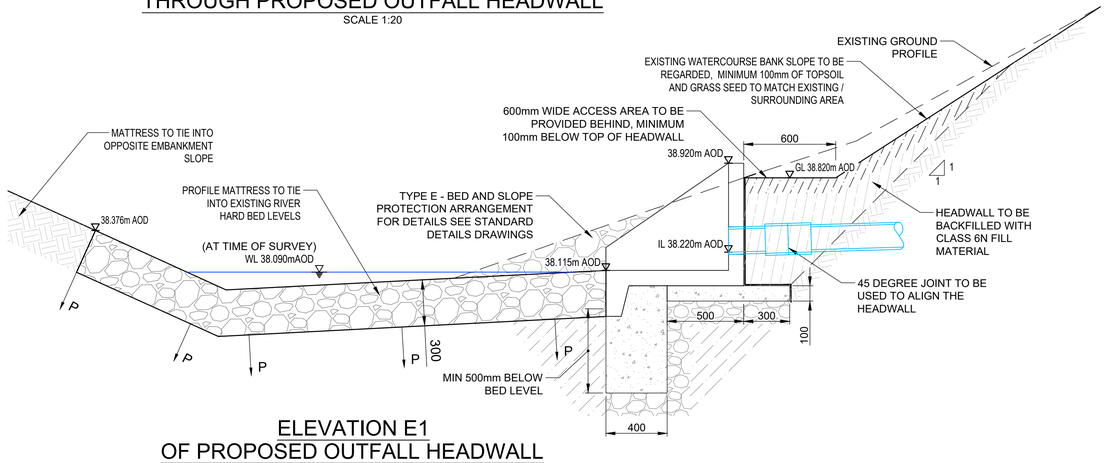

## PLAN
## PROPOSED SURFACE WATER OUTFALL HEADWALL
SCALE 1:50




## ELEVATION E2
## THROUGH PROPOSED OUTFALL HEADWALL
SCALE 1:20




## SECTION A-A
## THROUGH PROPOSED OUTFALL HEADWALL
SCALE 1:20




## ELEVATION E1
## OF PROPOSED OUTFALL HEADWALL
SCALE 1:20

NOTES CONTINUE:

6. STRUCTURE:
CONCRETE MIXES IN ACCORDANCE WITH BS8500 - 1: 2015 SHALL BE AS FOLLOWS:-
- COMPRESSIVE STRENGTH CLASS TO BE GRADE C32/40,
- MAXIMUM WATER CEMENT RATIO TO BE 0.50,
- MIN CEMENT CONTENT TO BE 340KG/MM
- CEMENT DESIGNATION - IIIB
- MAX AGGREGATE SIZE 20MM
- DESIGN CHEMICAL CLASS - DC-2
- CHLORIDE CLASS CL 0.20
- CONSISTENCE CLASS S3 (MINIMUM SLUMP 100mm)
- NO RECYCLED AGGREGATES TO BE USED
- NOMINAL COVER TO BE 60mm (MINIMUM 55mm).

CONCRETE WORKS ARE TO BE IN ACCORDANCE WITH SERIES 1700, VOLUME 1 SPECIFICATION FOR HIGHWAY WORKS.

- WHERE PIPES SURROUNDED IN CONCRETE, FLEXIBILITY TO BE MAINTAINED AT PIPE JOINTS BY THE USE OF SUITABLE COMPRESSIBLE MATERIAL EG. "FLEXCELL" OR "FIBREBOARD". ALL INCOMING AND OUTGOING PIPES SHALL BE SURROUNDED WITH 150mm MIN. OF CONCRETE TO THE FACE OF THE COLLAR OF THE FIRST FLEXIBLE JOINT AND A COMPRESSIBLE FILLER USED AS A FORMER BETWEEN THE CONCRETE SURROUND AND DOWNSTREAM PIPE COLLAR.
- FOR PIPE BEDDING AND SURROUNDING DETAILS REFER TO STANDARD DETAIL DRAWING V-R6438.00/500/06 - 09

DRAWING BACKGROUND IS BASED UPON AHR TOPOGRAPHIC SURVEY © 22.07.17
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NOTES:

1. EXCAVATION:
- EXCAVATION SHALL EXTEND AT LEAST 100mm BELOW THE UNDERSIDE OF THE PRECAST STRUCTURE BASE. THE EXCAVATION IS TO EXTEND A MINIMUM OF 300mm (225mm WHERE SOUND BEDROCK IS ENCOUNTERED AT FORMATION) BEYOND THE OUTSIDE FACES OF THE STRUCTURE WALLS.
- ANY OVERDIG TO THE FRONT AND UNDERSIDE OF THE TOE IS TO BE BACKFILLED WITH MASS CONCRETE AS SPECIFIED IN NOTE 4. ANY OVERDIG TO THE BASE ELSEWHERE IS TO BE BACKFILLED WITH COMPACTED IMPERVIOUS CLAY.
- EXCAVATION IS TO BE BENCHED TO A SLOPE OF 1 HORIZONTALLY TO 1 VERTICALLY. THE SLOPE OF THE EXCAVATION TO THE CULVERTS IS TO EXTEND UP TO THE GROUND LEVEL.
- FORMATION IS TO BE DENSE SAND / GRAVEL ANY SOFT SPOTS ENCOUNTERED AT FORMATION ARE TO BE REMOVED AND REPLACED WITH CLASS 20/20 CONCRETE AS DESCRIBED IN NOTE 4 BELOW.
- THE CONTRACTOR SHALL ALLOW FOR PROTECTION, TEMPORARY AND PERMANENT SUPPORT OF THE EXISTING UNDERGROUND SERVICES AND CO-ORDINATION WITH RELEVANT UTILITY COMPANIES.
- FOUNDATIONS TO HAVE A MINIMUM PENETRATION OF 150mm INTO DENSE SAND / GRAVEL. FORMATION SUB GRADE TO BE APPROVED BY THE PROJECT MANAGER BEFORE PLACING BEDDING CONCRETE, THE STRATUM IS TO BE COVERED WITH CONCRETE IMMEDIATELY AFTER THE APPROVAL OF THE EXCAVATION, TO PREVENT THE DETERIORATION OF THE SOIL BY WEATHERING.
- THE CONTRACTOR SHALL ALLOW FOR KEEPING SEWER TRENCHES AND EXCAVATIONS AS DRY AS PRACTICABLE BY PUMPING FROM TEMPORARY SUMPS AND DEWATERING AS APPROPRIATE.

2. BACKFILL:
- FILL TO STRUCTURES TO BE IMPORTED ACCEPTABLE MATERIAL CLASS 6N IN ACCORDANCE WITH VOLUME 1 SPECIFICATION FOR HIGHWAY WORKS.
- BACKFILLING AND COMPACTION SHALL BE IN ACCORDANCE WITH CLAUSE 610 OF VOLUME 1 SPECIFICATION FOR HIGHWAY WORKS.

3. WATERPROOFING:
- WHERE NOTED A PROPRIETARY WATERPROOFING SYSTEM IN ACCORDANCE WITH CLAUSE 2004 AND 2006, VOLUME 1 SPECIFICATION FOR HIGHWAY WORKS TO BE SUBMITTED FOR ACCEPTANCE TO THE PROJECT MANAGER.

4. OUTFALL HEADWALL:
- PROPOSED SURFACE WATER HEADWALL, PRECAST CONCRETE TYPE - H3C MANUFACTURED BY ALTHON OR SIMILAR APPROVED, WITH OPENING CAST IN REAR WALL TO SUIT 150mm DIAMETER TWIN WALL PLASTIC PIPE, OUTSIDE DIAMETER TO BE CONFIRMED BY CONTRACTOR ONSITE.

5. GABION SCOUR MATTRESS:
- SCOUR MATTRESS TO BE MIN 300mm THICK, CONSTRUCTED FROM GALVANIZED METAL WIRE NOMINAL MESH SIZE 80mm, FOR DETAILS REFER TO STANDARD DETAIL DRAWING V-R6438.00/500/09

1. THE WORKS SHALL BE IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS, NATIONAL BUILDING SPECIFICATION (NBS) AND SEWERS FOR ADOPTION, 7TH EDITION.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECT'S, ENGINEER'S AND SPECIALIST'S DRAWINGS TOGETHER WITH THE APPROPRIATE SPECIFICATION.
3. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CHECK ALL DIMENSIONS ON SITE. DIMENSIONS MUST NOT BE SCALED FROM THIS DRAWING. ANY DISCREPANCIES TO BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE ARCHITECT IN WRITING.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS DRAWINGS, ARCHITECTS DRAWINGS, MECHANICAL AND ELECTRICAL DRAWINGS AND SPECIFICATIONS.
5. THE LOCATION, LINE & LEVEL OF ALL KNOWN EXISTING BURIED SERVICE MAINS AND DRAINAGE PIPEWORK INDICATED ON THE DRAWINGS ARE APPROXIMATE AND FOR GUIDANCE PURPOSES ONLY. IT IS THE CONTRACTORS RESPONSIBILITY TO DETERMINE THEIR EXACT LINE & LEVEL, BY WAY OF HAND EXCAVATED TRIAL PITS, PRIOR TO THE COMMENCEMENT OF ANY EXCAVATION WORKS ON SITE. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO MAINTAIN THE STRUCTURAL INTEGRITY OF ALL ABOVE AND BELOW GROUND SERVICE MAINS / DRAINAGE INSTALLATIONS.
6. THE CONTRACTOR MUST COMPLY WITH ALL CURRENT LEGISLATION RELATING TO HEALTH & SAFETY.
12. ALL LEVELS ARE TO ORDNANCE DATUM
18. ALL SURPLUS EXCAVATED MATERIAL SHALL BE DISPOSED OF OFF SITE. AT A SUITABLE FACILITY AT THE CONTRACTORS COST.
19. THE MAIN CONTRACTOR IS RESPONSIBLE FOR THE DESIGN OF ALL TEMPORARY WORKS, CONSENTS, AND IS ALSO RESPONSIBLE FOR THE SAFE MAINTENANCE AND STABILITY OF EXISTING BUILDINGS AT ALL TIMES.
20. THE MAIN CONTRACTOR IS RESPONSIBLE FOR THE MITIGATION OF ALL OCCURRENCES OF GROUND WATER DURING THE CONSTRUCTION PERIOD.
21. THE CONTRACTOR SHALL MAKE ALLOWANCE FOR RAISING / LOWERING ALL EXISTING ACCESS COVERS & FRAMES TO SUIT NEW FINISHED LEVELS.
22. 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.

1:1 @ A1
1:2 @ A3
0 10 20 30 40 50 60 70 80 90 100 mm

TENDER

| Revision | Amendment | Approved | Revision Date |
|---|---|---|---|
| | | | |

ROBINWOOD ACTIVITY CENTRE LTD

OPUS
Wrexham Office
+44 1978 368100
Opus House, Yale Business Village, Wrexham Tech. Park, Wrexham LL13 7YL

| Drawn | Designed | Approved | Revision Date |
|---|---|---|---|
| TI | VM | MW | 10.05.2017 |

Project
PROPOSED ROBINWOOD ACTIVITY CENTRE
CROSS LANES, WREXHAM
LL13 0TF

Sheet
PROPOSED SURFACE WATER OUTFALL

| Project No. | Scale | Drawing No. | Sheet. No. | Revision |
|---|---|---|---|---|
| V-R6438.00 | AS SHOWN | V-R6438-00-500 | 10 | A |

Original Sheet Size A1 [841x594] Plot Date 23 May 2017 @ 3:09 PM Path G:\live\rc\rc6400s\rc6438-cross-lanes-wrexham\4-Technical\Drawings\Outgoing\01-WORKING DRAWINGS\Civils\V_R6438.00-500-10-A - Outfall Details.dwg A1H

# **Appendix B** – Proposed Development Plan




## Key

- Site Boundary
- Existing Road/hardstanding
- Existing Buildings
- Extension to existing Building
- Existing Trees
- Existing Trees to be removed
- Existing Hedgerow
- Proposed Activity Buildings
- Proposed Parking (Tarmac and Pel Kerb)
- Proposed Footpath (Self binding gravel with Timber edge)
- Hard Surfacing (Buidling surround and ramp)
- Proposed Woodland Planting
- Proposed Trees
- Proposed Hedge
- Proposed Grass (Spoil)
- Proposed Canoeing Lake
- Proposed Stone Feature
- Proposed Spoil
- ×+Xm Proposed Spoil Spot Heights
- Proposed Marginal Aquatics
- Proposed Estate Railing
- Proposed Gate
- Proposed Quest Area (Flexible Paving)
- Proposed Decking (TImber)

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards / risks associated with the types of work detailed on this drawing, note the following;

Construction;

Proximity to open water. Care to be taken to reduce risk of drowning, slips, electrical hazards and water borne diseases (leptospirosis).

Maintenance / Cleaning;

Proximity to open water. Care to be taken to reduce risk of drowning, slips, electrical hazards and water borne diseases (leptospirosis).

Decommissioning / Demolition;

Proximity to open water. Care to be taken to reduce risk of drowning, slips, electrical hazards and water borne diseases (leptospirosis).

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement.

| No. | Current Use | Proposed Use |
|---|---|---|
| 1 | Hotel Building and approved extension | Accomodation, dining and activities |
| 2 | Managers House | Staff and Administration |
| 3 | Stable Block | Rebuild as Changing/Showers for Lake |
| 4 | Garage / Retain | Toilets |
| 5 | Outbuildings | Demolition |
| 6 | Outbuildings | Demolition |
| 7 | Site of Hay Barn | New High Activities Building |
| 8 | – | Giant Swing |
| 9 | Store (prefabricated cabin) | – |
| 10 | Wood cabin(former indoor pool? | Replace with new Archery and Caving |
| 11 | Wood cabin (store) | with 10 |
| 12 | Gazebo, to be removed | Zip Wire |
| 13 | – | High ropes. |
| 14 | Outbuildings | Vacant, demolish or retain unused. |
| 15 | – | Raft building zone |
| 16 | – | Canoeing zone |
| 17 | – | Quest Zone |

m 0 5 10 15 20 25 30 35 40 45 50
SCALE
1:500

| rev | description | date | drawn | chk |
|---|---|---|---|---|
| POI | Planning Submission | 04.10.16 | GJH | PC |

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Urban Vision Partnership Limited
Emerson House Albert St Eccles Manchester M30 0TE T 0161 779 4800

client
Robinwood Activity Centre Ltd

project
Robinwood Activity Centre

drawing
Masterplan

| approval status | date |
|---|---|
| ○ Feasibility / Sketch | 03.10.16 |
| ◉ Design | drawn GJH |
| ○ Tender | |
| ○ Construction | checked PC |
| ○ For Record Purposes | |

project ref. UV007502 — scale @ A1 1:500
drawing number 007502-UV-EW-XX-DR-101 — revision POI




## Coach Parking Bays




**Key**

- Site Boundary
- Existing Road/hardstanding
- Existing Buildings
- Extension to existing Building
- Existing Trees
- Existing Trees to be removed
- Proposed Activity Buildings
- Proposed Parking (Tarmac and Pel Kerb)
- Proposed Footpath (Self binding gravel with Timber edge)
- Hard Surfacing (Buidling surround and ramp)
- Proposed Woodland Planting
- Proposed Trees
- Proposed Hedge
- Proposed Spoil
- Xm Proposed Spoil Spot Heights
- Proposed Marginal Aquatics

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### SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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**Construction;**

Proximity to open water. Care to be taken to reduce risk of drowning, slips, electrical hazards and water borne diseases (leptospirosis).

**Maintenance / Cleaning;**

Proximity to open water. Care to be taken to reduce risk of drowning, slips, electrical hazards and water borne diseases (leptospirosis).

**Decommissioning / Demolition;**

Proximity to open water. Care to be taken to reduce risk of drowning, slips, electrical hazards and water borne diseases (leptospirosis).

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement.

Refer to Tree Removal and Protection Plan for trees to be removed

PARKING DETAILS

Proposed Parking bays, 2.4x4.8m
47no (incl 4no disable bays) possibility of additional parking bays in the vicinity of manager house and existing garage/proposed block 4

Minibus parking
to use coach bays or park along access road

| rev | description | date | drawn | chk |
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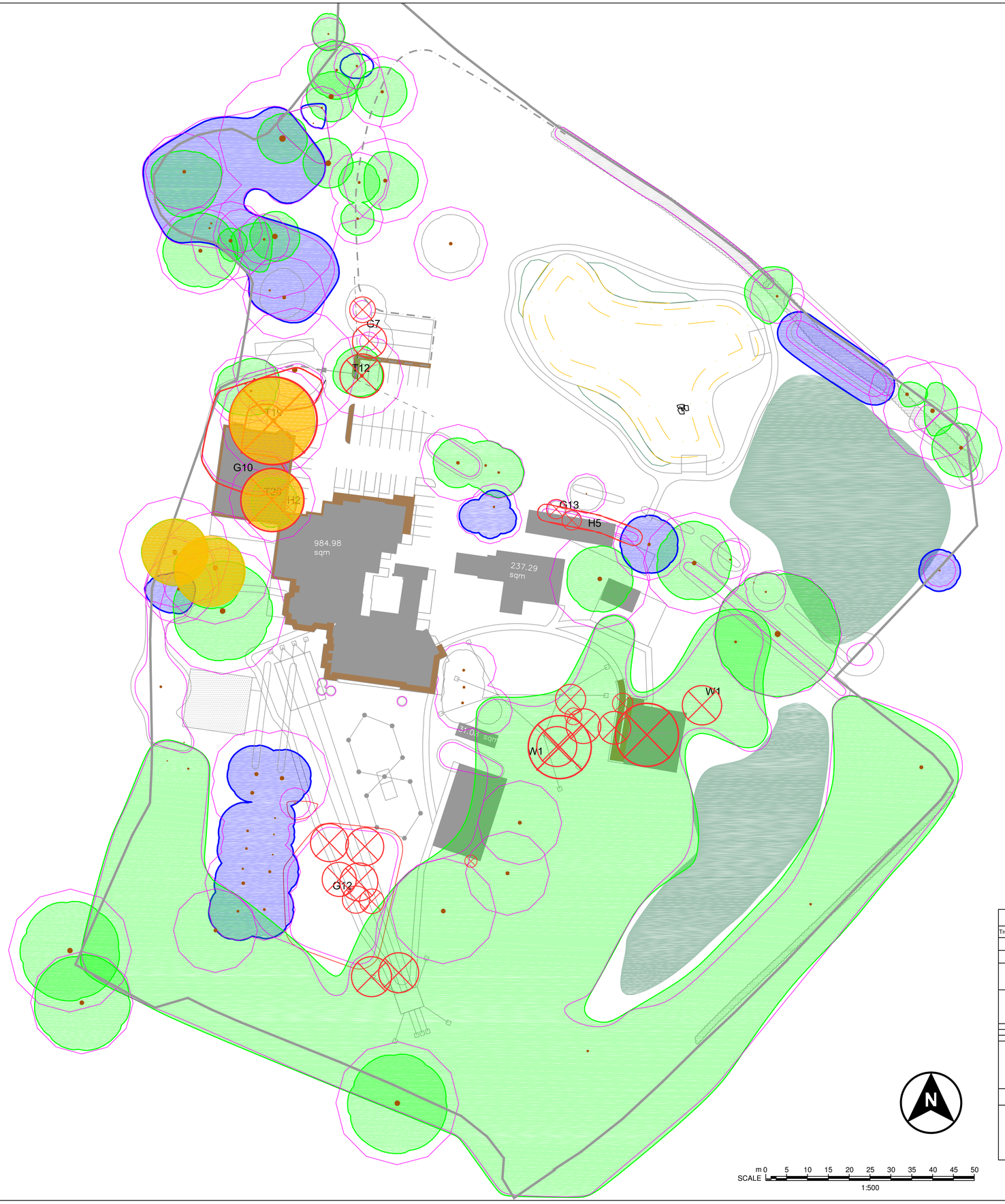
project
Robinwood Activity Centre

drawing
Proposed Car Park

| approval status | date |
|---|---|
| ○ Feasibility / Sketch | 07.09.16 |
| ● Design | drawn: NE |
| ○ Tender | |
| ○ Construction | checked: PC |
| ○ For Record Purposes | |

project ref. UV007502 | scale @ A2 1:250
drawing number 007502-UV-EW-XX-DR-102 | revision POI

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**Key**

Tree to be removed — Reference schedule below

Those to be Considered for Retention:

Category 'A' Tree/Group/Woodland/Hedge
*Those of a High Quality with an Estimated Remaining Life Expectancy of at Least 40 Years*

Category 'B' Tree/Group/Woodland/Hedge
*Those of a Moderate Quality with an Estimated Remaining Life Expectancy of at Least 20 Years*

Category 'C' Tree/Group/Woodland/Hedge
*Those of Low Quality with an Estimated Remaining Life Expectancy of at Least 10 Years, or Young Trees*

Those Considered Unsuitable for Retention:

Category 'U' Tree/Group/Woodland/Hedge
*Those in Such a Condition that they Cannot Realistically be Retained as Living Trees in the Context of the Current Land Use for Longer Than 10 Years*

**Root Protection Areas (RPAs):**

RPAs
Area(s) of Ground Around Trees that Should be Protected Throughout Development Works with Protective Fencing to form a Construction Exclusion Zone - see Temporary Protective Fencing Specification

Previously approved trees for removal

Tree Removal Specification / Schedule

| Tree Number | Category | Species | Height | Stem Diameter | Life Stage | General Observation and Comments |
|---|---|---|---|---|---|---|
| G7 | C1 | Horse Chestnut | <8 | <6x75(ms) | Young | - Multi-stemmed regrowth from two old stools of mature trees wit large Ganoderma sp. fungus brackets growing on them |
| G10 | C2 | Ash, Yew, Rhododendron, Sycamore, Cherry Laurel | <13 | <510 | Young and early mature | - Closely-spaced understorey group running along western boundary |
| G12 | U | Apple | <8 | <320 | Mature | - Moderately-spaced orchard in an area of wet ground<br>- Many trees evidently moribund and not in bud<br>- Many trees with lost leaders and in a state of decay<br>- Several trees with slight stem leans east |
| G13 | C2 | Ash, Horse, Chestnut, Sycamore | <10 | <1x290, 1x260 (ts) | Young to semi-mature | - Closely to moderately spaced group growing in hedges on either side of eastern driveway<br>- Some tree with dead and decaying leaders<br>- Crowns biased north due to proximity of neighbouring trees<br>- Some trees with light ivy growing up stems |
| H2 | C2 | Yew | <1.5 | N/A | Semi-mature | - Managed garden hedges |
| H5 | C2 | Holly, Ivy | <10 | N/A | Young | - Partially managed roadside hedge |
| T12 | A1 | Horse Chestnut | 20 | 810 | Mature | - Heavy ivy to upper crown |
| T19 | C1 | Beech | 18 | 1050 | Post-Mature | - Located in car park and surrounded by bitmac on all sides<br>- Numerous partially occluded wounds up stem with exposed and sometimes decaying wood beneath<br>- Sounding with nylon hammer indicates minor hollowing to southern side of base<br>- Evidently in a state of progressive decay, but crown showing good vigour |
| T20 | A1 | Beech | 18 | 840 | Mature | - Trifurcates at a height of 1.5m with included bark unions<br>- Crown slightly biased south |
| W1 | A1/2 | Common Lime, Ash, Cherry, Oak, Pine, Beech, Holly, Birch, Yew, Rhododendron, Hazel, Cedar, Hawthorn, Cherry Laurel, Sycamore, Poplar | <28 | <1030 | Young-matur e | - Western half of woodland mostly composed of large, mature limes to boundary with an understorey of Rhododendron and occasional mature Pine standards and semi to early mature broadleaf species<br>- Central section more scrub like in nature, with occasional mature broadleaf and conierous species<br>- Around pond in southern corner and along south-eastern boundary is largely early-mature beech and oak<br>- Numerous clearings throughout woodland |

Information sourced from 'Tree survey schedule for arboricultural constraints appraisal.' As provided by Bowland Tree Consultancy Limited
Survey Date; 11 & 12 April 2016 Job Ref: BTC1077

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards / risks associated with the types of work detailed on this drawing, note the following;

Construction;

Proximity to open water. Care to be taken to reduce risk of drowning, slips, electrical hazards and water borne diseases (leptospirosis).

Maintenance / Cleaning;

Proximity to open water. Care to be taken to reduce risk of drowning, slips, electrical hazards and water borne diseases (leptospirosis).

Decommissioning / Demolition;

Proximity to open water. Care to be taken to reduce risk of drowning, slips, electrical hazards and water borne diseases (leptospirosis).

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement.

| rev | description | date | drawn | chk |
|---|---|---|---|---|
| POI | Planning Submission | 04.10.16 | GJH | PC |

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client
Robinwood Activity Centre Ltd

project
Robinwood Activity Centre

drawing
Tree Removal and Protection Plan

approval status
- ○ Feasibility / Sketch
- ◉ Design
- ○ Tender
- ○ Construction
- ○ For Record Purposes

date 03.10.16
drawn GJH
checked DS

project ref. UV007502
scale @ A1 1:500
drawing number 007502-UV-EW-XX-DR-103
revision POI




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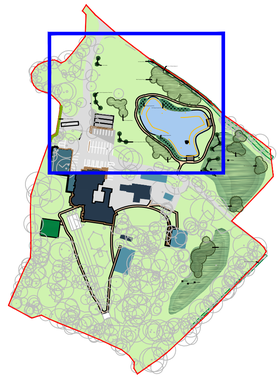
Maintenance / Cleaning;

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Decommissioning / Demolition;

Proximity to open water. Care to be taken to reduce risk of drowning, slips, electrical hazards and water borne diseases (leptospirosis).

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement.



Note;
For planting notes and schedule, refer to drawing: 007502-UV-EW-XX-DR-104.2

| rev | description | date | drawn | chk |
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| POI | Planning Submission | 04.10.16 | GJH | PC |

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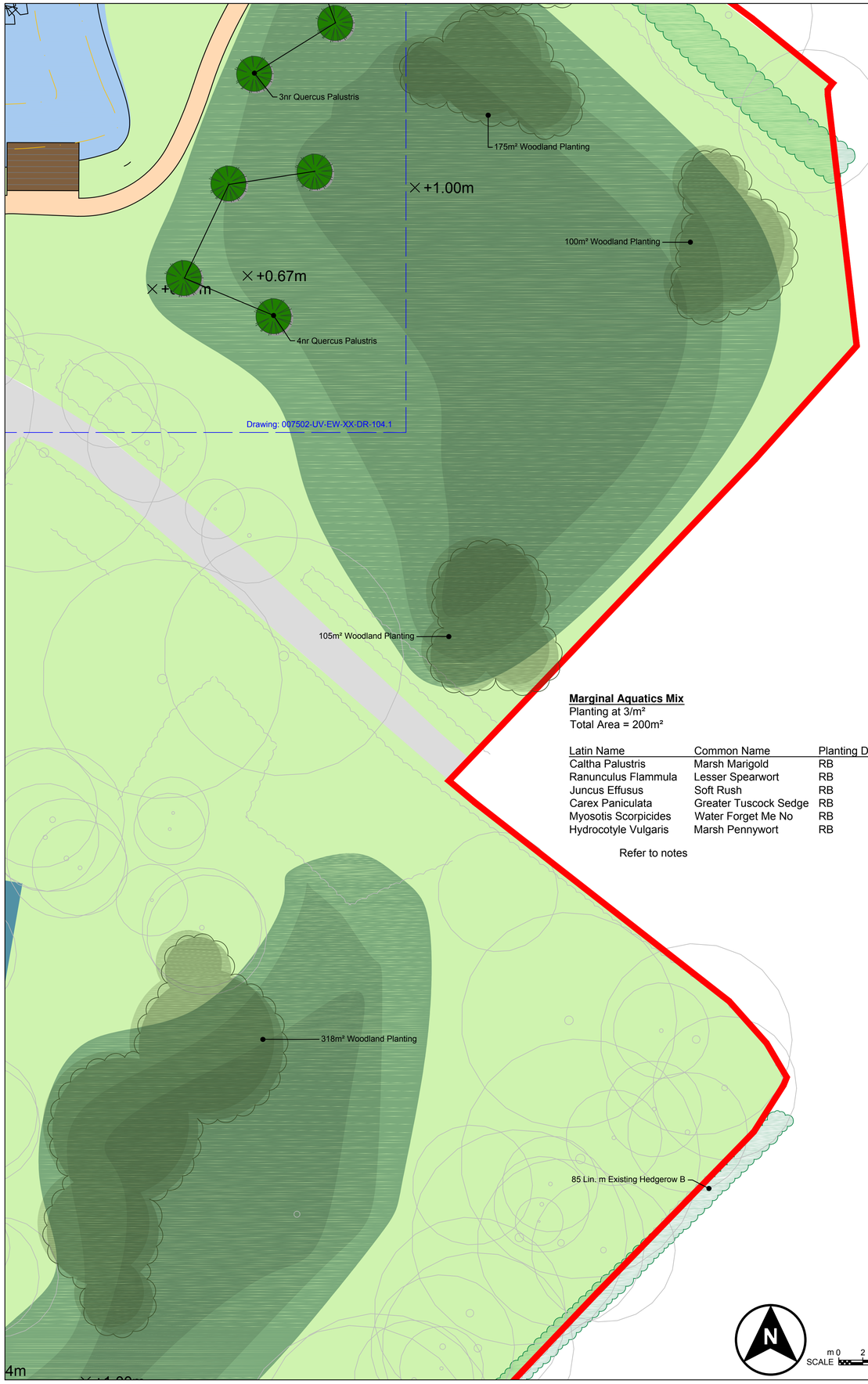
client
Robinwood Activity Centre Ltd

project
Robinwood Activity Centre

drawing
Planting Plan
Sheet 1 of 2

| approval status | date |
|---|---|
| ○ Feasibility / Sketch | 04.10.16 |
| ● Design | drawn GJH |
| ○ Tender | |
| ○ Construction | checked PC |
| ○ For Record Purposes | |

project ref.
UV007502
scale @ A1
1:200
drawing number
007502-UV-EW-XX-DR-104.1
revision
POI




**Planting Notes and Workmanship**

Any imported topsoil required will comply with BS3882.
Soil to be cultivated to 450mm for all shrub planting areas and 150mm for grass.

1. Plant handling at the nursery, and during transit up to delivery, shall be in accordance with 'Plant Handling' the booklet published by the Committee for Plant Supply and Establishment (CPSE). The contractor shall comply with clauses 3 & 4 of the above booklet (obtained from the Horticulture Trades Association) which refers to the receipt, unloading and temporary storage of plants.
2. Plants shall be first class examples of their species or variety, free from all pests and diseases with good fibrous root systems and materially undamaged.(Refer to relevant sections of BS3936 Parts 1-10 'Specification of Nursery Stock')
3. All planting is to be in general compliance with BS4428: 1989 'Code of Practice for general landscape operations (excluding hard surfaces)'.
4. The contractor must ascertain for himself the exact location of any underground services and maintenance points.
5. Water as necessary to ensure the establishment and continued thriving of planted and grassed matter.
6. Carry out all work when soil and weather conditions are suitable:i) Do not plant during periods of frost or strong winds. Plant only during the following periods
   - Container grown plants: At any time if ground water and weather conditions are favourable. Ensure that adequate watering and weed control is available.
7. All planted areas are to be mulched to a consolidated depth of 75mm using an approved Amenity Bark Mulch feathered into adjacent grassed or paved areas.

**Workmanship and Maintenance Generally**
All works will be subject to the following British Standards :
Construction: BS 4428 : 1989 General Landscape Operations BS 3936 : Part 1 1992 Nursery Stock (Specification for trees and shrubs)BS 3936 : Part 4 1984 Nursery Stock (Specification for forest trees)BS 3936 : Part 9 1987 Nursery Stock (Specification for bulbs, corms and tubers)BS 3936 : Part 10 1990 Nursery Stock (Specification for ground cover plants)BS 5837 : 2005 Trees in Relation to Construction BS 3882 : 1994 Topsoil BS 4043 : 1989 Transplanting root based trees BS 5236 : 1975 Cultivating and planting advance nursery stock

**Failures Of Planting:**
Any plants which have failed to thrive to be replanted with equivalent plants/ trees/ shrubs during the next suitable planting season.
(Exclusions: Theft or malicious damage after completion ) Replacements are to match size of adjacent or nearby plants of same species or match original specification, whichever is the greater.

**Planting Maintenance Generally:**
For 12 months following Practical Completion to establishment schedule.

**Weed control:**
A weed free area is to be provided around each shrub by maintaining a full thickness of mulch and only using a contact herbicide as necessary. Glyphosate herbicide to be used to a maximum of 2 times a year to shrub beds.

- Hard Surfacing (Buidling surround and ramp)
- Proposed Woodland Planting
- Proposed Trees
- Proposed Canoeing Lake
- Proposed Stone Feature
- Proposed Spoil

**Tree Planting**
Extra Heavy Standard Trees to be root balled and planted into prepared tree pit, 150mm wider than root ball nominally 750mm radius by 500mm deep; loosen sides and bottom of pit and backfill with 50/50 mix of excavated topsoil and tree planting and mulching compost; affix to single low stake and tie, water in, mulch 500mm radius x 75mm deep. Plant in locations shown, nominal spacing 8 – 10 metres.
**Woodland Planting**
Apply herbicide or remove turf if planting into undisturbed grass. All plants are open ground stock with the exception of Ilex sp which are pot grown. Plant in groups of 5-11 or same species Salix and Viburnum sp concentrated where ground is damp. Excavate sufficient soil to accommodate roots, backfill and firm in, water and fertilise with Enmag or other slow release fertiliser, mulch 250mm radius x 75mm deep. Prune to promote strong growth and reduce wind rock.
**Grass seeding**
Grade and cultivate topsoil to a depth of 150mm to create fine tilth to smooth, flowing lines. Stone pick to remove debris 20mm or over. Sow with low maintenance grass mix (Germinal Seeds A22) at 50gms/m2 and lightly rake/harrow and firm in. Control weed growth by manual or selective herbicide as required. Apply post seeding fertiliser to lake area grass only.
**Hedgerows**
Plant into cultivate row 450mm wider by 300mm deep. Cultivate by hand where existing tree roots are encountered. Plant into double row 150mm apart at 300mm centres; excavate sufficient soil to accommodate roots; plant in groups of 5-11 or same species Prunus spinosa and Viburnum sp concentrated where ground is damp; water in; fertilise with Enmag or other slow release fertiliser; mulch 450mm wide by 75mm deep. Prune to promote strong growth and reduce wind rock.
**Aquatic**
Aquatic marginal planting is to be placed onto prepared ledges using aquatic baskets or pre planted coir rolls, detailed fixing to suit method.

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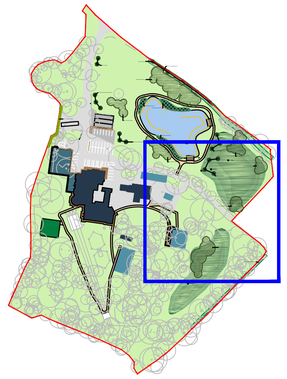
In addition to the hazards / risks associated with the types of work detailed on this drawing, note the following;

Construction;
Proximity to open water. Care to be taken to reduce risk of drowning, slips, electrical hazards and water borne diseases (leptospirosis).

Maintenance / Cleaning;
Proximity to open water. Care to be taken to reduce risk of drowning, slips, electrical hazards and water borne diseases (leptospirosis).

Decommissioning / Demolition;
Proximity to open water. Care to be taken to reduce risk of drowning, slips, electrical hazards and water borne diseases (leptospirosis).

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement.



**Marginal Aquatics Mix**
Planting at 3/m²
Total Area = 200m²

| Latin Name | Common Name | Planting Depth | % | No |
|---|---|---|---|---|
| Caltha Palustris | Marsh Marigold | RB | 20 | 120 |
| Ranunculus Flammula | Lesser Spearwort | RB | 16 | 96 |
| Juncus Effusus | Soft Rush | RB | 16 | 96 |
| Carex Paniculata | Greater Tuscock Sedge | RB | 16 | 96 |
| Myosotis Scorpicides | Water Forget Me No | RB | 16 | 96 |
| Hydrocotyle Vulgaris | Marsh Pennywort | RB | 16 | 96 |

Refer to notes

| Hatch Key | Area Type | Species (latin) | Species (common) | Qty | No | % of Maturity Coverage | Comments |
|---|---|---|---|---|---|---|---|
| | Woodland Area<br><br>Based on National Vegetation Classification W11 | Alnus glutinosa<br>Betula pubescens<br>Quercus petraea<br>Betula pendula<br>Quercus robur<br>Sorbus aucopariea<br>Crataegus monogyna<br>Prunus avium<br>Ilex aquifolium<br>Corylus avellana | Alder<br>Sessile Oak<br>Silver Birch<br>Downy Birch<br>Pedunculate Oak<br>Rowan<br>Hawthorn<br>Wild Cherry<br>Holly<br>Hazel | 20%<br>15%<br>15%<br>10%<br>10%<br>10%<br>5%<br>5%<br>5%<br>5% | 86<br>59<br>59<br>39<br>39<br>39<br>19<br>19<br>19<br>19 | 40% Feathered<br>60% Whips<br><br>**WHIP PLANTING TO BE 600 - 900MM, FEATHERED TREES TO BE 1800MM HIGH.**<br><br>at 2m Centres<br>Total 1565m² | See notes |

| Hatch Key | Area Type | Species (latin) | Species (common) | Qty | No | % of Maturity Coverage | Comments |
|---|---|---|---|---|---|---|---|
| | Native Hedgerow | Crataegus monogyna<br>Ilex aquifolium<br>Viburnum opulus<br>Prunus spinosa | Hawthorn<br>Holly<br>Guelder Rose<br>Blackthorn | 60%<br>20%<br>10%<br>10% | 164<br>56<br>28<br>28 | Plant in 2 rows<br>150mm apart at<br>300mm centres | See notes |

| Hatch Key | Area Type | Species (latin) | Species (common) | Qty | No | % of Maturity Coverage | Comments |
|---|---|---|---|---|---|---|---|
| | Existing Hedge A<br>To be filled | Crataegus monogyna<br>Ilex aquifolium<br>Viburnum opulus<br>Prunus spinosa | Hawthorn<br>Holly<br>Guelder Rose<br>Blackthorn | 60%<br>20%<br>10%<br>10% | 6<br>2<br>1<br>1 | Plant in 2 rows<br>150mm apart at<br>300mm centres<br>Total 20m | See notes |

| Hatch Key | Area Type | Species (latin) | Species (common) | Qty | No | % of Maturity Coverage | Comments |
|---|---|---|---|---|---|---|---|
| | Existing Hedge B<br>To be filled | Crataegus monogyna<br>Ilex aquifolium | Hawthorn<br>Holly | 80%<br>20% | 24<br>6 | Plant in 2 rows<br>150mm apart at<br>300mm centres<br>Total 50m | See notes |

Tree Planting Specification

| No. | *Scientific Name* | Common Name | Size | Pit Size | Root | Details |
|---|---|---|---|---|---|---|
| 2 | *Tilia cordata 'Greenspire'* | Lime | Extra Heavy Standard 14-18cm girth | 1000x1000x1000 mm | Root Balled | Single stake and tie |
| 6 | Aesculus hippocastanum 'Baumannii' | Horse Chestnut | Extra Heavy Standard 14-18cm girth | 1000x1000x1000 mm | Root Balled | Single stake and tie |
| 5 | *Quercus robur* | English Oak | Extra Heavy Standard 14-18cm girth | 1000x1000x1000 mm | Root Balled | Single stake and tie |
| 7 | *Quercus palustris* | Spanish Oak | Extra Heavy Standard 14-18cm girth | 1000x1000x1000 mm | Root Balled | Single stake and tie |

Note;
For planting notes and schedule, refer to drawing:
007502-UV-EW-XX-DR-104.1

| rev | description | date | drawn | chk |
|---|---|---|---|---|
| POI | Planning Submission | 04.10.16 | GJH | PC |

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Commercial in Confidence
Urban Vision Partnership Limited
Emerson House Albert St Eccles Manchester M30 0TE T 0161 779 4800

client
Robinwood Activity Centre Ltd

project
Robinwood Activity Centre

drawing
Planting Plan
Sheet 2 of 2

approval status
- ○ Feasibility / Sketch
- ● Design
- ○ Tender
- ○ Construction
- ○ For Record Purposes

date 04.10.16
drawn GJH
checked PC

project ref. UV007502
scale @ A1 1:200
drawing number 007502-UV-EW-XX-DR-104.2
revision POI




## Key

- Proposed Level (63.210)
- Proposed Lake Bed Level (63.210)
- Existing Level (63.210)
- Proposed Highway Level (64.345)
- Proposed Kerb Level (63.210)
- Proposed Gradient (1:5)
- Proposed Canoeing Lake
- Proposed Stone Feature
- Existing Trees

Note:

- Area of cover for spoil may vary, maximum height will be within 250mm of those stated
- Tree protection zones will be avoided

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In addition to the hazards / risks associated with the types of work detailed on this drawing, note the following;

Construction;

Proximity to open water. Care to be taken to reduce risk of drowning, slips, electrical hazards and water borne diseases (leptospirosis).

Maintenance / Cleaning;

Proximity to open water. Care to be taken to reduce risk of drowning, slips, electrical hazards and water borne diseases (leptospirosis).

Decommissioning / Demolition;

Proximity to open water. Care to be taken to reduce risk of drowning, slips, electrical hazards and water borne diseases (leptospirosis).

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| POI | Planning Submission | 04.10.16 | GJH | PC |

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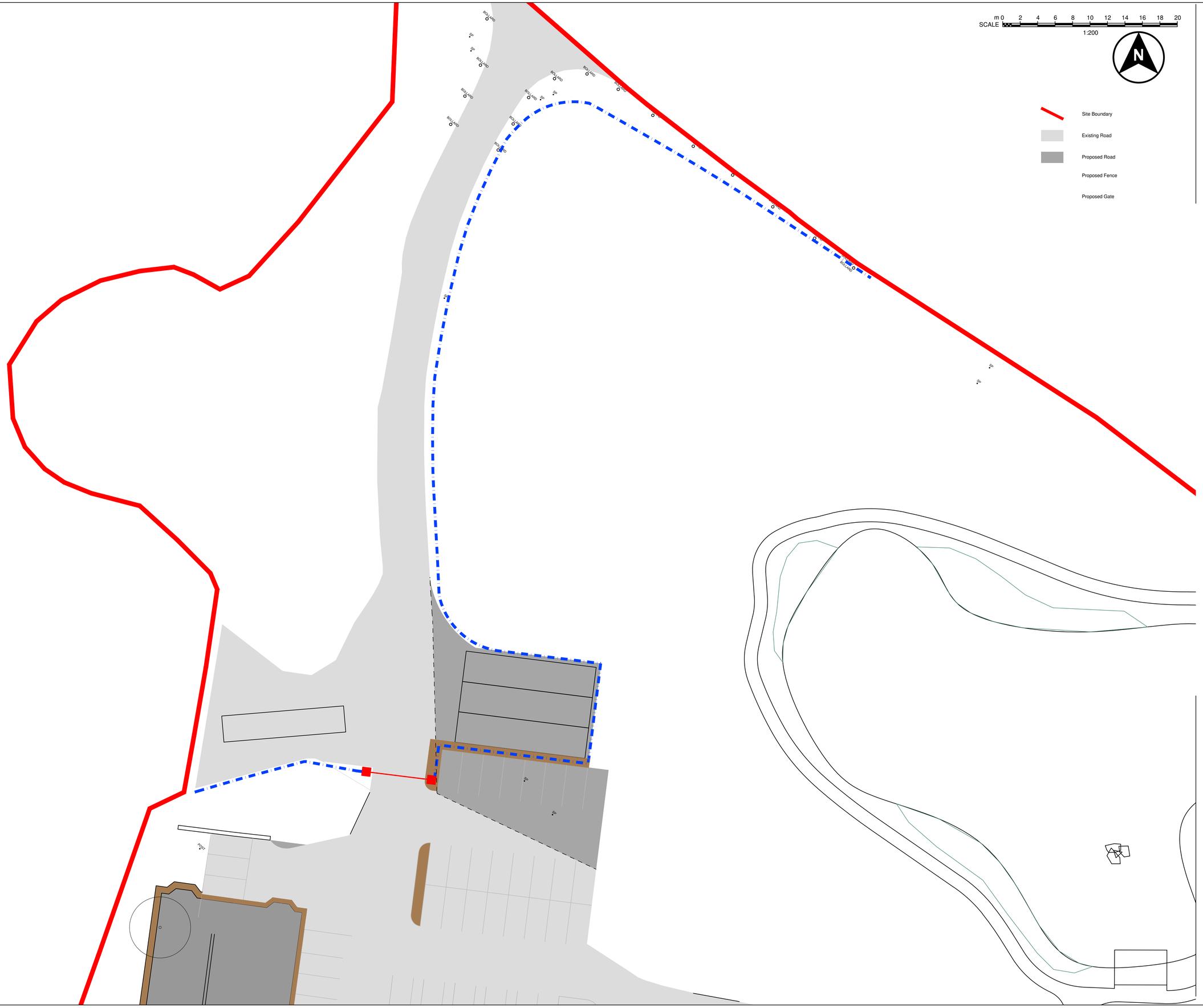
project
Robinwood Activity Centre

drawing
Proposed Levels

approval status
- ○ Feasibility / Sketch
- ● Design
- ○ Tender
- ○ Construction
- ○ For Record Purposes

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drawn GJH
checked DS

project ref. UV007502
scale @ A1 1:500
drawing number 007502-UV-EW-XX-DR-105
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## SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards / risks associated with the types of work detailed on this drawing, note the following;

### Construction;

Proximity to open water. Care to be taken to reduce risk of drowning, slips, electrical hazards and water borne diseases (leptospirosis).

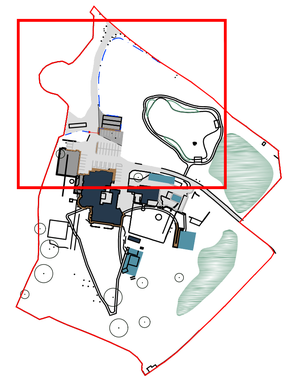
### Maintenance / Cleaning;

Proximity to open water. Care to be taken to reduce risk of drowning, slips, electrical hazards and water borne diseases (leptospirosis).

### Decommissioning / Demolition;

Proximity to open water. Care to be taken to reduce risk of drowning, slips, electrical hazards and water borne diseases (leptospirosis).

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement.



Location Plan
Scale 1:2500

| rev | description | date | drawn | chk |
|---|---|---|---|---|
| POI | Planning Submission | 04.10.16 | GJH | PC |

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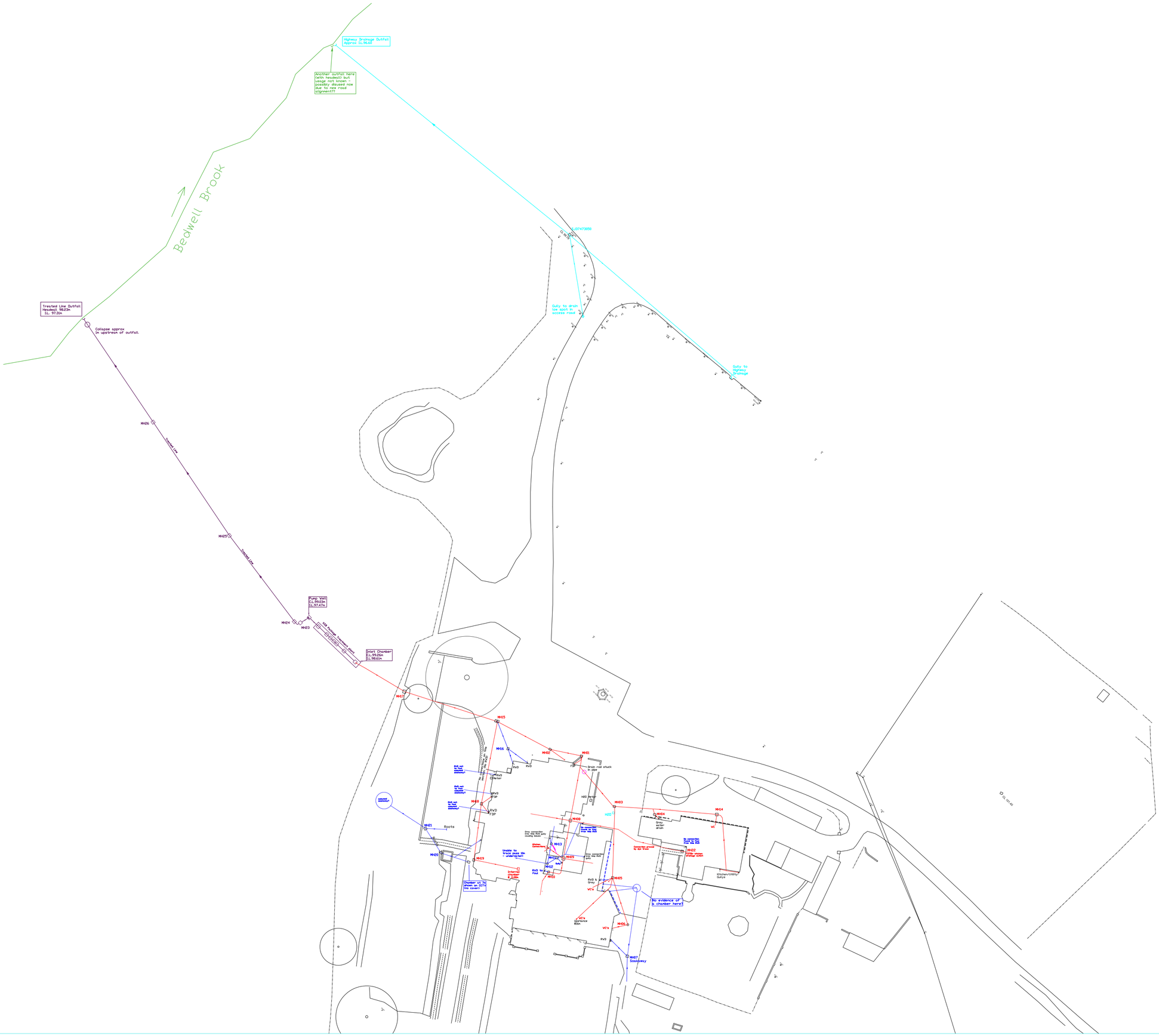
drawing
Proposed Fencing & Gate Layout

approval status
- ○ Feasibility / Sketch
- ● Design
- ○ Tender
- ○ Construction
- ○ For Record Purposes

date 20.09.16
drawn GJH
checked DS

project ref. UV007502
scale @ A1 1:200
drawing number 007502-UV-EW-XX-DR-106
revision POI

# **Appendix C** – Former Hotel Site Drainage




N

## Legend/Notes:

- Foul / Combined Sewer
- Surface Water Sewer
- Treated Sewer Line
- Highway Drainage

*Survey Notes:*

*A drainage survey was undertaken at this site understand the connectivity of the networks and obtain levels and pipe sizes of the sewers.*

*The connectivity (where possible) was established by means of dye testing and CCTV.*

*Many of the foul/combined chambers around the main hotel building were fully blocked with historic fat deposits and had to be repeatedly "high pressure water" jetted in order to free up the flows from chamber to chamber!*

*Even after repeated jetting, some of the lines were still heavily lined with these fat deposits; this reduces the bore of the pipe and flow capacity etc. The CCTV footage clearly shows the extent of the problem and which lines are affected!*

*There were several rain water downpipes around the site that discharged to the foul/combined system; these are shown on the plan.*

*We were able to prove that other rain water downpipes did not join the foul sewer (with CCTV in the foul sewer not having connections etc) but it was not possible, without chambers, to know where some of these downpipes went. We have to assume that they end up in buried soakaways!!*

*The foul/combined sewer now goes through a treatment package plant - this is still working and appears to be functioning adequately.*

*The treated water line from the package plant utilises the old septic tank line across the field to outfall, however, this has badly collapsed just before the outfall headwall and requires attention.*

Provisional

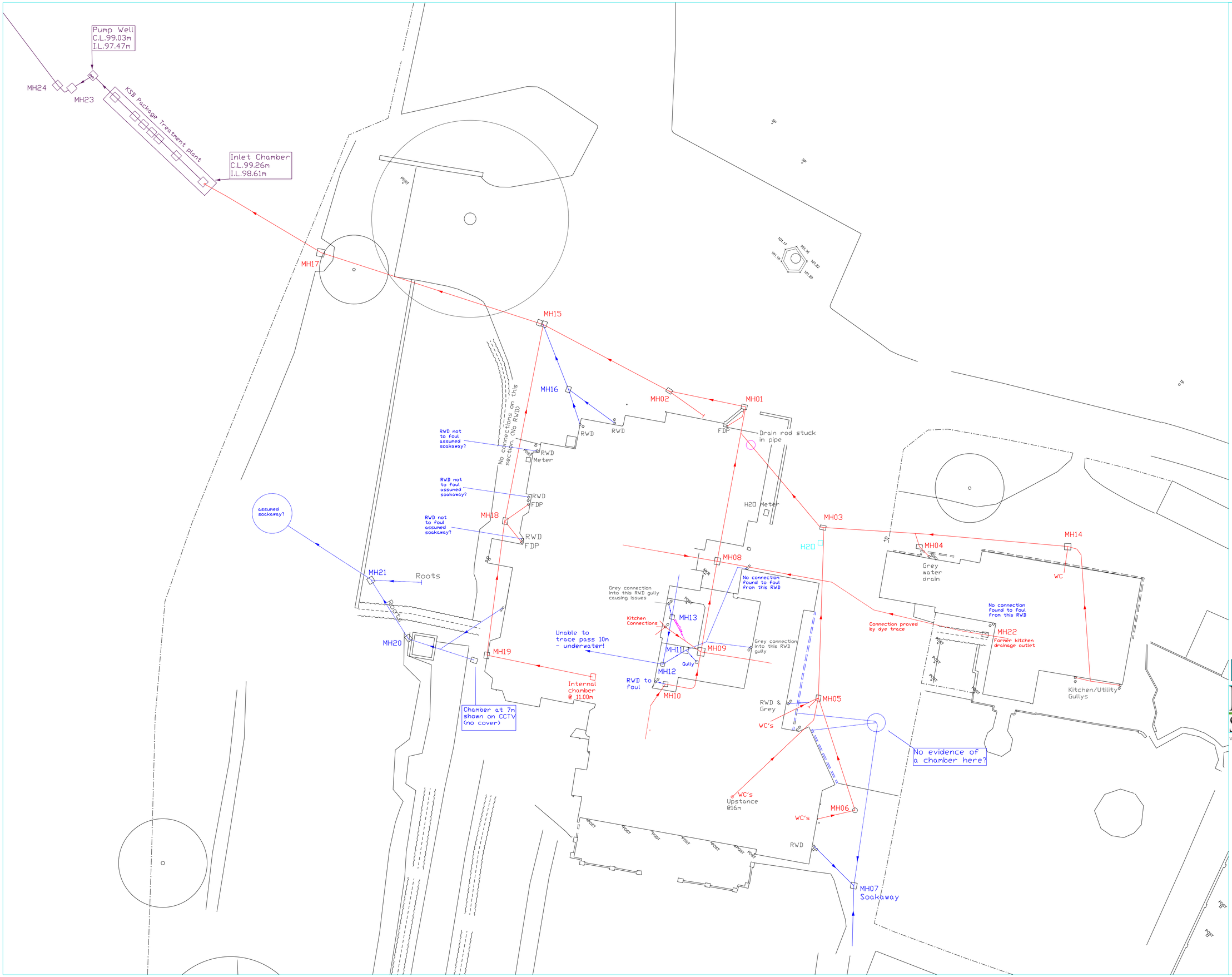

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Email: kevin@invek.com – www.invek.com


Client: Opus

Drawing Title: Cross Lanes Hotel, Wrexham
Drainage Layout 01

| | | | |
|---|---|---|---|
| Scale(s) | N.T.S | Drawn | PW |
| Date | 22.12.16 | Checked | RD |
| Job Number | 1124 | Approved | KN |

Sheet Size, Drawing Number & Revision: A1_1124/01_Rev_00







## Legend/Notes:

- Foul / Combined Sewer
- Surface Water Sewer
- Treated Sewer Line
- Highway Drainage

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*A drainage survey was undertaken at this site understand the connectivity of the networks and obtain levels and pipe sizes of the sewers.*

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Client: Opus

Drawing Title: Cross Lanes Hotel, Wrexham
Drainage Layout 02

| | | | |
|---|---|---|---|
| Scale(s) | N.T.S | Drawn | PW |
| Date | 22.12.16 | Checked | RD |
| Job Number | 1124 | Approved | KN |

Sheet Size, Drawing Number & Revision: A1_1124/02_Rev_00

# **Appendix D** – Kingspan Installation & Maintenance Guidance

- 017610-01 Commercial Bioficient 34-80

# 017610
## Commercial Bioficient 34 to 80 Wastewater Treatment Systems Installation & Maintenance Guidelines

Kingspan Environmental Service Contact Numbers:

GB: 0844 846 0500
NI: 028 3025 4077
IRL: 048 3025 4077



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# 1. Health & Safety

These warnings are provided in the interest of safety.

You must read them carefully before installing or using the equipment.

It is important that this document is retained with the equipment for future reference. Should the equipment be transferred to a new owner, always ensure that all relevant documents are supplied in order that the new owner can be acquainted with the functioning of the equipment and the relevant warnings.

Installation should only be carried out by a suitably experienced contractor, following these guidelines.

We recommend the use of a dust mask and gloves when cutting GRP components.

Electrical work should be carried out by only by a qualified electrician.

Sewage and sewage effluent, contaminated surface water can contain micro-organisms and substances harmful to human health. Any person carrying out maintenance on the equipment should wear suitable protective clothing, including gloves. Good hygiene practice should also be observed.

Covers should be kept locked. Do not walk on the covers. When covers are removed, precautions must be taken against personnel falling into the unit.

Alternate access covers should be selected with reference to the location of the unit and traffic loads to be accommodated. These are not part of the units supply.

Should you wish to inspect the operation of the equipment, please observe all necessary precautions, including those listed below, which apply to maintenance procedures.

Ensure that you are familiar with the safe working areas and accesses. Ensure that the working area is adequately lit.

Take care to maintain correct posture, particularly when lifting. Use appropriate lifting equipment when necessary. Keep proper footing and balance at all times. Avoid any sharp edges.

Observe all hazard labels and take appropriate action to avoid exposure to the risks indicated. The units contain electrical items, pumps, and air lifts.

The power supply to the equipment must be isolated at the control panel(s) before lifting the covers. Where a specific maintenance procedure requires the equipment to be running with the covers off, all care must be taken to avoid contact with moving parts and electrical components or conductors.

Once power has been isolated, the control panel must be kept locked shut to avoid accidental re-connection whilst work or inspection is being carried out.

The correct ongoing maintenance is essential for the proper operation of the equipment.

The removal of sludge and liquid from the unit must be carried out by a contractor holding the relevant permits to transport and dispose of such waste. The contractor should refer to the guidelines in this document.

# 2. Introduction

Thank you for choosing our Bioficient, High Effluent Quality waste water treatment system. This manual will help you to keep it operating efficiently over a long service life. Please read this manual thoroughly and before installation.

This manual should be referred to by:

a) The installer.
b) The electrician.
c) The maintenance engineer.
d) The desludge contractor.
e) The owner/user.

These Guidelines represent Best Practice for the installation of Bioficient wastewater treatment systems. Many years of specialist experience has led to the successful installation of thousands of systems. It must be noted, however, that these Guidelines are necessarily of a general nature. It is the responsibility of others to verify that they are **appropriate for the specific ground conditions and in-service loads of each installation.** Any information or advice given by employees or agents of the company in connection with the design of the installation must be verified by a qualified specialist (e.g. Civil engineering consultant).

Each Bioficient system has been individually selected to achieve the specified final effluent quality. The equipment size / system design is based on your declared required effluent quality, application and the estimated daily volume and loads for various parameters. Your quotation will have specified the incoming parameters and the final effluent quality to be obtained. You will be supplied with a control panel which includes the appropriate timed recycle settings and operations to achieve the quality specified.

Treatment takes place within a single horizontal tank which includes primary and final settlement areas as well as treatment zones. Within the system, the partially treated effluent is recycled.

When treating domestic effluents, the treatment process is designed to achieve an effluent quality with a daily average of:

**20mg/l BOD / 30mg/l SS / 5mg/l $NH_4$ N**

- Some system designs may be offered to achieve lower ammonia levels.
- Some system designs may offer to achieve a daily average specified Total Nitrogen consent.

**20mg/l BOD / 30mg/l SS / 5mg/l $NH_4$ N / 15 TN**

- Some system designs include a chemical dosing system to achieve alternate daily average effluent qualities such as defined phosphate levels.

Non domestic sewage applications with specified effluent qualities are specified individually.

Standard system designs require sludge removal at intervals of approx. 90 days. Units with chemical dosing may have a decreased interval.

In the UK, Wastewater equipment selection and application guidance is provided by the Environment Agency, Pollution Prevention Guidelines PPG 4. In Ireland, guidance is provided by the EPA manuals.

**You will require permission to install a wastewater treatment system and permission /consent to discharge the effluent which will probably include specified effluent qualities and a maximum volume.** Consult your local authority as the installation will probably require Planning and Building Control approval. In the UK, you will need to be aware of publication DETR 3/99 (Welsh office 10/99) "Planning requirement in respect to use of non mains sewerage incorporating septic tanks in new development" and the drainage and waste disposal building regulations H2 (2000). In Ireland, guidance is provided in circular letter SP/03 for the protection of groundwater. These documents require detailed site assessments.

Should you require information regarding the design of a drainage field or alternate system designs and sizing please contact us. Large systems treating large daily volumes require large land areas. In the UK, BS: 6297; 2007 provides drainage field designs. In Ireland, the single house EPA manual provides design guidance. Percolation test methods to identify soil suitability are slightly different in UK and Ireland, the percolation test results should be documented and retained. A building inspector may wish to examine the site before, during or after tank installation and may require sight of percolation test results.

Wastewater treatment systems are covered within the UK by H2 Building regulations 2000. Systems should have sufficient capacity to enable the breakdown of solid matter in the wastewater from the buildings, be sited and constructed so as to prevent overloading of the receiving water. They must not be prejudicial to health or be a nuisance, adversely affect any water sources or resources or pollute controlled waters. They must not be sited in an area where there is a risk of flooding. Systems must be constructed so as to have adequate ventilation and so as to prevent the leakage of the contents. They must have adequate means of access for maintenance and emptying.

Buildings which utilise Biological treatment systems should have a notice affixed within the building. This notice should advise the estimated emptying frequency and the need to use a licensed waste disposal contractor. Details of maintenance requirements are required. The owner is legally responsible for ensuring that the system does not cause pollution, a health hazard or a nuisance.

# 3. Handling and Storage

- Unit dimensions, connections, and weights etc. are provided on a separate drawing.
- Care must be taken to ensure that units are not damaged during delivery and handling on site. Tanks are manufactured in glass fibre reinforced polyester (GRP) which makes the tanks light in weight and easy to transport and install. The tanks can be damaged by sharp objects and point loads. The unit includes loose plastic media within three of the compartments. You must avoid rolling the unit. If there is any damage found at delivery, it should be reported to us within 48 hours.

- The design requirements of our products will frequently mean that the centre of gravity of the unit is “offset”. Care must therefore be taken to ensure that the unit is stable when lifting. If the covers have been removed, rainwater may collect inside units, adding weight and increasing instability. Check units before lifting and pump out any excess water.

- When lifting the unit, use webbing slings of a suitable specification. DO NOT USE CHAINS. Lifting equipment should be selected by taking into account the unit weight, length and the distance of lift required on site.

- A suitable spreader bar should be used to ensure that units are stable and that loads are evenly distributed during lifting. When lifting units, a spreader bar should be used where the slings would otherwise be at an angle > 30 degrees to the vertical.

- Whenever units are stored or moved on site, ensure that the storage location is free of rock, debris and any sharp objects, which may damage the unit. The units must be placed on ground, which is flat and level to evenly support the base of the unit evenly.

**SLINGING POSITIONS**

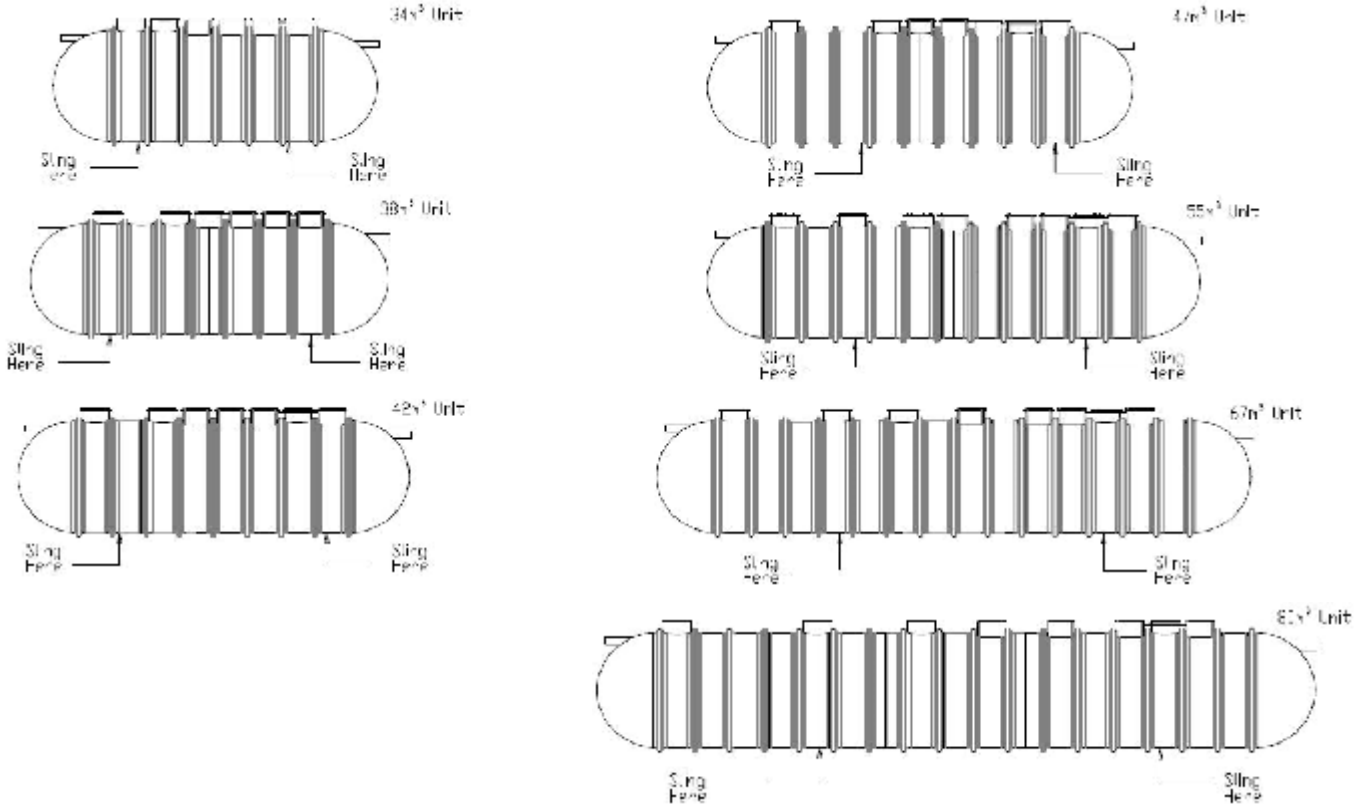



Figure 1; slinging positions (0.5m invert units shown)

# 4. Unit Installation

1. Do not install in trafficked areas unless a suitable top slab has been designed and constructed. The top slab should bear on a suitable foundation to prevent superimposed loads being transmitted to the unit and access turrets. Loads applied must bear on the top slab, not the access turrets.

2. See the section on “Deep Invert Units” for fitting of extension necks and manifolds.

3. Ground conditions and water table level should be assessed. If the water table will be above the base of the unit at any time of the year, adequate concrete backfill must be provided to avoid flotation. In poorly draining ground, consideration should also be given to the likelihood of flotation due to surface water collecting in the backfill. It should be borne in mind that the inlet drain trench will act as a land drain, directing surface water to the backfill around the unit.

4. Excavate a hole of sufficient length and width to accommodate the tank plus a minimum 225mm concrete surround. The depth should allow for the burial depth of the unit plus a concrete base slab of 300mm. The maximum depth to the base of the excavation must be no more than 4.7m including the base slab.

5. Construct a suitable concrete base slab appropriate to site conditions. Ensure that the slab is flat and level.

6. When the concrete base slab has set enough to support the installed load, lower the unit onto the slab using suitable webbing slings and lifting equipment. The selection of lifting equipment is the responsibility of the installer considering unit weight, length, height and distance of lift. The unit includes baffles, pumps, diffusers and other components so please note that the unit weight will not be evenly balanced.

7. Pour no more than 300mm depth of clean water into each compartment. This should be achieved simultaneously but avoid a shock load. A recommended way of doing this is to add clean water into the second biological treatment zone (which has media within it) until the level in the first primary zone (first turret from inlet) is 300mm. At the same time, fill the last turret, the final settlement zone.

8. **DO NOT OVERFILL**; the unit is not designed to hold water whilst unsupported. Place concrete backfill to approximately 300mm depth under and to the sides of the tank ensuring good compaction to remove voids. Concrete backfill must be manually compacted; WE DO NOT recommend the use of vibrating lances. ALLOW INITIAL CONCRETE SET TO OCCUR BEFORE PROCEEDING. Ensure concrete fills the voids underneath tank and ribs.

9. Continue adding concrete backfill, simultaneously keeping the internal water level no more than 300mm above the backfill level at all times, until the backfill is just below the underside of the outlet drain, giving sufficient room to connect the inlet and outlet pipework.

10. Connect the inlet and outlet drains to the site pipe work when safe access to the backfill can be gained.

11. Connect the ventilation pipes and run the pipe work to above ground level when safe access to the backfill can be gained.

12. Connect the cable conduits when safe access to the backfill can be gained.

13. Connect the three hoses to the internal diffuser assemblies via the pre-installed ducts in the necks of the tank, connect to the internal 2 inch hose tail at the top of the air diffuser assemblies, secure in place with relevant jubilee clips.

14. Run the lengths of hose through the ducting to the blower housing, cut hose to required length and connect the free ends to the outlet connections on the Blower Manifold securing in place with relevant jubilee clips.

15. Run the pre fitted control panel flying lead (15m) with ‘quick connector’ from the internal terminal box (JB001 situated in neck of Biozone 2) through the cable conduits to the main control panel and connect opposite end of quick connector.

16. Continue backfilling with concrete over the tank body to the required level. Build up a shell of concrete, minimum 225mm thick, around the access turrets.

17. For deeper invert units (above 800mm invert) we recommend that you temporarily strut extension turrets during this procedure to avoid distortion or collapse as the necks are non-structural.

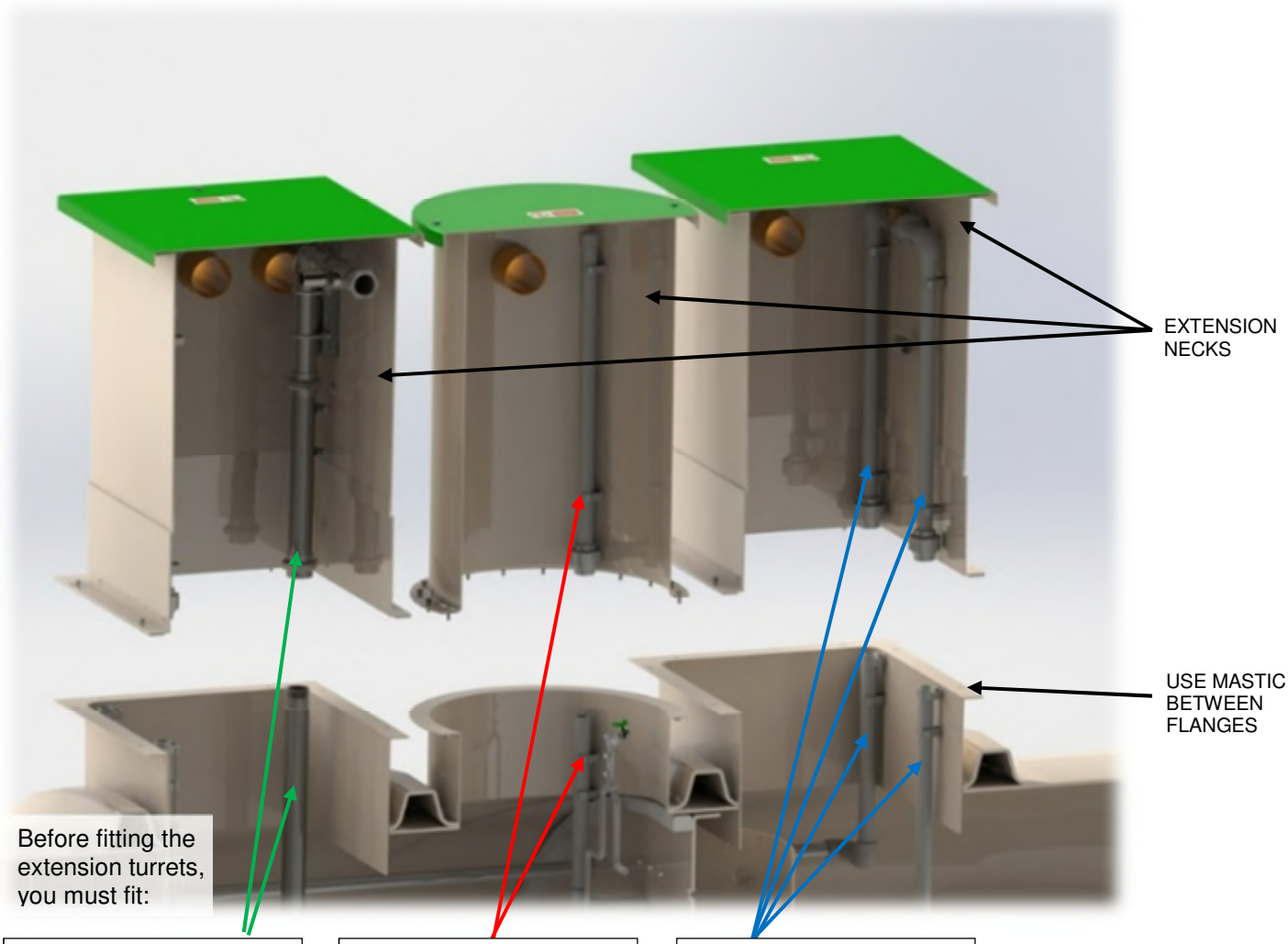
18. Continue back-filling in 300mm stages, ensuring minimum 225mm concrete thickness around the access turrets.

19. Leave until the concrete is fully cured. The unit should be left filled with clean water up to the invert level of the outlet pipe. Check that there is a discharge.

20. Replace all manhole covers.

**Deep Invert Units**

The standard units include fitted access turrets, however, for units with deeper inverts i.e. 1500 mm inlet inverts and above, additional access turret sections need to be site fitted.




**Diffusers**

The extension pipes to the diffuser downpipe using the union.

**Airlift**

The airlift(s) to the airlift extension(s) using the union(s)

**Recirculation**

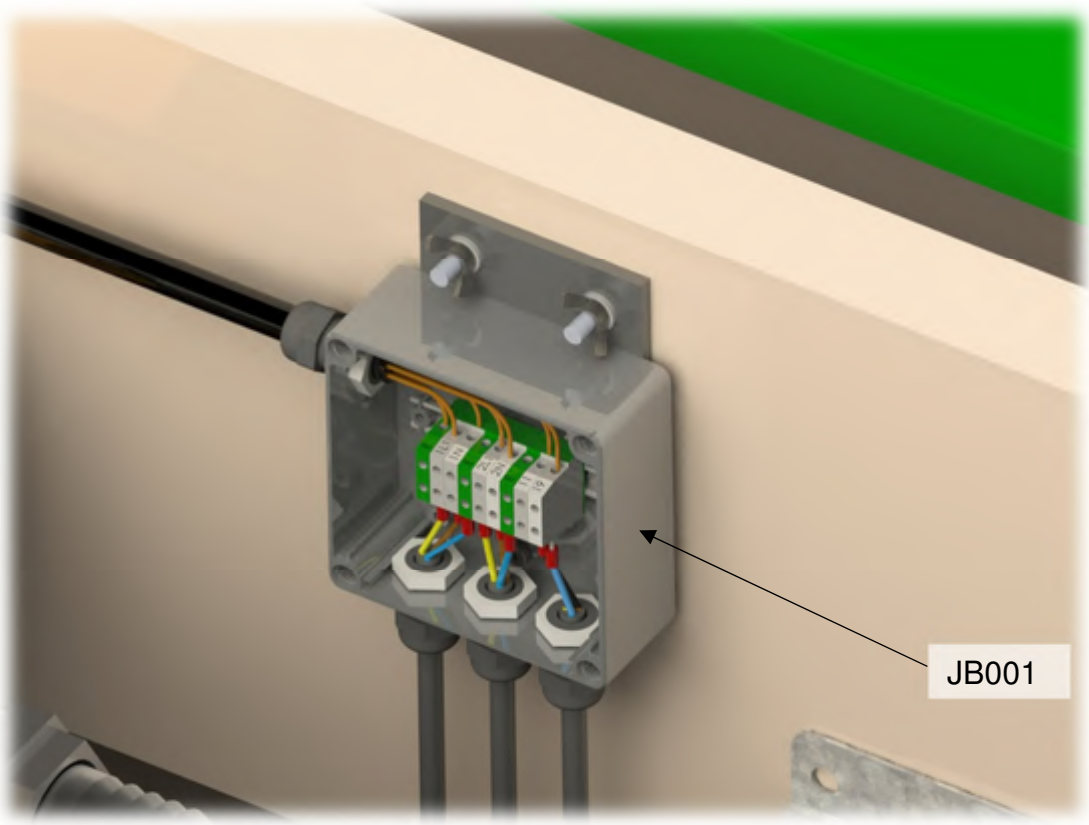
The recirculation pumps assembly to the recirculation extension pipework using the unions.

The pump cables should also be brought to the uppermost turret as installation progresses.

When the installation includes a separate structural concrete raft it is necessary to order the extension kit to the full invert depth. The full invert depth is from finished ground level, Failure to take account of the finished ground level will mean that the internal valves and junction boxes will not be accessible for routine maintenance and servicing. This may require “confined space” entry which will significantly increase the cost of maintenance and servicing.

**NB: For units with inverts greater than 800mm the wiring loom junction boxes will NOT be supplied fixed to the neck, once the extension turrets have been fitted the junction boxes should be fixed to the upper most extension pieces close to the top for ease of access.**

The additional turrets are flanged. Use the mastic supplied and bolt through the flanges, from top to bottom using washers below the bolt head and above the nut. Check that the flanges are fully sealed and water tight before completing the concrete backfill around each turret.




## Electrical connection

Electrical work should only be carried out by a qualified electrician working to the latest electrical regulations.

The Bioficient treatment unit contains the following electrical components inside the plant, all of which are prewired to a common electrical terminal (JB001) located within one of the middle turrets:

- High Level Float.
- Recirculation Pump 1.
- Recirculation Pump 2.

The main supply blower should be placed within a suitable kiosk or brick built housing (kiosks are available to purchase as an extra item, they are NOT included in standard supply).

The blower should be fixed down to the concrete base via fixing positions supplied. NB: it is recommended that the blower is mounted on anti vibration mounts. If the blower is housed in a kiosk, separate ventilation/cooling facilities may be required to prevent the blower overheating.

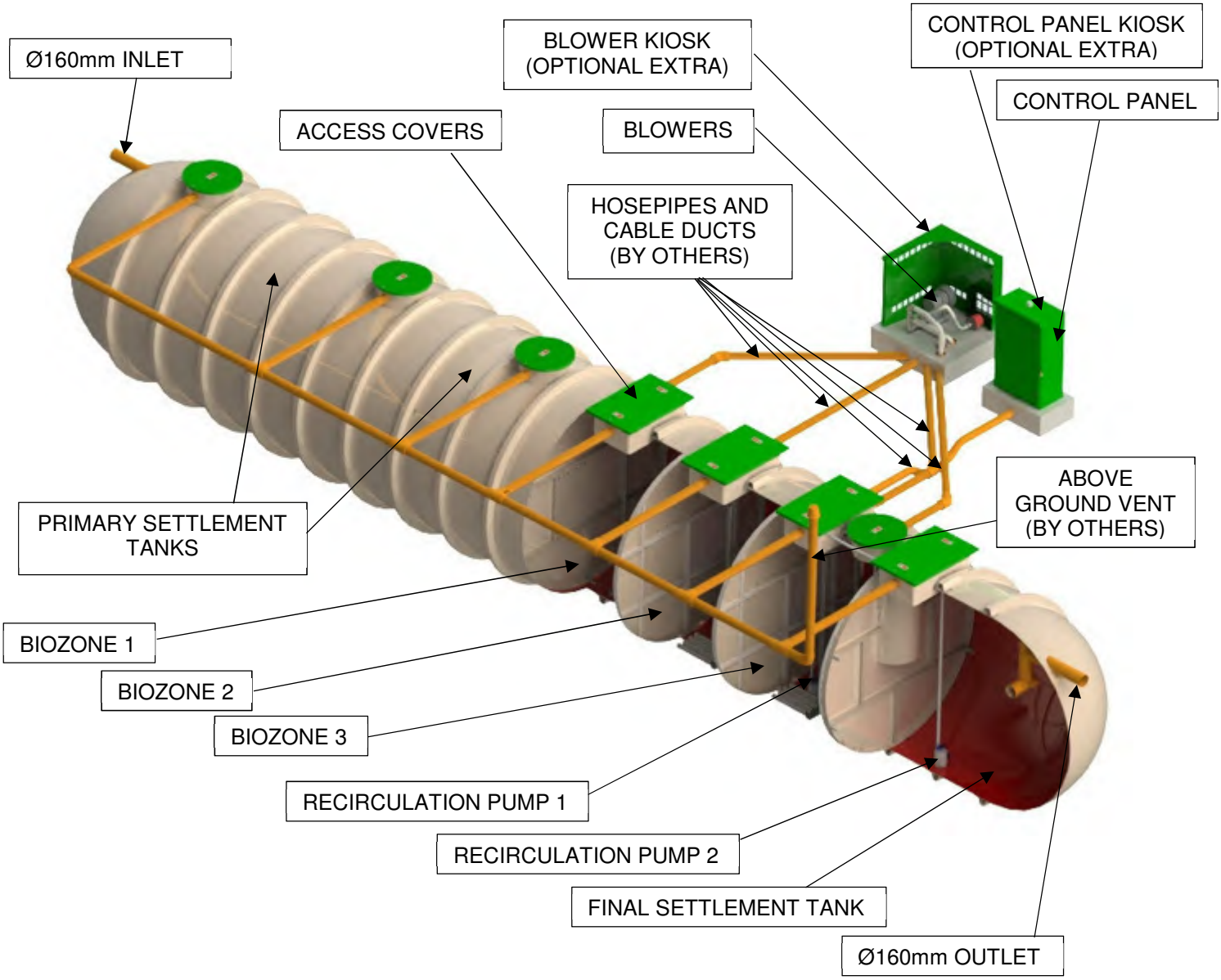
The control panel should be either mounted to the side of the constructed blower housing or mounted within a suitable kiosk (kiosks are available to purchase as an extra item, they are NOT included in standard supply).

**Connecting Blower:** Run cable between the blower terminal box and the Control Panel connecting the cable to the blower terminals within the control panel (see wiring diagram supplied with unit).
**Connecting Internal Loom:** Run the cable with quick connector (male end) from JB001 through the ducting to the Control panel kiosk. Connect the male quick connector to the female quick connector located on the base of the control panel.

Connect the control panel to the mains power supply. The wiring is complete. **Please insure you refer to the wiring diagrams provided in the control panel.**

## 5. System Overview.

Pictorial representation below indicates basic requirements for a standard system, please note not all of the items required are supplied from us as standard.



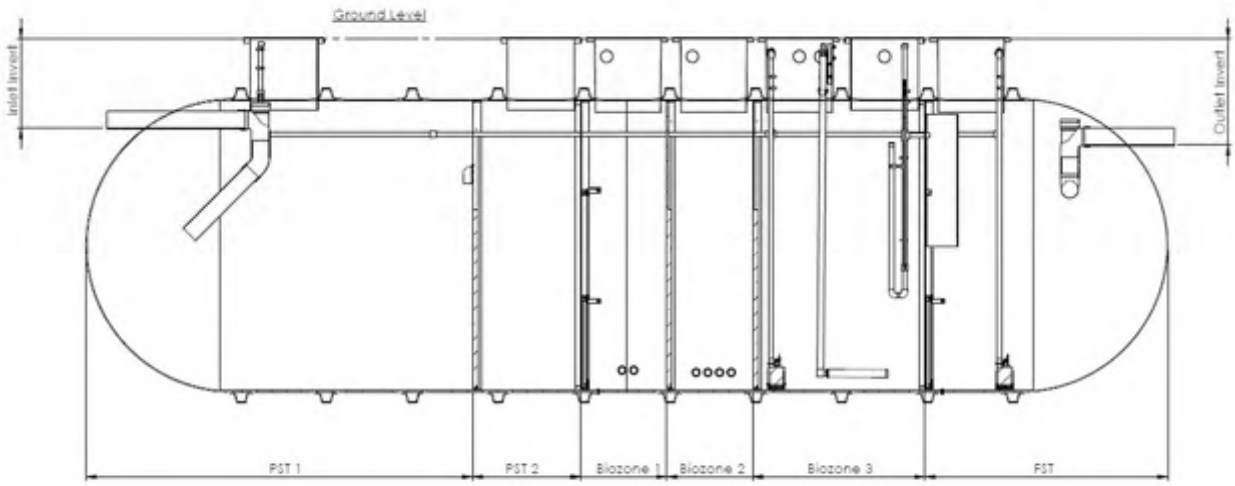
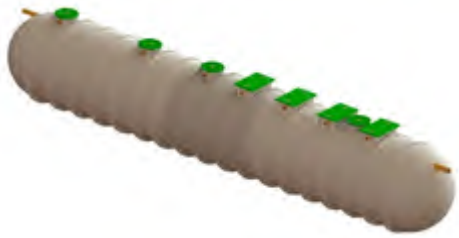




**Figure 4; Typical side elevation of installed plant. 0.8m Invert shown**

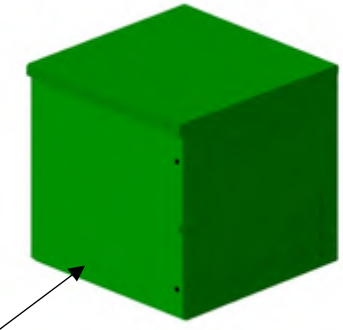
# 6. Site Delivery Checklist

The delivery checklist will have 2 or 3 module codes that will need to be checked against items actually delivered. Only 1.5m & 2.0m invert systems will have 3 module codes. Each module will be defined as described in the table below.

| | | |
|---|---|---|
| **Ø2.8 GRP Chamber:**<br>1. Below ground tank assembly<br>2. Access covers<br>3. Internal wiring loom<br>4. Internally fitted recycle pumps<br>5. NB: For tanks with invert depth greater than 0.8m access covers will be included in neck extension kit. | CASE ASSEMBLY |  |
| **Extension Necks & Fittings:**<br>1. Extension Neck Kits (only required for inverts 1.5m and 2.0m).<br>2. Access covers<br>3. Mastic Kits (consisting of: 2m mastic per neck, 24qty M8 bolts, 24qty M8 nuts and 48qty M8 washers per extension neck) | NECK ASSEMBLY |  |
| **Blowers, Controls & Connecting Pipe:**<br>1. Main supply blower (For Diffusers)<br>2. Main supply blower (For Airlift(s))<br>3. Blower Manifold<br>4. Control panel<br>5. High temperature hose (3 x 10m). Each hose from blower manifold connects to diffusers mounted inside the tank via pre drilled holes in neck).<br>6. PPFDS Hose (5m to connect the blower manifold to the control panel).<br>7. Clear braided hose (15m to connect the blower to the airlift mounted inside the tank via pre drilled holes in neck). | ELECTRICAL ASSEMBLY |  |

Additional items available on request NOT standard supply (please contact our sales department for more information):

1. Kiosk to house the blowers
2. Kiosk to house the control panel
3. Final effluent pump stations
4. Sample chambers
5. Chemical storage chamber for chemical dosing units



BLOWER & CONTROL PANEL KIOSKS AVAILABLE AS OPTIONAL EXTRA

# 7. Site Planning

The following points should be considered before installation of the equipment:

The discharge must have the consent of the relevant environmental regulator. Details of the consent should be advised to us in advance of placing an order. There will be a requirement to provide a sample chamber and there may be a requirement to provide facilities for flow measurement. (See notes below)

The installation should have planning and building control approval (See Introduction)

Position the unit at the maximum distance from habitation. For single house systems, distances in excess of 7m are usually the minimum acceptable to the planners, but this varies depending on buildings, boundaries, etc. and your local authority. Large systems, such as an Bioficient unit should be installed at greater distances. The installation must be sited so as not to be prejudicial to health, nor to contaminate water supplies.

See BS EN 752-4. Drain & sewer systems outside Buildings.

Consider placing inspection points in the drain line before and after units.

The regulator will require a sample chamber to be installed at the outlet of the treatment systems. The regulators will advise their specific requirements. They usually advise that access to the sampling point should be via a path and constructed from a firm material and on a level ground where possible. Sample chambers should be easily accessible and provide the means to take a running sample, a sample container must be able to be positioned under a protruding pipe lip which is located at a height of 200mm above the water level. (We can provide sample chambers however, some regulators may specify specific designs and other requirements). Samples, with agreement may also be taken at the inlet point of a downstream effluent pump station.

The treatment unit should preferably be installed at a level which will allow connection to the incoming drain and a free discharge at the system outlet. The system should not be installed deeper than necessary.
Units are available with inlet inverts of 0.5m, 0.8m, 1.5m and 2.0m. Selection of the correct inlet invert is key, it must be suitable for the drainage and ground levels on site, the invert CAN NOT be altered once the plant is installed. In any circumstance, the maximum allowable inlet invert is 2000mm.
Select a suitable location for the unit. This will normally be at the lowest ground level on the site so that the facilities can be drained by gravity, please consult architect.

Check that no other structure - or special access - is required at the selected position.

Provision can be made, if necessary, to place the unit in a roadway, provided that the backfill, cover slab and access cover are designed in accordance with the load requirements. Special provision to accommodate maintenance access needs to incorporated into the design. Please contact Kingspan Sales for advice.

Check that no underground cable, pipe or service duct lies beneath the selected position.

Consider if there is a need for a pumping station upstream of the treatment unit. The treatment unit is available with a number of standard invert options. The invert must be specified at the time of order. The process design may have specified a pump station to assist in flow attenuation or to minimise the excavation required. If the site contractor has specified their own pump station, this must be advised to us at the design stage, so that we can ensure that it will not adversely impact on the process.

Systems must be ventilated with both a “local to the unit vent” and with appropriate high level vent(s) located on the building(s) served, considering prevailing wind direction. The head of the drainage system should be connected to a stack pipe, open at high level, so as to draw foul air from the system and be sited with consideration to prevailing wind direction. Tile vents & air admittance valves within the buildings should not be used as the sole high level drainage ventilation facility. All inspection points within the drain system should be sealed so as to enable ventilation at high level. If tanks or pump stations are fitted before the treatment unit, then be aware of the possibility that the high level vent may only vent these units. The Bioficient unit requires independent ventilation. Check for any local regulations.

Uncontaminated run off such as roof and surface water must be excluded from the unit. Separate drains must be provided for surface water which must NOT enter the unit.

Ground conditions and water table level should be assessed. If the water table will be above the base of the unit at any time of the year, adequate concrete backfill must be provided to avoid the unit’s flotation. In poorly draining ground, consideration should also be given to the likelihood of flotation due to surface water collecting in the backfill, and an appropriate installation method devised to avoid this.

If the discharge is to a drainage field, a porosity test must be carried out as part of the assessment of suitability for sub-soil drainage. UK - See BS 6297:2007. Ireland - See EPA Manual.

There must be at least 1 metre of clear, level ground all around the access covers to allow for routine maintenance. There must be access to the unit for sludge gulpers. Vehicles should not be permitted within a distance equal to the depth of the unit, unless suitable

structural protection is provided when the unit is installed.

Provide separate suitable electrical supplies for the Bioficient system and any ancillary pump station. These should be RCD isolated and protected.

Proximity to a mains water hosepipe connection point is recommended, for maintenance purposes. Such a supply should be connected in accordance with water bylaws and regulations. **Never leave a hose connected and immersed in sewage.**

For discharge consents within the Environment Agencies control, we understand that for discharges above 50m3 per day, all new consents will stipulate the requirement for flow measurement. They may require flow measurement locations and devices for discharges 5-50m3 per day. You should contact the regulator for individual consent conditions and advice as to their requirements. See EA document EASD/230/1/3/27, water quality consenting standard flow measurement for discharges.

Installation should only be carried out by suitably qualified and experienced contractors in accordance with current Health and Safety Regulations. Electrical work should only be carried out by a qualified electrician, working to the latest edition of IEE.

Units are supplied with pedestrian duty access covers and frames.

unit may occur, the connecting pipework should be designed to minimise the risk of damage from differential movement of the unit(s) and/or surrounding material

# 8. Installation – General

The drawing supplied shows a general layout for a typical unit. Check the dimensions of your specific unit.

Check tank carefully before attempting to install, under no circumstances should you install a damaged unit. Check all other items are available, as identified by delivery list.
Inform us immediately, on delivery if there is any damage or shortages.

Additional items are required, (not supplied by us)

- External to the unit pipework. PVCu Inlet/Outlet, ventilation and cable/ ducting.
- Ventilation pipework
- Sample chamber
- Ventilated housing for blower either a brick built enclosure or suitable kiosk. (kiosk range available NOT part of standard supply, please contact sales department).
- Alternative special loading access covers. (Standard access covers are supplied)

When units are installed in unstable ground conditions where movement of the surrounding material and/or

For units with burial depths greater than 800mm from invert level to the top of the unit, specific site conditions should be taken into consideration and the backfill designed to bear any loads which may be applied during and after installation to prevent the tank being subjected to these loads.

The excavation must be deep enough to provide bedding and cover depth as determined by the type of surface pavement and loading. Asphalt and concrete base pads should extend a minimum of 300mm horizontally beyond the unit in all directions.

In situations where the excavation will not maintain a vertical wall, it will be necessary to shore up the side walls of the excavation with suitable trench sheets and bracing systems to maintain a vertical wall from the bottom to the top of the excavation. DO NOT completely remove the shoring system until the backfilling is complete, but before the concrete fully hardens.

In areas where the water table is above the bottom of the excavation and/or the excavation is liable to flood, the excavation should be dewatered using suitable pumping equipment and this should continue until the installation is complete.

During installation care must be taken to ensure that the body of any unit is uniformly supported so that point loads through the unit are avoided.

## Concrete Specification

The concrete Specification below is a *general* specification. It is not a site specific installation design.

| GENERAL CONCRETE SPECIFICATION IN ACCORDANCE WITH BS EN 206-1 ( BS 8500-1) | | |
|---|---|---|
| TYPE OF MIX | | (DC) DESIGN |
| PERMITTED TYPE OF CEMENT | | BS 12 (OPC): BS 12 (RHPC): BS 4027 (SRPC) |
| PERMITTED TYPE OF AGGREGATE (coarse & fine) | | BS 882 |
| NOMINAL MAXIMUM SIZE OF AGGREGATE | | 20 mm |
| GRADES: | C25 /30<br>C25 /30<br>C16 /20 | REINFORCED & ABOVE GROUND WITH HOLDING DOWN BOLTS<br>REINFORCED (EG. FOR HIGH WATER TABLE)<br>UNREINFORCED (NORMAL CONDITIONS) |
| MINIMUM CEMENT CONTENT | C30<br>C20 | 270 - 280 Kg/M$^3$<br>220 - 230 Kg/M$^3$ |
| SLUMP CLASS | | S1 (25mm) |
| RATE OF SAMPLING | | READY MIX CONCRETE SHOULD BE SUPPLIED COMPLETE WITH APPROPRIATE DELIVERY TICKET IN ACCORDANCE WITH BS EN 12350-1 |
| NOTE: STANDARD MIXES SHOULD NOT BE USED WHERE SULPHATES OR OTHER AGGRESSIVE CHEMICALS EXIST IN GROUND WATER | | |

## Typical site layout

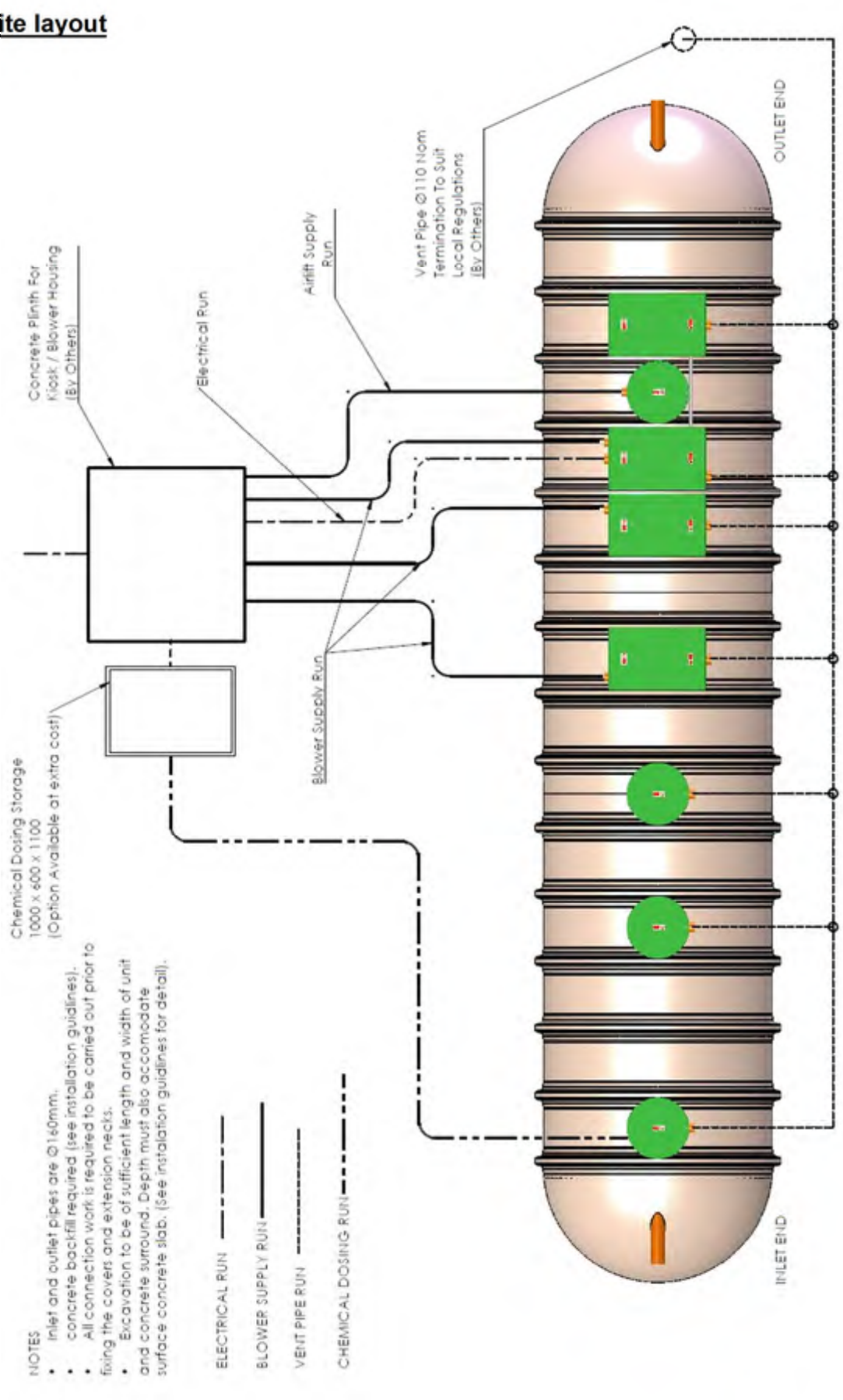
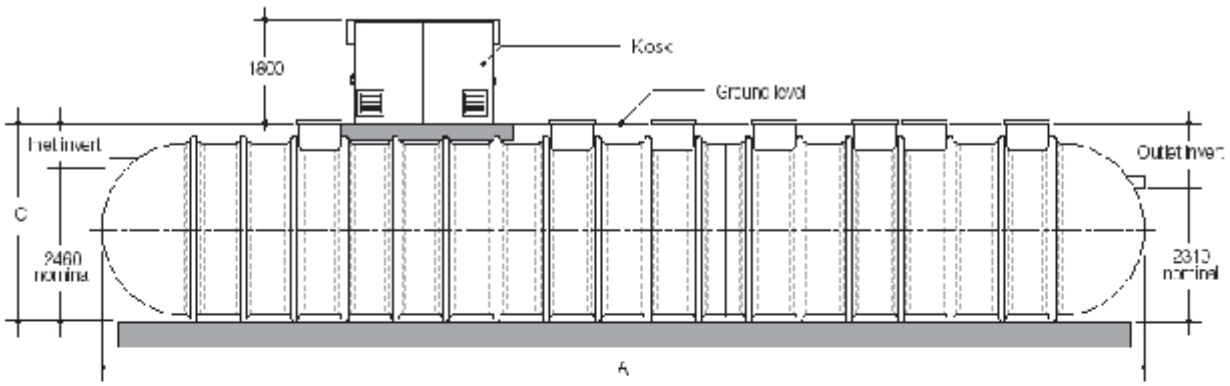



**Figure 5; typical layout (shown with optional chemical dosing)**

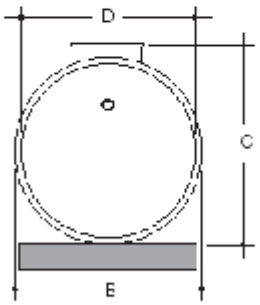
# 9. Technical Information

| **Bioficient Model** | | **34** | **38** | **42** | **47** | **55** | **67** | **80** |
|---|---|---|---|---|---|---|---|---|
| Max flow | $m^3$/ day | 15 | 20 | 25 | 30 | 40 | 50 | 60 |
| Peak flow rate for ½ hr in any 2 hour period | $m^3$/hr | 1.8 | 2.5 | 3.1 | 3.75 | 5 | 6.25 | 7.5 |
| Main Blower power / Power supply phase Full load current | Kw<br><br><br>A | 1.1<br>230 V<br>Single<br>6.8 | 1.1<br>230 V<br>Single<br>6.8 | 1.1<br>230 V<br>Single<br>6.8 | 1.5<br>230 V<br>Single<br>10.5 | 1.5<br>230 V<br>Single<br>10.5 | 2.2<br>230 V<br>Single<br>11.8 | 2.2<br>415 V<br>3 ph<br>11.8 |
| Recirculation Pump 1 power (on timer operation) Power supply phase Full load current | Kw<br><br><br>A | 0.35<br>230 V<br>single<br>1.4 | | | | | | |
| Chemical dosing pump* power. Power supply phase/Full load current **Not Supplied on ALL units** | w<br><br><br>Ma | 5<br>230 V<br>single<br>300 | | | | | | |
| Recirculation Pump 2 power (on timer operation) Power supply phase Full load current | Kw<br><br><br>A | 0.35<br>230 V<br>single<br>1.4 | | | | | | |

**Technical Specification**




| Model | 34 | 38 | 42 | 47 | 55 | 67 | 80 |
|---|---|---|---|---|---|---|---|
| Maximum flow (m³/day) | 15 | 20 | 25 | 30 | 40 | 50 | 60 |
| Retention time (hrs) | 48 | 39 | 35 | 29 | 26 | 27 | 27 |
| A Overal Length (m) | 7.7 | 8.1 | 8.9 | 9.7 | 11.2 | 13.5 | 15.8 |
| B Overal Width (m) | 2.3 | | | | | | |
| C Height (m) | | | | | | | |
| *500mm Inlet / 850mm Outlet Invert** | 3.02 | | | | | | |
| *800mm Inlet/ 950mm Outlet Invert** | 3.52 | | | | | | |
| *1500mm Inlet / 1550mm Outlet Invert** | 4.02 | | | | | | |
| *2000mm Inlet / 2150mm Outlet Invert** | 4.52 | | | | | | |
| D Diameter (m) | 2.3 | | | | | | |
| Volume (m³) | 34 | 38 | 42 | 47 | 55 | 67 | 80 |
| Weight approx (kg) | 3000 | 3200 | 3400 | 3800 | 4200 | 4700 | 5400 |
| Inlet / Outlet Diameter (mm) | 150 | | | | | | |




Notes:

* Extension risers can be added to wells to achieve deeper inverts. Alternative pipe sizes may be ordered.

For deep installations over our standard 2m invert, We recommend an independent civil engineer advice be sourced

Weights are dry weights and installers must ensure there is no water in the tanks before filling. All weights are approximate.

Kingspan Environmental reserve the right to alter the above dimensions without prior notice.

# 10. The Treatment Process

## General

The biological treatment process of your unit is self-regulating and it requires no specialised operational knowledge, but it is important that you are aware of the following points.

Your system uses colonies of live natural micro-organisms (biomass), to break down the pollutants in the sewage. Many chemicals used in households and commercial establishments can inhibit or kill these micro-organisms; particularly if used in excessive amounts.

Generally speaking all common household cleaning fluids are acceptable, **provided they are used in accordance with the makers' instructions and stipulated concentrations.** The golden rule is "If in doubt - leave it out". Commercial cleansing products are much stronger and some can adversely affect the biology." Please see the list of Do's and Don'ts.

## Standard Effluent quality

This system process is designed to achieve a high quality effluent from a domestic sewage feed.

When loaded at its maximum rated capacity (domestic sewage BOD and ammonia), the plant design provides for a 90 days desludge interval, the Bioficient 34 & 38 provide for 120 days sludge storage.

## Operation

The biological process requires the addition of power and air. Blowers, pumps, air lifts and diffusers are used to control the process; movement /recycling of liquids and solids and provide oxygen for the biological process. Within the unit there are aerobic zones, controlling aerobic biological treatment, nitrification and de-nitrification. The process energy efficiency is optimised as a result of utilising biological de-nitrification and high efficiency air diffusers.

The air supply is provided from a blower mounted remotely from the plant adjacent to the electrical control panel. Duty / Standby units or Duty / Assist configurations are available options. Single phase and 3 phase blowers can be used, please contact Kingspan Sales.

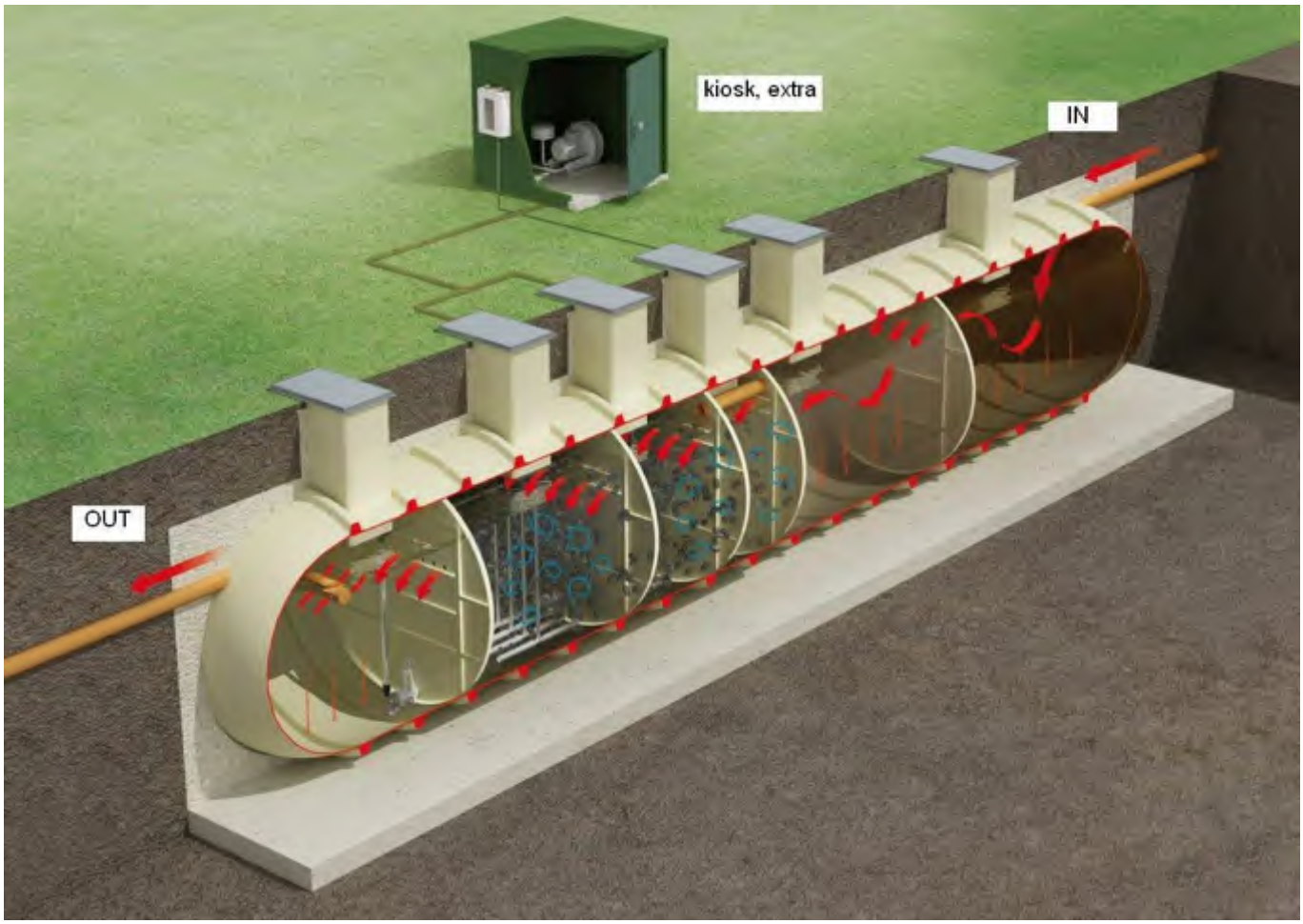



**Figure 6-process flow**

The unit is divided into a number of compartments. At the front of the unit is a large two stage compartment, the purpose of which is to provide a settlement zone for the primary solids. The settled liquid, free from gross solids, transfers through a baffle from the first to the second section of the primary compartment.

From the second primary compartment, the settled effluent passes into an aerated carbonaceous treatment biozone. This compartment contains diffusers and media. The carbonaceous biozone is followed by a large aerated nitrification biozone also with diffusers and media. Within these zones bacteria grow both on the surface of media and suspended within the liquor. The system is able to adapt quickly to a change in sewage loading and the bacterial biomasses will develop to cope with the normal daily load variations.

The system can be adjusted to perform with reduced loads (i.e. down to 50% of the specified maximum daily load) When it has been identified /agreed that this facility is required, the design modifications will have been completed pre delivery. The modifications can be made post installation to accommodate this requirement. (Site inspection charges will apply) This makes the Bioficient particularly useful for applications which expect to have periods of inactivity, such as schools, or when the loads are of a seasonal nature.

The final compartment acts as the final settlement tank (FST) where the fine solids settle. Effluent discharges by gravity, overflowing from the system into a sample chamber. (Optional Extra)

Within each compartment, the volume and liquid levels are controlled using a mixture of air lift transfers and pumped recycling. There is minimal hydraulic loss across the unit, (150mm fall). The plant design incorporates flow management to smooth out the volume and load variations and create the optimum conditions for bacterial growth.

In a gravity feed situation, in the event of a power failure, the sewage will flow into the plant, be primary settled and pass through the various zones before overflowing into the final settlement tank and out of the discharge pipe.

The system requires regular desludging from the primary and final compartments only. There is no need or requirement to empty either of the biozones. The biozones stay in operation during the period following servicing whilst the water level is restored. As a result of this, the final effluent quality remains consistently good.

Users should be made aware that their sewage enters a biological wastewater treatment system so that they can dispose of their waste considerately. Not everything is suitable for disposal into the system, for example where the unit serves premises with a catering function, special arrangements should be made to prevent the oils, fats and grease from entering the unit. Disinfectants, weedkillers, medicines, brewers cleansing chemicals etc. can all adversely affect the biological process.

Please request User leaflets which provides detailed information for individual householders.

Domestic and other properties feeding into the system should display a label within the building identifying use of a treatment system. See introduction notes. We can supply copies of the labels for use at individual properties.

**Specified effluent qualities**

Other parameters such as a Total Nitrogen or phosphate may have been specified. (See your individual quotation for effluent qualities) in which cases, additional processes may be employed.

The design will be tailored for each application to suit the expected daily incoming volume, the advised influent level and the required effluent quality. This information is provided separately or within the electrical panel settings.

**Units with Chemical Dosing systems (if fitted)**

Please note – The dosing chemical must be supplied by others, and is not included as part of the treatment plant order.

The reduction of phosphate is sometimes required by the environmental regulator in order to protect the local environment. The addition of limiting nutrients such as phosphate can cause eutrophication in the receiving water.

Units provided to meet effluent qualities with low phosphate discharge are provided with a chemical dosing system. The equipment provided includes a chemical dosing pump, and a timer/control is incorporated into the system panel to allow for the regular addition of chemical. The chemical used may be specified by the regulator. Our systems may be used with liquid ferric chloride, feral, or similar, or poly aluminium chloride such as Kemira XL60. For more stringent effluent quality further treatment may be required with separate dosing pumps and tanks.

You should select an appropriate location/storage facility for the chemical selected for use.

*Design of the chemical storage facility needs to take into account the type and estimated volume of chemical used, the purchase frequency and supply unit, i.e. 25litre drum or IBC container. The design should also consider safety access and the storage requirements for the chemical chosen. Please ensure that you have the most up to date versions of the COSHH and health and safety data sheets of the selected chemical from the chemical supplier and that you observe all health and safety precautions. * The location should be made secure and be locked.

The volume of chemical dosed can be adjusted, as can the interval between the doses. The chemical dosing point is located in the first neck into the primary settlement zone to enable good mixing of the chemical with the incoming liquid. The chemical pump is usually

mounted with the storage area designated for the chemical drums. This must not be too far away from the PST and the chemical line must be protected. The chemical is intermittently pumped into the dosing point positioned in the primary settlement zone. The chemical mixes with the dissolved phosphate and coagulates together to form settleable particles.

Use of a chemical significantly increases the sludge production from a unit and decreases the desludging interval.

Addition of the chemical is fundamental to the process and it is important to check the chemical usage and ensure continued availability replacing supplies before they are exhausted. Should the chemical run out, or there is no power, there will be no phosphate removal.

Customer Information- Detergents and chemical products used by consumers within the properties using the treatment plant should be selected with care so as to **reduce the amount of added phosphates** going into the treatment plant. It is possible to reduce the amount of phosphates entering the unit by up to 50%. The less phosphate entering the plant, the lower the chemical dose required.

Your unit will be provided with timers pre set, however, you must contact us with influent phosphate readings and the chemical proposed for use, so that the unit timers can be set up to optimise dose rates and effluent quality. An extra inspection visit is required after a month's operation.

## Do's and Don'ts

Domestic products

Washing machine and dishwasher detergents, washing up liquids:

These are generally all right to use in the normal concentrations and usage found in domestic housing applications but when chemical dosing, they should be chosen with care to avoid un-necessary addition of phosphate. All commercial applications should be individually assessed before installation for their laundry load. Please contact us for advice if any changes are contemplated e.g. addition of extra laundry facilities.

Floor cleaners, disinfectants and bleaches:

These are safe to use in accordance with the makers recommendations and in the minimum necessary quantity and concentration. Do not pour neat disinfectant or bleach down sinks or outside gullies. If these are smelly it usually indicates a build up of decaying material, fat or a plumbing problem and should be dealt with accordingly.

Nappy disinfectants and bottle sterilising fluids. e.g. Milton:

When disposing of the used fluid, ensure that it is well diluted with water. The easiest way of doing this is usually to flush it away down the toilet.

Waste disposal units:

These should not be used. Their use has not been considered when designing the process. They do not inhibit the biomass, but, depending on their use, they can present the treatment plant with considerable extra load and solids. This can result in the treatment process becoming unbalanced, leading to problems. It is much better to compost vegetable peelings etc - its cheaper and environmentally friendly.

Home beer and wine making.

This presents a similar problem to waste disposal units. The unit has to work as hard to treat one pint of beer tipped down the drain as it does to treat all the normal waste produced by one person in 24 hours. See also the notes above regarding sterilising fluids.

**THE FOLLOWING MUST NOT BE DISCHARGED INTO THE DRAINS (This is not an exhaustive list!):**

- Cooking oil and fat.
- Chemical Toilet Waste
- Motor oil, grease, anti-freeze, brake fluid etc.
- Weed-killers, insecticides, fungicides and other gardening chemicals.
- Paint, thinners, white spirit, turpentine, creosote etc.
- Medicines -Take unused medicines to a pharmacist for safe disposal.
- Photographic developing fluids and chemicals.
- Strong commercial cleansing chemicals, e.g., products for cleaning beer lines, drain products.
- Nappies, nappy liners, sanitary items, fabric wipes, rags, soft toys, tennis balls etc. Although such items are not directly damaging to the biomass they can cause problems, not the least of which is simple blockage of the drains. Even so-called disposable nappies and sanitary towels often do not degrade fully in the treatment plant and can lead to malfunction, so it is best to dispose of them by other means.

# 11. Operation

## General

Every care is taken to ensure that all mechanical components are correctly fitted and adjusted prior to leaving the factory. However, subsequent handling during transportation and installation may result in the movement of components and an alteration of valve settings causing a need to re-adjust prior to starting the unit. If, on inspection, you consider that any components require adjustment, please contact us. We consider that it is essential that these units are properly commissioned by us before use.

After installation, the unit should have been left full of clean water. Power should be connected to the control panel, pumps, unit and any ancillary equipment.

**Power should be left OFF, pending our inspection . Please contact us to arrange Pre-service Inspection Agreement**

Should you choose to start up the system without using our services, the following notes are provided for assistance however, in providing these, we have assumed that your contractor has correctly installed, connected and tested all the equipment correctly.

## Optional Pump Station

Check that the pumps have been installed and wired to the Pump Control Panel.

Check that the Pump Control Panel timer is set correctly. Our pump stations are usually supplied with a separate control panel, but in some instances, we may supply a single control panel to operate the treatment system and pump station)

Check the setting of the floats in the pump chamber.

Ensure that the float(s) can operate freely without risk of entanglement.

Influent pumps should be set to pump little and often in order to spread the load entering the treatment unit. Direct pumping into the unit should be avoided by using an external upstream discharge point. (Please consult us for further parameters)

## Treatment Unit

1. Check that the unit is full of water to the outlet level.
2. Check that the manual diffuser valves and the forward feed air lift valves are fully open.
3. Adjust the forward feed airlifts to the required average normal daily flow by measuring the flow rate at the sampling point.
4. Switching the main panel on will start the blower and will initiate the timed operation of the internal pumps and any connected ancillary items, (e.g. chemical dosing pump).
5. Check that the air coming from the diffusers is moving the media.
6. Check that the high level alarm is active if the water level is high enough to flow through the overflow into the FST. Adjust the float height accordingly.
7. Allow sewage to enter the unit, this will gradually displace the clean water used during installation.

*The colonisation by micro-organisms will commence naturally and a full operating biomass will establish itself within the biozones in 4-8 weeks, depending on individual site circumstances.*

*During start up the plant may generate some foam as the bacteria build up. This will subside as performance improves*

**Forward feed air lifts; maximum settings in table below.**

**Where two air lifts are provided, it is the combined flow rate.**

| Bioficient Model | 34 | 38 | 42 | 47 | 55 | 67 | 80 |
|---|---|---|---|---|---|---|---|
| Flow lpm | 22.8 | 30.6 | 38.2 | 45.8 | 61.1 | 76.4 | 91.7 |

## Running Checks

The following periodic checks should be carried out monthly. Your attention is specifically drawn to the Health and Safety section of this manual.

Sounds- Learn what is normal and abnormal from a sound point of view, i.e. normal blower noises and bubbling.

Looks- Visually check the general condition of the plant. Report any aspects of concern to your maintenance engineer. Know what the bubble pattern should be.

Levels- The front section is usually lower than the final tank, but this level fluctuates.

Biomass Development- Look within the biozones. There should be even turbulence with bubbles all over. The liquor may appear light grey to dark brown. The second biozone may appear a little browner.

Mechanics - Visually check that the all the forward feed air lifts are operating. (Clear any debris from pipes if there is a lack of flow).

Timing Check that the pumps operate at their prescribed times and durations. Each time the power is turned on the pumps will initiate the run cycle.

Alarms Check the alarms operate. Switch off the blower but not the power to the control panel. If the alarms do not operate properly, contact your maintenance engineer.

Chemical dosing Check the level of chemical in the chemical drum and the operation of the pump at the specified dosing time and interval. The dosing does not operate at low primary tank levels.

# 12. Maintenance

## General

The system operates with air blowers, pumps and airlifts.

Blowers will require checking regularly and will require filter cleaning and replacement.

Air lifts must be checked to ensure that they are performing correctly, delivering the correct volume and have not become blocked.

Pumps are operated using timers. Periodically pumps will need to be removed and their orifices checked for blockages.

## Units with chemical dosing

Replacement of the chemical containers is required before the chemical runs out.

The chemical dosing lines should be checked each time the chemical container is replaced.

The dosing action should be checked when the container is replaced.

Excess solids are created by using the chemical. Units with chemical dosing systems will require desludging more often than standard units without the addition of chemical.

## Desludging

The system requires emptying periodically. When operating at the normal daily load, emptying should take place at 90 day intervals. Bioficient 34 and 38 provide for 120 days sludge storage.

The frequency of sludge removal is expected to increase if the unit is chemically dosed. The volumes to be removed from each unit are given in the table below. Units which are over utilised may require more frequent emptying. Units which are not emptied will accumulate excess solids within the compartments. Final solids will be released and contribute to poor effluent qualities, run the risk of blocking any associated drainage field and contribute to pollution.

Different allowances/calculations should be made for non domestic inputs such as pubs and other commercial premises. Please contact us for an assessment.

**DO NOT EXTEND THE EMPTYING FREQUENCY**

Maintenance Contracts

We recommend and can provide regular planned maintenance visits to inspect the operation and performance of the units. Please contact us for details

## Desludging Procedure

The two stage primary zone should be de-sludged to remove the floating scum and approximately 60% of the volume. The FST requires the floating surface sludge to removed along with 50% of its volume. See table below for volumes.

1. Isolate power at the main control panel.
2. Remove access covers from the first, second,(in some cases third) and last access points.
3. Remove the floating surface scum from the final settlement tank. (last access point).
4. Place desludging nozzle into the base of the tank and withdraw the volume indicated, taking the settled sludge rather than the supernatant liquor. Note. Please avoid the location of the pump connected by fixed pipework from the base of the compartment.
5. Remove the floating surface scum from the first and then second compartments of the primary settlement zone (first and second access points)
6. Place desludging nozzle into the base of first compartment tank and withdraw 80% of the advised volume, taking the settled sludge rather than the supernatant liquor. Take any settled sludge from the base of the second compartment up to total volume indicated.
7. **DO NOT REMOVE LIQUOR FROM ANY OF THE OTHER COMPARTMENTS. (THESE MUST NOT BE EMPTIED AS TO DO SO REMOVES BOTH THE BIOMASS AND THE MEDIA)**
8. Replace all the access covers and secure.
9. Switch on power at the main control panel.
10. Allow sewage to enter the first compartment as normal, only if supplied by a pump station. Note. Level switches on the recycle pumps will prevent their operation until a satisfactory liquid level has been reached.

| **Bioficient Model** | **34** | **38** | **42** | **47** | **55** | **67** | **80** |
|---|---|---|---|---|---|---|---|
| **FST** plus scum layer<br>litres<br>gallons | 4,700<br>1,035 | 4,100<br>900 | 6,400<br>1,400 | 5,700<br>1,250 | 5,300<br>1,160 | 8,700<br>1,910 | 8,000<br>1,750 |
| **PST** plus scum layer<br>litres<br>gallons | 8,900<br>1,950 | 11,700<br>2,570 | 11,700<br>2,570 | 14,700<br>3,230 | 17,400<br>3,820 | 23,000<br>5,050 | 28,300<br>6,220 |
| **Total Volume to be removed per visit**<br>litres<br>gallons | 13,600<br>2,985 | 15,800<br>3,470 | 18,100<br>3,970 | 20,400<br>4,480 | 22,700<br>4,980 | 31,700<br>6,960 | 36,400<br>7,970 |

**Note**

- A log should be kept recording the frequency of emptying.
- The waste should be removed under the terms of The Waste Management Code of Practice. The Code imposes a duty of care on the waste producer to ensure that the Cleansing contractor is registered with the Environment Regulator and that the final disposal of the waste is to a licensed facility.

## Servicing

Our site engineers are available to carry out Pre-service Inspection Agreement, service and maintenance visits. We recommend regular maintenance contracts for these units. We offer a service to supervise tank emptying. Contact details are provided on the cover sheet.

# 13. Warranty

Taken from 'Kingspan's Terms & Conditions of Sale'

The company will replace or, at its option, properly repair without charge any goods which are found to be defective and which cause failure in normal circumstances of use within a period of twelve months from the date of delivery.

This warranty is conditional upon:

(a) the Buyer notifying the Company of any claim within Seven days of the failure becoming discernible.
(b) the Company being allowed a reasonable opportunity to inspect the goods so as to confirm that they are defective.
(c) the goods not having been modified, mishandled or misused and being used strictly in accordance with any relevant instructions issued by the Company.

The Company's liability under this Clause is limited to the repair or replacement of the defective goods, and does not cover costs of transport, installation or associated site costs, if applicable.

The Company's liability to replace or repair the goods is in lieu of and excludes all other warranties and conditions, and in particular (but without limitation) the Company shall have no liability of any kind for consequential loss or damage.

For any further advice, please contact us.

A Warranty Form is included in this package, to register your unit for Warranty. Please complete ALL sections of the Form, and return it at your earliest convenience.

Our service provider: Kingspan Environmental Services: 0844 846 0500

# 14. Commissioning Guidelines

## 1. PRE-INSTALLATION CHECKS

On arrival check the following:

- Is the installation pack, electrical and mechanical drawings, instructions and Owners pack on site and readable?
- Do the above information packs refer to the installed treatment plant?
- Is the tank correctly installed and backfilled to permit safe access?
- Are the electrical connections to the panel complete?
- Is the mains power wired in to the panel isolator?
- Is there suitable access to switch on the mains power at the customer's supply?
- Are the air connections between the blower and the treatment plant terminated correctly?
- Are the cable/air hose ducts sealed at one end to prevent foul air being drawn from the treatment plant to the air blower or the electrical control panel?
- Are the ventilation ducts installed and run to suitable external vent positions?
- Is the sample chamber installed, or other means of obtaining a final effluent sample to set up forward flow rates?

## 2. INSTALLATION CHECKS

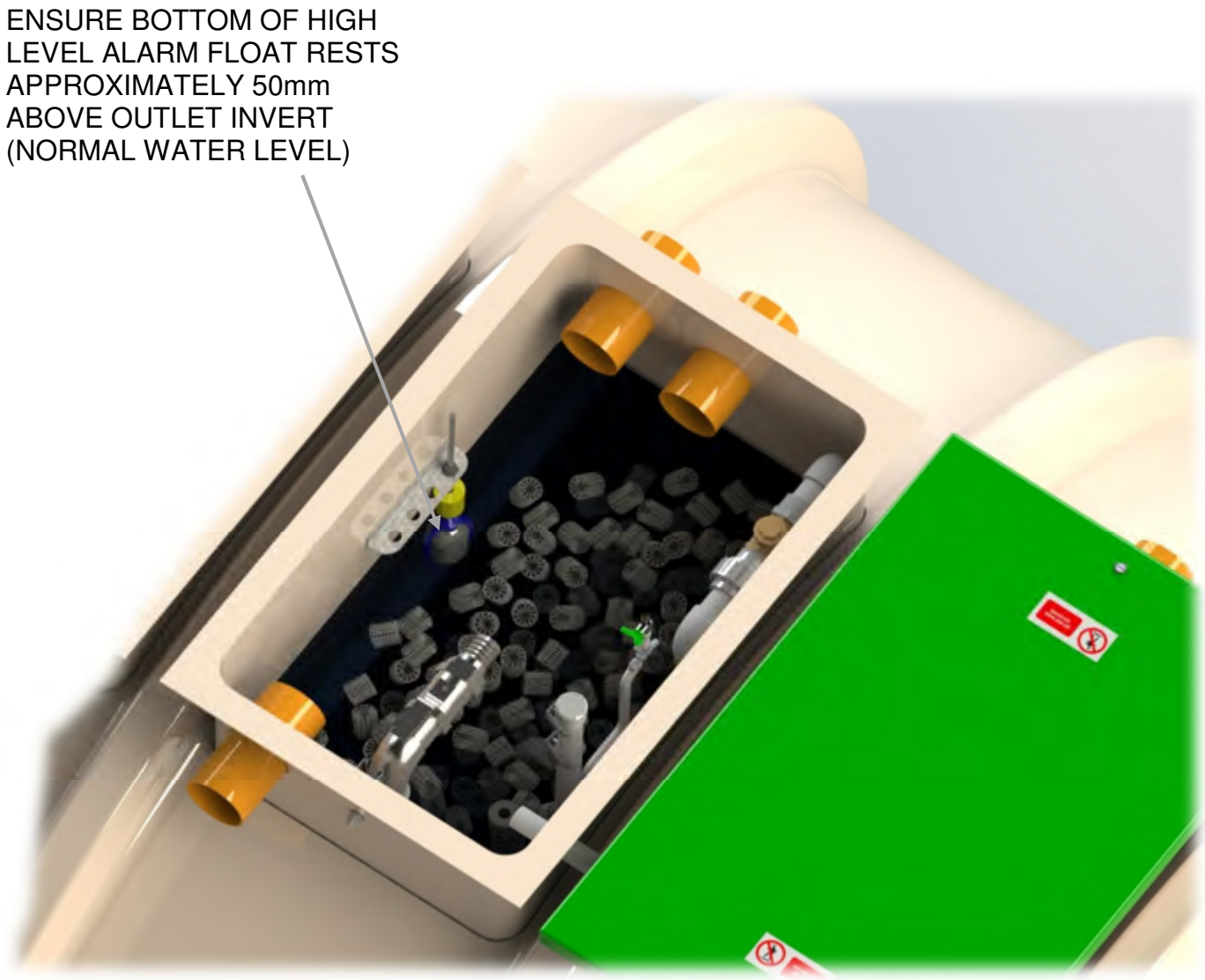
Remove the covers from the Treatment plant and check the following:

- Are the plant internals correctly located, they may have moved in transit?
- Is there any obvious debris which has entered the tank during installation which requires removal?
- Does the tank, access necks and extensions show any signs of distortion as a result of ground pressure?
- Are the air hoses correctly terminated with hose tails and the worm drive clips tightened such that the hoses are not able to be turned on the hose tails? Are the hoses neatly tied back?
- Are the air valves on the air manifolds to the diffusers all open?
- Is the forward feed air lift air tap closed? There are twin forward feed air lifts on larger plant!
- Is the air tap accessible, it may be necessary to tie it up in a suitable position to enable adjustment without stretching into the tank,
- Is the water level in the tank within approximately 300mm of the outlet invert? If NOT, arrange for more water in order to enable the treatment plant to be turned on and commissioned.
- Are the internal pumps (final settlement tank and final biozone) wired up to the internal junction boxes? On 1.5m and 2m inverts these pumps must be fitted with the extension pipework, then the extension shafts are fitted, and finally the pumps are wired in to the junction boxes.
- Is the high level alarm float switch at a high level in the tank? (To avoid early alarm whilst the tank is at a normal operating level). On 1.5m and 2m inverts the high level alarm needs to be fitted and wired into the junction box after the extension shafts have been fitted.
- Is sewage flowing into the tank?

## 3. DEEP INVERTS

Deep invert installations with extension necks check these items (otherwise move to step 4)

- The air diffuser extensions and the pump discharge pipework extensions should be built up before fitting the extension necks.
- Ensure that the diffusers are lined up “front to back” otherwise they will rest on the curved tank wall and may not fit on the manifold.
- Only position diffusers when there is sufficient water in the tank to cause the media to float.
- The internal wiring on deep invert plants should be completed on site with the junction boxes mounted high in the necks to enable reasonable access.
- The internal pumps require wiring in to the junction boxes.
- The high level alarm needs wiring in to the junction box, normally open in the down position, cores brown and black.



## 4. CHEMICAL DOSING CHECKS

Items to check for chemical dosing for phosphorus control, if fitted (if not fitted, move to step 6)

- The chemical to be used is potentially dangerous.
- The supplier will provide a Material Safety Data Sheet (MSDS) for the product. A copy of this must be kept with the other drawings provided with the plant (ideally kept adjacent to the electrical control panel) and also a copy should be given to the person in control of the premises.
- The dosing system should be wired in to the junction box with the pump box mounted in the Chemical store. The delivery hose should be run to the dosing position which in in the first neck in the First primary settlement zone.
- The chemical store must be able to be locked to prevent any unauthorised access, especially where children might be present.
- The level of the chemical in the chemical store needs to be below the dosing point to prevent siphoning, resulting in over dosing.
- Test the chemical dosing settings with water to ensure correct performance.
- Wearing appropriate personal protection equipment, open the chemical dosing container and insert the suction hose. Cutting the hose on the angle and tying the end to a stainless steel nut or bolt will keep the end of the suction pipe at the bottom of the container and prevent the hose from “sealing” onto the base of the container.

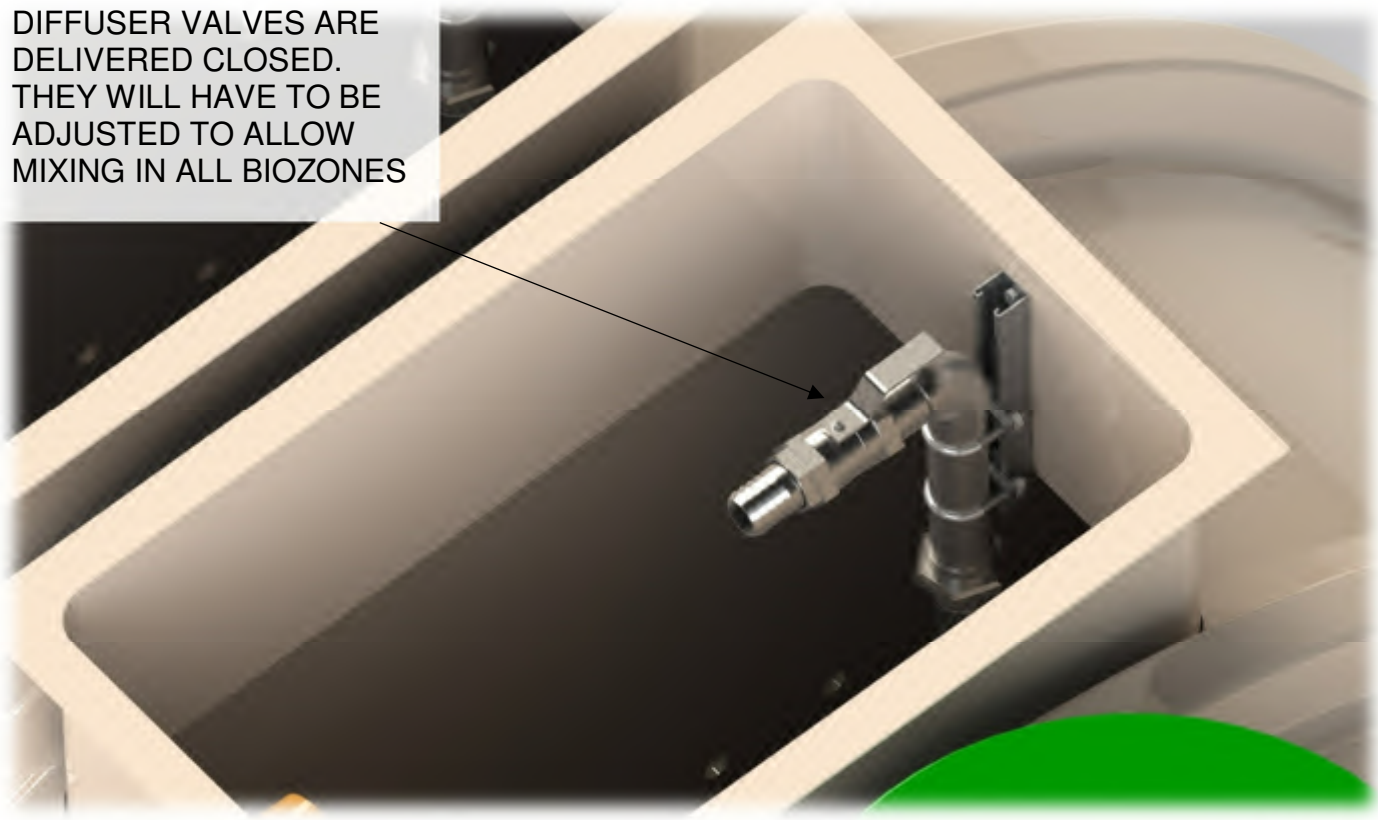
## 5. THE ELECTRICAL CONTROL PANEL CHECKS

All checks should be made by a suitably qualified competent person

- Is the panel mounted in a suitable location which is protected from the environment? Is access to the panel restricted to prevent unauthorised operation?
- Are the cables correctly and safely terminated?
- Is the earthing protection suitable for the installation, has it been checked?
- Are the wiring diagrams available inside the panel?
- Are the motor overloads set to the run position; they are delivered in the tripped position?
- Has the PPFDS impulse tube been run to the panel, when supplied?
- Is the remote alarm beacon wired in, when supplied?
- Replace any wiring diagrams
- Refit the cover to the panel enclosure.

## 6. GOING LIVE

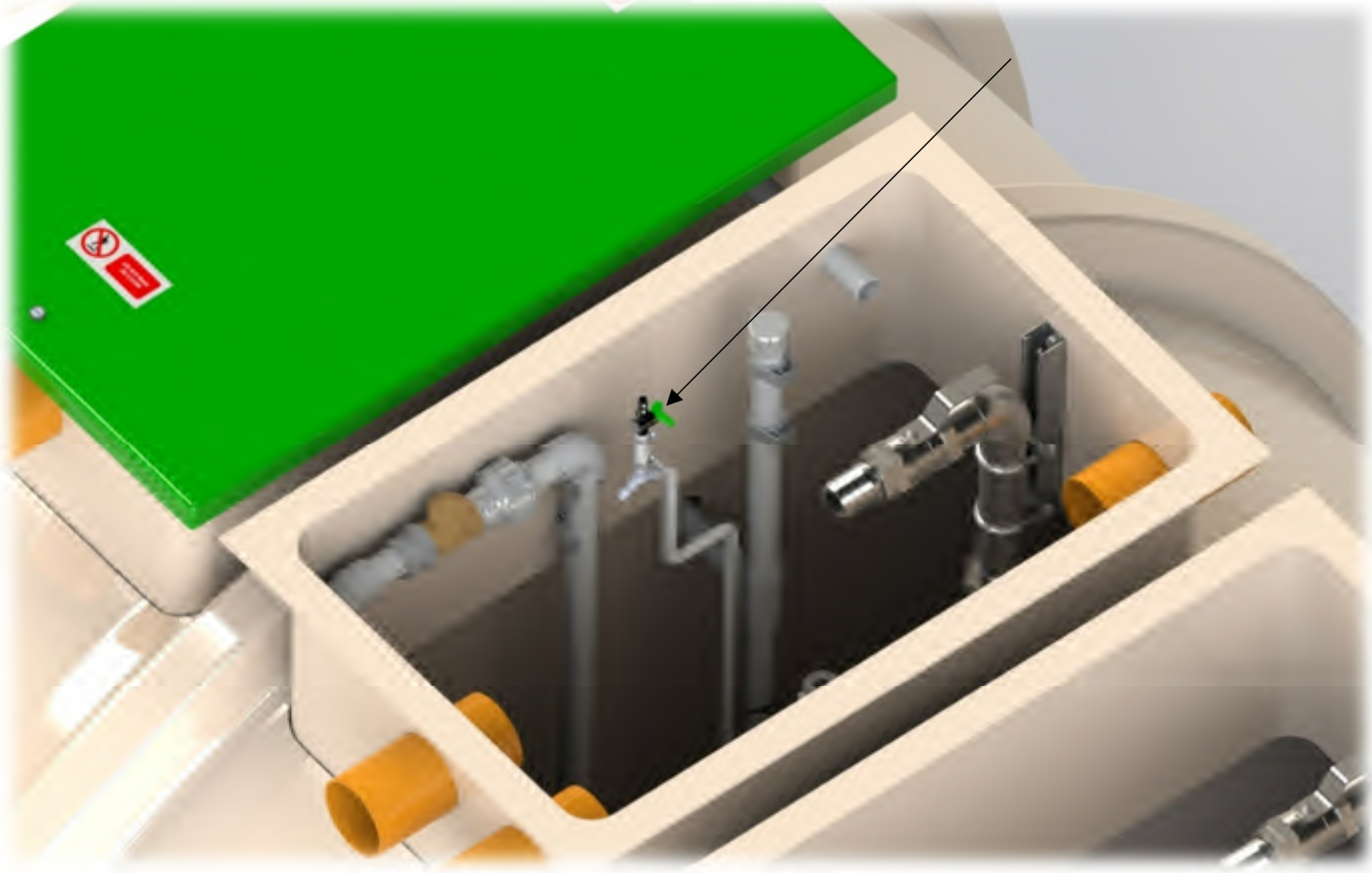
- Is there any reason that the power should not be turned on? (Is there sufficient water in the plant?)
- If safe to do so, turn on the mains electricity supply at the customer's end.
- Turn on the mains isolator on the control panel.
    - The motors will start immediately unless there is a delay timer.
    - The panel display will illuminate, is it showing any alarms? Refer to the Guidelines for the Alarm display explanations.
- Check the first manhole on the plant (Primary tank first stage), is the recirculation pump discharging?
- Check the 3rd, 4th and in some cases the 5th manhole (the biozones), is the liquid and media being agitated and having the appearance of a vigorous boiling? Is the mixing similar in all biozones?
- When the plant is reasonably full, set the forward flow air lifts to give an average forward flow equal to the expected daily flow of sewage. Flow measurement is taken at the sample chamber or other suitable point where a container can collect the flow over a short period of time measured with a watch with a second sweep or a stop watch.
- On some plants it is possible to remove the forward feed air lifts and to turn them around so they discharge back into the biozone. This enables the forward flow rate to be set in the event that access to a suitable sampling point is not available. Once the forward flow rate has been set, the forward feed air lifts should be remounted in their normal operating position without moving the green air taps.
- The green air taps will be almost shut in most cases, if the air taps are left fully open they will starve the biozones of air, reducing or even stopping any mixing, resulting in no biological treatment.
- Check the blower operating temperature and ensure adequate cooling is available. Increase the cooling ventilation if required, natural or forced ventilation as necessary. Ventilation selection may need to take account of local noise restrictions.
- If all satisfactory, replace the manhole covers and screw down as appropriate.
- Replace all documentation and hand the Owner's Pack to the installer/customer
- Close the Kiosk/room where the electrical panel is situated.



## 7. OPTIMISING PERFORMANCE

- Once the plant has seeded itself biologically there will be a visible growth on the media circulating around the biozones. This can be light or dark brown if the plant is operating normally.
- During biological start up there may be quite a lot of foam in the biozones. This usually subsides quite quickly as the population of bacteria on the media increases.
- The internal recirculation can be adjusted to modify the treatment operation, this changes the amount of nitrate returned as well as the dilution rate on the incoming sewage. In the absence of any analytical data we do not recommend making any changes to plant settings other than the forward flow air lifts.
- In general, the “slower” the plant the better the performance.
- Air blowers should not be restricted, either by operating with dirty inlet air filters or by closing the valves on the diffusers in the biozones.
- After a period of normal operation, the plant will require de-sludging/tankering. The Guidelines give the procedure and suggested interval for de-sludging. However, if the load on the plant is significantly different then the interval may be adjusted to suit. The procedure should always be the same.
- If the load is seasonal, then the de-sludging can also be adjusted to a seasonal cycle.
- If the biozones appearance changes from a dark to a more milky liquid, it is usually a sign that the plant is ready for de-sludging. It can also be a sign of excessive fat in the sewage, or a high proportion of detergent (laundry), or even an overload due to a change from the nature of the source and/or magnitude of the incoming sewage!

FORWARD FEED CONTROL VALVES (GREEN) ARE SUPPLIED CLOSED. THEY MUST BE ADJUSTED DURING PLANT COMMISIONING TO ACHIEVE THE CORRECT FORWARD FLOW RATE. THIS CAN BE MEASURED AT THE OUTLET SAMPLE CHAMBER.



# 15. FAQ's.

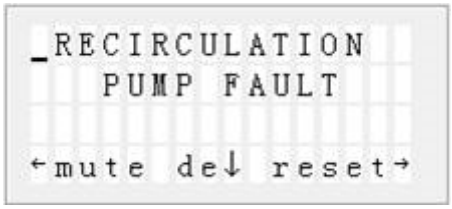
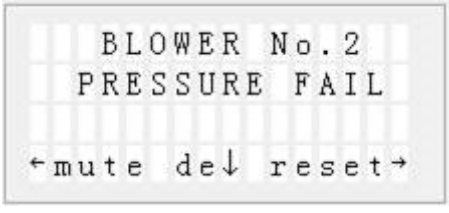
20 Frequently asked questions; if you do not find your answer please contact our technical team.

| | |
|---|---|
| ***1. General*** | • Maintenance and service checks should be carried out by suitably trained personnel.<br>• Electrical equipment should only be worked on by suitably skilled personnel. |
| ***2. Can I get into the tank to fix something?*** | • **On no account should anybody enter the tank.** |
| ***3. Is it safe to work on the plant?*** | • If suitable safety precautions are observed.<br>• Always wear rubber/latex gloves.<br>• Safely isolate the electricity supply to the plant<br>• Always wash thoroughly after contact with the plant.<br>• Do not eat/drink or smoke without washing hands first.<br>• Any splashes into the eye should be rinsed with saline water SEEK MEDICAL ADVICE.<br>• If any liquid in the plant is swallowed, do nor induce vomiting, drink plenty of water, seek medical attention. |
| ***4. Something has fallen into the tank.*** | • Do not attempt to enter the tank.<br>• If the item floats, use a fishing net or similar tool to remove.<br>• If it sinks and it is magnetic, tie a strong magnet to a rope and attempt to remove it.<br>• In the majority of cases small items are not a problem, but check the diffusers for damage particularly if vigorous "boiling" is evident |
| ***5. There is foam oozing out of the vent/access covers.*** | • This is normal on start up of this type of biological process.<br>• It will subside in a few days depending on the connected load on the plant.<br>• Water spray will knock it down or small doses of silicon based anti foam may be used. |
| ***6. There is a dry crust on the surface of the primary tank.*** | • This is quite normal and will not cause any problems.<br>• When the tank is "de-sludged", this crust will be removed. |
| ***7. There is a dark brown wet sludge on the surface of the final settlement zone.*** | • This is a good indication that the process is operating, but may also indicate a problem with the sludge return pump.<br>• Isolate the power to the plant, remove the pump and check operation. |
| ***8. A noise like a vigorous boiling water is coming from one of the access points.*** | • The diffuser may have come off. |
| ***9. The plant is smelling like raw sewage, slightly sickly sweet.*** | • Check that the air blower is operating, check the inlet air filter on the blower, if blocked fit a clean one.<br>• Check the liquid level in the plant, is there a blockage downstream causing the liquid to back up? (Particularly Soak-aways and drainage mounds).<br>• Check for indications of toxic chemicals such as disinfection, drain cleaning products or caustic based cleaners etc. |

| | |
|---|---|
| ***10. There is a white growth in the water course where the plant discharge is.*** | • A sign of poor treatment. The biological process is overloaded, the blower is under performing, Toxic chemicals, disinfectants, cleaners etc |
| ***11. The water discharging from the plant has a rainbow sheen on it.*** | • Petroleum products, oil or diesel have been discharge into the plant. Locate source and eliminate.<br>• The plant will recover from small discharges but a large discharge may require a special tanker, contact your local licensed waste disposal company. |
| ***12. The blower discharge pipe is very hot.*** | • If the blower is too hot, check the air filter, if there is a large resistance to removing the cover, the filter is blocked, replace.<br>• Check that the valves on the aeration drop pipes are open.<br>• Check the water level in the tank: high level the blower works harder so temperature high.<br>• The blower will normally be 25℃ to 30℃ higher than the outside air temperature.<br>• Are the ventilation louvers in kiosk clear, run with the kiosk door open for 10-15 minutes, does the blower cool down? If yes, increase the ventilation into the kiosk.<br>• Are there any signs of the blower pipe work being damaged or crushed? |
| ***13. The final effluent is cloudy.*** | • This usually occurs when the plant de-sludge is overdue.<br>• Check service records and arrange de-sludge.<br>• Other causes are “process” related and normal checks should be made on the blower, toxic chemicals and un-authorised discharges. |
| ***14. The final effluent is coloured.*** | • This can be: unauthorised discharges, or ground water entering the plant |
| ***15. Total nitrogen in the final effluent is high (H range plants only)*** | • Isolate the power to the plant; remove the recycle pump and check.<br>• Contact your service provider for advice. |
| ***16. Total phosphorous in the final effluent is high.<br>(H range with Chemical dosing only)*** | • Check the chemical levels.<br>• Check the chemical dosing pump is delivering (Wear necessary PPE).<br>• Check the pipe work for damage/blockage.<br>• Check chemical dosing increments (do they need increasing?). |
| ***17. What position should the ball valves in the diffuser pipes be?*** | • Valve position is determined by airflow so all plants may vary.<br>• Position valves so media is agitated but not moving violently. |
| ***18. Will the air diffusers need cleaning.*** | • Not in normal operation.<br>• Flow of air will unblock diffusers. |
| ***19. My warning beacon is flashing.*** | • Check control panel for fault (see next page). |

## 16. Control Panel Fault Messages

The control panel will operate a fault message in the following situations:

| | |
|---|---|
|  | When the system is on and there are no faults then this message appears to show that the system is running without any problems. |
|  | This message will appear when there is more than one fault with the system. |
|  | This message will appear when there is a fault with the recirculation pump 1 located in Biozone 3. |
|  | This message will appear when there is a fault with the recirculation pump 2 located in the FST. |
|  | This message will appear when there is a loss of pressure in the large blower for the diffusers. This indicates that the blower is not operating, or that there is a pipe rupture. You should investigate these situations, rectify, the alarm will clear. |
|  | This message will appear when there is a loss of pressure in the small blower for the airlift. This indicates that the blower is not operating, or that there is a pipe rupture. You should investigate these situations, rectify, the alarm will clear. |

| | |
|---|---|
|  | This message will appear when the water level has got higher than the working level which in turn triggers the high level float in the Biozone 2. You should investigate the cause, by checking within the compartment, rectify the problem (probable cause, air lift non-operational). Once the cause has been rectified and the level has dropped the alarm will clear. |
|  | This message will appear when there is a fault with the large blower for the diffusers and it's stopped working. |
|  | This message will appear when there is a fault with the small blower for the airlift and it's stopped working. |

## 17. Notice to affix within the building

Kingspan Environmental

# Bioficient

The foul drainage from this property discharges into a package treatment works.

Maintenance is required, the frequency of which depends upon the model installed, its use and application. Please consult your Operation & Maintenance Manual.

* When operating at the normal daily load, emptying should take place at 90 day intervals.

* The frequency of sludge removal is expected to increase if the unit is chemically dosed and require more frequent maintenance (see individual operating manuals)

Maintenance and Desludging should be carried out by the owner in accordance with the Manufactures instructions.

**THE OWNER OF THE PROPERTY IS LEGALLY RESPONSIBLE FOR ENSURING THAT THE SYSTEM DOES NOT CAUSE POLLUTION, A HEALTH HAZARD OR A NUISANCE.**

We recommend that a separate log is kept of all maintenance and service visits, the log should detail the date and any action taken, e.g. Regular maintenance service, breakdown visit, desludge volume removed, parts replaced.

**This notice should be fixed by the owner within the building alerting current and future owners to the maintenance requirement.**

**(Building regulation H2 (1.57)**

Please contact Service on +44 (0) 844 846 0500 to arrange a maintenance service or to request replacement operating instructions. It would be helpful if you provide your equipment serial number.

# **Appendix E** - Kingspan Grease Separators

# GREASE SEPARATORS

FOR EFFECTIVE REMOVAL OF FATS & GREASE
FROM WASTEWATER

NEW
BS EN 1825-1
COMPLIANT

Kingspan

Klargester

60 YEARS OF
Expertise &
1955–2015 Innovation



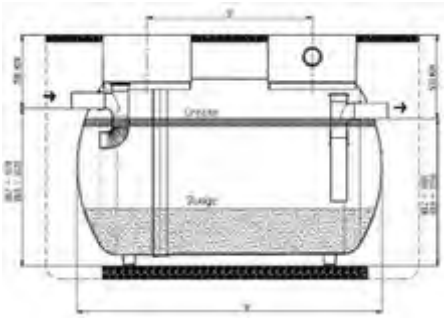
# GREASE SEPARATORS

**An effective and hygienic method of separating fat and grease from wastewater flow.**

Grease separators are designed for small canteens and public houses, as well as for larger applications such as hotels and big restaurants.



## GREASE SEPARATORS



## INSTALLATION & OPERATION

Separators allow fats and grease to naturally separate out from water, allowing their removal prior to the drainage system. The separator should be installed close to the source of contamination before any foul waste can enter the drainage flow and to suit the expected liquid temperature.

## FEATURES AND BENEFITS

- Greatly reduces drain blockages, for maximum operational efficiency
- Helps improve performance of septic tanks and field drains for best results
- Prevents contamination of small sewage treatment plants, reducing risk of breakdown
- Compliant with BS EN 1825-1
- Protects mains drainage system from grease blockages

| TANK | SEPARATOR MODEL | FLOW RATE (L/S) | DIMENSIONS (MM) | | CAPACITY (L) | APPROX WEIGHT (KG) | | SHIPPING HEIGHT (MM) | FALL ACROSS UNIT (MM) |
|---|---|---|---|---|---|---|---|---|---|
| | | | A | B | | EMPTY | FULL | | |
| Ø 1.2 | NSG04 | 4 | 2072 | 1122 | 2000 | 120 | 1860 | 1570 | 70 |
| | NSG06 | 6 | 3018 | 2068 | 3000 | 160 | 2820 | 1570 | 70 |
| | NSG09 | 9 | 3895 | 2940 | 4000 | 190 | 3760 | 1570 | 70 |
| Ø 1.8 | NSG18 | 18 | 3231 | 2281 | 8000 | 300 | 7162 | 2120 | 70 |
| | NSG24 | 24 | 4386 | 3436 | 11000 | 380 | 9885 | 2120 | 70 |

Larger sizes available on request.

bsi. ISO 9001 Quality Management

bsi. OHSAS 18001 Occupational Health and Safety Management

For further information

**UK:** College Road North,
Aston Clinton, Aylesbury
Buckinghamshire HP22 5EW
Tel: 01296 633 000
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Fax: +44 (0) 28 302 60046
ROI Tel: 048 302 66799
Fax: 048 302 60046

www.kingspanenviro.com/klargester

Kingspan Environmental

# **Appendix F** – Surface Water Inspection Check List

Surface Water Maintenance Inspection Checklist

| **GENERAL INFORMATION** | | | |
|---|---|---|---|
| Site ID | | | |
| Site Location and co-ordinates (GIS if appropriate) | | | |
| Elements forming the SuDS scheme | | Approved Drawing Reference(s) | |
| Inspection frequency | | Approved Specification Reference | |
| Type of development | | Specific purpose of any parts of the scheme (e.g. biodiversity, wildlife and visual aspects) | |

| | Inspection date | | | | Inspection date | | | |
|---|---|---|---|---|---|---|---|---|
| | **Details** | **Y/N** | **Action required** | **Date Completed** | **Details** | **Y/N** | **Action required** | **Date Completed** |
| **GENERAL INSPECTION ITEMS** | | | | | | | | |
| Is there any evidence of erosion, channelling, ponding (where not desirable) or other poor hydraulic performance? | | | | | | | | |
| Is there any evidence of accidental spillages, oils, poor water quality, odours, nuisance insects? | | | | | | | | |
| Have any health and safety risks been identified to either the public or maintenance operatives? | | | | | | | | |
| Is there any deterioration in the surface of permeable or porous surfaces (e.g. rutting, spreading of blocks or signs of ponding water)? | | | | | | | | |

| | Inspection date | | | | Inspection date | | | |
|---|---|---|---|---|---|---|---|---|
| | **Details** | **Y/N** | **Action required** | **Date Completed** | **Details** | **Y/N** | **Action required** | **Date Completed** |
| **SILT/SEDIMENT ACCUMULATION** | | | | | | | | |
| Is there any sediment accumulation at inlets (or other defined accumulation zones such as the surface of filter drains or infiltration basins and within proprietary devices)?<br>If yes, state depth (mm) and extent Is<br>removal required?<br>If yes, state waste disposal requirements and confirm all waste management requirements have been complied with (consult Environment Agency or SEPA). | | | | | | | | |
| Is surface clogging visible (potentially problematic where water has to soak into the underlying construction or ground (e.g. underdrained swale or infiltration basin)? | | | | | | | | |
| Does permeable or porous surfacing require sweeping to remove silt? | | | | | | | | |
| **SYSTEM BLOCKAGES / LITTER BUILD UP** | | | | | | | | |
| Is there evidence of litter accumulation in the system?<br>If yes, is this a blockage risk? | | | | | | | | |
| Is there any evidence of any other clogging/blockage of outlets or drainage paths? | | | | | | | | |

| | Inspection date | | | | Inspection date | | | |
|---|---|---|---|---|---|---|---|---|
| | **Details** | **Y/N** | **Action required** | **Date Completed** | **Details** | **Y/N** | **Action required** | **Date Completed** |
| **VEGETATION** | | | | | | | | |
| Is the vegetation condition satisfactory (density, weed growth, coverage etc.)? (Check against approved planting regime.) | | | | | | | | |
| Does any part of the system require weeding / pruning / mowing? (Check against maintenance frequency stated in approved design.) | | | | | | | | |
| Is there any evidence of invasive species becoming established?<br>If yes, state action required. | | | | | | | | |

| | Inspection date | | | | Inspection date | | | |
|---|---|---|---|---|---|---|---|---|
| | **Details** | **Y/N** | **Action required** | **Date Completed** | **Details** | **Y/N** | **Action required** | **Date Completed** |
| **INFRASTRUCTURE** | | | | | | | | |
| Are any check dams or weirs in good condition? | | | | | | | | |
| Is there evidence of any accidental damage to the system (e.g. wheel ruts?) | | | | | | | | |
| Is there any evidence of cross connections or other unauthorised inflows? | | | | | | | | |
| Is there any evidence of tampering with the flow controls? | | | | | | | | |
| Is there any evidence of tampering with the pumping station? | | | | | | | | |
| Has annual pumping station service been undertaken? | | | | | | | | |
| Is there any evidence of tampering with the Attenuation Tanks? | | | | | | | | |
| Are Attenuation tank vents clear? | | | | | | | | |
| Are gullies/channels/kerb drainage clear of debris/detritus? | | | | | | | | |
| Are there any other matters that could affect the performance of the system in relation to the design objectives for hydraulic, water quality, biodiversity and visual aspects? (Specify.) | | | | | | | | |
| **OTHER OBSERVATIONS** | | | | | | | | |
| Information appended (e.g. photos) | | | | | | | | |

| | Inspection date | | | | Inspection date | | | |
|---|---|---|---|---|---|---|---|---|
| | **Details** | **Y/N** | **Action required** | **Date Completed** | **Details** | **Y/N** | **Action required** | **Date Completed** |
| **SUITABILITY OF CURRENT MAINTENANCE REGIME** | | | | | | | | |
| Continue as current<br>Increase maintenance<br>Decrease maintenance | | | | | | | | |
| **NEXT INSPECTION** | | | | | | | | |
| Proposed date for next inspection | | | | | | | | |

# **Appendix G** - AquaCell Product and Installation Manual

Uniclass
JR12:L731/L71121/L2123 | EPIC J3413:X721
CI/SfB
(52.5) | (H1)
September 2016 WM424

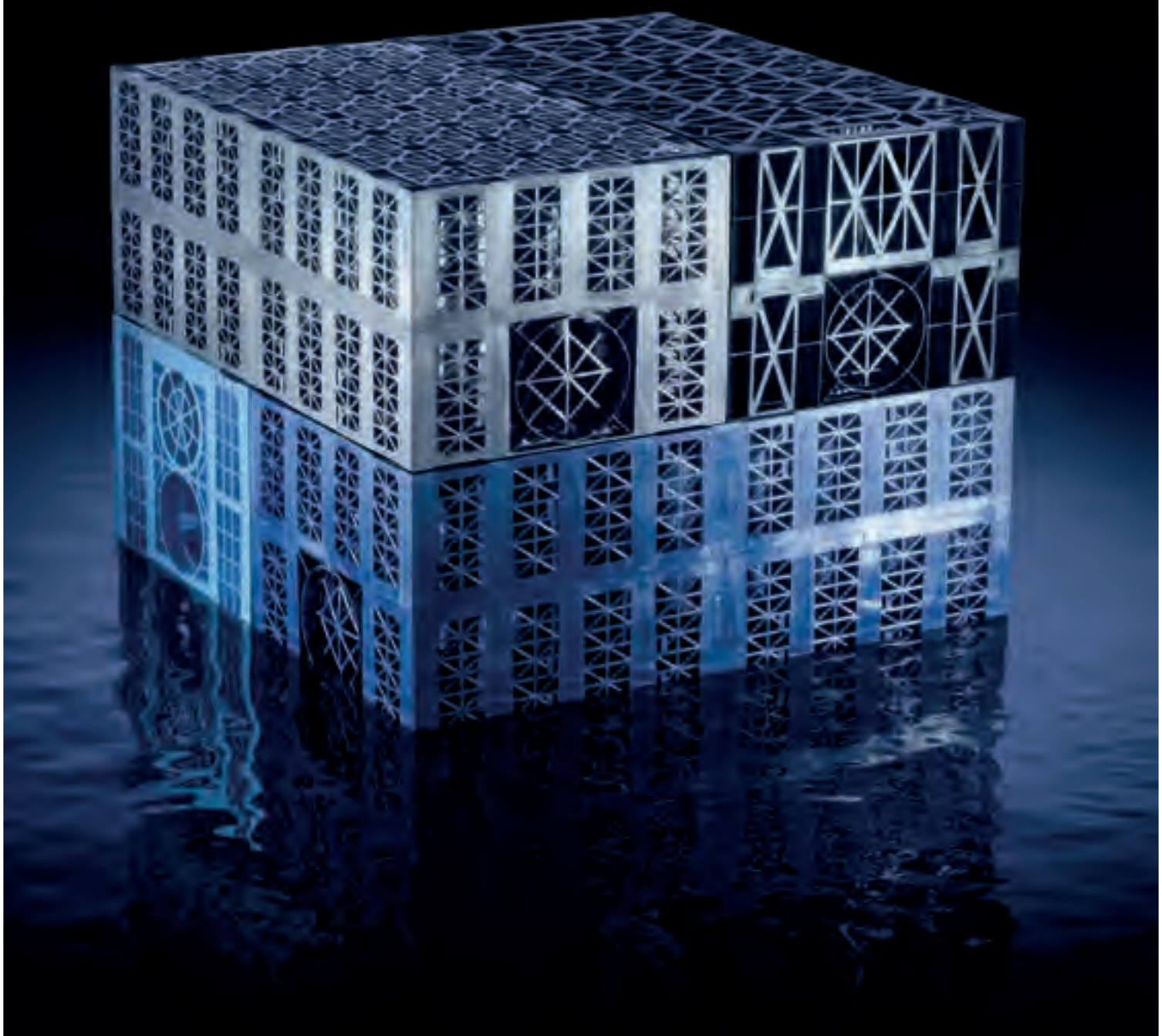
Water Management

**PRODUCT AND INSTALLATION MANUAL**

wavin

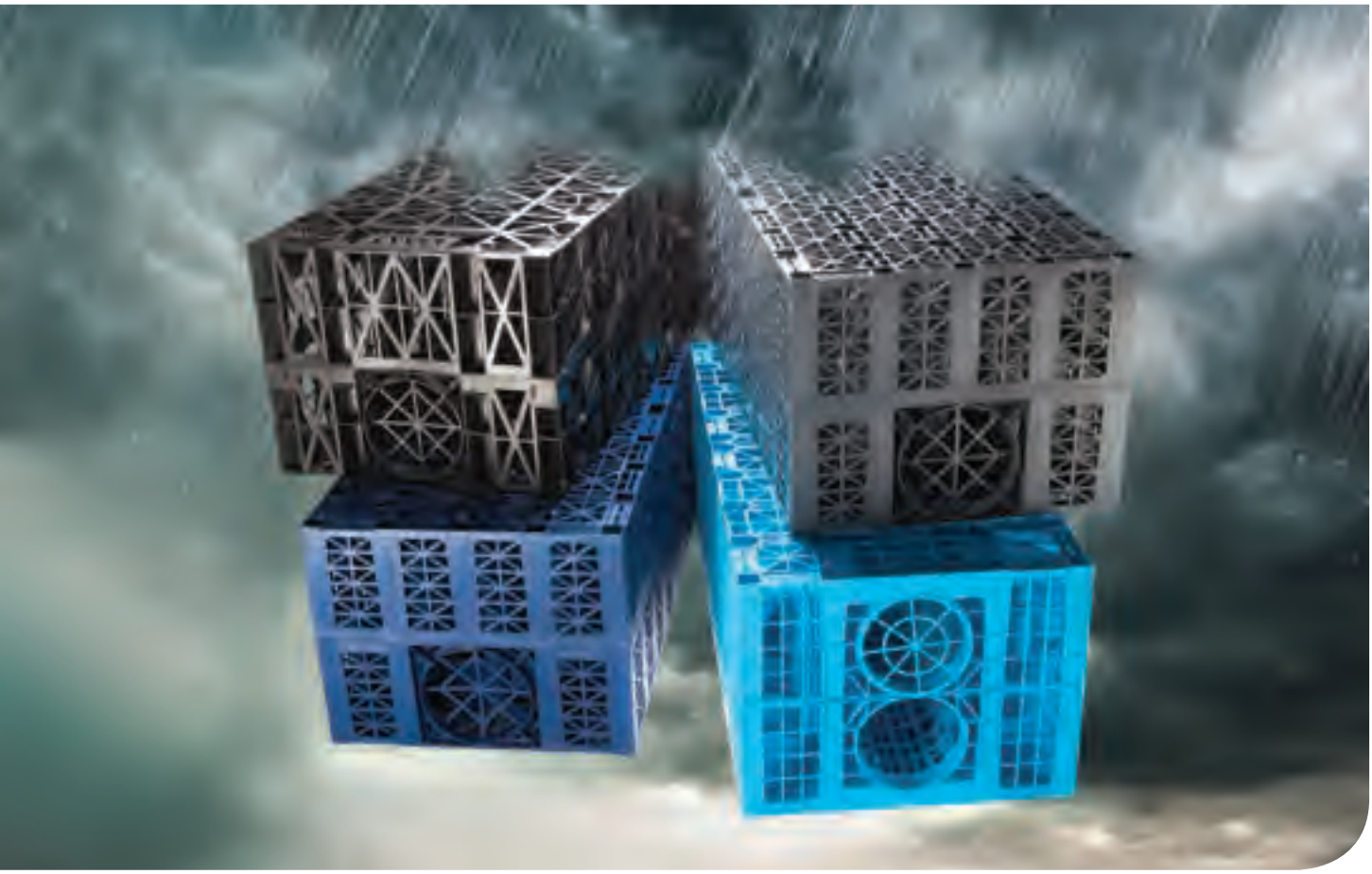
CONNECT TO BETTER

# AquaCell Systems



CONNECT TO BETTER

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# AquaCell Systems




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# Introduction to SuDS

Continuing urban development, a changing climate and the consequences of increased rainfall are all increasingly prominent issues on the political and environmental agenda and all drive the need to actively manage excessive rainfall with the use of SuDS (Sustainable Drainage Systems).

SuDS techniques recommend a number of ways to control water run-off as near to where it falls, via:

- Soft or natural SuDS
- Hard or engineered SuDS

SuDS should also aim to mimic nature, whilst focusing on 4 key areas (as shown below):

1. Controlling run-off / flood risk
2. Improving water quality
3. Providing amenities
4. Creating an environment for biodiversity

The CIRIA SuDS Manual gives guidance on all areas of SuDS and focuses on the cost-effective planning, design, construction, operation and maintenance of SuDS.

### Which SuDS Techniques are best?

- SuDS should help maximise amenity and biodiversity, whilst also delivering key objectives to manage flood risk and water quality
- For any given site, it is often beneficial to include a combination of 'soft' and 'hard' SuDS to ensure maximum efficiency from the Sustainable Drainage System

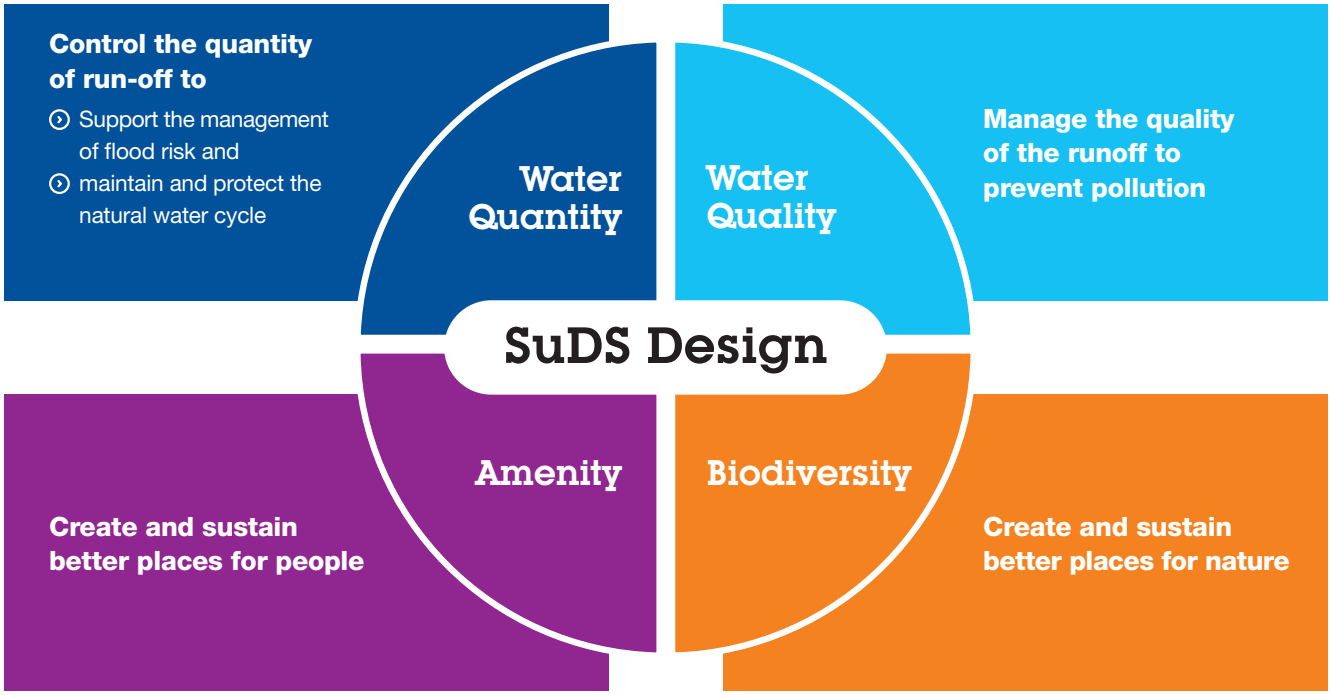
### How can the Wavin help with SuDS projects?

Wavin is well qualified to advise on how to comply with current and emerging regulation. We can aid specifiers, developers and contractors in responding to legislative demands as they pertain to flooding, sewage, urban drainage and sustainable resources use.

In particular, the proven qualities and performance of AquaCell systems not only support the achievement of SuDS, they can also help reinforce and enhance planning applications and enable development to proceed.

### CIRIA SuDS Design

*Source: The SuDS Manual (CIRIA)*



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# Keeping you on top of legislation

### Flood and Water Management Act 2010

Climate projections suggest that extreme weather will happen more frequently in the future. The Flood and Water Management Act is designed to reduce the risk of flooding and its consequences by providing for better, more comprehensive and co-ordinated water management, embracing groundwater, surface water and coastal erosion risk.

The Act gives DEFRA responsibility for establishing national standards for sustainable drainage and empowers local authorities to manage local flood risk – adapting and maintaining sustainable drainage schemes.

Specifically with regards to stormwater, Building Regulations Approved Document H3 stipulates that adequate provision should be made for rainwater to be carried from the roof of a building to either a soakaway, water course or sewer.

### The EU Water Framework Directive

Nearly half the EU population lives in 'water-stressed' countries, caused by high extraction from freshwater sources, and demand is growing all the time.

The EU Water Framework Directive introduces a new legislative approach designed to better manage and protect water resources, based not on national or political boundaries but on the natural formations of river basins.

### Building Regulation Part H (Drainage and Waste Disposal)

Building Regulation Part H embraces the guidelines for drainage and waste disposal that must be met in the UK.

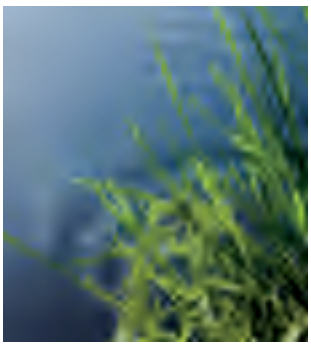
Although Part H extends to rainwater drainage and solid waste storage, waste drainage issues are to the fore. The Building Regulations are designed to ensure that all foul water (waste from urinals, portals, food preparation water etc.) is properly disposed of to maintain a decent level of sanitation, promoting both personal and environmental health.

The regulations also highlight the importance of pollution prevention, working sewage infrastructure and sewage maintenance.

### Planning Policy

Statement 25: Development and Flood Risk Responding to climate change, and replacing Planning Policy Guidance Note 25, the statement PPS25 sets out policy to ensure that flood risk is taken into account at all stages of the planning process and that inappropriate development in areas at risk of flooding is avoided.

The policy directs development away from areas of highest risk and where new development is, exceptionally necessary in such areas, aims to make it safe without creating an increase in flood risk elsewhere and, where possible, reduce flood risk overall.
Statement 3: Housing PPS3 underpins the delivery of the Government's strategic housing policy objectives. The statement replaces Planning Policy Guidance 3: Housing and earlier editions of PPS3, providing technical amendments to Annex B: Definitions to reflect the introduction of Affordable Rent.





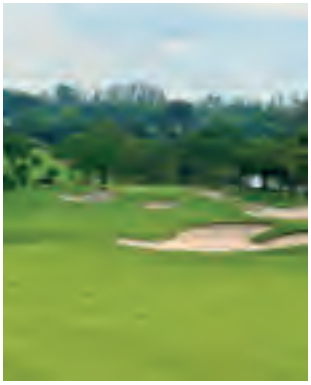

# Overview
# AquaCell Systems

The AquaCell range of geocellular systems are a fully tried and tested, BBA approved, modular technique for managing excessive rainfall.

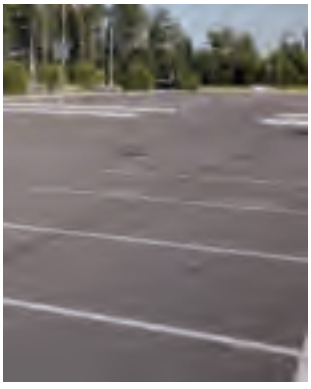
## Applications

The AquaCell range can be used as either a temporary storage tank or as a soakaway, and is suitable for applications including:

- Landscaped areas
- Parks
- Domestic gardens
- Residential developments
- Car parks & roads
- Industrial/commercial areas








## The AquaCell Range

There are four types of AquaCell unit. Each can be used as a standalone system or different unit types can be mixed and matched together in layers to value engineer the most cost effective solution.

All AquaCell units have identical dimensions (1m x 0.5m x 0.4m), but they are manufactured to perform differently. The type of unit, or combination of units required will depend on factors such as the load application, overall installation depth and site conditions.

## Features & benefits

The following are applicable to all AquaCell units:

- Fully BBA Approved – Eco/Prime/Core/Plus are all approved under certificate No. 03/4018
- Modular, lightweight and versatile
- Easy to handle and quick to install
- Proven clip and peg connection system
- 95% void (each unit holds 190 litres of water)
- Can be brick-bonded for extra stability
- Units can be mixed and matched together for optimum performance
- Safer than open or above ground storage structures
- Full range of ancillaries
- Can be used as part of a SuDS scheme to help reduce flood risk

## Environmental Benefits

In addition, the AquaCell range can also offer the following environmental benefits:

- Significantly reduced flooding risk
- Controlled, reduced-volume release of stormwater into existing sewer systems or watercourses
- Recharging of local groundwater (if infiltration/soakaway application)
- Aerobic purification to improve water run-off quality
- Sustainable, cost effective management of the water environment



## AquaCell Eco



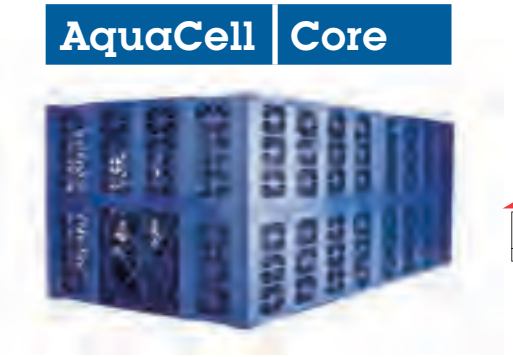
Eco is manufactured from specially reformulated, recycled material and has been designed for shallow, non-trafficked, landscape applications.

## AquaCell Prime



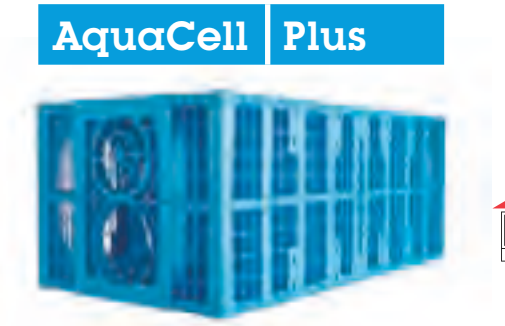
Prime is the latest addition to the AquaCell range, manufactured from specially reformulated, recycled material. It is ideal for use in both shallow and deep applications, subject to either regular traffic loading – such as car parks (for vehicles up to 12 tonnes) – or for landscaped areas.

## AquaCell Core



Core has been designed for use in deep applications, subject to both regular and heavy traffic loadings, such as cars and HGV's (for vehicles up to 44 tonnes).

## AquaCell Plus



Plus has been designed primarily for use in applications where inspectability is required, and is suitable for use in all applications from landscaped areas to heavily trafficked areas (for vehicles up to 44 tonnes).

### Optimise tank and soakaway designs with the AquaCell Configurator Tool

The AquaCell configurator tool aids and speeds the efficient design of stormwater tank or soakaway solutions. The tool guides users through a step-by-step specification process and, based on responses, will recommend the optimum design, based on the loadings, depths and site conditions of each project. The tool generates a PDF of the design for easy download and can store the data online for future reference. To start using the tool or to learn more visit: **myportal.wavin.co.uk/tools**



# Product Range Summary
# AquaCell Systems

The Product Range Summary below lists all components available to be used in conjunction with the AquaCell range.

### Abbreviations

**P/E –** Fittings with both ends plain or with one plain end and one special end.

**S/S –** Fittings with one or more ring-seal or push-fit sockets, but always one plain or special end.

**D/S –** Fittings with ring-seal or push-fit sockets at all ends.

**British Board of Agrément** – BBA logo identifies non-Kitemarked fittings covered by British Board of Agrément Certificate

Table 1: The Product Range Summary

| Product Description | Inlet Size (mm) | 110 | 150 | 160 | 225 | Page |
|---|---|---|---|---|---|---|
| Modular Units | AquaCell Eco – 1m x 0.5 x 0.4m | | | ● | | 9 |
| | AquaCell Prime – 1m x 0.5 x 0.4m | | | ● | | 10 |
| | AquaCell Core – 1m x 0.5 x 0.4m | | | ● | | 11 |
| | AquaCell Plus – 1m x 0.5 x 0.4m | | | ● | | 12 |
| Silt Traps | Silt Trap – Domestic | ● | | | | 36 |
| | Extension Piece – for Domestic Silt Trap | | | | | 36 |
| | Silt Bucket - for Domestic Silt Trap | | | | | 36 |
| | Silt Trap - Trafficked | | | ● | | 36 |
| Ancillaries | S/S Adaptor – UltraRib | | ● | | | 37 |
| | S/S Level Invert Reducer – 160mm UltraRib to 110mm spigot | | ● | | | 37 |
| | S/S Adaptor – TwinWall 6TW socket x 160mm OsmaDrain spigot | | ● | | | 37 |
| | S/S Level Invert Reducer – 160mm OsmaDrain to 110mm spigot | | | ● | | 38 |
| | P/E Adaptor – Solid Wall 160mm OsmaDrain spigot | | | ● | | 38 |
| | Flange Adaptor – for 150mm UltraRib connections | | ● | | | 38 |
| | Flange Adaptor – for 225mm UltraRib connections | | | | ● | 38 |
| Spares | AquaCell Clip – for use with all types of AquaCell units | | | | | 39 |
| | AquaCell Shear Connector – for use with all types of AquaCell units | | | | | 39 |
| | AquaCell Plus End Cap | | | ● | | 39 |

CONNECT TO BETTER

# Product Details
# AquaCell Eco

## Application

AquaCell Eco is manufactured from specially reformulated, recycled material and has been specifically designed for shallow, non-trafficked, landscaped applications. AquaCell Eco is **NOT** suitable for locations subject to high water tables.

AquaCell Eco is typically suitable for installations to a maximum depth of 1.5 metres, to the base of the units from ground level, with a minimum cover depth of 0.3 metres, (Wavin's recommendation, is to allow a cover depth of 0.5 metres).

Any installation using AquaCell Eco must **NOT** be subjected to additional loading at any time. Trafficking by construction plant on site, including mechanical equipment, must be avoided.

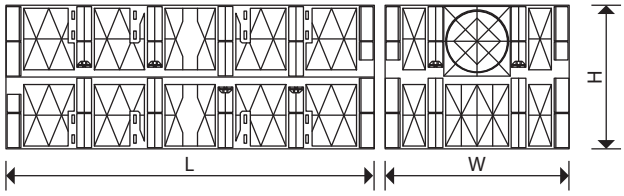
If trafficking of the buried tank by construction plant or, other vehicles is unavoidable, the installation should be constructed using AquaCell Core units (see page 11).

The width of an AquaCell Eco installation should not exceed 12 metres to allow for mechanical backfilling without loading. There is no limit to the length of the installation.

## Features and benefits

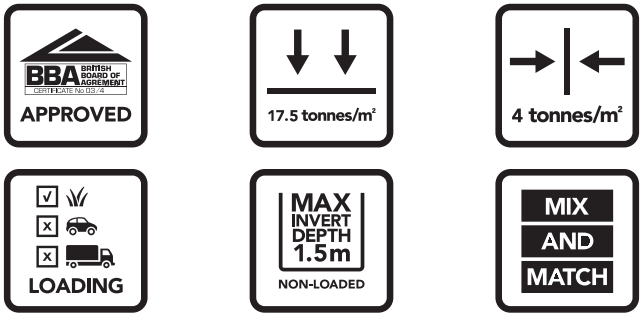
- Manufactured from specially reformulated, recycled material
- Suitable for both soakaway and attenuation applications
- Proven vertical loading capacity of: 17.5 tonnes/m²
- Proven lateral loading capacity of: 4.0 tonnes/m²
- Integral "hand holds" for ease of carrying/handling
- Black in colour, for ease of identification
- BBA approved – Certificate No 03/4018






Material: Reformulated polypropylene

| Nominal Size (mm) | Part Number | Dimensions (mm) W | H | L |
|---|---|---|---|---|
| 160 | 6LB025 | 500 | 400 | 1000 |




Maximum installation depths (to base units) and minimum cover depths [1]

| Typical soil type | Typical angle of shearing | Maximum depth of installation (m) | Minimum cover depth (m) |
|---|---|---|---|
| Stiff over-consolidated clay (e.g. London clay) | 24° | 0.95 | 0.30 |
| Normally consolidated silty, sandy clay (e.g. alluvium, made ground) | 26° | 1.05 | 0.30 |
| Loose sand and gravel | 29° | 1.2 | 0.30 |
| Medium dense sand and gravel | 33° | 1.5 | 0.30 |
| Dense sand and gravel | 38° | 1.9 | 0.30 |

(1) These values relate to installations where the groundwater is a minimum of one metre below the base of the excavation. AquaCell Eco units should not be used where groundwater is present.

*Source: BBA*

# Product Details
# AquaCell Prime

## Application

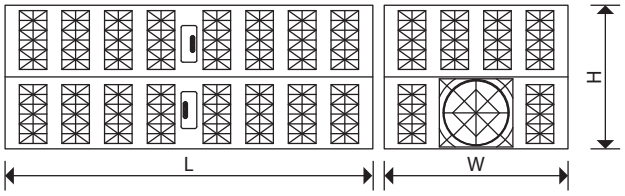
AquaCell Prime is manufactured from specially reformulated, recycled material. It is ideal for use in both shallow and deep applications, subject to either regular traffic loading – such as car parks (for vehicles up to 12 tonnes) or for landscaped areas.

Typically AquaCell Prime is suitable for installations to a maximum depth of 3.70m in landscaped areas (3.45m trafficked) to the base of the units from ground level, in best soil conditions.

## Features and benefits

- Manufactured from specially reformulated, recycled material
- Suitable for both soakaway and attenuation applications
- Suitable for regular traffic loading, e.g. car parks
- Proven vertical loading capacity of: 45.6 tonnes/m²
- Proven lateral loading capacity of: 7 tonnes/m²
- Grey in colour, for ease of identification
- BBA approved – Certificate No 03/4018
- Ideal for major attenuation and infiltration schemes






Material: Reformulated polypropylene

| Nominal Size (mm) | Part Number | Dimensions (mm) | | |
|---|---|---|---|---|
| | | W | H | L |
| 160 | 6LB075 | 500 | 400 | 1000 |



















Maximum installation depths (to base units)

| Typical soil type | Typical angle of shearing resistance (1) (2) (φ) | Maximum depth of installation – to base of units (m) | | | |
|---|---|---|---|---|---|
| | | With groundwater at 1m below ground level and units wrapped in geomembrane | | Without groundwater below base of units (normal case) | |
| | | Trafficked areas (cars only) (3) | Non-trafficked areas | Trafficked areas (cars only) (3) | Non-trafficked areas |
| Stiff over-consolidated clay (e.g. London clay) | 24° | 1.60 | 1.78 | 1.73 | 1.98 |
| Normally consolidated silty, sandy clay (e.g. alluvium, made ground) | 26° | 1.75 | 1.90 | 2.01 | 2.27 |
| Loose sand and gravel | 30° | 1.95 | 2.08 | 2.58 | 2.86 |
| Medium dense sand and gravel | 34° | 2.04 | 2.16 | 2.98 | 3.24 |
| Dense sand and gravel | 38° | 2.14 | 2.24 | 3.45 | 3.70 |

(1) Loosening of dense sand or softening of clay by water can occur during installation. Designer to factor in when selecting φ value.
(2) The design is very sensitive to small changes in the assumed value of φ, therefore, it should be confirmed by a chartered geotechnical engineer. In clay soils, it may be possible to utilise cohesion in some cases.
(3) Applicable for car parks or other areas trafficked only by cars or occasional refuse collection trucks or similar vehicles (typically one per week). Assumptions made are: ground surface is horizontal; shear planes or other weaknesses are not present within the structure of the soil

*Source: BBA*

CONNECT TO BETTER

# Product Details
# AquaCell Core

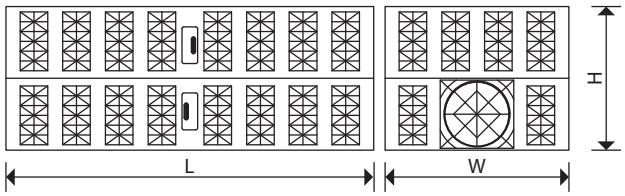
## Application

AquaCell Core has been designed for use in deep applications, subject to regular and heavy traffic loadings, e.g. cars and HGV's (for vehicles up to 44 tonnes). AquaCell Core can also be used for deep soakaways and landscaped applications.

Typically for use down to depths of 4.25m in landscaped areas (4.1m trafficked by cars and 4m trafficked by HGV's) to the base of the units from ground level, in best soil conditions.

Trafficking by heavy construction plant on site, including mechanical equipment, must be avoided until the minimum cover depth of 0.9 metres is in place.



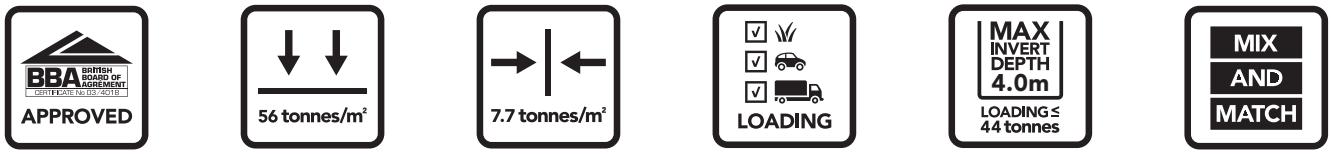



## Features and benefits

- Suitable for regular and heavy traffic loadings
- Proven vertical loading capacity of: 56 tonnes/m²
- Proven lateral loading capacity of: 7.7 tonnes/m²
- Dark blue in colour, for ease of identification
- BBA approved – Certificate No 03/4018
- Ideal for all types of shallow and deep projects including major attenuation and infiltration schemes

Material: Polypropylene

| Nominal Size (mm) | Part Number | Dimensions (mm) | | |
|---|---|---|---|---|
| | | W | H | L |
| 160 | 6LB100 | 500 | 400 | 1000 |




Maximum installation depths (to base units)

| Typical soil type | Typical angle of shearing resistance (1) (2) (φ) | Maximum depth of installation – to base of units (m) | | | |
|---|---|---|---|---|---|
| | | With groundwater at 1m below ground level and units wrapped in geomembrane | | Without groundwater below base of units (normal case) | |
| | | Trafficked areas (cars only) (3) | Non-trafficked areas | Trafficked areas (cars only) (3) | Non-trafficked areas |
| Stiff over-consolidated clay (e.g. London clay) | 24° | 1.65 | 1.75 | 2.35 | 2.50 |
| Normally consolidated silty, sandy clay (e.g. alluvium, made ground) | 26° | 1.70 | 1.80 | 2.50 | 2.65 |
| Loose sand and gravel | 29° | 1.80 | 1.90 | 2.85 | 2.95 |
| Medium dense sand and gravel | 33° | 1.90 | 2.00 | 3.30 | 3.45 |
| Dense sand and gravel | 38° | 2.05 | 2.15 | 4.10 | 4.25 |

(1) Loosening of dense sand or softening of clay by water can occur during installation. Designer to factor in when selecting φ value.

(2) The design is very sensitive to small changes in the assumed value of φ, therefore, it should be confirmed by a chartered geotechnical engineer. In clay soils, it may be possible to utilise cohesion in some cases.

(3) Applicable for car parks or other areas trafficked only by cars or occasional refuse collection trucks or similar vehicles (typically one per week). Assumptions made are: ground surface is horizontal; shear planes or other weaknesses are not present within the structure of the soil

*Source: BBA*

# Product Details
# AquaCell Plus

## Application

AquaCell Plus has been designed primarily for use in applications where inspectability is required, and is suitable for use in all applications from landscaped areas to heavily trafficked areas (for vehicles up to 44 tonnes). The units can be used in combination with AquaCell Prime and Core (and Eco if there is at least one layer of Prime or Core in between the Plus and Eco layer).

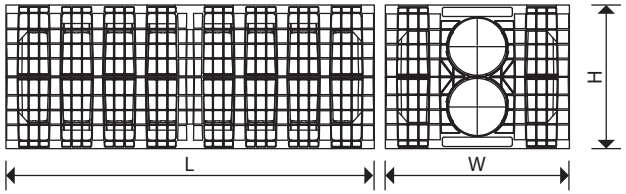
Extra lateral loading capacity allows installation at greater depths. Integral inspection channels in each unit combine to create viewing channels for the full length of the installed structure.

Typically for use down to depths of 5.08m in landscaped areas (4.78m trafficked by cars and 4.48m trafficked by HGV's) to the base of the units from ground level, in best soil conditions. Trafficking by heavy construction plant on site, including mechanical equipment, must be avoided until the minimum cover depth of 0.9 metres is in place.

## Features and benefits

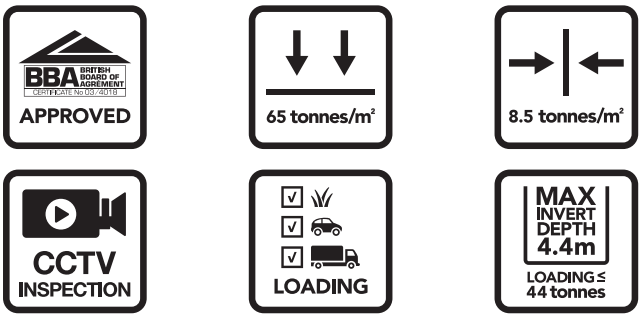
- Suitable for extra deep installations
- Inspectable (supplied with end cap for use when an inspection channel is not required)
- Proven vertical loading capacity of: 65 tonnes/m²
- Proven lateral loading capacity of: 8.5 tonnes/m²
- Light blue in colour, for ease of identification
- BBA approved – Certificate No 03/4018






Material: Polypropylene

| Nominal Size (mm) | Part Number | Dimensions (mm) W | H | L |
|---|---|---|---|---|
| 160 | 6LB200 | 500 | 400 | 1000 |




Maximum installation depths (to base units)

| Typical angle of shearing resistance (1) (2) (φ) | Maximum depth of installation – to base of units (m) Non-trafficked areas | Trafficked areas Cars (3) | HGV |
|---|---|---|---|
| 24° | 2.96 | 2.65 | 2.35 |
| 26° | 3.18 | 2.88 | 2.57 |
| 28° | 3.42 | 3.12 | 2.82 |
| 30° | 3.69 | 3.39 | 3.08 |
| 32° | 3.98 | 3.68 | 3.38 |
| 34° | 4.31 | 4.01 | 3.71 |
| 36° | 4.68 | 4.38 | 4.07 |
| 38° | 5.08 | 4.78 | 4.48 |

(1) Loosening of dense sand or softening of clay by water can occur during installation. Designer to factor in when selecting φ value.
(2) The design is very sensitive to small changes in the assumed value of φ, therefore, it should be confirmed by a chartered geotechnical engineer. In clay soils, it may be possible to utilise cohesion in some cases.
(3) Applicable for car parks or other areas trafficked only by cars or occasional refuse collection trucks or similar vehicles (typically one per week). Assumptions made are: ground surface is horizontal shear planes or other weaknesses are not present within the structure of the soil

*Source: BBA*

# Product Details
# AquaCell Plus

## AquaCell Plus: for inspectability

By aligning AquaCell Plus units end-to-end, full length viewing channels can be created – allowing for CCTV inspection if required. These are created in the bottom layer of an AquaCell tank installation.

The units can be used in combination with AquaCell Prime and Core (and with Eco if there is at least one layer of AquaCell Prime or Core in between the Plus and Eco layer).

NOTE: For any AquaCell Plus units on the perimeter of a structure that are NOT required for inspection access, the open ends of the integral inspection tunnels should be fitted with the end caps provided.

## Inspection chambers

An inspection chamber should precede the inlet pipework for the AquaCell structure.

A silt trap or hydro-dynamic separator prior to the inspection chamber is also recommended.

For on-line installations the following Chambers are recommended:
- Down to 3m Wavin Non-Entry Inspection Chambers
- Down to 5m Wavin Range 600 Inspection Chambers, or a traditional manhole*

**where inlet pipework is replaced by AquaCell units acting as flow conduit.*

For off-line installations:
– Manhole with in-built flow control

Recommendation: If installing any Wavin Non-Entry Inspection Chamber, deeper than 1.2 metres, ensure that the cover and frame includes a 350mm restrictor to prevent man entry.

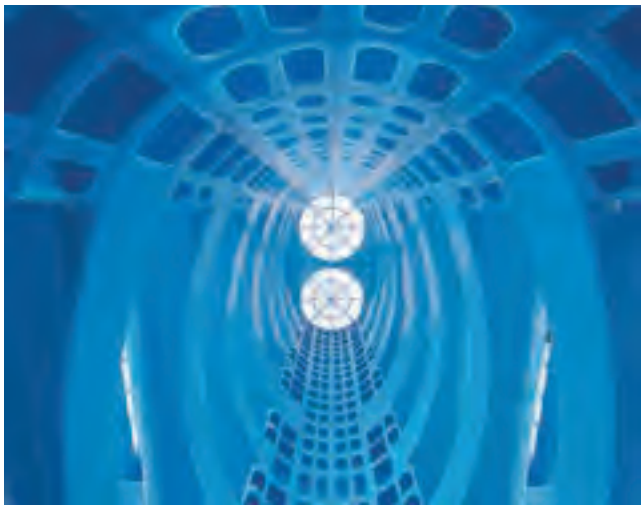
## Inspection and maintenance

CCTV inspection at every inspection point is recommended:
- after every major storm
- at regular intervals according to the specific maintenance plan for the site

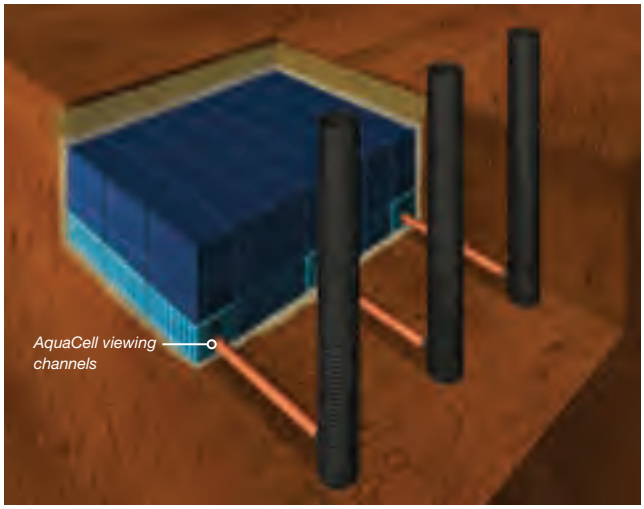
Silt traps prior to inlet pipework should be routinely inspected and cleaned out to minimise debris reaching the tank. It is important to prevent construction silt from entering the AquaCell structure.

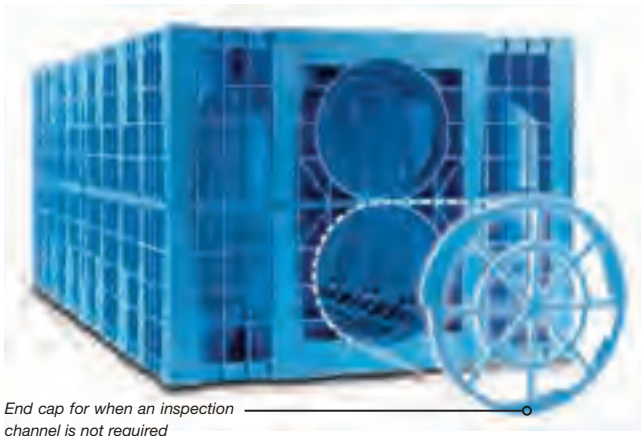
## Inspectability Scenarios

AquaCell Plus viewing channel



Trafficked tank installation with inspection chambers




AquaCell Plus 6LB200

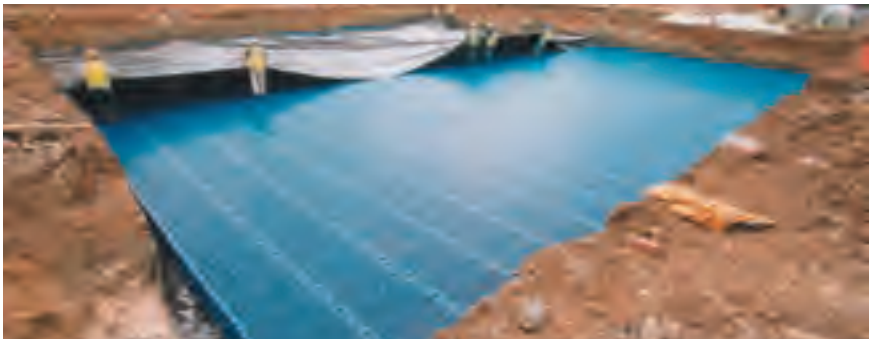
# Design Guidance
# AquaCell Units

### Infiltration or attenuation?

The AquaCell range can be used either as:

- A soakaway whereby the units will be installed in suitable pervious soils so the units can be wrapped in a geotextile to allow infiltration of the stormwater into the surrounding ground, or
- As an attenuation tank in impervious ground (e.g. clay) where infiltration is not possible, here the units are encapsulated in a geomembrane (which is in turn wrapped in a protective geotextile layer) so that the structure can hold the stormwater temporarily until local drainage flows can accept it for normal disposal at a permissible outflow rate.

Large scale AquaCell Core storage tank



Domestic AquaCell Core soakaway







### Site assessment

Ground conditions may be established as part of a geotechnical assessment. This may include tests for infiltration and ground water level.

If there is no confirmation that such assessments have been conducted, or resulting conclusions are unavailable, a trial pit will be required in accordance with BRE 365.

For further information and guidance, please contact the Wavin Technical Design Team.

### Infiltration (soakaways)

According to the principals of SuDS, wherever possible stormwater should be drained back into the ground via a soakaway as the first priority. A site must meet BOTH of the following criteria for infiltration to be possible:

- The underlying soil surrounding the proposed installation is sufficiently permeable
- The seasonally high water table is a minimum of 1 metre below the base of the proposed installation

If either of these criteria is not met, or cannot be confirmed for any reason, a soakaway system may not be suitable for the application, in which case a storage tank must be used.

### Attenuation (Storage tanks)

A storage tank may be designed to be online or offline (see pages 28-33 for typical details). However, if the site is subject to groundwater or a high water table, it is important to ensure that the tank is not vulnerable to flotation. Sufficient weight from soil, or other covering placed over the AquaCell units, must be sufficient to counter any buoyancy uplift force from the rising groundwater level.

## Important design considerations for geocellular structures

Rising rainfall levels and increased focus on SuDS compliance, have led to a sharp increase in the use of modular units to create underground structures for infiltration or the temporary storage of stormwater.

However, not all currently available systems have the proven performance characteristics necessary to meet the wide range of complex underground geocellular applications.

The Wavin range of AquaCell units provide assured performance, since all strength and hydraulic capabilities have been verified by independent testing and all units are fully BBA approved.

To guarantee the structural integrity of an engineered drainage system, any underground structure must be strong enough to support the loads to which it will be subjected without any unacceptable deflection.

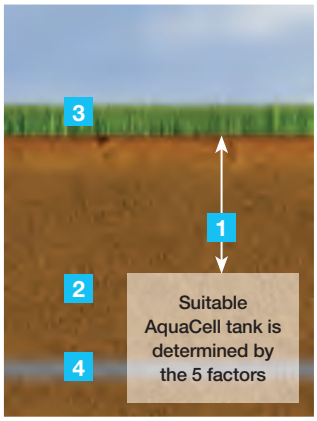
The correct choice of geocellular unit must have appropriate proven top (vertical) and side (lateral) load bearing capacity and deflection characteristics to suit site conditions.

The five key site considerations to be noted when designing a geocellular structure are:

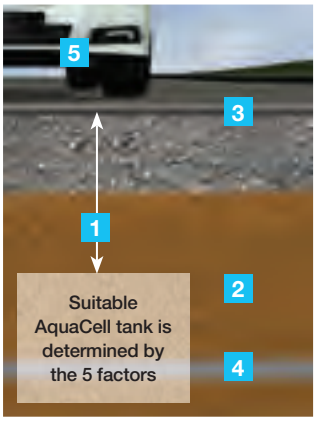
1. Depth of cover (See page 16)
2. Soil type
3. Surface finishing
4. Presence of groundwater
5. Type of traffic/loading

The combination of these 5 factors effectively means that the required characteristics of a geocellular structure to be installed under a trafficked location (for example) will be very different from that under a landscaped/low-loaded location.

Non-trafficked




Trafficked




Two typical examples are given below.

EXAMPLE A: Landscaped/non-trafficked location and 0.3m cover depth. Typically requires minimum vertical strength of 17.5 tonnes/$m^2$

EXAMPLE B: Car park with occasional light delivery traffic and between 0.71 – 0.75m cover depth. Typically requires minimum vertical strength of 40 tonnes/$m^2$

# Design Guidance
# AquaCell Units

### Hydraulic Design

All AquaCell units have identical dimensions: 1m x 0.4m x 0.5m, have a nominal void ratio of 95% and each holds 190 litres of water. Hydraulic calculations are accordingly the same for AquaCell Eco, Prime, Core and Plus.

Structural design however, requires careful consideration of loading factors specific to each location – see CIRIA C680 and CIRIA C737 for further guidance.

### Structural Design – Installation & cover depths

Each AquaCell unit has been designed to have specific loading capacities (see pages 9-12) that define the maximum depth parameters for which they are suitable.

Minimum depth of cover varies according to whether or not the installation will be subject to trafficking by cars/HGVs.

However, in some situations, installations may have to be located with greater cover depths. Reasons may include:

- Deep-running drainage network
- Other buried services running above tank location
- Installation into banked/ sloping ground
- Upper layer of clay preventing infiltration.

The table shows a summary of typical cover depths and installation depths as a guide.

Typical minimum cover depths and maximum installation depths

| Location type | Minimum cover depths | | | |
|---|---|---|---|---|
| | AquaCell Eco | AquaCell Prime | AquaCell Core | AquaCell Plus |
| Landscaped/non-trafficked areas | 0.3m[b] | 0.3m[b] | 0.3m[b] | 0.3m[b] |
| Car parks, vehicle up to 12000 kg[a] gross mass | n/a | 0.71m | 0.75m | 0.75m |
| HA/HGV loading [a] | n/a | n/a | 1.2m | 1.1m |
| | Maximum installation depths | | | |
| Maximum depth to base of unit (Landscaped) | 1.5m | 3.7m | 4.25m[c] | 5.08m |
| Maximum depth to base of unit (Trafficked) | n/a | 3.45m | 4.1m | 4.78m |

(a) For specific advice on cover depths for heavier loadings/HGV applications, contact Wavin Technical Design on 0844 856 5165.

(b) 0.3 is minimum depth for AquaCell Eco, although 0.5m cover is recommended to prevent accidental damage. If construction plant is to be used on site, extra protection may be needed.

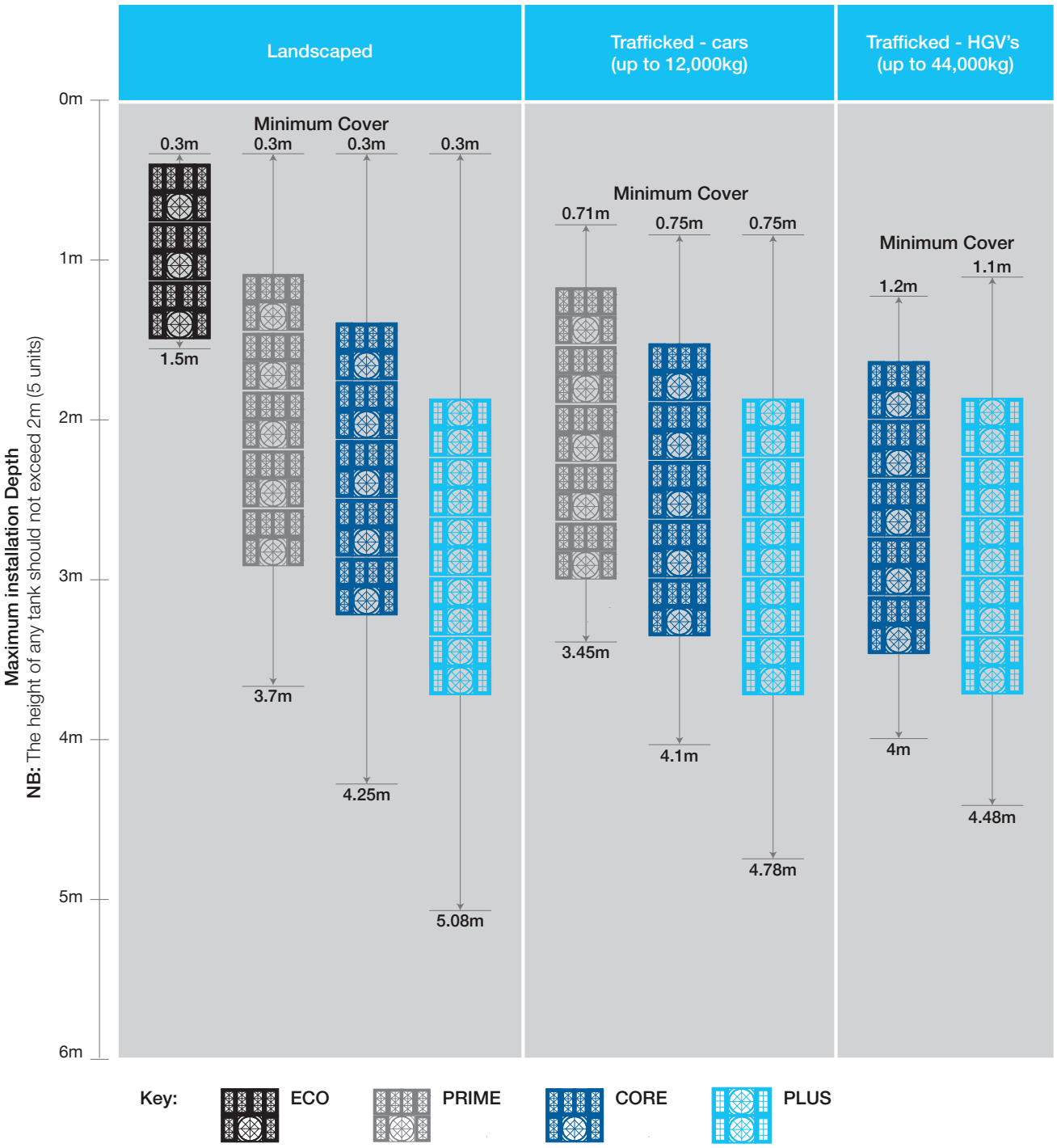
(c) Allowable maximum depth to base of bottom layer of units is dependent on soil type, angle of shearing resistance, loadings, and groundwater level. The above depths are based on 38° angle of shearing resistance and no groundwater.

**The height of any tank should not exceed 2m (5 units). If you require a tank that exceeds this, please contact Wavin Technical Design for guidance:**

**T: 0844 856 5165 E: technical.design@wavin.co.uk**

## Minimum cover and maximum installation depths to base of units from ground level, in best soil conditions

This chart shows how deep each unit can be used for different applications in best soil conditions.




Note: The AquaCell units can also be used in combination with each other, see page 18 for details.

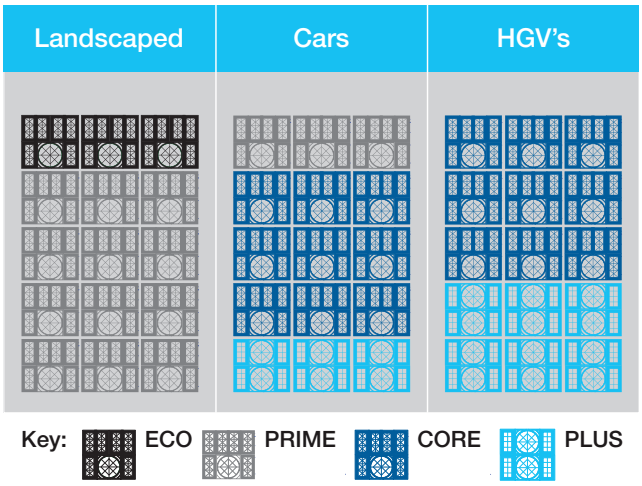
# Design Guidance
# AquaCell Units

### Mix and match

Although all AquaCell units have identical dimensions, and a high nominal void ratio of 95%, they are manufactured to perform at a range of depths, dependent on soil type, angle of shearing resistance, loading and ground water levels. For optimum performance the units can be mixed and matched (in layers) to value engineer the most effective design (in cost and performance terms) for each installation. For example, in a landscaped application if you needed to install a tank or soakaway that is deeper than 1.5m, you could install layers of AquaCell Prime underneath the AquaCell Eco. See below illustrations showing examples of how the AquaCell units can be mix and matched together. For advice on how to optimise a tank or soakaway design using more than one type of AquaCell please contact Wavin Technical Design.

Note: AquaCell Eco cannot be used directly with AquaCell Plus therefore there must be a layer of either AquaCell Prime or Core between them.

### Typical examples of Mix & Match with AquaCell




### Brick bonding – for extra stability

When assembling a geocellular structure that comprises two or more layers, it is recommended that AquaCell units are placed in a 'brick-bonded' configuration for extra stability.

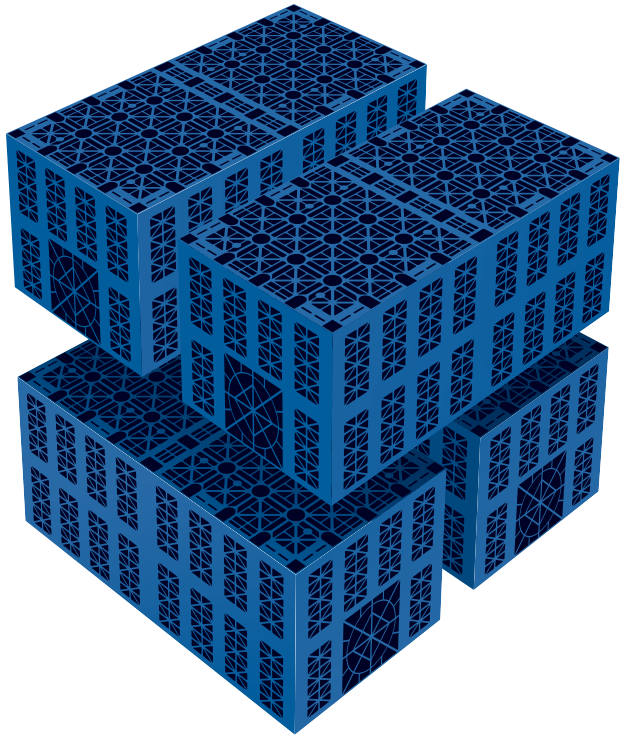
This helps minimise continuous vertical joints in the assembly, and gives the structure extra stability.

A significant advantage of AquaCell unit design is that brick bonding placement does not require extra connectors.

All four AquaCell units may be placed in this way, unless inspection channels and cleaning access are required using AquaCell Plus.

AquaCell Plus units incorporate integral inspection channels. These are designed for combined alignment to create viewing tunnels at the base of an assembled structure (see page 13).

### Example of AquaCell being brick bonded



CONNECT TO BETTER

# Installation Guidance
# AquaCell Units

## AquaCell Prime, Core and Plus: Construction Loads

Construction plant such as excavators can impose significant loads on any AquaCell unit. The following guidelines should be observed:

- Tracked excavators (not exceeding 21 tonnes weight) should be used to place fill over the AquaCell units when the geotextile or geomembrane wrapping has been completed
- At least 300mm of fill should be placed before the excavators or trucks delivering the backfill are allowed to traffic over the installed units
- Compaction plant used over the AquaCell units should not exceed 2300kg/metre width. This will allow the compaction of Type 1 sub-base in 150mm layers over the units in accordance with the Specification for Highways Works
- All other construction plant should be prevented from trafficking over the system once it is installed and surfacing completed, unless a site specific assessment demonstrates that it is acceptable
- In particular cranes should not be used over, or place their outriggers over the system

## AquaCell Eco: Construction Loads

As AquaCell Eco is designed for landscaped and non-loaded applications, certain precautions are recommended on site to prevent damage to the units through excess loading.

### Manual assembly

Whilst assembling the tank, it may be necessary to walk on top of previously laid AquaCell units. Therefore care should be taken not to damage the edges of the units.

### Backfilling

When backfilling AquaCell Eco installations:

- Machines placing the material must be located OFF the units
- Only light compaction should be applied to the material
- Backfill with suitable, stone-free, as-dug material
- First layer should be 300mm thick before using any compaction plant
- NO vibratory mechanism should be used for compacting this first layer
- Compaction plant must not exceed 2300kg per metre width

### Construction traffic on site

Once backfilled, if construction plant (e.g. excavators or loaders) are likely to run over the installation, ensure that:

- MINIMUM protective cover should be 500mm well-compacted granular material
- Only tracked excavators can be used and MUST NOT weigh more than 14 tonnes.
- HGVs MUST NOT run over installed AquaCell Eco units

### Manual assembly

All ancillaries and adaptors (see pages 36-39) can be used with either the AquaCell Eco, Prime, Core or Plus units, except the 225mm Flange Adaptor (6LB106) which must only be used with AquaCell Prime, Core or Plus.

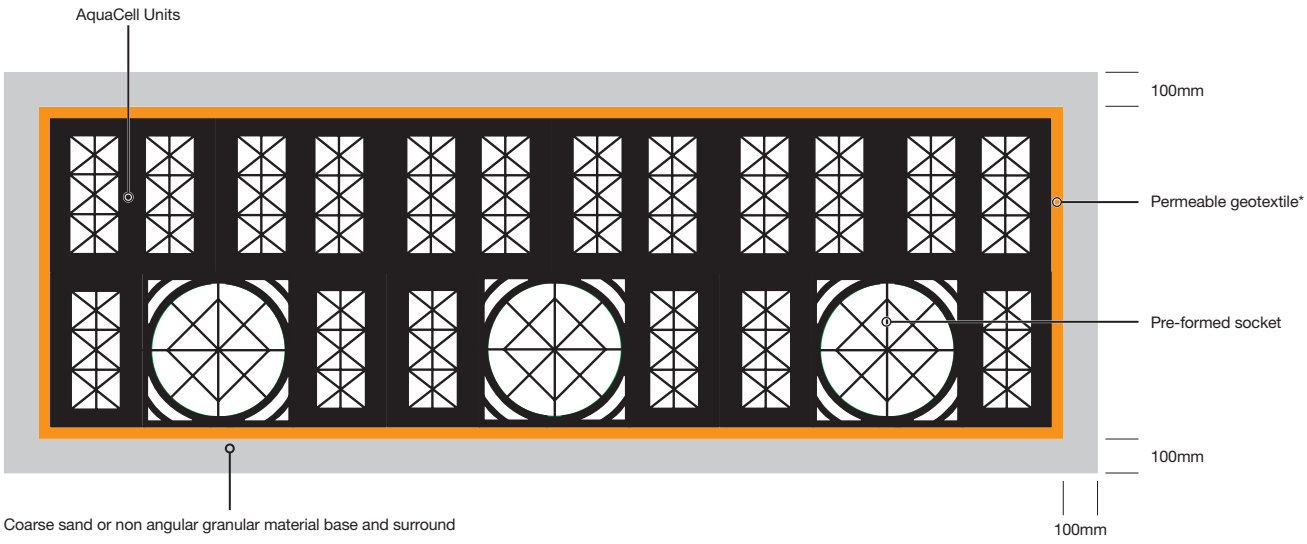
The 150mm Flange Adaptor (6LB104) should only be used when constructing an air vent on the top surface of an AquaCell Eco unit. The adaptor should not be used to connect inlet pipes to the side of an Eco unit.

# Installation
# AquaCell Units

## Typical Soakaway Installation Method

### Typical installation procedure

1. Excavate the trench to the required depth ensuring that the plan area is slightly greater than that of the AquaCell units.
2. Lay 100mm bed of coarse sand or non angular granular material, level and compact.
3. Lay the geotextile* over the base and up the sides of the trench.
4. Lay the AquaCell units parallel with each other. In multiple layer applications, wherever possible, continuous vertical joints should be avoided. AquaCell units can be laid in a 'brick bonded' formation (i.e. to overlap the joints below) – see page 18. For single layer applications use the AquaCell Clips and for multi layers use the AquaCell Clips and the AquaCell Shear Connectors (vertical rods).
5. Fix the Adaptors to the AquaCell units as required and connect pipework.
6. In order to prevent silt from entering the tank, clogging inlet pipework and reducing storage capacity, it is recommended that the Domestic Silt Trap (6LB300) or the standard Silt Trap (6LB600) is installed prior to the inlet pipework – see page 26 for installation guidelines.
7. Wrap and overlap the geotextile covering the entire AquaCell structure.
8. Lay 100mm of coarse sand or non angular granular material between the trench walls and the AquaCell structure and compact.
9. Lay 100mm of coarse sand or non angular granular material over the geotextile and compact.
10. Backfill with suitable material.
11. Rainwater from roof areas may discharge directly into the soakaway but rainwater from carparks must discharge through a catchpit manhole and/or a petrol interceptor.




Example shows the use of AquaCell Eco. However, a soakaway can also be installed as shown using either of the other versions of AquaCell units (Prime, Core or Plus) as appropriate.

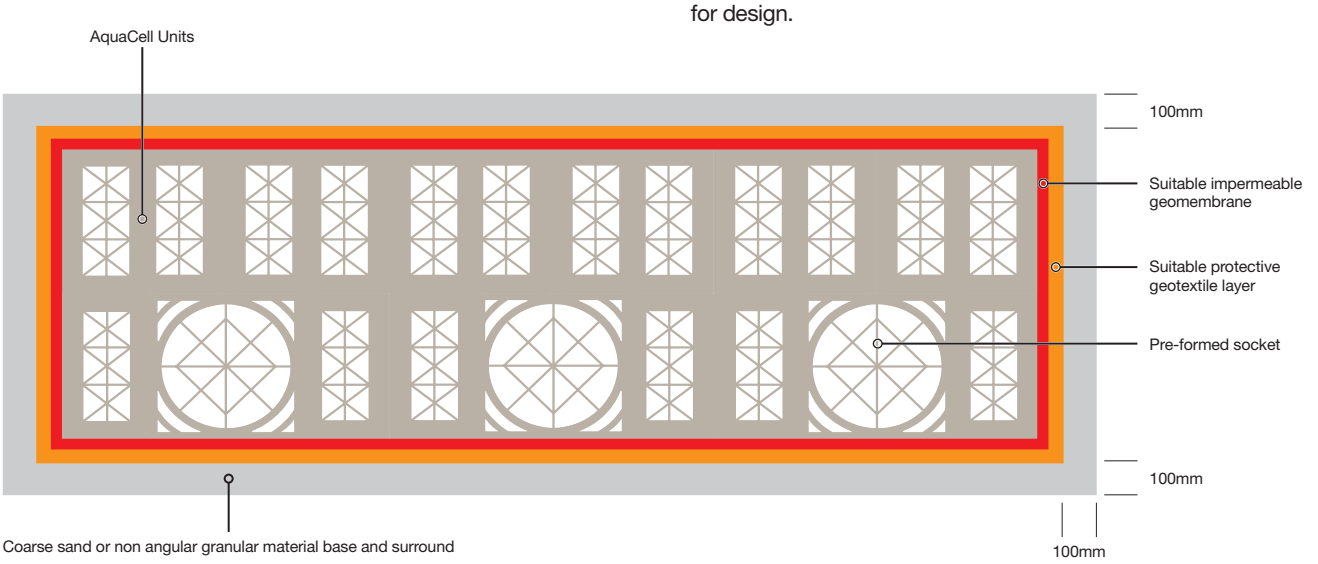
**The geotextile should be selected according to specific site conditions. Typically, however, a 300g non-woven material will be suitable. Specialist advice should be sought if surrounding soil characteristics exhibit a high degree of fines/low infiltration capacity and/or there is a high risk of damage from ground contaminants.*

# Typical Storage Tank Installation Method

## Typical installation procedure

1. Excavate the trench to the required depth ensuring that the plan area is slightly greater than that of the AquaCell units.
2. Lay 100mm bed of coarse sand, level and compact.
3. Lay the geotextile over the base and up the sides of the trench.
4. Lay the geomembrane on top of the geotextile over the base and up the sides of the trench.
5. Lay the AquaCell units parallel with each other. In multiple layer applications, wherever possible, continuous vertical joints should be avoided. AquaCell units can be laid in a 'brick bonded' formation (i.e. to overlap the joints below) – see page 18. For single layer applications use the AquaCell Clips and for multi layers use the AquaCell Clips and the AquaCell Shear Connectors (vertical rods).
6. Wrap the geomembrane around the AquaCell structure and seal to manufacturers recommendations.*
7. If side connections into the AquaCell units is required, (other than the preformed socket), use the appropriate Flange Adaptor (6LB104 or 6LB106). Fix the flange adaptor to the unit using self-tapping screws. Drill a hole through the Flange Adaptor and connect the pipework. (6LB106 should not be used with AquaCell Eco).
8. In order to prevent silt from entering the tank, clogging inlet pipework and reducing storage capacity, it is recommended that the Domestic Silt Trap (6LB300) or the standard Silt Trap (6LB600) is installed prior to the inlet pipework – see page 22 for installation guidelines.
9. Wrap and overlap the geotextile covering the entire AquaCell structure, to protect the geomembrane.
10. Lay 100mm of coarse sand between the trench walls and the AquaCell units and compact.
11. Lay 100mm bed of coarse sand over the geotextile and compact. Backfill with suitable material. .

NB: A storage tank must be vented, and it is recommended that one vent pipe, 110mm in diameter is provided per 7,500 square metres of impermeable catchment area on a site, see page 22 for design.



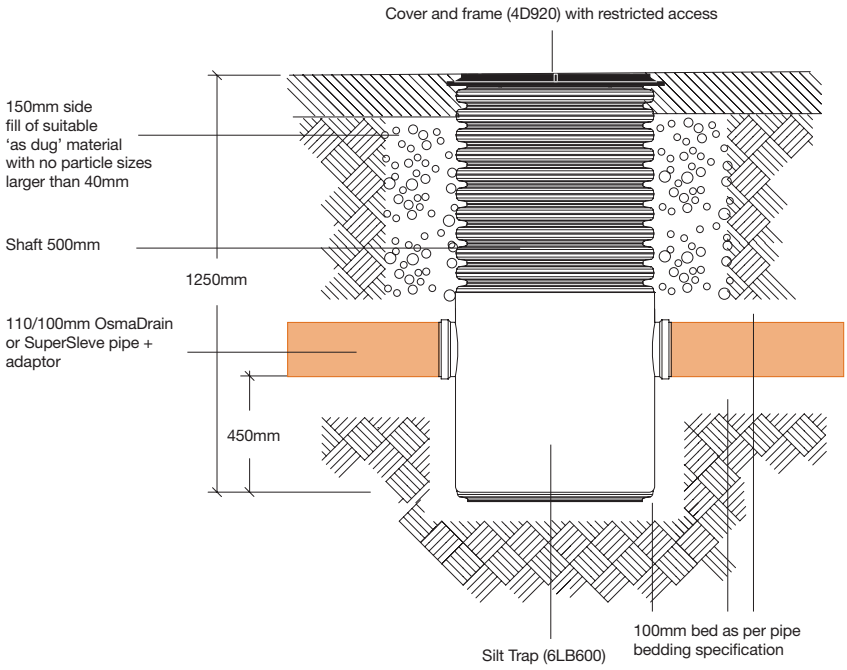

Example shows the use of AquaCell Prime. However, a storage tank can also be installed as shown using any of the other versions of AquaCell units (Eco, Core or Plus) as appropriate.

**For large scale, deep installations a 1mm thick geomembrane is recommended and joints should be sealed using proprietary welding techniques. For further details contact Wavin Technical Design.*

# Installation
# AquaCell Units

## Silt Trap and Air Vent Termination

### Silt Trap

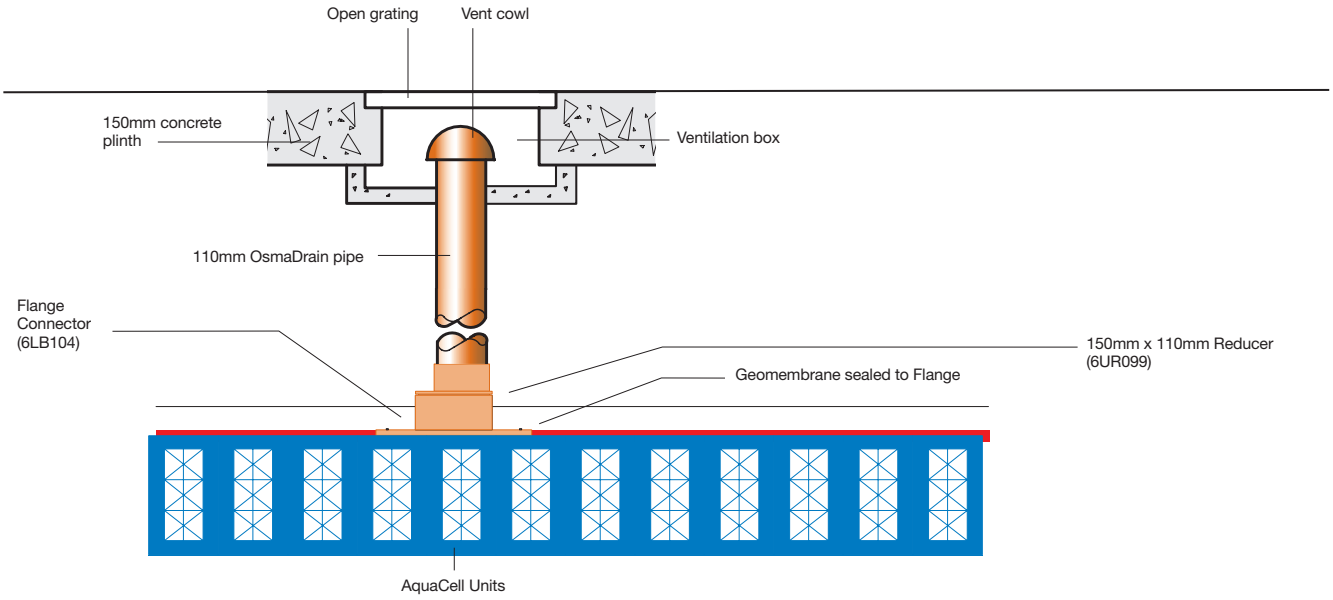



### Typical installation procedure

1. Place the Silt Trap (6LB600) on a minimum of 100mm bed as per pipe bedding specification. Ensure that the trap is as close to the AquaCell unit as possible and in a suitable position to allow pipework connection.
2. Connect the relevant pipework in accordance with standard pipe installation guidelines.
3. Surround the sides of the Silt Trap with 150mm of 'as dug' material, with no particle sizes larger than 40mm.
4. Fit relevant cover and frame.

NOTE: When surrounded by a concrete plinth (150mm x 150mm) the 4D920 Cover and Frame can be used in situations with a loading of up to 50kN (5 tonne).

### Typical Air Vent design




NOTE: It is recommended that all connections and air vent installations in storage applications (using geomembrane) are made using a Flange Adaptor.

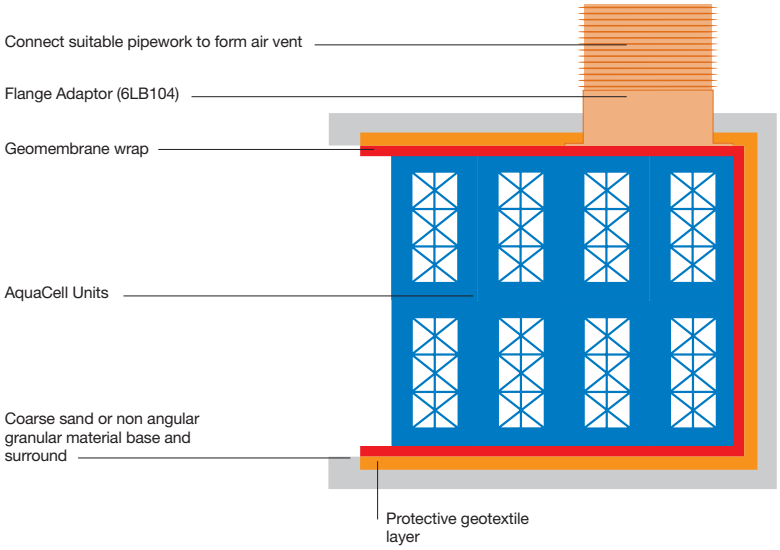
Adhesive or double sided tape should be used between the geomembrane and the flange plate to ensure a watertight seal.

NOTE: It is recommended that one vent pipe, 110mm in diameter, is provided per 7,500 square meters of impermeable catchment area on a site. Please contact Wavin Technical Design for further details.

# Typical Details
# AquaCell Units

## Top Connection for Air Vent

Connect into the top of the AquaCell unit, using Flange Adaptor.

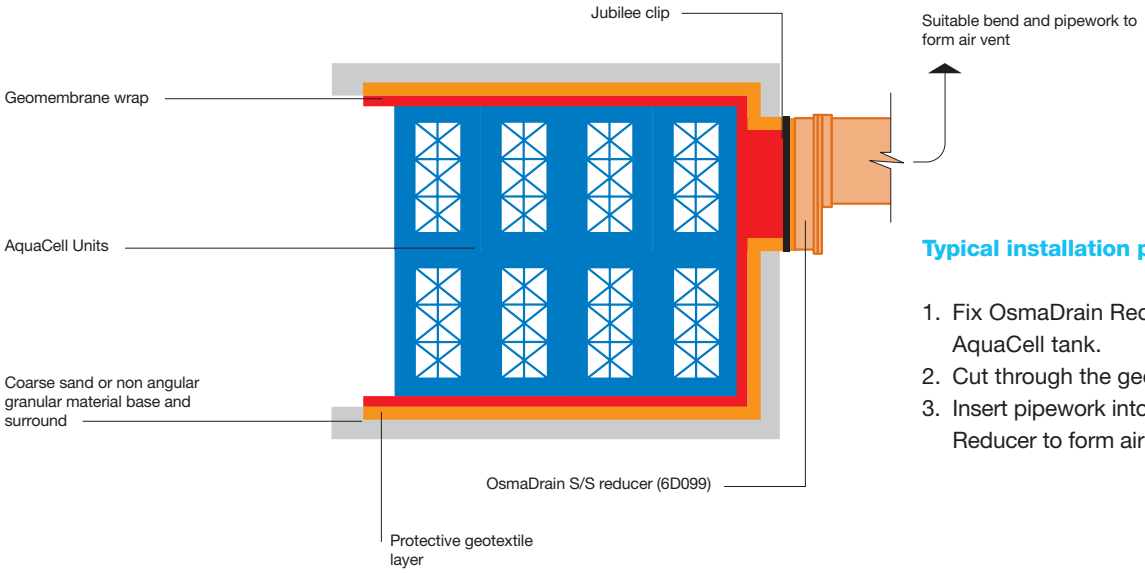



### Typical installation procedure

1. Fix Flange Adaptor to the AquaCell unit with self tapping screws.
2. Cut through the geomembrane.
3. Insert pipework into Flange Adaptor to form air vent.

## Side Connection for Air Vent

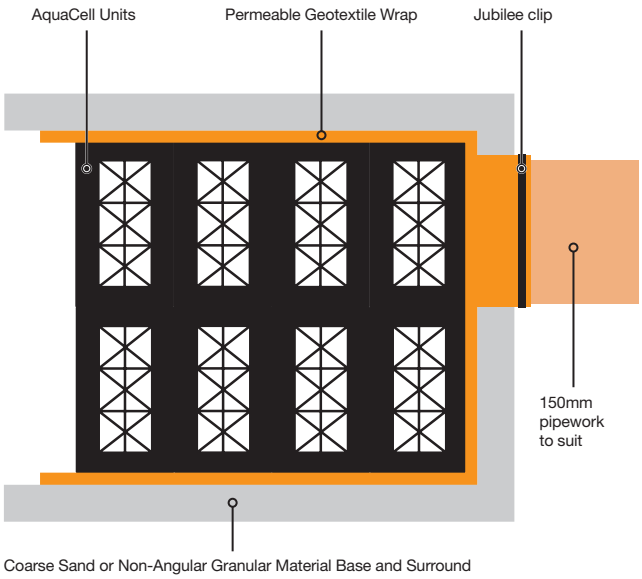
Connect into the side of the AquaCell tank unit using standard Reducer.




### Typical installation procedure

1. Fix OsmaDrain Reducer to the AquaCell tank.
2. Cut through the geomembrane.
3. Insert pipework into OsmaDrain Reducer to form air vent.

# Typical Details
# AquaCell Units

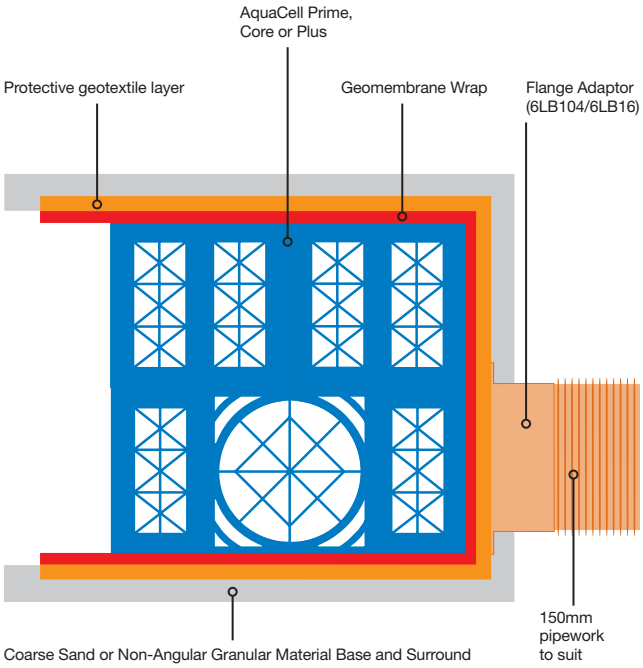



## Connections to AquaCell Units

Connection for soakaway application using either the pre-formed socket (as shown below) or standard adaptors into pre-formed socket*.

*NOTE: For pipework other than 160mm OsmaDrain, these adaptors can be used to connect to the following:

- 6TW141: TwinWall S/S Adaptor connects to 150mm TwinWall
- 6D099: OsmaDrain Adaptor connects to 110mm OsmaDrain
- 4D916: OsmaDrain PE Adaptor connects to 160mm OsmaDrain
- 6UR141: UltraRib S/S Adaptor connects to 150mm UltraRib
- 6D129: OsmaDrain S/S Adaptor connects to 150mm SuperSleve clay. (Use an appropriate reducer, as required, e.g. 6D099)




Connection for storage application using Flange Adaptor at points other than pre-formed socket, (for AquaCell Prime, Core or Plus).

### Installation procedure

1. Fix Flange Adaptor to the AquaCell unit with self tapping screws.
2. Cut through the geomembrane.
3. Insert pipework into Flange Adaptor.

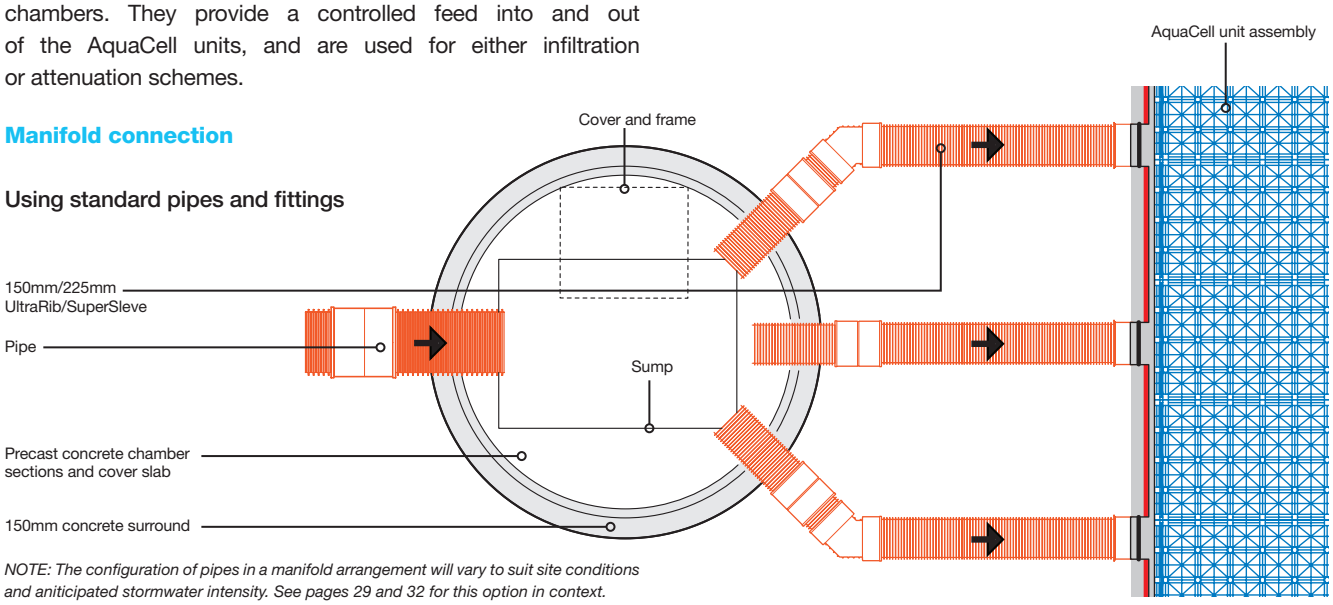
*NOTE: AquaCell Eco is not suitable for side connection using a Flange Adaptor.

# Connection Configurations

The connections shown here in schematic form, are the typical options used to connect AquaCell units to control chambers. They provide a controlled feed into and out of the AquaCell units, and are used for either infiltration or attenuation schemes.

## Manifold connection

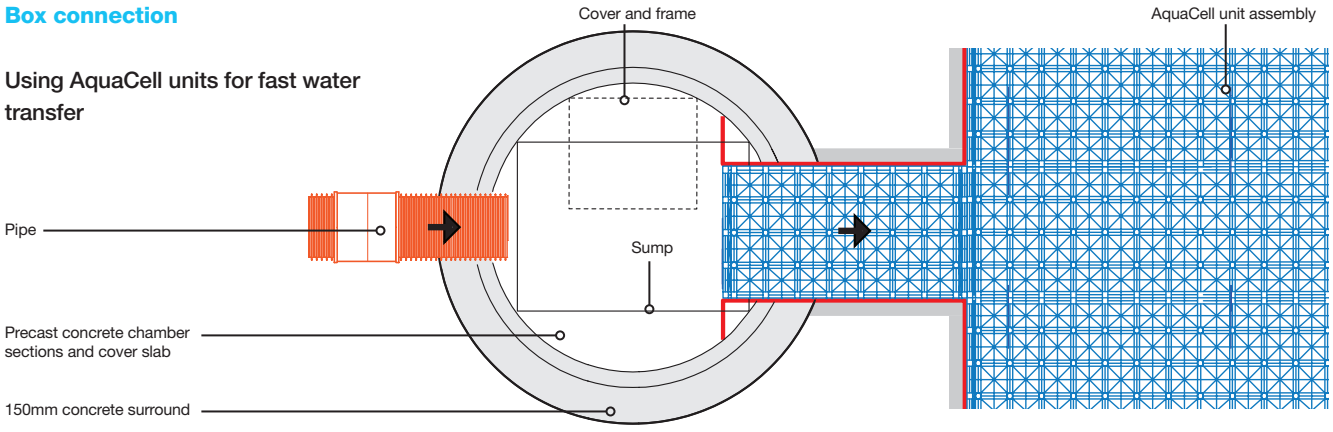
### Using standard pipes and fittings




*NOTE: The configuration of pipes in a manifold arrangement will vary to suit site conditions and aniticipated stormwater intensity. See pages 29 and 32 for this option in context.*

## Box connection

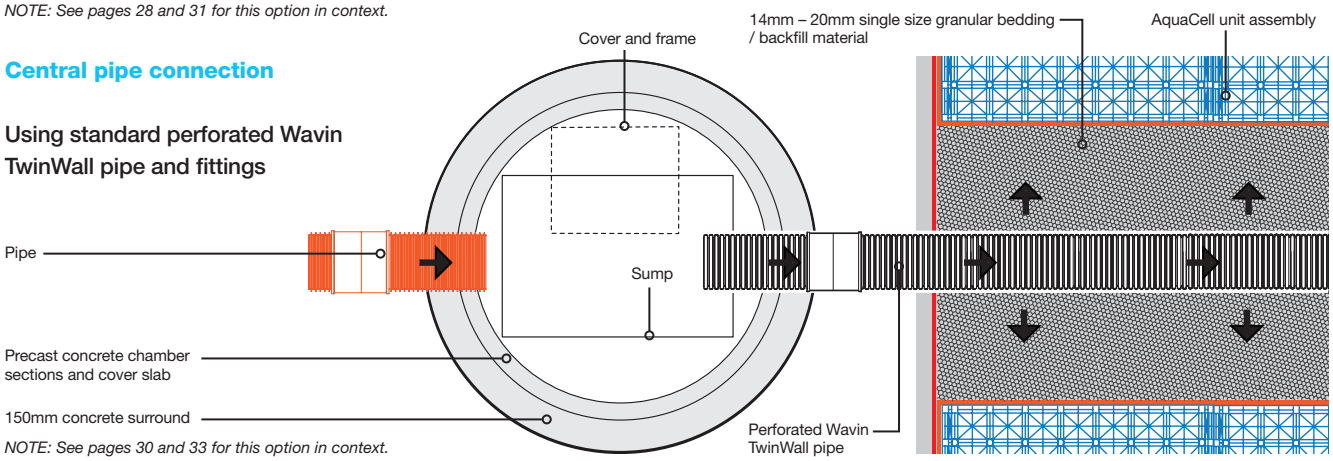
### Using AquaCell units for fast water transfer




*NOTE: See pages 28 and 31 for this option in context.*

## Central pipe connection

### Using standard perforated Wavin TwinWall pipe and fittings

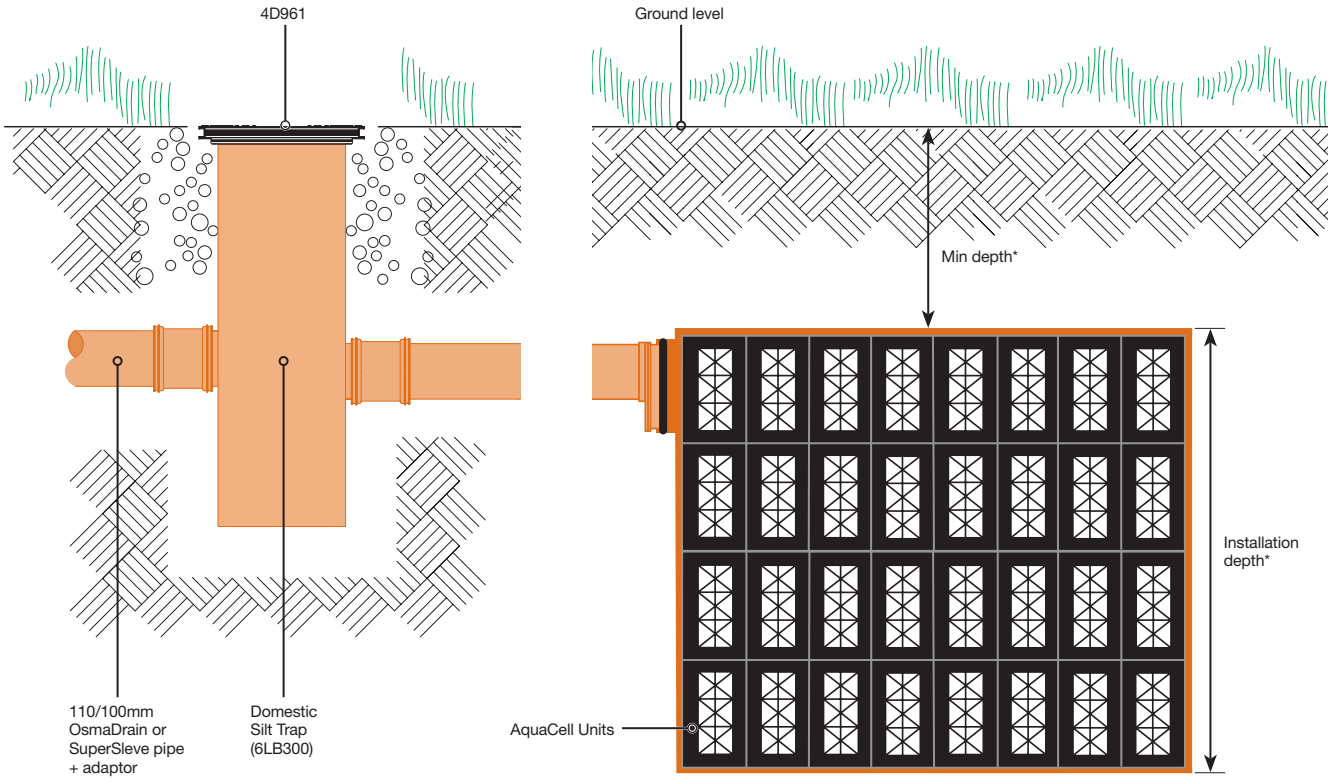



*NOTE: See pages 30 and 33 for this option in context.*

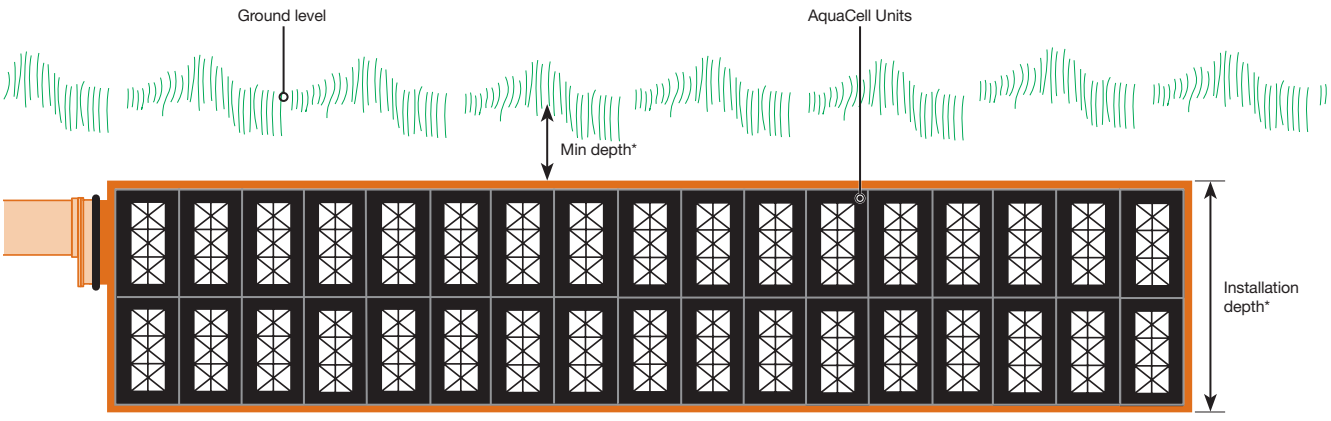
# Typical Details
# AquaCell Units

## Soakaway – Non-Traffic Loading

### Soakaway



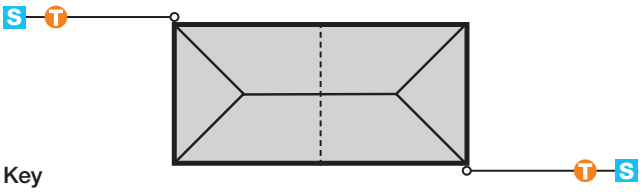

### Trench soakaway




Notes

1. Soakaways should be sited at least 5m away from the building (Ref BS EN 752-4).
2. The exact size and shape of the soakaways are to be determined once all the necessary calculations have been produced.

*For information regarding cover depths and installation depths, see page 17.



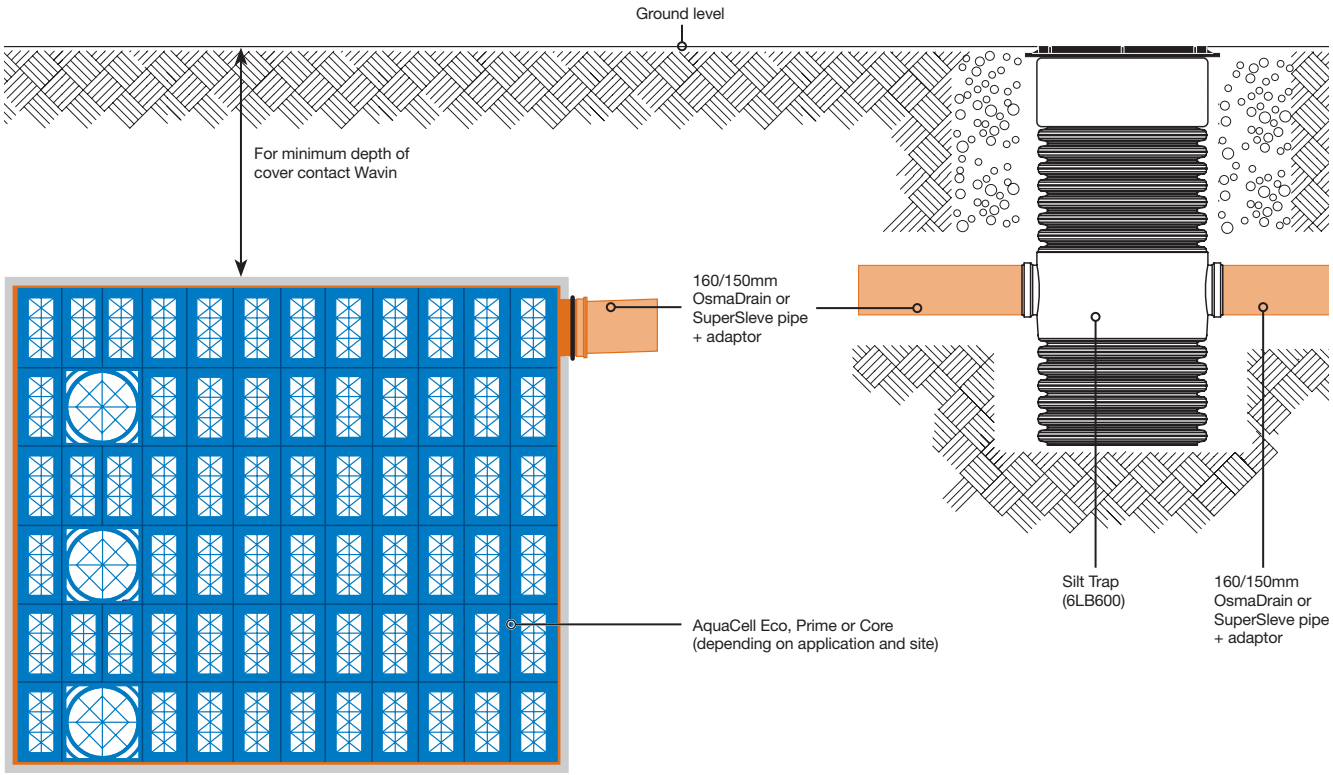

Key

S = AquaCell units soakaway (See note 2)

T = 250mm Dia Silt Trap

# Soakaway – Traffic Loading

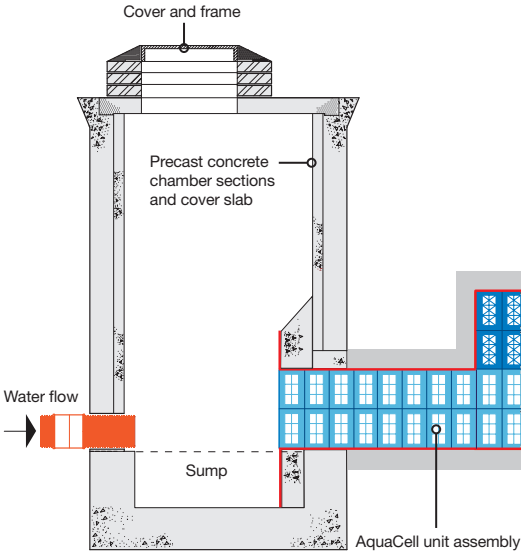
## Soakaway



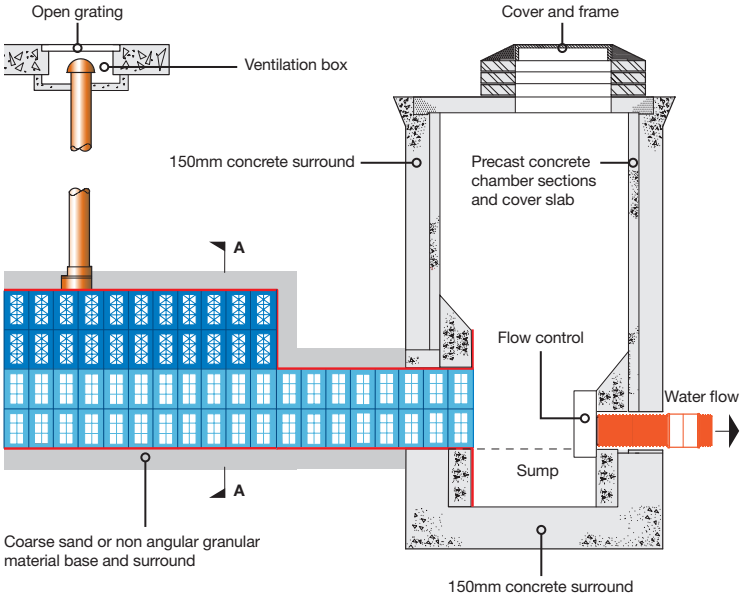
# Typical Details
# AquaCell Units

## On-Line Storage – Box Feed

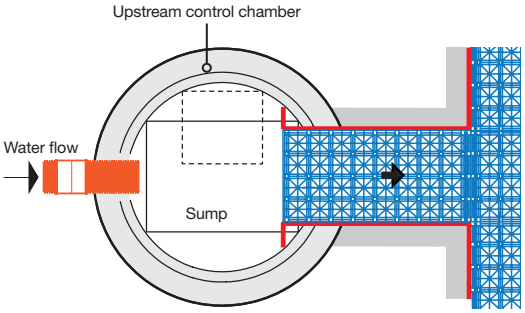
### Long section

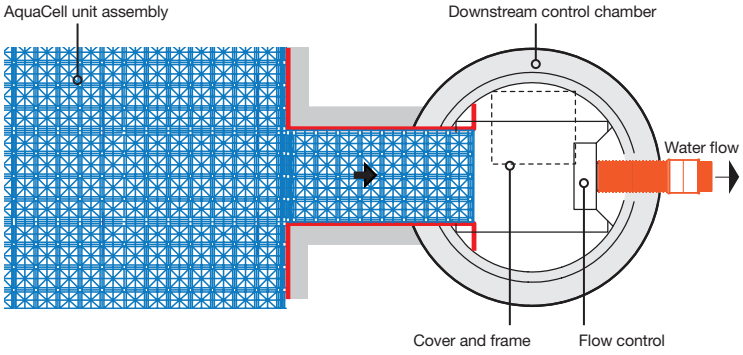



### Typical vent detail

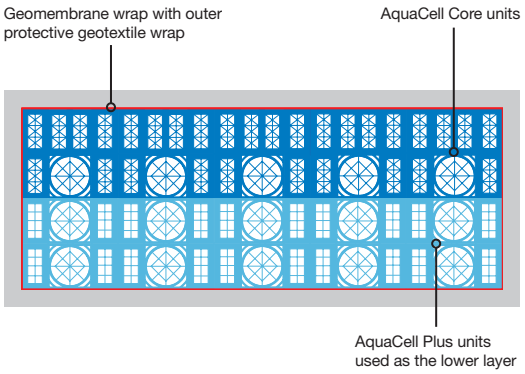



### Plan




### Cross section A-A

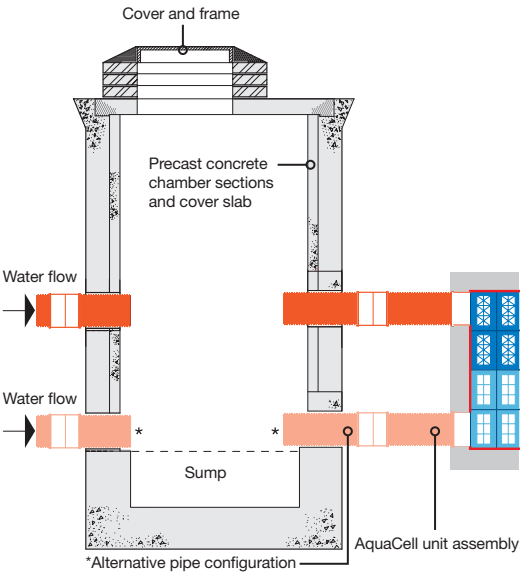



### What happens to the water?

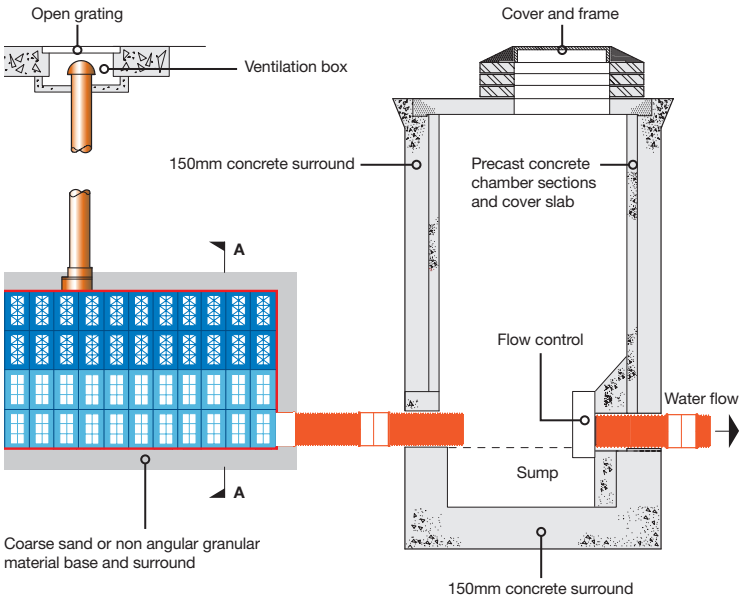
1. The water level in the upstream control chamber rises.
2. Then, during a storm event, the AquaCell storage assembly quickly fills with water via the AquaCell feed connection.
3. After storm event, water flows back out of the AquaCell storage assembly, finding its own level, and into the downstream control chamber.
4. The water then flows through the vortex flow control valve.

# On-Line Storage – Manifold Feed

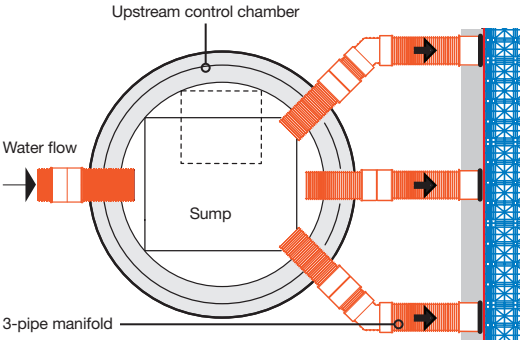
## Long section

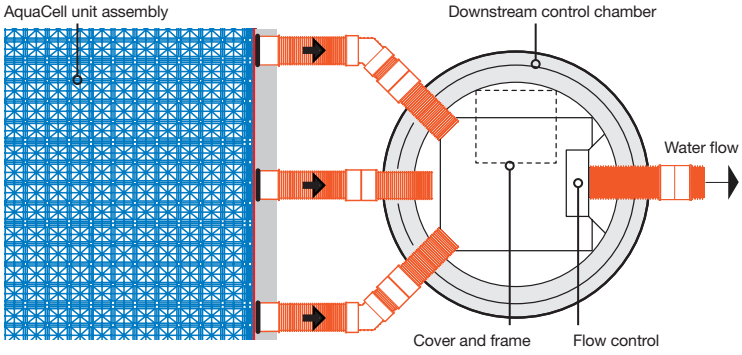



## Typical vent detail

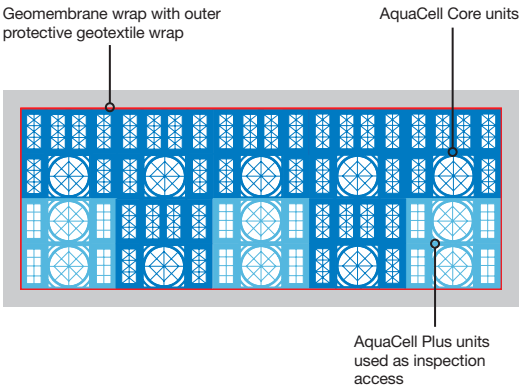



## Plan




## Cross section A-A



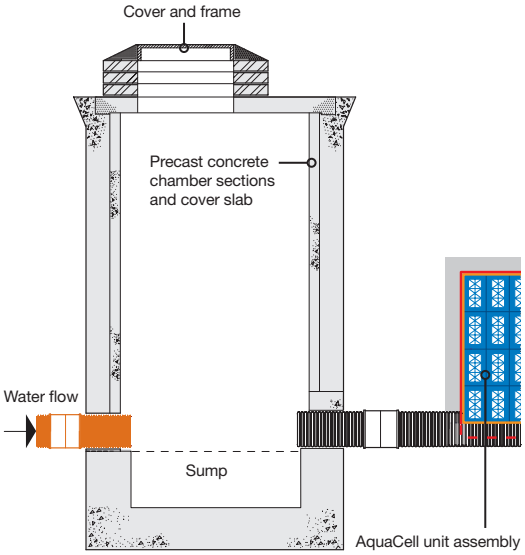

## What happens to the water?

1. The water level in the upstream control chamber rises.
2. During a storm event, the AquaCell storage assembly fills with water via the manifold feed connection.
3. After storm event, water flows back out of the AquaCell storage assembly, finding its own level, and into the downstream control chamber.
4. The water then flows through the vortex flow control valve.

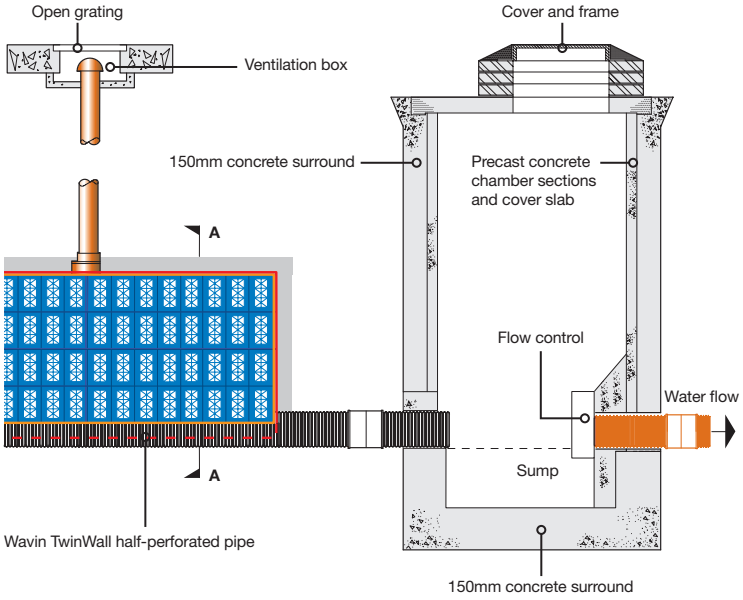
# Typical Details
# AquaCell Units

## On-Line Storage – Central Pipe Feed

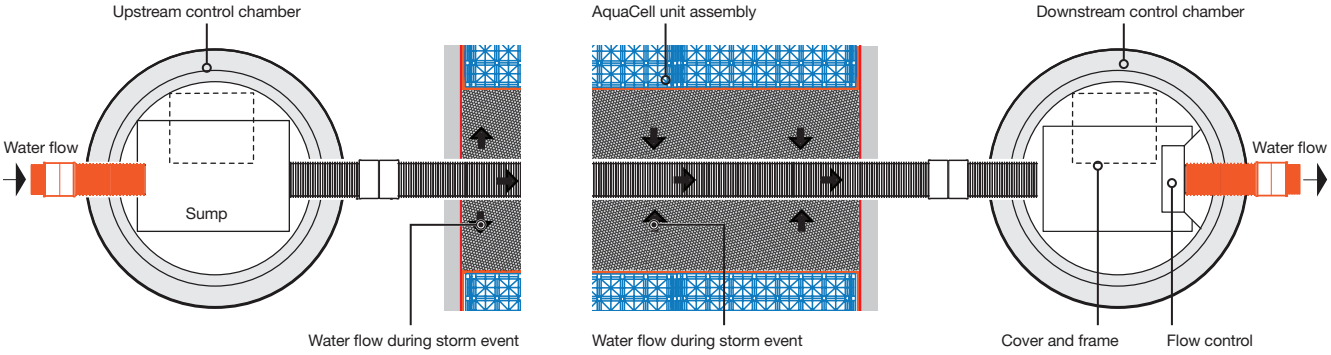
### Long section



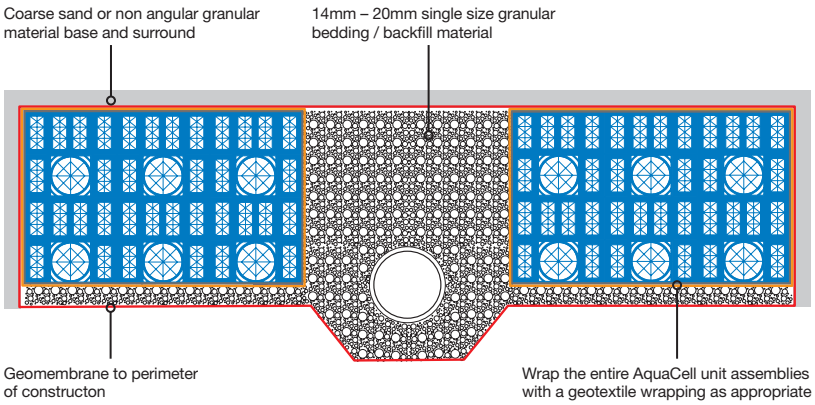

### Typical vent detail




### Plan




### Cross section A-A

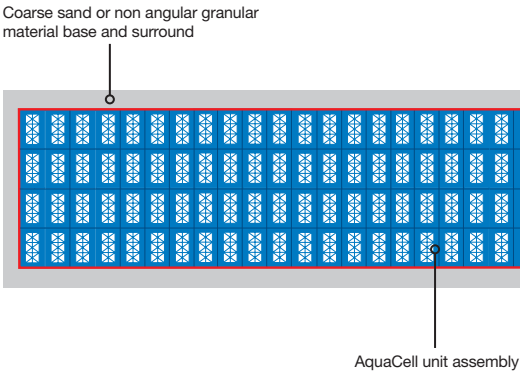



### What happens to the water?

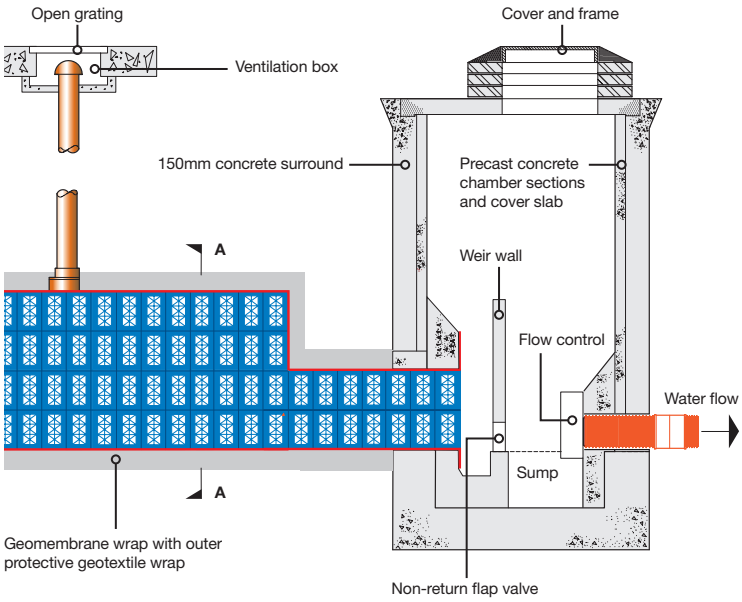
1. The water level in the upstream control chamber rises.
2. AquaCell storage assemblies fill with water via the central pipe connection and percolate's through the granular bedding material.
3. After storm event, water flows back out of the AquaCell storage assemblies, finding its own level, and into the downstream control chamber.
4. The water then flows through the vortex flow control valve.

# Off-Line Storage – Box Feed

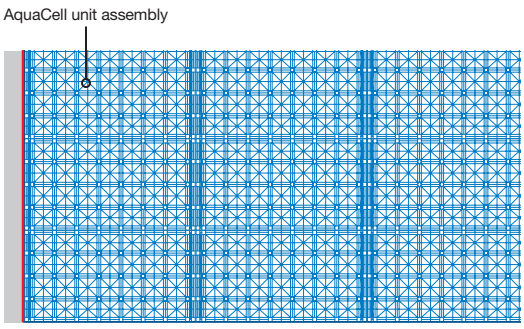
## Long section

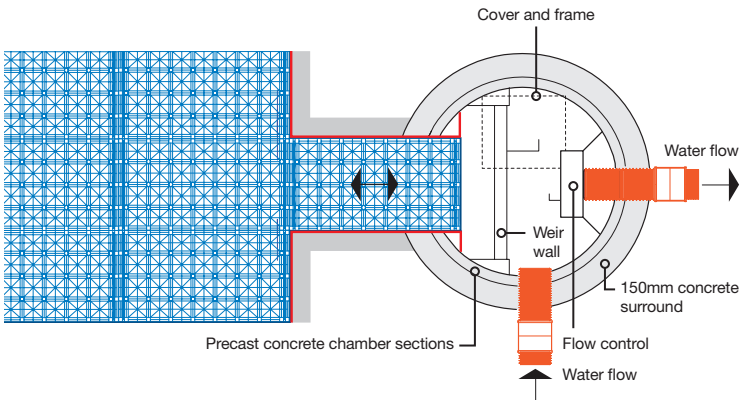



## Typical vent detail

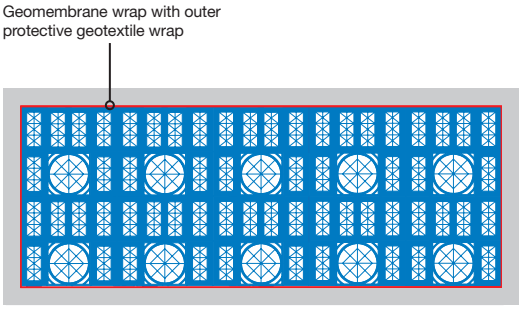



## Plan




## Cross section A-A



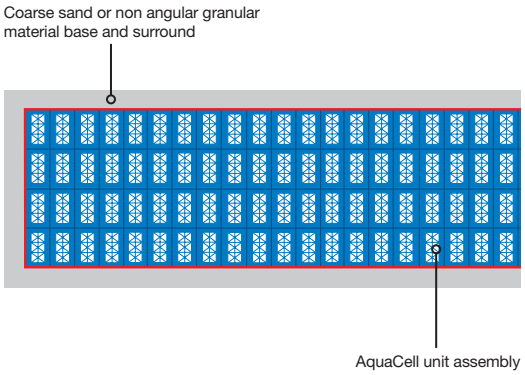

## What happens to the water?

1. Control chamber fills with water, up to the top of the weir wall.
2. The water overflows the weir wall and enters the AquaCell storage assembly via the AquaCell connection.
3. The AquaCell storage assembly fills with water.
4. After storm event, water flows back out of the AquaCell storage assembly, finding its own level, and through the non-return flap valve at the bottom of the weir wall.
5. The water then flows through the vortex flow control valve.

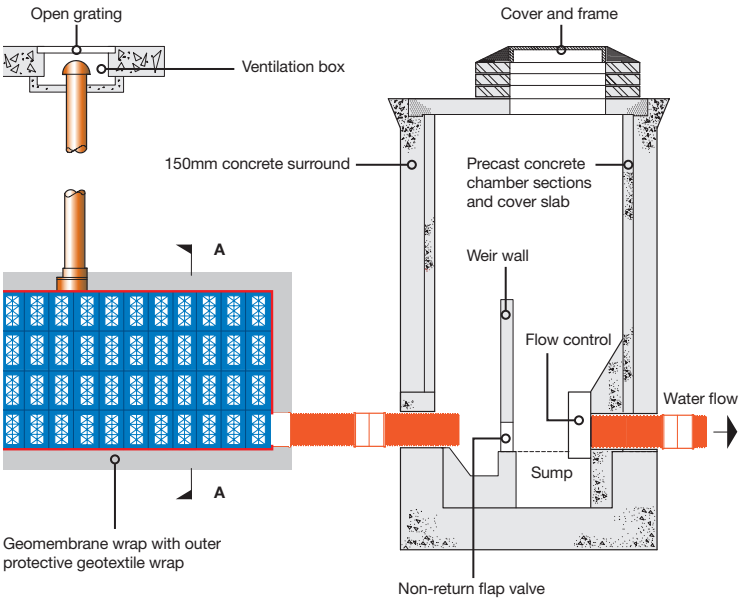
# Typical Details
# AquaCell Units

## Off-Line Storage – Manifold Feed

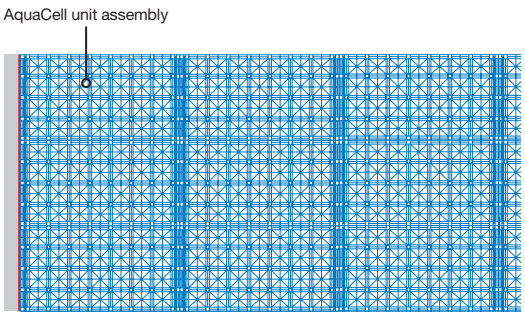
### Long section

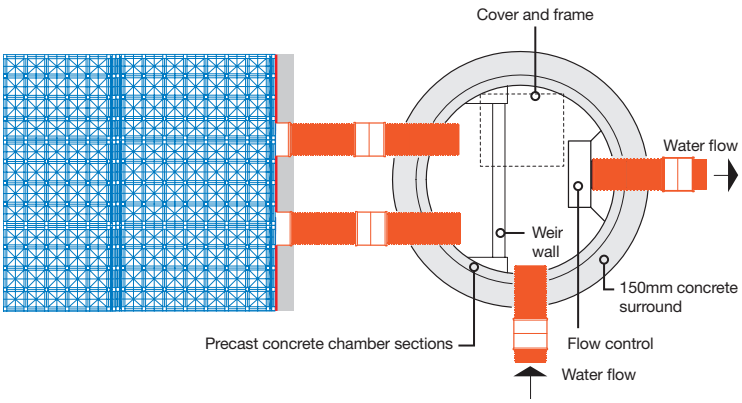



### Typical vent detail

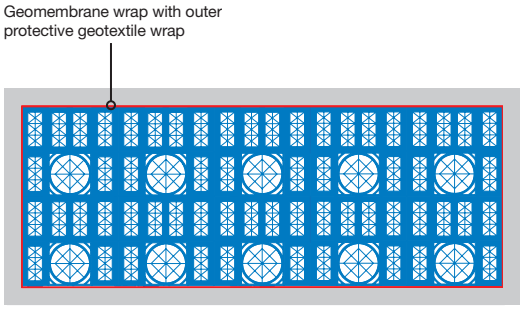



### Plan




### Cross section A-A

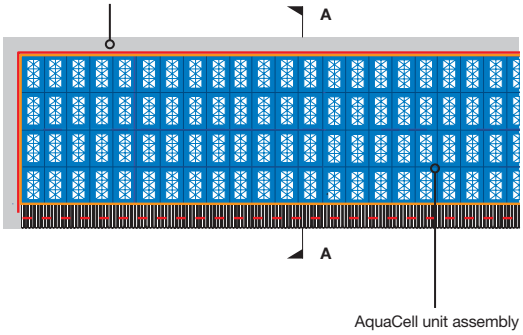



### What happens to the water?

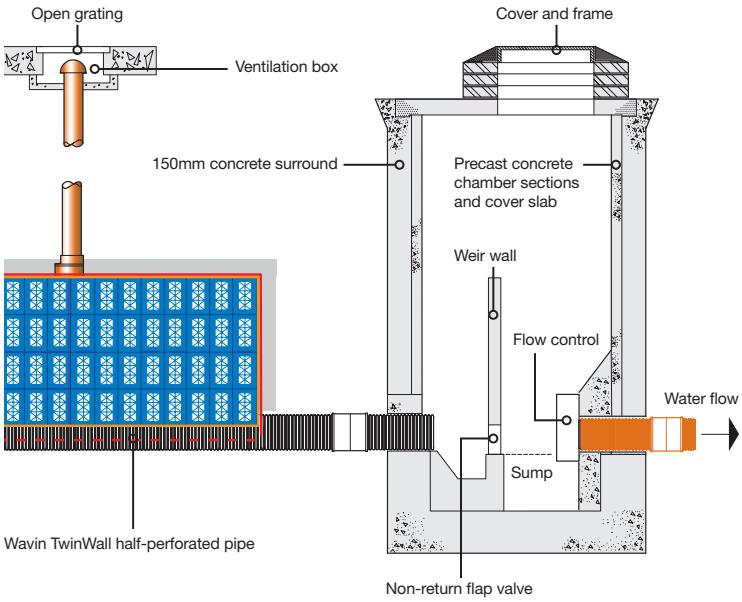
1. Control chamber fills with water, up to the top of the weir wall.
2. The water overflows the weir wall and enters the AquaCell storage assembly via the manifold connection.
3. The AquaCell storage assembly fills with water.
4. After storm event, water flows back out of the AquaCell storage assembly, finding its own level, and through the non-return flap valve at the bottom of the weir wall.
5. The water then flows through the vortex flow control valve.

# Off-Line Storage – Central Pipe Feed

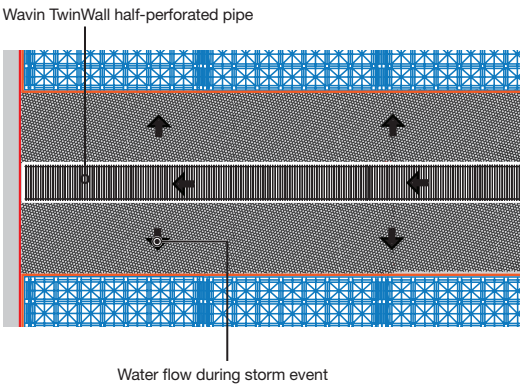
## Long section

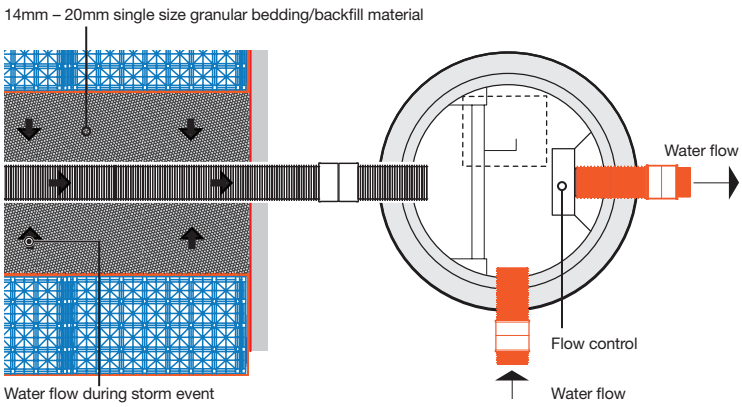



## Typical vent detail

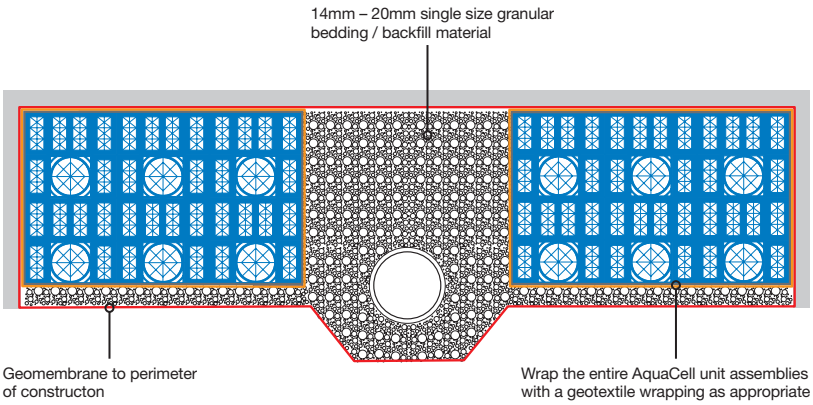



## Plan




## Cross section A-A

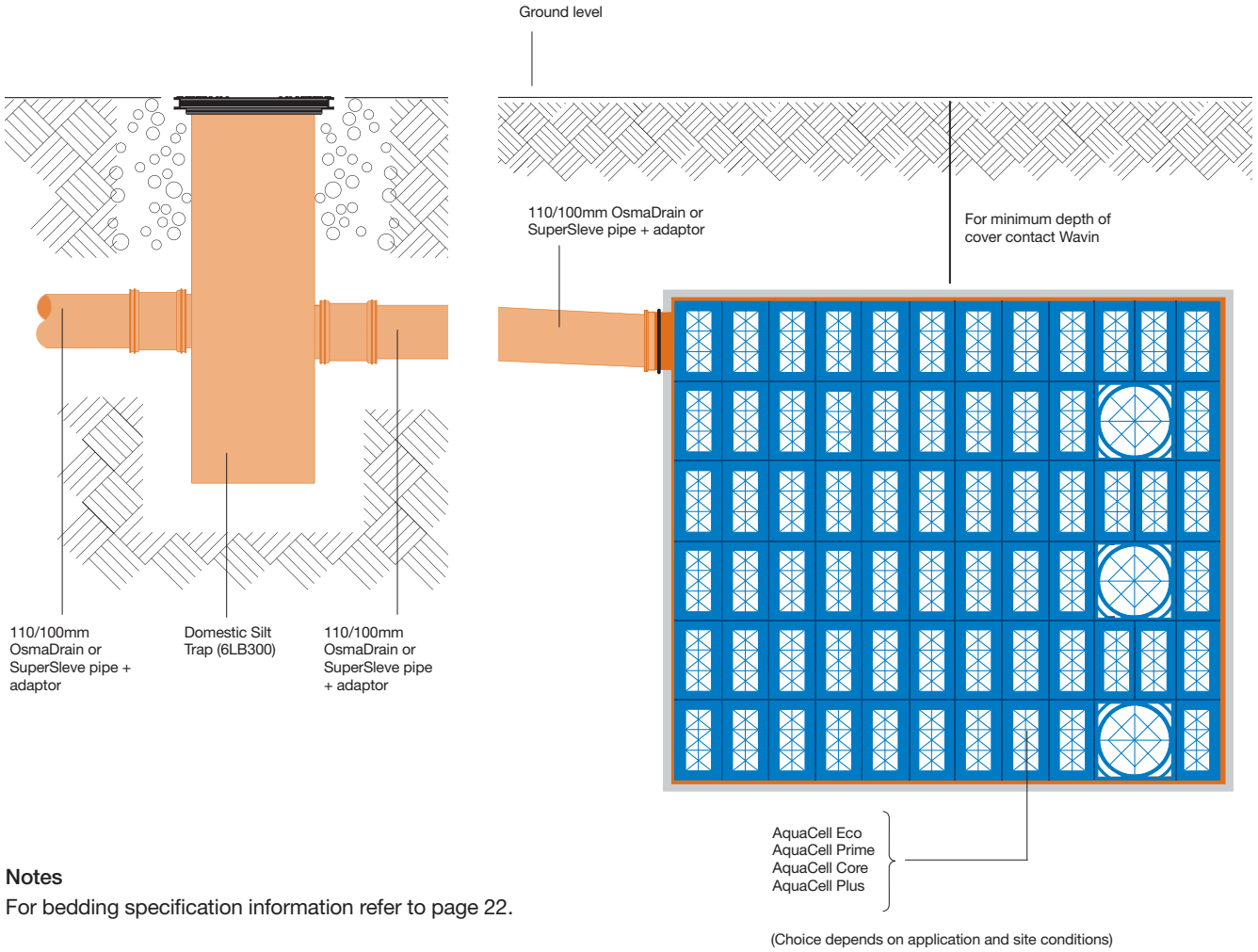



## What happens to the water?

1. Control chamber fills with water, up to the top of the weir wall.
2. The water overflows the weir wall and enters the AquaCell storage assemblies via the central pipe connection and percolate's through the granular bedding material.
3. The AquaCell storage assembly fills with water.
4. After storm event, water flows back out of the AquaCell storage assemblies, finding its own level, and through the non-return flap valve at the bottom of the weir wall.
5. The water then flows through the vortex flow control valve

# Typical Details
# AquaCell Units

## Soakaway or Storage Tank – With Silt Trap




**Notes**

For bedding specification information refer to page 22.

The silt trap can be used in conjunction with a soakaway (as shown) or a storage tank.

CONNECT TO BETTER

# Wavin Stormwater Management
# AquaCell Systems

## To Achieve Optimum Stormwater Management

The Wavin Stormwater Management System represents a combination of specialist expertise and technology from Wavin. This is specifically focused on achieving the optimum solution for each project requiring effective and sustainable management of stormwater.

Such a solution may be entirely based on a tailored combination of our engineered systems.

In other cases, Wavin Stormwater Systems can be integrated with 'soft' SuDS techniques, such as ponds and swales, to help achieve the optimal solution.

## Other Wavin Stormwater Systems

### Oil Separators

A comprehensive range of NS Oil Separators, tested to EN 858 Class 1 standard and complying with PPG-3 legislation for England and Wales.

### Channel Drainage

Environmentally-friendly polyester concrete systems to cover all EN 1433 load classes. With outstanding chemical resistance and low water absorption:

- Medium duty range for applications up to C250
- Heavy duty range for D400 / F900 application

### Plastic Pervious Paving

High performance, plastic pervious paving system, for use in all types of Sustainable Drainage systems (SuDS).

- AquaGrid 50 – for use in landscape projects
- AquaGrid 75 – for use in car parking areas

### Flow Control Valves

The Wavin+Mosbaek range of vortex flow control valves are manufactured from stainless steel and are custom-built to meet exact site requirements:

- Tornado, Hurricane and Typhoon stainless steel flow control valves with no moving parts of power needs

### Anti-flood Valves

- Anti-Flood Valves that comply with EN 13546-1, and Part H1– Sections 2.8-2.12 of Building Regulations

### Below Ground Water Transportation

Wavin Stormwater installations can draw from an extensive choice of plastic and clay water conveyance systems, including:

- OsmaDrain solid wall PVC-U pipe system
- Structured wall plastic UltraRib and TwinWall pipe systems
- SuperSleve and HepSeal clay pipe systems

Other options include perforated pipe for land drainage: WavinCoil plastic and HepLine clay – and a full range of Wavin Non-Entry Inspection Chambers.

### Rainwater Re-Use

The Wavin Stormwater Water Range can also exploit stored rain water. These reduce the use of potable mains water for non-potable purposes.

## The Wavin Stormwater Service

### Precision and Performance

The Wavin Technical team are ready to contribute to any stormwater management project.

This may be at the very earliest stage – or when initial plans have already been developed. There are no pre-conditions with regards to you requesting Wavin to become involved.

We are ready to:

- Originate project design
- Comment on an existing design
- Help validate a specification – or, where we see an opportunity to do so, to suggest how it may be enhanced
- Check, clarify and confirm maximum cost-efficiency, performance capability and regulatory compliance

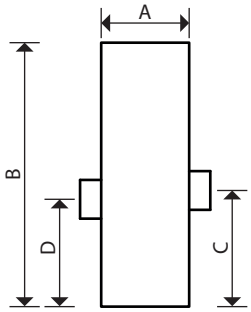
This involvement is a core part of the Wavin principle. It extends beyond the systems and components.

To discuss your stormwater management project, call 0844 856 5161 or email technical.design@wavin.co.uk.

# Product Details
# Supplementary Items

## Silt Trap – Domestic – for non loaded applications





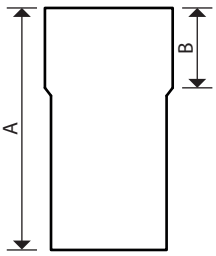

### Domestic Silt Trap

- 250mm x 750mm depth
- With 110mm diameter inlet and outlet spigots
- For use with the 4D961 cover and frame

Material: PVC-U

| Nominal Size (mm) | Part Number | Dimensions (mm) A | B | C | D |
|---|---|---|---|---|---|
| – | 6LB300 | 250 | 750 | 330 | 305 |





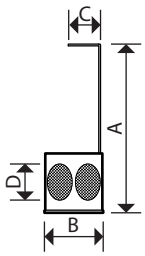

### Extension Piece for 6LB300

- 250mm x 500mm depth (effective length = 335mm)

Material: PVC-U

| Nominal Size (mm) | Part Number | Dimensions (mm) A | B |
|---|---|---|---|
| – | 6LB301 | 500 | 165 |






### Silt Trap Bucket for 6LB300

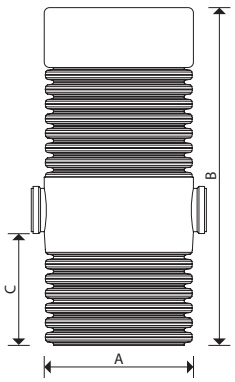
- 200mm x 210mm depth

Material: PVC-U/Polypropylene

| Nominal Size (mm) | Part Number | Dimensions (mm) A | B | C | D |
|---|---|---|---|---|---|
| – | 6LB302 | 597 | 208 | 114 | 127.5 |

## Silt Trap – Trafficked






### Silt Trap

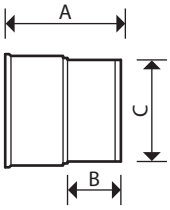
- 500mm diameter x 1.25m depth
- 160mm diameter inlet and outlets

Material: Polypropylene

| Nominal Size (mm) | Part Number | Dimensions (mm) A | B | C |
|---|---|---|---|---|
| – | 6LB600 | 500 | 1250 | 450 |

## Ancillaries





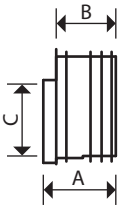

### S/S Adaptor

- 6UR socket x 160mm BS EN 1401 spigot

Material: PVC-U

| Nominal Size (mm) | Part Number | Dimensions (mm) A | B | C |
|---|---|---|---|---|
| 150 | 6UR141 | 180 | 84 | 160 |





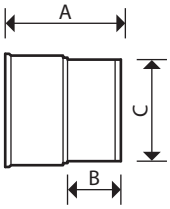

### S/S Level Invert Reducer

- To 110mm OsmaDrain spigot

Material: PVC-U

| Nominal Size (mm) | Part Number | Dimensions (mm) A | B | C |
|---|---|---|---|---|
| 150x110 | 6UR099 | 115 | 95 | 111 |






### S/S Adaptor

- 6TW socket x 160mm BS EN 1401 spigot

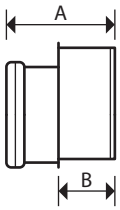
Material: PVC-U

| Nominal Size (mm) | Part Number | Dimensions (mm) A | B | C |
|---|---|---|---|---|
| 150 | 6TW141 | 180 | 84 | 160 |

# Product Details
# AquaCell Systems

## Ancillaries






### S/S Level Invert Reducer

- To 110 OsmaDrain

Material: PVC-U

| Nominal Size (mm) | Part Number | Dimensions (mm) A | B |
|---|---|---|---|
| 160 | 6D099 | 127 | 70 |



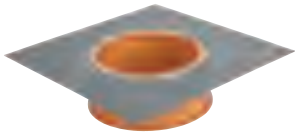


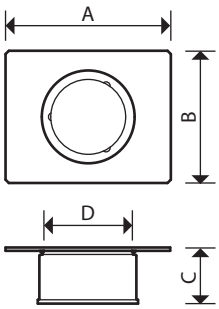

### P/E Adaptor

- 160mm spigot connection

Material: PVC-U

| Nominal Size (mm) | Part Number | Dimensions (mm) A |
|---|---|---|
| 160 | 4D916 | 325 |





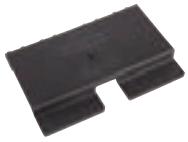

### Flange Adaptor

- 6UR socket for connection of UltraRib to infiltration unit at positions other than preformed opening
- 9UR socket for connection of UltraRib to infiltration unit (can only be used with AquaCell Prime, Core and Plus)

Material: PVC-U

| Nominal Size (mm) | Part Number | Dimensions (mm) A | B | C | D |
|---|---|---|---|---|---|
| 150 | 6LB104 | 300 | 300 | 100 | 160.3 |
| 225 | 6LB106 | 500 | 400 | 120 | 226.5 |

## Spares



### AquaCell Clip

- For jointing all AquaCell units horizontally

Material: Polypropylene

| Nominal Size (mm) | Part Number |
|---|---|
| – | 6LB105 |

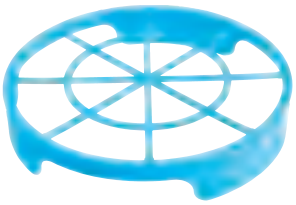


### AquaCell Shear Connector

- For jointing all AquaCell units vertically

Material: Polypropylene

| Nominal Size (mm) | Part Number |
|---|---|
| – | 6LB102 |



### AquaCell Plus End Cap

- For blocking off unused inlets/outlets

Material: Polypropylene

| Nominal Size (mm) | Part Number |
|---|---|
| – | 6LB201 |

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wavin
CONNECT TO BETTER

WM424 – September 2016

# **Appendix H** - Kingspan Fuel & Oil Separators

# SEPARATORS

A RANGE OF FUEL/OIL SEPARATORS
FOR PEACE OF MIND

Kingspan

Klargester

60 YEARS OF
Expertise &
1955–2015 Innovation



# Separators

## A RANGE OF FUEL/OIL SEPARATORS FOR PEACE OF MIND

Surface water drains normally discharge to a watercourse or indirectly into underground waters (groundwater) via a soakaway. Contamination of surface water by oil, chemicals or suspended solids can cause these discharges to have a serious impact on the receiving water.

The Environment Regulators, Environment Agency, England and Wales, SEPA, Scottish Environmental Protection Agency in Scotland and Department of Environment & Heritage in Northern Ireland, have published guidance on surface water disposal, which offers a range of means of dealing with pollution both at source and at the point of discharge from site (so called 'end of pipe' treatment). These techniques are known as 'Sustainable Drainage Systems' (SuDS).

Where run-off is draining from relatively low risk areas such as car-parks and non-operational areas, a source control approach, such as permeable surfaces or infiltration trenches, may offer a suitable means of treatment, removing the need for a separator.

Oil separators are installed on surface water drainage systems to protect receiving waters from pollution by oil, which may be present due to minor leaks from vehicles and plant, from accidental spillage.

Effluent from industrial processes and vehicle washing should normally be discharged to the foul sewer (subject to the approval of the sewerage undertaker) for further treatment at a municipal treatment works.

### SEPARATOR STANDARDS AND TYPES

A British (and European) standard (EN 858-1 and 858-2) for the design and use of prefabricated oil separators has been adopted. New prefabricated separators should comply with the standard.

### SEPARATOR CLASSES

The standard refers to two 'classes' of separator, based on performance under standard test conditions.

### CLASS I

Designed to achieve a concentration of less than 5mg/l of oil under standard test conditions, should be used when the separator is required to remove very small oil droplets.

### CLASS II

Designed to achieve a concentration of less than 100mg/l oil under standard test conditions and are suitable for dealing with discharges where a lower quality requirement applies (for example where the effluent passes to foul sewer).

Both classes can be produced as full retention separators. The oil concentration limits of 5 mg/l and 100 mg/l are only applicable under standard test conditions. It should not be expected that separators will comply with these limits when operating under field conditions.

### FULL RETENTION SEPARATORS

Full retention separators treat the full flow that can be delivered by the drainage system, which is normally equivalent to the flow generated by a rainfall intensity of 65mm/hr.

On large sites, some short term flooding may be an acceptable means of limiting the flow rate and hence the size of full retention systems.

Get in touch for a **FREE** professional site visit and a representative will contact you within 5 working days to arrange a visit.
**helpingyou@klargester.com**
to make the right decision
or call **028 302 66799**

### BYPASS SEPARATORS

Bypass separators fully treat all flows generated by rainfall rates of up to 6.5mm/hr. This covers over 99% of all rainfall events. Flows above this rate are allowed to bypass the separator. These separators are used when it is considered an acceptable risk not to provide full treatment for high flows, for example where the risk of a large spillage and heavy rainfall occurring at the same time is small.

### FORECOURT SEPARATORS

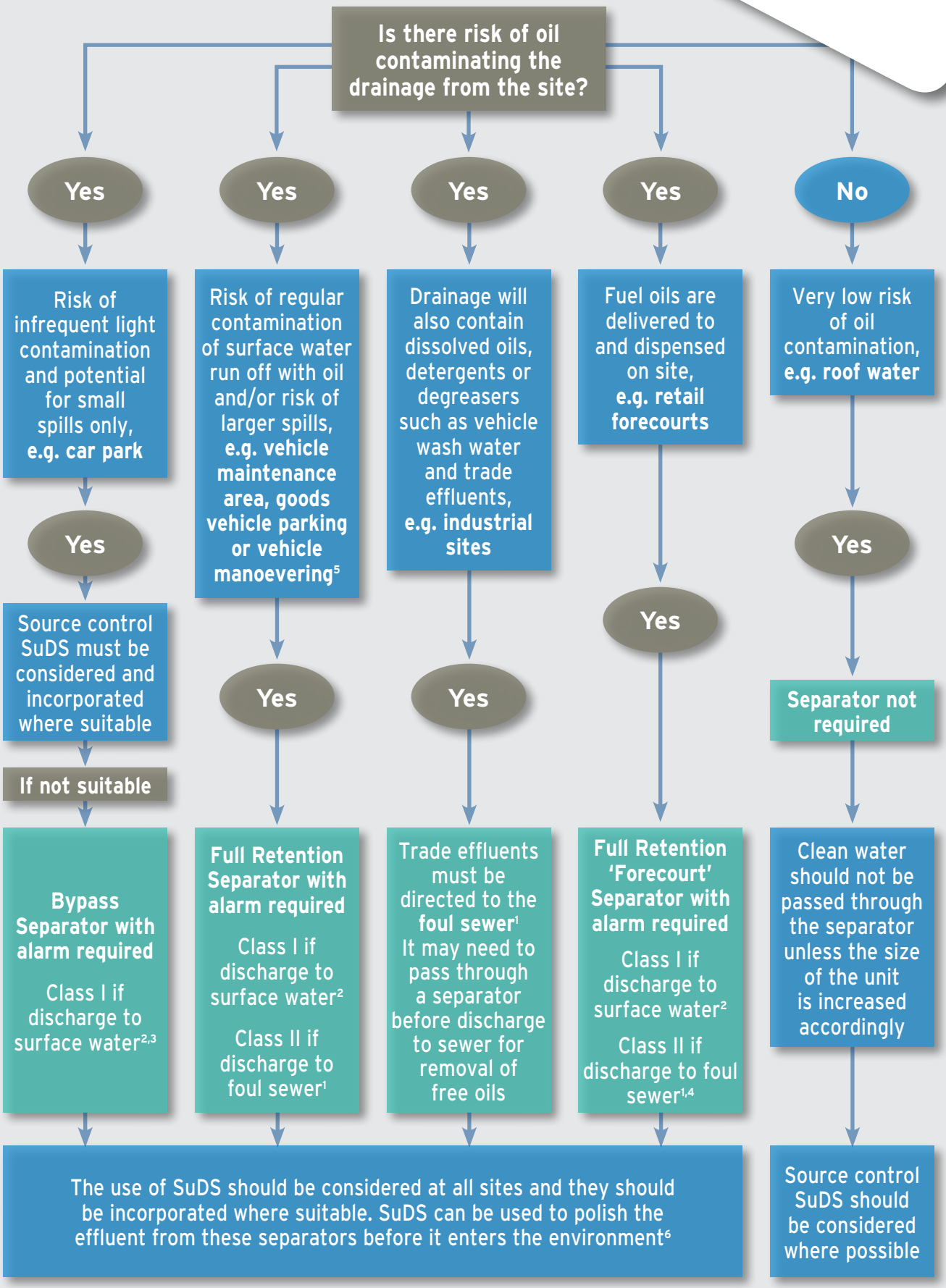
Forecourt separators are full retention separators specified to retain on site the maximum spillage likely to occur on a petrol filling station. They are required for both safety and environmental reasons and will treat spillages occurring during vehicle refuelling and road tanker delivery. The size of the separator is increased in order to retain the possible loss of the contents of one compartment of a road tanker, which may be up to 7,600 litres.

### SELECTING THE RIGHT SEPARATOR

The chart on the following page gives guidance to aid selection of the appropriate type of fuel/oil separator for use in surface water drainage systems which discharge into rivers and soakaways.

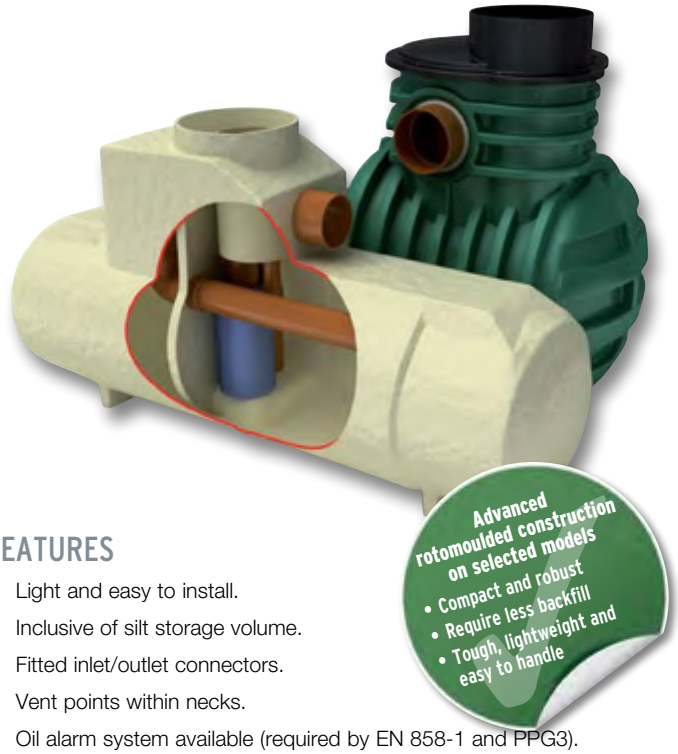
For further detailed information, please consult the Environment Agency Pollution Prevention Guideline 03 (PPG 3) 'Use and design of oil separators in surface water drainage systems' available from their website.

Kingspan Klargester has a specialist team who provide technical assistance in selecting the appropriate separator for your application.




1 You must seek prior permission from your local sewer provider before you decide which separator to install and before you make any discharge.
2 You must seek prior permission from the relevant environmental body before you decide which separator to install.
3 In this case, if it is considered that there is a low risk of pollution a source control SuDS scheme may be appropriate.
4 In certain circumstances, the sewer provider may require a Class 1 separator for discharges to sewer to prevent explosive atmospheres from being generated.
5 Drainage from higher risk areas such as vehicle maintenance yards and goods vehicle parking areas should be connected to foul sewer in preference to surface water.
6 In certain circumstances, a separator may be one of the devices used in the SuDS scheme. Ask us for advice.

# Bypass NSB RANGE




## APPLICATION

Bypass separators are used when it is considered an acceptable risk not to provide full treatment, for very high flows, and are used, for example, where the risk of a large spillage and heavy rainfall occurring at the same time is small, e.g.

- Surface car parks.
- Roadways.
- Lightly contaminated commercial areas.

## PERFORMANCE

Klargester were one of the first UK manufacturers to have separators tested to EN 858-1. Klargester have now added the NSB bypass range to their portfolio of certified and tested models. The NSB number denotes the maximum flow at which the separator treats liquids. The British Standards Institute (BSI) tested the required range of Kingspan Klargester Bypass separators and certified their performance in relation to their flow and process performance assessing the effluent qualities to the requirements of EN 858-1. Klargester bypass separator designs follow the parameters determined during the testing of the required range of bypass separators.

Each bypass separator design includes the necessary volume requirements for:

- Oil separation capacity.
- Oil storage volume.
- Silt storage capacity.
- Coalescer.

The unit is designed to treat 10% of peak flow. The calculated drainage areas served by each separator are indicated according to the formula given by PPG3 NSB = 0.0018A(m2). Flows generated by higher rainfall rates will pass through part of the separator and bypass the main separation chamber.

Class I separators are designed to achieve a concentration of 5mg/litre of oil under standard test conditions.

## FEATURES

- Light and easy to install.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Vent points within necks.
- Oil alarm system available (required by EN 858-1 and PPG3).
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- GRP or rotomoulded construction (subject to model).

To specify a nominal size bypass separator, the following information is needed:-

- The calculated flow rate for the drainage area served. Our designs are based on the assumption that any interconnecting pipework fitted elsewhere on site does not impede flow into or out of the separator and that the flow is not pumped.
- The drain invert inlet depth.
- Pipework type, size and orientation.

### SIZES AND SPECIFICATIONS

| UNIT NOMINAL SIZE | FLOW (l/s) | PEAK FLOW RATE (l/s) | DRAINAGE AREA (m²) | STORAGE CAPACITY (litres) SILT | OIL | UNIT LENGTH (mm) | UNIT DIA. (mm) | ACCESS SHAFT DIA. (mm) | BASE TO INLET INVERT (mm) | BASE TO OUTLET INVERT | STANDARD FALL ACROSS (mm) | MIN. INLET INVERT (mm) | STANDARD PIPEWORK DIA. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NSBP003 | 3 | 30 | 1670 | 300 | 45 | 1700 | 1350 | 600 | 1420 | 1320 | 100 | 500 | 160 |
| NSBP004 | 4.5 | 45 | 2500 | 450 | 60 | 1700 | 1350 | 600 | 1420 | 1320 | 100 | 500 | 160 |
| NSBP006 | 6 | 60 | 3335 | 600 | 90 | 1700 | 1350 | 600 | 1420 | 1320 | 100 | 500 | 160 |
| NSBE010 | 10 | 100 | 5560 | 1000 | 150 | 2069 | 1220 | 750 | 1450 | 1350 | 100 | 700 | 315 |
| NSBE015 | 15 | 150 | 8335 | 1500 | 225 | 2947 | 1220 | 750 | 1450 | 1350 | 100 | 700 | 315 |
| NSBE020 | 20 | 200 | 11111 | 2000 | 300 | 3893 | 1220 | 750 | 1450 | 1350 | 100 | 700 | 375 |
| NSBE025 | 25 | 250 | 13890 | 2500 | 375 | 3575 | 1420 | 750 | 1680 | 1580 | 100 | 700 | 375 |
| NSBE030 | 30 | 300 | 16670 | 3000 | 450 | 4265 | 1420 | 750 | 1680 | 1580 | 100 | 700 | 450 |
| NSBE040 | 40 | 400 | 22222 | 4000 | 600 | 3230 | 1920 | 600 | 2185 | 2035 | 150 | 1000 | 500 |
| NSBE050 | 50 | 500 | 27778 | 5000 | 750 | 3960 | 1920 | 600 | 2185 | 2035 | 150 | 1000 | 600 |
| NSBE075 | 75 | 750 | 41667 | 7500 | 1125 | 5841 | 1920 | 600 | 2235 | 2035 | 200 | 950 | 675 |
| NSBE100 | 100 | 1000 | 55556 | 10000 | 1500 | 7661 | 1920 | 600 | 2235 | 2035 | 200 | 950 | 750 |
| NSBE125 | 125 | 1250 | 69444 | 12500 | 1875 | 9548 | 1920 | 600 | 2235 | 2035 | 200 | 950 | 750 |

Rotomoulded chamber construction  GRP chamber construction  * Some units have more than one access shaft – diameter of largest shown.

# Full Retention NSF RANGE

## APPLICATION

Full retention separators are used in high risk spillage areas such as:

- Fuel distribution depots.
- Vehicle workshops.
- Scrap Yards

## PERFORMANCE

Kingspan Klargester were the first UK manufacturer to have the required range (3-30 l/sec) certified to EN 858-1 in the UK. The NSF number denotes the flow at which the separator operates.

The British Standards Institute (BSI) have witnessed the performance tests of the required range of separators and have certified their performance, in relation to their flow and process performance to ensure that they met the effluent quality requirements of EN 858-1. Larger separator designs have been determined using the formulas extrapolated from the test range.

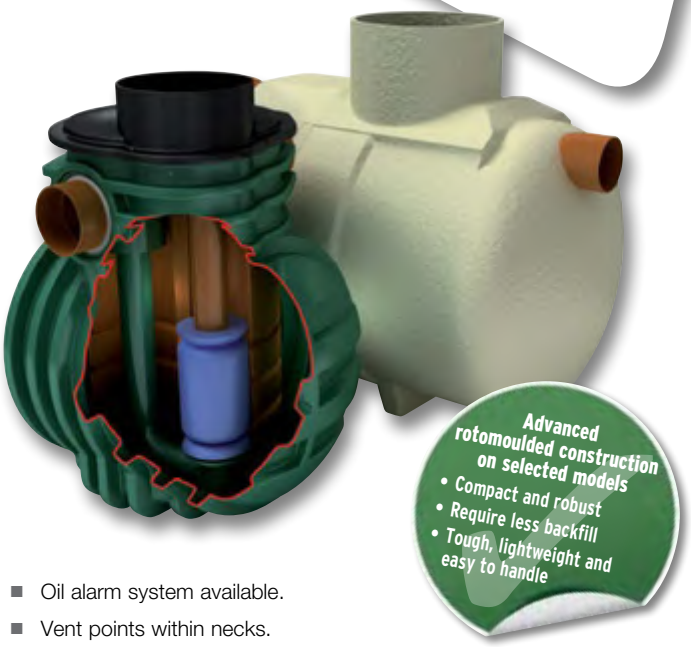
Each full retention separator design includes the necessary volume requirements for:

- Oil separation capacity.
- Silt storage capacity.
- Automatic closure device.
- Oil storage volume.
- Coalescer (Class I units only).

Klargester full retention separators treat the whole of the specified flow.

## FEATURES

- Light and easy to install.
- Class I and Class II designs.
- 3-30 l/sec range independently tested and performance sampled, certified by the BSI.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.




- Oil alarm system available.
- Vent points within necks.
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- GRP or rotomoulded construction (subject to model).

To specify a nominal size full retention separator, the following information is needed:-

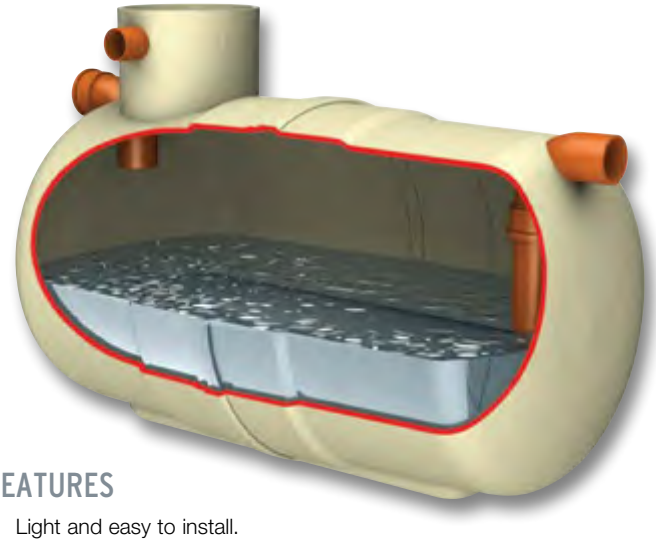
- The calculated flow rate for the drainage area served. Our designs are based on the assumption that any interconnecting pipework fitted elsewhere on site does not impede flow into or out of the separator and that the influent is not pumped.
- The required discharge standard. This will decide whether a Class I or Class II unit is required.
- The drain invert inlet depth.
- Pipework type, size and orientation.

### SIZES AND SPECIFICATIONS

| UNIT NOMINAL SIZE | FLOW (l/s) | DRAINAGE AREA ($m^2$) PPG-3 (0.018) | STORAGE CAPACITY (litres) SILT | OIL | UNIT LENGTH (mm) | UNIT DIA. (mm) | BASE TO INLET INVERT (mm) | BASE TO OUTLET INVERT | MIN. INLET INLET (mm) | STANDARD PIPEWORK DIA. (mm) |
|---|---|---|---|---|---|---|---|---|---|---|
| NSFP003 | 3 | 170 | 300 | 30 | 1700 | 1350 | 1420 | 1345 | 500 | 160 |
| NSFP006 | 6 | 335 | 600 | 60 | 1700 | 1350 | 1420 | 1345 | 500 | 160 |
| NSFA010 | 10 | 555 | 1000 | 100 | 2610 | 1225 | 1050 | 1000 | 500 | 200 |
| NSFA015 | 15 | 835 | 1500 | 150 | 3910 | 1225 | 1050 | 1000 | 500 | 200 |
| NSFA020 | 20 | 1115 | 2000 | 200 | 3200 | 2010 | 1810 | 1760 | 1000 | 315 |
| NSFA030 | 30 | 1670 | 3000 | 300 | 3915 | 2010 | 1810 | 1760 | 1000 | 315 |
| NSFA040 | 40 | 2225 | 4000 | 400 | 4640 | 2010 | 1810 | 1760 | 1000 | 315 |
| NSFA050 | 50 | 2780 | 5000 | 500 | 5425 | 2010 | 1810 | 1760 | 1000 | 315 |
| NSFA065 | 65 | 3610 | 6500 | 650 | 6850 | 2010 | 1810 | 1760 | 1000 | 315 |
| NSFA080 | 80 | 4445 | 8000 | 800 | 5744 | 2820 | 2500 | 2450 | 1000 | 300 |
| NSFA100 | 100 | 5560 | 10000 | 1000 | 6200 | 2820 | 2500 | 2450 | 1000 | 400 |
| NSFA125 | 125 | 6945 | 12500 | 1250 | 7365 | 2820 | 2500 | 2450 | 1000 | 450 |
| NSFA150 | 150 | 8335 | 15000 | 1500 | 8675 | 2820 | 2550 | 2450 | 1000 | 525 |
| NSFA175 | 175 | 9725 | 17500 | 1750 | 9975 | 2820 | 2550 | 2450 | 1000 | 525 |
| NSFA200 | 200 | 11110 | 20000 | 2000 | 11280 | 2820 | 2550 | 2450 | 1000 | 600 |

Rotomoulded chamber construction  GRP chamber construction

# Washdown & Silt



## APPLICATION

This unit can be used in areas such as car wash and other cleaning facilities that discharge directly into a foul drain, which feeds to a municipal treatment facility.

If emulsifiers are present the discharge must not be allowed to enter an NS Class I or Class II unit.

- Car wash.
- Tool hire depots.
- Truck cleansing.
- Construction compounds cleansing points.

## PERFORMANCE

Such wash down facilities must not be allowed to discharge directly into surface water but must be directed to a foul connection leading to a municipal treatment works as they utilise emulsifiers, soaps and detergents, which can dissolve and disperse the oils.

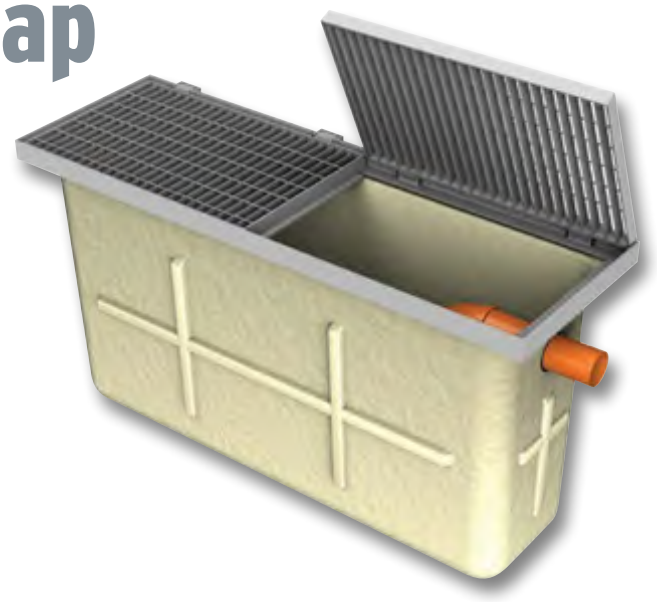
## FEATURES

- Light and easy to install.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Vent points within necks.
- Extension access shafts for deep inverts.
- Maintenance from ground level.

### SIZES AND SPECIFICATIONS

| REF. | TOTAL CAPACITY (litres) | MAX. REC. SILT | MAX. FLOW RATE (l/s) | LENGTH (mm) | DIAMETER (mm) | ACCESS SHAFT DIA. (mm) | BASE TO INLET INVERT (mm) | BASE TO OUTLET INVERT (mm) | STANDARD FALL ACROSS UNIT (mm) | MIN. INLET INVERT (mm) | STANDARD PIPEWORK DIA. (mm) | APPROX EMPTY (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| W1/010 | 1000 | 500 | 3 | 1123 | 1225 | 460 | 1150 | 1100 | 50 | 500 | 160 | 60 |
| W1/020 | 2000 | 1000 | 5 | 2074 | 1225 | 460 | 1150 | 1100 | 50 | 500 | 160 | 120 |
| W1/030 | 3000 | 1500 | 8 | 2952 | 1225 | 460 | 1150 | 1100 | 50 | 500 | 160 | 150 |
| W1/040 | 4000 | 2000 | 11 | 3898 | 1225 | 460 | 1150 | 1100 | 50 | 500 | 160 | 180 |
| W1/060 | 6000 | 3000 | 16 | 4530 | 1440 | 600 | 1360 | 1310 | 50 | 500 | 160 | 320 |
| W1/080 | 8000 | 4000 | 22 | 3200 | 2020 | 600 | 2005 | 1955 | 50 | 500 | 160 | 585 |
| W1/100 | 10000 | 5000 | 27 | 3915 | 2020 | 600 | 2005 | 1955 | 50 | 500 | 160 | 680 |
| W1/120 | 12000 | 6000 | 33 | 4640 | 2020 | 600 | 2005 | 1955 | 50 | 500 | 160 | 770 |
| W1/150 | 15000 | 7500 | 41 | 5435 | 2075 | 600 | 1940 | 1890 | 50 | 500 | 160 | 965 |
| W1/190 | 19000 | 9500 | 52 | 6865 | 2075 | 600 | 1940 | 1890 | 50 | 500 | 160 | 1200 |

# Car Wash Silt Trap



## APPLICATION

Car Wash silt trap is designed for use before a separator in car wash applications to ensure effective silt removal.

## FEATURES

- FACTA Class B covers.
- Light and easy to install.
- Maintenance from ground level.

# Forecourt



## APPLICATION

The forecourt separator is designed for installation in petrol filling station forecourts and similar applications. The function of the separator is to intercept hydrocarbon pollutants such as petroleum and oil and prevent their entry to the drainage system, thus protecting the environment against hydrocarbon contaminated surface water run-off and gross spillage.

## PERFORMANCE

Operation ensures that the flow cannot exit the unit without first passing through the coalescer assembly.

In normal operation, the forecourt separator has sufficient capacity to provide storage for separated pollutants within the main chamber, but is also able to contain up to 7,600 litres of pollutant arising from the spillage of a fuel delivery tanker compartment on the petrol forecourt. The separator has been designed to ensure that oil cannot exit the separator in the event of a major spillage, subsequently the separator should be emptied immediately.

## FEATURES

- Light and easy to install.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Vent points within necks.
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- Class I and Class II design.
- Oil storage volume.
- Coalescer (Class I unit only).
- Automatic closure device.
- Oil alarm system available.

## INSTALLATION

The unit should be installed on a suitable concrete base slab and surrounded with concrete or pea gravel backfill. See sales drawing for installation.

If the separator is to be installed within a trafficked area, then a suitable cover slab must be designed to ensure that loads are not transmitted to the unit.

The separator should be installed and vented in accordance with Health and Safety Guidance Note HS(G)41 for filling stations, subject to Local Authority requirements.

### SIZES AND SPECIFICATIONS

| ENVIROCEPTOR CLASS | TOTAL CAP. (litres) | DRAINAGE AREA ($m^2$) | MAX. FLOW RATE (l/s) | LENGTH (mm) | DIAMETER (mm) | ACCESS SHAFT DIA. (mm) | BASE TO INLET INVERT (mm) | BASE TO OUTLET INVERT (mm) | STD. FALL ACROSS UNIT (mm) | MIN. INLET INVERT (mm) | STD. PIPEWORK (mm) | EMPTY WEIGHT (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | 10000 | 555 | 10 | 3963 | 1920 | 600 | 2110 | 2060 | 50 | 400 | 160 | 500 |
| II | 10000 | 555 | 10 | 3963 | 1920 | 600 | 2110 | 2060 | 50 | 400 | 160 | 500 |
| I | 10000 | 1110 | 20 | 3963 | 1920 | 600 | 2110 | 2060 | 50 | 400 | 200 | 500 |
| II | 10000 | 1110 | 20 | 3963 | 1920 | 600 | 2110 | 2060 | 50 | 400 | 200 | 500 |

# Alarm Systems



British European Standard EN 858-1 and Environment Agency Pollution Prevention Guideline PPG3 requires that all separators are to be fitted with an oil level alarm system and that it should be installed and calibrated by a suitably qualified technician so that it will respond to an alarm condition when the separator requires emptying.

- Easily fitted to existing tanks.
- Excellent operational range.
- Visual and audible alarm.
- Additional telemetry option.

## PROFESSIONAL INSTALLERS



Kingspan Klargester Accredited Installers
Experience shows that correct installation is a prerequisite for the long-lasting and successful operation of any wastewater treatment product. This is why using an installer with the experience and expertise to install your product is highly recommended.

Services include :

- Site survey to establish ground conditions and soil types
- Advice on system design and product selection
- Assistance on gaining environmental consents and building approvals
- Tank and drainage system installation
- Connection to discharge point and electrical networks
- Waste emptying and disposal

Discover more about the Accredited Installers and locate your local expert online.

www.kingspanenviro.com/klargester

## CARE & MAINTENANCE



Kingspan Environmental Services
Who better to look after your treatment plant than the people who designed and built it?

Kingspan Environmental have a dedicated service division providing maintenance for wastewater products.

Factory trained engineers are available for site visits as part of a planned maintenance contract or on a one-off call out basis.

To find out more about protecting your investment and ensuring peace of mind, call us on:



**0844 846 0500**

or visit us online:
www.kingspanenvservice.com

## COMMERCIAL WASTEWATER SOLUTIONS

- **BIODISC® & ENVIROSAFE**
  HIGH PERFORMANCE SEWAGE TREATMENT SYSTEMS
- PACKAGE PUMP STATIONS
- **PUMPSTOR24** PUMPING SYSTEMS
- OIL/WATER SEPARATORS
- BELOW GROUND STORAGE TANKS
- GREASE & SILT TRAPS

## RAINWATER SOLUTIONS

- BELOW GROUND RAINWATER HARVESTING SYSTEMS
- ABOVE GROUND RAINWATER HARVESTING SYSTEMS


**Klargester**
UK: College Road North, Aston Clinton, Aylesbury, Buckinghamshire HP22 5EW
Tel: +44 (0) 1296 633000 Fax: +44 (0) 1296 633001 Scottish Office: Tel: +44 (0) 1355 248484
email: klargester@kingspan.com

Ireland: Unit 1a, Derryboy Road, Carnbane Business Park, Newry, Co. Down BT35 6QH
NI Tel : +44 (0) 28 302 66799 Fax: +44 (0) 28 302 60046 ROI Tel: 048 302 66799 Fax: 048 302 60046
email: klargesterinfo@kingspan.com

Visit our website **www.kingspanenviro.com/klargester**


Part of Kingspan Environmental


In keeping with Company policy of continuing research and development and in order to offer our clients the most advanced products, Kingspan Environmental reserves the right to alter specifications and drawings without prior notice.



Issue No. 21: September 2015

# **Appendix I** – Low Impact Installation Checklist

## Guidance Note C2 – Installation Checklist

| Condition | Report Reference |
|---|---|
| A – Management techniques | This report outlines the required maintenance for both the foul and surface water drainage systems, including the treatment plant, oil & fuel and grease separators. |
| B – Aqueous waste | The Flow Calculations have been outlined within Section 3.1.1 Proposed Foul flows From Proposed Development |
| C – Abatement systems | Refer to Section 5: Environmental Considerations. |
| D - Groundwater | No soakaways on the site. see Section 1.3 Proposed Drainage Strategy |
| E – Producing waste | None proposed |
| F – Using energy | 0.0022MW |
| G – Preventing accidents | See Maintenance sections for Oil & fuel and grease separator and Treatment plant.<br>Section 3.2 New Package Treatment Plant<br>Section 3.3 Grease Separator,<br>Section 4.2 Fuel & Oil Separator, |
| H - Noise | Refer to Section 5: Environmental Considerations. |
| I - Emissions of polluting substances | Refer to Section 5: Environmental Considerations. |
| J – Odours | Refer to Section 5: Environmental Considerations. |
| K – History of keeping to the regulations | N/A |

# **Appendix I** – Typical Maintenance Contract – Kingspan Environmental

# BENEFITS OF HAVING A KINGSPAN SERVICE CONTRACT

- Service & maintenance (of a **treatment plant**) ensures that the sewage system is operating effectively and maintains a healthy environment for any micro-organisms, allowing them to break down matter that enters the plant.
- 
- Service & maintenance (of a **pump station**) ensures the efficient operation of the pumps reducing the risk of expensive pump failure and any subsequent backing up or flooding that may occur as a result of a failure.

- **Reduced** rate or **FREE Breakdown cover** offers customers added security, knowing that any sewage system call outs are dealt with promptly and as a priority. *(Please refer to the "Scope of Supply" sheet for details).*

- Kingspan can **replace specialist parts** quickly, efficiently and at highly competitive rates, without you having to source the parts yourselves or have to get near to the plant to replace them.

- Regular **servicing of blowers & pumps** allows you to get the maximum life expectancy from them and ensure they're working efficiently limiting electricity consumption.

- If **discharging directly into a watercourse**, regular servicing will help a treatment plant **maintain a good quality of final effluent** required by your **environmental consent** (permit). Breach of consent can be costly.

- If **discharging to a soakaway**, regular maintenance will help to meet groundwater regulations and also helps **prevent solids building up** in the soakaway leading to blinding and soakaway failure.

- **Identify Health & Safety hazards** that may arise in & around the plant. Important if in a social area or garden.

- Help to **recognise when** the plant requires a **desludge (emptying)**.

- **Advice** on how to **remedy any problems** you may have with the plant.

- **Peace of mind** knowing that you are having the plant managed & maintained professionally with someone to call should things go wrong.

KINGSPAN ENVIRONMENTAL SERVICES
College Road North, Aston Clinton, Aylesbury,
Buckinghamshire, United Kingdom HP22 5EW
Unit 1a, Derryboy Road, Carnbane Business Park,
Newry, Co. Down, Northern Ireland BT35 6QH
UK 0844 846 0500
ROI 048 302 54077
info@kingspanenvservice.com
kingspanenvservice.com
Company Reg. No. 3888183

Service & Support Solutions

Kingspan Environmental Services




# QUOTATION

**Name**

Opus International

**Site Address**

Robinwood Activity Centre, Cross Lanes, Bangor Road, Marchwiel, Wrexham, LL13 OTF

**Level of Service**

Bronze service plan

**Quote Reference Number**

Q37026-17

RELIABLE & RESPONSIVE

We provide specialist service and maintenance packages for a variety of environmental products for businesses with single or multiple premises. For buildings which are off-mains that treat and store wastewater, that use harvested rainwater and renewable heating systems or require on-site fuel management, we can ensure that all are maintained to the highest standards. We provide peace of mind that you are complying with relevant Health & Safety and Environmental legislation. We service not only our own Kingspan Environmental products but also any other manufacturer's product.

## PRODUCTS WE SERVICE:

- Septic Tanks
- Sewage Treatment Plants
- Pump Stations
- Cesspools
- Oil/Water and Grease Separators
- Rainwater Harvesting Systems
- Solar Thermal Panels
- Solar PV Panels
- Hot Water Cylinders
- Wind Turbines
- Oil, Fuel & AdBlue Storage and Dispensing Tanks

## OUR SERVICES INCLUDE:

- Planned Maintenance and Breakdown Repair
- Activation or commissioning of new assets
- Parts & Spares
- Sampling & Grease Management
- Desludging, CCTV Drain Inspections, Jetting
- Water Treatment and Legionella Testing & Treatment
- Standard Commercial Service Packages and National Contract Packages available
  (National Contract is suitable for multiple sites with 24/7 support)
- 24/7 monitoring
- Tank Cleaning & Fuel Polishing

## BENEFITS

**High priority emergency call-out within 4 hours 24/7**

**Competitive preventative maintenance contract rates**

**Reliable and responsive breakdown cover**

- Qualified Mechanical and Electrical factory trained Engineers with British Water Accreditation
- Tailored planned maintenance to suit your business needs and keeping you aware and compliant with regulations
- Dedicated account management ensuring communication and service delivery is of the highest standard
- Technical and engineering expertise at every step: design & manufacture, installation & commissioning, servicing, repair & upgrade, technical advice & consultancy.

"Finding cost effective and efficient servicing of our sewage treatment plants was a priority as we have multiple sites across the country. We needed a guaranteed fast response from a company with professionally trained engineers. I contacted Kingspan Environmental Services, through their website, and after talking to their technical support team, I was able to get set up with a bespoke servicing plan to suit our business needs." **Ovoca Manor, Co Wicklow**

"Kingspan Environmental Service came out to repair our sewage treatment plant. They arrived within 48 hours and were able to solve the problem by replacing a part quite quickly. The engineers were helpful in explaining what the problem was, I have taken out a service contract for the future to prevent the breakdown again." **Yorkshire Housing, Yorkshire**

Service & Support Solutions

Quote Reference Number

Q37026-17

# YOUR SERVICE PLAN QUOTE

Following your consultation we are pleased to provide a quotation for the services indicated. We recommend the benefits of the long term service cover to ensure your system is kept in good condition with a professional service partner.

| SERVICE PLAN | ANNUAL COST | SAVING |
|---|---|---|
| | | |
| | | |
| 1 year plan | £6647.00 + vat | |

| NAME | ADDRESS |
|---|---|
| Opus International | Robinwood Activity Centre, Cross Lanes, Bangor Road, Marchwiel, Wrexham, LL13 OTF |

## SITE AND EQUIPMENT DETAILS

NSG06 grease separator - 3000L
Bioficient 55 sewage treatment plant

## SERVICES INCLUDED

4 annual planned service visits on the Bioficient sewage treatment plant
2 annual planned service visits on the grease separator
4 annual planned tanker visits on the Bioficient (in line with manufacturers guidelines) - allowing for 5000g removal per visit
4 annual planned tanker visits on the grease trap - allowing for 600g removal per visit (Frequency of the emptying regime on grease trap may increase/decrease pending on on-site usage - no two sites are the same)
4 annual planned samples on the discharge of the sewage treatment plant - testing BOD, SS and Ammonia - certs would be issued for comparison against your Environmental Agency discharge license.
24/7 monitoring devices
Reduced call outs - for any visits outside of the planned annual services
Priority site attendance
Technical support and a dedicated account manager in the Kingspan Service office

| SCOPE OF SUPPLY | |
|---|---|
| Reduced callout charges | ✓ |
| Priority site attendance for callouts | ✓ |
| Routine maintenance visits | ✓ |
| Technical support | ✓ |
| 24/7 monitoring | ✓ |

## GB CONTRACTED CLIENTS

- Reduction on Call-out charges (50%) £131.43 plus VAT which inc one hour onsite and travel costs
- Hourly rate thereafter of £99.97 plus VAT for on-site labour
- Parts at list price

Ronan Rocks

Digitally signed by Ronan Rocks
DN: cn=Ronan Rocks, o, ou=Kingspan Environmental Service, email=ronan.rocks@kingspan.com, c=GB
Date: 2017.06.06 15:50:18 +01'00'

# PAYMENT

| WE ACCEPT QUOTATION NUMBER | NAME (please print in BLOCK CAPITALS) |
|---|---|
| Q37026-17 | |
| **INVOICE ADDRESS** | **SIGNED** |
| | |

| TELEMETRIC MONITORING | ☐ YEAR CONTRACT | ☐ YEAR CONTRACT |
|---|---|---|
| ☐ Yes | | |

| ORDER NUMBER | SITE POSTCODE |
|---|---|
| | |

| SITE CONTACT / TEL NUMBER |
|---|
| |

## PAYMENT METHOD

*CREDIT CARD ☐ (Confirmation invoice to follow)

| CREDIT CARD NUMBER | | |
|---|---|---|
| | | |
| **CARD TYPE** ie Visa | **EXPIRY DATE** | **ISSUE NUMBER** (Switch only) |
| | | |

*CHEQUE ☐ (Confirmation invoice to follow)

I enclose a cheque for £ inc VAT £

*ACCOUNT ☐

Please submit invoice for payment

Please return completed form to Kingspan Environmental Services, 180 Gilford Road, Portadown, Co. Armagh BT63 5LF

**1.0 Contracts and Terminology**

1.1 Your Contract is with Kingspan Environmental Ltd, T/A Kingspan Env. Service.
1.2 The expression 'Company' refers to Kingspan Environmental Service
1.3 The expression 'You/Your/Client/Buyer' refer to the person/s or business who have entered into this contract (with the company).
1.4 The expression 'We/us/our' refer to Kingspan Environmental Service.
1.5 The expression 'Contract' refers to the Service Contract which you have entered into with us and includes these terms and conditions.
1.6 The expression 'Start date' means the date on which you signed and paid thereby entered into this contract (Direct Debit / full payment)
1.7 The expression 'Premises' means site at which the equipment is installed.
1.8 The expression 'Equipment/System' shows the only equipment covered by this contract, and installed at the premises.
1.9 The expression 'Misuse' refers to the placing into the system items including, but not limited to, nappies, sanitary towels, rags, motor oil, grease or any products deemed to cause the system to fail.
1.10 The expressions 'Abuse' refers to the failure to install or operate the system in accordance with any installation and operating instruction and/or manufactures guidelines. In particular 'Abuse' refers to a failure to desludge the system properly and with the appropriate frequency.
1.11 The Company shall not be liable in damages for any delay or default in performing hereunder if such delay or default is caused by conditions beyond its control including, but not limited to Acts of God, Government restrictions, wars, insurrections and/or any other cause beyond the reasonable control of the party whose performance is affected.
1.12 The expressions 'Risk assessment & Method Statement' refer to the Health & Safety checks/documentation required under current legislation to indicate adequate precautions are being taken to protect both our staff and general public.
1.13 The expression 'Additional chargeable works' refers to works, which are additional to the scope of works provided under this level cover.

**2.0 Details of Service Cover**

2.1 These Terms and Conditions are attached to a document headed 'Service Contract' that document sets out the following details:
2.2 The price of the contract
2.3 The Start Date
2.4 The number of Maintenance Visits for which have contracted
2.5 The type of cover you have requested/require
2.6 The equipment which is covered by this contract
2.7 The address of the premises
2.8 Your address and contact details
2.9 Your unique Service Contract Number (which must always be quoted in any correspondence with us).

**3.0 Cancellation**

3.1 You have the right to cancel this contract within 7 days of the date on which you entered into it. This right is however, subject to the proviso set out below.
3.2 Existing Direct Debit Customers must provide notice 7 Days prior to their renewal of their wish to cancel.
3.3 Your right to cancel the contract will be lost if we do not receive your notice of cancellation in writing within 7 days.
3.4 Your right to cancel the contract will be lost if we have started to provide services in accordance with this contract prior to receipt of your notice of cancellation.
3.5 On cancellation we will reimburse any sum paid to us by you or on your behalf in relation to this contract.
3.6 Any cancellation after 7 days the Company reserve the right to collect in full any sum due, including missed payments, or remaining Direct Debit Payments.
3.7 The Company retain the right to cancel your contract without reason provided they give written notice of at least 14 days. This shall not be the same as ending a contract under the termination provision set out in clause 16.

**4.0 Parties to the Contract (Privacy and Non- Assignment)**

4.1 The terms of the contract (which includes these Terms and Conditions) are intended to apply only between you and the Company. They are not intended to apply for the benefit of anyone else.
4.2 It is not intended that any of the terms of the contract should be enforceable by a third party under the contracts (Rights of Third Parties Act 1999) or otherwise.
4.3 Your rights and obligations, nor benefits, under the contract cannot be assigned or transferred to anyone else.
4.4 You agree to advise us immediately of any changes to the Customer or Premises details provided.

**5.0 Moving Away from or Selling the Premises**

5.1 If you sell or move away from the premises you cannot transfer your rights and obligations under the contract to the new owner or occupier. The new owner or occupier will have to enter into a new contract with us.
5.2 Failure to notify us of change of ownership will mean you are liable for the contract Until it's renewal date, and you will continue to be responsible for paying for any additional charges incurred.

**6.0 Access**

6.1 You will allow our engineers and/or any engineer sent to the premises at our behest to have sufficient access to the premises so that he or she is able to perform in accordance with the contract.
6.2 If for any reason our engineer is unable to have sufficient access, without a minimum of one working days notice being given to enable us to cancel or reschedule the visit, no refund will be applicable.
6.3 We will endeavour to contact you within 48 hours of any planned visit.
6.4 We are unable to tell you the precise time that any engineer will attend at the premises. However, if you contact us on the day of the intended visit can advise you of an approximate time.
6.5 If you wish to cancel a visit, you must notify us of your wish to cancel at least 1 working day in advance of the date of the planned visit.
6.6 If you fail to give 1 working days' notice of your wish to cancel a planned visit then we will charge you for any expense which we reasonably incur as a result.

**7.0 Scope of Works**

7.1 Under your contract you will receive the following cover:
7.2 A specified number of planned maintenance visits (as detailed in the document headed "Service Contract" to which these Terms and Conditions are attached).
7.3 Priority site attendance in the event of call-outs.
7.4 Advice about operating and emptying the system available upon request.
7.5 No work will be undertaken by us without carrying out a Risk Assessment and without preparing and following a Method Statement.
7.6 Any additional cover you have purchased. (see attached Scope of Supply)

**8.0 Additional Chargeable Works**

8.1 Following your planned maintenance visit we will provide you with a Service Report. This will confirm whether the system has received adequate maintenance to ensure the continued operation of the system or whether further work will be required.
8.2 If additional chargeable work is required then that work will be chargeable over and above the contract price.
8.3 If additional chargeable work is required then we will seek your approval and payment prior to proceeding with the work which we will endeavour to commence while our engineer is still at the premises.
8.4 If we are unable to contact you to obtain your approval and payment whilst the engineer is still at the premises, then we will provide you with a quotation for the cost of the additional chargeable work. The quotation will include the cost incurred in sending the engineer back to the premises.
8.5 If we are unable to contact you whilst the engineer is still at the premises that causes any delay in the repair of the system, we cannot be held responsible for any inconvenience or pollution hazard, which results from that delay.
8.6 If work on your system requires the engineer to enter into a confined space then, in order to comply with health and safety legislation, it will be necessary for us to provide an additional engineer(s). This will require a re visit to complete the work.
8.7 Where additional chargeable work is required and it is necessary for us to send out an additional engineer(s) in order to comply with health and safety legislation, the additional engineer(s) will be chargeable.
8.8 If the company deems a conversion or rebuild is required to rectify your system this work will be chargeable and a quotation will be provided.
8.9 A Silver or Gold contract will be lowered to the level of a Bronze contract if a unit requires additional works due to, but not limited to, Misuse or Abuse of the System, flooding, intervention by a third unauthorised party, accidental or malicious damage, power failure or abnormalities.
8.10 In the event we inadvertently provide incorrect information within a quotation we reserve the right to correct the information. If the amended quotation is not agreeable we will refund in full all costs paid.

**9.0 Emptying**

9.1 Your system requires regular emptying. This service is not covered by the scope of works to be undertaken under this contract. We can provide advice and a quote on emptying as part of our service.

**10.0 Business Hours and Call-Outs**

10.1 Our normal hours of business are 8.30am to 5.00pm Monday to Friday.
10.2 Outside normal business hours (including Bank Holidays) you may leave a message on our telephone answering system and we will endeavour to respond to you during our normal business hours.
10.3 Any call-outs will be attended by our engineers only during our normal working hours.
10.4 We do not provide weekend or bank holiday site attendance.
10.5 We do not provide an emergency call-out service. We do however endeavour to attend call-outs to contracted customers as matter of priority.
10.6 In the event that our own engineers are unavailable to attend a call-out we Reserve the right to send an approved sub-contractor at our discretion.

**11.0 Payment**

11.1 On receipt of your signed copy of the document entitled "Service Contract" to which these Terms and Conditions are attached, we will process payment or set up your Direct Debit as appropriate.
11.2 You are responsible for paying the contract price. The contract price is shown on the Document entitled "Service Contract" to which these Terms and Conditions are attached.
11.3 We do not accept payment by use of the following credit cards: American Express, Diners club, JCB, Visa Electron, Solo or Lazer.
11.4 In the event that you fail to pay an invoice in accordance with these Terms and Conditions, We will withhold all and any further services until you have paid the invoice sum.
11.5 We reserve the right to charge interest (both before and after any judgement) on any outstanding invoice at the rate of 8 per cent per annum above Barclays Bank Plc base rate from time to time until payment in full is made (a part of a month being treated as a full month for the purpose of calculating interest).
11.6 The Direct Debit Payment amount is due from you to us. You are obligated to make the Minimum Number of Direct Debit payments stated with the first one being paid on the 1st Direct Debit Payment Date and then every month thereafter. For the avoidance of doubt you are obligated to make every Direct Debit Payment. Should you fail to make a Direct Debit Payment then the remainder of these Payments will become due immediately.
11.7 If you fail to pay any monies due under this agreement or if any Direct Debit is returned Unpaid or any cheque is returned unpaid or if any other form of payment is not honoured for whatever reason we reserve the right to charge an administration fee of £15.00.
11.8 If at any point you request changes made to paperwork, Including Invoices, we reserve the right to charge an appropriate administration fee, not less than £15.00.

**12.0 Guarantee and Warranty**

12.1 We will repair or (if we choose) replace without charge any goods supplied and/or fitted by us which are found to be defective and which cause your system to fail in normal circumstances of use within a period of 12 months from the date on which the goods were supplied to you.
12.2 Any repair work carried out under the terms of the contract will be guaranteed for a period of 3 months unless the original repair works were necessitated by reason of abuse or misuse of the system (in which case any and all repair works will be chargeable).
12.3 All mechanical parts purchased and fitted carry a 12 month warranty except in the case of Envireau units which have a 24 month warranty) from the date of dispatch. Any Parts supplied free of charge under warranty are protected under these terms until the product warranty to which the part is fitted expires. Parts will generally be dispatched within 3 working days. The guarantees and warranty set out above apply only in respect of goods supplied and/or services provided by us in the United Kingdom.
12.4 The guarantees and warranty set out above will be invalidated if you do not gives us a reasonable opportunity to inspect the goods and the system to confirm the cause of the problem which you have encountered with it.
12.5 The guarantees and warranty set out above will be invalidated if you abuse and/or Misuse the goods and/or the system.
12.6 The guarantees and warranty set out above will be invalidated if you use the goods and/or the system in any way which is inconsistent with any of the following:
(a) any specific instruction given to you by us;
(b) the manufacturer's guidelines; or
(c) any operating instructions.
12.7 The guarantees and warranty set out above will be invalidated if you fail to notify us in writing of the defect or failure in the goods or system within 28 days of your discovery of the defect or failure.
12.8 We cannot take responsibility for any loss of profit, which you may suffer as a result of any failure or defect in the goods or system.

**13.0 Notices**

13.1 Any notice which you are required by these Terms and Conditions to give us should be given in writing and should be sent by post to the following address: KINGSPAN ENVIRONMENTAL SERVICE, Carnbane Industrial Estate, Newry, Co Down, BT35 6QH.

**14.0 Complaints Generally**

14.1 Any complaint, which you may have should be sent in writing to the 'Complaints Department' at the address set out above.

**15.0 Complaints about Deliveries**

15.1 When you order parts we will endeavour to deliver them within 3 working days of the date on which they were ordered. Excludes non standard items
15.2 If you do not receive the parts which you ordered within 3 days of the date on which you placed the order then you must report this to us.
15.3 Any damage to or shortfall in the parts delivered must be reported to Kingspan Environmental Service within 2 days of the date of delivery. If you do not report the damage or shortfall within 2 days of the date of delivery we will take no responsibility.

**16.0 Termination**

16.1 If we fail to comply with any of these Terms and Conditions then you are entitled to terminate the contract with immediate effect by sending us written notice of termination.
16.2 If you fail to comply with any of these Terms and Conditions (and in particular if you fail to pay the contract price) then we are entitled to terminate the contract with immediate effect by sending your written notice of termination.
16.3 In the absence of termination as a result of either party failing to comply with these Terms and Conditions, the contract will terminate on the expiry of the cover duration.

**17.0 Conditions of Sale**

17.1 Any advice or recommendation given the Company or its employees or agents to the Buyer or its employees or agents as to the storage application or use of the Goods which Is not confirmed in writing by the Company is followed or acted upon entirely at the Buyer's Own risk and accordingly the Company shall not be liable for any such advice or Recommendation which is not so confirmed.
17.2 Any typographical clerical or other error or omission in any sales literature, quotation, price list, acceptance of offer, invoice or other document or information issued by the Company shall be subject to correction without any liability on the part of the Company.
17.3 All specifications, drawings, particulars of weight and dimension and performance data contained in any of the Company's literature are approximate only.
17.4 The Company Reserves the right to improve and/or modify and specifications, designs and dimensions without notice.
17.5 The Price shall be either:
17.5.1 the Company's quoted price which shall only be valid for 30days from its date after which time the Price may be altered by the Company and shall be subject to the Company quoting; or
17.5.2 where no price has been quoted the Price listed in the then current price list of the Company sent by the Company to the Buyer from time to time.
17.6 The Company reserve the right to charge the Buyer for returnable packages and/or packaging materials. If the goods are received by the Company in good condition a credit will be made to the value of 75% of the amount charged for the goods. Carriage is non-refundable.
17.7 The Price and any other sums payable by the Buyer to the Company is exclusive of any applicable Value Added Tax, which the Buyer shall be additionally liable to pay to the Company.
17.8 Subject to any special terms agreed in writing between the Buyer and Company, the Company may invoice the Buyer for the Price of the Goods on or at any time after delivery of the Goods, or any instalment of the Goods unless the Goods are to be collected by the Buyer or the Buyer wrongfully fails to take delivery of the Goods, in which even the Company shall be entitled to invoice the Buyer for the Price at any time after the Company has notified the Buyer that the Goods are ready for collection or (as the case may be) the Company has tendered delivery of the Goods.
17.9 Save as otherwise agreed in writing payment of the Price and VAT shall be due within 30 days of the end of the month in which delivery take place without deduction or set off. Time for payment shall be of the essence.
17.10 The Buyer shall be responsible to the Company for ensuring the accuracy of the terms of any order and any information supplied for the Company as to its requirements (including but without limitation the use to which the Goods will be put and any applicable specification) submitted by the Buyer and for giving the Company any necessary information relating to the Goods within a sufficient time to enable the Company to perform the Contract in accordance with its terms.
17.11 No order which has been accepted by the Company may be cancelled by the Buyer except with the agreement in writing of the Company and on terms that any deposit paid shall not be repayable and that the Buyer shall indemnify the Company in full against all loss (including loss of profit) costs (including the cost of all labour and materials used) damages, charges and expenses incurred by the Company in carrying out any work in respect of the Goods or otherwise as a result of cancellation.
17.12 Unless otherwise agreed in writing the Company shall deliver the Goods to such delivery address as is specified by the Buyer to the Company at such time as the Goods or part thereof (as the case may be) are ready for delivery.
17.13 The Buyer shall be responsible for offloading the Goods at the delivery address and shall advise the Company of any local or internal laws, byelaws or rules relating to parking or loading of vehicles at the delivery address.
17.14 The Buyer shall be responsible for ensuring that access to the delivery address is wholly by road with a surface capable of withstanding the weight and size of a vehicle carrying the goods.
17.15 Any dates quoted for delivery of the Goods are approximate only and the Company shall not be liable for any delay in delivery of the Goods howsoever caused. Time for delivery shall not be of the essence unless previously agreed by the Company in writing. The Goods may be delivered by the Company in advance of the Delivery Date upon giving reasonable notice to the Buyer.
17.16 Where the Goods are to be delivered in instalments each delivery shall constitute a separate contract and failure by the Company to deliver any one or more of the instalments in accordance with these Conditions or any claim by the Buyer in respect of any one or more instalments shall not entitle the Buyer to treat the Contract as a whole as repudiated.
17.17 If the Buyer fails for any reason whatsoever to take delivery of the Goods or fails to give The Company adequate delivery instructions at the time stated for delivery (otherwise than by reason any cause beyond the Buyer's reasonable control or by reason of the Company's Fault) then without prejudice to any other right or remedy available to the Company the Company may:
17.17.1 store the Goods until actual delivery and charge the Buyer for the reasonable costs (including insurance) or returning the Goods to the Company's premises, Storage and for transport, packaging and insurance for redelivery of the Goods; Or
17.17.2 sell the Goods at the best price readily obtainable and (after deducting all reasonable storage and selling expenses) account to the Buyer for the excess over the Price or charge the Buyer for any shortfall below the Price.
17.18 Risk of damage to or loss of the Goods shall pass to the Buyer.
17.18.1 in the case of Goods to be delivered otherwise than at the Company's premises at the time of delivery or if the Buyer wrongfully fails to take delivery of the Goods the time when the Company has tendered delivery of the Goods.
17.19 Notwithstanding delivery and the passing of risk in the Goods or any other provision of these Conditions the property in the Goods shall not pass to the Buyer until the Company has received in cash or cleared funds payment in full of the Price of the Goods and all other goods agreed to be sold by the Company to the Buyer for which payment is then due.
17.20 Until such time as the property in the Goods passes to the Buyer the Buyer shall hold the Goods as the Company's fiduciary agent and bailee and shall keep the Goods separate from those of the Buyer and third parties and properly stored protected and insured and identified as the Company's property. Until that time the Buyer shall be entitled to resell or use the Goods in the ordinary course of its business.
17.21 Until such time as the property in the Goods passes to the Buyer (and provided the Goods are still in existence and have not been resold) the Company shall be entitled at any time to resell the Goods or to require the Buyer to deliver up the Goods to the Company and if the Buyer fails to do so forthwith to enter upon any premises of the Buyer or any third party where the Goods are stored and repossess the Goods.
17.22 Warranty and liability is covered under clause 12 of this agreement.

**18.0 Entire Agreement**

18.1 This contract supersedes and invalidates all prior representation, arrangements, understandings and agreements between us (whether written or oral) relating to the services and products, which we agree to provide. Any such prior representations, arrangements, understandings and agreements between us will become null and void from the start date.
18.2 These Terms and Conditions set out the entire agreement and understanding between us in relation to the services which we agree to provide.
18.3 You promise that in deciding to sign the document headed "Service Contract" to which these Terms and Conditions are attached, you have not relied upon any representation, agreement, understanding or agreement (whether written or oral) which is not expressly set out or refereed to in these Terms and Conditions.
18.4 Nothing in these Terms and Conditions will operate so as to exclude or limit any liability for fraud.

**19.0 Governing Law and Jurisdiction**

19.1 English law governs this contract.
19.2 Any dispute arising out of or in relation to the contract will be the subject of the exclusive jurisdiction of the English Courts.
19.3 Any changes to Legislation will take immediate effect without prior notification. We would like to emphasise that this service does not replace the need for operational maintenance which should be carried out in accordance with the operating instructions and manufacture's guidelines.

It is imperative that the equipment and the system are operated only under the conditions for which they were designed.

We make every effort to ensure that all technical publications and advisory manuals produced by us are correct but reserve the right to amend and upgrade them as required. You are therefore recommended to ensure that you have the most up to date version.

**Global Head Office**
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BT63 5LF

GB: 0333 240 6868
helpingyou@kingspan.com

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Quotation Prepared By

Ronan Rocks - ronan.rocks@kingspan.com

**DATED**

**(1) Kingspan Environmental Limited**

**(2) <<Insert name of Client>>**

# STANDARD SERVICE AGREEMENT

**THIS AGREEMENT** is made the day of

**BETWEEN:**

(1) Kingspan Environmental Limited t/a Kingspan Environmental Services **[**a company registered in United Kingdom under number 3888183 whose registered office is at**] OR [**of**]** 180 Gilford Road, Portadown, County Armagh, BT63 5LF ("the Service Provider") and

(2) <<Name of Client>> **[**a company registered in <<Country of Registration>> under number <<Company Registration Number>> whose registered office is at**] OR [**of**]** <<insert Address>> ("the Client")

**WHEREAS:**

(1) The Service Provider provides Water and Energy planned and reactive maintenance services to business clients. The Service Provider has reasonable skill, knowledge and experience in that field.

(2) The Client wishes to engage the Service Provider to provide the services set out in this Agreement, subject to the terms and conditions of this Agreement.

(3) The Service Provider agrees to provide the services set out in this Agreement to the Client, subject to the terms and conditions of this Agreement.

**IT IS AGREED** as follows:

1. **Definitions and Interpretation**

1.1 In this Agreement, unless the context otherwise requires, the following expressions have the following meanings:

| | |
|---|---|
| **"Business Day"** | means, any day (other than Saturday or Sunday) on which ordinary banks are open for their full range of normal business in United Kingdom and Ireland; |
| **"Commencement Date"** | means the date on which provision of the Services shall commence, as set out in sub-Clause 9.1; |
| **"Confidential Information"** | means, in relation to either Party, information which is disclosed to that Party by the other Party pursuant to or in connection with this Agreement (whether orally or in writing or any other medium, and whether or not the information is expressly stated to be confidential or marked as such); |
| **"Fees"** | means any and all sums due under this Agreement from the Client to the Service Provider, as specified in Schedule 2; |

| | |
|---|---|
| **"Services"** | means the services to be provided by the Service Provider to the Client in accordance with Clause 2, as fully defined in Schedule 1, and subject to the terms and conditions of this Agreement; and |
| **"Term"** | means the term of this Agreement as set out in Clause 9. |

1.2 Unless the context otherwise requires, each reference in this Agreement to:

1.2.1 "writing", and any cognate expression, includes a reference to any communication effected by electronic or facsimile transmission or similar means;

1.2.2 a statute or a provision of a statute is a reference to that statute or provision as amended or re-enacted at the relevant time;

1.2.3 "this Agreement" is a reference to this Agreement and each of the Schedules as amended or supplemented at the relevant time;

1.2.4 a Schedule is a schedule to this Agreement; and

1.2.5 a Clause or paragraph is a reference to a Clause of this Agreement (other than the Schedules) or a paragraph of the relevant Schedule.

1.2.6 a "Party" or the "Parties" refer to the parties to this Agreement.

1.3 The headings used in this Agreement are for convenience only and shall have no effect upon the interpretation of this Agreement.

1.4 Words imparting the singular number shall include the plural and vice versa.

1.5 References to any gender shall include the other gender.

1.6 References to persons shall include corporations.

## 2. Provision of the Services

2.1 With effect from the Commencement Date, the Service Provider shall, throughout the Term of this Agreement, provide the Services to the Client.

2.2 The Service Provider shall provide the Services with reasonable skill and care, commensurate with prevailing standards in the Water and Energy sector in the United Kingdom.

2.3 The Service Provider shall act in accordance with all reasonable instructions given to it by the Client provided such instructions are compatible with the specification of Services provided in Schedule 1.

2.4 The Service Provider shall be responsible for ensuring that it complies with all statutes, regulations, byelaws, standards, codes of conduct and any other rules relevant to the provision of the Services.

2.5 The Service Provider may, in relation to certain specified matters related to the Services, act on the Client's behalf. Such matters shall not be set out in this Agreement but shall be agreed between the Parties as they arise from time to time. Examples of this would be representing the client with the Environmental Agency.

2.6 The Service Provider shall use all reasonable endeavours to accommodate

any reasonable changes in the Services that may be requested by the Client, subject to the Client's acceptance of any related reasonable changes to the Fees that may be due as a result of such changes.

3. **Client's Obligations**

3.1 The Client shall use all reasonable endeavours to provide all pertinent information to the Service Provider that is necessary for the Service Provider's provision of the Services.

3.2 The Client may, from time to time, issue reasonable instructions to the Service Provider in relation to the Service Provider's provision of the Services. Any such instructions should be compatible with the specification of the Services provided in Schedule 1.

3.3 In the event that the Service Provider requires the decision, approval, consent or any other communication from the Client in order to continue with the provision of the Services or any part thereof at any time, the Client shall provide the same in a reasonable and timely manner.

3.4 If any consents, licences or other permissions are needed from any third parties such as landlords, planning authorities, local authorities or similar, it shall be the Client's responsibility to obtain the same in advance of the provision of the Services (or the relevant part thereof).

3.5 If the nature of the Services requires that the Service Provider has access to the Client's premises or any other location, access to which is lawfully controlled by the Client, the Client shall ensure that the Service Provider has access to the same at the times to be agreed between the Service Provider and the Client as required.

3.6 Any delay in the provision of the Services resulting from the Client's failure or delay in complying with any of the provisions of this Clause 3 shall not be the responsibility or fault of the Service Provider.

4. **Fees, Payment and Records**

4.1 The Client shall pay the Fees to the Service Provider in accordance with the provisions of Schedule 2 and this Clause 4.

4.2 The Service Provider shall invoice the Client for Fees due in accordance with the provisions of Schedule 2.

4.3 All payments required to be made pursuant to this Agreement by either Party shall be made within 30<<insert period>> Business Days of receipt by that Party of the relevant invoice.

4.4 All payments required to be made pursuant to this Agreement by either Party shall be made in £sterling <<insert currency>> in cleared funds to such bank as outlined on the invoice the receiving Party may from time to time nominate, without any set-off, withholding or deduction except such amount (if any) of tax as that Party is required to deduct or withhold by law.

4.5 Where any payment pursuant to this Agreement is required to be made on a day that is not a Business Day, it may be made on the next following Business Day.

4.6 Without prejudice to sub-Clause 9.4.1, any sums which remain unpaid

following the expiry of the period set out in sub-Clause 4.3 shall incur interest on a daily basis at 3%<<insert percentage>>% above the base rate of Natwest Bank<<insert name of bank>> from time to time until payment is made in full of any such outstanding sums.

4.7 Each Party shall:

4.7.1 keep, or procure that there are kept, such records and books of account as are necessary to enable the amount of any sums payable pursuant to this Agreement to be accurately calculated;

5. **Liability, Indemnity and Insurance**

5.1 The Service Provider shall ensure that it has in place at all times suitable and valid insurance that shall include public liability insurance.

5.2 In the event that the Service Provider fails to perform the Services with reasonable care and skill it shall carry out any and all necessary remedial action at no additional cost to the Client.

5.3 The Service Provider's total liability for any loss or damage caused as a result of its negligence or breach of this Agreement shall be limited to 100% of the fee charged

5.4 The Service Provider shall not be liable for any loss or damage suffered by the Client that results from the Client's failure to follow any instructions given by the Service Provider.

5.5 Nothing in this Agreement shall limit or exclude the Service Provider's liability for death or personal injury.

5.6 Subject to sub-Clause 5.3 the Service Provider shall indemnify the Client against any costs, liability, damages, loss, claims or proceedings arising out of the Service Provider's provision of the Services or any breach of this Agreement.

5.7 The Client shall indemnify the Service Provider against any costs, liability, damages, loss, claims or proceedings arising from loss or damage to any equipment (including that belonging to any third parties appointed by the Service Provider) caused by the Client or its agents or employees.

5.8 Neither Party shall be liable to the other or be deemed to be in breach of this Agreement by reason of any delay in performing, or any failure to perform, any of that Party's obligations if the delay or failure is due to any cause beyond that Party's reasonable control.

6. **Guarantee**

6.1 The Service Provider guarantees that the product of all Services provided shall be free from any and all defects for a period of 3 months<<insert period e.g. 12 months>> following completion of the Services.

6.2 If any defects in the product of the Services appear during the guarantee period set out in sub-Clause 6.1 the Service Provider shall rectify any and all such defects at no cost to the Client.

7. **Confidentiality**

7.1 Each Party undertakes that, except as provided by sub-Clause 7.2 or as

authorised in writing by the other Party, it shall, at all times during the continuance of this Agreement and **[**for <<insert period>>2 years**]** after its termination:

7.1.1 keep confidential all Confidential Information;

7.1.2 not disclose any Confidential Information to any other party;

7.1.3 not use any Confidential Information for any purpose other than as contemplated by and subject to the terms of this Agreement;

7.1.4 not make any copies of, record in any way or part with possession of any Confidential Information; and

7.1.5 ensure that none of its directors, officers, employees, agents, sub-contractors or advisers does any act which, if done by that Party, would be a breach of the provisions of sub-Clauses 7.1.1 to 7.1.4 above.

7.2 Either Party may:

7.2.1 disclose any Confidential Information to:

7.2.1.1 any sub-contractor or supplier of that Party;

7.2.1.2 any governmental or other authority or regulatory body; or

7.2.1.3 any employee or officer of that Party or of any of the aforementioned persons, parties or bodies;

to such extent only as is necessary for the purposes contemplated by this Agreement (including, but not limited to, the provision of the Services), or as required by law. In each case that Party shall first inform the person, party or body in question that the Confidential Information is confidential and (except where the disclosure is to any such body under sub-Clause 7.2.1.2 or any employee or officer of any such body) obtaining and submitting to the other Party a written confidentiality undertaking from the party in question. Such undertaking should be as nearly as practicable in the terms of this Clause 7, to keep the Confidential Information confidential and to use it only for the purposes for which the disclosure is made; and

7.2.2 use any Confidential Information for any purpose, or disclose it to any other person, to the extent only that it is at the date of this Agreement, or at any time after that date becomes, public knowledge through no fault of that Party. In making such use or disclosure, that Party must not disclose any part of the Confidential Information that is not public knowledge.

7.3 The provisions of this Clause 7 shall continue in force in accordance with their terms, notwithstanding the termination of this Agreement for any reason.

## 8. Force Majeure

8.1 No Party to this Agreement shall be liable for any failure or delay in performing their obligations where such failure or delay results from any cause that is beyond the reasonable control of that Party. Such causes include, but are not limited to: power failure, internet service provider failure, industrial action, civil unrest, fire, flood, storms, earthquakes, acts of terrorism, acts of war, governmental action or any other event that is beyond the control of the Party in question.

8.2 In the event that a Party to this Agreement cannot perform their obligations hereunder as a result of force majeure for a continuous period of 6 months, the other Party may at its discretion terminate this Agreement by written notice at the end of that period. In the event of such termination, the Parties shall agree upon a fair and reasonable payment for all Services provided up to the date of termination. Such payment shall take into account any prior contractual commitments entered into in reliance on the performance of this Agreement.

## 9. Term and Termination

9.1 This Agreement shall come into force on the commencement date as per schedule 2 and shall continue for a Term as outlined on schedule 2from that date, subject to the provisions of this Clause 9.

9.2 Either Party shall have the right, subject to the agreement and consent of the other Party and exercisable by giving not less than 60 days written notice to the other at any time prior to the expiry of the Term specified in sub-Clause 9.1 (or any further period for which this Agreement has been extended pursuant to this provision) to extend this Agreement for a further period of 12 months.

9.3 Either Party may terminate this Agreement by giving to the other not less than 60 days written notice, to expire on or at any time after the initial 12 months of this Agreement..

9.4 Either Party may immediately terminate this Agreement by giving written notice to the other Party if:

9.4.1 any sum owing to that Party by the other Party under any of the provisions of this Agreement is not paid within 60 days Business Days of the due date for payment;

9.4.2 the other Party commits any other breach of any of the provisions of this Agreement and, if the breach is capable of remedy, fails to remedy it within 60 daysBusiness Days after being given written notice giving full particulars of the breach and requiring it to be remedied;

9.4.3 an encumbrancer takes possession, or where the other Party is a company, a receiver is appointed, of any of the property or assets of that other Party;

9.4.4 the other Party makes any voluntary arrangement with its creditors or, being a company, becomes subject to an administration order (within the meaning of the Insolvency Act 1986);

9.4.5 the other Party, being an individual or firm, has a bankruptcy order made against it or, being a company, goes into liquidation (except for the purposes of bona fide amalgamation or re-construction and in such a manner that the company resulting therefrom effectively agrees to be bound by or assume the obligations imposed on that other Party under this Agreement);

9.4.6 anything analogous to any of the foregoing under the law of any jurisdiction occurs in relation to the other Party;

9.4.7 that other Party ceases, or threatens to cease, to carry on business; or

9.4.8 control of that other Party is acquired by any person or connected persons not having control of that other Party on the date of this

Agreement. For the purposes of this Clause 9, "control" and "connected persons" shall have the meanings ascribed thereto by Sections 1124 and 1122 respectively of the Corporation Tax Act 2010.

9.5 For the purposes of sub-Clause 9.4.2, a breach shall be considered capable of remedy if the Party in breach can comply with the provision in question in all respects.

9.6 The rights to terminate this Agreement given by this Clause 9 shall not prejudice any other right or remedy of either Party in respect of the breach concerned (if any) or any other breach.

## 10. Effects of Termination

Upon the termination of this Agreement for any reason:

10.1 any sum owing by either Party to the other under any of the provisions of this Agreement shall become immediately due and payable;

10.2 all Clauses which, either expressly or by their nature, relate to the period after the expiry or termination of this Agreement shall remain in full force and effect;

10.3 termination shall not affect or prejudice any right to damages or other remedy which the terminating Party may have in respect of the event giving rise to the termination or any other right to damages or other remedy which any Party may have in respect of any breach of this Agreement which existed at or before the date of termination;

10.4 subject as provided in this Clause 10 and except in respect of any accrued rights neither Party shall be under any further obligation to the other; and

10.5 each Party shall (except to the extent referred to in Clause 7) immediately cease to use, either directly or indirectly, any Confidential Information, and shall immediately return to the other Party any documents in its possession or control which contain or record any Confidential Information.

## 11. No Waiver

No failure or delay by either Party in exercising any of its rights under this Agreement shall be deemed to be a waiver of that right, and no waiver by either Party of a breach of any provision of this Agreement shall be deemed to be a waiver of any subsequent breach of the same or any other provision.

## 12. Further Assurance

Each Party shall execute and do all such further deeds, documents and things as may be necessary to carry the provisions of this Agreement into full force and effect.

## 13. Costs

Subject to any provisions to the contrary each Party to this Agreement shall pay its own costs of and incidental to the negotiation, preparation, execution and carrying into effect of this Agreement.

14. **Set-Off**

Neither Party shall be entitled to set-off any sums in any manner from payments due or sums received in respect of any claim under this Agreement or any other agreement at any time.

15. **Assignment and Sub-Contracting**

15.1 The Service Provider shall be entitled to perform any of the services obligations undertaken by it through any other member of its group or through suitably qualified and skilled sub-contractors. Any act or omission of such other member or sub-contractor shall, for the purposes of this Agreement, be deemed to be an act or omission of the Service Provider.

16. **Time**

16.1 The Parties agree that the times and dates referred to in this Agreement are for guidance only and are not of the essence of this Agreement and may be varied by mutual agreement between the Parties.

17. **Relationship of the Parties**

Nothing in this Agreement shall constitute or be deemed to constitute a partnership, joint venture, agency or other fiduciary relationship between the Parties other than the contractual relationship expressly provided for in this Agreement.

18. **Non-Solicitation**

18.1 Neither Party shall, for the Term of this Agreement and for a period of 12 monthsafter its termination or expiry, employ or contract the services of any person who is or was employed or otherwise engaged by the other Party at any time in relation to this Agreement without the express written consent of that Party.

18.2 Neither Party shall, for the term of this Agreement and for a period of 12 months after its termination or expiry, solicit or entice away from the other Party any customer or client where any such solicitation or enticement would cause damage to the business of that Party without the express written consent of that Party.

19. **Third Party Rights**

19.1 No part of this Agreement is intended to confer rights on any third parties and accordingly the Contracts (Rights of Third Parties) Act 1999 shall not apply to this Agreement.

19.2 Subject to this Clause 19 this Agreement shall continue and be binding on the transferee, successors and assigns of either Party as required.

20. **Notices**

20.1 All notices under this Agreement shall be in writing and be deemed duly given if signed by, or on behalf of, a duly authorised officer of the Party giving the notice.

20.2 Notices shall be deemed to have been duly given:

20.2.1 when delivered, if delivered by courier or other messenger (including registered mail) during normal business hours of the recipient; or

20.2.2 when sent, if transmitted by facsimile or e-mail and a successful transmission report or return receipt is generated; or

20.2.3 on the fifth business day following mailing, if mailed by national ordinary mail, postage prepaid; or

20.2.4 on the tenth business day following mailing, if mailed by airmail, postage prepaid.

In each case notices shall be addressed to the most recent address, e-mail address, or facsimile number notified to the other Party.

21. **Entire Agreement**

21.1 This Agreement contains the entire agreement between the Parties with respect to its subject matter and may not be modified except by an instrument in writing signed by the duly authorised representatives of the Parties.

21.2 Each Party acknowledges that, in entering into this Agreement, it does not rely on any representation, warranty or other provision except as expressly provided in this Agreement, and all conditions, warranties or other terms implied by statute or common law are excluded to the fullest extent permitted by law.

22. **Counterparts**

This Agreement may be entered into in any number of counterparts and by the Parties to it on separate counterparts each of which when so executed and delivered shall be an original, but all the counterparts together shall constitute one and the same instrument.

23. **Severance**

In the event that one or more of the provisions of this Agreement is found to be unlawful, invalid or otherwise unenforceable, that / those provision(s) shall be deemed severed from the remainder of this Agreement. The remainder of this Agreement shall be valid and enforceable.

24. **Dispute Resolution**

24.1 The Parties shall attempt to resolve any dispute arising out of or relating to this Agreement through negotiations between their appointed representatives who have the authority to settle such disputes.

24.2 If negotiations under sub-Clause 24.1 do not resolve the matter within 60 days

of receipt of a written invitation to negotiate, the parties will attempt to resolve the dispute in good faith through an agreed Alternative Dispute Resolution ("ADR") procedure.

24.3 If the ADR procedure under sub-Clause 24.2 does not resolve the matter within 60 days of the initiation of that procedure, or if either Party will not participate in the ADR procedure, the dispute may be referred to arbitration by either Party.

24.4 The seat of the arbitration under sub-Clause 24.3 shall be England and Wales. The arbitration shall be governed by the Arbitration Act 1996 and Rules for Arbitration as agreed between the Parties. In the event that the Parties are unable to agree on the arbitrator(s) or the Rules for Arbitration, either Party may, upon giving written notice to the other Party, apply to the President or Deputy President for the time being of the Chartered Institute of Arbitrators for the appointment of an arbitrator or arbitrators and for any decision on rules that may be required.

24.5 Nothing in this Clause 24 shall prohibit either Party or its affiliates from applying to a court for interim injunctive relief.

24.6 The Parties hereby agree that the decision and outcome of the final method of dispute resolution under this Clause 24 shall be final and binding on both Parties.

## 25. Law and Jurisdiction

25.1 This Agreement (including any non-contractual matters and obligations arising therefrom or associated therewith) shall be governed by, and construed in accordance with, the laws of England and Wales.

25.2 Subject to the provisions of Clause 24, any dispute, controversy, proceedings or claim between the Parties relating to this Agreement (including any non-contractual matters and obligations arising therefrom or associated therewith) shall fall within the jurisdiction of the courts of England and Wales.

**IN WITNESS WHEREOF** this Agreement has been duly executed the day and year first before written

SIGNED by
<<Name and Title of person signing for Service Provider>>
for and on behalf of Kingspan Environmental Limited t/a Kingspan Environmental Services

In the presence of
<<Name & Address of Witness>>

SIGNED by

<<Name and Title of person signing for Client>>
for and on behalf of <<Client's Name>>

In the presence of
<<Name & Address of Witness>>

## SCHEDULE 1

### Specification of Services

| SITE REF | SITE NAME | ASSET DESCRIPTION | PPM VISITS P.A | DE-SLUDGE VISITS P.A | OTHER WORKS DESCRIPTION | OTHER WORKS COMMENT |
|---|---|---|---|---|---|---|
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## SCHEDULE 2

### Fees and Payment and term

This Agreement shall be for a fixed term of [3/5] years and the date of commencement shall be [*insert date*].

This Agreement shall continue in force until terminated in writing in accordance with the termination provisions contained within Clause 9 in this Agreement.

This Agreement shall be automatically renewed for 12 months periods unless prior written notice of termination has been received from either party to the other 60 days before the expiry date. If such prior written notice is given by either party then this agreement shall terminate on the original expiry date or any subsequent expiry date.

### Fees and Payment

1. The total fees payable per annum shall be [ ] exclusive of VAT

2. The Annual fee shall be the total fee payable for the Services save in respect of those items noted in Schedule One specifications as being subject to an additional fee. The Service Provider shall provide the Client with a quote for such work on request and once agreed in writing by the Client, the agreed quote ("Additional Fee") shall be payable in addition to the Annual Fee and shall be included on the next monthly invoice as a clearly identifiable item.

3. The maintenance contract Annual fee shall be invoiced and payable in advance on the anniversary of the Commencement date. The Contractor shall be entitled to raise: a separate invoice for any Additional Fee.



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