GEO-ENVIRONMENTAL CONSULTING ENGINEERS

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Our Ref: BEK-18396-180529-PVD

29 May 2018

FAO Ribble Valley Borough Council

FAO Planning Officer

Discharge of Planning Conditions 12 and 13 (Drainage) for Planning Application Ref: 3/2017/0674 Former Moorcock Inn, Slaidburn Road, Waddington

This report has been developed to discharge Planning Conditions 12 and 13 concerning surface water and foul drainage at the above site associated with the decision notice dated 29/09/2017.

Ribble Valley Borough Council Comments

Condition 12

1.No development shall commence until details of an appropriate management and maintenance plan for the sustainable drainage system for the lifetime of the development have been submitted which, as a minimum, shall include:

a) the arrangements for adoption by an appropriate public body or statutory undertaker, management and maintenance by a Residents' Management Company
b) arrangements concerning appropriate funding mechanisms for its on-going maintenance of all elements of the sustainable drainage system (including mechanical components) and will include elements such as:
    i. on-going inspections relating to performance and asset condition assessments
    ii. ii. operation costs for regular maintenance, remedial works and irregular maintenance caused by less sustainable limited life assets or any other arrangements to secure the operation of the surface water drainage scheme throughout its lifetime;
c) Means of access for maintenance and easements where applicable.

The plan shall be implemented in accordance with the approved details prior to first occupation of any of the approved dwellings, or completion of the development, whichever is the sooner. Thereafter the sustainable drainage system shall be managed and maintained in accordance with the approved details.

The scheme shall be implemented in accordance with the approved details prior to first occupation of any of the approved dwellings, or completion of the development, whichever is the sooner. Thereafter the drainage system shall be retained, managed and maintained in accordance with the approved details.

REASON: To ensure that the proposed development can be adequately drained. To ensure that there is no flood risk on or off the site resulting from the proposed development. To ensure that appropriate and sufficient funding and maintenance mechanisms are put in place for the lifetime of the development to reduce the flood risk to the development as a result of inadequate maintenance and

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to identify the responsible body/bodies for the sustainable drainage system and comply with Policy DMG1 of the Ribble Valley Core Strategy.

Condition 13

No development shall commence until final details of the design, based on sustainable drainage principles, and implementation of an appropriate surface water sustainable drainage scheme have been submitted to and approved in writing by the local planning authority.

Those details shall include, as a minimum:

a) Information about the lifetime of the development, design storm period and intensity (1 in 30 & 1 in 100 year + allowance for climate change see EA advice Flood risk assessments: climate change allowances'), discharge rates and volumes (both pre and post development), temporary storage facilities, the methods employed to delay and control surface water discharged from the site, and the measures taken to prevent flooding and pollution of the receiving groundwater and/or surface waters, including watercourses, and details of floor levels in AOD;
b) The drainage strategy should demonstrate that the surface water run-off must not exceed pre-development runoff rates. The scheme shall subsequently be implemented in accordance with the approved details before the development is completed.
c) Any works required off-site to ensure adequate discharge of surface water without causing flooding or pollution (which should include refurbishment of existing culverts and headwalls or removal of unused culverts where relevant);
d) Flood water exceedance routes, both on and off site;
e) A timetable for implementation, including phasing as applicable;
f) Evidence of an assessment of the site conditions to include site investigation and test results to confirm infiltrations rates;
g) Details of water quality controls, where applicable.

The scheme shall be implemented in accordance with the approved details prior to first occupation of any of the approved dwellings, or completion of the development, whichever is the sooner. Thereafter the drainage system shall be retained, managed and maintained in accordance with the approved details.

REASON: To ensure that appropriate and sufficient funding and maintenance mechanisms are put in place for the lifetime of the development; to reduce the flood risk to the development as a result of inadequate maintenance and to identify the responsible organisation /body/company/undertaker for the sustainable drainage system and comply with Policy DMG1 of the Ribble Valley Core Strategy.

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Ribble Valley Borough Council's concerns have been addressed within the text below:

Pre/Post Development Surface Water Drainage

Existing Runoff Rates

Total site area = 0.736 Ha (Positively Drained Area = 0.15 Ha)

The pub building on the Former Moorcock site was the only part of the development to be positively drained, the car parking area did not have any formal drainage network to collect surface water flows.

As such the ICP SUDS Methods has been utilised to calculate existing runoff rates in line with greenfield runoff with a percentage urban applied to account for the building i.e. 20% of the total site area. A summary of the results for the 1 in 1 year, 1 in 30 year and 1 in 100 year return periods have been tabulated below.

1 Year Discharge Rate (l/s)	30 year Discharge Rate (l/s)	100 year + 40% Climate Change Discharge Rate (l/s)
9.7	18	21.1

Table 1: Surface Water Discharge Rates (Area = 0.736 Ha 20% Urban)

*It is anticipated that these rates are indicative of the SPR HOST being 0.5 i.e. shallow rock.

Climate Change Allowance

Due to the development site being classified as 'More Vulnerable' and located within Flood Zone 1, with a design life in between the years 2070 and 2115, 40% has applied to account for climate change over the lifetime of the development in line with current EA guidance.

Hierarchy of Surface Water Disposal

In accordance with Building Regulations Document H surface water from the site must be disposed of in the following order:

1. Discharge to ground via infiltration
2. Discharge to watercourse
3. Discharge to public sewer

Infiltration

Following a desk top study using Soilscape maps the site is considered to be loamy and clayey soils that are 'slowly permeable seasonally wet acid loamy and clayey soils' with impeded drainage. Furthermore the site investigation proved the presence of boulder clay across the site (See BEK Letter Report Ref BEK-18396-180525-PVD).

Furthermore, the site is located on a steep hill that could experience surface water emergence at lower levels if infiltration methods where to be utilised. Therefore, for these reasons it is not recommended that disposal of surface water is directed to ground.

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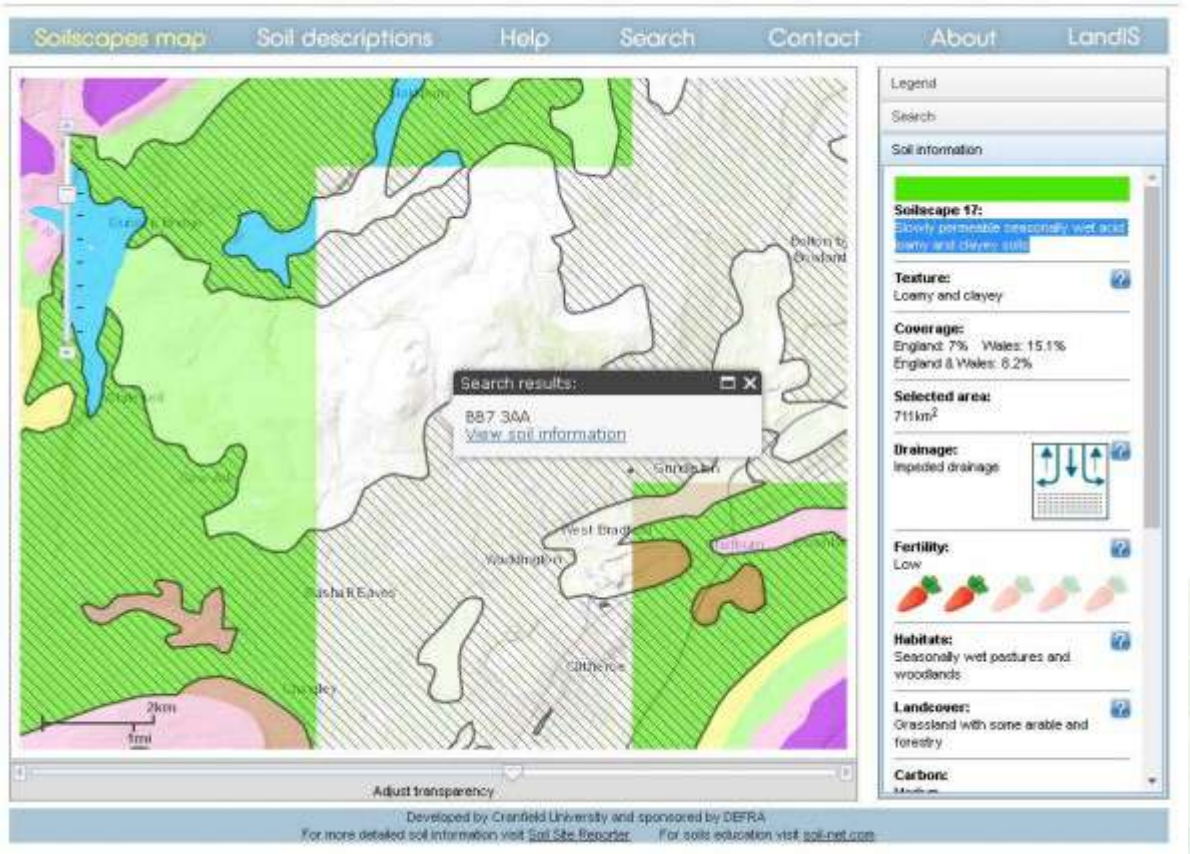
As such it is concluded that due to the underlying ground being found to be unsuitable for the application of soakaways the surface water should be directed to watercourse.



Watercourse

BEK Enviro have undertaken on-site investigations which identify that an unnamed culverted watercourse flows along the east of the application site in which the public house directed surface water flows.

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For full details of the route of the watercourse see BEK Enviro drawing number 18396-4 which is attached to this document as an annex.

Due to its proximity, it is recommended that surface water is directed to the unnamed culverted watercourse, located at the north east of the application site, using an existing manhole on the route of the culvert, within the highway to the south east of the site.

Drainage Strategy with Pollution Control and Flow Control

Following development, the surface water network will collect flows from only the roof areas of the properties, accounting for a total impermeable area of 0.116 Hectares.

Due to the site constraints i.e. topography and lack of available space for attenuation within the highway the access road to the properties will be constructed from resin bound gravel or similar surfaces, which does not requirement for positive drainage.

Surface water flows are to be collected via rainwater down pipes, with flows attenuated in geo-cellular storage crates located within the driveways of the properties, restricted via individual flow control chambers to greenfield runoff rates, before being directed to the culverted watercourse at the south east of the application site.

Geo-cellular Tank Dimensions

Tank 1

- Plan area = 13m^2
- Depth of tank = 0.4m
- Flow control orifice dia = 58mm

Tank 2

- Plan area = 10m^2
- Depth of tank = 0.4m
- Flow control orifice dia = 55mm

Tank 3

- Plan area = 10m^2
- Depth of tank = 0.4m
- Flow control orifice dia = 55mm

Tank 4

- Plan area = 13m^2
- Depth of tank = 0.4m
- Flow control orifice dia = 56mm

Post Development Runoff Rates

The drainage strategy for the site has been modelled using MicroDrainage software for various return periods, the results are tabulated below:

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1 Year Discharge Rate (l/s)	30 year Discharge Rate (l/s)	100 year + 40% Climate Change Discharge Rate (l/s)
7.8	13.1	21.1

Table 2: Surface Water Discharge Rates

During the 1 and 30 year event the proposed discharge from the site provides a substantial betterment compared to the existing situation, during the 100 year plus 40% climate change event greenfield runoff rates have been matched.

Exceedance Routes

The drainage strategy has been designed to accommodate flows up to and including the 1 in 100 year plus 40% climate change event with no surface flooding.

Foul Flows

Due to the lack of available infrastructure i.e. public sewer networks foul flows will be dealt with onsite by means of individual package treatment plants located within the garden space of the plots.

Treated effluent is to be directed into the surface water drainage network downstream of the flow control devices so that flows will not back up the system potentially disrupting the function of the PTP's.

Ultimately treated effluent will discharge into the culverted watercourse which has adequate flows to dilute liquids due to the large catchment it serves upstream of the site.

The Proposed Drainage Layout drawing has recommended that Klargester Bio Disc BA package treatment plants or similar should be used for individual dwellings, technical information is attached as an appendix to this report.

Timetable for Implementation

The developer will address this issue directly, at the time of writing this information was not available.

Land Drainage Consent (Lancashire County Council)

Any works within 6m of an Ordinary Watercourse will require land drainage consent from Lancashire County Council in order to facilitate a connection.

Extracts below are taken from the LCC District Flood Report:

'Land drainage comprises systems of rivers, watercourses, ditches, culverts, pipes, lakes and ponds intended to drain water resulting from rainfall and flows from underground sources. Typically the primary responsibility for maintaining responsible flows in land drainage systems lies with the riparian owner or owners, with the LLFA, EA, IDB and local councils holding enforcement powers to use if the land owner/s default in their duties.

(Land Drainage Consent – guidance available on the LCC website www.lancashire.gov.uk)'

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Maintenance Plan

The drainage strategy will remain private, as such maintenance of the drainage network will remain the responsibility of the developer via a drainage maintenance contract, payment details will be addressed directly by the developer, possibly by means of an annual levy.

General maintence requirements for the attenuation structure has been taken from CIRIA SUDS Manual are identified below:

Geo-Cellular Tanks

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

Furthermore, attached within the appendix is a copy of CIRIA RP992 which outlines 'Guidance to a Maintenance Plan' to enable the building management team to compose a robust maintenance/management plan.

We trust that the additional information provided above is acceptable and answers the conditions raised, if you have any questions please do not hesitate to contact the undersigned.

Yours sincerely

D. Emmott

DAVID EMMOTT
BSc (Hons) MSc AMIEnvSci

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ANNEX A

Greenfield Runoff Rates

ICP SUDS Mean Annual Flood

Input

Return Period (years)	1	Soil	0.500
Area (ha)	0.736	Urban	0.200
SAAR (mm)	1337	Region Number	Region 10

Results l/s

QBAR Rural	8.7
QBAR Urban	11.1
Q1 year	9.7
Q1 year	9.7
Q30 years	18.0
Q100 years	21.1

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ANNEX B

Proposed Drainage Strategy and Associated Details

NOTES:

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5. NO DIMENSIONS TO BE SCALED FROM THIS DRAWING.
6. THE LOCATION AND LEVELS OF EXISTING DRAINAGE PIPES AND CULVERTS MUST BE CHECKED ON-SITE PRIOR TO CONSTRUCTION.
7. ANY LAND DRAINAGE INCLUDING BACK OF WALL DRAINAGE SHOULD NOT CONNECT UPSTREAM OF THE FLOW CONTROL CHAMBER TO PREVENT SILTATION OF THE ATTENUATION TANK.

SAFETY HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS, RISKS NORMALLY ASSOCIATED WITH THE TYPE OF CONSTRUCTION WORK OR RELATED STRUCTURAL WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING SIGNIFICANT RISKS AND INFORMATION.

RISKS LISTED HERE ARE SIGNIFICANT, AND ASSOCIATED WITH THE CONSTRUCTION WORK OR RELATED STRUCTURAL WORK.

HAZARDOUS SUBSTANCE - SKIN CONTACT WITH HOT BITUMEN AND CONTENTIOUS

DUST - AIRBORNE DUST PARTICLES FROM GRANULAR SUB BASE AND CUTTING OF CONCRETE .

PUBLIC - STRUCK BY MOVING PLANT.

FOR INFORMATION RELATING TO END USE, MAINTENANCE DEMOLITION, SEE HEALTH AND SAFETY FILE.

IT IS ASSUMED THAT ALL WORK WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

THE TABLE BELOW IDENTIFIES IN MORE DETAIL THE POTENTIAL RISKS ASSOCIATED WITH DIFFERENT TASKS

ITEM	RECOMMENDATION
1. EXCAVATION ADJACENT TO BOUNDARIES	CARE TO BE TAKEN WITH DEEP EXCAVATIONS IN ORDER TO PREVENT SIDEWALL COLLAPSE / SUPPAGE. CONTRACTOR TO PROVIDE METHOD STATEMENTS WHERE NECESSARY. EXCAVATIONS TO BE SAFELY CORDONED OFF AND ENSURE SAFE PEDESTRIAN AND VEHICLE ACCESS IS MAINTAINED TO ADJACENT BUILDINGS. ENSURE EXCAVATIONS/PLANT AND MACHINERY ARE MADE SECURE OUTSIDE WORKING HOURS TO PREVENT INJURY TO THE PUBLIC.
2. CONSTRUCTING NEW M.H'S AND ALTERATIONS TO EXISTING MANHOLES	CONTRACTOR TO PROVIDE METHOD STATEMENT FOR SAFE CONSTRUCTION WHEN WORKING IN CONFINED SPACES. ALL PERSONNEL AFFECTED TO BE TRAINED AND BRIEFED ON THE RELEVANT METHOD STATEMENT.
3. PLACING AND HANDLING CUT AND BENT REINFORCEMENT	CONTRACTOR TO ENSURE WEIGHTS OF MATERIALS ARE INLINE WITH CURRENT REGULATIONS. NO PROJECTING BARS DETAILED. LENGTH OF BARS LIMITED TO MANAGEABLE SECTIONS.
4. EXCAVATION NEAR TO EXISTING SERVICES.	NEW CAVITY WALL LEAVES TO BE CONSTRUCTED SIMULTANEOUSLY THROUGHOUT CONSTRUCTION TO REDUCE RISK OF COLLAPSE AND PREVENTS EXPOSURE OF PROTRUDING WALL TIES. WALLS TO BE CONSTRUCTED IN SUITABLE LIFTS TO MAINTAIN FRESH MORTAR STABILITY. ISSUE AVAILABLE SERVICE RECORDS TO THE CONTRACTOR.
5. WORKING NEAR TO LIVE TRAFFIC.	CONTRACTOR TO PROVIDE METHOD STATEMENT FOR TRAFFIC MANAGEMENT/TEMPORARY WORKS. CONTRACTOR TO PROVIDE APPROPRIATE PROTECTION BARRIERS IF REQUIRED. WORKERS TO WEAR HIGH VISIBILITY CLOTHING TO AVOID BEING STRUCK BY PASSING VEHICLES OR PLANT.
6. GENERAL PUBLIC; EXISTING RESIDENTS; OR CHILDREN ON SITE.	ENSURE THAT THE SITE IS PROPERLY SECURE TO PREVENT INJURY FROM SLIPS, TRIPS, FALLS, FALLING FROM HEIGHT, UNCOVERED MANHOLES/TRENCHES. PROVIDE ADVANCE WARNING TO RESIDENTS REGARDING THE START OF CONSTRUCTION. IDENTIFY DIVERSIONS TO PUBLIC RIGHTS OF WAY, ESTABLISHED AND CLEARLY SIGNED IF REQUIRED.
7. NOISE, DUST AND VIBRATION RESULTING FROM CONSTRUCTION WORKS	METHOD STATEMENT TO BE PROVIDED. SITE STAFF TO BE PROVIDED WITH APPROPRIATE PPE. WORK MAY HAVE TO BE UNDERTAKEN AT SPECIFIC TIMES IN SENSETIVE AREAS TO MINIMISE DISRUPTION TO ADJACENT PROPERTIES.
8.0 WORKING NEAR WATER	CONTRACTOR TO PROVIDE DETAILED METHOD STATEMENT IN ACCORDANCE WITH THE APPROVED LAND DRAINAGE CONSENT, TO ENSURE SAFE WORKING ARRANGEMENTS AROUND AREAS OF OPEN OR FLOWING WATER; AND TO ENSURE THAT SUITABLE SITE OPERATION PROCEDURES ARE IN PLACE TO ELIMINATE THE RISK OF POLLUTION TRANSFER TO THE WATER ENVIRONMENT FROM PLANT & SITE MATERIALS.

SW MANHOLE SCHEDULE

MANHOLE	CL	IL	DEPTH TO IL	MANHOLE DIA	CHAMBER TYPE	COVER TYPE
RE1	254.850	254.400	0.450	-	RODDING EYE	A15
S1	254.850	254.257	0.593	450	PPIC	A15
S2	254.850	254.017	0.833	450	PPIC	A15
S3	254.850	253.570	1.280	450	PPIC	A15
RE2	254.850	254.400	0.450	-	RODDING EYE	A15
S4	254.600	252.600	2.000	450	PPIC SILT TRAP	B125
S5	253.924	252.483	1.441	500	FLOW CONTROL	B125
S6	253.500	252.043	1.457	450	PPIC	B125
S7	252.700	251.350	1.350	1200	TYPE B1	D400
RE3	254.350	253.900	0.450	-	RODDING EYE	A15
S8	254.350	253.765	0.585	450	PPIC	A15
S9	255.250	254.350	0.900	450	PPIC	A15
S10	254.350	253.750	0.600	450	PPIC	B125
S11	254.350	253.631	0.719	450	PPIC	A15
S12	254.350	253.468	0.882	450	PPIC	A15
RE4	254.350	253.900	0.450	-	RODDING EYE	A15
S13	254.350	253.471	0.879	450	PPIC	A15
S14	254.350	253.314	1.036	450	PPIC	A15
S15	254.350	252.674	1.676	450	PPIC SILT TRAP	A15
S16	253.620	252.550	1.070	500	FLOW CONTROL	B125
S17	253.000	251.270	1.730	450	PPIC	B125
		BD 251.890				
S18	251.900	250.450	1.450	1200	TYPE B1	D400
RE5	253.850	253.550	0.300	-	RODDING EYE	A15
S19	253.850	253.450	0.400	450	PPIC	A15
S20	253.850	252.903	0.947	1200	TYPE B1	A15
S21	254.750	253.500	1.250	450	PPIC	A15
S22	253.500	253.050	0.450	1200	TYPE B1	D400
S23	253.850	252.790	1.060	450	PPIC	B125
RE6	253.850	253.400	0.450	-	RODDING EYE	A15
S24	253.850	252.188	1.662	450	PPIC SILT TRAP	A15
S25	253.850	252.048	1.802	450	PPIC	B125
S26	252.800	250.800	2.000	500	RODDING EYE	B125
		BD 251.341				
S27	251.000	249.650	1.350	1200	TYPE B1	D400
RE7	252.850	252.400	0.450	-	RODDING EYE	A15
S28	253.750	252.405	1.345	450	PPIC	A15
S29	252.850	252.282	0.568	450	PPIC	B125
S30	252.850	252.166	0.684	450	PPIC	A15
S31	252.850	252.049	0.801	450	PPIC	A15
RE8	252.850	252.400	0.450	-	RODDING EYE	A15
S32	252.850	252.313	0.537	450	PPIC	A15
S33	252.850	252.262	0.588	450	PPIC	A15
S34	252.850	251.173	1.677	450	SILT TRAP	A15
S35	252.180	251.050	1.130	500	FLOW CONTROL	B125
S36	251.800	249.900	1.900	450	PPIC	B125
		BD 250.670				
S37	250.400	248.850	1.550	1200	TYPE B1	D400

FOUL MANHOLE SCHEDULE

MANHOLE	CL	IL	DEPTH TO IL	MANHOLE DIA	CHAMBER TYPE	COVER TYPE
F1	254.850	254.250	0.600	450	PPIC	A15
F2	254.850	254.194	0.656	450	PPIC	A15
F3	254.850	254.069	0.781	450	PPIC	A15
F4	254.850	254.250	0.600	450	PPIC	A15
F5	254.850	254.156	0.694	450	PPIC	A15
F6	254.850	253.748	1.102	450	PPIC	A15
F7	254.600	252.958	1.642	450	PPIC	D400
F8	253.900	252.388	1.512	450	PPIC	A15
F9	254.350	253.200	1.150	450	PPIC	A15
F10	254.350	253.156	1.194	450	PPIC	A15
F11	254.350	252.989	1.362	450	PPIC	A15
F12	254.350	252.920	1.430	450	PPIC	A15
F13	254.350	252.139	2.211	450	PPIC	A15
F14	254.350	252.051	2.299	450	PPIC	A15
F15	253.700	252.031	1.669	450	PPIC	D400
F16	253.400	251.963	1.438	450	PPIC	A15
F17	253.850	253.250	0.600	450	PPIC	A15
F18	253.850	253.156	0.694	450	PPIC	A15
F19	253.850	252.116	1.734	450	PPIC	A15
F20	253.850	253.250	0.600	450	PPIC	A15
F21	253.500	253.205	0.295	450	PPIC	D400
F22	253.800	252.571	1.229	450	PPIC	D400
F23	253.300	251.961	1.339	450	PPIC	A15
F24	252.850	251.750	1.100	450	PPIC	A15
F25	252.850	251.616	1.234	450	PPIC	A15
F26	252.600	251.528	1.072	450	PPIC	D400
F27	252.750	251.149	1.601	450	PPIC	D400
F28	252.350	251.054	1.296	450	PPIC	D400
F29	252.850	251.004	1.846	450	PPIC	A15
F30	252.300	250.564	1.737	450	PPIC	A15

KEY:

- SURFACE WATER SEWER
- FOUL SEWER
- TREATED EFFLUENT/SURFACE WATER SEWER
- EXISTING CULVERTED WATERCOURSE
- SURFACE WATER MANHOLE
- TREATED EFFLUENT/SURFACE WATER MANHOLE
- FOUL MANHOLE
- PACKAGE TREATMENT PLANT
- GEO CELLULAR ATTENUATION TANK

REVISION	COMMENT	DATE	BY

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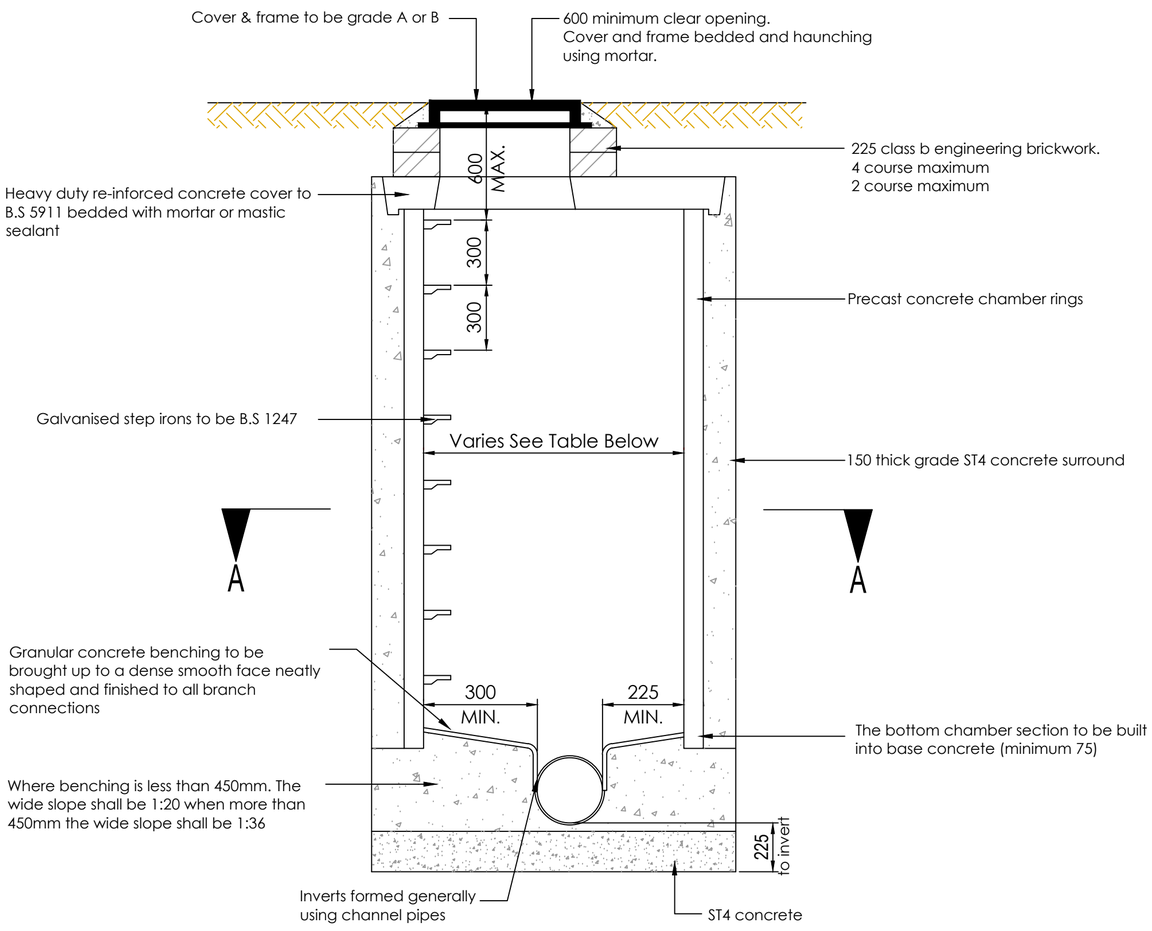
CLIENT:	BEK Enviro Ltd
PROJECT:	Former Moorcock Pub
DRAWING TITLE:	Proposed Surface Water / Foul Drainage Layout & MH Schedule
DRAWING REFERENCE:	2018 - 051 - 01
DATE:	29.05.18
DRAWN BY:	CV
SCALE:	1:250
SIZE:	A1
REVISION:	/



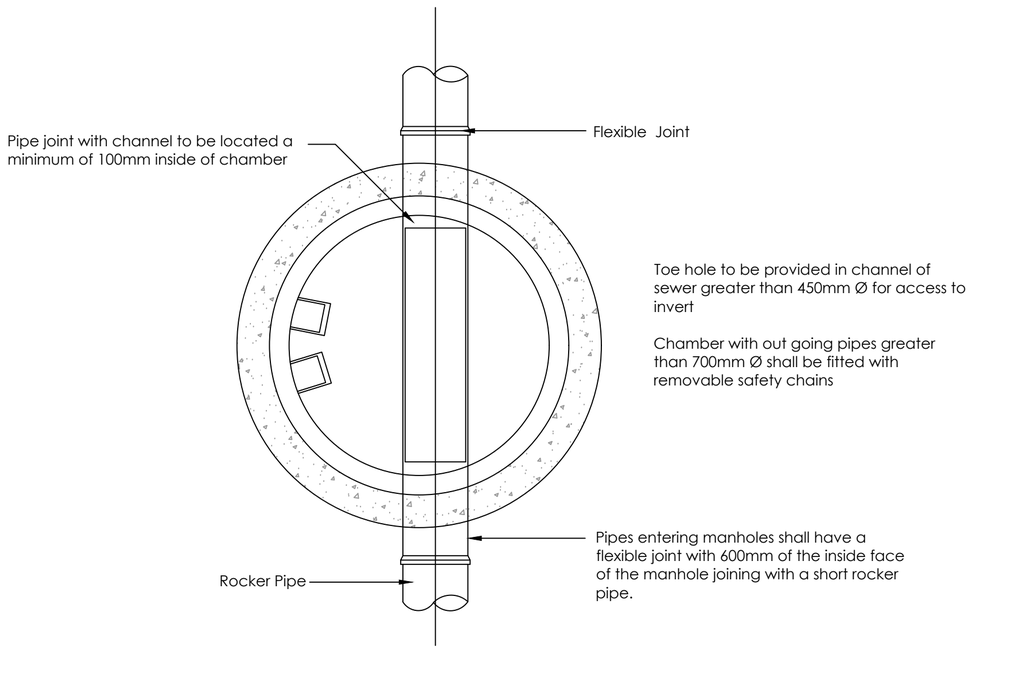
Type B1 Manhole Detail

(1.35m - 3m Deep with Step Irons)

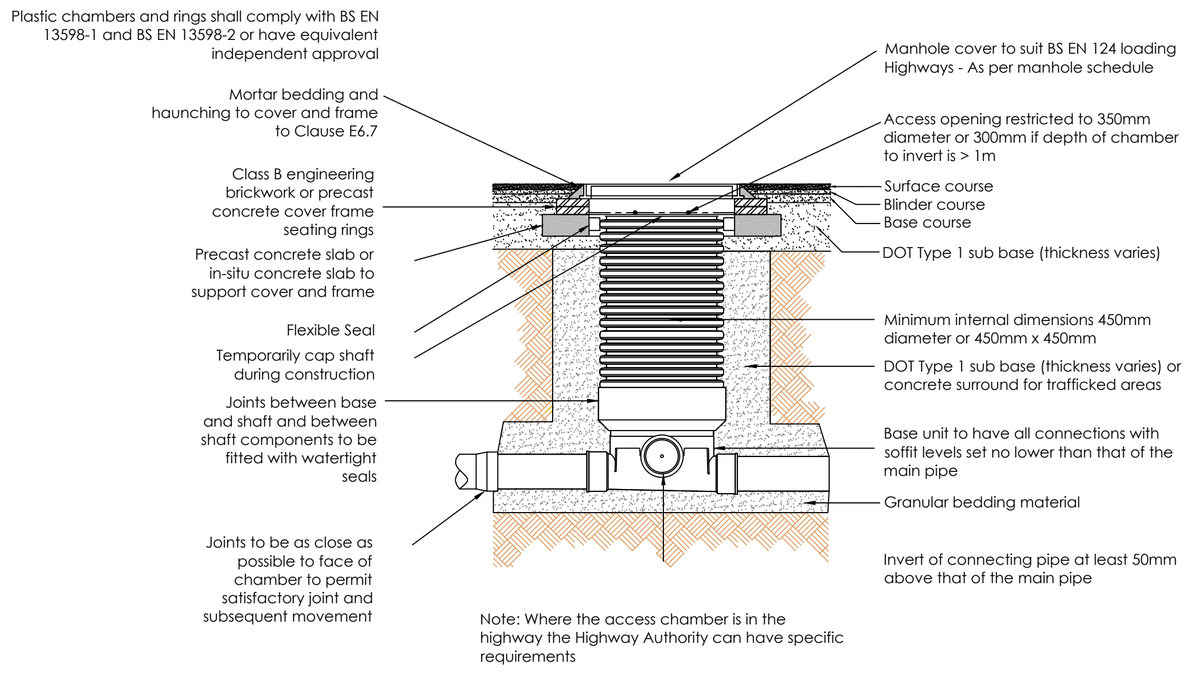
Scale 1:20

MIN. DIMENSIONS FOR ACCESS FITTINGS & INSPECTION CHAMBERS					
TYPE		DEPTH TO INVERT FROM COVER LEVEL (m)	INTERNAL SIZES		COVER SIZES
			RECTANGULAR LENGTH & WIDTH	CIRCULAR DIAMETER	RECTANGULAR LENGTH & WIDTH / CIRCULAR DIAMETER
RODDING EYE			AS DRAIN BUT MIN. 100mm		SAME SIZE AS PIPE (SEE NOTE 1)
ACCESS FITTINGS					
SMALL	150Ø	0.6 OR LESS, EXCEPT WHERE SITUATED IN A CHAMBER	150x100	150	150x100 (SEE NOTE 1) / SAME SIZE AS ACCESS FITTING
	150x100				
LARGE	225x100		225x100	225	225x100 (SEE NOTE 1)
INSPECTION CHAMBER					
SHALLOW		0.6 OR LESS	225x100	190 (SEE NOTE 2)	190 (SEE NOTE 1)
		1.2 OR LESS	450x450	450	MIN. 430x430 / 430
DEEP		>1.2 BUT <3.0	450x450	450	MAX. 300x300 (SEE NOTE 3) / ACCESS RESTRICTED TO MAX. 350 (SEE NOTE 3)

NOTES:
1. THE CLEAR OPENING MAY BE REDUCED BY 20mm IN ORDER TO PROVIDE PROPER SUPPORT FOR THE COVER & FRAME.
2. DRAINS UP TO 150mm
3. A LARGER CLEAR OPENING MAY BE USED IN CONJUNCTION WITH RESTRICTED ACCESS. THE SIZE IS RESTRICTED FOR HEALTH & SAFETY REASONS TO DETER ENTRY.



Typical Inspection Chamber
Max. 3m Deep Non Entry
Scale 1:20



Note: Where the access chamber is in the highway the Highway Authority can have specific requirements

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THE TABLE BELOW IDENTIFIES IN MORE DETAIL THE POTENTIAL RISKS ASSOCIATED WITH DIFFERENT TASKS

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1. EXCAVATION ADJACENT TO BOUNDARIES	CARE TO BE TAKEN WITH DEEP EXCAVATIONS IN ORDER TO PREVENT SIDEWALL COLLAPSE / SLIPPAGE. CONTRACTOR TO PROVIDE METHOD STATEMENTS WHERE NECESSARY. EXCAVATIONS TO BE SAFELY CORDONED OFF AND ENSURE SAFE PEDESTRIAN AND VEHICLE ACCESS IS MAINTAINED TO ADJACENT BUILDINGS, ENSURE EXCAVATIONS/PLANT AND MACHINERY ARE MADE SECURE OUTSIDE WORKING HOURS TO PREVENT INJURY TO THE PUBLIC.
2. CONSTRUCTING NEW M.H'S AND ALTERATIONS TO EXISTING MANHOLES	CONTRACTOR TO PROVIDE METHOD STATEMENT FOR SAFE CONSTRUCTION WHEN WORKING IN CONFINED SPACES. ALL PERSONNEL AFFECTED TO BE TRAINED AND BRIEFED ON THE RELEVANT METHOD STATEMENT.
3. PLACING AND HANDLING CUT AND BENT REINFORCEMENT	CONTRACTOR TO ENSURE WEIGHTS OF MATERIALS ARE INLINE WITH CURRENT REGULATIONS. NO PROJECTING BARS DETAILED. LENGTH OF BARS LIMITED TO MANAGEABLE SECTIONS.
4. EXCAVATION NEAR TO EXISTING SERVICES.	NEW CAVITY WALL LEAVES TO BE CONSTRUCTED SIMULTANEOUSLY THROUGHOUT CONSTRUCTION TO REDUCE RISK OF COLLAPSE AND PREVENTS EXPOSURE OF PROTRUDING WALL TIES. WALLS TO BE CONSTRUCTED IN SUITABLE LIFTS TO MAINTAIN FRESH MORTAR STABILITY. ISSUE AVAILABLE SERVICE RECORDS TO THE CONTRACTOR.
5. WORKING NEAR TO LIVE TRAFFIC.	CONTRACTOR TO PROVIDE METHOD STATEMENT FOR TRAFFIC MANAGEMENT/TEMPORARY WORKS. CONTRACTOR TO PROVIDE APPROPRIATE PROTECTION BARRIERS IF REQUIRED. WORKERS TO WEAR HIGH VISIBILITY CLOTHING TO AVOID BEING STRUCK BY PASSING VEHICLES OR PLANT.
6. GENERAL PUBLIC; EXISTING RESIDENTS; OR CHILDREN ON SITE.	ENSURE THAT THE SITE IS PROPERLY SECURE TO PREVENT INJURY FROM SLIPS, TRIPS, FALLS, FALLING FROM HEIGHT, UNCOVERED MANHOLES/TRENCHES. PROVIDE ADVANCE WARNING TO RESIDENTS REGARDING THE START OF CONSTRUCTION. IDENTIFY DIVERSIONS TO PUBLIC RIGHTS OF WAY, ESTABLISHED AND CLEARLY SIGNED IF REQUIRED.
7. NOISE, DUST AND VIBRATION RESULTING FROM CONSTRUCTION WORKS	METHOD STATEMENT TO BE PROVIDED. SITE STAFF TO BE PROVIDED WITH APPROPRIATE PPE. WORK MAY HAVE TO BE UNDERTAKEN AT SPECIFIC TIMES IN SENSETIVE AREAS TO MINIMISE DISRUPTION TO ADJACENT PROPERTIES.
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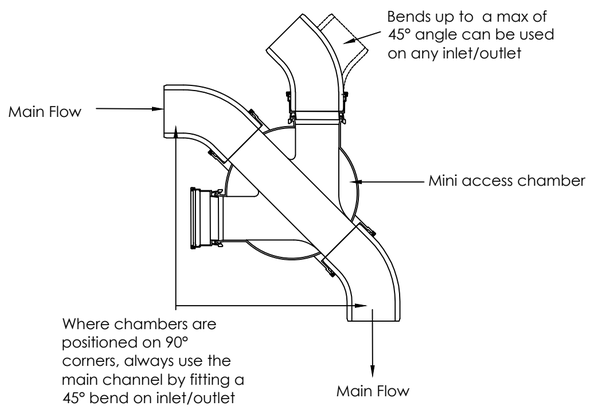

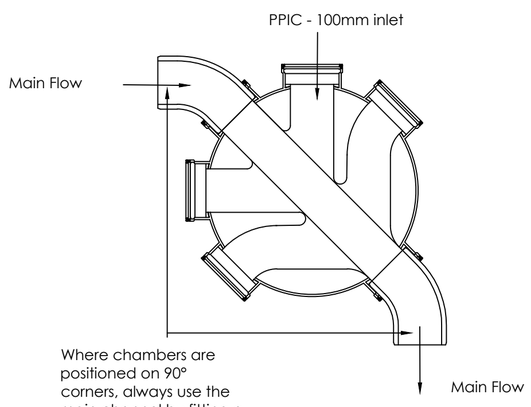

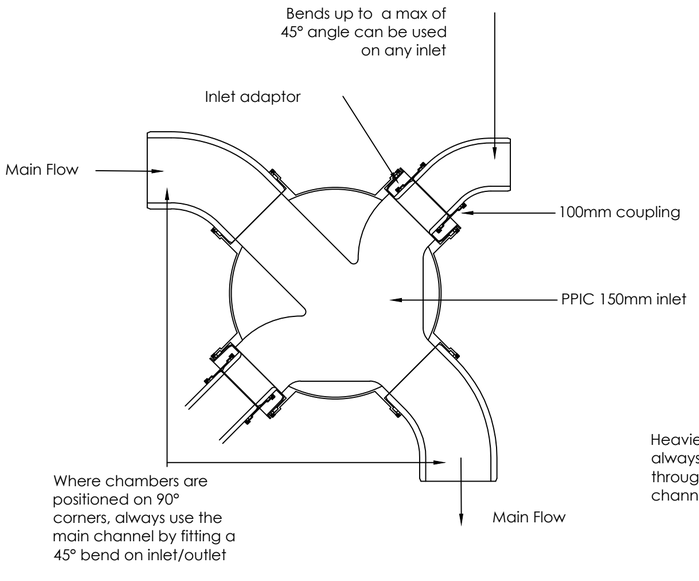

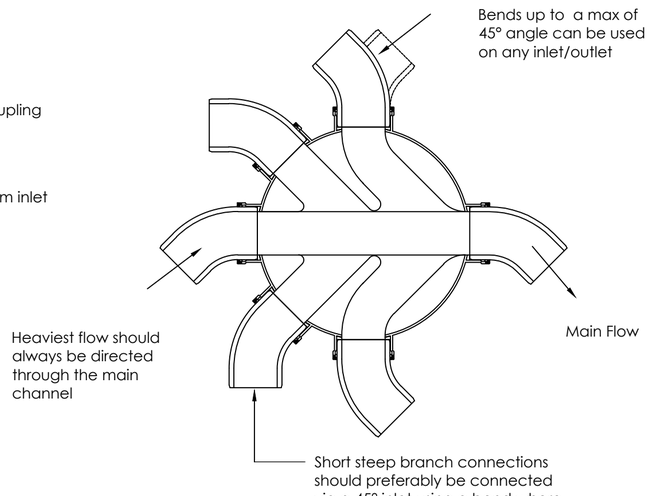

Mini Access Chamber & PPIC
Installation Details
Scale 1:10

REVISION	COMMENT	DATE	BY

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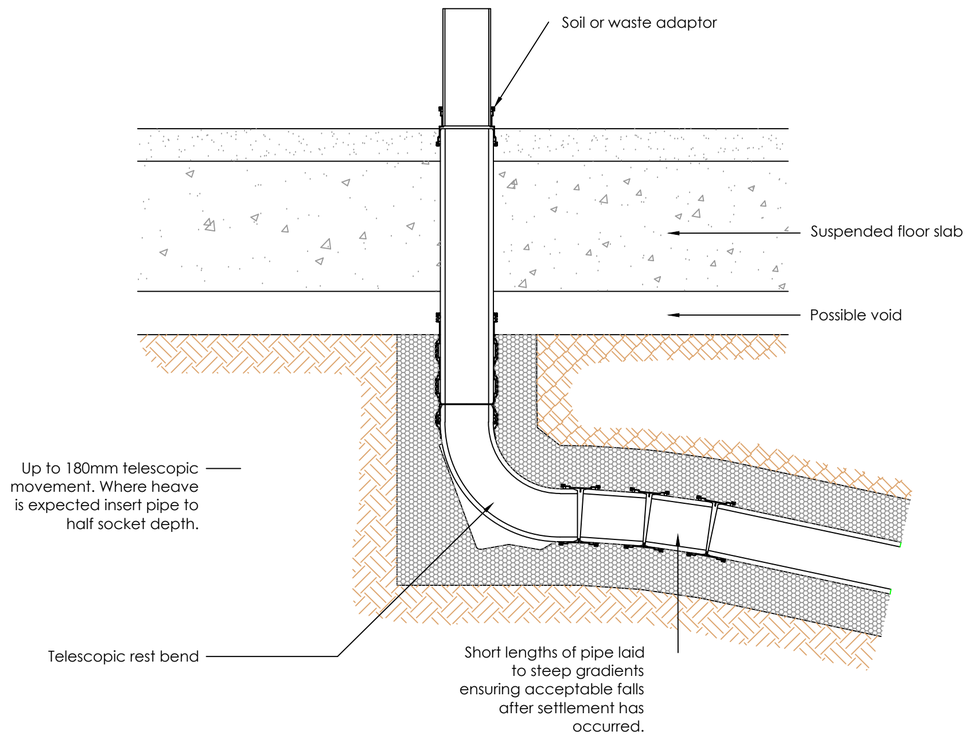
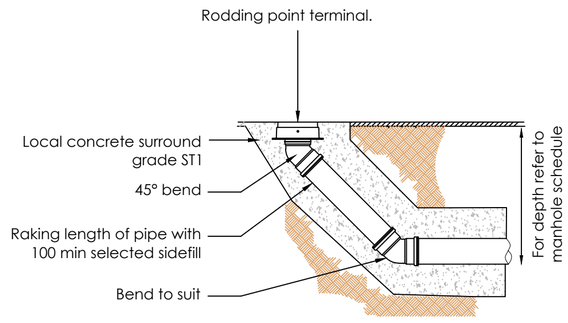
Elm Street Business Park
Burnley, BB10 1PD
TEL: 01282 792591
EMAIL: INFO@FLOODRISKCONSULT.COM
WEBSITE: WWW.FLOODRISKCONSULT.COM

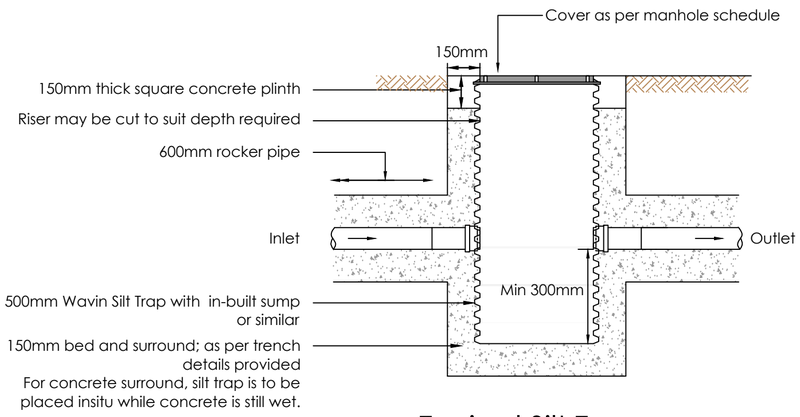
CLIENT:	Bek Enviro Ltd
PROJECT:	Former Moorcock Pub
DRAWING TITLE:	Typical Drainage Details Sheet 1 of 3
DRAWING REFERENCE:	2018 - 051 - 02
DATE:	29.05.18
DRAWN BY:	CV
SCALE:	AS SHOWN
SIZE:	A1
REVISION:	/



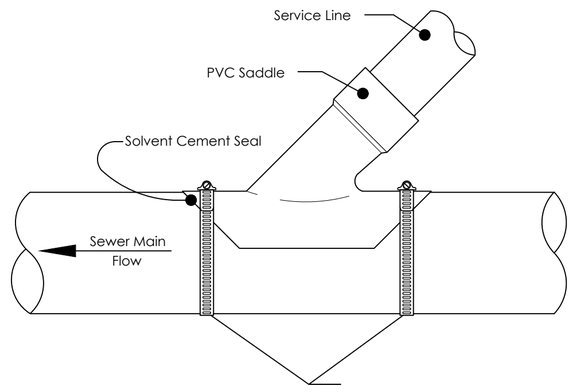
Telescopic Rest Bend Detail
Scale 1:10



Rodding Eye
Scale 1:20



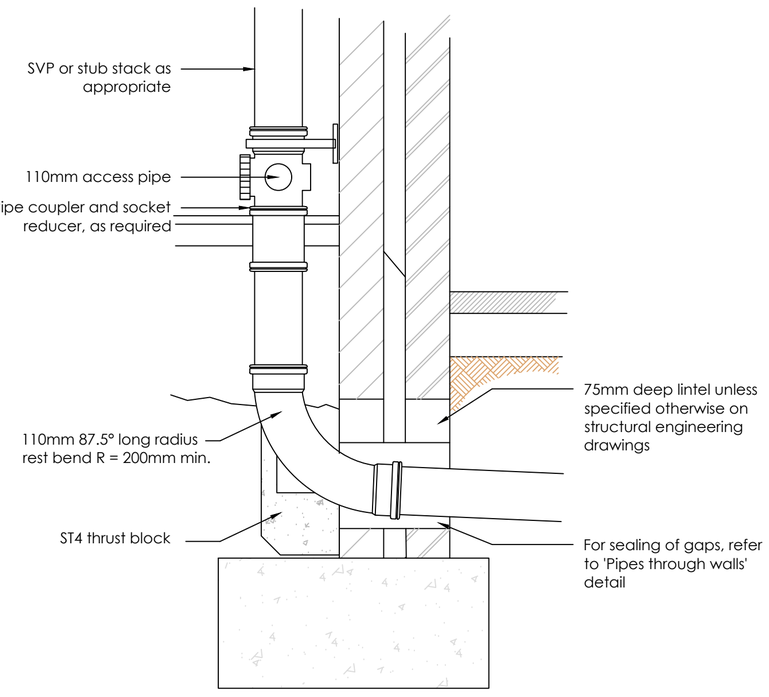
Typical Silt Trap
Scale 1:20



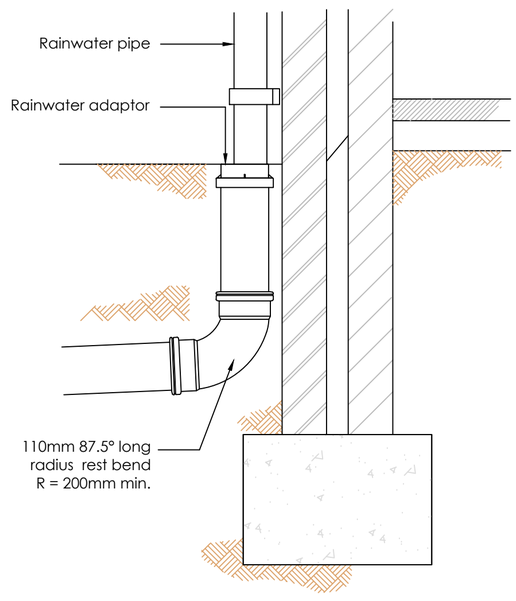
PVC Main

Notes:
1) PVC solvent cement shall be used for saddle.
2) Truss saddle shall be used with truss pipe.
3) Ii-line WYE fitting to be provided with new construction.

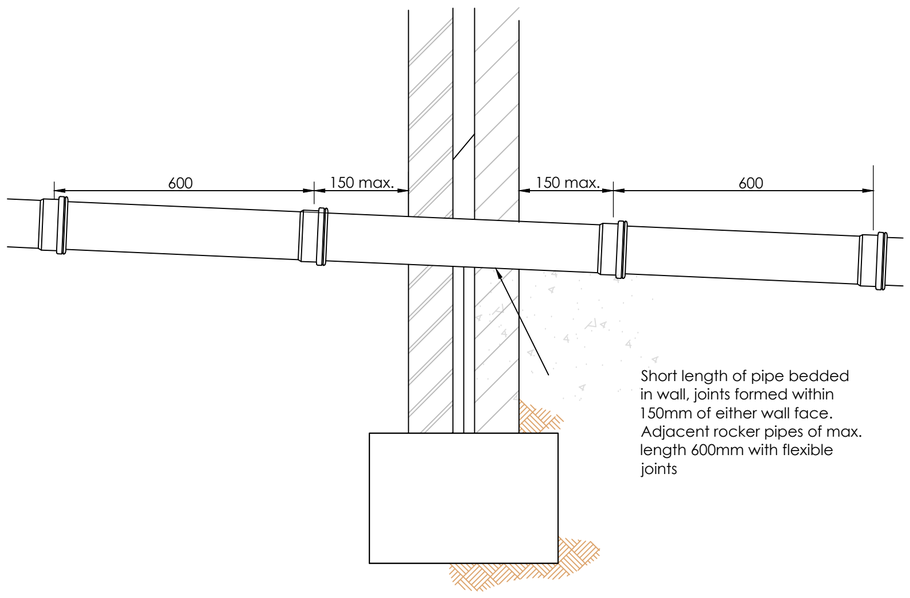
Saddle Connection
Scale 1:10



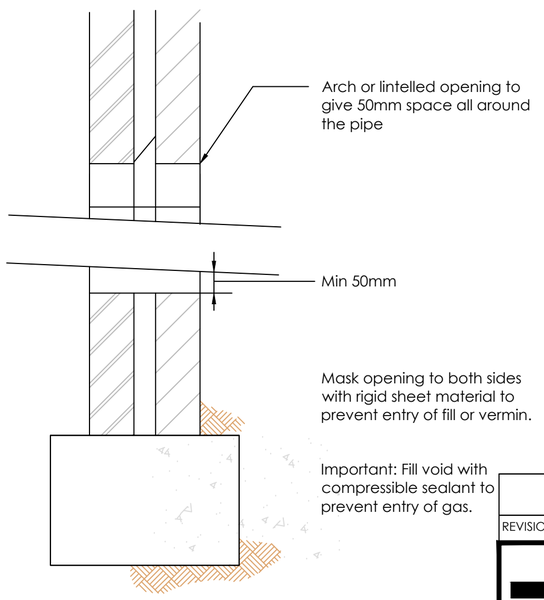
Internal SVP/Stub Stack Connection Through External Wall to Drain
Scale 1:10



External RWP to Drain
Scale 1:10



Pipes Through Walls (a)
Scale 1:10



Pipes Through Walls (b)
Scale 1:10

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CLIENT: Bek Enviro Ltd

PROJECT: Former Moorcock Pub

DRAWING TITLE: Typical Drainage Details Sheet 2 of 3

DRAWING REFERENCE: 2018 - 051 - 03

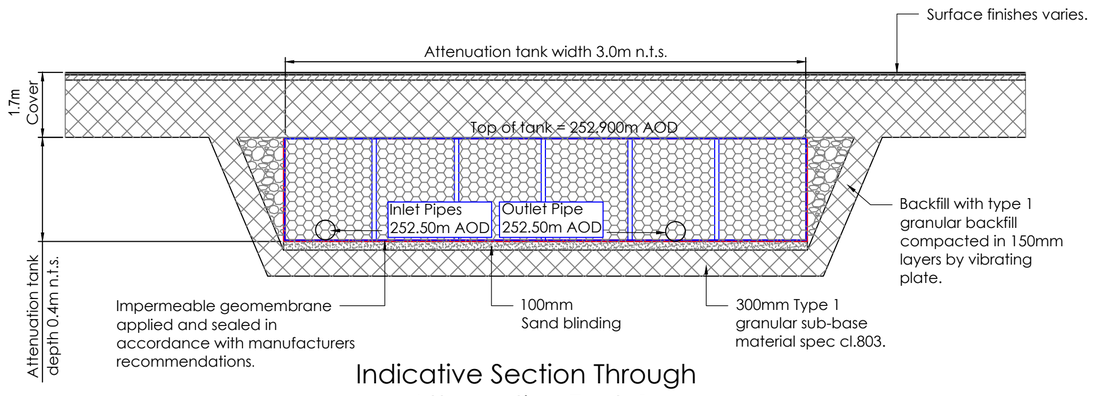
DATE: 29.05.18

DRAWN BY: CV

SCALE: AS SHOWN

SIZE: A1

REVISION: /

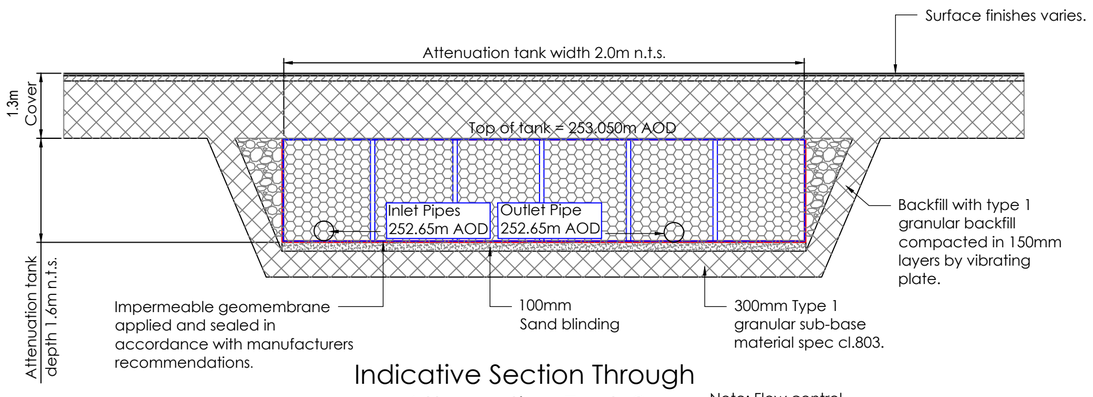


Indicative Section Through Attenuation Tank 1 Not to Scale

Note: Flow control orifice aperture 0.058m Ø

Installation Method:

- Specialist supplier to prepare and submit appropriate layouts, schedules and details to enable fully compliant installation of storm bloc units
- Excavate
- Install sub-base
- Install impermeable geomembrane (in accordance with manufacturers recommendations)
- Install stormbloc units + connections (in accordance with manufacturers recommendations)
- Install inspection chambers as required
- Install stormbloc end plates
- Cover sides & top with geotextile membrane (note: care taken not to rip, tear or puncture membrane
- Seal membrane
- Lateral backfilling
- Cover & backfill



Indicative Section Through Attenuation Tank 2 Not to Scale

Note: Flow control orifice aperture 0.055m Ø

Installation Method:

- Specialist supplier to prepare and submit appropriate layouts, schedules and details to enable fully compliant installation of storm bloc units
- Excavate
- Install sub-base
- Install impermeable geomembrane (in accordance with manufacturers recommendations)
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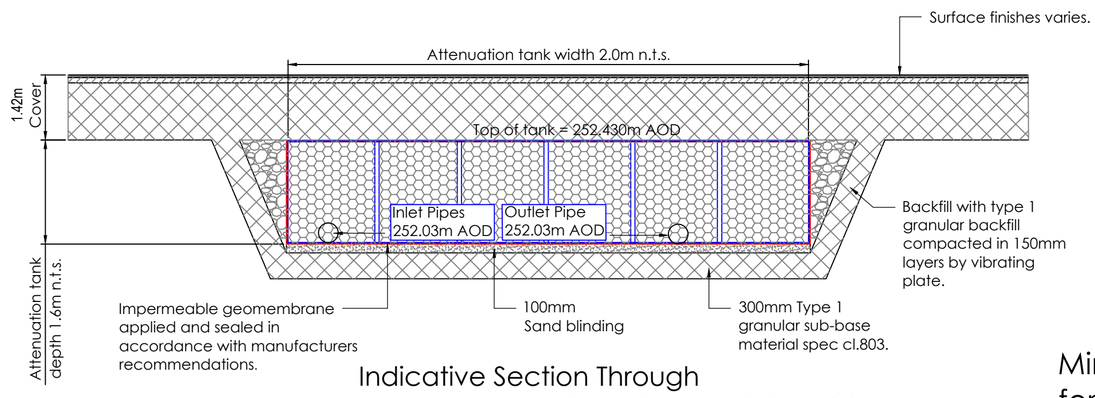

Indicative Section Through Attenuation Tank 3 Not to Scale

Note: Flow control orifice aperture 0.055m Ø

Installation Method:

- Specialist supplier to prepare and submit appropriate layouts, schedules and details to enable fully compliant installation of storm bloc units
- Excavate
- Install sub-base
- Install impermeable geomembrane (in accordance with manufacturers recommendations)
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- Install stormbloc end plates
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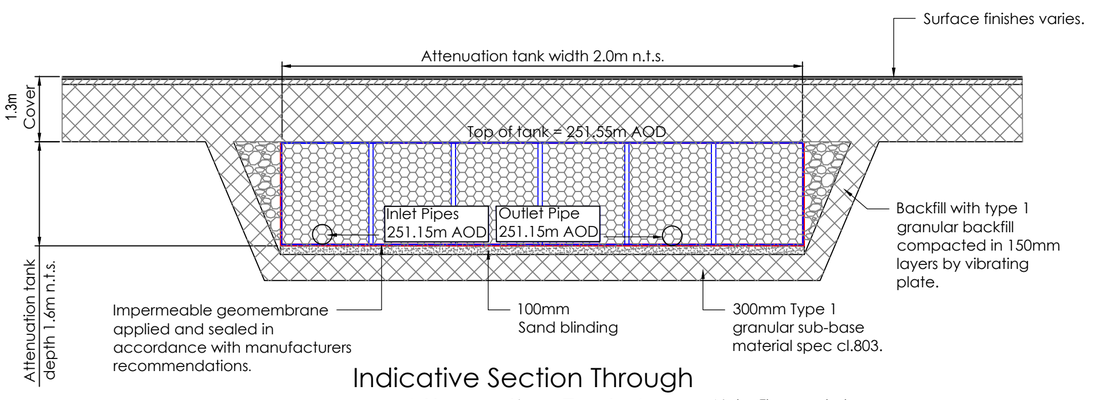
- Seal membrane
- Lateral backfilling
- Cover & backfill



Indicative Section Through Attenuation Tank 4 Not to Scale

Note: Flow control orifice aperture 0.056m Ø

Installation Method:

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- Excavate
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- Install inspection chambers as required
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- Seal membrane
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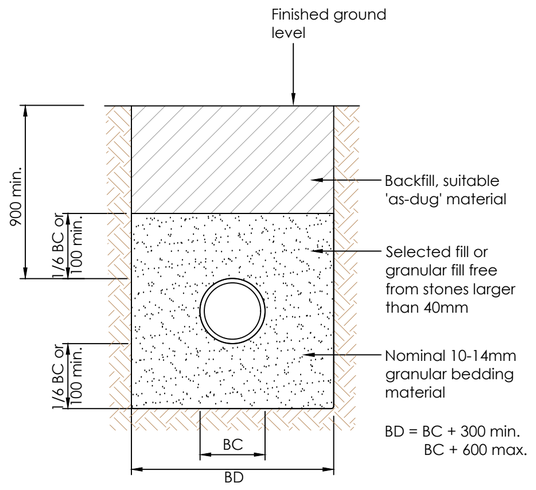
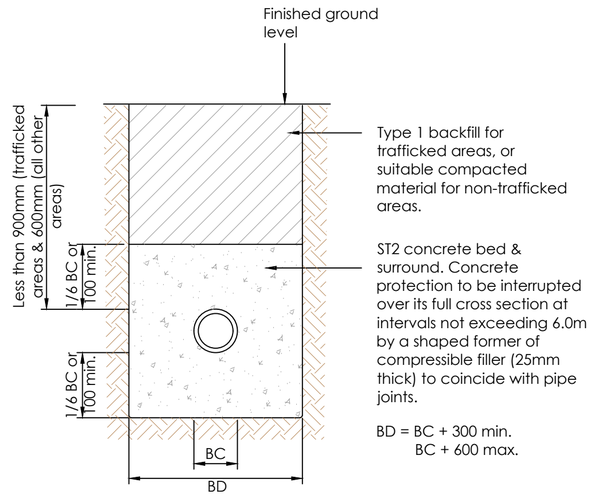


Typical Trench Detail Scale 1:10

NOTE: To be used where cover depth:

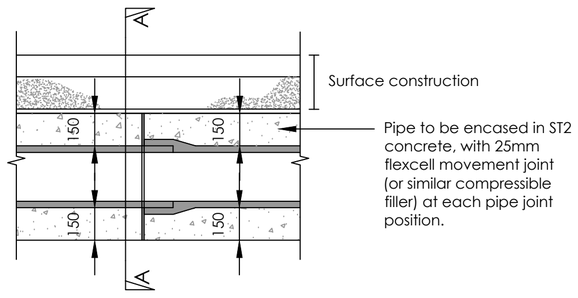
- >0.6m fields & gardens
- >0.9m lightly trafficked areas e.g. light roads & drives



Shallow Trench Detail Scale 1:10

NOTE: To be used where cover depth:

- <0.6m fields & gardens
- <0.9m lightly trafficked areas e.g. light roads & drives



Joints for Concrete Encased Pipes Scale 1:10

This applies to pipes that have less cover than the following:

- 0.35m gardens pathways non trafficked
- 0.50 domestic driveways vehicles less than 7.5 tonnes
- 0.9m domestic driveways vehicles in excess of 7.5 tonnes
- 1.2m highways

Extract from Table A2 WIS 4-08-02

Processed granular bedding & sidefill materials for flexible pipes

Pipe nominal bore (mm) (see note D)	Nominal Maximum particle size (mm)	Materials specified in British Standards (see note A)
100	10	10mm nominal single size
Over 100 to 150	15	10 or 14mm nominal single size or 14mm to 5mm graded
Over 150 to 300	20	10-14mm or 20mm nominal single size or 14-5mm graded or 20-5mm graded
Over 300 to 500	20	14 or 20mm nominal single size or 14-5mm graded or 20-5mm graded
Over 500	40	14 or 20mm or 40mm nominal single size or 14-5mm graded or 20-5mm graded or 40-5mm graded

Notes:

A. Processed granular materials to include aggregates and air cooled blast furnace slag to BS EN 12620:220 + A1:2008; and lightweight aggregates to BS EN 13101:2002.
B. -
C. For the purpose of this table, PE pipe of 630mm OD can be regarded as having nominal bores of over 550mm, irrespective of wall thickness.
D. Nominal bore is used in preference to DN because of the different nominal size classifications for flexible pipes.

Minimum Recommended Trench Widths for Structured Wall Pipes in Poor Ground Conditions.

Native soil modulus between 3 & 4 MPA
Typical soil Classifications: Very loose gravel, loose sand, medium dense clayey silty sand, firm clay

Nominal pipe diameter (mm)	150	225	300	375	450	525	600	750	900
Minimum trench width (mm)*	450	525	600	750	900	1050	1200	1500	1800

* A vertical trench face has been assumed to allow a modulus of 7MPA to be achieved for the pipe bedding and sidefill material.

Other assumed values:
Depth of cover = 6m (max)
Traffic loading = main road
Pipe stiffness = SNB

Note: Where the native soil modulus is below 3MPA or the depth of cover exceeds 6m, guidance should be sought from the pipe manufacturer regarding structural design and installation details.

NOTES:

1. FLOW CONTROL CHAMBER TO BE RIGISTORM ORIFICE PLASTIC 500mm Ø CHAMBER OR SIMILAR, SEE ASSOCIATED DOCUMENTS FOR TECHNICAL SPECIFICATION..
2. PACKAGE TREATMENT PLANT TO BE KLARGESTER BIO DISC BA OR SIMILAR, SEE ASSOCIATED DOCUMENTS FOR TECHNICAL SPECIFICATION.

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PUBLIC - STRUCK BY MOVING PLANT.

FOR INFORMATION RELATING TO END USE, MAINTENANCE DEMOLITION, SEE HEALTH AND SAFETY FILE.

IT IS ASSUMED THAT ALL WORK WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

THE TABLE BELOW IDENTIFIES IN MORE DETAIL THE POTENTIAL RISKS ASSOCIATED WITH DIFFERENT TASKS

ITEM	RECOMMENDATION
1. EXCAVATION ADJACENT TO BOUNDARIES	CARE TO BE TAKEN WITH DEEP EXCAVATIONS IN ORDER TO PREVENT SIDEWALL COLLAPSE / SLIPPAGE. CONTRACTOR TO PROVIDE METHOD STATEMENTS WHERE NECESSARY. EXCAVATIONS TO BE SAFELY CORDONED OFF AND ENSURE SAFE PEDESTRIAN AND VEHICLE ACCESS IS MAINTAINED TO ADJACENT BUILDINGS, ENSURE EXCAVATIONS/PLANT AND MACHINERY ARE MADE SECURE OUTSIDE WORKING HOURS TO PREVENT INJURY TO THE PUBLIC.
2. CONSTRUCTING NEW M.H'S AND ALTERATIONS TO EXISTING MANHOLES	CONTRACTOR TO PROVIDE METHOD STATEMENT FOR SAFE CONSTRUCTION WHEN WORKING IN CONFINED SPACES. ALL PERSONNEL AFFECTED TO BE TRAINED AND BRIEFED ON THE RELEVANT METHOD STATEMENT.
3. PLACING AND HANDLING CUT AND BENT REINFORCEMENT	CONTRACTOR TO ENSURE WEIGHTS OF MATERIALS ARE INLINE WITH CURRENT REGULATIONS. NO PROJECTING BARS DETAILED. LENGTH OF BARS LIMITED TO MANAGEABLE SECTIONS.
4. EXCAVATION NEAR TO EXISTING SERVICES.	NEW CAVITY WALL LEAVES TO BE CONSTRUCTED SIMULTANEOUSLY THROUGHOUT CONSTRUCTION TO REDUCE RISK OF COLLAPSE AND PREVENTS EXPOSURE OF PROTRUDING WALL TIES. WALLS TO BE CONSTRUCTED IN SUITABLE LIFTS TO MAINTAIN FRESH MORTAR STABILITY. ISSUE AVAILABLE SERVICE RECORDS TO THE CONTRACTOR.
5. WORKING NEAR TO LIVE TRAFFIC.	CONTRACTOR TO PROVIDE METHOD STATEMENT FOR TRAFFIC MANAGEMENT/TEMPORARY WORKS. CONTRACTOR TO PROVIDE APPROPRIATE PROTECTION BARRIERS IF REQUIRED. WORKERS TO WEAR HIGH VISIBILITY CLOTHING TO AVOID BEING STRUCK BY PASSING VEHICLES OR PLANT.
6. GENERAL PUBLIC; EXISTING RESIDENTS; OR CHILDREN ON SITE.	ENSURE THAT THE SITE IS PROPERLY SECURE TO PREVENT INJURY FROM SLIPS, TRIPS, FALLS, FALLING FROM HEIGHT, UNCOVERED MANHOLES/TRENCHES. PROVIDE ADVANCE WARNING TO RESIDENTS REGARDING THE START OF CONSTRUCTION. IDENTIFY DIVERSIONS TO PUBLIC RIGHTS OF WAY, ESTABLISHED AND CLEARLY SIGNED IF REQUIRED.
7. NOISE, DUST AND VIBRATION RESULTING FROM CONSTRUCTION WORKS	METHOD STATEMENT TO BE PROVIDED. SITE STAFF TO BE PROVIDED WITH APPROPRIATE PPE. WORK MAY HAVE TO BE UNDERTAKEN AT SPECIFIC TIMES IN SENSETIVE AREAS TO MINIMISE DISRUPTION TO ADJACENT PROPERTIES.
8.0 WORKING NEAR WATER	CONTRACTOR TO PROVIDE DETAILED METHOD STATEMENT IN ACCORDANCE WITH THE APPROVED LAND DRAINAGE CONSENT, TO ENSURE SAFE WORKING ARRANGEMENTS AROUND AREAS OF OPEN OR FLOWING WATER; AND TO ENSURE THAT SUITABLE SITE OPERATION PROCEDURES ARE IN PLACE TO ELIMINATE THE RISK OF POLLUTION TRANSFER TO THE WATER ENVIRONMENT FROM PLANT & SITE MATERIALS.

REVISION	COMMENT	DATE	BY

FLOOD RISK CONSULTANCY LTD
APPRAISING, MANAGING & REDUCING FLOOD RISK
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Elm Street Business Park
Burnley, BB10 1PD
TEL: 01282 792591
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WEBSITE: WWW.FLOODRISKCONSULT.COM

CLIENT: Bek Enviro Ltd
PROJECT: Former Moorcock Pub
DRAWING TITLE: Typical Drainage Details Sheet 3 of 3
DRAWING REFERENCE: 2018 - 051 - 04
DATE: 29.05.18
DRAWN BY: CV
SCALE: AS SHOWN
SIZE: A1
REVISION: /

GEO-ENVIRONMENTAL CONSULTING ENGINEERS

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ANNEX C

MicroDrainage Calculations

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	6.000	0.143	42.0	0.008	4.00	0.0	0.600	o	100	Pipe/Conduit	
1.001	14.290	0.240	59.5	0.004	0.00	0.0	0.600	o	100	Pipe/Conduit	
1.002	4.450	0.447	10.0	0.002	0.00	0.0	0.600	o	100	Pipe/Conduit	
1.003	9.700	0.970	10.0	0.009	0.00	0.0	0.600	o	100	Pipe/Conduit	
2.000	27.300	1.800	15.2	0.012	4.00	0.0	0.600	o	100	Pipe/Conduit	
1.004	1.000	0.100	10.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
1.005	1.000	0.017	58.8	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
1.006	4.400	0.440	10.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
1.007	8.200	0.643	12.8	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
1.008	29.690	0.900	33.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.000	5.700	0.135	42.2	0.006	4.00	0.0	0.600	o	100	Pipe/Conduit	
3.001	7.840	0.134	58.5	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
4.000	7.500	0.600	12.5	0.003	4.00	0.0	0.600	o	100	Pipe/Conduit	
4.001	7.000	0.119	58.8	0.003	0.00	0.0	0.600	o	100	Pipe/Conduit	
3.002	7.000	0.163	42.9	0.006	0.00	0.0	0.600	o	100	Pipe/Conduit	
3.003	12.300	0.794	15.5	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	46.71	4.08	254.400	0.008	0.0	0.0	0.0	1.19	9.4	1.0
1.001	45.85	4.32	254.257	0.012	0.0	0.0	0.0	1.00	7.9	1.5
1.002	45.74	4.35	254.017	0.014	0.0	0.0	0.0	2.46	19.4	1.7
1.003	45.51	4.42	253.570	0.023	0.0	0.0	0.0	2.46	19.3	2.8
2.000	46.18	4.23	254.400	0.012	0.0	0.0	0.0	1.99	15.7	1.5
1.004	45.49	4.42	252.600	0.035	0.0	0.0	0.0	2.46	19.3	4.3
1.005	45.43	4.44	252.500	0.035	0.0	0.0	0.0	1.01	7.9	4.3
1.006	45.33	4.47	252.483	0.035	0.0	0.0	0.0	2.46	19.3	4.3
1.007	45.12	4.53	252.043	0.035	0.0	0.0	0.0	2.18	17.1	4.3
1.008	44.19	4.82	251.350	0.035	0.0	0.0	0.0	1.76	31.1	4.3
3.000	46.72	4.08	253.900	0.006	0.0	0.0	0.0	1.19	9.3	0.8
3.001	46.25	4.21	253.765	0.006	0.0	0.0	0.0	1.01	7.9	0.8
4.000	46.81	4.06	254.350	0.003	0.0	0.0	0.0	2.20	17.3	0.4
4.001	46.38	4.17	253.750	0.006	0.0	0.0	0.0	1.01	7.9	0.8
3.002	45.90	4.31	253.631	0.018	0.0	0.0	0.0	1.18	9.3	2.2
3.003	45.53	4.41	253.468	0.018	0.0	0.0	0.0	1.97	15.5	2.2

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
5.000	5.300	0.429	12.4	0.004	4.00	0.0	0.600	o	100	Pipe/Conduit	
5.001	7.100	0.157	45.2	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
5.002	6.400	0.640	10.0	0.004	0.00	0.0	0.600	o	100	Pipe/Conduit	
3.004	1.400	0.024	58.3	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
3.005	1.000	0.100	10.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
3.006	6.600	0.660	10.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
3.007	7.700	0.770	10.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
1.009	29.900	0.800	37.4	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
6.000	6.000	0.100	60.0	0.006	4.00	0.0	0.600	o	100	Pipe/Conduit	
6.001	8.000	0.547	14.6	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
6.002	6.800	0.113	60.2	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
7.000	7.200	0.450	16.0	0.003	4.00	0.0	0.600	o	100	Pipe/Conduit	
7.001	4.100	0.260	15.8	0.003	0.00	0.0	0.600	o	100	Pipe/Conduit	
6.003	13.500	0.742	18.2	0.002	0.00	0.0	0.600	o	100	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
5.000	46.87	4.04	253.900	0.004	0.0	0.0	0.0	2.21	17.4	0.5
5.001	46.49	4.14	253.471	0.004	0.0	0.0	0.0	1.15	9.0	0.5
5.002	46.33	4.19	253.314	0.008	0.0	0.0	0.0	2.46	19.3	1.0
3.004	45.45	4.44	252.674	0.026	0.0	0.0	0.0	1.01	7.9	3.2
3.005	45.43	4.44	252.650	0.026	0.0	0.0	0.0	2.46	19.3	3.2
3.006	45.28	4.49	252.550	0.026	0.0	0.0	0.0	2.46	19.3	3.2
3.007	45.10	4.54	251.270	0.026	0.0	0.0	0.0	2.46	19.3	3.2
1.009	43.25	5.12	250.450	0.061	0.0	0.0	0.0	1.65	29.2	7.1
6.000	46.65	4.10	253.550	0.006	0.0	0.0	0.0	1.00	7.8	0.8
6.001	46.41	4.17	253.450	0.006	0.0	0.0	0.0	2.03	15.9	0.8
6.002	46.00	4.28	252.903	0.006	0.0	0.0	0.0	0.99	7.8	0.8
7.000	46.79	4.06	253.500	0.003	0.0	0.0	0.0	1.94	15.2	0.4
7.001	46.66	4.10	253.050	0.006	0.0	0.0	0.0	1.96	15.4	0.8
6.003	45.56	4.40	252.790	0.014	0.0	0.0	0.0	1.82	14.3	1.7

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
8.000	18.400	1.212	15.2	0.009	4.00	0.0	0.600	o	100	Pipe/Conduit	
8.001	1.400	0.140	10.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
6.004	1.000	0.017	58.8	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
6.005	6.900	0.690	10.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
6.006	11.000	1.100	10.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
1.010	10.400	0.800	13.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
9.000	13.700	0.234	58.5	0.005	4.00	0.0	0.600	o	100	Pipe/Conduit	
10.000	7.200	0.123	58.5	0.003	4.00	0.0	0.600	o	100	Pipe/Conduit	
10.001	6.800	0.116	58.6	0.003	0.00	0.0	0.600	o	100	Pipe/Conduit	
9.001	7.000	0.117	59.8	0.008	0.00	0.0	0.600	o	100	Pipe/Conduit	
9.002	13.800	0.876	15.8	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
11.000	5.100	0.087	58.6	0.002	4.00	0.0	0.600	o	100	Pipe/Conduit	
11.001	3.000	0.051	58.8	0.002	0.00	0.0	0.600	o	100	Pipe/Conduit	
11.002	19.300	1.089	17.7	0.009	0.00	0.0	0.600	o	100	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
8.000	46.45	4.15	253.400	0.009	0.0	0.0	0.0	1.99	15.7	1.1
8.001	46.42	4.16	252.188	0.009	0.0	0.0	0.0	2.46	19.3	1.1
6.004	45.51	4.42	252.048	0.023	0.0	0.0	0.0	1.01	7.9	2.8
6.005	45.34	4.47	252.031	0.023	0.0	0.0	0.0	2.46	19.3	2.8
6.006	45.09	4.54	250.800	0.023	0.0	0.0	0.0	2.46	19.3	2.8
1.010	43.06	5.18	249.650	0.084	0.0	0.0	0.0	2.81	49.6	9.8
9.000	46.19	4.23	252.400	0.005	0.0	0.0	0.0	1.01	7.9	0.6
10.000	46.58	4.12	252.405	0.003	0.0	0.0	0.0	1.01	7.9	0.4
10.001	46.17	4.23	252.282	0.006	0.0	0.0	0.0	1.01	7.9	0.8
9.001	45.76	4.35	252.166	0.019	0.0	0.0	0.0	1.00	7.8	2.4
9.002	45.35	4.47	252.049	0.019	0.0	0.0	0.0	1.96	15.4	2.4
11.000	46.71	4.08	252.400	0.002	0.0	0.0	0.0	1.01	7.9	0.3
11.001	46.52	4.13	252.313	0.004	0.0	0.0	0.0	1.01	7.9	0.5
11.002	45.90	4.31	252.262	0.013	0.0	0.0	0.0	1.84	14.5	1.6

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
9.003	1.400	0.023	60.9	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
9.004	1.000	0.100	10.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
9.005	3.800	0.380	10.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
9.006	10.000	1.000	10.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
1.011	20.300	1.740	11.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
9.003	45.27	4.49	251.173	0.032	0.0	0.0	0.0	0.99	7.8	3.9
9.004	45.24	4.50	251.150	0.032	0.0	0.0	0.0	2.46	19.3	3.9
9.005	45.16	4.52	251.050	0.032	0.0	0.0	0.0	2.46	19.3	3.9
9.006	44.93	4.59	249.900	0.032	0.0	0.0	0.0	2.46	19.3	3.9
1.011	42.72	5.29	248.850	0.116	0.0	0.0	0.0	2.97	52.4	13.4

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
RE1	254.850	0.450	Open Manhole	450	1.000	254.400	100				
S1	254.850	0.593	Open Manhole	450	1.001	254.257	100	1.000	254.257	100	
S2	254.850	0.833	Open Manhole	450	1.002	254.017	100	1.001	254.017	100	
S3	254.850	1.280	Open Manhole	450	1.003	253.570	100	1.002	253.570	100	
RE2	254.850	0.450	Open Manhole	450	2.000	254.400	100				
S4	254.600	2.000	Open Manhole	450	1.004	252.600	100	1.003	252.600	100	
								2.000	252.600	100	
TANK	254.200	1.700	Open Manhole	450	1.005	252.500	100	1.004	252.500	100	
S5	253.924	1.441	Open Manhole	500	1.006	252.483	100	1.005	252.483	100	
S6	253.500	1.457	Open Manhole	450	1.007	252.043	100	1.006	252.043	100	
S7	252.700	1.350	Open Manhole	1200	1.008	251.350	150	1.007	251.400	100	
RE3	254.350	0.450	Open Manhole	450	3.000	253.900	100				
S8	254.350	0.585	Open Manhole	450	3.001	253.765	100	3.000	253.765	100	
S9	255.250	0.900	Open Manhole	450	4.000	254.350	100				
S10	254.350	0.600	Open Manhole	450	4.001	253.750	100	4.000	253.750	100	
S11	254.350	0.719	Open Manhole	450	3.002	253.631	100	3.001	253.631	100	
								4.001	253.631	100	
S12	254.350	0.882	Open Manhole	450	3.003	253.468	100	3.002	253.468	100	
RE4	254.350	0.450	Open Manhole	450	5.000	253.900	100				
S13	254.350	0.879	Open Manhole	450	5.001	253.471	100	5.000	253.471	100	
S14	254.350	1.036	Open Manhole	450	5.002	253.314	100	5.001	253.314	100	
S15	254.350	1.676	Open Manhole	450	3.004	252.674	100	3.003	252.674	100	
								5.002	252.674	100	
TANK	254.350	1.700	Open Manhole	450	3.005	252.650	100	3.004	252.650	100	
S16	253.620	1.070	Open Manhole	500	3.006	252.550	100	3.005	252.550	100	
S17	253.000	1.730	Open Manhole	450	3.007	251.270	100	3.006	251.890	100	620
S18	251.900	1.450	Open Manhole	1200	1.009	250.450	150	1.008	250.450	150	
								3.007	250.500	100	
RE5	253.850	0.300	Open Manhole	450	6.000	253.550	100				
S19	253.850	0.400	Open Manhole	450	6.001	253.450	100	6.000	253.450	100	
S20	253.850	0.947	Open Manhole	1200	6.002	252.903	100	6.001	252.903	100	
S21	254.750	1.250	Open Manhole	450	7.000	253.500	100				
S22	253.500	0.450	Open Manhole	1200	7.001	253.050	100	7.000	253.050	100	
S23	253.850	1.060	Open Manhole	450	6.003	252.790	100	6.002	252.790	100	
								7.001	252.790	100	
RE6	253.850	0.450	Open Manhole	450	8.000	253.400	100				
S24	253.850	1.662	Open Manhole	450	8.001	252.188	100	8.000	252.188	100	
S25	253.850	1.802	Open Manhole	450	6.004	252.048	100	6.003	252.048	100	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
								8.001	252.048	100	
TANK	253.850	1.819	Open Manhole	450	6.005	252.031	100	6.004	252.031	100	
S26	252.800	2.000	Open Manhole	500	6.006	250.800	100	6.005	251.341	100	541
S27	251.000	1.350	Open Manhole	1200	1.010	249.650	150	1.009	249.650	150	
								6.006	249.700	100	
RE7	252.850	0.450	Open Manhole	450	9.000	252.400	100				
S28	253.750	1.345	Open Manhole	450	10.000	252.405	100				
S29	252.850	0.568	Open Manhole	450	10.001	252.282	100	10.000	252.282	100	
S30	252.850	0.684	Open Manhole	450	9.001	252.166	100	9.000	252.166	100	
								10.001	252.166	100	
S31	252.850	0.801	Open Manhole	450	9.002	252.049	100	9.001	252.049	100	
RE8	252.850	0.450	Open Manhole	450	11.000	252.400	100				
S32	252.850	0.537	Open Manhole	450	11.001	252.313	100	11.000	252.313	100	
S33	252.850	0.588	Open Manhole	450	11.002	252.262	100	11.001	252.262	100	
S34	252.850	1.677	Open Manhole	450	9.003	251.173	100	9.002	251.173	100	
								11.002	251.173	100	
TANK	252.850	1.700	Open Manhole	450	9.004	251.150	100	9.003	251.150	100	
S35	252.180	1.130	Open Manhole	500	9.005	251.050	100	9.004	251.050	100	
S36	251.800	1.900	Open Manhole	450	9.006	249.900	100	9.005	250.670	100	770
S37	250.400	1.550	Open Manhole	1200	1.011	248.850	150	1.010	248.850	150	
								9.006	248.900	100	
	248.190	1.080	Open Manhole	0		OUTFALL		1.011	247.110	150	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	100	RE1	254.850	254.400	0.350	Open Manhole	450
1.001	o	100	S1	254.850	254.257	0.493	Open Manhole	450
1.002	o	100	S2	254.850	254.017	0.733	Open Manhole	450
1.003	o	100	S3	254.850	253.570	1.180	Open Manhole	450
2.000	o	100	RE2	254.850	254.400	0.350	Open Manhole	450
1.004	o	100	S4	254.600	252.600	1.900	Open Manhole	450
1.005	o	100	TANK	254.200	252.500	1.600	Open Manhole	450
1.006	o	100	S5	253.924	252.483	1.341	Open Manhole	500
1.007	o	100	S6	253.500	252.043	1.357	Open Manhole	450
1.008	o	150	S7	252.700	251.350	1.200	Open Manhole	1200
3.000	o	100	RE3	254.350	253.900	0.350	Open Manhole	450
3.001	o	100	S8	254.350	253.765	0.485	Open Manhole	450
4.000	o	100	S9	255.250	254.350	0.800	Open Manhole	450
4.001	o	100	S10	254.350	253.750	0.500	Open Manhole	450
3.002	o	100	S11	254.350	253.631	0.619	Open Manhole	450
3.003	o	100	S12	254.350	253.468	0.782	Open Manhole	450

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	6.000	42.0	S1	254.850	254.257	0.493	Open Manhole	450
1.001	14.290	59.5	S2	254.850	254.017	0.733	Open Manhole	450
1.002	4.450	10.0	S3	254.850	253.570	1.180	Open Manhole	450
1.003	9.700	10.0	S4	254.600	252.600	1.900	Open Manhole	450
2.000	27.300	15.2	S4	254.600	252.600	1.900	Open Manhole	450
1.004	1.000	10.0	TANK	254.200	252.500	1.600	Open Manhole	450
1.005	1.000	58.8	S5	253.924	252.483	1.341	Open Manhole	500
1.006	4.400	10.0	S6	253.500	252.043	1.357	Open Manhole	450
1.007	8.200	12.8	S7	252.700	251.400	1.200	Open Manhole	1200
1.008	29.690	33.0	S18	251.900	250.450	1.300	Open Manhole	1200
3.000	5.700	42.2	S8	254.350	253.765	0.485	Open Manhole	450
3.001	7.840	58.5	S11	254.350	253.631	0.619	Open Manhole	450
4.000	7.500	12.5	S10	254.350	253.750	0.500	Open Manhole	450
4.001	7.000	58.8	S11	254.350	253.631	0.619	Open Manhole	450
3.002	7.000	42.9	S12	254.350	253.468	0.782	Open Manhole	450
3.003	12.300	15.5	S15	254.350	252.674	1.576	Open Manhole	450

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
5.000	o	100	RE4	254.350	253.900	0.350	Open Manhole	450
5.001	o	100	S13	254.350	253.471	0.779	Open Manhole	450
5.002	o	100	S14	254.350	253.314	0.936	Open Manhole	450
3.004	o	100	S15	254.350	252.674	1.576	Open Manhole	450
3.005	o	100	TANK	254.350	252.650	1.600	Open Manhole	450
3.006	o	100	S16	253.620	252.550	0.970	Open Manhole	500
3.007	o	100	S17	253.000	251.270	1.630	Open Manhole	450
1.009	o	150	S18	251.900	250.450	1.300	Open Manhole	1200
6.000	o	100	RE5	253.850	253.550	0.200	Open Manhole	450
6.001	o	100	S19	253.850	253.450	0.300	Open Manhole	450
6.002	o	100	S20	253.850	252.903	0.847	Open Manhole	1200
7.000	o	100	S21	254.750	253.500	1.150	Open Manhole	450
7.001	o	100	S22	253.500	253.050	0.350	Open Manhole	1200
6.003	o	100	S23	253.850	252.790	0.960	Open Manhole	450

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
5.000	5.300	12.4	S13	254.350	253.471	0.779	Open Manhole	450
5.001	7.100	45.2	S14	254.350	253.314	0.936	Open Manhole	450
5.002	6.400	10.0	S15	254.350	252.674	1.576	Open Manhole	450
3.004	1.400	58.3	TANK	254.350	252.650	1.600	Open Manhole	450
3.005	1.000	10.0	S16	253.620	252.550	0.970	Open Manhole	500
3.006	6.600	10.0	S17	253.000	251.890	1.010	Open Manhole	450
3.007	7.700	10.0	S18	251.900	250.500	1.300	Open Manhole	1200
1.009	29.900	37.4	S27	251.000	249.650	1.200	Open Manhole	1200
6.000	6.000	60.0	S19	253.850	253.450	0.300	Open Manhole	450
6.001	8.000	14.6	S20	253.850	252.903	0.847	Open Manhole	1200
6.002	6.800	60.2	S23	253.850	252.790	0.960	Open Manhole	450
7.000	7.200	16.0	S22	253.500	253.050	0.350	Open Manhole	1200
7.001	4.100	15.8	S23	253.850	252.790	0.960	Open Manhole	450
6.003	13.500	18.2	S25	253.850	252.048	1.702	Open Manhole	450

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
8.000	o	100	RE6	253.850	253.400	0.350	Open Manhole	450
8.001	o	100	S24	253.850	252.188	1.562	Open Manhole	450
6.004	o	100	S25	253.850	252.048	1.702	Open Manhole	450
6.005	o	100	TANK	253.850	252.031	1.719	Open Manhole	450
6.006	o	100	S26	252.800	250.800	1.900	Open Manhole	500
1.010	o	150	S27	251.000	249.650	1.200	Open Manhole	1200
9.000	o	100	RE7	252.850	252.400	0.350	Open Manhole	450
10.000	o	100	S28	253.750	252.405	1.245	Open Manhole	450
10.001	o	100	S29	252.850	252.282	0.468	Open Manhole	450
9.001	o	100	S30	252.850	252.166	0.584	Open Manhole	450
9.002	o	100	S31	252.850	252.049	0.701	Open Manhole	450
11.000	o	100	RE8	252.850	252.400	0.350	Open Manhole	450
11.001	o	100	S32	252.850	252.313	0.437	Open Manhole	450
11.002	o	100	S33	252.850	252.262	0.488	Open Manhole	450

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
8.000	18.400	15.2	S24	253.850	252.188	1.562	Open Manhole	450
8.001	1.400	10.0	S25	253.850	252.048	1.702	Open Manhole	450
6.004	1.000	58.8	TANK	253.850	252.031	1.719	Open Manhole	450
6.005	6.900	10.0	S26	252.800	251.341	1.359	Open Manhole	500
6.006	11.000	10.0	S27	251.000	249.700	1.200	Open Manhole	1200
1.010	10.400	13.0	S37	250.400	248.850	1.400	Open Manhole	1200
9.000	13.700	58.5	S30	252.850	252.166	0.584	Open Manhole	450
10.000	7.200	58.5	S29	252.850	252.282	0.468	Open Manhole	450
10.001	6.800	58.6	S30	252.850	252.166	0.584	Open Manhole	450
9.001	7.000	59.8	S31	252.850	252.049	0.701	Open Manhole	450
9.002	13.800	15.8	S34	252.850	251.173	1.577	Open Manhole	450
11.000	5.100	58.6	S32	252.850	252.313	0.437	Open Manhole	450
11.001	3.000	58.8	S33	252.850	252.262	0.488	Open Manhole	450
11.002	19.300	17.7	S34	252.850	251.173	1.577	Open Manhole	450

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
9.003	o	100	S34	252.850	251.173	1.577	Open Manhole	450
9.004	o	100	TANK	252.850	251.150	1.600	Open Manhole	450
9.005	o	100	S35	252.180	251.050	1.030	Open Manhole	500
9.006	o	100	S36	251.800	249.900	1.800	Open Manhole	450
1.011	o	150	S37	250.400	248.850	1.400	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
9.003	1.400	60.9	TANK	252.850	251.150	1.600	Open Manhole	450
9.004	1.000	10.0	S35	252.180	251.050	1.030	Open Manhole	500
9.005	3.800	10.0	S36	251.800	250.670	1.030	Open Manhole	450
9.006	10.000	10.0	S37	250.400	248.900	1.400	Open Manhole	1200
1.011	20.300	11.7		248.190	247.110	0.930	Open Manhole	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	4
Number of Online Controls	4	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	21.000	Storm Duration (mins)	30
Ratio R	0.232		

Online Controls for Storm

Orifice Manhole: S5, DS/PN: 1.006, Volume (m³): 0.3

Diameter (m) 0.058 Discharge Coefficient 0.600 Invert Level (m) 252.483

Orifice Manhole: S16, DS/PN: 3.006, Volume (m³): 0.2

Diameter (m) 0.055 Discharge Coefficient 0.600 Invert Level (m) 252.550

Orifice Manhole: TANK, DS/PN: 6.005, Volume (m³): 0.3

Diameter (m) 0.055 Discharge Coefficient 0.600 Invert Level (m) 252.031

Orifice Manhole: S35, DS/PN: 9.005, Volume (m³): 0.2

Diameter (m) 0.056 Discharge Coefficient 0.600 Invert Level (m) 251.050

Storage Structures for Storm

Cellular Storage Manhole: TANK, DS/PN: 1.005

Invert Level (m) 252.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	13.0	13.0	5.200	0.0	21.7
0.400	13.0	18.8	5.600	0.0	21.7
0.800	0.0	21.7	6.000	0.0	21.7
1.200	0.0	21.7	6.400	0.0	21.7
1.600	0.0	21.7	6.800	0.0	21.7
2.000	0.0	21.7	7.200	0.0	21.7
2.400	0.0	21.7	7.600	0.0	21.7
2.800	0.0	21.7	8.000	0.0	21.7
3.200	0.0	21.7	8.400	0.0	21.7
3.600	0.0	21.7	8.800	0.0	21.7
4.000	0.0	21.7	9.200	0.0	21.7
4.400	0.0	21.7	9.600	0.0	21.7
4.800	0.0	21.7	10.000	0.0	21.7

Cellular Storage Manhole: TANK, DS/PN: 3.005

Invert Level (m) 252.650 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	10.0	10.0	5.200	0.0	17.6
0.400	10.0	15.1	5.600	0.0	17.6
0.800	0.0	17.6	6.000	0.0	17.6
1.200	0.0	17.6	6.400	0.0	17.6
1.600	0.0	17.6	6.800	0.0	17.6
2.000	0.0	17.6	7.200	0.0	17.6
2.400	0.0	17.6	7.600	0.0	17.6
2.800	0.0	17.6	8.000	0.0	17.6
3.200	0.0	17.6	8.400	0.0	17.6
3.600	0.0	17.6	8.800	0.0	17.6
4.000	0.0	17.6	9.200	0.0	17.6
4.400	0.0	17.6	9.600	0.0	17.6
4.800	0.0	17.6	10.000	0.0	17.6

Cellular Storage Manhole: TANK, DS/PN: 6.005

Invert Level (m) 252.031 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Cellular Storage Manhole: TANK, DS/PN: 6.005

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	10.0	10.0	5.200	0.0	17.6
0.400	10.0	15.1	5.600	0.0	17.6
0.800	0.0	17.6	6.000	0.0	17.6
1.200	0.0	17.6	6.400	0.0	17.6
1.600	0.0	17.6	6.800	0.0	17.6
2.000	0.0	17.6	7.200	0.0	17.6
2.400	0.0	17.6	7.600	0.0	17.6
2.800	0.0	17.6	8.000	0.0	17.6
3.200	0.0	17.6	8.400	0.0	17.6
3.600	0.0	17.6	8.800	0.0	17.6
4.000	0.0	17.6	9.200	0.0	17.6
4.400	0.0	17.6	9.600	0.0	17.6
4.800	0.0	17.6	10.000	0.0	17.6

Cellular Storage Manhole: TANK, DS/PN: 9.004

Invert Level (m) 251.150 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	13.0	13.0	5.200	0.0	21.7
0.400	13.0	18.8	5.600	0.0	21.7
0.800	0.0	21.7	6.000	0.0	21.7
1.200	0.0	21.7	6.400	0.0	21.7
1.600	0.0	21.7	6.800	0.0	21.7
2.000	0.0	21.7	7.200	0.0	21.7
2.400	0.0	21.7	7.600	0.0	21.7
2.800	0.0	21.7	8.000	0.0	21.7
3.200	0.0	21.7	8.400	0.0	21.7
3.600	0.0	21.7	8.800	0.0	21.7
4.000	0.0	21.7	9.200	0.0	21.7
4.400	0.0	21.7	9.600	0.0	21.7
4.800	0.0	21.7	10.000	0.0	21.7

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	4
Number of Online Controls	4	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.232
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	21.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	50.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	RE1	15 Winter	1	+0%					254.423
1.001	S1	15 Winter	1	+0%					254.287
1.002	S2	15 Winter	1	+0%					254.038
1.003	S3	15 Winter	1	+0%	100/15 Summer				253.595
2.000	RE2	15 Winter	1	+0%					254.421
1.004	S4	15 Winter	1	+0%	30/15 Summer				252.649
1.005	TANK	30 Winter	1	+0%	30/15 Summer				252.598
1.006	S5	30 Winter	1	+0%	1/15 Winter				252.602
1.007	S6	30 Winter	1	+0%					252.067
1.008	S7	30 Winter	1	+0%					251.375
3.000	RE3	15 Winter	1	+0%					253.921
3.001	S8	15 Summer	1	+0%					253.787
4.000	S9	15 Winter	1	+0%					254.361
4.001	S10	15 Winter	1	+0%					253.771
3.002	S11	15 Winter	1	+0%	100/15 Summer				253.665
3.003	S12	15 Winter	1	+0%					253.493
5.000	RE4	15 Winter	1	+0%					253.912

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	RE1	-0.077	0.000	0.13		1.0	OK	
1.001	S1	-0.070	0.000	0.20		1.5	OK	
1.002	S2	-0.079	0.000	0.10		1.7	OK	
1.003	S3	-0.075	0.000	0.14		2.6	OK	
2.000	RE2	-0.079	0.000	0.10		1.6	OK	
1.004	S4	-0.051	0.000	0.47		4.1	OK	
1.005	TANK	-0.002	0.000	0.52		2.0	OK	
1.006	S5	0.019	0.000	0.12		2.0	SURCHARGED	
1.007	S6	-0.076	0.000	0.13		2.0	OK	
1.008	S7	-0.125	0.000	0.07		2.0	OK	
3.000	RE3	-0.079	0.000	0.09		0.8	OK	
3.001	S8	-0.078	0.000	0.11		0.8	OK	
4.000	S9	-0.089	0.000	0.03		0.4	OK	
4.001	S10	-0.079	0.000	0.10		0.7	OK	
3.002	S11	-0.066	0.000	0.25		2.1	OK	
3.003	S12	-0.075	0.000	0.14		2.1	OK	
5.000	RE4	-0.088	0.000	0.03		0.5	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
5.001	S13	15 Summer	1	+0%					253.487
5.002	S14	15 Winter	1	+0%					253.329
3.004	S15	15 Winter	1	+0%	30/15 Summer				252.737
3.005	TANK	15 Winter	1	+0%	30/15 Summer				252.697
3.006	S16	15 Winter	1	+0%	1/15 Summer				252.697
3.007	S17	15 Winter	1	+0%					251.293
1.009	S18	30 Winter	1	+0%					250.488
6.000	RE5	15 Summer	1	+0%					253.572
6.001	S19	15 Summer	1	+0%					253.465
6.002	S20	15 Summer	1	+0%					252.925
7.000	S21	15 Winter	1	+0%					253.511
7.001	S22	15 Winter	1	+0%					253.065
6.003	S23	15 Winter	1	+0%					252.813
8.000	RE6	15 Winter	1	+0%					253.419
8.001	S24	15 Summer	1	+0%	100/15 Summer				252.210
6.004	S25	30 Winter	1	+0%	30/15 Summer				252.118
6.005	TANK	30 Winter	1	+0%	30/15 Summer				252.115
6.006	S26	30 Winter	1	+0%					250.819
1.010	S27	30 Winter	1	+0%					249.685
9.000	RE7	15 Winter	1	+0%					252.420
10.000	S28	15 Winter	1	+0%					252.420
10.001	S29	15 Winter	1	+0%	100/15 Summer				252.303
9.001	S30	15 Winter	1	+0%	100/15 Summer				252.204
9.002	S31	15 Winter	1	+0%	100/15 Summer				252.075
11.000	RE8	15 Winter	1	+0%					252.412
11.001	S32	15 Winter	1	+0%					252.331
11.002	S33	15 Winter	1	+0%					252.283
9.003	S34	15 Winter	1	+0%	30/15 Summer				251.245
9.004	TANK	30 Winter	1	+0%	30/15 Summer				251.204
9.005	S35	15 Winter	1	+0%	1/15 Summer				251.207
9.006	S36	30 Winter	1	+0%					249.924
1.011	S37	30 Winter	1	+0%					248.890

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
5.001	S13	-0.084	0.000	0.06		0.5	OK	
5.002	S14	-0.085	0.000	0.05		0.9	OK	
3.004	S15	-0.037	0.000	0.70		3.0	OK	
3.005	TANK	-0.053	0.000	0.24		2.1	OK	
3.006	S16	0.047	0.000	0.12		2.1	SURCHARGED	
3.007	S17	-0.077	0.000	0.12		2.1	OK	
1.009	S18	-0.112	0.000	0.15		4.1	OK	
6.000	RE5	-0.078	0.000	0.11		0.8	OK	
6.001	S19	-0.085	0.000	0.05		0.8	OK	
6.002	S20	-0.078	0.000	0.11		0.8	OK	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
7.000	S21	-0.089	0.000	0.03		0.4	OK	
7.001	S22	-0.085	0.000	0.05		0.7	OK	
6.003	S23	-0.077	0.000	0.12		1.7	OK	
8.000	RE6	-0.081	0.000	0.08		1.2	OK	
8.001	S24	-0.078	0.000	0.11		1.2	OK	
6.004	S25	-0.030	0.000	0.60		2.4	OK	
6.005	TANK	-0.016	0.000	0.09		1.5	OK	
6.006	S26	-0.081	0.000	0.08		1.5	OK	
1.010	S27	-0.115	0.000	0.13		5.6	OK	
9.000	RE7	-0.080	0.000	0.09		0.7	OK	
10.000	S28	-0.085	0.000	0.05		0.4	OK	
10.001	S29	-0.079	0.000	0.10		0.7	OK	
9.001	S30	-0.062	0.000	0.31		2.2	OK	
9.002	S31	-0.074	0.000	0.15		2.2	OK	
11.000	RE8	-0.088	0.000	0.04		0.3	OK	
11.001	S32	-0.082	0.000	0.07		0.5	OK	
11.002	S33	-0.079	0.000	0.10		1.4	OK	
9.003	S34	-0.028	0.000	0.85		3.6	OK	
9.004	TANK	-0.046	0.000	0.26		2.3	OK	
9.005	S35	0.057	0.000	0.14		2.3	SURCHARGED	
9.006	S36	-0.076	0.000	0.13		2.3	OK	
1.011	S37	-0.110	0.000	0.16		7.8	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	4
Number of Online Controls	4	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.232
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	21.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	50.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	RE1	15 Winter	30	+0%					254.438
1.001	S1	15 Summer	30	+0%					254.308
1.002	S2	15 Summer	30	+0%					254.052
1.003	S3	15 Summer	30	+0%	100/15 Summer				253.615
2.000	RE2	15 Winter	30	+0%					254.434
1.004	S4	30 Summer	30	+0%	30/15 Summer				252.827
1.005	TANK	30 Winter	30	+0%	30/15 Summer				252.785
1.006	S5	30 Winter	30	+0%	1/15 Winter				252.777
1.007	S6	30 Winter	30	+0%					252.075
1.008	S7	30 Winter	30	+0%					251.385
3.000	RE3	15 Winter	30	+0%					253.932
3.001	S8	15 Summer	30	+0%					253.800
4.000	S9	15 Winter	30	+0%					254.366
4.001	S10	15 Winter	30	+0%					253.785
3.002	S11	15 Summer	30	+0%	100/15 Summer				253.693
3.003	S12	15 Summer	30	+0%					253.512
5.000	RE4	15 Winter	30	+0%					253.919

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	RE1	-0.062	0.000	0.31		2.6	OK	
1.001	S1	-0.049	0.000	0.52		3.8	OK	
1.002	S2	-0.065	0.000	0.27		4.5	OK	
1.003	S3	-0.055	0.000	0.41		7.4	OK	
2.000	RE2	-0.066	0.000	0.25		3.8	OK	
1.004	S4	0.127	0.000	1.16		10.2	SURCHARGED	
1.005	TANK	0.185	0.000	0.92		3.6	SURCHARGED	
1.006	S5	0.194	0.000	0.22		3.6	SURCHARGED	
1.007	S6	-0.068	0.000	0.23		3.6	OK	
1.008	S7	-0.115	0.000	0.12		3.6	OK	
3.000	RE3	-0.068	0.000	0.23		1.9	OK	
3.001	S8	-0.065	0.000	0.27		1.9	OK	
4.000	S9	-0.084	0.000	0.06		1.0	OK	
4.001	S10	-0.065	0.000	0.27		1.9	OK	
3.002	S11	-0.038	0.000	0.69		5.8	OK	
3.003	S12	-0.056	0.000	0.40		5.8	OK	
5.000	RE4	-0.081	0.000	0.08		1.3	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
5.001	S13	15 Winter	30	+0%					253.497
5.002	S14	15 Summer	30	+0%					253.340
3.004	S15	30 Winter	30	+0%	30/15 Summer				252.869
3.005	TANK	30 Winter	30	+0%	30/15 Summer				252.852
3.006	S16	30 Winter	30	+0%	1/15 Summer				252.845
3.007	S17	30 Winter	30	+0%					251.299
1.009	S18	30 Winter	30	+0%					250.500
6.000	RE5	15 Winter	30	+0%					253.586
6.001	S19	15 Summer	30	+0%					253.474
6.002	S20	15 Summer	30	+0%					252.939
7.000	S21	15 Winter	30	+0%					253.517
7.001	S22	15 Summer	30	+0%					253.075
6.003	S23	15 Winter	30	+0%					252.830
8.000	RE6	15 Winter	30	+0%					253.430
8.001	S24	30 Winter	30	+0%	100/15 Summer				252.271
6.004	S25	30 Winter	30	+0%	30/15 Summer				252.268
6.005	TANK	30 Winter	30	+0%	30/15 Summer				252.256
6.006	S26	30 Winter	30	+0%					250.826
1.010	S27	30 Winter	30	+0%					249.697
9.000	RE7	15 Winter	30	+0%					252.431
10.000	S28	15 Winter	30	+0%					252.429
10.001	S29	15 Winter	30	+0%	100/15 Summer				252.317
9.001	S30	15 Summer	30	+0%	100/15 Summer				252.238
9.002	S31	15 Summer	30	+0%	100/15 Summer				252.094
11.000	RE8	15 Winter	30	+0%					252.420
11.001	S32	15 Summer	30	+0%					252.344
11.002	S33	15 Summer	30	+0%					252.299
9.003	S34	15 Winter	30	+0%	30/15 Summer				251.409
9.004	TANK	30 Winter	30	+0%	30/15 Summer				251.372
9.005	S35	30 Winter	30	+0%	1/15 Summer				251.364
9.006	S36	30 Winter	30	+0%					249.930
1.011	S37	30 Winter	30	+0%					248.902

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
5.001	S13	-0.074	0.000	0.16		1.3	OK	
5.002	S14	-0.074	0.000	0.15		2.6	OK	
3.004	S15	0.095	0.000	1.54		6.6	SURCHARGED	
3.005	TANK	0.102	0.000	0.37		3.3	SURCHARGED	
3.006	S16	0.195	0.000	0.19		3.3	SURCHARGED	
3.007	S17	-0.071	0.000	0.18		3.3	OK	
1.009	S18	-0.100	0.000	0.24		6.9	OK	
6.000	RE5	-0.064	0.000	0.28		1.9	OK	
6.001	S19	-0.076	0.000	0.13		1.9	OK	
6.002	S20	-0.064	0.000	0.27		1.9	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
7.000	S21	-0.083	0.000	0.07		1.0	OK	
7.001	S22	-0.075	0.000	0.15		1.9	OK	
6.003	S23	-0.060	0.000	0.33		4.5	OK	
8.000	RE6	-0.070	0.000	0.19		2.9	OK	
8.001	S24	-0.017	0.000	0.22		2.3	OK	
6.004	S25	0.120	0.000	1.47		5.8	SURCHARGED	
6.005	TANK	0.125	0.000	0.16		2.8	SURCHARGED	
6.006	S26	-0.074	0.000	0.16		2.8	OK	
1.010	S27	-0.103	0.000	0.22		9.7	OK	
9.000	RE7	-0.069	0.000	0.21		1.6	OK	
10.000	S28	-0.076	0.000	0.13		1.0	OK	
10.001	S29	-0.065	0.000	0.27		1.9	OK	
9.001	S30	-0.028	0.000	0.86		6.1	OK	
9.002	S31	-0.055	0.000	0.42		6.1	OK	
11.000	RE8	-0.080	0.000	0.09		0.6	OK	
11.001	S32	-0.069	0.000	0.20		1.3	OK	
11.002	S33	-0.063	0.000	0.30		4.2	OK	
9.003	S34	0.136	0.000	2.38		10.0	SURCHARGED	
9.004	TANK	0.122	0.000	0.40		3.5	SURCHARGED	
9.005	S35	0.214	0.000	0.21		3.5	SURCHARGED	
9.006	S36	-0.070	0.000	0.19		3.5	OK	
1.011	S37	-0.098	0.000	0.27		13.1	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	4
Number of Online Controls	4	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.232
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	21.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	50.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	RE1	15 Winter	100	+40%					254.453
1.001	S1	15 Summer	100	+40%					254.333
1.002	S2	15 Summer	100	+40%					254.067
1.003	S3	60 Winter	100	+40%	100/15 Summer				253.811
2.000	RE2	15 Winter	100	+40%					254.447
1.004	S4	60 Winter	100	+40%	30/15 Summer				253.742
1.005	TANK	60 Winter	100	+40%	30/15 Summer				253.673
1.006	S5	60 Winter	100	+40%	1/15 Winter				253.603
1.007	S6	60 Winter	100	+40%					252.091
1.008	S7	60 Winter	100	+40%					251.400
3.000	RE3	15 Winter	100	+40%					253.945
3.001	S8	15 Winter	100	+40%					253.833
4.000	S9	15 Winter	100	+40%					254.372
4.001	S10	15 Winter	100	+40%					253.830
3.002	S11	15 Winter	100	+40%	100/15 Summer				253.803
3.003	S12	15 Winter	100	+40%					253.543
5.000	RE4	15 Winter	100	+40%					253.926

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	RE1	-0.047	0.000	0.55		4.6	OK	
1.001	S1	-0.024	0.000	0.93		7.0	OK	
1.002	S2	-0.050	0.000	0.49		8.1	OK	
1.003	S3	0.141	0.000	0.44		7.9	SURCHARGED	
2.000	RE2	-0.053	0.000	0.46		7.0	OK	
1.004	S4	1.042	0.000	1.34		11.8	SURCHARGED	
1.005	TANK	1.073	0.000	1.87		7.4	SURCHARGED	
1.006	S5	1.020	0.000	0.44		7.3	SURCHARGED	
1.007	S6	-0.052	0.000	0.47		7.3	OK	
1.008	S7	-0.100	0.000	0.25		7.3	OK	
3.000	RE3	-0.055	0.000	0.42		3.5	OK	
3.001	S8	-0.032	0.000	0.47		3.4	OK	
4.000	S9	-0.078	0.000	0.11		1.7	OK	
4.001	S10	-0.020	0.000	0.47		3.4	OK	
3.002	S11	0.072	0.000	1.19		10.0	SURCHARGED	
3.003	S12	-0.025	0.000	0.68		10.0	OK	
5.000	RE4	-0.074	0.000	0.15		2.3	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
5.001	S13	15 Winter	100	+40%					253.507
5.002	S14	15 Summer	100	+40%					253.349
3.004	S15	15 Winter	100	+40%	30/15 Summer				253.189
3.005	TANK	30 Winter	100	+40%	30/15 Summer				253.132
3.006	S16	30 Winter	100	+40%	1/15 Summer				253.105
3.007	S17	30 Winter	100	+40%					251.304
1.009	S18	60 Winter	100	+40%					250.518
6.000	RE5	15 Winter	100	+40%					253.600
6.001	S19	15 Summer	100	+40%					253.483
6.002	S20	15 Summer	100	+40%					252.953
7.000	S21	15 Winter	100	+40%					253.523
7.001	S22	15 Summer	100	+40%					253.085
6.003	S23	15 Summer	100	+40%					252.846
8.000	RE6	15 Winter	100	+40%					253.441
8.001	S24	30 Summer	100	+40%	100/15 Summer				252.540
6.004	S25	30 Winter	100	+40%	30/15 Summer				252.525
6.005	TANK	60 Winter	100	+40%	30/15 Summer				252.498
6.006	S26	60 Winter	100	+40%					250.832
1.010	S27	60 Winter	100	+40%					249.712
9.000	RE7	15 Winter	100	+40%					252.443
10.000	S28	15 Winter	100	+40%					252.442
10.001	S29	15 Winter	100	+40%	100/15 Summer				252.429
9.001	S30	15 Winter	100	+40%	100/15 Summer				252.406
9.002	S31	15 Winter	100	+40%	100/15 Summer				252.173
11.000	RE8	15 Winter	100	+40%					252.427
11.001	S32	15 Winter	100	+40%					252.355
11.002	S33	15 Summer	100	+40%					252.315
9.003	S34	30 Summer	100	+40%	30/15 Summer				251.781
9.004	TANK	60 Winter	100	+40%	30/15 Summer				251.710
9.005	S35	60 Winter	100	+40%	1/15 Summer				251.677
9.006	S36	60 Winter	100	+40%					249.936
1.011	S37	60 Winter	100	+40%					248.918

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
5.001	S13	-0.064	0.000	0.28		2.3	OK	
5.002	S14	-0.065	0.000	0.27		4.6	OK	
3.004	S15	0.415	0.000	3.26		14.1	SURCHARGED	
3.005	TANK	0.382	0.000	0.52		4.6	SURCHARGED	
3.006	S16	0.455	0.000	0.26		4.6	SURCHARGED	
3.007	S17	-0.066	0.000	0.26		4.6	OK	
1.009	S18	-0.082	0.000	0.42		11.9	OK	
6.000	RE5	-0.050	0.000	0.50		3.5	OK	
6.001	S19	-0.067	0.000	0.24		3.5	OK	
6.002	S20	-0.050	0.000	0.49		3.5	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
7.000	S21	-0.077	0.000	0.13		1.7	OK	
7.001	S22	-0.065	0.000	0.27		3.5	OK	
6.003	S23	-0.044	0.000	0.60		8.1	OK	
8.000	RE6	-0.059	0.000	0.35		5.2	OK	
8.001	S24	0.252	0.000	0.44		4.6	SURCHARGED	
6.004	S25	0.377	0.000	2.67		10.5	SURCHARGED	
6.005	TANK	0.367	0.000	0.24		4.2	SURCHARGED	
6.006	S26	-0.068	0.000	0.23		4.2	OK	
1.010	S27	-0.088	0.000	0.36		16.0	OK	
9.000	RE7	-0.057	0.000	0.39		2.9	OK	
10.000	S28	-0.063	0.000	0.24		1.7	OK	
10.001	S29	0.047	0.000	0.45		3.2	SURCHARGED	
9.001	S30	0.140	0.000	1.43		10.1	SURCHARGED	
9.002	S31	0.024	0.000	0.68		9.9	SURCHARGED	
11.000	RE8	-0.073	0.000	0.17		1.2	OK	
11.001	S32	-0.058	0.000	0.37		2.3	OK	
11.002	S33	-0.047	0.000	0.54		7.5	OK	
9.003	S34	0.508	0.000	3.84		16.2	SURCHARGED	
9.004	TANK	0.460	0.000	0.58		5.1	SURCHARGED	
9.005	S35	0.527	0.000	0.31		5.1	SURCHARGED	
9.006	S36	-0.064	0.000	0.28		5.1	OK	
1.011	S37	-0.082	0.000	0.43		21.1	OK	

RIDGISTORMCheck Orifice Plate Flow Control Chambers

Data Sheet

PRODUCT INFORMATION P1 **ISSUE 1 - MAY 2016**

Where flows within drainage system are required to be limited or checked (i.e. prior to discharge from site), in a simple and cost effective design, we are able to offer our RIDGISTORMCheck Orifice Plate Flow Control Chamber. Incorporating an integral orifice plate flow control with an optional removable Permavoid filter unit wrapped in a 2mm polyethylene mesh, to provide filtration and ease of maintenance.

RIDGISTORMCheck Orifice Plate Flow Control Chambers offer a cost effective means of limiting flows, particularly when used in conjunction with our range of attenuation systems on smaller scale projects.

Applications

Site specific RIDGISTORMCheck Orifice Plate Flow Control Chambers are engineered to suit a range of stormwater attenuation and infiltration systems, providing a means of flow regulation and are used regularly when designing to source control principles. The optional filter unit on the outlet provides a filtration system for reduced maintenance.

Key Features and Benefits

- Manufactured with an integral sump for silt retention
- Eliminates wastage associated with in-situ construction
- Multiple inlet and outlet options, supplied with integral sockets as standard allowing quick and seamless connection to pipeline
- Depths can be tailored to suit project requirements
- Lockable steel covers available
- Optional step rungs to BS EN 13101 and ladders to BS EN 14396
- Optional riser section, and riser location ring
- Integral lifting points available on request to improve Health and Safety of handling and installation
- Stub connections are available

Other fabrications in our RIDGISTORMCheck range:

- Vortex Flow Control Chambers

Performance

RIDGISTORMCheck Orifice Plate Flow Control Chambers are fabricated from Ridgistorm-XL pipework, which is manufactured to meet the material requirements of BS EN 13476:2007 (Part 1-3).

RIDGISTORMCHECK ORIFICE PLATE FLOW CONTROL CHAMBERS	
PHYSICAL PROPERTIES	
Diameter	500-3000mm
Depth	To suit requirements
Material	HDPE
Colour	Black with blue Interior
Chemical resistance	HDPE is naturally resistant to most chemicals associated with stormwater drainage systems
Inlets/outlets	100-3000mm
Hydraulic performance	Orifice plate flow controls to suit site specific flow rates and head

Our Ridgistorm-XL Fabrications range

All of our Ridgistorm-XL fabrications are tailor-made, fully-welded, watertight structured wall chambers to suit project-specific requirements. Health and Safety benefits become apparent during handling and installation, due to our fabrications' strong but light in weight nature. In addition, off-site construction ensures uncompromised, high quality products being delivered to site ready-to-install, reducing installation time and costs.

wrc approved PT/348/0614

Polypipe Civils
Charnwood Business Park, Loughborough, Leicestershire LE11 1LE
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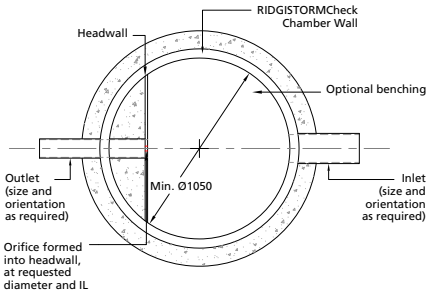
www.polypipe.com/civils

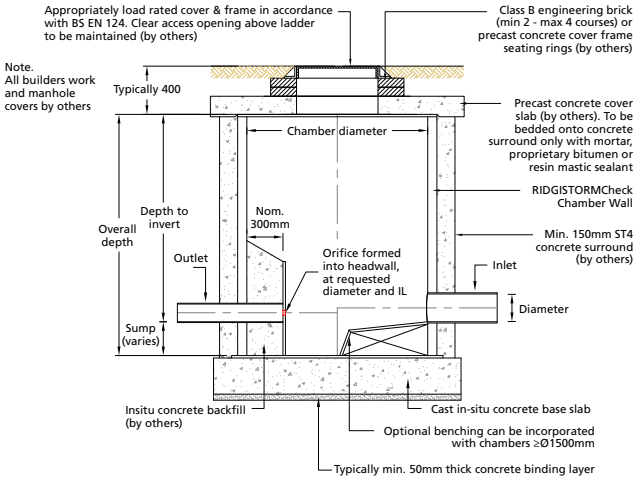
Polypipe

RIDGISTORMCheck Orifice Plate Flow Control Chambers

Data Sheet

RIDGISTORMCheck Orifice Plate Flow Control Chambers





For further information please contact our Technical Team on +44 (0) 1509 615100 or download our CAD Standard Details from our website www.polypipe.com/toolbox

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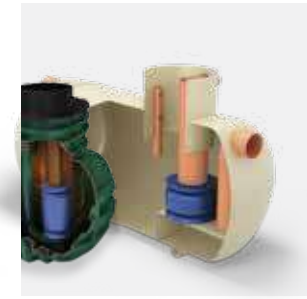
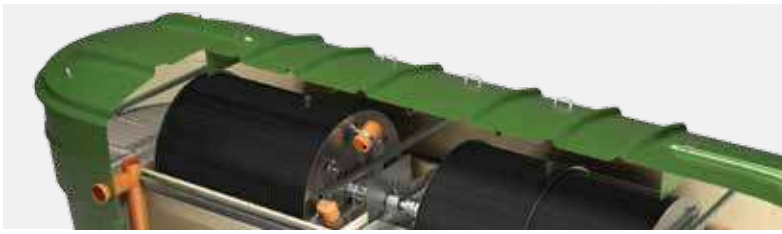
Water Management Solutions

Klargester
Product Guide

The Klargester range of fully integrated wastewater management, surface water and rainwater harvesting solutions





kingspan.co.uk/klargester

Kingspan

About Kingspan

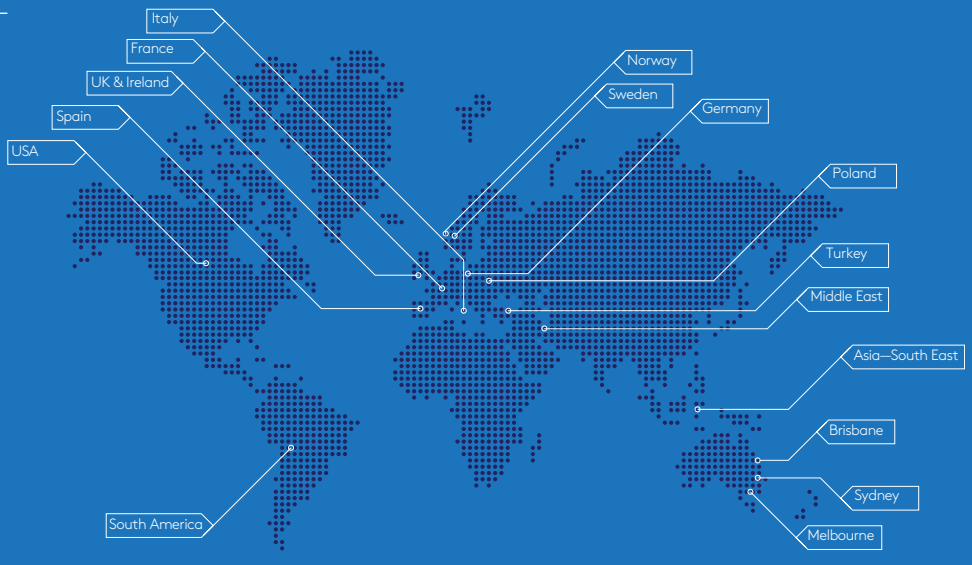
Operating in over 85 countries worldwide, we offer a global distribution network backed by experienced local sales and technical teams.

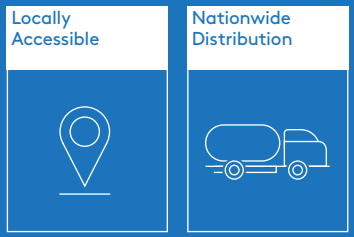
Trusted Water Management Solutions

Kingspan, manufacturers of the Klargester Product Range, are the water management experts with over 60 years of innovation and knowledge. We design and manufacture tried and tested water management solutions on a global scale for the leisure, public, hospitality, transport and domestic sectors whilst offering one of the largest and most technologically advanced wastewater ranges available.

Our technical support teams provide focused customer service from delivery scheduling to consultancy and installation guidance. We give you the confidence of support over the lifetime of the product and beyond, in your local area.

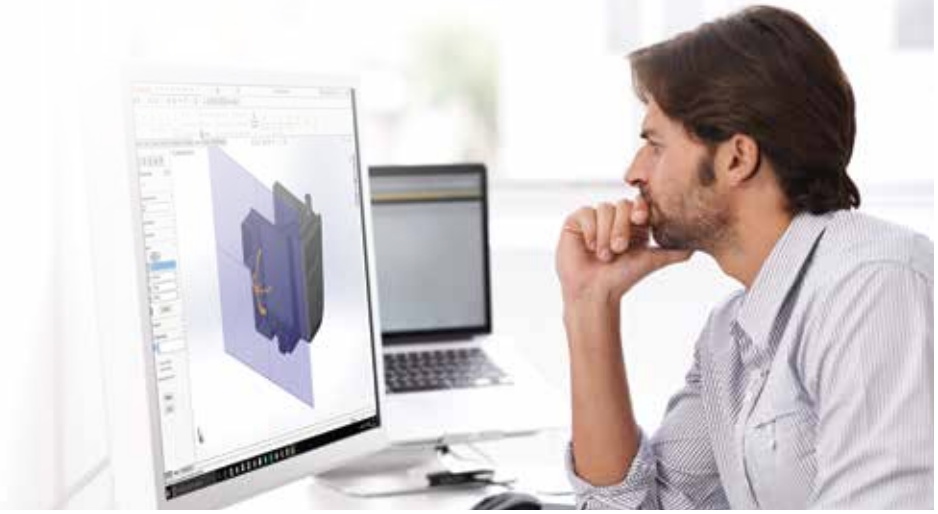
Global Reach





Expert Technical Support

Kingspan's support doesn't stop once you have purchased the product. Our expert team are here to help you with technical, sales and delivery enquiries. We are dedicated to our customers and pride ourselves on top class customer service.



We stand by the quality and performance of Kingspan water management solutions and our support doesn't stop once your tank is installed.

Our world class design consultancy is complemented by engineering expertise and advice as well as service throughout your commercial or industrial water management project.

We use the latest design technology to produce drawings of extremely high quality. Our project management process is a step-by-step one, to ensure the very best experience and results. It covers everything from system sizing, product selection and system design to calculations, manufacturing, installation and delivery.

Our advice also spans water management specification, design, product application and integration with building regulations, code compliance and site work installation practices to meet the most demanding effluent qualities, flow rates and discharge consents.

Contact our technical team today for expert advice and information on any of our water management solutions.

Email: **water@kingspan.com**

Regional Installations

Manufactured in the UK and Ireland, the Klargester Product Range is supported by our nationwide network of dedicated external Area Sales Managers.

We offer free site visits to discuss project specific requirements and provide a detailed written report and specification to recommend the best water management solution for your project.

We also provide on-site installation assistance when required and help you with formal discussions with Building Control, Local Planning departments, The Environment Agency/SEPA, architects and consultants.

To arrange your free site survey contact us now on **01296 633033** or email **water@kingspan.com**

Kingspan operates in over 85 countries worldwide, with currently over 5 million water management system installations. Take a look at a selection of our case studies for the Klargester Product Range.

Thanet Earth
Kent, England
UK

Four vertical pumping stations to aid water management for a complex green house development.

Elite Office Furniture
Goole, England
UK

Surface water separators, foul, effluent and crude sewage pump stations, grease trap and BioFicient commercial system.

Everton FC (Training Ground)
Liverpool, England
UK

Modular BioFicient commercial system including fuel/oil separators for a complete waste water management solution.

Manchester City FC
Manchester, England
UK

Oil separators for its all-important surface water drainage system.

The Castlefields Inn
Clifford, England
UK

BioDisc Commercial sewage treatment plant providing an efficient water management solution.

Primark Distribution Centre
Kettering, England
UK

Modular BioFicient commercial system for multi-million pound distribution centre.

Barn Conversion
Wing, England
UK

Domestic BioDisc sewage treatment plant, ensuring a safe, odour-free environment.

Supermarket Carpark
London, England
UK

Bypass separator, NSBE50, to assist in decontamination of surface water drainage.

Multi-Housing Development
Dundee, Scotland
UK

A complex sewage treatment and surface pumping solution to meet the varying needs of multiple housing.

Social Housing Installation
Co. Louth, Ireland
IRE

Rainwater harvesting solution used to flush the WCs in each home. The system is fully integrated with the main plumbing, easing demand on the mains supply.

Marble Arch Caves
Co. Fermanagh, N. Ireland
IRE

Grease separator and BioDisc sewage treatment plant work together giving optimum performance and extremely low running costs.

Klargester BioDisc®
Domestic Sewage Treatment Plant

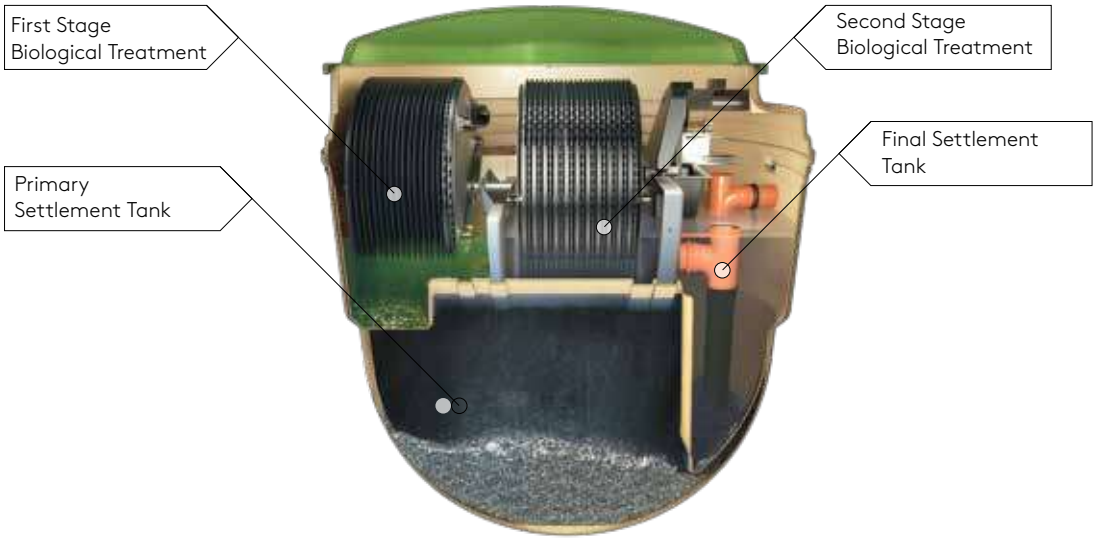
The Klargester Domestic BioDisc® is engineered to treat wastewater to the highest level of standards and offers one of the lowest lifetime costs compared to other treatment processes.

Product Benefits

- Utilises Rotating Biological Contactor technology.
- Low running costs.
- Low level visibility with a lockable child-proof cover – safe for children and pets.
- Delivers better than 95% pollution removal.
- 10 year warranty options available when purchased with a service and maintenance plan.
- Supplied with a control panel and alarm.
- Managed Flow System.
- Totally silent in operation.
- The most stable process in the market.
- Controls the discharge volume.

The Rotational Biological Contactor

The RBC is central to the operation of each Klargester BioDisc®. It supports a biologically active film or biomass onto which aerobic micro-organisms, naturally found in sewage, become established. Natural breakdown of sewage can then occur as described below.



01

Primary Settlement Tank

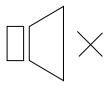
Wastewater and sewage flows into the primary settlement tank where the large solids are retained for future removal.

02

First Stage Biological Treatment

The liquor and fine solids then flow into the Biological Treatment Zone 1 where the first stage of treatment occurs.

Noise Free



Technical Specifications

Model Reference	BA	BA-X	BB	BC
Population Equivalent (Std Flow)	6	9	12	18
Maximum Daily BOD (kg)	0.36	0.54	0.72	1.08
Maximum Daily Flow (m3)	1.2	1.8	2.4	3.6
Ø/Width (mm)	Ø1995	Ø1995	Ø1995	Ø2450
Length (mm)	-	-	-	-
Inlet Invert depth (mm)	450/750/1250	450/750/1250	450/750/1250	600/1100
Depth Below Inlet Invert (mm)	1400	1400	1400	1820
Outlet Invert Depth (mm)	1315	1315	1315	1735
Overall Height (mm)	2160/2460/2960	2160/2460/2960	2160/2460/2960	2825/3325
Height to Rim of Cover (mm)	1945/2245/2745	1945/2245/2745	1945/2245/2745	2485/2985
Empty Weight (kg)	310/325/380	310/325/380	335/350/405	650/750
Standard Power Supply	1 phase	1 phase	1 phase	1 phase
Motor Rating - 1 Phase (Watts)	50	50	50	75
Full Load Current 1 Phase (amps)	0.51	0.51	0.51	1.1
Optional Power Supply	N/A	N/A	N/A	3 phase
Motor Rating - 3 Phase (Watts)	N/A	N/A	N/A	90
Full Load Current 3 Phase (amps)	N/A	N/A	N/A	0.38
Sludge Return Pump Rating (watts)	250	250	250	250

Pumped Outlet Available on BA, BA-X, BB models.

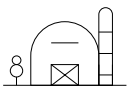
Performance and Compliance

- Certified to European Standard BS EN 12566 Part 3.
- Performance certified to achieve 10mg/l BOD, 15mg/l SS and 3.8mg/l ammonia.
- Fully marked in line with the CPR 2013.

Applications:

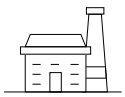
The Klargester Domestic BioDisc® BA–BC range is suitable for a range of applications including:

Single & Multiple Homes



Barn Conversions

Small Offices



Light Industrial Premises

Farms

03

Second Stage Biological Treatment

The liquor is then fed forward at a controlled rate into Biological Treatment Zone 2 for further cleaning.

04

Final Settlement Tank

The clean liquid passes into the final settlement tank where it can be discharged to ground or water course.

Klargester BioFicient®
Domestic Sewage Treatment Plant

The Klargester BioFicient® treatment plant provides a reliable and effective solution for domestic applications without access to mains drainage. Suitable for homes with up to 30 people, the BioFicient is manufactured from high quality materials and uses the latest treatment technology to deliver a high level of water discharge quality.

Product Benefits

- Shallow Dig.
- New low energy compressor.
- Low level visibility with a lockable child-proof cover – safe for children and pets.
- Suitable for installation in traffic areas (structural advice required).
- Supplied with a control panel and alarm.
- Easy to set up and operate.
- Integral pump option available for BioFicient 1-4.

Performance and Compliance

- BS EN 12566 Part 3 tested and approved.
- Industry leading NH4 (ammonia) removal.
- Fully CE marked in line with the CPR 2013.

01

Primary Chamber

Raw sewage gravitates to the unit where it is received in the primary settlement zone. Here, gross solids and other social debris settle to the bottom of the tank where they remain until the tank requires desludging. Settled sewage is displaced from primary zone and enters the first of two sequential moving aerated media reactors.

Control Panel Included

Technical Specifications

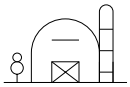
Model Reference	BioFicient 1	BioFicient 2	BioFicient 2+	BioFicient 3	BioFicient 4	BioFicient 5	BioFicient 6
Population Equivalent	6	8	10	10	15	20	30
Overall Diameter (mm)	1,540	1,420	2,010	1,420	1,920	1,920	1,920
Length (mm)	2,500	3,760	3,189	3,760	3,230	4,390	6,220
Depth (mm)	1,794-2,104	1,830/2,330/ 2,830	2,785	1,830/2,330/ 2830	2,300/2,800/ 3,300	2,300/2,800/ 3,300	2,300/2,800/ 3,300
Inlet Invert (mm)*	500-810/ 500-810*	500/1,000/ 1,500	700-1,500	500/1,000/ 1,500	500/1,000/ 1,500	500/1,000/ 1,500	5,00/1,000/ 1,500
Outlet Invert (mm)	600-910/ 555-865*	600/1,100/ 1,600*	800-1600	600/1,100/ 1,600*	630/1,130/ 1,630*	630/1,130/ 1,630	630/1,130/ 1,630
Material	MDPE	GRP	MDPE	GRP	GRP	GRP	GRP
Blower Ratings	50W	75W	95W	75W	95W	115W	225W
Cover sizes	700	1,500/900	700	1,500/900	1,500/900+600**	1,500/900+600**	1,500/900+ 600**

Note: *Optional inlet depth down to 1800mm*
**BioFicient IPS models only (Outlet Depth 320mm) | **BioFicient 4, 5, 6 has two shafts.*

Applications:

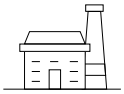
The Klargester Domestic BioFicient® 1–6 range is suitable for use across the following applications:

Single & Multiple Homes



Barn Conversions

Small Offices



Light Industrial Premises

Farms

02

Biozone 1 & 2

Solids are broken down by air agitated media in the Biozone. Media and liquid circulation in the Biozone is achieved through the use of a compressor and diffuser, which introduces fresh air into each compartment. The liquor is constantly re-circulated and contacts the moving media and as it does so, it is purified by the micro organisms growing on the surface of the media and within the moving liquor. Excess growth of biomass is shed as solid particles into the liquor.

03

Final Settlement Tank

Where fine solids are settled out. The Final effluent is discharged via either gravity outlet or IPS (Integral Pump System) chamber. With regulatory approval, it is suitable for discharge to a watercourse or drainage field.

Klargester BioTec®
Domestic Sewage Treatment Plant

The Klargester BioTec® sewage treatment system is ideal for single/ multiple houses and employs the well proven aerobic biological trickling filter process for the treatment of sewage.

Product Benefits

- No mechanical or electrical components within the plant – low running and maintenance costs.
- Low level visibility with a lockable child-proof duty cover – safe for children and pets.
- Easy to install and maintain with annual desludging.
- PPFDS and HLA Alarms as standard.
- Control Panel
- Beacon

Performance and Compliance

› Certified to BS EN 12566 Part 3.

› Assured performance of 20mg/l BOD, 30mg/l S.S., 20mg/l Ammonia.

› Fully CE marked in line with the CPR 2013.

**Blower is externally mounted.*

01

Incorporating the well-proven aerobic biological process, the BioTec® sewage treatment plant has a three-stage process.

Coarse solids are filtered and retained for gradual breakdown.

02

The resulting liquid is continuously distributed over a plastic suspended filter by an integral lift, powered by a remotely sited blower.

Easy to Install

Technical Specifications

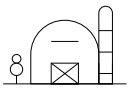
Model Reference	BioTec® 1	BioTec® 1 IPS	BioTec® 2	BioTec® 2 IPS	BioTec® 3	BioTec® 3 IPS	BioTec® 4	BioTec® 4 IPS
Population Equivalent	6	6	12	12	18	18	25	25
Outside Diameter (m)	1.9	1.9	1.9	1.9	2.7	2.7	2.7	2.7
BOD Load (kg/day)	0.36	0.36	0.72	0.72	1.1	1.1	1.5	1.5
Weight Empty (kg)	195	220	217	260	445	471	470	495
Depth (m)	2.2	2.2	2.7	2.7	2.6	2.6	2.6	2.6
Inlet Invert (m)	1.0*	1.0*	1.0*	1.0*	1.0*	1.0*	1.0*	1.0*
Inlet Invert to Base (m)	1.2	1.2	1.7	1.7	1.6	1.6	1.6	1.6
Outlet Invert (m)	1.1	0.605	1.1	0.605	1.1	0.605	1.1	0.655
Motor Rating (watts)	60	60	60	60	150	150	150	150

** There are two depths of inlet in the range 1.0m and 1.5m.*
IPS - Integral Pump System

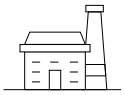
Applications:

The Klargester Domestic BioTec® Range is suitable for a range of applications, including:

Single & Multiple Homes

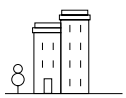


Barn Conversions



Light Industrial Premises

Farms



Small Offices

Economy Version Available

The Klargester Domestic BioTec® Economy Range is available for requirements of up to 18PE and features the following Product Benefits:

Product Benefits

- No mechanical or electrical components within the plant – low running and maintenance costs.
- Low level visibility with a lockable child-proof duty cover – safe for children and pets.
- Easy to install and maintain with annual desludging.

03

The solids are allowed to settle and under normal domestic conditions, effluent of 20mg/l BOD, 30mg/l S.S., 20mg/l Ammonia can be achieved.

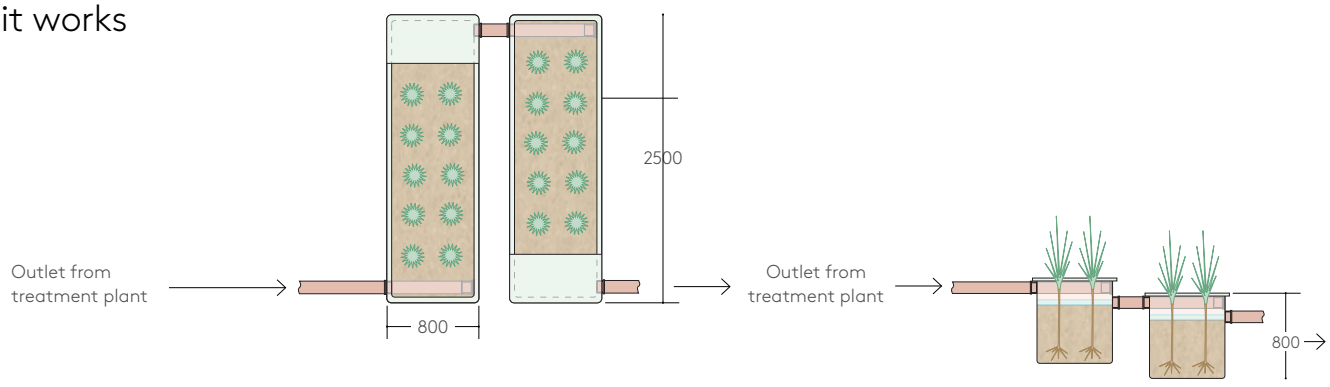
Klargester Reed Beds

A reed bed is a filtration process used in conjunction with a Klargester sewage treatment system to further enhance the quality of the effluent migrating into a drainage field or surrounding watercourse.

Product Benefits

- Tertiary treatment for new applications with tight discharge consents.
- Satisfies new building regulations.
- Improved effluent quality for existing works.
- Very low maintenance.
- Aesthetically pleasing and environmentally friendly.
- Easy to install and maintain.
- Effluent discharge is typically improved by at least 50% providing reduced BOD and suspended solids.

How it works



Technical Specifications

Model Reference	Population Equivalent	Length (mm)	Width (mm)	Depth (mm)	No. Required	Outlet Size (mm)
HRB006	6	2500	800	800	2	110
HRB012	12	2500	800	800	4	110

Selecting the Correct Solution

Regulations Compliant

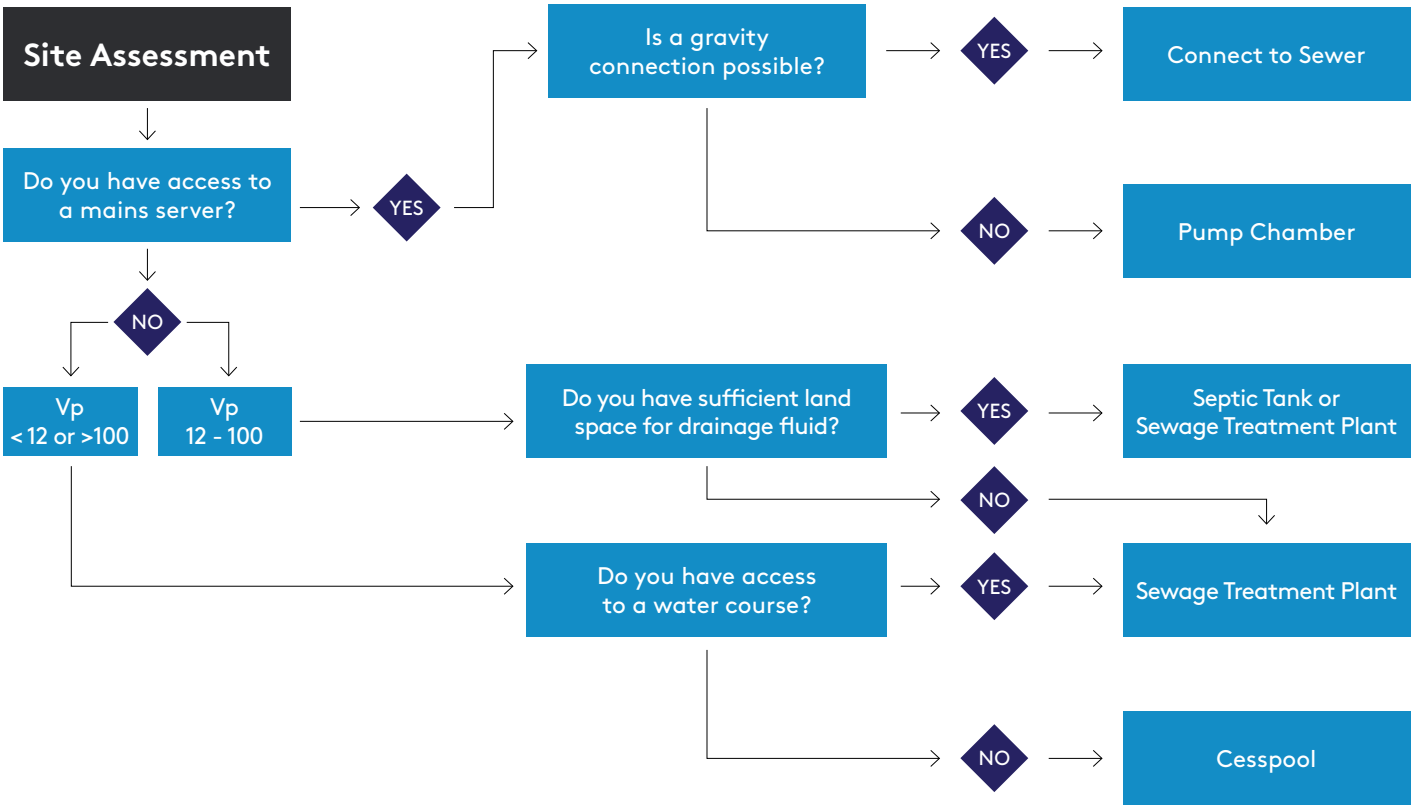
To ensure selection of the correct sewage treatment and disposal method to meet your requirements, expert advice should be sought. In all instances a sewage treatment plant should be considered as the first option.

Environmental Regulators and British Water have developed the system selection process below, to help in guiding you through the process to choose the correct system to meet your requirements.

Did you know?

If you have a septic tank that discharges directly to a surface water you will need to replace or upgrade your treatment system by 1 January 2020, or when you sell your property if before this date.

Environment Agency — General Binding Rules



Klargester Alpha Septic Tank

Klargester Alpha tanks provide a reliable and economic solution for homes not connected to mains drainage.

Did you know?

If you have a septic tank that discharges directly to a surface water you will need to replace or upgrade your treatment system by 1 January 2020, or when you sell your property if before this date.

Environment Agency — General Binding Rules

Basic septic tanks only retain solids and discharge effluent of low quality. The installation will not contaminate any ditch, stream or other watercourse. However, many authorities in the UK prohibit their use. In all instances a sewage treatment system should be considered as a first option.

Septic tanks may be installed, subject to consent, in applications where:

- Soil is of suitable porosity.
- Installation complies with Building Regulations (Approved Document H).
- The installation will not contaminate any ditch,stream or other watercourse.

—

Product Benefits

- Made from composite GRP - strong, light, and watertight.
- Press moulded shape provides wide, squat, form which makes the tank easy to install and handle.
- Stable base for storage.
- Lifting eyes are provided for lifting and positioning within the excavation.

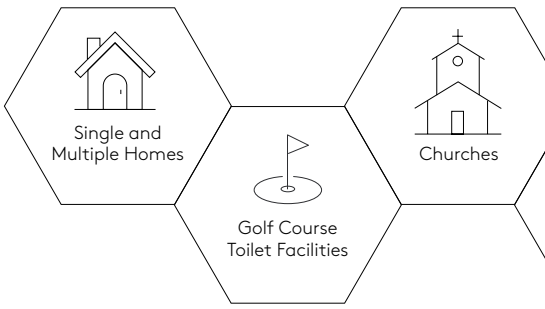
Performance & Compliance

› Performance tested to BS EN 12566 Part 1 requirements.

› Fully CE marked in line with the CPR 2013.

Applications

The Klargester Alpha and Gamma septic tank ranges, each comprise three sizes and are typically suitable for applications not connected to mains drainage including:



Technical Specifications

Model Reference	Volume (L)	No. People (150 Ltrs/head/day)	Overall Diameter (mm)	Height (mm)	Standard Inlet Invert (mm)	Standard Outlet Invert (mm)
STS02810	2800	5	2075	2599/3099	1000/1500	1050/1550
STS03810	3800	12	2075	2810/3310	1000/1500	1050/1550
STS04610	4600	17	2084	2984/3484	1000/1500	1050/1550

Klargester Gamma Septic Tank

The Klargester Gamma tank is an affordable solution for domestic applications with an efficiency rating of 99.97% – an industry benchmark.

Manufactured from tough polyethylene, the tank is robust and lightweight which makes it easy to handle and install.

Due to its design features, the Gamma tank is the perfect solution where a shallow dig installation is required, reducing installation time and costs.

—

Product Benefits

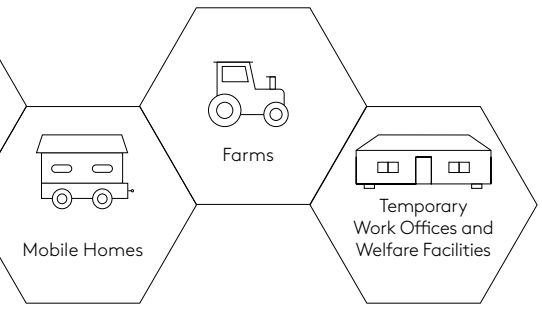
- Manufactured from robust, impact resistant, high quality polyethylene.
- Strong, easy to move and simple to install.
- Less excavation costs, less soil disposal and less backfill material.
- Wide neck for easy access for annual desludging.
- Trimmable neck to suit site.

Performance & Compliance

› 99.97% efficiency rating.

› BS EN 12566 Part 1 approved.

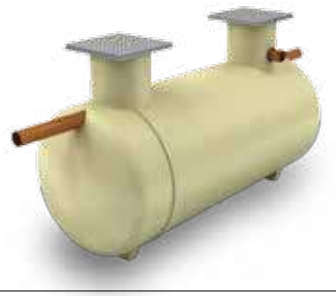
› Fully CE marked in line with the CPR 2013.



Technical Specifications

Model Reference	Volume (L)	No. People (150 Ltrs/head/day)	Width (mm)	Length (mm)	Height (mm)	Standard Inlet Invert (mm)	Standard Outlet Invert (mm)	Depth (mm)
GST028	2800	5	1130	2480	1755 - 2255	550-1050	550-1050	2255
GST035	3500	10	1180	3000	1755 - 2255	550-1050	550-1050	2255
GST040	4000	13	1215	3360	1755 - 2255	550-1050	550-1050	2255

Klargester Sigma Septic Tank



The Klargester Sigma shallow dig septic tank is designed to reduce both installation time and cost. The range is available in various sizes suitable for properties with dig height restrictions.

Product Benefits

- Made from GRP - strong and durable for ultimate reliability.
- Robust and simple to install, reducing on site installation time.
- Less excavation costs, less soil disposal and less backfill material required.
- Light, watertight and chemically resistant.
- Robust, weather proof for guaranteed durability, giving you value for money.

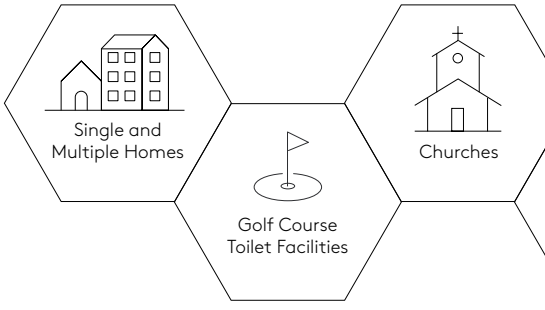
Performance and Compliance

› Certified to BS EN 12566 Part 1

› Fully CE marked in line with the CPR 2013.

Applications

Klargester Sigma septic tanks and below ground water storage tanks and cesspools, offer a solution for applications not connected to mains drainage including:



Technical Specifications

Model Reference	Volume (L)	No. People (150 Ltrs/head/day)	Overall Diameter (mm)	Length (mm)	Standard Inlet Invert (mm)	Standard Outlet Invert (mm)	Depth (mm)
STH028	2800	5	1225	2955	500	530	1627/1587*
STH038	3800	12	1225	3895	500	530	1617/1577*
STH057	5700	24	1425	4275	500	530	1826/1786*
STH071	7150	34	1920	3225	500	550	2290
STH091	9150	47	1920	3960	500	550	2290

**110mm diameter pipework/ 160mm diameter pipework*

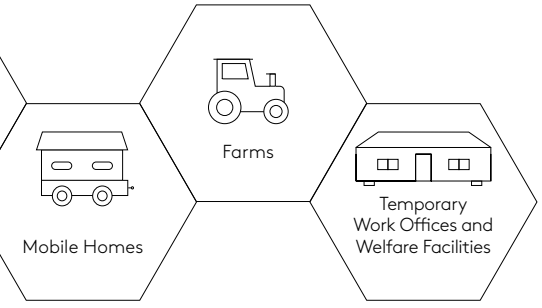
Klargester Below Ground Water Storage Tanks and Cesspools

The range of Klargester below ground storage tanks provide a reliable solution for the collection and retention of sewage (cesspool), surface water, veterinary / animal waste, firefighting reservoirs and rainwater harvesting reservoirs.

The advanced design of the Klargester below-ground storage tanks ensures consistent high performance, even in the toughest environmental conditions.

Product Benefits

- Easy to install with minimal on site installation time.
- Designed in accordance with BS6297, ensuring that you meet all building regulations.
- High level alarm available for complete peace of mind.
- Lockable manhole cover for ultimate security.



Technical Specifications

Nominal Litres	Capacity (Gallons)	Length (mm)	Diameter (mm)
18,000	3960	4317	2620
22,000	4889	5073	2620
26,000	5720	5837	2620
34,000	7480	7376	2620
46,000	10,120	9684	2620
54,000	11,880	11,222	2620
59,000	12,968	11,991	2620
63,000	13,860	12,760	2620
71,000	15,620	14,295	2620
79,000	17,380	15,833	2620

Klargester BioDisc® Commercial Sewage Treatment Plant

Delivered as a single, packaged system, the Klargester BioDisc® RBC range (up to 300PE), offers low running costs due to its unique design and operational efficiencies.

Product Benefits

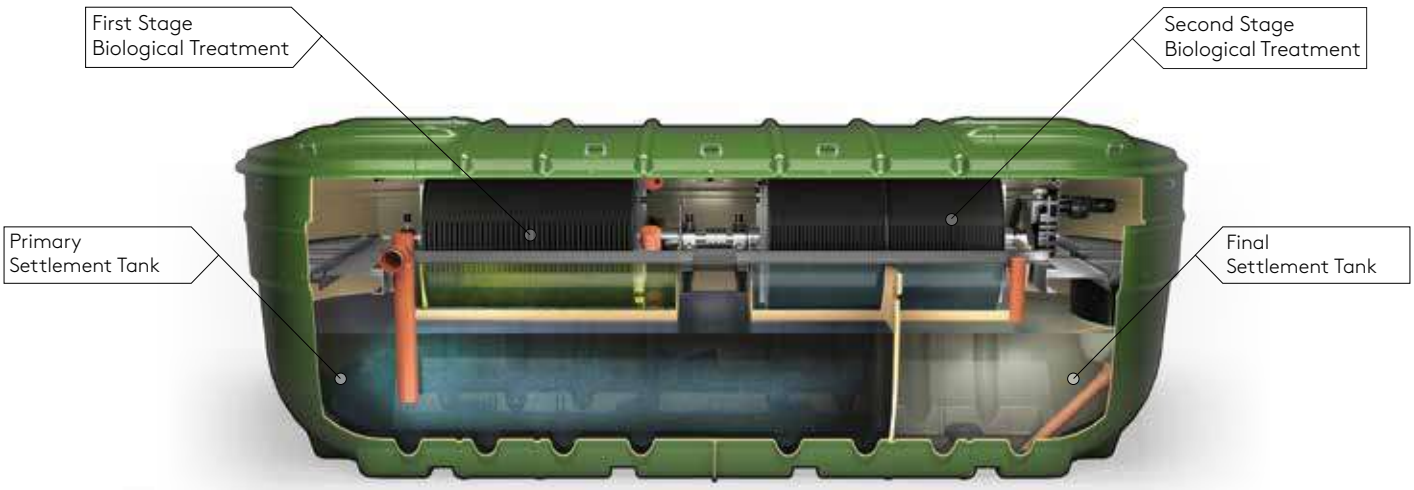
- Unique RBC technology.
- Tried and tested technology, offers robust and efficient water management treatment.
- Low running costs.
- Noise free.
- Fully removable lid for easy desludging.
- Fully packaged system, delivered direct on site.
- Bespoke technical support offered from our in-house technical teams.

Performance & Compliance

› Odour free – tested and fully approved in accordance with BSEN13725.

› Designed for applications selected in compliance with British Water Code of Practice Flows and Loads.

› 100% compliance with industry requirements across commercial sectors, including national and international regulations such as BS EN12255 and EN12566-3 (up to 50 PE).



01

Primary Settlement Tank

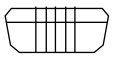
This is the initial stage of treatment and simply involves the retention of coarse solids present in raw sewage and wastewater for subsequent gradual breakdown. BioDisc® features one chamber to ensure efficient operation with a flow balancing facility.

02

First Stage Biological Treatment

The liquor and fine solids then flow into the first stage of Biological Treatment. A unique managed flow system ensures peak performance by smoothing variable loads.

Single Piece System



Technical Specifications

Model Reference	BD	BE	BF	BG	BH	BJ	BK	BL	BM	BN
Maximum Daily BOD (kg)	1.5	2.1	3	4.2	4.5	6	7.5	9	13.5	18
Maximum Daily Flow (m3)	5	7	10	14	15	20	25	30	45	60
Ø/Width (mm)	2450	2450	2450	2450	2450	2450	2450	2450	2450	2450
Length (mm)	3340	3340	4345	5235	7755	7755	7755	7755	10420	13100
Inlet Invert depth (mm)	600/1100	600/1100	600/1100	600/1100	600/1000	600/1000	600/1000	600/1000	600/1000	600/1000
Depth Below Inlet Invert (mm)	1820	1820	1820	1820	1790	1790	1790	1790	1790	1790
Outlet Invert Depth (mm)	1735	1735	1720	1720	1640	1640	1640	1640	1640	1640
Overall Height (mm)	2825/3325	2825/3325	2825/3325	2825/3325	2830/3230	2830/3230	2830/3230	2830/3230	2830/3230	2830/3230
Height to Rim of Cover (mm)	2485/2985	2485/2985	2485/2985	2485/2985	2490/2890	2490/2890	2490/2890	2490/2890	2490/2890	2490/2890
Empty Weight (kg)	1100/1200	1200/1300	1315/1465	1660/1810	3000/3020	3100/3120	3200/3220	3300/3320	4200/4250	5500/5650
Standard Power Supply	1 phase	1 phase	1 phase	1 phase	1 phase	1 phase	1 phase	1 phase	1 phase	1 phase
Motor Rating - 1 Phase (Watts)	75	75	120	180	250	250	370	370	550	2 x 370
Full Load Current 1 Phase (amps)	1.1	1.1	1.3	1.6	1.5	1.5	2.35	2.35	2.8	2 x 2.35
Optional Power Supply	3 phase	3 phase	3 phase	3 phase	3 phase	3 phase	3 phase	3 phase	3 phase	3 phase
Motor Rating - 3 Phase (Watts)	90	90	120	180	250	250	370	370	550	2 x 370
Full Load Current 3 Phase (amps)	0.38	0.38	0.42	0.63	0.88	0.88	1.35	1.35	2.8	2 x 1.35
Sludge Return Pump Rating (watts)	250	250	250	250	250	250	250	250	250	250

03

Second Stage Biological Treatment

The liquor is then fed forward at a controlled rate into Biological Treatment stage 2 for further cleaning. This process ensures the whole media area available is utilised ensuring maximum efficiency.

04

Final Settlement Tank

The surplus micro-organisms continuously slough off the discs and are carried forward to the final settlement where they settle out as a humus sludge, leaving a clear treated effluent to be discharged to ground or water course. The settled humus sludge is returned to the Primary Settlement Tank by the sludge return pump under timer control. The sludge return pump also removes any floating scum which helps to keep the final settlement tank working efficiently.

Klargester Modular BioDisc®
Sewage Treatment Plant

The new Klargester Modular BioDisc® containerised sewage treatment plant range, is designed with scalability in mind for populations of between 300PE and 2500PE.

A Brand New Solution for 2018

The Klargester modular RBC system is designed for applications with higher populations.

The RBC comprises of a complete modular system containing the RBC units along with primary and final settlement tanks.

Both RBC units and tanks can be increased in numbers or size to make a flexible system for an expanding or phased population growth.

Each unit is supplied as a 250PE unit and further units supplied depending on population requirements.

Primary and final settlement tanks can be sized for the intended end population or additional tanks can be supplied in the future and fed into the system.

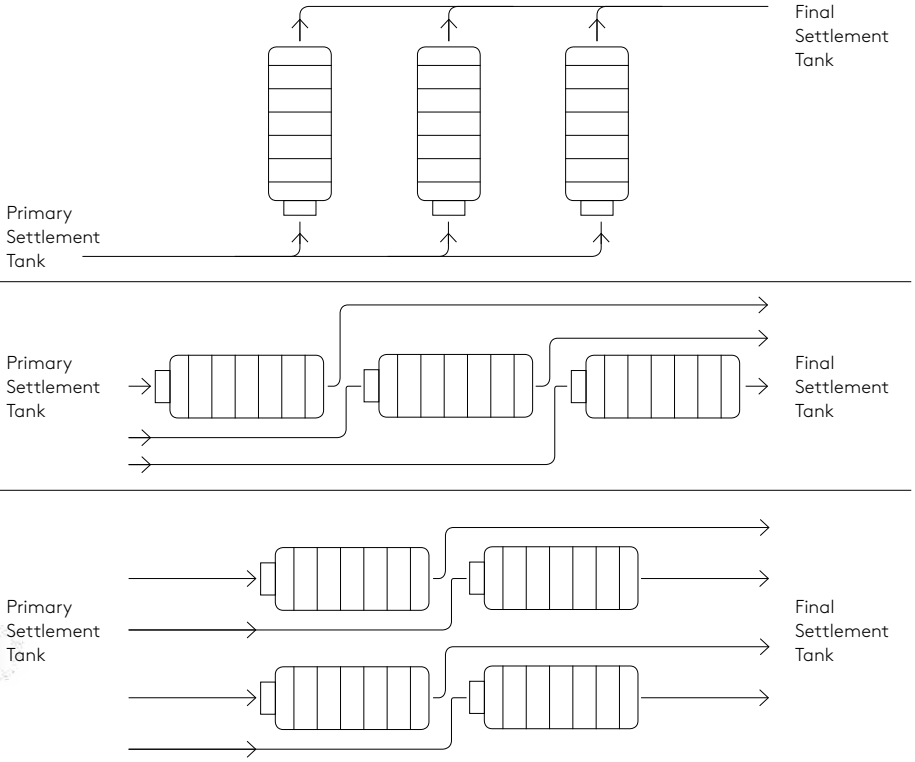
Each of the units can be linked to create a complete sewage treatment system. The feed to each RBC can be controlled independently to give further flexibility.

The RBC unit measures 6.7 metres long x 2.2 metres wide x 2.4 metres high. The size of primary and final settlement tanks will vary with each customer application and site location.

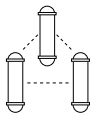
Modular BioDisc®

A flexible engineered solution, for above or below ground installation, the Modular BioDisc solution is ideal fro off-mains sites with seasonal loads due to its unique flow management activity.

Total flexibility with a unique modular RBC system



Available in our Modular System



Technical Specifications

Model Reference	Daily Flow (l/day)	Daily Load (kg/BOD/day)	Length(mm)	Width(mm)	Height(mm)	Weight(kg)	Motor Power
Modular BioDisc 250PE	50,000	15	6,700	2,210	2,400	5,000	1.1 Kw/400v

Max daily flow based on 200 L/Person/Day, system PE will vary by site flow rate per person.

More Savings

Kingspan's unique to market solar back up option is the ideal solution for customers in remote locations. Our solar panels can cater for up to 100% of the used energy on any site, offering a potential payback of three years on a typical BioDisc commercial system.

More Scalability

The commercial BioDisc range offers a totally scalable solution. For applications larger than 300PE, we offer a brand new containerised Modular solution, with flexibility to suit sites with populations up to 2500PE.

More Efficiency

Our unique flow management system delivers an improved biological process and overall treatment efficiency, by catering for seasonal changes to flows and loads. Adaptive forward feed management allows for total flexibility for seasonally fluctuating sites.

More Control

Featuring local alarms and Kingspan's intelligent SmartServ remote monitoring solution, the challenges associated with remote performance monitoring are greatly reduced. Our fully integrated connectivity package allows for greater control over your assets, saving time and money when it comes to servicing your treatment plant.

Klargester BioFicient® Commercial Sewage Treatment Plant

The Klargester BioFicient commercial sewage treatment plant is designed with efficiency in mind. It offers reliable performance using tried and tested technology to ensure consistently high effluent quality.

Product Benefits

- Adaptable to specific consent requirements including 'Total Nitrogen'.
- Low head loss.
- Minimal footprint area and visual impact.
- Variable invert options (0.5 - 2.0 m).
- May be installed in trafficked areas (subject to loading).
- Low maintenance.
- Alarm protected.

Performance and Compliance

› Compliant with EN-12255 and EN12566-3 (up to 50 PE).

› Designed and sized in accordance with British Water Code of Practice Flows and Loads but can be sized to suit local site conditions.

Applications:

The BioFicient range is suitable for a range of applications including:

Public sector

Leisure

Transport

Hospitality

Campsites

Offices

Multi-housing developments

— 2.6 diameter BioFicient is also available as an alternative model. —

01

Primary Settlement Chamber

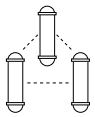
This is the initial stage of treatment and simply involves the retention of coarse solids present in raw sewage and wastewater for subsequent gradual breakdown. BioFicient features two chambers to ensure efficient operation with a flow balancing facility.

02

Biozone 1

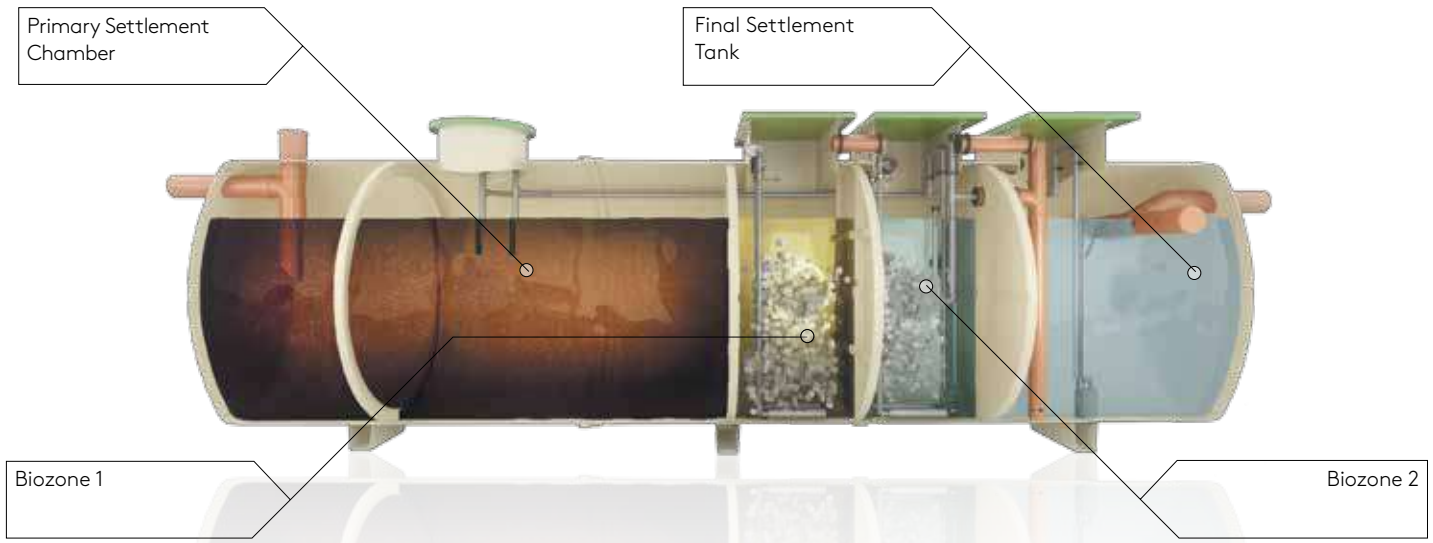
The liquor enters the first stage of Biological treatment where the active bacteria within the fluidized bed begin to break down organic solids, majority of BOD removal occurs here.

Available in our Modular System



Technical Specifications

Model Reference	17H	23H	34H	38H	42H	47H	55H	67H	80H
A Overall Length (m)	7.4	9.3	7.4	8.1	8.9	9.7	11.2	13.5	15.8
B Overall Width (m)	1.9	1.9	1.9	1.9	1.9	2.8	2.8	2.8	2.8
C Height (m)									
560mm Inlet / 860mm Outlet Invert*	2.28	2.28	3.02	3.02	3.02	3.02	3.02	3.02	3.02
1060mm Inlet / 1360mm Outlet Invert*	2.78	2.78	3.52	3.52	3.52	3.52	3.52	3.52	3.52
1560mm Inlet / 1860mm Outlet Invert*	3.28	3.28	4.02	4.02	4.02	4.02	4.02	4.02	4.02
2060mm Inlet / 2360mm Outlet Invert*	3.78	3.78	4.52	4.52	4.52	4.52	4.52	4.52	4.52
D Diameter (m)	1.8	1.8	1.8	1.8	1.8	2.6	2.6	2.6	2.6
Volume (m3)	17	23	34	38	42	47	55	67	80
Weight Approx (kg)	1200	1450	3000	3200	3400	3800	4200	4700	5400
Inlet / Outlet Diameter (mm)	160	160	160	160	160	160	160	160	160
Maximum Flow (m3/day) Models	8	11	15	20	25	30	40	50	60
Retention Time (hrs)	76	66	51	43	39	35	31	31	30



03

Biozone 2

Within the second stage of Biological treatment the second fluidized bed continues to clean the liquor giving further BOD reduction along with removal of nitrogen.

04

Final Settlement Tank

A natural by-product of biological treatment is humus sludge and this is separated for further treatment. The treated effluent is discharged via the outlet or to disinfection stage.

Choosing the Right Separator

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

The chart below 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.

Is there a risk of oil contaminating the drainage from the site?

YES

Risk of infrequent light contamination and potential for small spills only, e.g. car park

YES

Source control SuDS must be considered and incorporated where suitable

If not suitable

Bypass separator with alarm required

Class I if discharge to surface water[2,3]

YES

Risk of regular contamination of surface water runoff with oil and/or risk of larger spills, e.g. vehicle maintenance area, goods vehicle parking or vehicle manoeuvring[5]

YES

Full retention separator with alarm required

Class I if discharge to surface water[2]

Class II if discharge to foul sewer[1]

YES

Drainage will also contain dissolved oils, detergents or degreasers such as vehicle wash water and trade effluents, e.g. industrial sites

YES

Trade effluents must be directed to the foul sewer[1]

It may need to pass through a separator before discharge to sewer for removal of free oils

YES

Fuel oils are delivered to and dispensed on site, e.g. retail forecourts

YES

Full retention 'forecourt' separator with alarm required

Class I if discharge to surface water[2]

Class II if discharge to foul sewer[1,4]

NO

Very low risk of oil contamination, e.g. roof water

YES

Separator not required

Clean water should not be passed through the separator unless the size of the unit is increased accordingly

The use of SuDS should be considered at all sites and they should be incorporated where suitable. SuDS can be used to polish the effluent from these separators before it enters the environment[6]

Source control SuDS should be considered where possible

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.

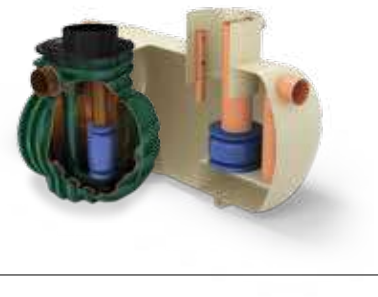
4 In certain circumstances, the sewer provider may require a Class 1 separator for discharges to sewer to prevent explosive atmospheres from being generated.

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.

Klargester Full Retention Separators

NSF RANGE



Full Alarm Range Available

Full retention separators are used in high risk spillage areas such as fuel distribution depots, vehicle workshops and scrap metal recycling yards.

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

- Oil separation capacity
- Oil storage volume
- Silt storage capacity
- Coalescer (Class 1 units only)
- Automatic closure device

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

Performance and Compliance

› Kingspan were one of the first UK manufacturers to have the required range certified to EN 858-1 in the UK.

› The NSF number denotes the flow at which the separator operates.

› Approved by The British Standards Institute (BSI) in relation to flow and process performance, meeting effluent quality requirements of EN 858-1.

Technical Specifications

Model Reference	Flow (l/s)	Drainage Area (m2) PPG-3 (0.018)	Storage Capacity (Ltrs)		Length (mm)	Diameter (mm)	Manhole Cover Dimensions (mm)	Base Inlet Invert (mm)	Base to Outlet Invert (mm)	Min Inlet Invert (mm)	Standard Pipework Diameter (mm)
			Silt	Oil							
Polyethylene Chamber Construction											
NSFP003	3	170	300	30	1700	1350	600	1410	1335	550	160
NSFP006	6	335	600	60	1700	1350	600	1410	1335	550	160
GRP Chamber Construction											
NSFA010	10	555	1000	100	2610	1225	600	1050	1000	500	200
NSFA015	15	835	1500	150	3910	1225	600	1050	1000	1000	200
NSFA020	20	1115	2000	200	3200	2010	600	1810	1760	1000	315
NSFA030	30	1670	3000	300	3915	2010	600	1810	1760	1000	315
NSFA040	40	2225	4000	400	4640	2010	600	1810	1760	1000	315
NSFA050	50	2780	5000	500	5425	2010	600	1810	1760	1000	315
NSFA065	65	3160	6500	650	6850	2010	600	1810	1760	1000	315
NSFA080	80	4445	8000	800	5744	2820	600	2500	2450	1000	315
NSFA100	100	5560	10000	1000	6200	2820	600	2500	2450	1000	400
NSFA125	125	6945	12500	1250	7365	2820	600	2500	2450	1000	450
NSFA150	150	8335	15000	1500	8675	2820	600	2500	2450	1000	525
NSFA175	175	9725	17500	1750	9975	2820	600	2500	2450	1000	525
NSFA200	200	11110	20000	2000	11280	2820	600	2500	2450	1000	600
NSFA210	210	11667	21000	2100	11991	2820	600	2550	2450	1000	600
NSFA225	225	12500	22500	2250	12760	2820	600	2550	2450	1000	600
NSFA240	240	13333	24000	2400	13527	2820	600	2550	2450	1000	600
NSFA255	255	14167	25500	2550	14295	2820	600	2550	2450	1000	600
NSFA270	270	15000	27000	2700	15065	2820	600	2550	2450	1000	600
NSFA285	285	15833	28500	2850	15833	2820	600	2550	2450	1000	600

** Some units have more than one access shaft – diameter of largest shown.*

Klargester Bypass Separators

NSB RANGE

Concentration Less Than

5 MG/L

Bypass separators are used when it is considered an acceptable risk to not provide full treatment for very high flows, such as, where the risk of a large spillage and heavy rainfall occurring at the same time is small. Typical applications include surface carparks, roadways and lightly contaminated commercial areas.

Product Benefits

- 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 polyethylene construction (subject to model).

Performance & Compliance

› Fully compliant and tested to EN 858-1.

› Bypass separators are tested by British standards institute (BSI).

› Certified flow and process performance assessing effluent qualities to the requirements of EN 858-1.

› The unit is designed to treat the 'first flush' - 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).

› Class I separators are designed to achieve a concentration of less than 5mg per litre.

Technical Specifications

Model Reference	Flow (l/s)	Peak Flow Rate (l/s)	Drainage Area(M2) Based on UK rainwater flow	Storage Capacity (Ltrs)		Length (mm)	Diameter (mm)	Access Shaft Diameter (mm)	Base Inlet Invert (mm)	Base to Outlet Invert (mm)	Standard Fall Across (mm)	Min Inlet Invert (mm)	Standard Pipework Diameter (mm)**
				Silt	Oil								
Polyethylene Chamber Construction													
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
GRP Chamber Construction													
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

** Some units have more than one access shaft – diameter of largest shown | ** Larger pipework available on request.*

† Achieves concentration of less than 5MG/L

Klargester Forecourt Separators

Expert Technical Advice

Forecourt separators are used to intercept hydrocarbon pollutants such as petroleum and oil to prevent their entry to the drainage system. Typical applications include petrol filling station forecourts and car breaker yards.

Performance and Compliance

- 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 with an automatic closure device to ensure that oil cannot exit the separator in the event of a major spillage, subsequently the separator should be emptied immediately.

Installation

- The unit should be installed on a suitable concrete base slab and surrounded with concrete or pea gravel backfill.
- 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.

Technical Specifications

Separator Class	Backfill Type	Total Capacity (Ltrs)	Drainage Area (m2)	Peak Flow Rate (l/s)	Length (mm)	Diameter (mm)	Access Shaft Diameter (mm)	Base Inlet Invert (mm)	Base to Outlet Invert (mm)	Standard Fall Across (mm)	Min Inlet Invert (mm)	Standard Pipework Diameter (mm)	Empty Weight (kg)
I	Concrete	10000	720	15	3915	2020	600	2180	2130	50	600	160	620
I	Concrete	10000	115	20	3915	2020	600	2180	2130	50	600	200	620

Fuel & Oil Separator Alarms

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. 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.

Product Benefits

- Easily fitted to existing tanks.
- Excellent operational range.
- Visual and audible alarm.
- Additional telemetry option.

Klargester Grease Separators

Easy to Install

Klargester Grease Separators are an effective and hygienic method of separating fat and grease from wastewater flow. Grease Separators are designed for restaurants, hotels, public houses, canteens and similar applications.

Key Standard Features

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

How it works

Grease separators allow fats and grease to naturally separate out from water, allowing their removal prior to the wastewater reaching 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.

Grease Range Sizing Table

Meals Per Day	Standard Meal	Fast Food	Fine Cuisine
40	NSG01	NSG01	NSG02
60	NSG02	NSG02	NSG02
80	NSG02	NSG02	NSG04
100	NSG02	NSG04	NSG04
200	NSG04	NSG06	NSG09
300	NSG06	NSG09	NSG14
500	NSG09	NSG14	NSG18
700	NSG14	NSG18	NSG24
900	NSG18	NSG24	—
1,300	NSG24	—	—

Technical Specifications

Model Reference	Dimensions (mm)		Flow Rates	Shipping Height (mm)	Capacity (L)	Approx Weight (Kg)		Fall Across The Unit (mm)
	Length	Width				Empty	Full	
NSG01	1320	750	1LPS	1100	500	70	570	75
NSG02	1620	1100	2LPS	1175	1000	90	1090	75
NSG04	2072	1224	4LPS	1570	2000	120	1860	70
NSG06	3018	1224	6LPS	1570	3000	160	2820	70
NSG09	3895	1224	9LPS	1570	4000	190	3760	70
NSG14	4418	1422	14LPS	1745	6000	215	5535	70
NSG18	3231	1917	18LPS	2120	8000	300	7162	70
NSG24	4386	1917	24LPS	2120	11000	380	9885	70

Klargester Washdown and Silt Units

Klargester Washdown and Silt units 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.

How it works

As contaminated water passes through the separation chamber, it is retained long enough to allow solids to sink to the bottom of the unit. Our design uses a maximum of 6 minutes hydraulic retention time, at the flow rate given. The separator water is then able to discharge safely.

The nature of the silt varies depending on either the ground or surface receiving the flow. These aspects should be considered when selecting the size of the unit in relation to the flow being treated.

If emulsifiers are present, the discharge must not be allowed to enter an NS unit.

Applications

These units can be used to serve vehicle wash down areas and car wash facilities, although it should be noted that the prime function of such separators is for the removal of silt. Typical locations using wash down separators are: car wash, tool hire depots, truck cleansing, construction compounds cleansing points.

Locations requiring silt separators are: highly silted sites where NS separators are used, i.e. works constructions sites and temporary work compounds.

Our Washdown and Silt Separators are manufactured from durable, rot and corrosion proof glass reinforced polyester combining lightweight with outstanding strength. The units are delivered complete with inlet and outlet pipework as well as factory fitted access shafts to ensure quick and easy installation on site.

Technical Specifications

Model Ref	Total Capacity (Ltrs)	Max.rec. Silt (Ltrs)	Max. Flow Rate (L/S)	Length (MM)	Diameter (MM)	Access Shaft Diameter (MM)	Base Inlet Invert (MM)	Base To Outlet Invert (MM)	Standard Fall Across (MM)	Min Inlet Invert (MM)	Standard Pipework Diameter (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

Klargester Compact Pumping Stations

Our proven range of compact pump stations can be used for effluent or sewage and are easy to install.

Quick to install and easy to maintain, Klargester pump stations are the ideal solution for outbuildings and extensions, cellars, pool houses and external WCs. They can be used for effluent or sewage, depending on the pump, distance and height.

Product Benefits

- Non-return valves and outlet pipe compression coupling as standard.
- 3 pump options; effluent low head, effluent high head and sewage vortex.
- Service and maintenance plans available to prolong the life of the pump systems.
- Complete pre-fabricated solution ready for installation.
- Fully automatic.

Technical Specifications

Chamber Size (mm)	Capacity (Ltrs)	Tank Material	Control Panel	Alarm	Pump Type
610 x 700	200	GRP	N/A	Optional	Single
560 x 1,650	400	GRP	N/A	Optional	Single

Selecting the Correct Pumping Station System

All Klargester pumping stations are suitable for pumping waste water effluent and sewage in accordance with BS 756-2.

They are also designed in line with Building Regulations for Foul Drainage. Your system size will depend on the type of waste you need to manage, your distance from the sewer and the difference in levels.

For expert advice, to help you select the correct system, please contact our specialist team on **01296 633033**

The key factors to size your system are as follows:

- Application: domestic, residential or commercial.
- Material application: sewage, effluent or surface water.
- Inlet depth (below ground level).
- Pumping distance and lift.
- Electrical supply.

Klargester Domestic and Domestic+ Pumping Stations

Our domestic pumping stations are ideal for homes or properties with up to 13 people.

Quick and simple to install, they require minimal maintenance. They come with single or twin pumps, and are suitable for sewage, surface water and effluent. Appropriate for 24 Hour storage requirements.

Product Benefits

- Made with super-tough, low maintenance GRP and high quality polyethylene for guaranteed durability.
- Comes with options of remote monitoring systems.
- Designed with easy access features for maintenance.
- Choose from either 110mm or 160mm inlet connections.
- Lockable covers for optimum security.
- Quick connection outlet couplings.

Technical Specifications - Domestic

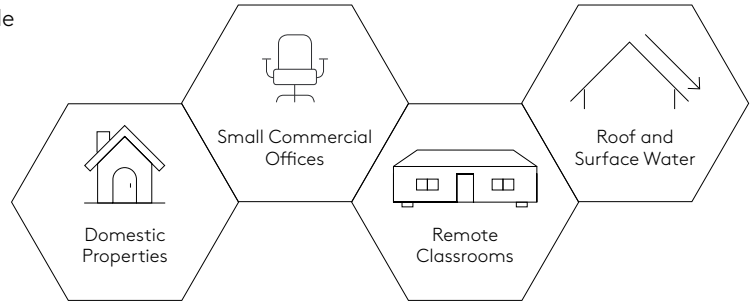
Chamber Size	Capacity (Ltrs)	Tank Material	Control Panel	Alarm	Pump Type
900 x 2580	1,600	GRP	Included	Optional	Single/Twin
900 x 2080	1,250	GRP	Included	Optional	Single/Twin

Technical Specifications - Domestic+

Chamber Size	Capacity (Ltrs)	Tank Material	Control Panel	Alarm	Pump Type
1000 x 2000	1,450	Polyethylene	Included	Standard	Single/Twin
1000 x 2500	2,200	Polyethylene	Included	Standard	Single/Twin

Applications

Suitable for a wide range of applications, the Compact and Domestic range of Klargester Pumping Stations are suitable for the following types of applications and many more:



Klargester Vertical Pumping Stations

Our Pumpstor Commercial pumping systems are ideal for developments and premises where drainage by gravity isn't an option.

Tanks and pumps come in a range of sizes and dimensions and have a 24-hour storage capacity for foul waste to comply with Building Regulations. A wide range of surface water pumps are available for such applications from small roof run offs, to large SUDS schemes, delivering up to 70 litres/second.

Pumpstor Commercial pumping stations are made from robust GRP. They are designed as a single-piece chamber, ready for installation with no man-entry required.

Product Benefits

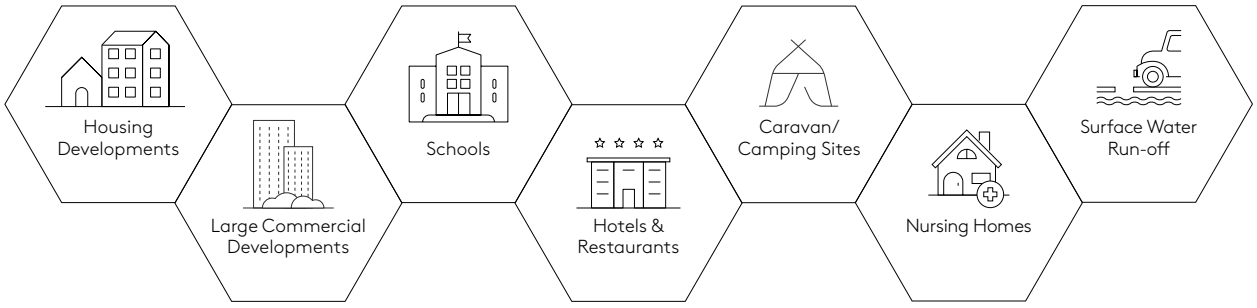
- High-level alarm.
- Internal lifting chains and guide rails (as specified).
- Wide range of pump options including macerators/vortex.
- Range of emergency overflow tanks, if required.
- Inlet connection sizes to suit site.
- Various invert depths and positions.
- GRP chambers with internal pipework in plastic, galvanised or cast iron.
- Optional kiosks with warning beacons and optional telemetry systems.
- Service and maintenance plans available to prolong the life of the pump systems.

Technical Specifications

Vertical Tank Size (mm)	Capacity (Ltrs)	Tank Material	Control Panel	Alarm	Pump Type
1250 Diameter	Up to 4,800	GRP	Included	Standard	Single/Twin
1800 Diameter	Up to 10,000	GRP	Included	Standard	Single/Twin
2600 Diameter	Up to 22,000	GRP	Included	Standard	Single/Twin

Applications

Designed for easy installation and available in many sizes to meet an extensive range of customer requirements, the Klargester range of Horizontal and Vertical Pumping Stations are typically used in applications including:



Klargester Horizontal Pumping Stations

If power supplies fail, Pumpstor Commercial responds instantly, separating liquids and solids into a separate chamber and storing waste for up to 24 hours. Once power is restored, the pumps will work normally again without further maintenance.

Product Benefits

- Single-tank installation up to 79m^3 (multiple tank systems available).
- Multiple valve chamber location and invert options.
- Weir screen features innovative removable filters, so there's no need to access the chamber during maintenance.
- High-level alarm.
- Totally sealed system.
- One-piece tank chamber for easy installation.
- Minimal on-site assembly.
- Less cranage and shallower excavation than concrete pumping stations.
- On-site Health & Safety issues are minimised – no requirement for personnel to enter the tank.

Commercial Pump Systems are made from GRP. It is designed as a single piece chamber with two separate sections. one for normal operation and one for emergency storage.

Technical Specifications

Tank Size (mm)	Capacity (Ltrs)	Tank Material	Control Panel	Alarm	Pump Type
2,600 Diameter	18000-79000	GRP	Included	Standard	Single/Twin

Klargester Adoptable and High Specification Pump Systems

The adoptable and high specification pump stations are designed to meet the requirements of 'Sewers for Adoption 7th Edition' and the 'Water Industry Standard' (WIS).

For expert advice, please contact our specialist team on **01296 633033**

Manufactured as a ready to install pre-fabricated unit for Type 1 and Type 2 installations for up to 20 dwellings.

Product Benefits

- GRP single piece wet well delivered to site ready to install.
- Pre-fitted internal pipework, pump guide rails and overflow filters.
- Approved control panel and kiosk.
- All necessary drawings supplied.

Klargester Gamma
Fully Integrated Rainwater Harvesting System

The Klargester Gamma rainwater harvesting system is designed as an intelligent rainwater harvesting system, tailor made for your home.

Typical Applications Include:

- WC Flushing
- Garden and Landscape Watering
- Domestic Laundry
- Vehicle Washing

With a technologically advanced finish, Gamma is suitable for both self build projects and residential developments.

It works by taking the rain from your roof gutters, filtering out leaves and debris and storing the water in an underground tank.

Manufactured from tough polyethylene, the tank is robust and lightweight, which makes it easy to handle and install. Its fuss free design offers high functionality, making it the perfect choice for your home or garden.

Automatic in operation, the Gamma rainwater harvesting system offers powerful features for complete peace of mind in your home. The intelligent system ensures an automatic supply of harvested rainwater for your home and garden.

For home and garden use, the Gamma is available in capacities between 2,350-4,600 litres.

Model Reference	Tank Dimensions					
	Capacity	Standard Overall Height	Standard Inlet Invert*	Standard Outlet Invert*	Length	Width
Gravity System						
GRW080	2,350 Ltrs	1,770mm	720mm	750mm	3,000mm	1,180mm
GRW110	3,100 Ltrs	2,260mm	720mm	750mm	2,480mm	1,130mm
GRW160	4,600 Ltrs	2,260mm	720mm	750mm	3,360mm	1,215mm
Direct System						
GRW080	2,350 Ltrs	1,768mm	720mm	750mm	3,000mm	1,180mm
GRW110	3,100 Ltrs	2,260mm	720mm	750mm	2,480mm	1,130mm
GRW160	4,600 Ltrs	2,260mm	720mm	750mm	3,360mm	1,215mm

* Includes tank neck - adjustable to suit required invert.

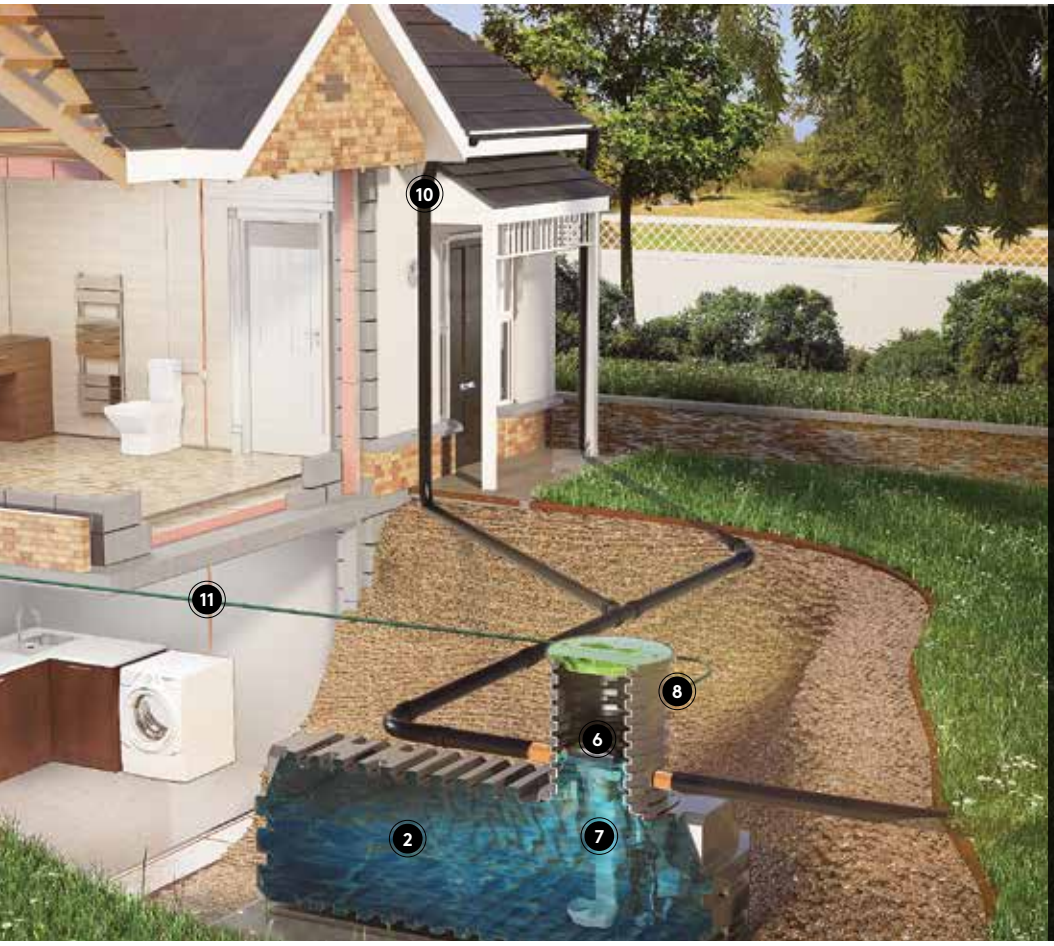
01 The Gravity System

The Gravity System uses an elevated header tank to store filtered water after the main tank.

02 The Direct System

The Direct System pumps water from the main storage tank and is used where a header tank is impractical.

Home and Garden



1 Water main
2 Storage tank
3 Header tank (optional extra)
4 Pressure Vessel (not supplied)
5 In-line filter 120 microns
6 Internal rainwater filter
7 Grundfos Intelligent Pump—SBA 3-23M
8 Adjustable tank neck
9 External tap (not supplied)
10 Roof rainwater feed
11 Filtered rainwater feed

Reduces Water Consumption

Regulations Compliant

Offers Fast Payback

Advisory Consultants

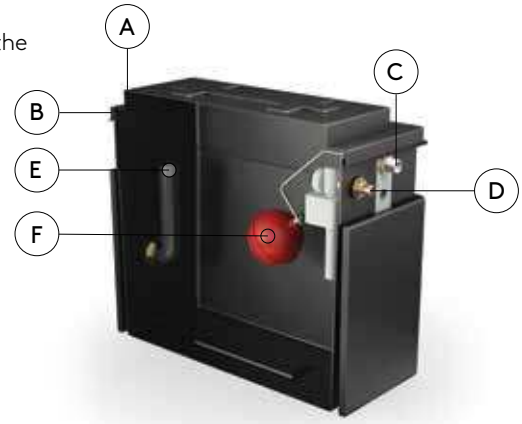
Features and Benefits

- Can reduce water consumption in domestic applications by up to 50%.
- Easy to install and simple to maintain.
- 'Fit and Forget' system, ensuring an automatic supply of harvested rainwater.
- Shallow Dig—the Gamma is designed with easy, affordable installation in mind.
- Pea shingle backfill available—no costly excavation and soil disposal necessary (dependent upon site conditions).
- Fully compliant—Gamma is tested in accordance with BS 8515:2009. standards.

Optional Extra - Header Tank

When ordering your system, to make the Gravity System complete you will require a header tank. Klargester offers a header tank with weir, ballcock and float valve which allows the switch over to mains, the weir provides the mandatory air gap.

A Mains Input
B Rainwater Input
C Water Regulations Compliant Mandatory Air Gap
D Overflow Point
E Rainwater Level Control
F Mains Level Control



Klargester Aquabank®
Rainwater Harvesting Range

Overview

The Klargester Aquabank rainwater harvesting system is designed with simplicity in mind.

Applications:

Vehicle Washing

Garden Watering

WC Flushing

Domestic Laundry

Aquabank is suitable for single residential applications. It uses cohesive design with the system controlled by a pump, with options for either direct or gravity fed applications. It's a highly intuitive system – easy to use with no need for a control panel, display panel or depth sensor.

Manufactured from strong GRP material, Aquabank is a complete 'kit in a box' – easy to install and the smart choice for your home's rainwater harvesting needs. For home and garden use, the Aquabank is available in capacities between 1,000 and 6,000 litres.

—

Features and Benefits

- Easy to install.
- Simplified system designed for rapid installation.
- Quick start set up procedure.
- 'Kit in a box' set of key components.
- Easy conversion to gravity system with header tank.
- Minimal energy use in operation.
- Fully compliant - designed in accordance with BS EN8515.

Benefits of Installing Klargester Domestic Rainwater Systems

SAVE UP TO 50% On water consumption in domestic applications with Klargester Rainwater Harvesting solutions

The system that pays for itself — money saved through reduced water bills means aquabank can pay back its purchase costs

Assists Planning Application — Authorities increasingly expect applications to demonstrate Sustainable Drainage (SUDS)

How it works

01

Rainwater is stored in underground tank

02

Rainwater is pumped at a constant pressure to an elevated header tank

03

Water is pumped to a garden sprinkler or hose as required

Model	Capacity (Ltrs)	Standard Overall Height	Standard Inlet Invert	Standard Outlet Invert	Diameter / Width	Length
Gravity & Direct System						
AQB010	1,000	2,140mm	500-800mm	530-830mm	1,225mm	1,125mm
AQB028	2,800	2,582mm	500-1000mm	530-1030mm	2,070mm	—
AQB038	3,800	2,811mm	500-1000mm	530-1030mm	2,070mm	—
AQB046	4,600	2,961mm	500-1000mm	530-1030mm	2,070mm	—
AQB060	6,000	2,365mm	500-800mm	530-830mm	1,424mm	4,275mm

—

Klargester RainTrap®
Rainwater Storage and Delivery System

Easy to Install

Overview

An economical rainwater harvesting system designed to make garden watering simple. The Klargester RainTrap system comprises of a filter, an underground storage tank and a pump. Rainwater runs down the roof and into the guttering and downpipes in the normal way before passing through the filter, which removes any leaves or debris. Rainwater is stored in the underground tank from which it is pumped at a constant pressure to an outside tap as required.

The RainTrap has many advantages over traditional garden waterbutts. In addition to being able to store far larger quantities of water, it removes the need to carry water around and does not flood when full, since the excess water exits via a soakaway or surface water drain.

—

Features and Benefits

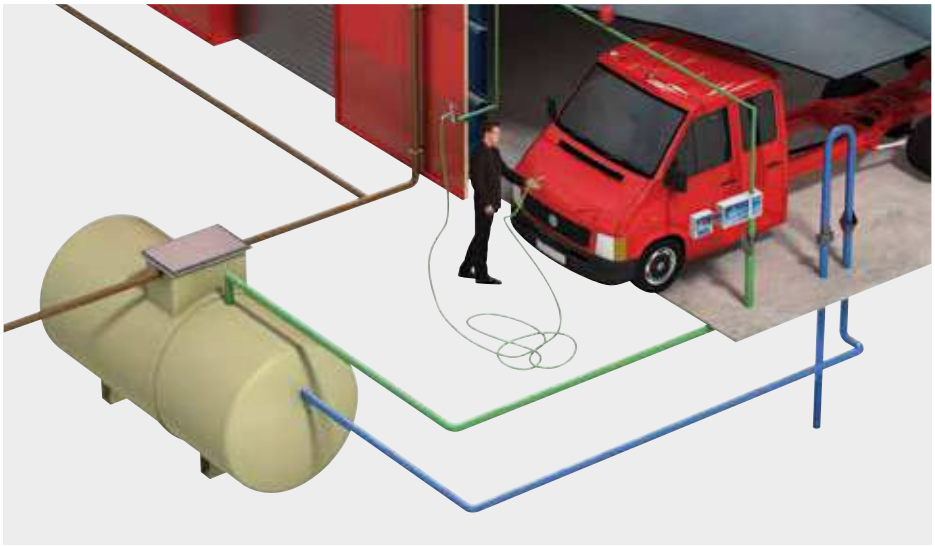
- Easy to install.
- Inexpensive.
- Simple on/off operation.
- Suitable for existing and new homes.
- Available in sizes from 1,000 — 6,000 litres.
- Automatic rainwater diversion when tank reaches full capacity.
- Internal leaf filter.
- Designed and manufactured in the UK.

Technical Specifications – RainTrap

Model Reference	Capacity (Ltrs)	Diameter (mm)	Height Base to Outlet (mm)
RT2800	2,800	2,070	1,540
RT3800	3,800	2,070	1,760
RT4600	4,600	2,080	1,925

Klargester Commercial Below Ground Rainwater Harvesting System

The Klargester commercial range is a fully integrated, intelligent rainwater harvesting solution suitable for such applications as commercial vehicle washdown areas, garden centres and golf courses.



The commercial range provides a secure solution for any size of building project from 6,000 litres up to 79,000 litres of water in a single tank. For larger capacities, multiple tanks may be connected together to meet storage requirements.

It is available as either a gravity or direct system, depending on specific site requirements.

Large installations are carefully sized and selected, taking into consideration the following factors:

- Roof water yield.
- Projected water consumption.
- Groundwork criteria (prevailing water table, soil conditions, requirements or traffic access).
- Suitable filters and pumps to match system specifications, ensuring the water is kept at an optimum level of clarity and supply pressure).

Features

- Capacities from 6,000 to 79,000 litres within a single tank.
- Multiple tanks can be joined to cater for larger volumes.
- Can be installed under trafficked areas (with reinforced concrete support).
- Complete packaged units delivered directly to site.

Technical Specifications

Single Pump Model Reference	Twin Pump Model Reference	Capacity (Ltrs)	Diameter(m)
ENV0200SKSW	ENV0200TKSW	6000	1.4
ENV0275SKSW	ENV0275TKSW	8000	1.8
ENV0350SKSW	ENV0350TKSW	10000	1.8
ENV0485SKSW	ENV0485TKSW	14000	1.8
ENV0625SKSW	ENV0625TKSW	18000	2.6
ENV0765SKSW	ENV0765TKSW	22000	2.6
ENV0900SKSW	ENV0900TKSW	26000	2.6
ENV1040SKSW	ENV1040TKSW	30000	2.6
ENV1320SKSW	ENV1320TKSW	38000	2.6
ENV1460SKSW	ENV1460TKSW	42000	2.6
ENV1735SKSW	ENV1735TKSW	50000	2.6
ENV2050SKSW	ENV2050TKSW	59000	2.6
ENV2325SKSW	ENV2325TKSW	67000	2.6
ENV2745SKSW	ENV2745TKSW	79000	2.6

After Sales Service and Support

We recognise the importance of after sales service and support and are proud of our nationwide Kingspan Service network, which comprises our Kingspan in-house Service team and Accredited Installer network in support of the Klargester Product Range.

Together we are working to provide first class service across a range of sectors, including domestic, commercial, industrial, leisure, hospitality and many more.

With expertise across the Klargester range of waste water and drainage solutions, pumping stations, separators and rainwater harvesting, our dedicated support network offers the following offers the after sales service and support you would expect from a global organisation.

- First class technical engineering expertise across a range of off-mains sewage and wastewater applications.
- Day to day technical support.
- 24 hour breakdown repair.
- Preventative maintenance plans.
- Installation and commissioning.
- Asset monitoring.
- Consultancy and advice.

To speak with us about any aspect of installation, commissioning or service simply contact:

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Tel: **0333 240 6868**
Email: **helpingyou@kingspan.com**

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ANNEX D

Guidance to a Maintenance Plan

Maintenance Inspection Checklists

3. Objectives

This checklist is a generic list that can be added to, or have items removed from, to suit a particular site. The exact content of the checklist will depend on the combination of different SuDS components used in a scheme. Checklists should be selected based on the combination of elements in the drainage system to provide a bespoke inspection report.

The objective of this checklist is to:

- Confirm that appropriate routine maintenance of the system is being undertaken
- Confirm that the system is continuing to operate effectively
- Identify any remedial works required
- Provide a consistent record of the condition and performance of the system.

It is not a checklist of maintenance items (see CIRIA C697 for maintenance schedules – page references are provided below). It is a checklist to facilitate consistent inspection of the condition of the system. It can be used by any organisation responsible for the long-term maintenance of the SuDS system as a recording process, or by a sub-contracted organisation as part of their client reporting procedures.

The SuDS Manual – Page references for appropriate maintenance activities and frequencies

Component	**SuDS Manual Page Ref ***
Filter strip	
Swale	
Infiltration basin	
Soakaway	
Detention basin	
Pond	
Wetland	
Bioretention	
Permeable/porous pavement	
Filter drain	
Proprietary systems	Maintenance and inspection activities and frequency of proprietary systems should follow the advice provided by the manufacturer or supplier and should be included on the checklist for a site. These should be checked during the first year of operation to make sure they are appropriate for the site.
Attenuation tanks	
Green roofs	

(*) SuDS Manual Page References will be included once the SuDS Manual update has been completed.

Inspections should comply with all relevant Health and Safety legislation (Health and Safety at Work Regulations, 1999) including the development of risk assessments for working close to or in water.

Inspections should ideally be carried out monthly (and no less than 3 monthly), at the same time as other routine maintenance activities.

Table 1: SuDS 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)? If yes, state depth (mm) and extent Is removal required? 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. under-drained 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? If yes, is this a blockage risk?								
Is there any evidence of any other clogging/blockage of outlets or drainage paths?								
VEGETATION								

	Inspection date				Inspection date			
	Details	**Y/N**	**Action required**	**Date Completed**	**Details**	**Y/N**	**Action required**	**Date Completed**
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? If yes, state action required.								
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?								
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 Increase maintenance Decrease maintenance								
NEXT INSPECTION								
Proposed date for next inspection								

GEO-ENVIRONMENTAL CONSULTING ENGINEERS

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ANNEX E

Drawings

CL = 248.91 mAOD
IL = 247.11 mAOD

LEGEND

SURFACE WATER MANHOLE

FOUL MANHOLE

SURFACE WATER SEWER/CULVERTS

OPEN SECTION OF WATERCOURSE

REV	DESCRIPTION	DATE	BY

GEO-ENVIROMENTAL CONSULTING ENGINEERS
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Web: www.bekenviro.co.uk

CLIENT.
PENDLE VIEW DEVELOPMENTS LTD

JOB TITLE.
FORMER MOORCOCK INN, SLAIDBURN ROAD, WADDINGTON

DRAWING TITLE.
DRAINAGE SURVEY

SCALE @ A3.	DRAWN BY.	APPROVED BY.	DATE.
NTS	D.E.	M.B.	02/05/18

DRAWING No. 18396-4

REV. -