Discharge of the treated water

After treatment, the water must be discharged from the plant. The chosen solution depends on the daily volume of treated water on the neighbouring circumstances (the possibility to discharge it into the natural receiver or directly into the ground) and the soil structure.
Seepage into the soil – by means of a well or a filtering field – implies that the soil has the adequate capacity for this and that the groundwater level is deep enough under the drain level.

Where to discharge

1. Carefully assess the daily produced water quantity. If it surpasses 2000 litres/24 hours then it must be discharged into a natural receiver.
2. If it is lower than that you may consider soil seepage.
3. If you possess a geodetical survey find out the soil structure and the depth of the groundwater.
4. If soil is pervious and the groundwater at 6 m depth then you can use a filtering well.
5. If the soil is pervious/ semi pervious and the groundwater at small depth then you can use the filtering field.
6. If the soil is impervious find out the limits of this layer. For max. 4.5 m depths you can use a filtering well that has to cross this layer.
7. If you do not have a survey like this then you can perform a rapid absorption test. Thus you can find out the absorption capacity of the soil.

Perviousness test

In case you do not have a geodetical survey you can find out the soil perviousness using the following test.

ATTENTION!

The test must be carried out under normal weather conditions, such as the pedoclimatic conditions you live in.
Do not perform this test during excess rains, low temperatures or excess drought.

1. Dig a 30x30x25 cm (length x width x depth) hole in the area the filtering field will be on – if applicable you may use a revolving driller with a diameter of 30 cm.
2. Measuring will be done using a ruler or a level marker.
3. Pour 25 cm of water and let it infiltrate over the night.
4. The next day another you will pour another 25 cm and then clock the time in seconds it infiltrates into the ground. Record the time it takes for the water level to decrease mm by mm. Then average them.
5. Measurement will be carried out three times; in case there are big differences the test will be repeated.
6. In case the average is bigger than 140 s/mm (more than 7 hours for the infiltration of the 25 cm of water) then the soil is not proper for drainage.
7. The required length for the infiltration drain is 1000 litres/day:

Percolation ratio [sec / mm]	Active ditch surface [m^2]	Drain length [m]
15	18,75	31
20	25,00	42
30	37,50	63
40	50,00	83
50	62,50	104
60	75,00	125
70	87,50	146
80	100,00	167
90	112,50	188
100	125,00	208

Soil infiltration by means of absorbing wells.

It is the most efficient and least invasive method (easy to hide and small footprint). It is recommended for small/ average water volumes and in areas with a pervious soil structure – stone, sand, chalkstone, etc.
The groundwater level must be low and the flood risk minimum.
The absorbing well consists of a tube with or without side nozzles, tube immersed into the ground and filled with successive layers of filtering materials. Thus, water is slowly infiltrated into the soil, successively filtered/ clarified as it passes through the well and the ground and finally it goes into the groundwater.

ATTENTION!

The filtering wells clog in time; that is why they have to be cleaned and the filtering material replaced every 3-5 years.

To establish the capacity of the well you can use the following guiding flows:

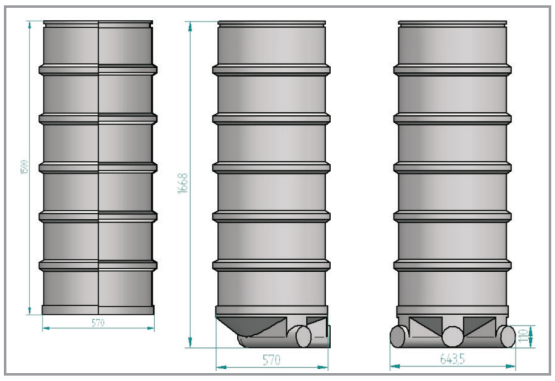
- sandy lands – 150-200 l/m^{2}xday
- loamy/sandy lands – 100-150 l/m^{2}xzi;
- loamy lands – 100 l/m^{2}xzi;

Practical:

- dig a hole with 20-30 cm larger sized than the sizes of the well;
- its depth must end at minimum 1-2 m above the groundwater;
- immerse the tube of the well into the hole;
- drill a hole using the proper driller and connect the pipe to the outlet of the plant; the well will be crossed using an air-tightening gasket;
- fill the hole with ground; in case the well has lateral nozzles fill the hole with filtering material of broken or grained brick;
- fill the well with successive layers if of filtering material (granulation 1-6), the coarse-grained at the bottom and the fine-grained in the upper part;
- the final layer is fine sand on top of which you place a deflecting plate (so that water will not flow directly onto the sand and wash it away);
- the distance between the pipe and the sand layer must be of approx. 50 cm, being considered the space for the water accumulation;

INFO

Such a well manufactured by Valrom consists of Ø 550 polyolefin tubes, in 1.5 mm sections of pipelines, that can be connected using sleeves and gaskets until max. 4.5 m depths. A Ř 550x1.5 m pipeline section has an active surface of 2.5 m^2.



Model of a 600l/day well

The well is built out of ND 550 tube (H = 2.6÷3.0 m, the max. depth for the mini-plant to be buried at), with perimeter nozzles in all the filtering area that are arranged to form a filter as in the drawing.

The 3 layers will be placed in the following assembly order:

1. material granulation of 4-6 cm – 20 cm depth;
2. material granulation of 2-4 cm – 30 cm depth;
3. material granulation of 1-2 cm – 30 cm depth.

On top of the filter there will be laid 30 cm of screened sand on top of which there will be placed a run-off plate for spreading the water. The distance between the inlet level of the well and the run-off plate is of approx. 20 cm.
Required accessories for the assembly process: polyethylene lid provided with aeration end.

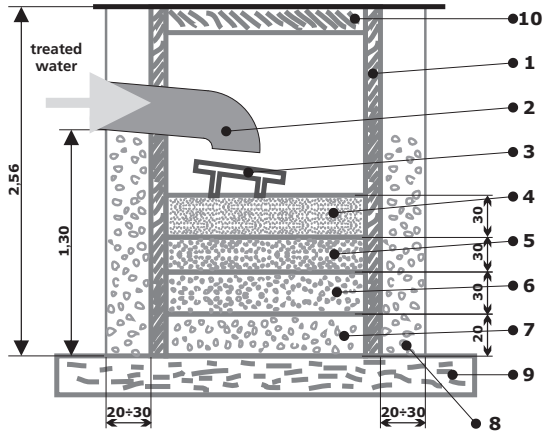


Fig. 3 – absorbent well layout

1. ND 500 PVC tube
2. feeding pipe
3. spatter plate
4. sand layer
5. 1-2 cm gravel layer
6. 2-4 cm gravel layer
7. 4-6 cm gravel layer
8. 4-6 cm gravel layer
9. pervious layer
10. lid provided with aeration end

Seepage into the soil through seepage fields

In case the soil structure does not allow seepage to depths bigger than 1.5 m (the ground is not pervious) the solution is to use a filtering field. It consists of a network of flexible perforated tubes immersed into the ditches and wrapped into a filtering material.

The wide surface and the presence of the superficial vegetation at the surface (grass) helps to evaporate the water inside the soil. The filtering field is a compromised solution that cannot handle large and/or anomalous flows, it is sensitive to wet seasons or when the evaporation capacity is minimum (fall-spring) and becomes fully non-operational in case of flooding.

They are underground sewerage networks with ND 75-110, provided in the lower part with approx. 3 mm nozzles through which the clarified water is immersed into the soil. The length of each drain is max. 30 cm and the distance between the drains ranges from 1 m to 2.5 m. To ensure discharge of the water in good conditions all through their length the drains will be mounted with an up to 3% slope in the sandy lands and almost horizontally in the loamy ones. The mounting depth ranges between 0.70 and 1.2 m. The total length of the drains is calculated considering the water volume that needs to e infiltrated and the nature of the soil.

The total length of the drainage pipes:

$$L_{tot} = \frac{Q_{zil}}{q}$$

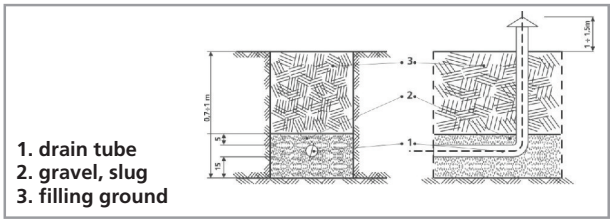
L_{tot} - represents the total length of the drainage pipes
Q_{zil} - represents the average daily slow of the run-off waters, in litres;
q - is the daily loading norm with run-ff waters of a linear metre of drain.

The run-off water loading norm of the underground filtering fields:

The distance from the bottom of the irrigation tube (drain) to the level log the groundwater	Daily load of a linear meter of soil irrigation q [l]		
	sandy	sandy loam	loam
1,00 - 1,50	12-18	6-12	4-8
over 1,50	15-25	12-20	6-10

Minimum figures – excess humidity area
Maximum figures – insufficient humidity areas

Recommendations for carrying out the drains using the aquaClean kit:



1. drain tube
2. gravel, slug
3. filling ground

Practical

- for drainage choose a pipe made of corrugated PE with a ND of 10-125, with nozzles or PVD 0110 with nozzles;
- dig the drainage trenches in accordance with the fig. below;
- fill in the trench with a 15 cm gravel layer or other pervious filling, with a 38-50 grain size;
- lower the pipe into the trench and connect it to a distribution chamber (especially when you have many drainage layers) which is mounted right after the treatment plant;
- fill with another approx. 5 cm layer of filtering material on top of which you can place a waterproofing geomembrane;
- in the end the structure must look like the one in the drawing;
- provide aeration.

ATTENTION!

The level of underground waters must be at least 1 m deeper from the drain.

INFO

In the Valrom offer there is available a distribution chamber consisting of polyolefin tubes with Ř 550, H = 1.5 mm, 3 lines, that can be connected to a 0110 mm corrugated drainage tube.

The aquaClean kit can be used to seepage approx. 600 l/day of water into pervious soils, to an approx. 1.4 m depth. The kit contains a spreading chamber and the materials required to built 3 drainage lines having a total length of 50 m.

ATTENTION!

Treated wastewaters will be reused or discharged only if the capacitated organism in the environment and water protection approve it.

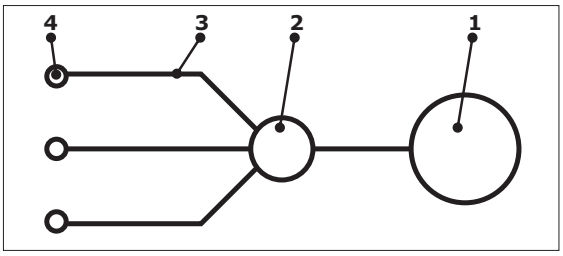
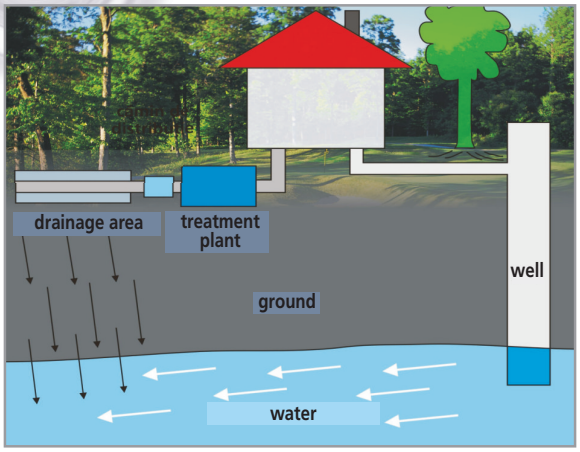


Fig. 1 Drainage system connection layout

1. treatment plant
2. distribution chamber
3. drainage tube
4. aeration at the end of the drainage tube

Requirements for the usage of the absorbent well
The absorbing well that helps infiltrating the effluent resulted from aquaClean® CAP1/4 LE plant into the ground is dug until reaching a pervious layer.

Building solution
- polyethylene 0110 chamber, H total = 2.000 mm, with a lid
- double layer drainage tube, D 125, L = 50 m
- PP tube, D 110, L = 1.5 m, 4 units
- aeration column ending element D 110
- Channel curve 87°, D 110, 3 units
- connector 125/110, 3 units
- direction valve



Drainage system connection layout

Requirements for the usage of the drain using the aquaClean kit:

1. Knowledge on the soil type in the area where the drains are being carried out, based on the hydro-geological survey. The soil must be pervious.
2. The land where the drains are to me mounted must be naturally settled. If it is not naturally settled then 1 year time period is required for this process to take place;
3. The drainage lines will be located such as to keep a minimum 2 m level from the closest groundwater layer.
4. The drainage network must be located minimum 30 m further from any well or any source of drinking water (distance measured on the horizontal).

	Sandy lands
Drain diameter: ND [mm]	110
Slope, i:	0.001 - 0.003
Distance between the axes of the tubes: [m]	1.50 - 2.00

ATTENTION!

The maximum length of a drain line is 30 m.

1. Drains will be mounted into a gravel or crushed slug layer allowing homogenous distribution of the water into the soil (within these layers there are also occurring biochemical processes);
2. Each branch has at the end an aeration orifice at approx. 1.00-1.50 m height above the earth. This also contributes to the biochemical action as well as to the run-off of the water.

Discharge into a natural receiver

This is the favourite solution in the impervious or semi-impervious lands. This implies that the wastewater is discharged into a creek, river, stormwaters channel, natural clough even if they do not have water all through the year.

ATTENTION!

Never discharge into small still waters (lakes, ponds, etc.) that do not provide a consistent dilution. In time, the quality of water will decrease and the risk of natural biotope alteration may occur.

Re-entering it into consumption

This is the ideal solution in terms of environment protection but it implies additional arrangements, equipment and maintenance activities. Due to the high micro-organisms contents, only the water undergoing the 3rd treatment stage (membrane filtering, chemical substances or UV radiations disinfection, etc.) can be used.

The resulted water is collected into an additional tank (underground or overground)and used only for irrigations or even for domestic purposes in case there is a separate circuit for toilets/ showers/ washing machines.

It is a solution mainly recommended for generators or average/ big water consumers (boarding houses, hotels, clubs, offices, other public buildings, etc.).

ATTENTION!

- In case the plant is the MBR type, due to ultra-filtration water is clarified and can be reused without sterilization;
- During the cold season the consumption of reused water is low.
- This water will NEVER be used as drinking water.