Puraflo® Coir

Coconut Fiber Biofilter

Reference Manual

Only mods bearing the NSF® mark
are certified NSF/ANSI Standard 40, Class I and NSF/ANSI Standard 350

ANUA

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1.0 General Description of System

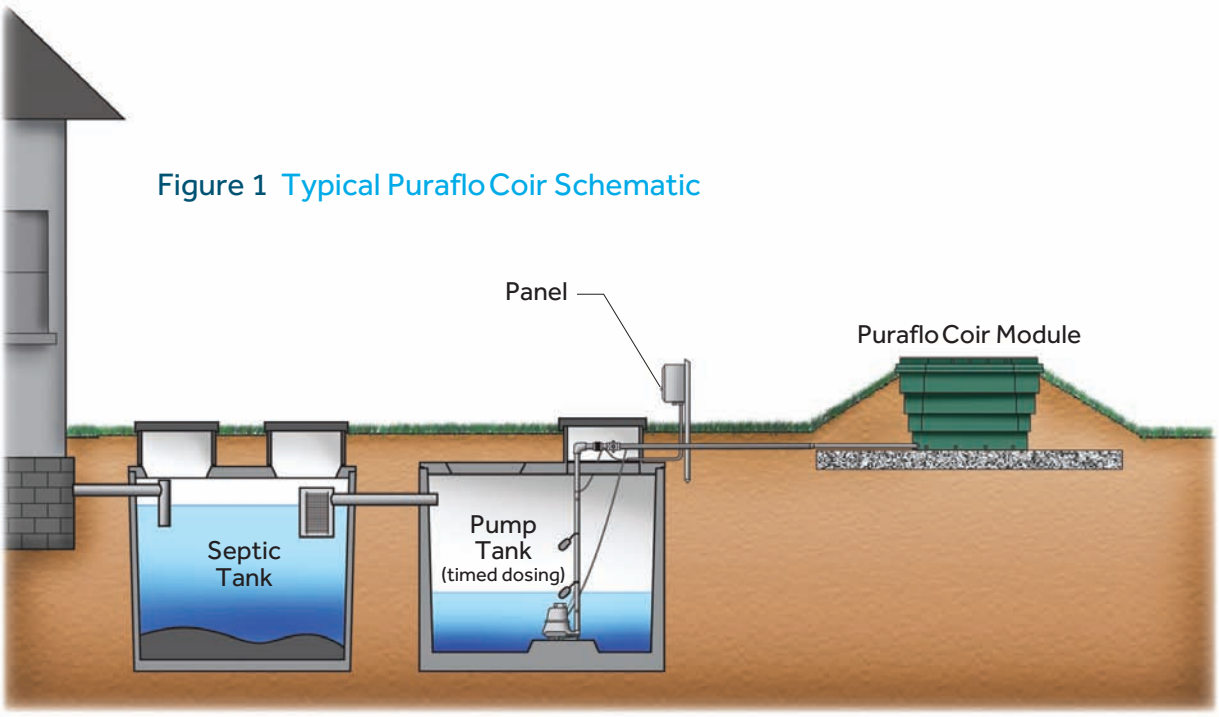
The Puraflo Coir is an advanced secondary treatment system that purifies septic tank effluent to an extremely high degree before final dispersal.

A typical Puraflo Coir system consists of:

- Septic tank with a commercially-rated effluent filter connected to the tank outlet pipe
- Dosing tank and effluent pump to accommodate dosing of the septic tank effluent onto the coconut fiber media
- Biofilter modules where advanced treatment occurs due to the physical, chemical and biological processes that are optimized in the coconut fiber media.
- Site specific, final effluent dispersal system

The filtered septic tank effluent is collected under gravity in the pump tank. A timed dosing system is activated by a programmable timer which pumps the effluent through a flow splitting inlet manifold located at the base of the treatment modules. An orifice plate is located inside the top of each inlet manifold which allows the flows to be split equally and fed simultaneously to each rectangular distribution grid with helical spray nozzles located underneath the module lid. The effluent percolates laterally and vertically through the depth of the coconut fiber and emerges as a clear, innocuous liquid from the base of the system. The treated effluent is then collected and dispersed.

Figure 1 Typical Puraflo Coir Schematic



2.0 System Design and Specification

The Puraflo Coir is a pre-engineered treatment system housed in pre-assembled molded HDPE modules. It is a highly efficient system designed to minimize site construction. Domestic quality primary effluent is evenly distributed over the specialized coconut fiber media.

2.1 System Configuration

The designer of a Puraflo system will be responsible for proper configuration and sizing of the components of the system, pump and other peripheral component specifications, timer settings, and construction details.

2.2 Design Flow and Number of Modules

Applicable regulations usually define the daily flow based on the number of bedrooms or the number of occupants with a defined flow per person per day. One module (7.1' L x 4.5' W x 2.5' H) is designed for up to 200 gallons per day or 2 bedrooms.

2.3 Septic Tank

The size and configuration of the septic tank shall be in accordance with the NSF listing (as applicable) or State or Local requirements. The septic tank shall have a usable volumetric capacity of at least 24 hours retention. The septic tank, risers, and lids must be watertight.

A commercial effluent filter must be specified. Acceptable commercial effluent filters are the Zabel A300, BEST GF10-32, Sim/Tech Pleated Gravity Filter and Polylok PL-625 (alternatively, the Sim/Tech Pressure Filter STF-100 or Sim/Tech No-Vault Pump Filter may be used). The effluent filter is installed on the septic tank outlet pipe to prevent grease and solids carryover into the pump tank.

2.4 Timed Dose Pump Tank

Dosing is typically regulated by a control panel with programmable timer, low water cut-off float, and high water alarm float. Storage capacity above the high water alarm float equal to or greater than one quarter of the daily design flow must be provided. The flow equalization zone (between the low water cut-off and high water alarm float) should be approximately half the daily flow to avoid nuisance alarms. **An override float or override capability must not be used.** A 500 gallon pump tank is the minimum. The size and configuration of the pump tank shall be based on design flow and occupancy and per the NSF listing (as applicable) or State or Local requirements. The pump tank, risers and lids must be watertight.

The dosing rate should be a nominal 12 gallons per minute per module. The dose timer default setting is 15 seconds "on" and 19 minutes 45 seconds "off" for a 400 gpd system. If the force main is set up to drain back, the drain back volume should be factored into the dosing calculations.

The diameter of the force main piping is typically 1.25 to 2 inches.

Buoyancy calculations for the septic tank and pump tank should be performed as applicable.

2.5 Biofilter Modules

Effluent from the force main is distributed to the modules via a flow splitting manifold with pressure equalizing orifice plates. Effluent is distributed over the media by a pre-installed rectangular grid with helical spray nozzles.

The site specific design will detail the final effluent dispersal method. Effluent may be either discharged directly to a pad installation or may have a piped outlet for discharge to trench, pressure system, point discharge system or other effluent dispersal method, as applicable.

Modules are pre-assembled depending on the final effluent dispersal method and can have:

Pad system:

- Weep-holes at the base for drainage to a pad system (Blue Module color code)
- Partial weep-holes with a piped outlet on the sealed end diverting effluent to a sample chamber (Green Module color code)

Other effluent dispersal methods:

- Piped outlet for connection to another dispersal system (White Module color code)

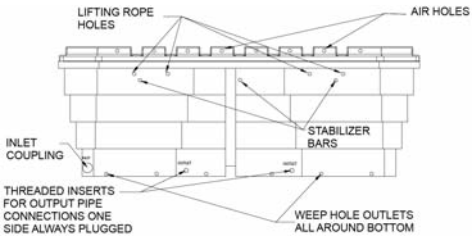
It is important to specify which modules are needed for a particular design. The type of module is designated by a painted logo on the module lid.

Green module(s) adjacent to a sample chamber have half of their effluent piped from one end of the base of the module through the sample chamber; therefore, there are no weep holes on the end of the module feeding the sample chamber. The chamber essentially provides access to the sample pipes for performance testing purposes. Any uncollected effluent exits the sample chamber through holes in the base or side of the sample chamber.

3 Module Types

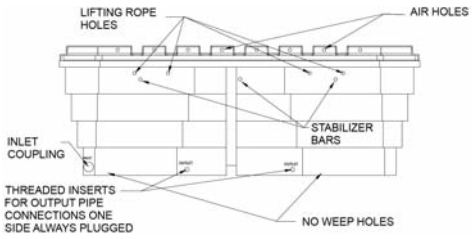
Blue Coded Module

Type A: Pad System



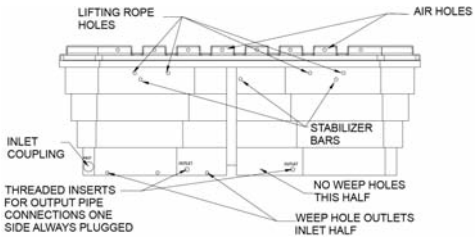
White Coded Module

Type B: Trench System



Green Coded Module

Type A: Pad System (for Sample Chamber)



Module Color Coding

- **Blue Coded Module:** (23) 7/8" dia. holes around bottom area of module
- **Green Coded Module:** (11) 7/8" dia. holes around half of module for sampling requirements
- **White Coded Module:** Closed bottom area, no holes in module

Table 5 Puraflo Coir Models P200C*XX

Design flow, per module (gpd)	200
BOD_5 loading, per module (lbs/d)	0.5
NSF Standard 40 certified	Yes
NSF Standard 350 certified with UV	Yes
Mode	Single Pass

Notes:

1. "A" denotes modules with weep holes around the base for discharge directly into a dispersal pad or trench. "B" denotes modules with a set of two, 1" threaded-ports at the base for connection to collection piping that can be routed to a drainfield or to a pump tank/chamber.
2. "XX" denotes number of modules and type. Type = "A" or "B". Example: "P200*3A" = 3 Type A modules.
3. Module type is denoted by color-coded logo on lid (see "Module Color Coding" above).
4. *NSF 40 and NSF 350* models bearing the mark are for residential use only and for flows of 400 to 1,500 gallons per day.

2.6 Cold Weather Conditions

Certain precautions should be taken in extreme cold weather conditions. In particular, the force main should be designed to drain back after each cycle. Also, the modules may be ordered with foam insulation on the underside of the lid. All systems must be verified for force main drain back and module lid insulation. Any other accepted standard practice for cold weather conditions should be used per State or Local requirements.

2.7 Life of the Coconut Fiber Media

The effective life of the Puraflo coconut fiber media is estimated to be 10 to 15 years under the following conditions:

- System has been operated at or under design flow and loadings
- System has been designed and installed in accordance with Anua guidelines
- System has been maintained in accordance with Anua guidelines, been operated under and ongoing service contract, and is in compliance with all Administrative Authority permit conditions

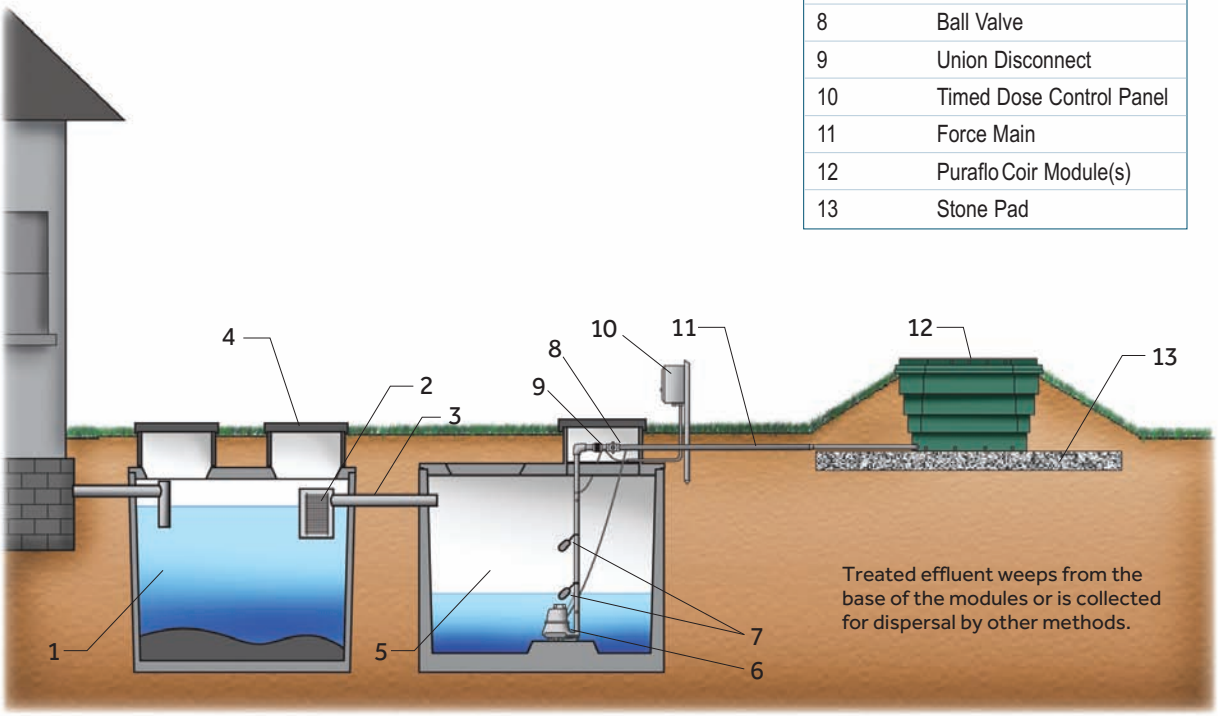
2.8 Final Dispersal System

The final dispersal system must be designed in accordance with State or Local regulations and Anua guidelines.

3.0 System Layout and Components

3.1 Schematic of Puraflo Coir System Components

Part No.	Description
1	Septic Tank
2	Effluent Filter
3	Sewer Line
4	Riser and Lid
5	Pump Tank
6	Pump
7	Floats
8	Ball Valve
9	Union Disconnect
10	Timed Dose Control Panel
11	Force Main
12	Puraflo Coir Module(s)
13	Stone Pad



3.2 Specification of Puraflo Coir Module

Max Treatment Capacity per Module:

- 200 gpd (residential)

Module Length: 7' 1"
Module Height: 2' 6"
Module Width: 4' 6"
Module Weight: ~900 lbs

4.0 Installation Requirements

Installation of the Puraflo Coir system is straight forward and can usually be completed in less than a day.

- **Warning:**
- Use recognized, safe lifting techniques to off-load and set modules.
- Ensure all lifting equipment is clear of overhead obstructions such a power lines, trees, rooftops or any other construction.
- Place the lifting equipment on solid, stable ground.
- Use a four-point sling or equivalent (see Fig.2).

The contractor/installer is required to provide the following:

- Mechanical excavator (backhoe) with operator.
- An electrician or person qualified to undertake the work in accordance with State or Local regulations (the electrician will be required to connect the pump and alarm to the control panel, set timer as required, and connect the control panel/junction box with the main power supply). Provide and supervise the installation of the underground cable from the control panel/junction box to the main circuit board.
- Provide gravity and force main piping and fittings per design. Piping under pressure must be PVC Schedule 40 or equivalent.
- Clean stone (3/4 to 1-inch) as required.
- Additional/imported fill material (typically not sand) and topsoil as required.
- Labor as necessary to install the system.
- Necessary supervision to ensure the system is installed per design.

5.0 Electrical Requirements

An independent electrical circuit to power the control panel (115/230 volts and 20 amps typical) must be provided. These requirements may change by State or Local code or when a duplex panel, a larger pump or a high head pump is required per design. Please refer to site specific design to verify electrical requirements noting the requirement for 115 or 230 volts and the amps rating required for the controls and the pump.

Figure 2 Module Off-loading

6.0 Sequential Installation Procedure

6.1 Site Clearance

- Clear site vegetation as required (minimize site disturbance).
- Provide sufficient access to proposed system.

6.2 Septic Tank

- Supply and install septic tank and sewer pipe from the dwelling in accordance with applicable State or Local regulations. The septic tank must be watertight against ground and/or surface water infiltration and exfiltration.
- Install septic tank on stable, compacted ground and backfill with suitable material as recommended by the manufacturer.
- Fit an effluent filter on the outlet pipe.
- Install water tight risers over inlet and outlet access ports to provide access for filter maintenance, septage removal, etc.
- Backfill and grade around the septic tank to prevent infiltration of surface water.
- See Appendix 1: *Typical Septic Tank Detail.*

6.3 Pump Tank Installation

- Supply and install the pump tank in accordance with applicable State or Local regulations. The pump tank must be watertight against ground or surface water infiltration and/or exfiltration.
- Install pump tank on stable, compacted ground and backfill with suitable material as recommended by the manufacturer.
- Install gravity main from the septic tank to the pump tank in accordance with applicable State or Local regulations.
- Excavate a trench, typically 18 inches deep, from the pump tank to the location of the modules. In colder climates the force main may be buried deeper (below frost line).
- Place sufficient risers on top of the pump tank to reach slightly above grade level. It is extremely important to ensure a water-tight seal between the pump tank and the first riser and between individual risers.
- All connections/seals should be made water tight in accordance with manufacturer's recommendations.
- Backfill, compact and landscape around the pump tank inlet/outlet pipes and electrical cable points of entry. Ensure suitable backfill material is used in accordance with manufacturers instructions.

6.4 Pump Fittings and Piping

- Place the base of the pump 4 to 6 inches above the base of the pump tank.
- Glue required length of PVC force main into the fitting at the outlet of the pump. Install the required fittings (check valve, union, ball valve, etc. as required by the design). In some cases, the force main may be designed to drain back and a drain back hole will be required above the check valve. Install an air vent hole when required and an anti-siphon hole if the module grid is lower than the liquid level in the pump tank.
- Floats are generally used however other suitable level devices may be installed. Install on/off float typically at pump level (to ensure that the pump is kept submerged). Install alarm float with 1/2 day storage above the on/off float. Strap floats to force main or separate stand pipe or hang from bracket.
- Install the force main in the trench from the pump tank to the modules. Backfill trench once the line is correctly installed and connected. Be careful not to damage the installed force main line with heavy vehicle activity.
- See Appendix 1: *Typical Septic Tank Detail.*

6.5 Puraflo Coir Installation

The site specific design will detail the final effluent dispersal method. Effluent may be either discharged directly to a pad installation or may have a piped outlet for discharge to trench, pressure systems, point discharge systems or other effluent dispersal methods, as applicable. The model numbers are identified as A for a pad installation and B for a piped outlet installation.

Type A – In-Ground Pad Installation
See Appendix 2:
Type A: In-Ground Pad Configuration

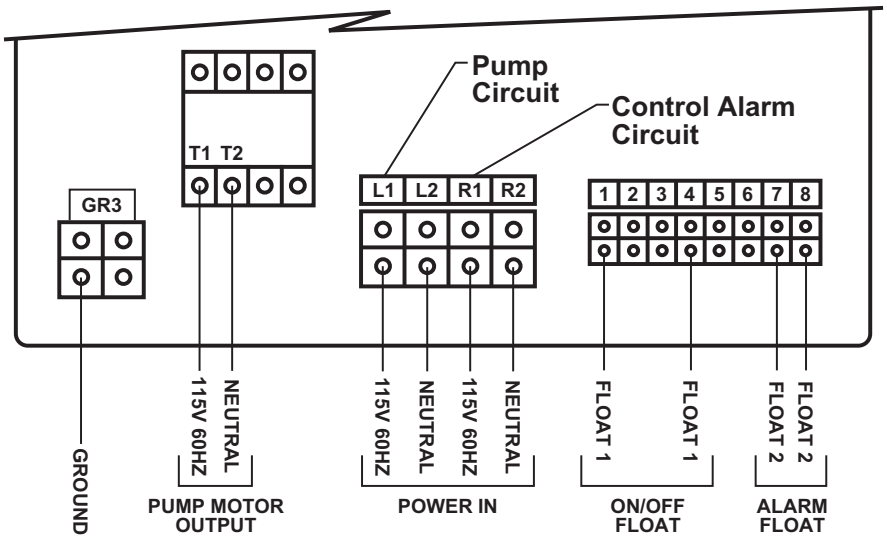
- Excavate a pad area (as specified in the design), making sure to maintain the required vertical separation distance between the bottom of the pad and any vertical restrictions such as seasonal high water table. The pad bottom must be level.
- Fill and level the excavated area with clean stone (3/4 to 1 inch, see Appendix 5) in accordance with the design, to a minimum depth of 6 inches.
- Position the modules on the stone pad area. Connect the force main to the module inlet coupling (incorporating a flexible pipe).
- Fit the sample chamber pipe to the outlet from the side of the green color coded module that does not have weep holes in the base. Insert the sample chamber pipe so that it extends 3 inches into the sample chamber and at least 5 inches off the base of the sample chamber. The sample chamber is pre-drilled with 7/8 inch holes in the base/side of the sample chamber to allow effluent to enter the pad foot-print area when samples are not being collected. The top of the sample chamber should be positioned at approximately the same level as the top of the modules.
- Backfill with stone around the modules to a height of 6 inches above the weep holes around the base of the modules when applicable.
- Cover the remaining exposed stone surface around the outside of modules with a suitable filter fabric. This prevents smaller soil particles from being washed into and subsequently clogging the foot-print area.
- Reinstate with suitable backfill and topsoil to finished design level.
- Ensure that the module lids are securely fastened.

Type B – Piped Outlet Installation
See Appendix 2: *Type B: Final Dispersal Separate from Module Configuration*

- For piped outlet installations the pad area's primary function is to level and support the modules.
- Excavate a pad area (as specified in the design). The pad bottom must be level.
- Fill and level the excavated area with clean stone (3/4 to 1 inch) in accordance with the design, to a minimum depth of 6 inches.
- Position the modules on the stone pad area. Connect the force main to the module inlet coupling (incorporating a flexible pipe). Construct the outlet pipework to the sampling chamber and to the final dispersal system in accordance with the design.
- Backfill with stone around the modules to a height of 6 inches above the drain holes on the side of the modules.
- Reinstate with suitable backfill and topsoil to finished design level.
- Ensure the Puraflo lids are securely fastened.

6.6 Electrical Connections

- Select a location for the electrical control panel near the pump tank or home.
- Install the cable between the power source and the control panel in accordance with State or Local regulations.
- Place the electrical power cable(s) in the trench/conduit (do not stretch cable). Connect each cable coming from the equipment in the pump tank in accordance with the wiring diagram located on the door of the control panel (a typical wiring schematic is detailed below). The cable between the pump tank and the control panel is to be installed in conduit and include the appropriate conduit seal. Reinstate area.
- Connect the electrical power cable(s) to an independent electrical power supply of the specified voltage (usually 115 volts), terminating in a socket or junction box protected by an M.C.B. as required (usually 20 amps). If a duplex control panel or high head pump is required the voltage and amperage requirements may increase.
- Input timer settings in accordance with design.
- Test and commission pump operation, start/stop conditions and alarms.
- All electrical work shall be done in accordance with State or Local regulations and/or building codes.



Typical Wiring Schematic for a simplex pump system. Please refer to the inside of the Control Panel for the actual wiring diagram and specifications.

6.7 Spare Parts

Spare or replacement parts can be obtained from the manufacturer of the component or Anua if they need to be replaced.

6.8 Site Restoration

- The modules must be installed at grade or above grade with the ground landscaped to divert storm water away from the modules.
- Backfill around modules to a height just under the lid of the modules.

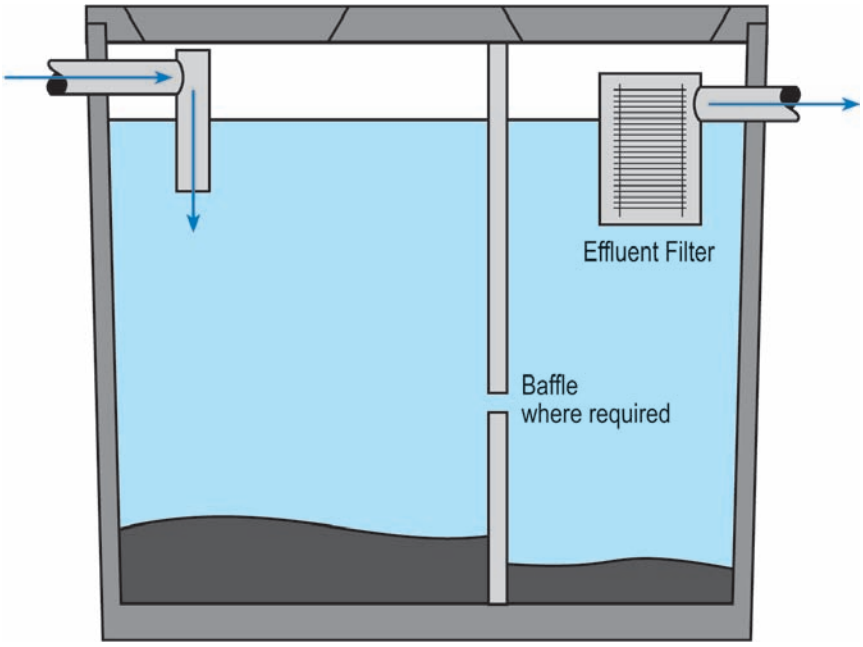
  Grade the backfill back to the existing ground level on a slope no steeper than 2:1.

  Backfill should be suitable, loose, workable material.

  Compact backfill sufficiently to counteract settlement.

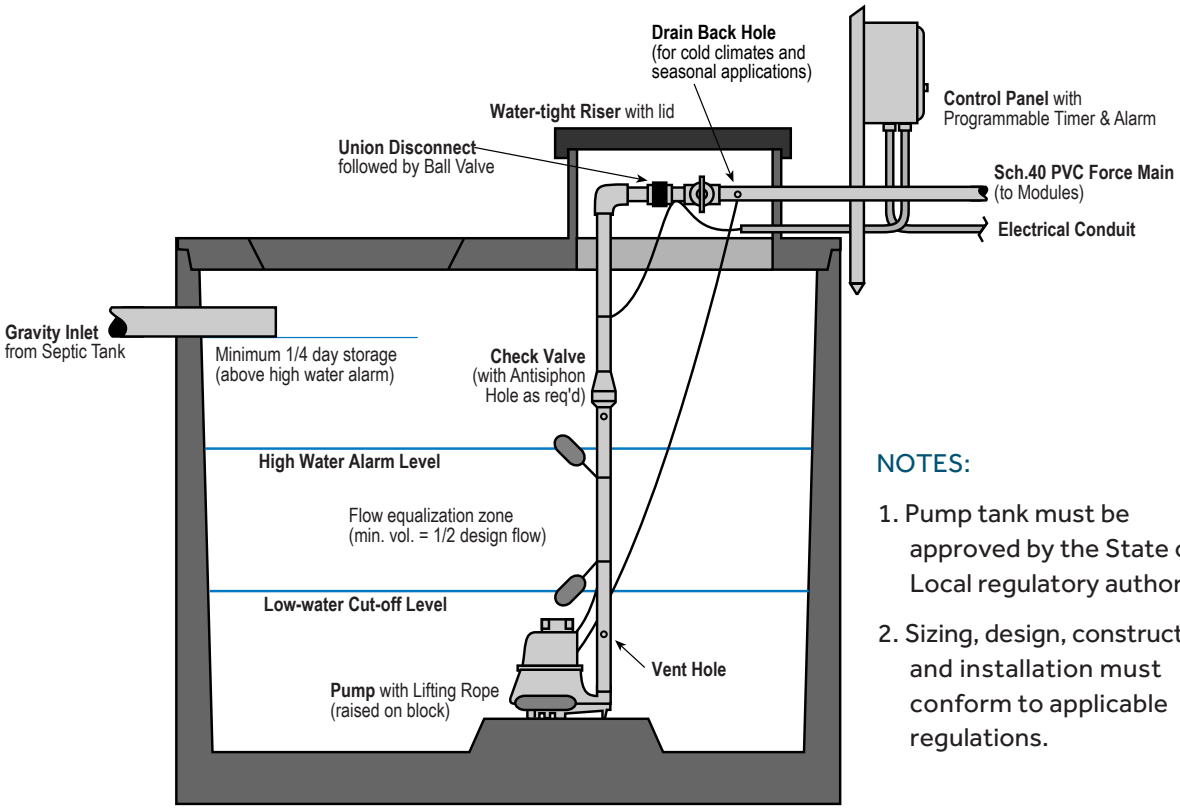
  Ensure a 6 inch minimum cover over drainfield stone where applicable.
  The final layer (6 inches) of fill material should be suitable topsoil capable of supporting vegetative growth.
- Grass seed and straw the sloped backfill area and any trench excavation lines with a suitable indigenous seed variety. In some cases, sodding for immediate stabilization may be specified.
- PROVIDE EROSION PROTECTION AS REQUIRED PER DESIGN PLAN.

Appendix 1 Typical Septic Tank and Pump Detail



NOTES:

1. Septic tank must be approved by the State or Local regulatory authority.
2. Sizing, design, construction and installation must conform to applicable regulations.
3. For polishing filter model, Puraflo module(s) will be preceded by a treatment unit, in lieu of a septic tank, designed to meet secondary effluent standards. See *Puraflo Polishing Filter Guidelines*.

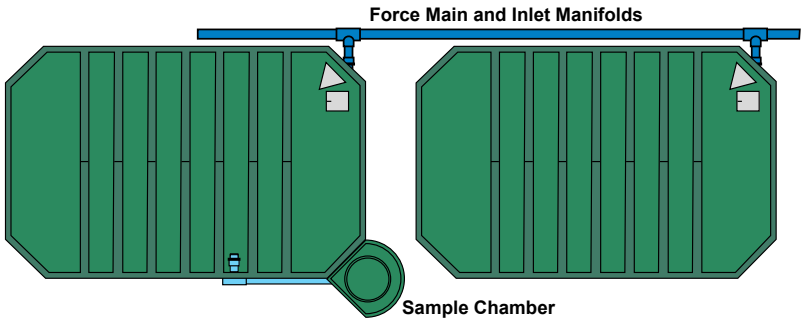


NOTES:

1. Pump tank must be approved by the State or Local regulatory authority.
2. Sizing, design, construction and installation must conform to applicable regulations.

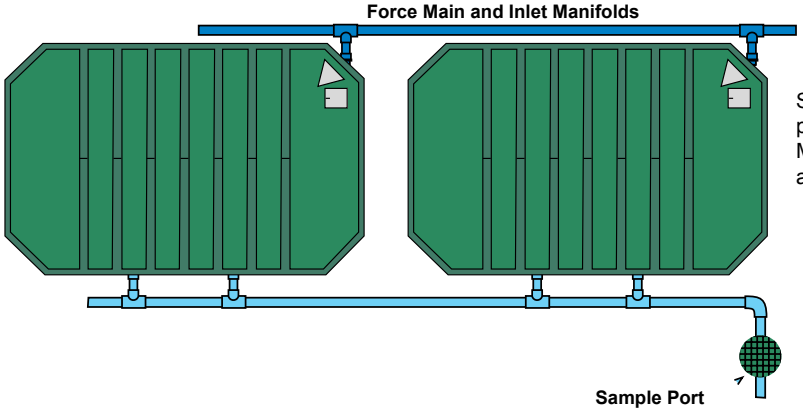
Appendix 2 Type A and Type B Installation

Type A – Pad Installation



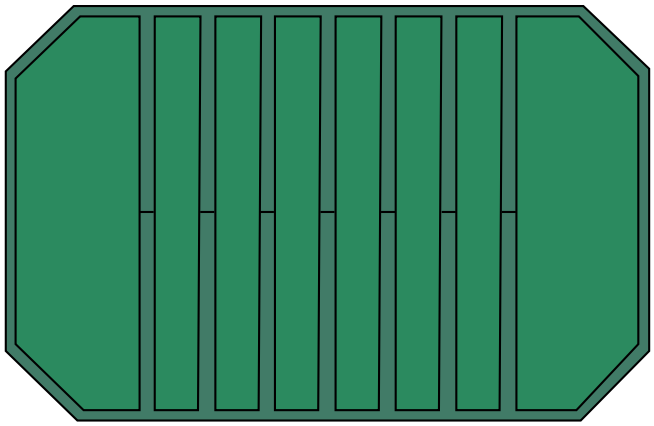
Blue coded modules with weep holes and one green coded module with sampling chamber, drain into a stone pad for final treated effluent disposal. Pad dimensions can be selected to match site conditions and modules can be installed side-by-side as well as end-to-end (as shown above)

Type B – Piped Outlet Installation

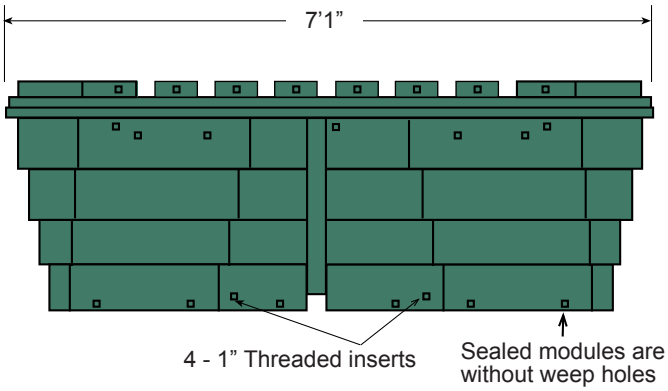


Sealed white coded modules (no weep-hole placed on a 6” support gravel bed. Modules connected via outlet manifolds to a gravity Drain Line.

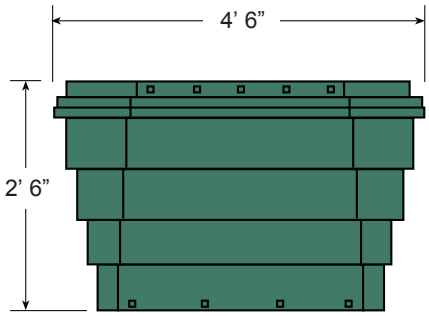
Appendix 3 Assembled Module Detail



Plan View

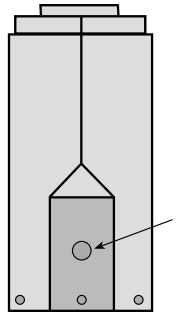


Elevation View

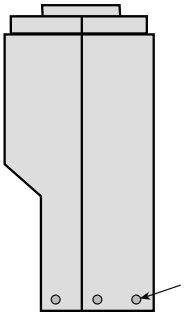


End View

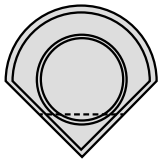
Appendix 4
Sample Chamber Detail



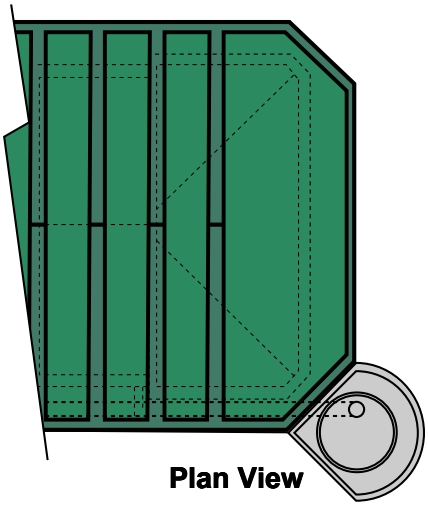
Elevation View



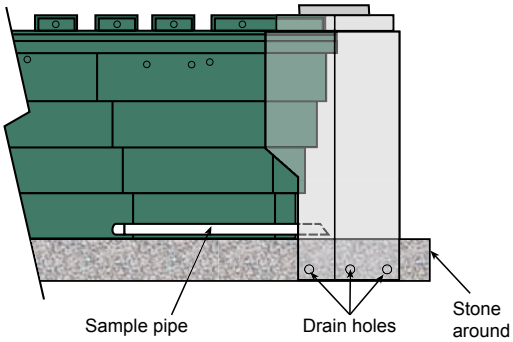
End View



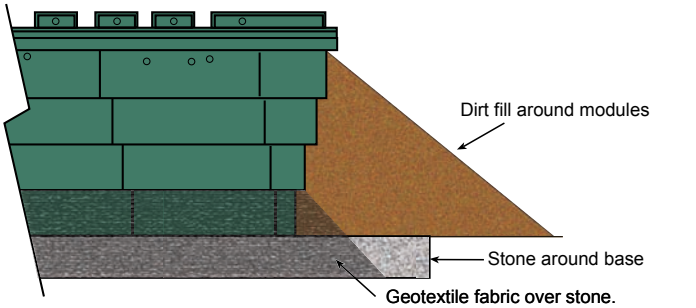
Plan View



Plan View



Elevation View 1



Elevation View 2

Appendix 5 Additional Effluent Dispersal Criteria

Type A System: Puraflo Modules Combined with IN-GROUND PAD Dispersal

- All components used in conjunction with the Puraflo Coir must comply with all applicable State or Local rules and codes.
- The septic tank shall be sized according to State or Local code.
- An effluent filter shall be placed on the outlet of the septic tank that meets the requirements of Section 5.3 of this manual.
- The pump tank shall be sized according to State or Local code.
- Calculations can be done with the Microsoft Excel Design Sheet.
- The in-ground pad dispersal area may be sized per the soil texture hydraulic loading (BOD=30) in Table 4-3 of the USEPA 2002 Onsite Wastewater Treatment Systems Manual or Anua criteria.
- The length and width can be sized using the Kaplan (1991), Allen (1980), or Poeter (2005) water mounding equations or linear loading rates in the Tyler (2001) Table ≤30 mg/l BOD_5.
- The bottom of the stone dispersal area shall maintain a minimum vertical separation distance from limiting conditions per State or Local requirements or 1 foot (6 inches to seasonal high water table). Seasonal high water table vertical separation distance may be reduced to greater than 0 inches and less than 6 inches if approved by the local board of health or administrative authority. In situ soil must be a minimum of 6 inches or per hydraulic modeling.
- The dispersal aggregate shall be clean stone (3/4 to 1 inch). The stone shall be washed with not more than 5% passing the No. 200 (75 µm) sieve as determined by ASTM C117, "Test Method for Material Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing" and shall be durable with a hardness of 3 or greater on the Moh's Scale of Hardness. Alternatively, gravelless technologies may be utilized instead of stone.
- The dispersal material shall be leveled to a depth of 6 inches.
- The Puraflo modules shall be placed on the dispersal material so that they are evenly spaced from the sides of the distribution bed and end of the distribution bed with even spaces between each module and the ends of the dispersal area. The minimum spacing from the end of the dispersal material to module end is 1 foot. For spacing calculation, see example below. The modules shall consist of one green coded module and the remainder blue coded (modules may be shipped from the factory as white coded that can be field modified to blue or green by drilling the appropriate number of 7/8" holes on predetermined spots on the modules). If modules are field modified it is the responsibility of the installer to change the color code on the lid of the module.

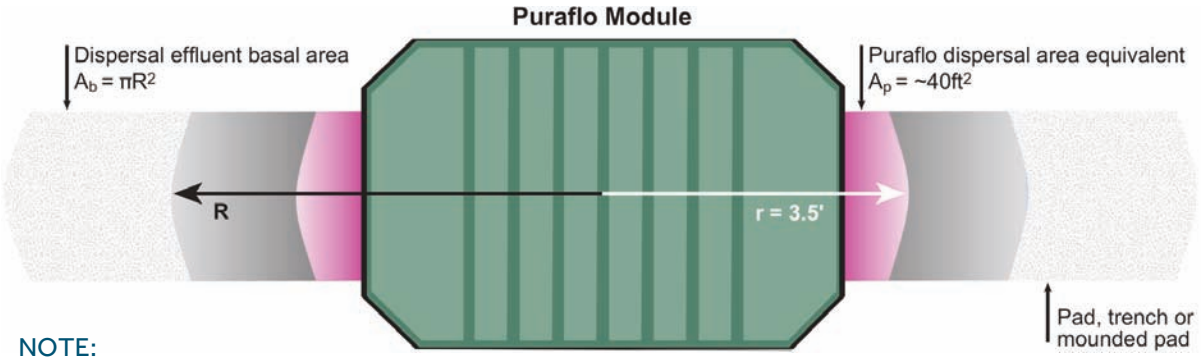
Sample spacing calculation

3 modules, each module is 4.58'W x 7.08'L
Dispersal pad is 10'W x 96'L
Total module L = 3 x 7.08' = 21.24'
Spacing between modules & ends = 96' - 21.24' = 74.76'
=74.76' / 2 (in-between modules) + 2 (ends) = 74.76' / 4
= 18.69' between modules and from ends

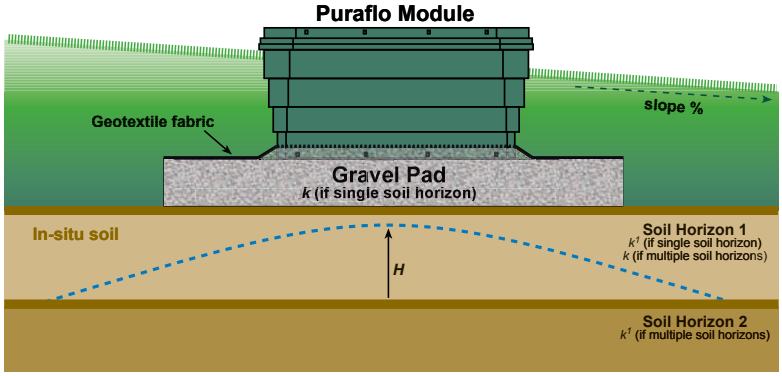
- The Puraflo modules shall be level from side-to-side and end-to-end.
- Connect the force main to the module inlet coupling (incorporating a flexible pipe). Note sizing requirements in Section 5.3 of this guide. The manifold connection shall be configured like the illustration in Appendix 2 and 4 of this guide and shall pass the last module by a minimum of six Inches and be capped. It is recommended that a clean-out be brought to finished grade.
- Distribution media shall be placed at a level to completely cover the distribution holes on the side bottom of the Puraflo modules.
- An Anua specified sample chamber shall be placed on one of the outlet connections of a green color coded module for sampling of effluent.
- Once the Puraflo modules are installed and all connections have been made, the distribution media shall be covered with a geotextile fabric.
- The system shall be backfilled with sandy to loamy soil material and topsoil to the bottom lip of the Puraflo modules.
- Additional design considerations:

  For slowly permeable soils, designers must use professional judgment to ensure effluent absorption into the soil and that other potential issues are mitigated, such as water mounding. For most soils, absorption and water mounding are not issues, even with as little as 1 foot of minimum vertical separation. Also, Converse and Tyler (2000) note, "The design loading rates are based on 150 gpd/bedroom resulting in 450 gpd for a 3 bedroom home. If the mound, as well as other soil based units, is loaded at 450 gpd on a regular basis, it will likely fail. The daily average flow is expected to be no more than about 60% of design or 270 gpd."

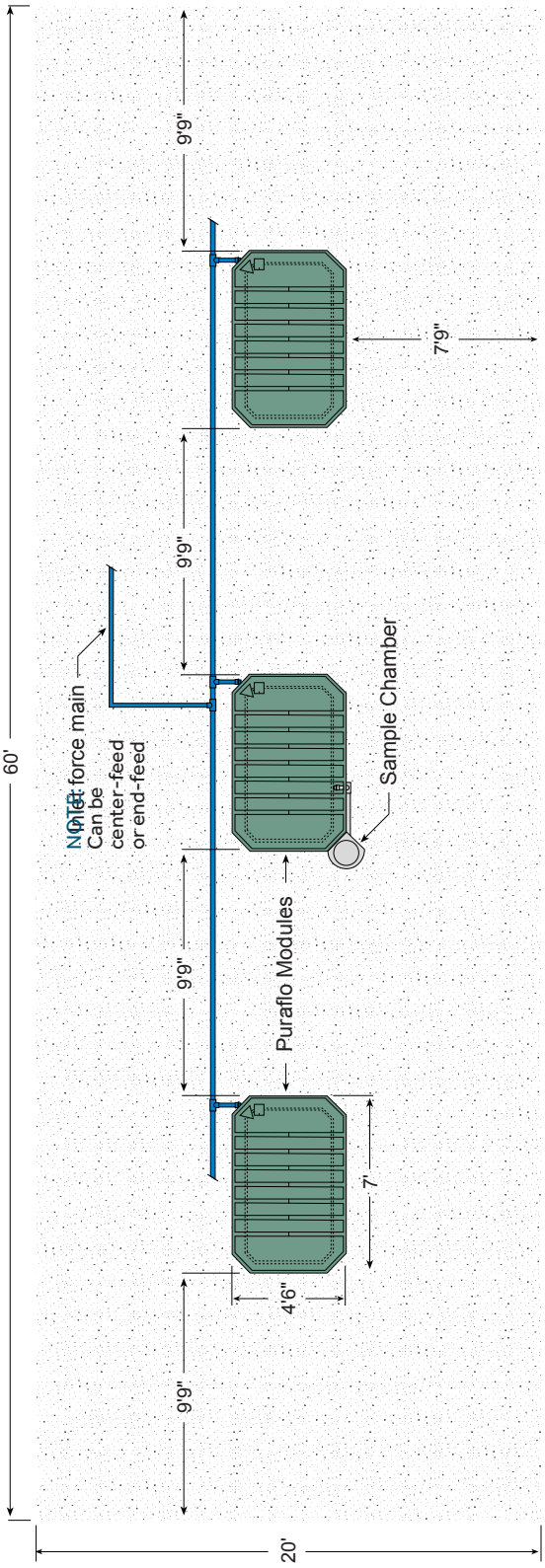
The effluent spread, as depicted in the diagram below, and water mounding height can be calculated using the Kaplan (1991) equations below:

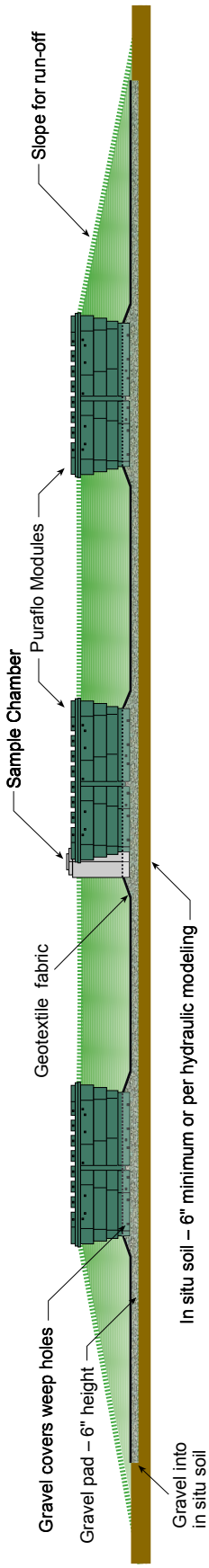


NOTE:
In-ground effluent movement will occur within gravel layer.
For mounded applications, movement will occur through gravel and sand along contour.



In-ground Pad System Diagram (typical)





Type A System: Puraflo Coir Modules Combined with MOUNDED PAD Dispersal

Conditions

- All components used in conjunction with the Puraflo Coir must comply with all applicable State or Local rules and codes.
- The septic tank shall be sized according to State or Local codes.
- An effluent filter shall be placed on the outlet of the septic tank that meets the requirements of Section 5.3 of this manual.
- The pump tank shall be sized according to State or Local codes.
- Calculations can be done with the Microsoft Excel Design Sheet.
- The bottom of the stone dispersal area shall maintain a minimum vertical separation distance from limiting conditions per State or Local requirements or 1 foot (6 inches to seasonal high water table). Seasonal high water table vertical separation distance may be reduced to greater than 0 inches and less than 6 inches if approved by the local board of health or administrative authority. In situ soil must be a minimum of 6 inches or per hydraulic modeling.

Site limitations and Modifications

- Mounded pads shall be oriented parallel to natural surface contours and shall be sited to avoid natural drainage features and depressions that may hold surface water. A design plan shall address surface water diversion as needed.
- An interceptor drain may be used upslope of a mounded pad soil absorption component to intercept the horizontal flow of subsurface water to reduce its impact on the down gradient mounded pad component.
- A mounded pad soil absorption component shall not be sited on a slope greater than 25 percent unless the design plan includes special installation criteria.
- Sites with boulders or numerous trees are less desirable for a mounded pad soil absorption component. Such conditions shall be avoided or the design plan shall increase the basal area to compensate for losses due to boulders or flush cut trees and shall include special instructions for the basal area preparation under such conditions.

Site and Soil Information

- Site information shall include a description of landscape position, slope, vegetation, drainage features, rock outcrops, erosion and other natural features; and documentation of any relevant surface hydrology, geologic and hydrogeologic risk factors for the specific site or in the surrounding area that may indicate vulnerability for surface water and ground water contamination.
- Soil Information shall include identification of depth to limiting conditions including but not limited to water table and rock strata, and a description of soil texture, consistence, and structure, including shape and grade.

Design Criteria

- The mounded pad basal area may be sized per the soil texture hydraulic loading (BOD=30) in Table 4-3 of the USEPA 2002 Onsite Wastewater Treatment Systems Manual or Anua criteria.
- The length and width can be sized using the Kaplan (1991), Allen (1980), or Poeter (2005) water mounding equations or linear loading rates in the Tyler (2001) Table ≤30 mg/l BOD_5.
- Location must be comply with State of Local codes.

Sand Fill

- The mounded pad sand fill depth shall be determined based on the depth to the limiting conditions. The sand fill depth shall not exceed two feet and shall not be less than four inches. The loading rate for the sand fill material shall not exceed 2.0 gpd/ft^2.
- Natural sand is defined as naturally deposited silica based sand not manufactured by mechanical processing such as the crushing of rock or coarse aggregates.
- Sand fill for the mounded pad must be concrete sand meeting the gradation requirements of ASTM C33 provided not more than 5% passes the No. 100 sieve and not more than 5% passes the No. 200 sieve as determined by ASTM C117, "Test Method for Material Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing".
- A comparison of sand application rates from various regulatory authorities is in the table below.

Table 6 Sand Application Rates Comparison

Regulatory Authority	Gradation	Additional Gradation Requirements	Effective Size	Uniformity Coefficient	Sand Application Rate Gpd/ft^2 (≤30mg/l BOD^5)
Iowa	ASTM C33 or IDOT No.1	Sand fill must not have more than 20% (by weight) material that is greater than 2mm in diameter (coarse fragments), which includes stone, cobbles and gravel. Also, there must not be more than 3% silt and clay (<0.53 mm, 270 mesh sieve) in the fill.	0.15 – 0.3mm	4 – 6	2.0
Minnesota	ASTM C33	No spec for No. 100 sieve. No. 200 sieve 0-5% passing. Clean sand must also contain less than three percent deleterious substances and be free of organic impurities.	None Specified	None Specified	1.6
Washington	ASTM C33	No. 100 sieve prefer <4% passing. No. 200 sieve 0-3% passing.	None Specified	None Specified	2.0
Wisconsin	ASTM C33	None Specified	None Specified	None Specified	2.0
British Columbia	ASTM C33	No. 100 sieve 0-4% passing. No. 200 sieve 0-1% passing.	None Specified	None Specified	1.6 – 3.15
Manitoba	CSA A23.1 (ASTM C33)	No. 200 sieve 0-5% passing.	None Specified	None Specified	1.6 – 3.75

Distribution of Area Over Sand Fill

- The dispersal aggregate shall be clean stone (3/4 to 1 inch). The stone shall be washed with not more than 5% passing the No. 200 (75 µm) sieve as determined by ASTM C117, "Test Method for Material Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing" and shall be durable with a hardness of 3 or greater on the Moh's Scale of Hardness. Alternatively, gravelless technologies may be utilized instead of stone.
- The dispersal material shall be leveled to a depth of 6 inches.
- The Puraflo modules shall be placed on the dispersal material so that they are evenly spaced from the sides of the distribution bed and end of the distribution bed with even spaces between each module and the ends of the dispersal area. The minimum spacing from the end of the dispersal material to module end is 1 foot. For spacing calculation, see "Mounded Pad Design Example".
- The Puraflo modules shall be level from end-to-end.
- Connect the force main to the module inlet coupling (incorporating a flexible pipe). Note sizing requirements in Section 5.3 of this guide. The manifold connection shall be configured like the illustration in Appendix 2 and 4 of this guide and shall pass the last module by a minimum of six inches and be capped. It is recommended that a clean-out be brought to finished grade.

Distribution Network (if applicable)

Modules are typically Type A with weep holes; however, Type B modules with distribution network may be used as required by the regulatory authority.

Monitoring Components

- At least three inspection ports shall be spaced at intervals adequate for observation of the absorption area and any ponding at the sand fill surface. The ports shall be anchored and be accessible with at least a four inch opening and a removable watertight cap.

Mound Cover

- Once the Puraflo modules are installed and all connections have been made, the distribution media shall be covered with a geotextile fabric used to prevent introduction of soil fines and allow for free movement of air and water.
- The soil cover shall be applied to allow for an approximate depth of six inches after settling, and the mounded pad shall be crowned to promote runoff.
- Soil cover shall be of a quality to allow for oxygen transfer and growth of vegetation.

Installation

- **Pre-Installation:** The full soil absorption area shall be free of any site disturbances. If any disturbance or damage has occurred, installation shall not proceed and the registered installer shall contact the owner and the board of health. Prior to installation the registered installer shall check all elevations in the design plan relative to the established benchmark including the surface contour and the flow line elevation of other components to assure proper flow through the system and freeze protection as applicable. Soil moisture conditions shall be evaluated and basal area preparation shall not proceed when there is risk of smearing or compaction.

- **Site Preparation & Installation:** The mound shall be installed according to the design manual and any referenced resource and shall comply with the following:

  (1) All vegetation shall be cut close to the ground and removed from the site. Stumps, roots, sod, topsoil, and boulders shall not be removed.
  (2) The force main should be installed from the upslope side. All vehicle traffic on the basal area and downslope area of the mounded pad should be avoided with installation work being conducted from the upslope side or end of the mounded pad basal area.
  (3) The basal area of the mounded pad shall be prepared to provide a sand/soil interface and to improve infiltration if needed. The basal area preparation shall not reduce the infiltrative capacity of the soil surface. The degree of basal area preparation shall be determined on a site by site basis depending on soil conditions. Any basal scarification or other basal area preparation shall be conducted working along the contour. Sand may be incorporated into the basal area during the preparation process. Following basal preparation, a layer of sand fill shall be placed on the entire basal area to prevent damage from precipitation and foot traffic.
  (4) The specified depth and sufficient amount of sand fill shall be placed to cover the basal area, form the absorption area, and shall not be steeper than 3 to 1 side slopes. The distribution area shall be formed to the specified dimensions and the sand surface of the distribution area shall be level.
  (5) Construct and install all components, including the distribution laterals and observation ports.
  (6) Once the Puraflo modules are installed and all connections have been made, the distribution media shall be covered with a geotextile fabric.
  (7) Field test the sand to verify quality with one of the methods outlined below.

Minnesota Method

(from 1995 University of Minnesota "Onsite Sewage Treatment Manual")

Jar Test for Clean Sand for Mounds

Use a 1 quart Mason jar

If the fines that settle out in 1 hour is greater than **1/8 inch**, then the percentage of fines is too great and the sand **SHOULD NOT** be used for mound construction.

Manitoba Method

(from OWMS Jar Test revised April, 2010)

OWMS – Field Reference Guide Jar Test

Under some circumstances, it may be beneficial to perform a jar test for fines (silt or clay) on the sand when it is received or before it is purchased to determine if the sand supplied meets the specification of the sand ordered.

An 8 hour jar test must be conducted for best results.

The jar test is a "quick" method to determine if the sand contains too many fines. The jar test is not to be used as a replacement for sieve analysis; however the test can be used as a field method to determine that the sand meets CSA A23.1-04 (ASTM C33) specifications.

After settling for several hours, if the layer of fines that settle on top of the sand is thicker than 3.2mm (1/8 inch), the sand contains too many fines and is not suitable for use in a treatment mound. When in doubt the aggregate supplier should provide an aggregate analysis report to confirm that the product meets the sieve specification.

When a "check" in the sand is required, it is recommended that a sample of the sand be obtained prior to construction and the 8 hour jar test be conducted.

Jar test procedure is as follows:

- Place approximately 2 inches of sand in a glass quart jar.
- Fill the jar with water.
- Shake the jar vigorously to mix the sand and water.
- Set the jar on a level platform and allow to settle for 4–8 hours.
- Upon settling, after 4–8 hours, the layer of fines that settle on top of the sand layer should not be thicker than 3.2mm (1/8 inch).

Tips:

- Take a sample from the middle of the pile.
- It may be necessary to jar test a composite sample.
- It may be necessary to conduct two jar tests.
- When in doubt, obtain the sieve analysis report from the aggregate supplier or send a sample to the laboratory. Be sure to ask the laboratory to include the No. 200 sieve size.

Completion

(1) The area around the mound system shall be protected from erosion through upslope surface water diversion and provision of suitable vegetative cover, mulching, or other specified means of protection.
(2) Installer documentation shall include the drawdown test, as specified in Appendix 7, as baseline measure for future O&M and monitoring. Documentation shall be provided to the local health district to be included in the permit record.
(3) The system shall be backfilled with sandy to loamy soil material and topsoil to the bottom lip of the Puraflo modules.

Mounded Pad Operation and Maintenance

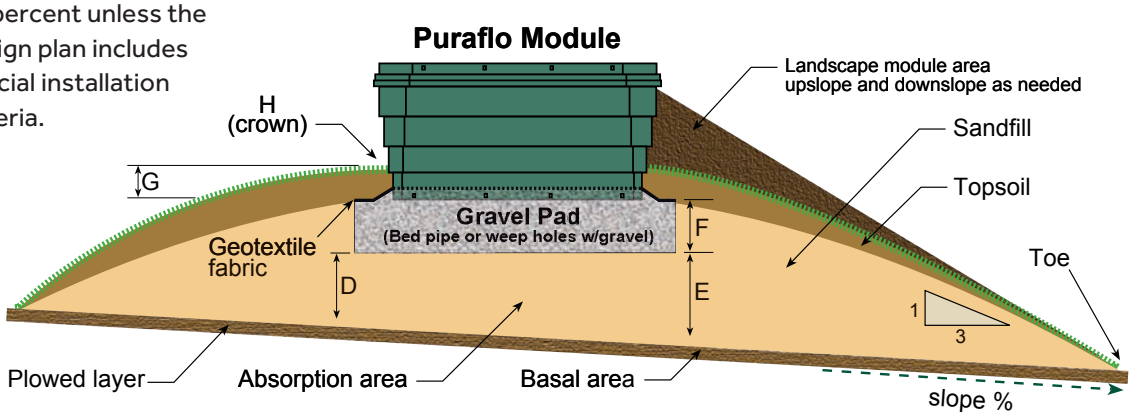
- The mounded pad system shall be operated, maintained, and monitored as outlined in the "Operation and Maintenance Manual" and per requirements of the regulatory authority.

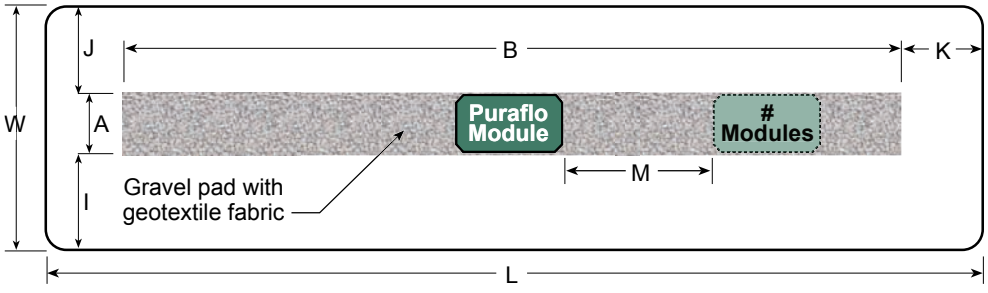
- The O&M of a mound soil absorption system shall include but is not limited to:

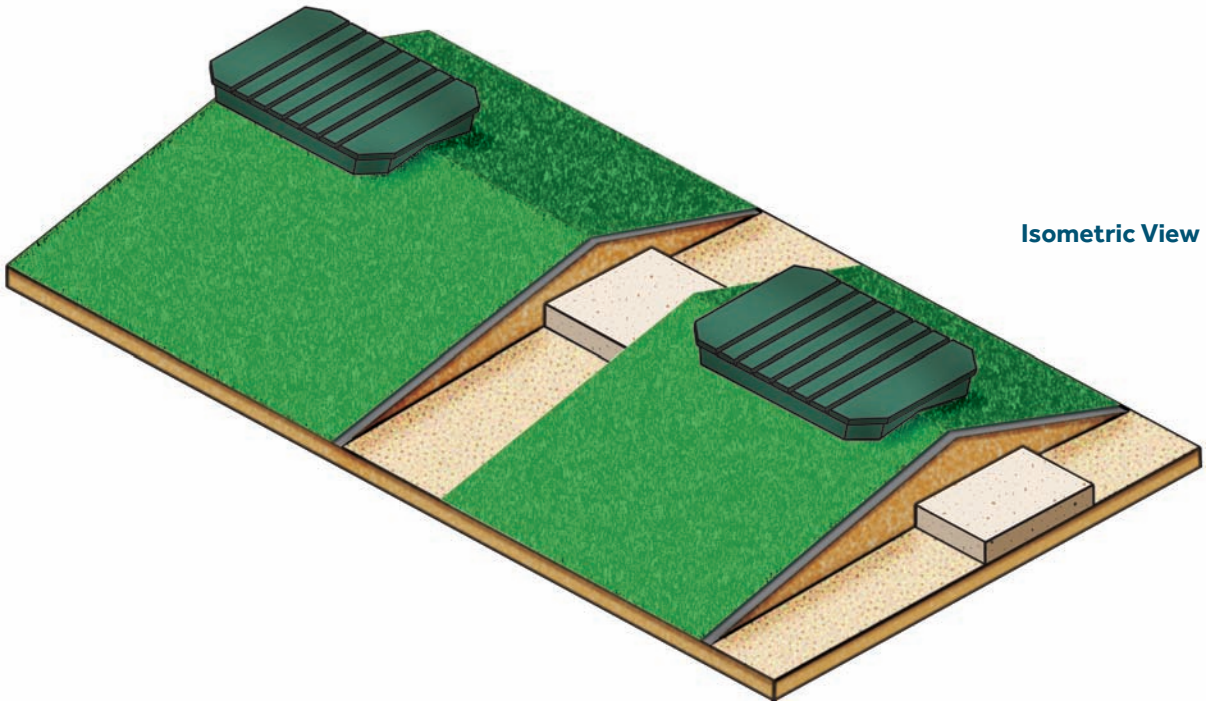
(1) Checking the mounded pad vegetative cover for erosion or settling and any evidence of seepage on the sides or toes of the mounded pad.
(2) Flushing of distribution laterals.
(3) Checking for ponding in the distribution area.
(4) Monitoring the dose volume to the Puraflo modules and performing the drawdown test as outlined in Appendix 7.
(5) Checking for any surface water infiltration or clear water flows from the dwelling or structures into the system components or around the mounded pad soil absorption area.

Mounded Pad System Diagram (typical)

NOTE:
A mounded pad soil absorption component shall not be sited on a slope greater than 25 percent unless the design plan includes special installation criteria.







Isometric View

References for Mounded Pad

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- Converse J.C. and E.J. Tyler. (2000). *Wisconsin mound soil absorption system: siting, design and construction manual*. Small Scale Waste Management Project #15.24. 345 King Hall, University of Wisconsin-Madison, 1525 Linden Drive, Madison, WI 53706.
- Iowa Department of Natural Resources. (2007). *Sand Mound Technology Assessment and Design Guidance*. Des Moines, IA.
- Ohio Department of Health. (2010). Special Device Approval per OAC 3701-29-20(C) *Low Pressure Distribution Sand Filter.* Columbus, OH.
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- Tyler E.J. (2001). *Hydraulic Wastewater Loading Rates to Soil.* Publication #4.43 by Small Scale Waste Management Project (SSWMP): University of Wisconsin, Madison, WI.
- Washington Department of Health. (2009). *Recommended Standards and Guidance for Performance, Application, Design, and Operation & Maintenance Mound Systems.* Olympia, WA.

Type B System: Puraflo Modules Combined with SEPARATE Dispersal

- Refer to section 5 and 9 of this manual.
- All components used in conjunction with the Puraflo Coir must comply with all applicable State or Local rules and codes.
- The septic tank shall be sized according to State or Local codes.
- An effluent filter/screen shall be placed on the outlet of the septic tank that meets the requirements of Section 5.3 of this manual.
- The pump tank shall be sized according to State or Local codes.
- Calculations can be done with the Microsoft Excel Design Sheet.
- The bottom of the stone dispersal area shall maintain a minimum vertical separation distance from limiting conditions per State or Local requirements or 1 foot (6 inches to seasonal high water table). In situ soil must be a minimum of 6 inches.

Appendix 6 References

Allen, D.H. (1980). *Hydraulic Mounding of Groundwater Under Axisymmetric Recharge.* Water Resource Research Center, University of New Hampshire. Durham, NH.

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Poeter, E., McCray, J., Thyne, G., and Siegrist, R. (2005). Designing Cluster and High-Density Wastewater Soil Absorption Systems to Control Groundwater Mounding. *Small Flows Quarterly, Winter 2005, Vol. 6, No. 1, pp 36-48.* Morgantown, WV.

Tyler E.J. (2001). *Hydraulic Wastewater Loading Rates to Soil.* Publication #4.43 by Small Scale Waste Management Project (SSWMP): University of Wisconsin, Madison, WI.

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