Intermittent Sand Filter Systems (August 2002)

Standards and Guidance for Performance, Application, Design, and Operation and Maintenance

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1.0 Introduction

Intermittent sand filters provide biodegradation or decomposition of wastewater constituents by bringing the wastewater into close contact with a well developed aerobic biological community attached to the surfaces of the filter media. This process requires unsaturated downward flow of the effluent through a filter media which may be a mineral sand or equivalently sized crushed glass meeting one of the media specifications listed in Appendix A. The media is contained in a watertight vessel either below the surface of the ground or wholly or partially elevated in a containment vessel. Proper function requires that the influent to the filter be distributed over the media in controlled, uniform doses. In order to achieve accurate dosing, these systems require a timer controlled pump with associated pump tank, electrical components, and distribution network to deliver a minimum of 12 doses per day spread evenly over a 24 hour period. The effluent is collected in the bottom of the sand filter and discharged either by gravity or pressure to a suitable disposal component, usually a sub-surface drainfield.

This technology is used on sites with high groundwater levels and/or shallow soil conditions where treatment must be accomplished before disposal. Intermittent sand filters are also used as part of a mitigation strategy when horizontal separations are reduced.

Figure 1-Typical Layout of an Intermittent Sand Filter

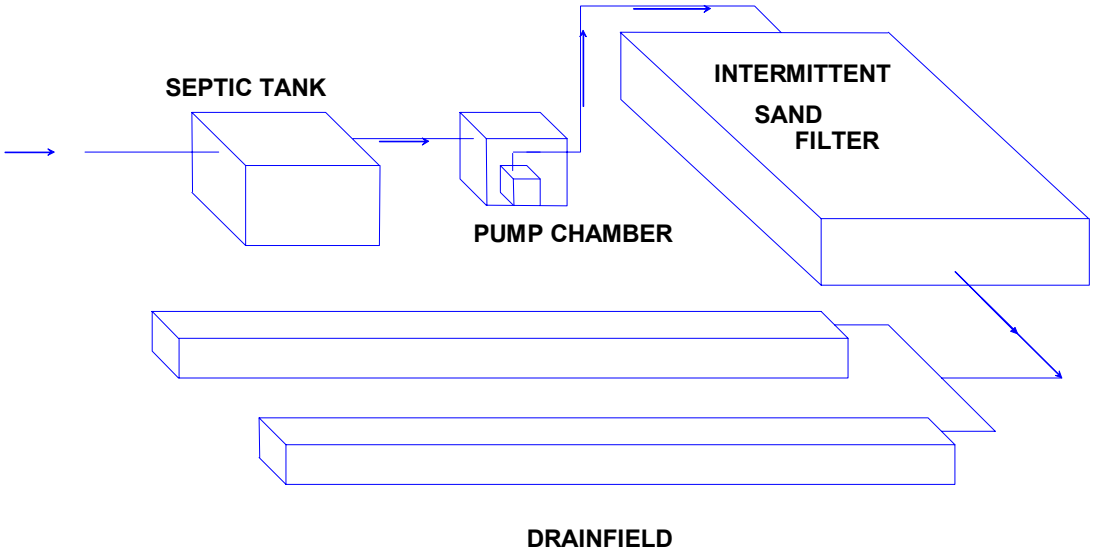


Figure 2-Typical Intermittent Sand Filter, Cross-Section

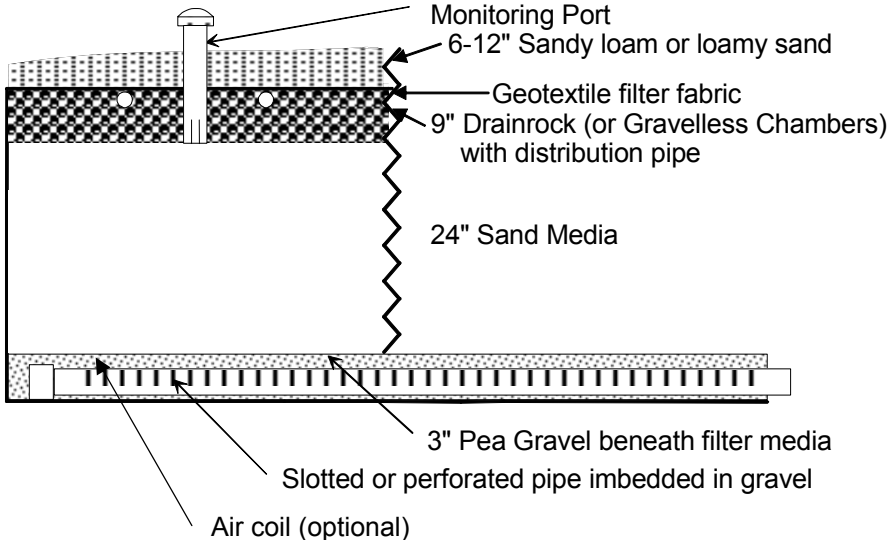
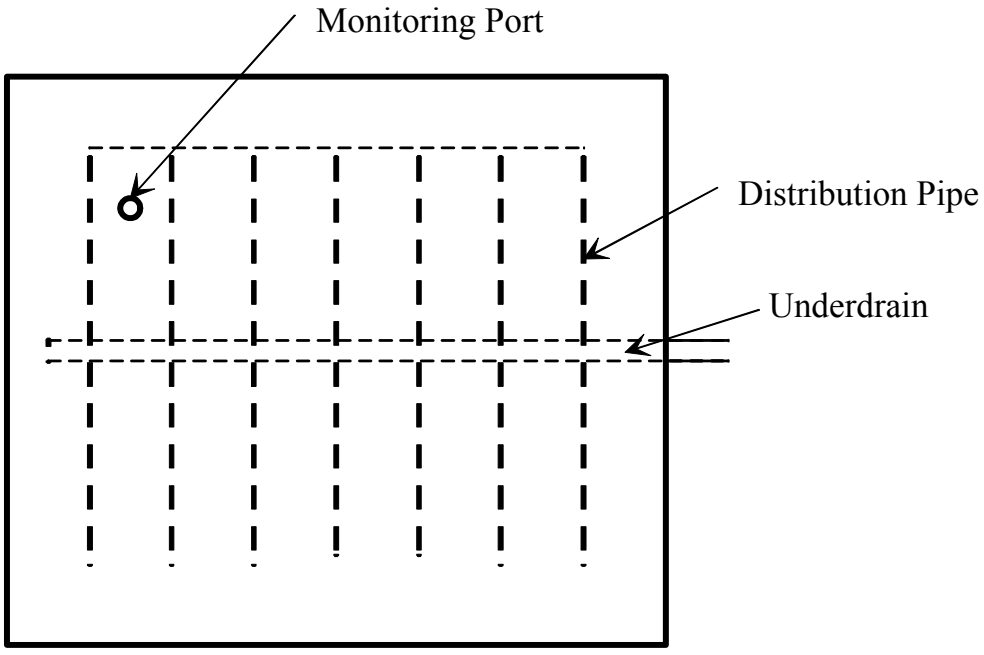


Figure 3-Typical Intermittent Sand Filter, Top View



2.0 Performance Standards

2.1 Based on sand column studies and field testing, intermittent sand filters, when constructed and used according to these standards and guidance, are expected to perform to Treatment Standard 2 levels.

2.2 Effluent from an intermittent sand filter can be discharged to 24 inches of suitable soil (minimum 12 inches of vertical separation).

3.0 Application Standards

3.1 **Listing --** Intermittent sand filters are a generic alternative technology and therefore are not listed in the Department's *List of Approved Systems and Products* as a proprietary system, but may be permitted as technical standards have been adopted by the Department.

3.2 **Permitting –** Installation permits (and operational permits if required) must be obtained from the Health Officer prior to installation and use.

3.3 Influent Characteristics

3.3.1 Residential Wastewater: Intermittent sand filters are designed for treating residential strength wastewater. The wastewater applied to the intermittent sand filter must not be higher in strength than 230 mg/L BOD_5 150 mg/L TSS (no TSS particles should be retained on a 1/8-inch mesh screen), or 25 mg/L FOG. Lower wastewater strengths without increased flow rates are preferable to assure long term operation of an intermittent sand filter system.

3.3.2 Non-Residential Wastewater: High-strength wastewater and wastewater from non-residential facilities must be individually evaluated for treatability and degree of pretreatment required prior to distribution to an intermittent sand filter.

3.3.3 Daily Wastewater Flow – Design Estimates

3.3.3.1 Residential – For all residential applications, a minimum wastewater design flow of at least 150 gallons/day/bedroom must be used.

3.3.3.2 Non-Residential – For non-residential applications, a minimum wastewater design flow equal to 150% of the daily design flow shall be used. A minimum design flow for a non-residential facility shall be 150 gallons/day.

3.4 Pretreatment

3.4.1 If the wastewater is residential sewage, settleable and floatable solid separation by a properly sized two-compartment septic tank with effluent screening will suffice.

3.4.2 If the wastewater is from a non-residential facility, influent to the sand filter must be equivalent to residential strength septic tank effluent.

Aerobic treatment or some other treatment process may be needed to modify the influent to the intermittent sand filter to within the range of residential septic tank effluent quality.

3.5 **Location Requirements --** The minimum setback requirements for intermittent sand filters are the same as required for septic tanks (Sutter County Chapter 700-090).

3.6 Installation Issues

3.6.1 If the containment vessel is constructed of a 30-mil PVC liner, the liner must be protected by a 3-inch layer of sand beneath the liner.

3.6.2 In order to prevent differential settling when the sand filter is put into service, the filter media must have a uniform density throughout.

Uniform density may be accomplished one of two ways, depending on the moisture content of the filter media during construction. If the filter media is so dry that it can be poured (like salt or sand in an hourglass), it can simply be poured to fill the sand filter frame, then settled lightly (not compacted) to allow about 5% settling or volume reduction. However, if the filter media is moist enough that it cannot be poured, it should be placed in successive 6-inch lifts with each lift lightly settled. The intent of the light settling in both cases is to eliminate large voids in the media that may collapse later when effluent is added. The light settling may be accomplished by walking on the sand, then raking (with hand tools) into the corners, along the sides, around the pumpwell (if applicable) and around monitor ports. The final bulk density should be approximately 1.3 to 1.4 g/cm^3 (81.2 to 87.4 lb/ft^3). Higher densities will reduce infiltration rates and oxygen exchange potential.

3.6.3 A permeable, woven geotextile filter fabric must be used as a barrier material over the drain rock. The cover soil must be capable of maintaining vegetative growth while not impeding the passage of air (loamy sand or sandy loam).

3.6.4 **Observation ports --** If the intermittent sand filter effluent exits the sand filter through the underdrain by gravity flow, two observation ports must be installed in the sand filter. One observation port must be installed to the bottom of the drainrock/top of the media interface. A second observation port must be installed to the bottom of the underdrain. If the effluent if pumped from the sand filter out of a pump basin, the pump basin may be used as the second observation port.

3.7 Drainfield

3.7.1 Direct discharge of effluent from an intermittent sand filter to surface water or upon the ground surface is prohibited by Sutter County Chapter 700-170.

3.7.2 Drainfield size allowances vary according to treatment performance levels. Refer to Table 1 for maximum application rates for intermittent sand filter effluent.

Table 1 – Maximum soil application rates for the drainfield

Soil Type	Septic Tank Effluent Application Rate (GPD/ft^2)	Sand Filter Effluent Application Rate (GPD/ft^2)
Soil Type 1 (Coarse sand, medium sand)	1.2	1.2
Soil Type 2 (Fine sand, loamy sand)	0.8	1.2
Soil Type 3 (Sandy loam, loam)	0.7/0.6	1.0
Soil Type 4 (Silt loams, that are porous)	0.5	0.8
Soil Type 5 (Other silt loams, sandy clay loams, silty clay loams, and clay loams)	0.3	0.4 (Except where appreciable amounts of expandable clay are present)
Soil Type 6 (Clays of low clay content with moderate or strong structure)	0.2	0.2

(a) The Health Officer may require loading rates for the drainfield receiving sand filter system effluent that are different than those listed here based on site and soil conditions.
(b) The replacement drainfield area must equal 100% of that required for drainfields receiving residential septic tank effluent.

3.7.3 The design of the drainfield must be consistent with the methods and procedures indicated by Sutter County Chapters 700-100 (Soil and Site Evaluations) and 700-160 (OSS Design and Installation Criteria).

3.7.4 The drainfield location must meet minimum horizontal setback distances as specified by Sutter County Chapters 700-090 (Location of On-Site Sewage Systems) and 700-180 (Repair of On-Site Sewage Systems).

3.7.5 A development using an intermittent sand filter must meet the minimum land area requirements specified in Sutter County Chapter 700-140 (Standards for Subdivisions).

4.0 Design

4.1 Design Approval -- A design must be submitted by an authorized professional and approved by the Health Officer prior to permit issuance.

4.2 Filter Bed

4.2.1 Media Specifications -- The filter media must meet either the Coarse Sand Media or the Sand Filter Media specifications for particle size gradation detailed in Appendix A. Filter media used in constructing a sand filter must be accompanied with a written certification from the supplier that the sand fully conforms to one of the media specifications listed in Appendix A as determined by ASTM D136 (dry sieving) and ASTM C-117 (wet sieving).

4.2.2 Filter Bed Sizing

4.2.2.1 Loading Rate – The loading rate to the sand filter shall not exceed 1.25 gallons/day/square foot.

4.2.2.2 Surface area of filter bed – The surface area must be determined by dividing the daily design flow by the loading rate.

4.2.2.3 Depth of media -- The media depth must be a minimum of 24 inches.

4.2.3 Filter bed containment – The filter bed must be contained either in a flexible, membrane-lined pit, or a concrete vessel. Design and construction must conform to the containment standards set forth in Appendix B.

4.3 Wastewater Distribution

4.3.1 Pressure distribution of the sand filter is required and must comply with the Department's *Standards and Guidance for Pressure Distribution*.

4.3.2 The wastewater must be applied to the layer of drain rock atop the filter media, or sprayed upward against the top of gravelless chambers.

4.4 Minimum Dosing Frequency – A timer-controlled system (timed-dosing) is required. The dosing frequency or dose volume is dependent on the media specification used with the sand filter. To assure that appropriate dose volumes are delivered to the sand filter, the timer must be set to dose the filter at the following minimum dosing frequency:

Media Specification	Number of Doses/Day
Coarse Sand Media	18 times per day
Sand Filter Media	12 times per day

4.5 Treated Wastewater (Filtrate) Collection and Discharge -- Filtrate may be collected and discharged from the bottom of the sand filter by either a gravity flow underdrain, or pumped from a pump basin. When sand filters are membrane-lined, gravity flow underdrains must exit through a boot. The boot and exit pipe must be watertight.

5.0 Operation and Maintenance

5.1 Management – The Health Officer has the authority to require that an acceptable management plan be established prior to the issuance of a permit for the installation of an intermittent sand filter system. Management of intermittent sand filters shall be accomplished as follows:

5.1.1 The operation and maintenance requirements for an intermittent sand filter (including frequency of service inspections, treatment standard to be met, and maintenance reporting requirements) shall be recorded with the property at the Sutter County Recorder's Office;

5.1.2 A maintenance agreement with a qualified service provider shall be established and maintained on non-conforming repairs, non-residential facilities, and as required by any administrative rules established under Sutter County Chapter 700-020. The maintenance agreement or contract shall provide for the minimum service required under Section 5.3; and

5.1.3 A signed copy of the maintenance agreement shall be submitted to the Department. The owner shall notify the Health Officer within thirty (30) days of any revision to or cancellation of a maintenance agreement.

5.2 User's Manual -- A user's manual for the sand filter system must be developed and/or provided by the system designer. These materials must contain the following, at a minimum:

- Diagrams of the system components;
- Explanation of the general system function, operational expectations, and owner responsibility;
- Names and telephone numbers of the system designer, the Department, component manufacturer, supplier/installer, and/or the management entity to be contacted in the event of a failure;
- Information on the maintenance requirements of the system and service item schedule;
- Information on "Trouble-shooting" common operational problems that might occur. This information should be as detailed and complete as needed to assist the system owner to make accurate decisions about when and how to attempt corrections of operational problems, and when to call for professional assistance; and
- For proprietary sand filter devices, a complete operation and maintenance document must be developed and provided by the manufacturer. The document must include all the appropriate items mentioned above, plus any additional general and site-specific information useful to the system owner, and/or the maintenance provider. A copy of this document must also be provided to the Department prior to the issuance of an installation permit.

5.3 Maintenance – For the on-site sewage system to operate properly, its various components need periodic inspection and maintenance. The maintenance is the responsibility of the homeowner, but may be best performed by experienced and qualified service providers.

5.3.1 Minimum Maintenance Descriptions – The minimum maintenance description items shall be included in an operation and maintenance inspection report of an intermittent sand filter system:

- Owner of system (including property address or parcel number);
- Location of system (site plan);
- Type of use and daily design flow;
- Age of system and general condition;
- Specifications of all electrical and mechanical components installed;
- Nuisance factors, such as odors or user complaints;
- Mechanical malfunctions (other than those affecting sewage pumps) including problems with valves, or other mechanical or plumbing components;
- Malfunction of electrical equipment such as pump switches, floats, timers, counters, control boxes, or other electrical components;
- Material fatigue, failure, corrosion problems, or use of improper materials, as related to construction or structural design;
- Neglect or improper use, such as loading beyond the design rate, poor maintenance, or excessive weed growth;
- Installation problems, such as improper location or failure to follow design;
- Overflow or backup problems where sewage is involved;
- Elapsed time meter and counter readings or water meter records to monitor hydraulic loading of the system; and
- The Health Officer may require sampling of specific chemical/biological indicators, such as BOD_5, TSS, and FOG to monitor the biological loading of the system for non-residential facilities.

5.3.2 **Service item schedule –** At a minimum, the following service items must be completed at six months after the system is put into use and yearly thereafter:

- Inspect septic tank for structural integrity, effluent filter, evidence of ground water intrusion, and proper sizing. Inspect and clean the effluent filter and pump the septic tank as needed.
- Inspect the pump tank for structural integrity, clean the screened pump vault, and inspect and clean the pump switches and floats. Pump the accumulated sludge from the bottom of the tank if necessary.
- Inspect and test for malfunction of electrical equipment such as timers, counters, control boxes, pump switches, floats, alarm system, junction box, or other electrical components, and repair as needed. Check floats for improper setting or failure.
- Check monitoring ports for ponding.
- Evaluate laterals for residual pressure at the distal ends, equal distribution, and need for cleaning.
- Inspect the pump basin in the sand filter for infiltration, structural problems, and improper liquid level. Check for pump malfunctions, including problems related to dosing volume, pressurization, breakdown, clogging, burnout, or cycling. Pump the accumulated sludge from the bottom of the pump basin if necessary.

The liquid level at the pump start must be below the bottom of the filter media in order to prevent ponding and rise of the capillary fringe into the sand media.

5.4 **Monitoring** – The minimum frequency of service as required by Section 5.3.2 may be revised from an initial inspection at six months and yearly thereafter to not less frequent than every five (5) years if remote monitoring of the system with telemetry is conducted. Access to system information must be provided to the Department along with the submittal of an annual report by the service provider.

5.5 **Action Conditions --** When inspections or any other observation reveals a failing system as defined by Sutter County Chapter 700-170; or a documented history of long-term, continuous ponding of wastewater within the sand filter or drainfield, the owner of the system must take one of the following actions:

5.4.1 Repair or modify the system;

5.4.2 Expand the drainfield; or

5.4.3 Reduce the wastewater strength or hydraulic flows at the source.

Appendix A – Filter Media Specifications

A. Particle Size Analysis

The standard method to be used for performing particle size analysis must comply with one of the following:

1. The sieve method specified in ASTM D136 and ASTM C-117
2. The method specified in Soil Survey Laboratory Methods and Procedures for Collecting Soil Samples, Soil Survey Investigation Report #1, US Department of Agriculture, 1984.

B. Intermittent Sand Filter Media

The filter media must meet either the Coarse Sand Media or the Sand Filter Media specification listed below. Media may be either mineral sand or equivalently sized crushed glass.

1. Coarse Sand Media Specification

The filter media must meet items a, b, and c, below: (Source: State of Oregon On-Site Sewage Disposal Rules and the State of Wisconsin Single Pass Sand Filter Component Manual)

(a) Particle size distribution:

Sieve	Particle Size	Percent Passing
3/8 in	9.50 mm	100
No. 4	4.75 mm	95 to 100
No. 8	2.36 mm	80 to 100
No. 16	1.18 mm	45 to 85
No. 30	0.6 mm	15 to 60
No. 50	0.3 mm	3 to 15
No. 100	0.15 mm	0 to 4

(b) Effective Particle Size (D_{10}) > 0.3 mm.

(c) Uniformity Coefficient (D_{60}/ D_{10}) < 4.0

2. Sand Filter Media Specification

The filter media must meet items a, b, c, and d, below: (Source: State of Washington Intermittent Sand Filter Standards)

(a) Particle size distribution:

Sieve	Particle Size	Percent Passing
3/8 in	9.50 mm	100
No. 4	4.75 mm	95 to 100
No. 8	2.36 mm	80 to 100
No. 16	1.18 mm	50 to 100
No. 30	0.6 mm	25 to 60
No. 50	0.3 mm	10 to 30
No. 100	0.15 mm	0 to 4

[For No. 200 sieve, see note (d).]

(b) The sand must have not more than 45% passing any one sieve and retained on the next consecutive sieve of those shown above.

(c) The fineness modulus must not be less than 2.3 or more than 3.1. The fineness modulus is calculated by adding the cumulative percentages of material in the sample retained in the sieves shown above and dividing the sum by 100.

(d) The material that can pass the No. 200 sieve shall not be greater than 1%.

Appendix B – Containment Vessel Standards

A. Lined Pit--When an intermittent sand filter is constructed in an excavated pit, the following criteria are to be met:

1. Liner Material

   (a) Polyvinyl chloride (PVC) liners shall be a minimum thickness of 30 millimeters and be resistant to tears or breaks;

   (b) Patches, repairs and seams shall have the same physical properties as the parent material;

   (c) The supporting plywood frame and foundation to accept the liner shall be stable and structurally sound including appropriate compaction. Particular attention shall be paid to the potential of differential settlement as non-reinforced liners have high elongation and can conform to irregular surfaces reducing the thickness and life expectancy of the liner by lessening the chemical resistance of the thinner (stretched) material;

   (d) Only fully buried membrane liner installation shall be considered to avoid weathering;

2. Construction and installation:

   (a) Pit preparation:

      (1) The bottom of the pit shall be:

         - Covered with sand to "bed" liner, adequate in depth (minimum 3") to protect liner from puncture, or covered with a non-woven needle-punched synthetic geotextile fabric with adequate thickness to protect the liner; and

         - Graded to provide a sloping liner surface, from the outer edge of the filter toward the point of underdrain collection.

      (2) The sides of the pit or frame shall be free of possible puncture points.

   (b) Boots:

      When boots are used (required when using a gravity-flow underdrain), the boot and exit pipe must be installed with the following criteria:

      (1) Seaming, patching and attaching boots shall be done under dry conditions;

      (2) The system designer shall identify the use of a sand filter liner with underdrain and boot as a part of the design of the system and provide specifications detailing installation requirements;

      (3) The boot outlet shall be bedded in sand;

(4) The boot shall be sized to accommodate a 4" underdrain outlet pipe;

(5) The boot shall be secured to the 4" outlet pipe with two (2) stainless steel bands and screws, and sealant strips as recommended by the manufacturer;

(6) An inspection port must be installed in the sewer pipe from the sand filter to the drainfield;

(7) The trench from the sand filter to the drainfield must be back-filled with a minimum 5-lineal foot, clay dam to prevent the trench from acting as a conduit for ground water movement towards the drainfield; and

(8) If the boot may be submerged in a seasonal high water table, performance testing of the sand filter/boot for leakage must be conducted.

(d) Liner Placement:

(1) Transportation, handling and storage procedures shall be planned to prevent material damage. Material shall be stored in a secured area and protected from adverse weather;

(2) A site inspection shall be carried out by the Health Officer or by an authorized professional prior to liner installation to verify proper surface conditions; and

(3) Completed liner installations shall be visually checked for punctures, rips, tears and seam discontinuities before placement of any backfill. It is strongly recommended that the installer conduct a watertightness test on the liner prior to any backfill.

B. Concrete Containment Vessel – Any concrete containment vessel constructed below ground or partially or wholly above ground shall be designed by a qualified professional engineer and approved by the Health Officer prior to construction.

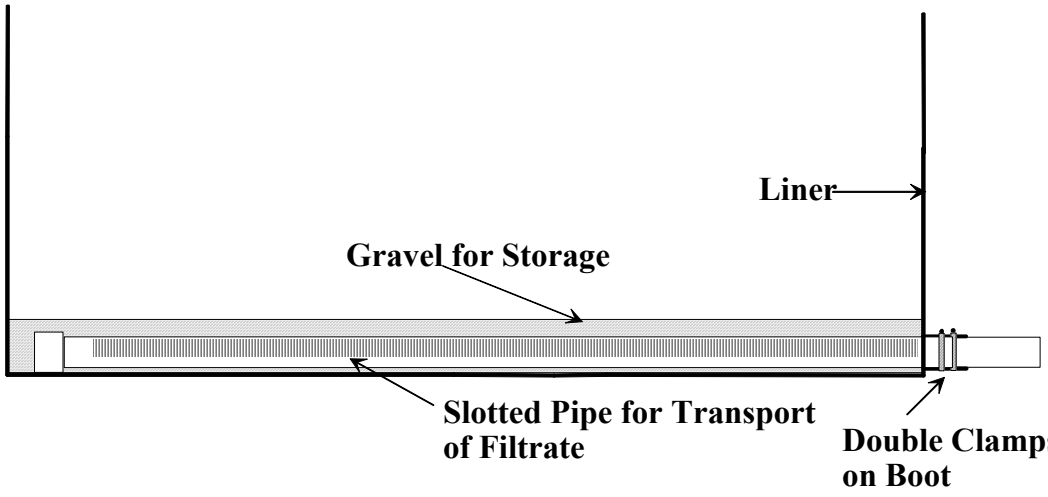
Appendix C – Underdrains

Either gravity underdrains or pump basins may be used for collection of intermittent sand filter effluent in a concrete containment vessel or membrane-lined pit.

A. **Underdrains –** Underdrains must be designed with sufficient void storage volume to provide for a single drainfield dose with reserve capacity to maintain unsaturated filter media above the underdrain system. Collection pipe must be sized of sufficient size, with adequate perforations, or slots so that filtrate can flow from the void storage space into the collection pipe rapidly enough to maintain unsaturated filter media above the underdrain system. They may be designed in a variety of ways.

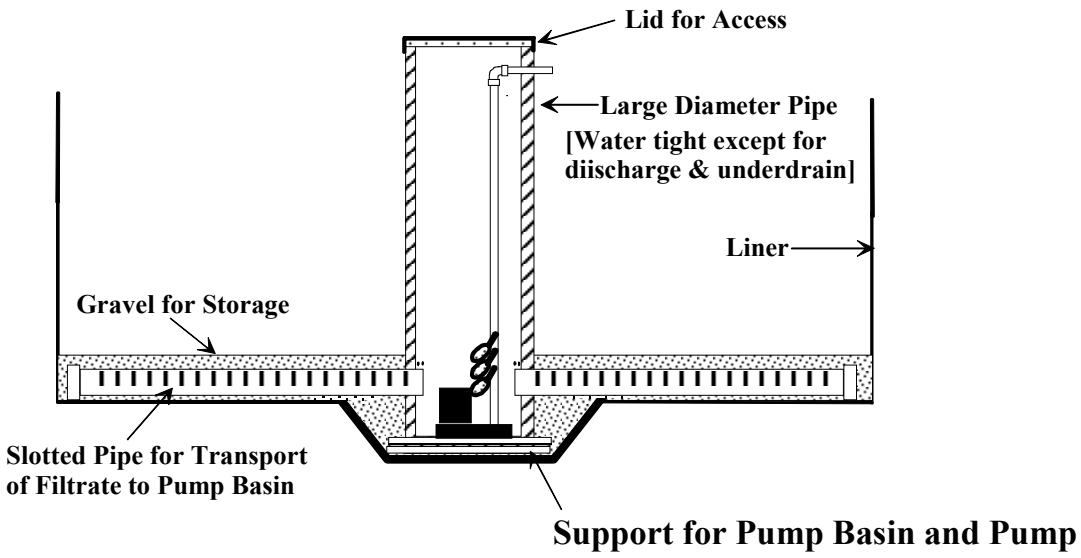
Typical Intermittent Sand Filter Underdrain

Place a 3-inch layer of pea gravel over a 6-inch layer of 3/4 to 2-1/2 inch gravel containing the underdrain collection pipe. The purpose of the pea gravel is to restrict the migration of sand into the gravel and pipe in the underdrain. The gravel surrounding the slotted or perforated pipe should be sized larger than the slots or perforations to prevent migration of gravel into the pipe. For the purpose of calculating void storage space in the medium gravel (3/4 to 2-1/2 inch), 3.0 gallons per cubic foot may be used assuming 40% void space per cubic foot.



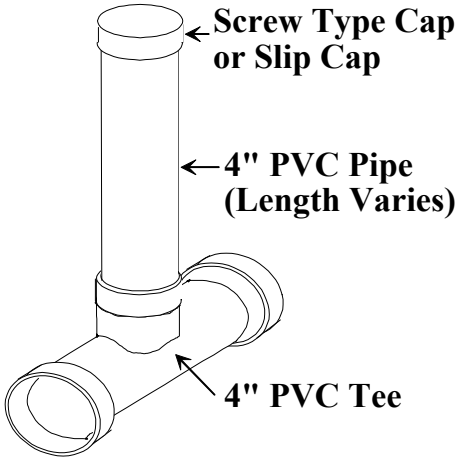
Cross-section of Underdrain

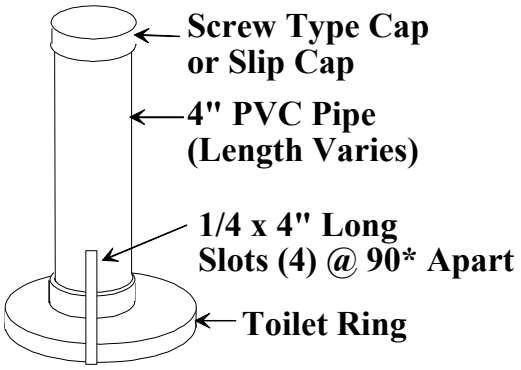
B. **Pump Basins –** Pump basins are located within the filter. Filtrate is collected in an underdrain system underlying the filter media and is discharged directly into the pump basin. The basin may be designed a variety of ways, but it must be constructed of concrete or plastic sewer pipe. A sufficient number and size of holes must exist in the pump basin, at the level of the underdrain system, so that filtrate can flow into the basin from the underdrain void space as rapidly as the filtrate is pumped out. The pump basin must also be adequately supported on both sides of the synthetic membrane.

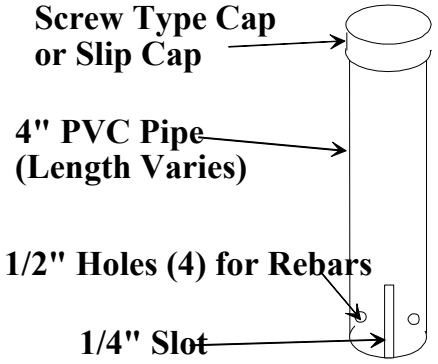


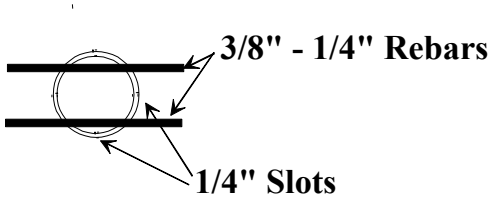
Typical Cross-section of a Pump Basin

Appendix D – Inspection/Monitoring Ports









END VIEW (BOTTOM)

Appendix E – Glossary of Terms

Term	Meaning / Description
Alternative System	An on-site sewage system other than a conventional gravity system or pressure distribution system. Properly and maintained alternative systems provide equivalent or enhanced treatment performance as compared to conventional gravity systems.
Approved List	"List of Approved Systems and Products" developed and maintained by the Department and Technical Advisory Committee. This document contains the following: (a) List of proprietary devices approved by the Department and/or RWQCB; (b) List of specific systems meeting Treatment Standard 1 and Treatment Standard 2; (c) List of experimental systems approved by the Department in consultation with RWQCB; (d) List of septic tanks, pump tanks, and holding tanks approved by the Department.
Biological Oxygen Demand (BOD_5)	An index of the amount of oxygen that will be consumed by the decomposition of organic matter in a wastewater. This is the result of a laboratory analysis that consists of measuring the initial dissolved oxygen concentration, incubating the sample for five days at 68^o F, and then measuring the final dissolved oxygen. The difference in dissolved oxygen concentration corrected for the initial dilution and sample volume is called the BOD_5. The BOD_5 test is one of the commonly used indicators of wastewater strength.
Coliform (Bacteria)	A group of bacteria that produce gas and ferment lactose, some of which are found in the intestinal tract of warm-blooded animals. They are indicators of potential ground water and/or surface water contamination with such fecal material.
Demand System	Any system where the dosing frequency (or flow to a treatment or disposal component) is controlled by the volume of effluent flowing to the component. For a demand system containing a pump and pressure distribution system, the pump turns on when sufficient volumes (demand) flow into the pump tank causing the pump-on float to activate and the predetermined dose volume to be discharged to the drainfield.
Design Flow	The volume of wastewater predicted to be generated by occupants of a structure. For residential dwellings, this volume is calculated by multiplying the number of bedrooms by the design standard of 150 gallons per day (gpd).
Drain Rock	Clean, washed gravel, varying in size from ¾ inch to 2 ½ inches.
Effective Particle Size, $ES=D_{10}$	The diameter of the particle in a granular sample such as sand for which 10 percent of the total grains are smaller and 90 percent larger on a weight basis.
Effluent	Liquid which is discharged from an on-site sewage system component, such as a septic tank (septic tank effluent) or sand filter (sand filter effluent).
Failure	A condition of an on-site sewage system that threatens the public health by inadequately treating sewage or creating a potential for direct or indirect contact between sewage and the public. (Sutter County Chapter 700-170) Examples of failure include: (a) Sewage on the surface of the ground; (b) Sewage backing up into a structure caused by slow absorption of septic tank effluent; (c) Sewage leaking from a septic tank, pump tank, holding tank, or collection system; (d) Inadequately treated effluent contaminating ground water or surface water.
Fats, Oils & Greases (Fog)	FOG is a measure of the amount of fatty matter from animal and vegetable sources and hydrocarbons from petroleum products and waxes, such as from lotions, shampoos, and tanning oils. High levels of fats, oils and greases in the wastewater stream may interfere with wastewater treatment efficiency.
Fecal Coliform (Bacteria)	Coliform bacteria specifically originating from the intestines of warm-blooded animals, used as a potential indicator of ground water and/or surface water pollution.
Filter Media	The material through which wastewater is passed for the purpose of treatment.
Fineness Modulus	A numeric quantity to control the distribution of filter media particle sizes within the specified range for intermittent sand filters. It is calculated by adding the cumulative percentages of material in the sample retained on the 3/8 in., No. 4, No. 8, No. 16, No. 30, No. 50, and No. 100 sieves, and dividing the sum by 100.
Particle Size	The diameter of a soil or sand particle, usually measured by sedimentation or sieving.
Proprietary Device Or Method	A device or method classified as an alternative system, or a component thereof, held under a patent, trademark or copyright.
Pump Tank	A tank or compartment following the septic tank or other pretreatment process which contains a pump, floats and volume for storage of effluent.
Residential Sewage	Sewage having the consistency and strength typical of wastewater from domestic households.

Term	Meaning / Description
Restrictive Layer	A stratum impeding the vertical movement of water, air, and growth of plant roots, such as hardpan, clay pan, fragipan, caliche, some compacted soils, bedrock, unstructured clay soils, or unsuitable soils.
Septic Tank	A water tight pretreatment receptacle receiving the discharge of sewage from a building sewer or sewers, designed and constructed to permit separation of settleable and floating solids from the liquid, detention and anaerobic/facultative digestion of the organic matter, prior to discharge of the liquid.
Sewage	Any urine, feces, and the water carrying human wastes including kitchen, bath, and laundry wastes from residences, building, industrial establishments or other places. For the purposes of this document, "sewage" is generally synonymous with domestic wastewater. Also see "residential sewage."
Suitable Soil	Undisturbed soil of types 1 through 6 as defined in Sutter County Chapter 700-100.
Timer-Controlled System	A pressure distribution system where the pump on and off times are preset, discrete time periods.
Total Suspended Solids (TSS)	Suspended solids refer to the dispersed particulate matter in a wastewater sample that may be retained by a filter medium. Suspended solids may include both settleable and unsettleable solids of both inorganic and organic origin. This parameter is widely used to monitor the performance of the various stages of wastewater treatment, often used in conjunction with BOD5 to describe wastewater strength. The test consists of filtering a known volume of sample through a weighed filter membrane that is then dried and re-weighed.
Treatment Standard 1	A thirty-day average of less than 10 mg/l of BOD_5 and 10 mg/l of total suspended solids and a thirty-day geometric mean of less than 200 fecal coliform/100ml.
Treatment Standard 2	A thirty-day average of less than 10 mg/l of BOD_5 and 10 mg/l of total suspended solids and a thirty-day geometric mean of less than 800 fecal coliform/100ml.
Uniformity Coefficient, U_c	A numeric quantity which is calculated by dividing the size of the opening which will pass 60% of a sample by the size of the opening which will pass 10% of the sample on a weight basis. (symbolically $D_{60}/D_{10}=U_C$)
Vertical Separation	The depth of unsaturated, undisturbed soil of Soil types 1–6 between the bottom of a disposal component and the highest seasonal water table, a restrictive layer, or unsuitable soils.