Santa Clara County Onsite Systems Manual

PART 4

GUIDELINES FOR ALTERNATIVE SYSTEMS

PART 4
GUIDELINES FOR ALTERNATIVE SYSTEMS

CONTENTS

INTRODUCTION

"Alternative System" means a type of OWTS that utilizes either a method of wastewater treatment other than a conventional septic tank and/or a method of wastewater dispersal other than a conventional drainfield trench for the purpose of producing a higher quality wastewater effluent and improved performance of and siting options for effluent dispersal.

This part of the Onsite Systems Manual provides guidelines for the design and application of various alternative onsite wastewater treatment and disposal technologies suited to the conditions and constraints in Santa Clara County.

These guidelines provide the technical criteria and standards for the use of alternative OWTS as provided by Santa Clara County Code Section B11-90 through B11-95, and are intended to be followed for both new development and repair situations. Santa Clara County Code does not provide for the use of alternative OWTS as the basis for new lot creation (subdivisions). Schematic and cross-section diagrams are included to illustrate the key design features of each type of system.

ALTERNATIVE TREATMENT SYSTEMS

Guidelines are provided for the following alternative treatment systems:

- Intermittent and Recirculating Sand Filters
- Proprietary Treatment Units, and
- Other alternative treatment systems approved by the director and the appropriate California Regional Water Quality Control Board(s).

ALTERNATIVE DISPERSAL SYSTEMS

Guidelines are provided for the following types of alternative dispersal systems.

- Shallow Pressure Distribution
- Mound
- At-Grade
- Pressure-Dosed Sand Trench
- Raised Sand Filter Bed
- Drip Dispersal, and
- Other alternative dispersal systems approved by the director and appropriate California Regional Water Quality Control Board(s).

SITING CRITERIA

All requirements specified in section B11-67 of Santa Clara County Code for conventional OWTS also apply to alternative OWTS, with the following clarifications and exceptions.

- **Horizontal Setbacks.** Horizontal setback requirements for alternative treatment systems are the same as those specified in section B11-67 for septic tanks. Horizontal

setback requirements for alternative dispersal systems are the same as those specified in section B11-67 for conventional dispersal systems.

- **Areas of Flooding.** Alternative OWTS shall not be located in areas subject to flooding as defined by the limits of the 10-yr floodplain, determined or estimated from published floodplain maps or on the basis of historical evidence acceptable to the director. Alternative OWTS shall be located and designed to avoid contamination of or damage from inundation by floodwaters during a 100-year flood event. As appropriate, such measures shall include: 1) protecting OWTS supplemental treatment, pressure distribution and/or drip dispersal components from flood damage using structural tie-downs and/or elevating critical components above the 100-year flood level; 2) preventing discharge of wastewater into flooded dispersal areas from pump systems (e.g., using flood-activated float switches to override/disable pump operation during high water conditions); and 3) providing additional emergency storage capacity for flood periods.

- **Ground Slope.** Maximum ground slope for different types of alternative wastewater dispersal systems are as follows:

Maximum Ground Slope for Alternative Wastewater Dispersal Systems[1]

Type of Disposal System	20%	30%	40%	50%
• Mound, • At-Grade	X			
• Raised Sand Filter Bed		X		
• Shallow Pressure Distribution • Pressure-dosed Sand Trench			X	
• Subsurface Drip Dispersal				X

[1]Related Requirements: Any disposal system located on a slope greater than 20 percent shall require the completion and approval of a geotechnical report per Code section B11-83.

- **Vertical Separation to Groundwater.** Where alternative OWTS are used, minimum vertical separation distance to groundwater, measured from the bottom of the dispersal system to the seasonal high water table, may be reduced from the requirements that apply to conventional OWTS (per section B11-67 of the County Code), as specified in the table below. See specific requirements for the type of alternative OWTS for additional restrictions on groundwater separation distances that may apply based on system size (i.e., volume of wastewater flow) or for particular site conditions or geographic areas.

Minimum Vertical Separation Distance to Ground Water for Alternative OWTS (feet)[1]

Type of OWTS	Percolation Rate (MPI)	Vertical Separation to Groundwater (feet)[1]			
		2'	3'	5'	8'
• Conventional Trench w/ Supplemental Treatment	1-5 6-30 31-120		 X	X	X
• Shallow Pressure Distribution (PD) • At-Grade	1-5 6-120		 X	X	
• Shallow PD w/Supplemental Treatment • At-Grade w/Supplemental Treatment • Mound • Pressure-dosed Sand Trench (PDST) • Raised Sand Filter Bed • Subsurface Drip Dispersal w/Supplemental Treatment	1-5 6-120	 X	 X		
• Raised Sand Filter Bed, w/Supplemental Treatment & Drip Dispersal	1-5 6-120	X X			

[1] Measured from the bottom of the dispersal system to the seasonal high water table.

- **Soil Depth.** Minimum depth of permeable soil beneath the bottom of the dispersal field shall be as specified in the table below for different types of alternative OWTS. Permeable soil is defined as having a percolation rate of 120 minutes per inch or faster or having a clay content of less than 60 percent, and shall not include solid rock formations or those that contain continuous channels, cracks or fractures. Design requirements for alternative OWTS prescribed in the Onsite Systems Manual may impose additional soil depth requirements based on system size (i.e., volume of wastewater flow) or for particular site conditions or geographic locations.

Minimum Soil Depth Beneath Alternative OWTS (feet)[1]

Type of OWTS	Minimum Soil Depth (feet)[1]	
	2'	3'
• Conventional Trench w/ Supplemental Treatment • Shallow Pressure Distribution Trench (PD) • At-Grade		X
• Shallow PD w/Supplemental Treatment • At-Grade w/Supplemental Treatment • Mound • Raised Sand Filter Bed (Open Bottom Sand Filter) • Subsurface Drip Disposal w/Supplemental Treatment • Raised Sand Filter Bed, w/Supplemental Treatment & Drip Dispersal	X	

[1] Measured from the bottom of the dispersal trench, bed or piping (drip dispersal only).

SITE EVALUATION, DESIGN AND CONSTRUCTION REQUIREMENTS

Site evaluation, engineering plans, operation and maintenance guidelines, and other permitting requirements for alternative systems shall conform to all requirements for conventional OWTS as well as any additional requirements specified in this Manual for the type of alternative system proposed. Design and construction of alternative OWTS shall be in conformance with requirements in this Manual.

GUIDELINES FOR
INTERMITTENT AND RECIRCULATING SAND FILTER SYSTEMS

A. DESCRIPTION

Intermittent sand filters (ISF) and recirculating sand filters (RSF) are used to provide supplemental treatment of septic tank effluent prior to discharge to the dispersal system. They are used to improve or restore the capacity of the dispersal field, reduce pathogenic bacteria and can provide additional nitrogen removal.

Sand filtration is well established in sanitary engineering practice for more than 100 years as a passive, reliable "biofilm" treatment process. An ISF consists of a packed-bed filter of medium-grained sand, designed for single pass-through treatment of septic tank effluent; it is sometimes referred to as a "single pass filter".

An RSF utilizes coarse-grained sand and a recirculation system, usually controlled by a timer that causes the effluent to pass through the sand media several times prior to final dispersal. RSFs have the ability to produce effluent quality similar to ISFs, except that they are less effective in bacteria removal. However, RSFs typically provide greater nitrogen removal than ISFs, on the order of 50-percent reduction as compared with conventional septic tank effluent.

Effluent from sand filters may be discharged to conventional leachfields and to any type of alternative dispersal system identified in this Onsite Systems Manual. Effluent from an ISF or RSF designed and operated in accordance with these guidelines will be considered to meet the criteria for "supplemental treatment".

B. CONSTRAINTS ADDRESSED

Used in combination with the appropriate type of dispersal system, sand filters can be applied to address the following onsite wastewater constraints:

1. High groundwater;
2. Shallow soil over fractured rock or coarse alluvium;
3. Shallow soil over impermeable soil or bedrock;
4. Slow percolation at standard dispersal trench depths;
5. Steep slopes;
6. Limited dispersal area; and

7. Nitrogen limitations (RSFs)

C. SITING CRITERIA

1. **Sand Filter Treatment Unit**. All siting criteria for septic tanks, as specified in Santa Clara County Code Chapter B11-67, shall also apply to intermittent and recirculating sand filters and associated tanks and pumping units.

2. **Dispersal Systems Receiving Sand Filter Effluent**. Dispersal systems receiving sand filter effluent are subject to all siting criteria for conventional septic tank-dispersal trench systems, except as modified in accordance with adopted requirements for the specific type of alternative dispersal system proposed, including any allowances for the incorporation of supplemental treatment. Allowances for supplemental treatment may include reduced vertical separation distances or increased wastewater application rates. Refer to the adopted guidelines for the specific type of dispersal system for applicable requirements and supplemental treatment allowances.

D. DESIGN CRITERIA

1. **Septic Tank Pretreatment**. Sand filter treatment units shall be preceded by a septic tank, sized for the projected sewage flow for the structure or facility being served, determined in accordance with sewage flow estimation guidelines in Part 3 of this Manual.

2. **Pressure Dosing**. Septic tank effluent shall be applied to the sand filter treatment unit by pressure dosing, utilizing either an automatic dosing siphon (intermittent filter only) or pump. The pressure distribution system shall be designed in accordance with accepted engineering practices to achieve, at a minimum:

    (a) Uniform dosing of effluent over the surface application area of the sand filter distribution bed;

    (b) Adequate flow rate, screening of effluent and suitable piping network to preclude solids accumulation in the pipes or clogging of discharge orifices;

    (c) Suitable access provisions for inspection, testing and adjustment of the pressure distribution system;

    (d) Dosing volume as follows:
        (1) Intermittent Sand Filters: Dosing volume to achieve a minimum of 3 to 5 doses per day at design flow conditions; and,

(2) Recirculating Sand Filters: Timed dosing to achieve a recirculation rate of approximately 5:1 at design flow conditions.

(e) At least one distribution lateral for every 36 inches of bed width.

Additional requirements for the design and construction of pressure distribution systems contained in "Guidelines for Shallow Pressure Distribution Systems" shall also apply.

Also, where a sand filter is used in conjunction with a gravity-fed dispersal system, the dosing pump system for the sand filter shall provide emergency storage capacity equal to at least 1.5 times the daily wastewater flow, consistent with requirements for pump systems provided in Part 3 of this Manual.

3. **Wastewater Application Rate**. The wastewater application rate used for sizing the surface area of the sand filter shall be as follows:

   (a) Intermittent Sand Filters:

   (1) 1.2 gpd/ft^2 for individual residential OWTS

   (2) 1.0 gpd/ft^2 for all commercial, industrial, institutional, and multi-residential OWTS

   (b) Recirculating Sand Filters:

   (1) Maximum of 5.0 gpd/ft^2 for individual residential OWTS

   (2) Maximum of 4.0 gpd/ft^2 for all commercial, industrial, institutional, and multi-residential OWTS

   Reduction in the above wastewater loading rates or other provisions to insure the long-term integrity and performance of the sand filter may be required for high strength waste flows, such as those from restaurants.

4. **Containment Liner**. The sand filter shall be provided with an impermeable containment liner to prevent leakage out of or into the filter. The liner shall consist of either: (a) 30 mil plastic; (b) reinforced poured-in-placed concrete; or (c) an equivalent impermeable structure or barrier.

5. **Finished Grade**. The finished grade of the sand filter shall be at or above the surrounding ground elevation. Above-ground installation shall be structurally supported with retaining wall(s), as required.

6. **Shape**. The sand filter shall not be restricted as to its shape in plan view.

7. **Multiple Units**. The sand filter may be divided into compartments or multiple units.

8. **Sand Filter Media**

(a) **Sand Specification**. The sand media shall be a medium to coarse sand that meets the gradation specifications in **Table SF-1**:

(b) **Sand Depth**. The minimum sand depth below the gravel distribution bed shall be 24 inches.

Table SF-1. Sand Specifications

Sieve Size	Percent Passing	
	Intermittent Sand Filter	Recirculating Sand Filter*
3/8	100	100
#4	90-100	70-100
#10	62-100	5-78
#16	45-62	0-4
#30	25-55	0-2
#50	5-20	0-1
#60	0-10	0-1
#100	0-4	0-1
#200	0-2	0-1

*Additional sand specifications for RSF:

- Effective size of sand/gravel, D_{10}: 1.5 to 2.0 mm
- Uniformity coefficient, U_c: <2.5

Documentation of laboratory sieve analysis results for the proposed sand fill material shall be supplied to DEH to verify conformance with the above specifications, as applicable.

9. **Gravel Distribution Bed**

(a) **Material**. The distribution bed shall consist of 3/8-inch double-washed pea gravel, substantially free of fines.

(b) **Depth**. Pea gravel shall extend a minimum of 6 inches below the invert and 2 inches above the top of the distribution piping. If the distribution piping is installed with chambers, the pea gravel depth below the distribution pipe may be reduced from 6 inches to 4 inches, and the 2-inch pea gravel cover may be eliminated.

10. **Silt Barrier**. For an intermittent sand filter, the gravel distribution bed shall be covered in its entirety with a geotextile ("filter fabric") silt barrier. Filter fabric shall be either polyester, nylon or polypropylene, or any combination thereof, and shall be suitable for underdrain applications. Filter fabric shall be non-woven, shall not act as a wicking agent and shall be permeable.

Recirculating sand filters do not require a silt barrier.

11. **Cover**

    (a) **Intermittent Sand Filters:**
        (1) **Material**. A soil cover shall be placed over the distribution bed, consisting of a medium, loamy-textured soil.
        (2) **Depth**. Soil cover depth shall be a minimum of 12 inches and a maximum of 18 inches over the top of the distribution bed. Soil cover shall be crowned or sloped to promote rainfall runoff.

    (b) **Recirculating Sand Filters:**
        (1) **Material**. A granular media cover shall be placed over the distribution bed, consisting of clean gravel that may range in size from 3/8-inch pea gravel to 2 ½ –inch rounded rock.
        (2) **Depth**. Cover depth shall be a minimum of 12 inches and a maximum of 18 inches over the top of the distribution bed.

12. **Underdrain**

    (a) **Material**. The underdrain beneath the sand media shall consist of 3/8" washed pea gravel with 4-inch diameter perforated drain pipe, installed with perforations oriented down.

    (b) **Depth**. The pea gravel underdrain shall have a minimum depth of 9 inches.

    (c) **Grade**. The underdrain shall be constructed and the drain pipe set with a minimum grade of 1% toward the outlet point.

    (d) **Watertight Outlet "Boot"**. The sand filter underdrain shall be equipped with a watertight outlet "boot" for connection of piping to the dosing tank. An exception to this is for intermittent sand filters that are equipped with an internal pump system for direct dosing to the disposal field (see paragraph #15 below).

    (e) **Clean-out Riser**. For clean-out and inspection purposes the upslope end of the perforated drain pipe in the underdrain shall be equipped with a vertical riser constructed of non-perforated pipe of equal diameter. The riser shall extend to finished grade of the sand filter.

13. **Air Manifold.** An air manifold shall be installed within the pea gravel underdrain for the purpose of introducing forced air to into the sand filter media, as needed, for maintenance or drainage rehabilitation. The air manifold shall consist of small diameter PVC piping, with drilled perforations (pointed down), and positioned above the perforated underdrain pipe. The manifold shall be connected to a vertical leader pipe

that extends to the surface of the sand filter, fitted with a threaded pipe cap or plug at the top where a portable air line can be connected.

14. **Inspection Wells**. An inspection well shall be installed in the gravel distribution bed of each sand filter compartment. The inspection well shall extend from finished grade to the pea gravel-sand interface of the distribution bed and shall be perforated in the pea gravel zone only. Inspection wells shall be 2-inch to 4-inch diameter plastic pipe and fitted with a wrench-tight cap or pipe plug. Perforations shall consist of hacksaw slots at nominal 1" spacing; alternatively, commercially slotted pipe may be used. For intermittent sand filters, inspection wells shall be sealed against surface infiltration with a bentonite or concrete annular seal through the soil backfill zone.

15. **Internal Pump System (ISF only)**. In lieu of gravity flow from the sand filter to the dispersal field (or dispersal field dosing system), an internal pump system may be installed within the intermittent sand filter for dosing directly to the dispersal field. In such applications:

    (a) pump chamber shall be seated at or below the bottom of the underdrain;

    (b) pump operating depth shall be entirely within the depth of the underdrain; and,

    (c) storage volume equal to at least 50 percent of the disposal field dose volume shall be provided in the network of perforated drain pipe within the underdrain.

E. ENGINEERING PLANS AND CONSTRUCTION

1. Reference Guidelines. In addition to the requirements set forth herein, design and construction of sand filter systems shall utilize applicable guidelines contained in the following references:

a. "Onsite Wastewater Treatment Systems Manual", U.S. Environmental Protection Agency, February 2002 and as amended.

b. “Design Manual – Onsite Wastewater Treatment and Disposal Systems”, U.S. Environmental Protection Agency, October 1980.

2. Engineering Plans. Engineering plans for sand filter systems shall include:

a. All relevant elevation data and hydraulic calculations;

b. Specific step-by-step construction guidelines and notes for use by the installer;

c. Recommended make and model of all components;

d. Recommended pump system components, with cut-sheet depicting float settings;

e. Control panel programming; and

f. An inspection schedule listing critical control points.

4. **Construction Inspection.** At a minimum, inspection of the sand filter system installation should include the items listed below. Joint inspection by the designer, contractor, and DEH may be required.

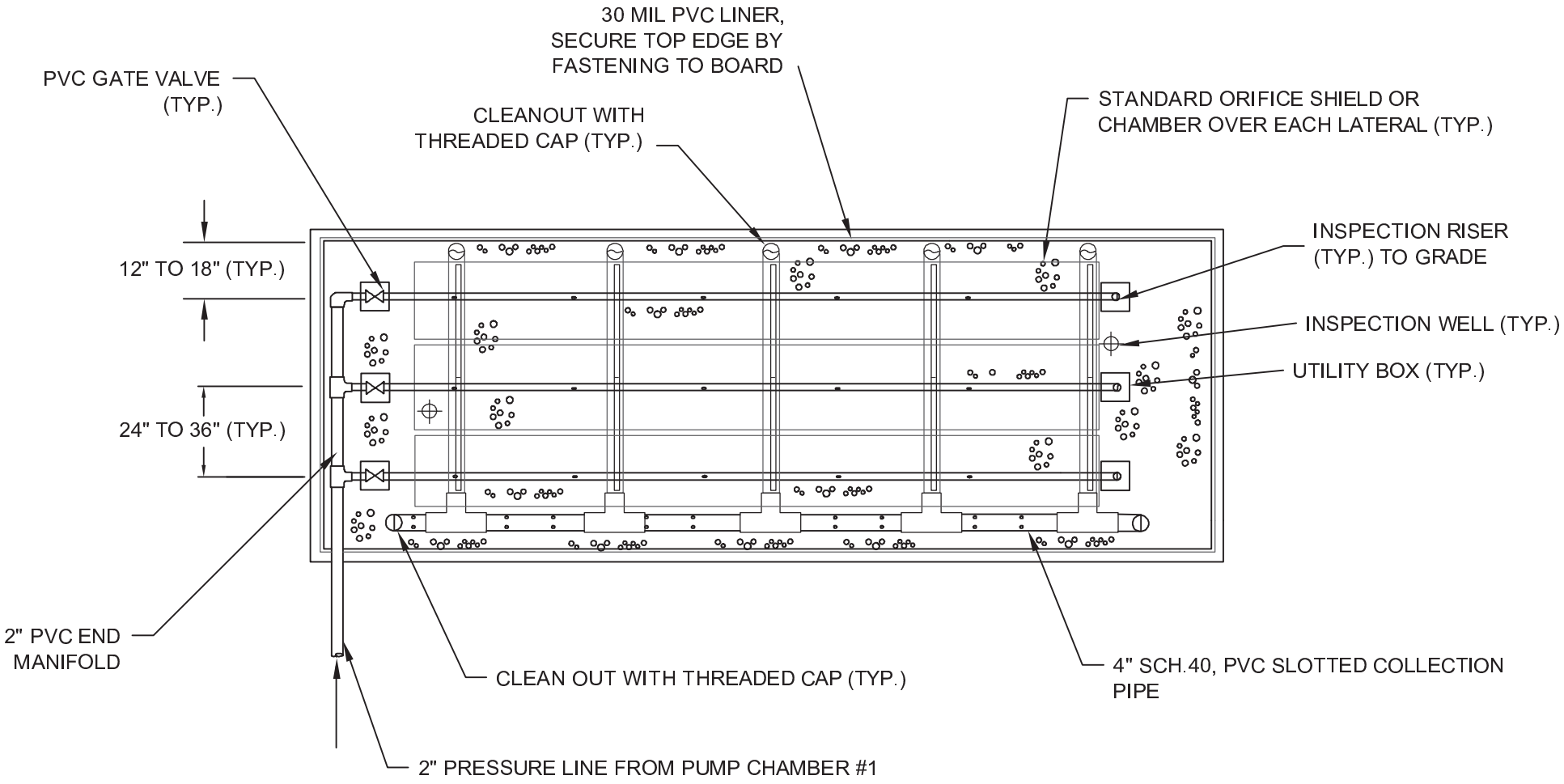
- Pre-construction inspection where the construction staking or marking of the sand filter is provided and construction procedures discussed;
- Water tightness of septic tank and dosing (pump) tank;
- Sand filter dimensions, structure and liner;
- Underdrain piping and filter rock;
- Sand quality and placement;
- Piping installation and hydraulic ("squirt") test of the distribution system;
- Functioning and setting of all control devices; and
- Final Inspection to verify that all construction elements are in conformance with the approved plans and specifications, all inspection wells are installed; and erosion control has been completed.

F. MANAGEMENT REQUIREMENTS.

Recommended minimum procedures and frequency for inspection, maintenance, monitoring and reporting activities for intermittent and recirculating sand filter systems are outlined in **Table SF-2.**

Table SF-2. Intermittent and Recirculating Sand Filter System Management Requirements

	Work	Frequency
Inspection	• Observe surface conditions on and around filter for effluent leakage, drainage/infiltration, erosion or other problems. • Check/measure water level in inspection wells in filter bed. • Perform all inspection work as recommended by designer or equipment manufacturer. • Perform inspection protocol for pump systems (per O&M manual and Performance Evaluation Guidelines, Part 5 of this Manual). • Record observations.	• According to permit conditions, typically every 6 to 12 months, depending on system size, usage, and history.
Maintenance	• Purge laterals. • Perform squirt and balance laterals. • Exercise valves to ensure functionality. • Perform all maintenance work as recommended by designer or equipment manufacturer. • Record work done.	• According to permit conditions, typically every 6 to 12 months, depending on system size, usage, and history. • Responsive maintenance as necessary.
Water Monitoring & Sampling	• Report observation findings and maintenance actions, including notation of problems and corrective actions. • Record dose counter and elapsed time meter readings from control panel.	• According to permit conditions, if applicable.
Reporting	• Report findings to DEH per permit requirements. • Standard report to describe findings, analyze performance, and detail actions taken. • Report emergency or failure conditions to DEH immediately.	• According to permit conditions, typically every 1 to 2 years, depending on system size, usage, history, location.



PLAN VIEW

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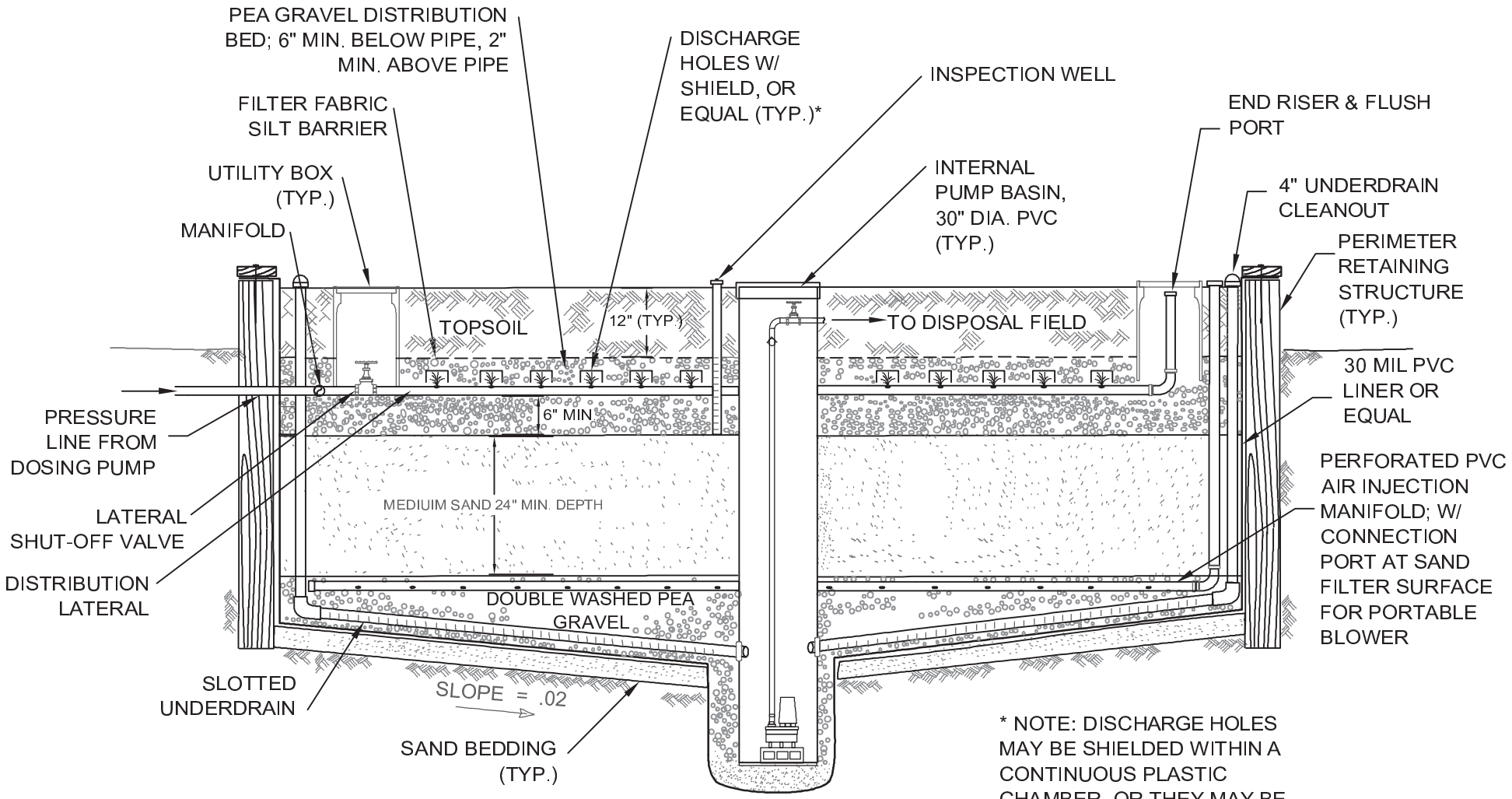
INTERMITTENT SAND FILTER
PLAN VIEW



* NOTE: DISCHARGE HOLES MAY BE SHIELDED WITHIN A CONTINUOUS PLASTIC CHAMBER, OR THEY MAY BE ORIENTED DOWN WITHOUT THE NEED FOR ANY SHIELD.

INTERMITTENT SAND FILTER
WITH INTERNAL PUMP BASIN

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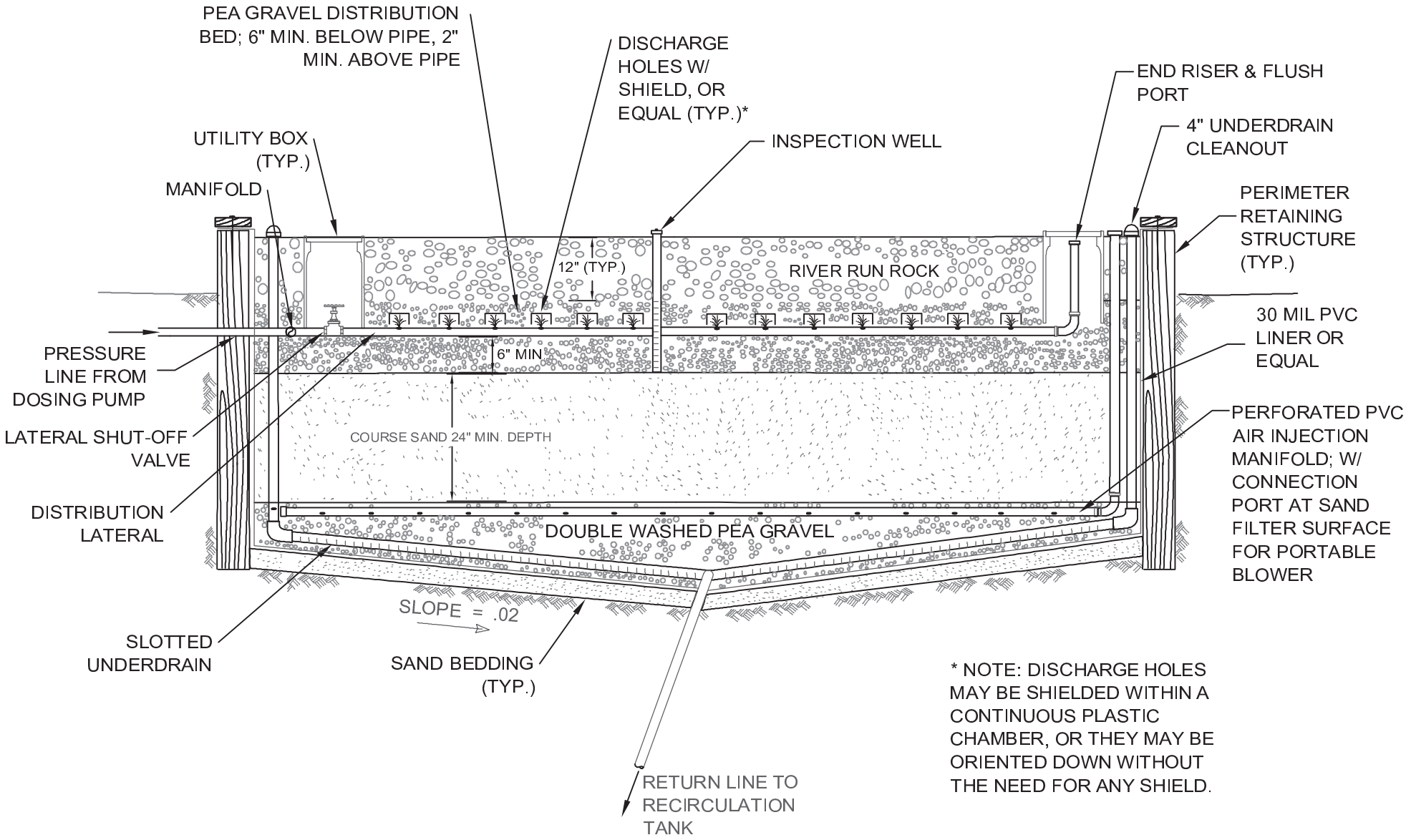

* NOTE: DISCHARGE HOLES MAY BE SHIELDED WITHIN A CONTINUOUS PLASTIC CHAMBER, OR THEY MAY BE ORIENTED DOWN WITHOUT THE NEED FOR ANY SHIELD.

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RECIRCULATING SAND FILTER

GUIDELINES FOR
PROPRIETARY TREATMENT UNITS

A. DESCRIPTION

Propriety treatment units cover a category of manufactured or "package" systems specifically developed for residential and other small-scale sewage treatment applications. Most proprietary designs currently available fall into two general categories: (1) aerobic treatment units (ATUs); and (2) media filters.

1. **Aerobic Treatment Units (ATUs).** ATUs utilize forced air to oxidize the wastewater, promoting aerobic decomposition of the wastewater solids. These systems provide supplemental treatment of wastewater for improvement in dispersal field performance; they also provide varying degrees of nitrogen removal. In general, ATUs can be relied on to produce secondary quality effluent, better than 30 mg/L BOD and TSS. ATUs are generally not as effective in reducing pathogen levels as are systems that incorporate media filtration. However, some ATUs provide reduction in nitrogen levels equal to or greater than that provided by sand filters and other media filters.

2. **Media Filters.** This includes proprietary designs that function similar to sand filters. In these systems the sand is replaced with an alternate media; peat, gravel or textile are a few examples. Textile and other media filters have been found to produce effluent quality reasonably similar to recirculating sand filters, and provide similar capabilities in overcoming various soil and site constraints.

Effluent from proprietary treatment units may be discharged to conventional dispersal trenches and to any type of alternative dispersal system identified in this Onsite Systems Manual. Effluent from proprietary treatment units designed and operated in accordance with these guidelines will be considered to meet the criteria for "supplemental treatment".

B. CONSTRAINTS ADDRESSED

Used in combination with the appropriate type of dispersal system, proprietary treatment units can be applied to address the following onsite wastewater constraints:

1. High groundwater;

2. Shallow soil over fractured rock or coarse alluvium;

3. Shallow soil over impermeable soil or bedrock;

4. Slow percolation at standard dispersal trench depths;
5. Steep slopes;
6. Limited dispersal area; and
7. Nitrogen limitations.

C. SITING CRITERIA

1. **Treatment Unit**. All siting criteria for septic tanks, as specified in Santa Clara County Code Chapter B11-67, shall also apply to proprietary treatment units and associated tanks and pumping units.
2. **Dispersal Systems Receiving Proprietary Treatment Effluent**. Dispersal systems receiving effluent from a proprietary treatment unit are subject to all siting criteria for conventional septic tank-dispersal trench systems, except as modified in accordance with adopted requirements for the specific type of alternative dispersal system proposed, including any allowances for the incorporation of supplemental treatment. Allowances for supplemental treatment may include reduced vertical separation distances, increased wastewater application rates or modified slope restrictions. Refer to the adopted guidelines for the specific type of dispersal system for applicable requirements and supplemental treatment allowances.

D. DESIGN AND CONSTRUCTION REQUIREMENTS

1. **NSF Standard 40.** The proprietary treatment unit shall be listed by the National Sanitation Foundation (NSF) as meeting the NSF Standard 40, Class 1 performance evaluation, or have certification by a third-party listing agency as complying with NSF Standard 40 performance requirements. The treatment unit shall be manufactured and installed in accordance with the design specifications used to determine compliance to NSF Standard 40. This specification is applicable to treatment units for wastewater flows of up to 1,500 gpd and is based on compliance with US EPA standards for secondary treatment of municipal wastewater, including 30-day average effluent limits of 25 mg/L for $CBOD_5$ and 30 mg/L for TSS. Treatment units for flows in excess of 1,500 gpd will require certification by a third-party listing agency of equivalent performance.
2. **Design Sewage Flow**. Sizing and design of proprietary treatment units shall be based on the projected sewage flow for the structure or facility being served, determined in accordance with sewage flow estimation guidelines in Part 3 of this Manual.

3. **Tanks.** All tanks housing a proprietary treatment unit shall be structurally sound, water-tight and capable of withstanding 1,000 pounds of weight.

4. **Controls.** Control panels shall be designed and configured in such a manner that, in the event of a treatment unit malfunction, an alarm system will be triggered and discharge from the treatment system to the dispersal field will be interrupted until the treatment unit malfunction is rectified. At a minimum, the alarm system shall include an audible and visual alarm located within the building served by the system.

5. **Emergency Storage Provisions.** Where a proprietary treatment unit is used in conjunction with a gravity-fed dispersal system, the system shall provide emergency storage capacity equal to at least 1.5 times the daily wastewater flow, consistent with requirements for pump systems provided in Part 3 of this Manual.

6. **Compliance with Manufacturer Requirements.** The designer and installer shall follow the proprietary manufacturer's design, installation, construction, and operations procedures.

7. **Engineering Plans.** Engineering plan submittals for proprietary treatment units shall provide documentation of compliance with manufacturer requirements and sufficient design analysis to verify the appropriateness of the treatment unit for the proposed application. Engineering plans shall contain specific step-by-step construction guidelines and notes for use by the installer, including any manufacturer instructions.

8. **Installer Requirements.** Anyone installing a proprietary treatment unit shall be trained and certified by the system manufacturer. Documentation verifying conformance to this requirement shall be provided to DEH prior to system installation.

9. **Maintenance Contract**. The applicant must demonstrate that a written maintenance agreement with a qualified service provider has been obtained for the proposed proprietary treatment unit to ensure satisfactory post-construction operation and maintenance. A maintenance agreement must be maintained valid for the life of the treatment unit.

10. **Construction Inspection.** The following minimum inspections prior to commencing construction or covering any elements of the system shall be required. Joint inspection by the designer, installer, and Santa Clara County DEH may be required.

    a. Pre-construction inspection where the construction staking or marking of the treatment unit is to be placed and installation procedures are discussed;

b. Testing of the treatment unit:

   i. Function and setting of all control devices and alarms.

   ii. Water-tightness of septic tank, treatment tank(s), and dosing tank, as applicable.

c. Final Inspection:

   i. A letter from the designer that the treatment unit has been installed and is operating in conformance with design specifications shall be provided.

   ii. A valid, signed maintenance agreement between the applicant/property owner and service provider shall be provided.

E. MANAGEMENT REQUIREMENTS

Recommended minimum procedures and frequency for inspection, maintenance, monitoring and reporting activities for proprietary treatment systems are outlined in **Table P-1** below.

Table P-1. Proprietary Treatment System Management Requirements

	Work	Frequency
Inspection	• Inspection to be in accordance with manufacturer specifications.	• According to permit conditions, typically every 6 to 12 months, depending on system size, usage, and history.
Maintenance	• Perform all maintenance as required and in accordance with equipment manufacturer specifications.	• According to permit conditions, typically every 6 to 12 months, depending on system size, usage, and history.
Water Monitoring & Sampling	• Monitoring to be in accordance with manufacturer specifications.	• If required, according to permit conditions, typically every 6 to 12 months, depending on system size, usage, and history.
Reporting	• Report findings to DEH per permit requirements. • Standard report to describe findings, analyze performance, and detail actions taken. • Report crisis or failure conditions to DEH immediately.	• According to permit conditions, typically every 1 to 2 years, depending on system size, usage, history, location.

GUIDELINES FOR
SHALLOW PRESSURE DISTRIBUTION SYSTEMS

A. DESCRIPTION

Shallow pressure distribution (PD) systems are a variation of a conventional gravity drainfield system that use a pump and small-diameter pressure piping to achieve broad, uniform distribution of wastewater in the shallow soil zones for improved soil absorption and better treatment of percolating effluent. This type of design, especially in conjunction with supplemental treatment, is well suited for steeper terrain and shallow soil conditions.

B. CONSTRAINTS ADDRESSED

1. High groundwater;
2. Shallow soil over impermeable soil or bedrock;
3. Shallow soil over fractured rock or coarse alluvium;
4. Slow percolation at standard dispersal trench depths; and
5. Steep terrain.

C. SITING CRITERIA

1. **Setbacks**. Horizontal setback requirements for shallow PD systems shall be those applicable to conventional dispersal fields, as specified in Santa Clara County Code section B11-67.
2. **Vertical Separation Requirements.**
    a. **Depth to Groundwater.** Minimum depth to seasonal high groundwater for shallow PD systems, as measured from trench bottom, shall vary according to soil percolation rate as shown in **Table PD-1**.
    b. **Soil Depth**. Minimum depth of soil, as measured from trench bottom to impermeable soil or rock, for shallow PD systems shall vary according to soil percolation rate and the level of treatment provided as shown in **Table PD-1**.
3. **Percolation Rate**. Average percolation rate for shallow PD systems shall be within the range of 1 to 120 minutes per inch (MPI), as determined in accordance with standard percolation requirements for conventional dispersal trenches.

Table PD-1
Minimum Vertical Separation Requirements for Shallow PD System
(feet, below trench bottom)

Percolation Rate (MPI)	Depth to Groundwater		Soil Depth	
	Primary Treatment*	Supplemental Treatment*	Primary Treatment**	Supplemental Treatment**
1-5	5	3	3	2
6 – 120	3	2	3	2

* Provided by a septic tank sized and constructed in accordance with requirements in Part 3 of this Manual.

** Provided by an approved alternative treatment system identified in this Manual

4. **Ground Slope**.

   a. Maximum ground slope in areas used for shallow PD systems shall be 40 percent.

   b. Any shallow PD system located on slopes greater than 20 percent shall require the completion of a geotechnical report and slope stability analysis as specified in Santa Clara County Code section B11-83.

5. **Dual System**. Per Santa Clara County Code section B11-67(d), two shallow PD dispersal fields, each one hundred percent of the total size required for the design sewage flow, shall be installed and interconnected with an approved flow diversion device (pressure-rated), intended to allow alternate use of the two fields.

D. DESIGN CRITERIA

1. **Treatment**. The following treatment requirements shall apply in connection with the use of shallow PD systems:

   a. Primary (septic tank) treatment shall be the minimum level of treatment, and shall be acceptable where applicable vertical separation distances are met per **Table PD-1**.

   b. Supplemental treatment, using an approved alternative treatment system identified in this Manual, may be used to allow compliance with reduced vertical separation distances as provided in **Table PD-1**.

2. **Design Sewage Flow.** Shallow PD systems shall be designed on the basis of the projected sewage flow for the structure or facility being served, determined in accordance with sewage flow estimation guidelines in Part 3 of this Manual.

3. **Pressure Dosing**. Septic tank effluent shall be applied to the shallow PD system by pressure dosing, utilizing either an automatic dosing siphon or pump system. The pressure distribution system shall be designed in accordance with accepted engineering practices to achieve, at a minimum:

    a. Uniform dosing of septic tank effluent throughout the system of shallow PD trenches;

    b. Adequate flow rate, screening of effluent and suitable piping network to preclude solids accumulation in the pipes or clogging of discharge orifices;

    c. Suitable access provisions for inspection, testing and adjustment of the pressure distribution system; and

    d. Dosing volume to achieve minimum of 3 to 5 doses per day at design flow conditions.

4. **Dispersal Trenches.** Shallow PD trenches shall conform to the same design and construction requirements as conventional trenches, per Part 3 of this Manual, with the exception that the piping system shall consist of pressure piping rather than gravity piping.

5. **Pressure Distribution Piping**.

    a. **Pressure-Rated Pipe Material**. All pipe, fittings and valves shall be pressure-rated PVC pipe, minimum 150 psi.

    b. **Solvent Welded.** All joints in the pressure piping system shall be solvent welded.

    c. **Pipe Sizing**. All pressure distribution pipes and fittings, including transport lines, manifolds, laterals and valves, must be adequately sized for the design flow, and shall be designed to minimize frictional losses to the maximum extent practicable.

    d. **Thrust Blocks.** Concrete thrust blocks, or equivalent restraint, shall be provided at sharp changes in piping directions.

    e. **Shut-off Valves.** The distribution lateral for each trench shall be fitted with a shut-off valve to adjust or terminate the flow to individual trenches. This valve may be either a ball or gate valve, and shall be located in a utility/valve box.

    f. **Lateral End Riser.** The end of each lateral shall be fitted with a 90^{o} long sweep to facilitate line cleaning and hydraulic testing. The end riser pipe shall also be fitted with a ball valve and/or threaded end cap or plug, housed in a valve box.

6. **Pump System.** The pump system shall be: (a) appropriate for sewage applications; (b) of the size and type to meet the hydraulic design requirements; and (c) designed and

constructed in accordance with pump system requirements provided in Part 3 of this Manual.

7. **Wastewater Application Rates.** The wastewater application rates used for sizing the infiltrative surface (trench bottom and/or sidewall area), shall be based upon representative percolation test results for the soil zone corresponding with trench bottom depth, and the loading rate criteria in **Table PD-2**.

Table PD-2. Wastewater Application Rates for Shallow PD System[1]

Percolation Rate (MPI)	Septic Tank Treatment	Supplemental Treatment		
	Standard Rate (gpd/ft^2)	Standard Rate[2] (gpd/ft^2)	Enhanced Rate[3] (gpd/ft^2)	Treatment Multiplier[4]
1-5	1.2	1.2	1.2	0
10	0.80	0.80	1.2	1.5
24	0.60	0.60	1.2	2.0
30	0.56	0.56	1.12	2.0
45	0.45	0.45	0.68	1.5
60	0.35	0.35	0.53	1.5
90	0.20	0.20	0.25	1.25
91-120	0.20	0.20	0.25	1.25

[1] Interpolate between reference values for other percolation rates; see end of Part 4 for expanded table listing interpolated values.
[2] Applies where supplemental treatment is used in connection with reduced depth to groundwater and/or reduced soil depth.
[3] Applies where standard vertical separation distances are met.
[4] For information only.

Reduction in the above wastewater loading rates or other provisions to insure the long-term integrity and performance of the shallow PD trenches may be required for high strength waste flows, such as from restaurants.

8. **Trench Sizing**. The required square footage of trench infiltrative surface shall be calculated based on the design flow and the applicable wastewater application rate per **Table PD-2**. The required length of trench shall be calculated based on the combined bottom area and trench sidewalls, up to a maximum of four (4) square feet of effective infiltrative surface per lineal foot of trench. For example, this may be comprised of: (a) 1.5-ft wide bottom area plus two sidewalls of 1.25 feet each; (b) 2-ft wide bottom area plus two sidewalls of 1 foot each; and so on.

9. **Inspection Wells**. A minimum of three (3) inspection wells shall be installed within and around shallow PD systems for the purpose of checking groundwater levels, and may also be used for water quality sampling, as needed. Inspection wells shall extend to a depth of

3 feet below the bottom of the PD trenches or to contact with impermeable materials, whichever is less. The inspection wells shall be located and constructed as follows:

a. One shall be located upslope of the dispersal field, typically 10- to 15-feet away, to serve as a background or control well;

b. One shall be located within the dispersal field, typically between trenches near the center of the field;

c. One shall be located down-slope of the dispersal field, typically 10 to 25 feet horizontally from the lowest trench(es), and positioned to provide a representative point for monitoring the area estimated to be in the probable flow path of percolating wastewater;

d. Inspection wells shall be constructed of 2" to 4" diameter pipe, equipped with a wrench-tight cap or pipe plug, and a bottom cap. All wells shall be perforated beginning at a depth of 18 inches below grade and extending to the bottom of the pipe. Perforations shall consist of hacksaw slots at nominal 1" spacing, or equivalent commercially-slotted pipe. To prevent surface water infiltration, inspection wells shall be sealed with a bentonite or concrete annular seal (or equivalent) to a depth of 12 inches, minimum.

E. ENGINEERING PLANS AND CONSTRUCTION

1. **Reference Guidelines**. In addition to the requirements set forth herein, design and construction of shallow PD systems shall utilize applicable guidelines contained in the following references:

a. "Onsite Wastewater Treatment Systems Manual", U.S. Environmental Protection Agency, February 2002 and as amended.

b. “Design Manual – Onsite Wastewater Treatment and Disposal Systems”, U.S. Environmental Protection Agency, October 1980.

2. **Engineering Plans.** Engineering plans for shallow PD systems shall include:

a. All relevant elevation data and hydraulic calculations;

b. Specific step-by-step construction guidelines and notes for use by the installer;

c. Erosion control plan for any site over 20% slpoe, utilizing cover fill or with design flow >1,000 gpd;

d. Recommended make and model of all components;

e. Recommended pump system components, with cut-sheet depicting float settings;

f. Control panel programming; and

g. An inspection schedule listing critical control points.

3. **Construction Inspection.** At a minimum, inspection of the shallow PD system installation should include the items listed below. This is in addition to inspection work required for a supplemental treatment system, if used. This is in addition to inspection work required for a supplemental treatment system, if used. Joint inspection by the designer, contractor, and DEH may be required.

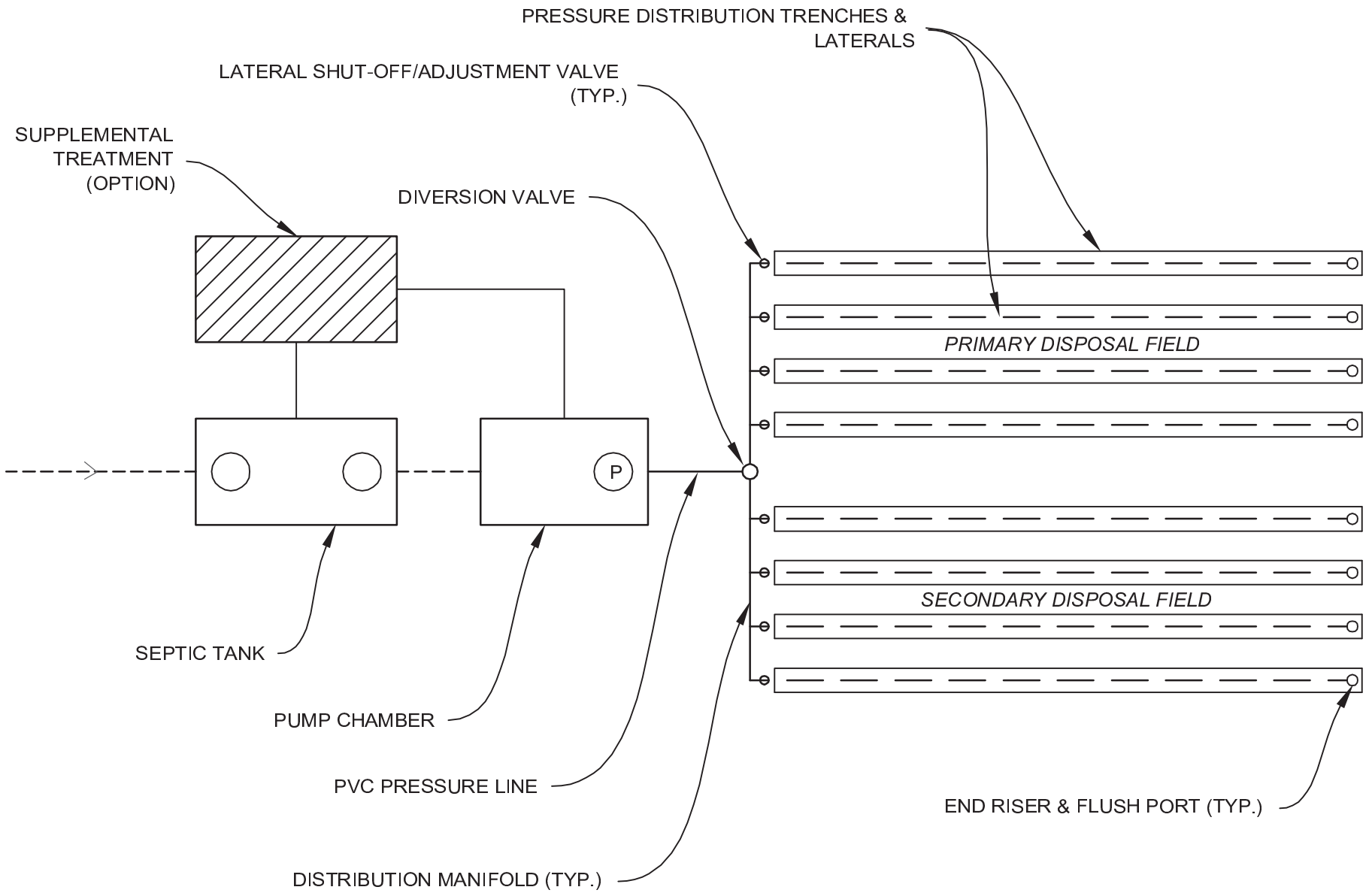
   - Pre-construction inspection where the construction staking or marking of the various system components is provided and construction procedures discussed;
   - Water tightness of septic tank and dosing (pump) tank;
   - Layout and excavation of dispersal trenches and piping;
   - Drain rock material and placement;
   - Piping installation and hydraulic ("squirt") test of the distribution system;
   - Functioning and setting of all control devices; and
   - Final Inspection to verify that all construction elements are in conformance with the approved plans and specifications, all performance wells are installed; and erosion control has been completed.

F. MANAGEMENT REQUIREMENTS

Recommended minimum procedures and frequency for inspection, maintenance, monitoring and reporting activities for shallow pressure distribution systems are outlined in **Table PD-3.**

Table PD-3. Shallow Pressure Distribution System Management Requirements

	Work	Frequency
Inspection	• Conduct routine visual observations of disposal field and downslope area and surroundings for wet areas, pipe leaks or damage, soil erosion, drainage issues, abnormal vegetation, or other problems. • Perform all inspections of pump and appurtenances (per O&M manual and Performance Evaluation Guidelines, Part 5 of this Manual).	• Every 6 to 12 months.
Maintenance	• Purge laterals, squirt and balance. • Exercise valves to ensure functionality. • Perform all maintenance work as recommended by equipment manufacturer for any special valves or other components. • Investigate and repair erosion, drainage or other disposal field problems, as needed. • Investigate and perform distribution system corrective work, as required. • Record work done.	• Distribution system maintenance annually. • Other maintenance as required.
Water Monitoring & Sampling	• Measure and record water levels in trench observation wells. • Measure and record water levels in dispersal field monitoring wells, as applicable, per permit requirements. • Obtain and analyze water samples from monitoring wells, as applicable, per permit requirements.	• Measure trench water levels annually. • Other monitoring according to permit conditions, as applicable.
Reporting	• Report findings to DEH per permit requirements. • Standard report to include dates, observation well and monitoring well readings and other data collected, work performed, corrective actions taken, and performance summary. • Report public health/water quality emergency to DEH immediately.	• According to permit conditions, typically every 1 to 2 years, depending on system size, usage, history, location.



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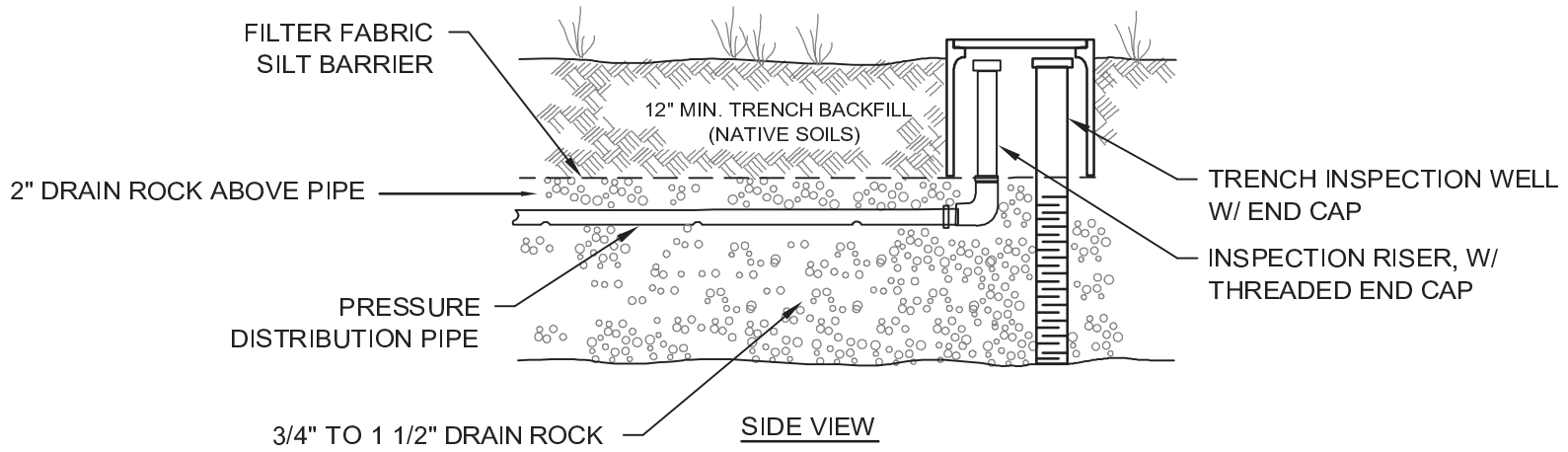
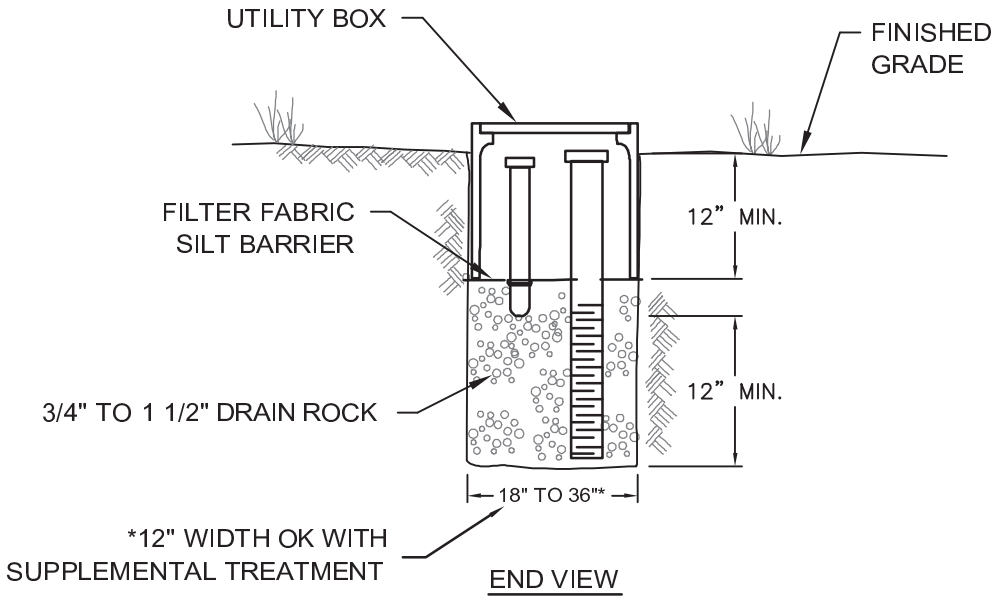
SHALLOW PRESSURE DISTRIBUTION SYSTEM SCHEMATIC





SHALLOW PRESSURE-DISTRIBUTION SYSTEM

GUIDELINES FOR MOUND SYSTEMS

A. DESCRIPTION

A mound system consists of an elevated sand bed with a gravel distribution bed covered by soil fill. Mound systems are intended to raise the soil absorption system above grade and provide further treatment (sand filtration) of effluent before it reaches native soils. It utilizes the shallow surface soils for broad distribution of effluent, and is used to mitigate high water table and shallow soil conditions on flat or gently sloping terrain. Mound systems can be used where there are at least two feet of permeable surface soils (above the water table or restrictive soils) on slopes up to 20 percent, depending upon percolation characteristics.

B. CONSTRAINTS ADDRESSED

1. High groundwater;
2. Shallow soil over fractured rock or coarse alluvium;
3. Shallow soil over impermeable soil or bedrock;
4. Slow percolation at standard dispersal trench depths; and
5. Limited disposal area.

C. SITING CRITERIA

1. **Setbacks**. Horizontal setback requirements for mound systems shall be those applicable to conventional disposal fields, as specified in Santa Clara County Code section B11-67.

2. **Vertical Separation Requirements.**

a. **Depth to Groundwater.** Minimum depth to seasonal high groundwater, as measured from ground surface, shall vary according to soil percolation rate as follows:

Percolation Rate, MPI	Depth to Groundwater
1-5	3 feet
6-120	2 feet

b. **Soil Depth**. Minimum depth of soil, as measured from ground surface to impermeable soil or rock, for mound systems shall be 2 feet. This soil depth

requirement shall apply within the mound fill area and in the adjacent area extending a distance of 25 feet down-slope of the mound system.

3. **Percolation Rate**. Average percolation rate for mound systems shall be within the range of 1 to 120 minutes per inch (MPI), as determined from testing at depths of 1 to 2 feet below ground surface. These percolation requirements shall apply within the mound fill area and in the adjacent area extending a distance of 25 feet down-slope of the mound system.

4. **Ground Slope**. Maximum ground slope for mound systems shall be 20% where the percolation rate is in the range of 1 to 60 MPI. For soils with a percolation rate greater than 60 MPI, maximum ground slope for mound systems shall be 15%.

5. **Reserve Area/Dual System.** A reserve area having suitable site conditions and sufficient area for full, 100% replacement of the primary mound shall be provided or a complete dual primary and secondary mound system shall be installed initially. See D.9 for circumstances requiring the installation of a dual system (and applicable requirements). In determining the necessary space for the primary and secondary mound, the required basal area (per D.8) of the primary and secondary mound shall not overlap. The surplus sand run-out and soil fill may also not overlap unless the primary and secondary mounds are installed together as a dual system.

D. DESIGN CRITERIA

1. **Treatment**. The mound system shall be preceded by a septic tank sized for the design sewage flow and constructed in accordance with requirements contained in Part 3 of this Manual.

2. **Design Sewage Flow**. The mound system shall be designed on the basis of the projected sewage flow for the structure or facility being served, determined in accordance with sewage flow estimation guidelines in Part 3 of this Manual.

3. **Pressure Dosing**. Septic tank effluent shall be applied to the mound system by pressure dosing, utilizing a pump system. The pressure distribution system shall be designed in accordance with accepted engineering practices to achieve, at a minimum:

    a. Uniform dosing of septic tank effluent over the surface application area of the mound distribution bed;

    b. Adequate flow rate, screening of effluent and suitable piping network to preclude solids accumulation in the pipes or clogging of discharge orifices;

    c. Suitable access provisions for inspection, testing and adjustment of the pressure distribution system;

d. Dosing volume to achieve a minimum of 3 to 5 doses per day at design flow conditions; and

e. At least one distribution lateral for every 36 inches of bed width.

Additional requirements for design and construction of pressure distribution piping systems contained in "Guidelines for Shallow Pressure Distribution Systems" shall also apply.

4. **Pump System.** The pump system shall be: (a) appropriate for sewage applications; (b) of the size and type to meet the hydraulic design requirements; and (c) designed and constructed in accordance with pump system requirements provided in Part 3 of this Manual.

5. **Sand Fill**.

a. **Sand Specifications**. The sand media shall be a medium to coarse sand which meets the following gradation specifications:

Sieve Size	Percent Passing
3/8	100
#4	90 – 100
#10	62 – 100
#16	45 – 82
#30	25 – 55
#50	5 – 20
#60	0 – 10
#100	0 – 4
#200	0 – 2

Documentation of laboratory sieve analysis results for the proposed sand fill material shall be supplied to DEH to verify conformance with the above specifications.

b. **Sand Depth**. The minimum depth of sand fill, below the gravel distribution bed, shall be 12 inches. The minimum depth of sand fill shall be increased to 24 inches for sites where the average percolation rate is between 1 and 5 MPI; such sites also require greater separation to groundwater below ground surface (3 feet rather than 2 feet).

c. **Lateral Dimensions**. The sand shall be placed as a continuous fill extending in lateral dimensions as necessary to meet the following minimum requirements:

(1) Top of the sand fill shall extend horizontally beyond the gravel distribution bed:

- 1 foot in the upslope direction

- 2 feet in the down-slope direction
- 2 feet in the longitudinal (side) direction

(2) Maximum slope of the top of the sand surface shall be 3 horizontal to 1 vertical.

(3) Bottom of the sand fill shall be large enough to meet minimum mound sizing requirements based on basal area and linear loading rate criteria per D.8 below.

6. **Gravel Distribution Bed**

   a. **Material.** The distribution bed shall consist of 3/8-inch double-washed pea gravel, substantially free of fines.

   b. **Depth.** Pea gravel shall extend a minimum of 6 inches below the invert and 2 inches above the top of the distribution piping.

   c. **Width.** Maximum width of the distribution bed shall be 10 feet.

   d. **Level.** The bottom of the distribution bed shall be level; and the down-slope side shall be parallel to the slope contour.

7. **Silt Barrier**. The gravel distribution bed shall be covered in its entirety with a geotextile ("filter fabric") silt barrier. Filter fabric shall either be polyester, nylon or polypropylene, or any combination thereof, and shall be suitable for underdrain applications. Filter fabric shall be non-woven, shall not act as a wicking agent and shall be permeable.

8. **Soil Cover**

   a. **Material**. A continuous soil cover shall be placed over the entire distribution bed and sand fill. The soil cover shall consist of a medium, loamy-textured soil.

   b. **Depth**. Soil cover depth shall be a minimum of 12 inches and a maximum of 18 inches over the top of the distribution bed, and 12 inches minimum over the sand fill portion of the mound. Soil cover over the distribution bed shall be crowned to promote rainfall runoff, and compacted by track-rolling, minimum two passes.

   c. **Lateral Extension**. The soil cover shall extend a minimum of 4 feet beyond the perimeter edge of the sand fill in all directions.

9. **Wastewater Application Rate**. The wastewater application rates used for sizing the surface area of the distribution bed and the basal area of the sand fill shall be as follows:

   a. **Distribution Bed**.

      (1) 1.2 gpd/ft^2 for individual residential OWTS; and

(2) 1.0 gpd/ft^2 for commercial, industrial, institutional and multi-residential OWTS.

Reduction in the above wastewater loading rates or other provisions to insure the long-term integrity and performance of the mound distribution bed may be required for high strength waste flows, such as from restaurants.

b. **Sand Basal Area**. The basal area of the sand fill shall be sized to meet maximum basal wastewater application rates and linear loading requirements as follows:

(1) **Basal Wastewater Application Rates**.

- **Effective Application Area.**
  - For level sites (0 - 2% slope) the effective basal wastewater application area includes the entire sand fill basal area.
  - For sloping sites (>2% slope) the effective basal wastewater application area includes the sand basal area immediately below and directly down-slope (at right angles to the natural slope contours) of the distribution bed.
- **Wastewater Flow.** The wastewater flow used for sizing the basal area shall be the design sewage flow for the system.
- **Application Rates.** The maximum basal application rate shall be based on the demonstrated percolation rate of the upper 12 to 24 inches of soil depth as shown in **Table M-1.**

Table M-1. Basal Wastewater Application Rates[1]

Percolation Rate (MPI)	Wastewater Application Rate (gpd/ft^2)
1-5	1.2
10	1.2
24	1.2
30	1.12
45	0.68
60	0.53
90	0.25
91-120	0.2

[1] Interpolate between reference values for other percolation rates; see end of Part 4 for expanded table listing interpolated values.

(2) **Linear Loading Requirements**

- **Linear Loading Rate Definition.** Linear loading rate is defined as the volume of wastewater flow (in gpd) divided by the effective length of the disposal system measured along the slope contour.

- **Effective Length**. The effective length (L) of the mound system for determining the linear loading rate shall be the length of the gravel distribution bed along the down-slope edge. Separate linear loading rate calculations shall be made for the primary and secondary (reserve) systems. The effective length of each mound may overlap for purposes of determining compliance with linear loading rate criteria, since only one system would be in operation at a given time.

- **Wastewater Flow**. The wastewater flow used for determining the linear loading rate shall be as follows:

  - 100 gpd/bedroom for residential systems;

  - Design sewage flow rate for commercial, institutional, industrial and multi-residential systems.

- **Loading Rate Criteria**. Maximum linear loading rates for mound systems vary according to ground slope and percolation rate as indicated in **Table M-2.** If a variance from these criteria is proposed, it must be supported by detailed groundwater mounding analysis carried out in accordance with accepted methodology and/or scientific references dealing with water movement in soils and utilizing site specific hydraulic conductivity (permeability) data.

Table M-2. Maximum Linear Loading Rates (gpd/lineal foot)

Soil Depth (ft)	Ground Slope (%)	Percolation Rate (MPI)		
		1-30	31-60	61-120
2 to 2.5	0-10	5	4	3
	11-20	6	5	4
2.5 to 3.0	0-10	7	6	5
	11-20	8	7	6
3.0 to 4.0	0-10	9	8	7
	11-20	10	9	8
> 4.0	0-10	11	10	9
	11-20	12	11	10

9. **Dual Mound Systems**.

    a. **Dual System Requirement**. Dual mound systems shall be required for any system where, due to space constraints, the sand fill run-out of the primary mound overlaps the sand fill run-out area of the secondary mound.

    b. **Distribution Bed Placement**. Dual mound systems shall have at least two distinctly separate distribution beds. The beds may be placed within one continuous mound or in separate mounds. The distribution beds may be placed end-to-end or upslope/down-slope of one another subject to meeting minimum sizing requirements for basal and linear loading rates per D.8.b above.

    c. **Distribution Bed Separation**. The minimum lateral (i.e., end-to-end) separation between distribution beds in a dual mound system shall be six feet.

    d. **Effective Basal Area**. For dual mound systems the effective basal area for sizing the two systems shall not overlap.

    e. **Alternate Dosing**. The distribution beds for dual mound systems shall be designed and operated to provide alternate dosing and resting of the beds.

10. **Inspection Wells**. A minimum of six inspection wells shall be installed within and around mound systems as follows:

    a. One shall be located near the center of the mound, extending from the mound surface to the bottom of the gravel distribution bed.

    b. One shall be located within the effective basal area (outside of the distribution bed), extending from the mound surface to 6 inches into the native soil.

    c. Four shall be located, respectively, midway along each of the four sides of the mound, near the toe of the slope, extending from ground surface to a depth of 5 feet or to the depth of impermeable materials, whichever is less.

    d. Inspection wells shall be constructed of 2" to 4" diameter pipe, equipped with a wrench-tight cap or pipe plug and a bottom cap. All wells shall be perforated beginning at a depth of 18 inches below grade and extending to the bottom of the pipe. Perforations shall consist of hacksaw slots at nominal 1" spacing, or equivalent commercially-slotted pipe. To prevent surface water infiltration, inspection wells shall be sealed with a bentonite or concrete annular seal (or equivalent) to a depth of 12 inches, minimum.

E. ENGINEERING PLANS AND CONSTRUCTION

1. Reference Guidelines. Construction of mound systems shall be in accordance with guidelines contained in the following references:

a. "Design and Construction Manual for Wisconsin Mounds", Small Scale Waste Management Project, University of Wisconsin, Madison, January 2000, including any amendments.

b. "Onsite Wastewater Treatment Systems Manual", U.S. Environmental Protection Agency, February 2002.

2. **Engineering Plans**. Engineering plans for mound systems shall include:

   a. All relevant elevation data and hydraulic calculations;

   b. Specific step-by-step construction guidelines and notes for use by the installer;

   c. Erosion control plan;

   d. Recommended make and model of all components;

   e. Recommended pump system components, with cut-sheet depicting float settings;

   f. Control panel programming; and

   g. An inspection schedule listing critical control points.

3. **Construction Inspection.** At a minimum, inspection of the mound system installation should include the following. Joint inspection by the designer, contractor, and DEH may be required.

   - Pre-construction inspection where the construction staking or marking of the mound system is provided and construction procedures discussed;
   - Water tightness of septic tank and dosing (pump) tank;
   - Clearing and ripping/plowing of the mound basal area soils;
   - Sand material and placement;
   - Pea gravel distribution bed and piping installation;
   - Hydraulic (“squirt”) test of the distribution system;
   - Functioning and setting of all control devices;
   - Placement of filter fabric silt barrier and soil cover;
   - Final Inspection to verify that all construction elements are in conformance with the approved plans and specifications, all inspection wells are installed; and erosion control has been completed.

F. MANAGEMENT REQUIREMENTS.

Recommended minimum procedures and frequency for inspection, maintenance, monitoring and reporting activities for mound systems are outlined in Table M-3 below.

Table M-3. Mound System Management Requirements

	Work	Frequency
Inspection	• Conduct routine visual observations of mound and downslope area and surroundings for wet areas, pipe leaks or damage, soil erosion, drainage issues, abnormal vegetation, gophers or other problems. • Perform all inspections of pump and appurtenances (per O&M manual and Performance Evaluation Guidelines, Part 5 of this Manual). • Record observations.	• Every 6 to 12 months.
Maintenance	• Purge laterals, squirt and balance. • Exercise valves to ensure functionality. • Perform all maintenance work as recommended by equipment manufacturer for any special valves or other components. • Maintain mound area landscape vegetation, as req'd • Investigate and repair erosion, drainage or other disposal field problems, as needed. • Investigate and perform distribution system corrective work, as req'd • Record work done.	• Distribution system maintenance annually. • Other maintenance as required.
Water Monitoring & Sampling	• Measure and record water levels in observation wells in distribution bed, sand fill and around mound perimeter. • Obtain and analyze water samples from monitoring wells, as applicable, per permit requirements.	• Measure mound system water levels annually. • Other monitoring according to permit conditions, as applicable.
Reporting	• Report findings to DEH per permit requirements. • Standard report to include dates, observation well and monitoring well readings and other data collected, work performed, corrective actions taken, and performance summary. • Report public health/water quality emergency to DEH immediately.	• According to permit conditions, typically every 1 to 2 years, depending on system size, usage, history, location.

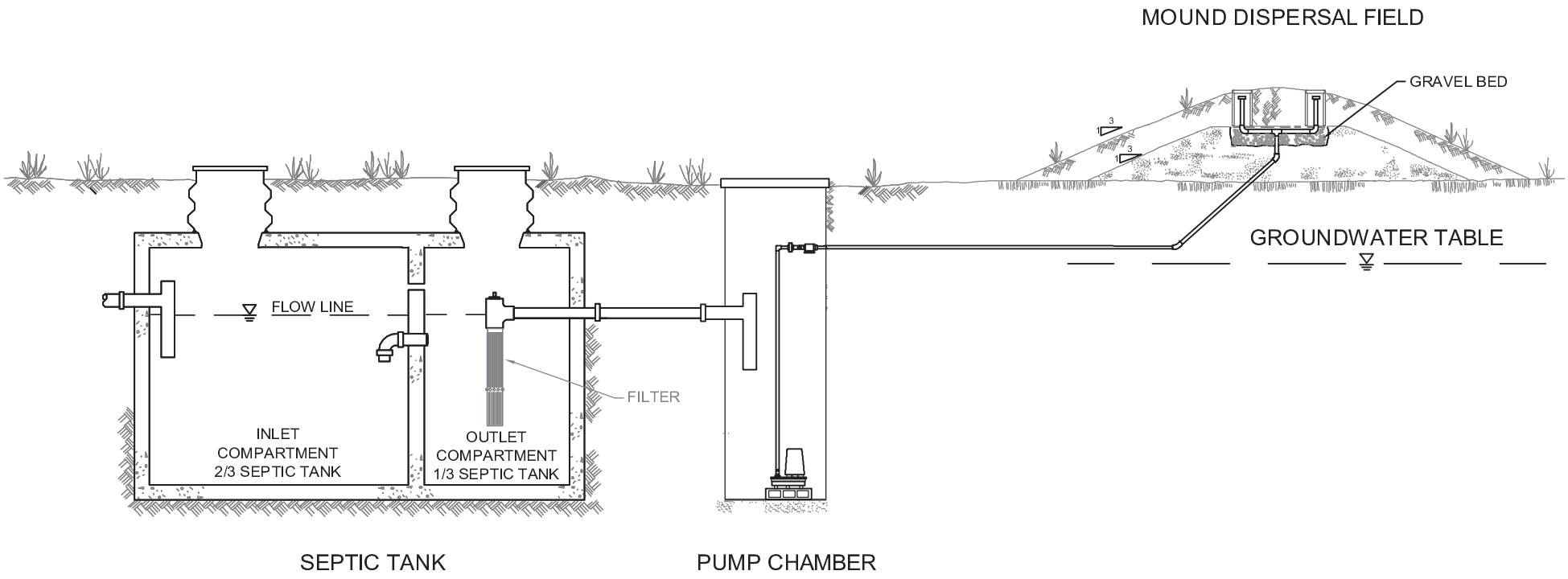


DIAGRAM OF A MOUND SYSTEM

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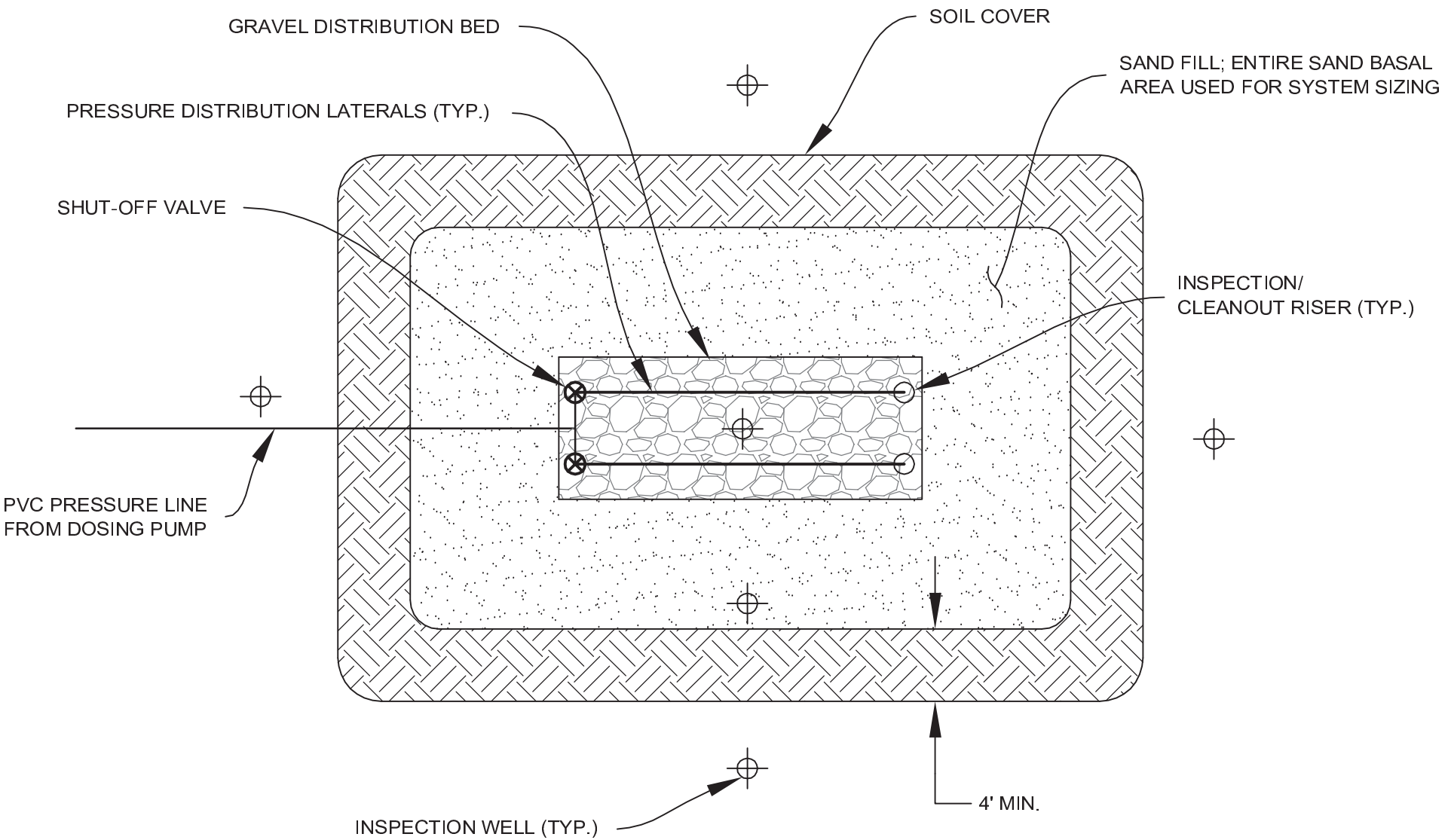

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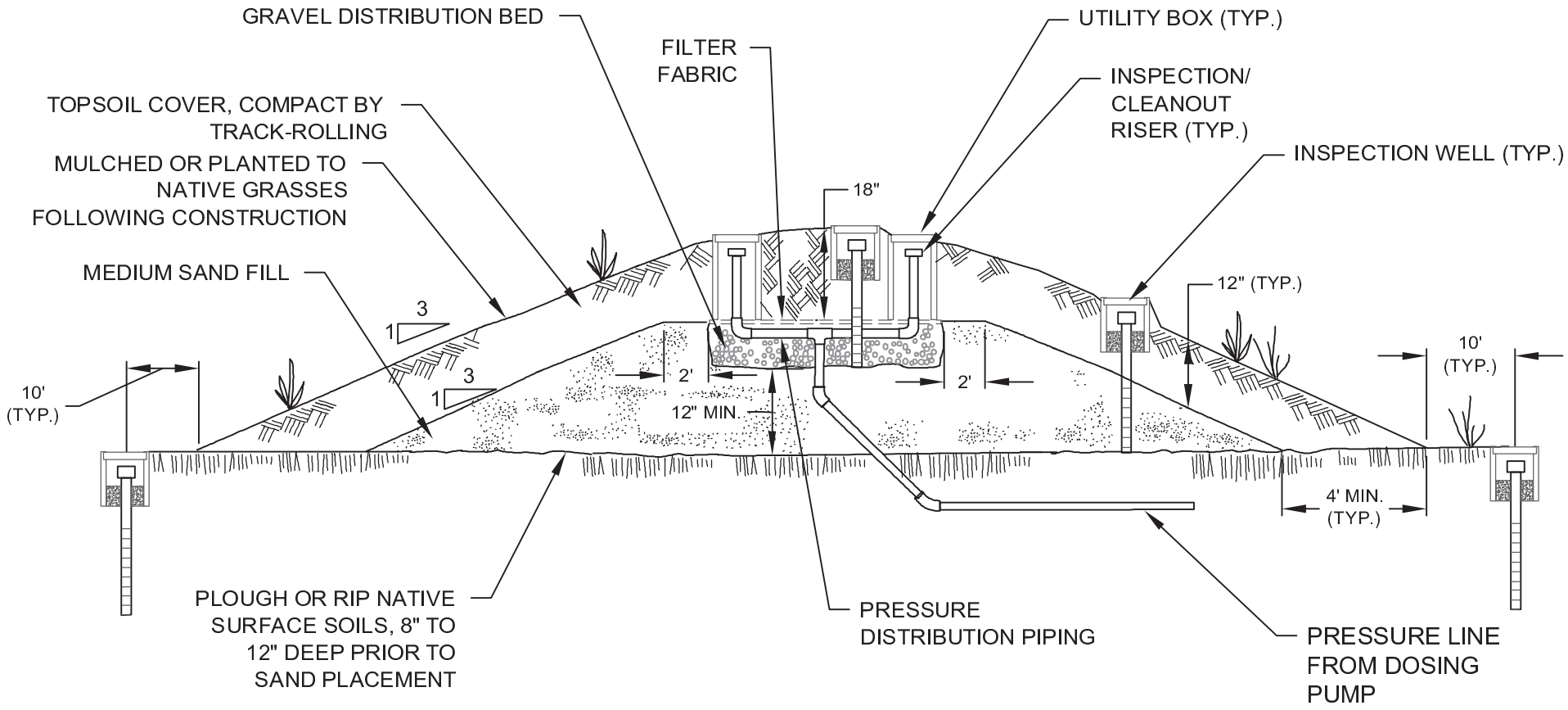
MOUND SYSTEM SCHEMATIC
~ LEVEL SITE ~



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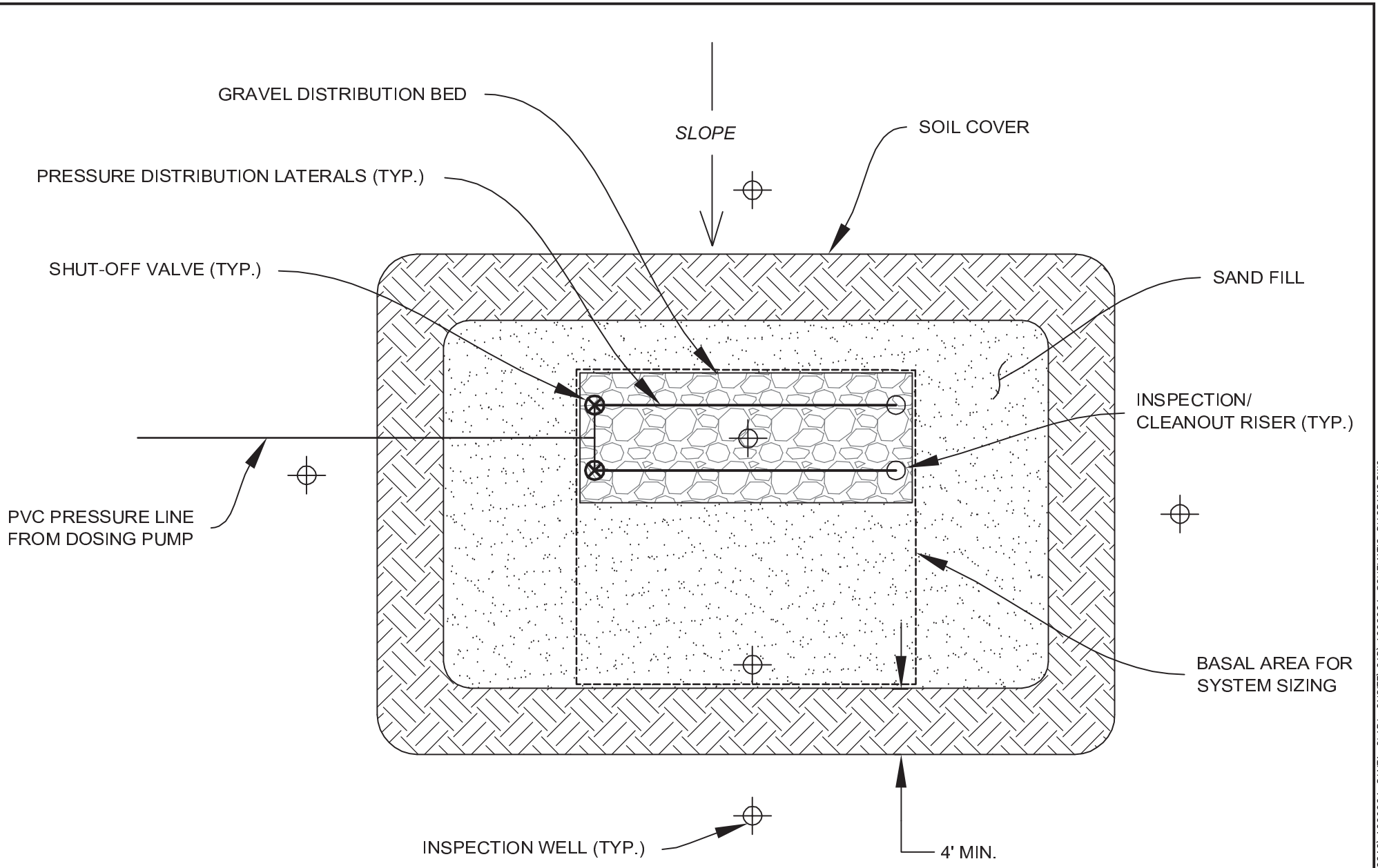
MOUND SYSTEM CROSS-SECTION
~ LEVEL SITE ~



MOUND SYSTEM SCHEMATIC
~ SLOPING SITE ~

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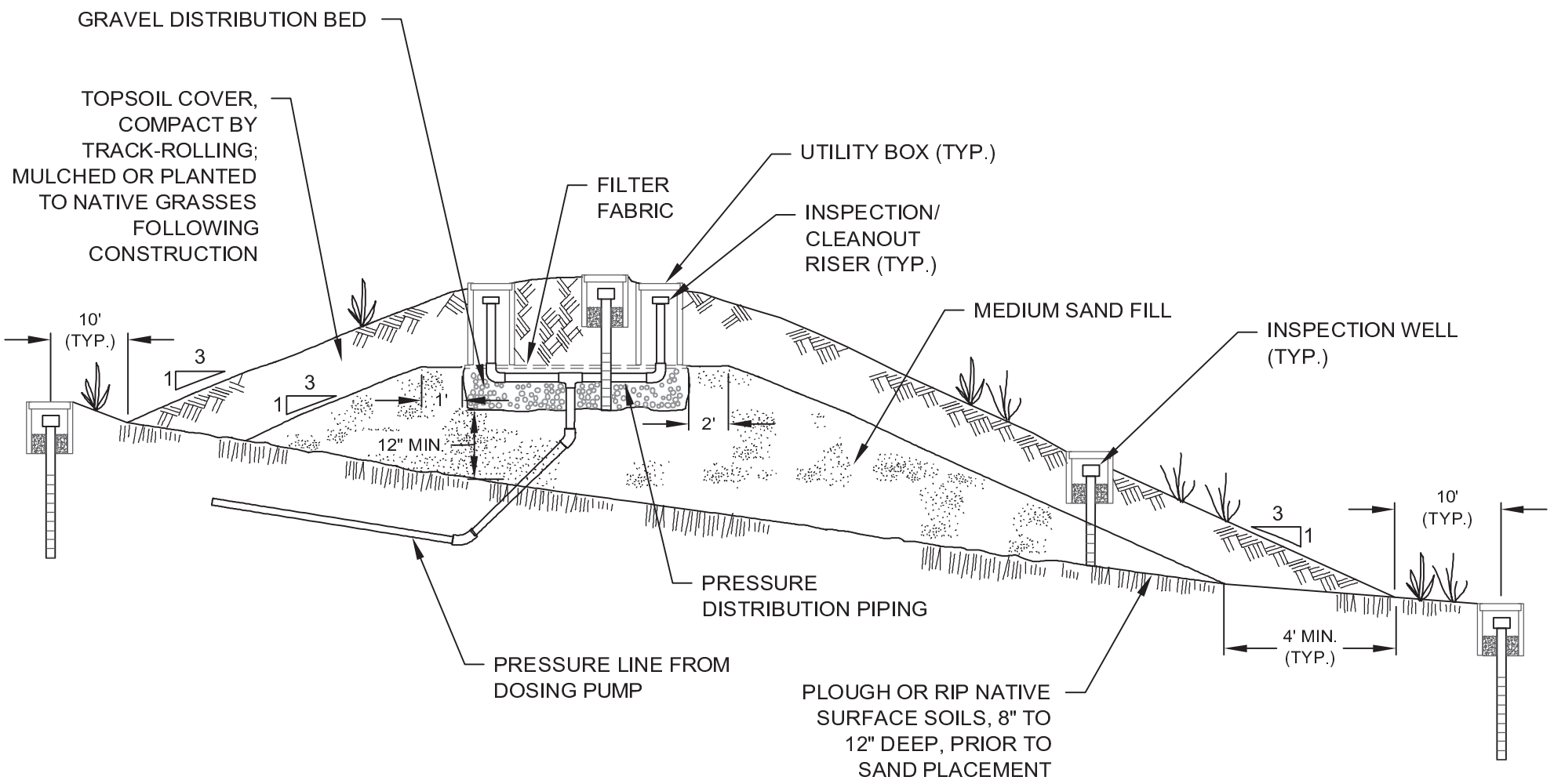

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MOUND SYSTEM CROSS-SECTION
~ SLOPING SITE ~

GUIDELINES FOR AT-GRADE SYSTEMS

A. DESCRIPTION

At-grade systems are similar to mound systems, except that they do not include the sand bed; the gravel distribution bed is placed directly on the scarified (i.e., plowed) soil surface. They are often used in conjunction with a supplemental treatment system. They can be used in the same types of situations as mound systems to overcome shallow soil depths and high groundwater.

B. CONSTRAINTS ADDRESSED

1. High groundwater;
2. Shallow soil over impermeable soil or bedrock;
3. Shallow soil over fractured rock or coarse alluvium; and
4. Limited dispersal area.

C. SITING CRITERIA

1. **Setbacks**. Horizontal setback requirements for At-grade systems shall be those applicable to conventional dispersal fields, as specified in Santa Clara County Code section B11-67.
2. **Vertical Separation Requirements.**
    a. **Depth to Groundwater.** Minimum depth to seasonal high groundwater for At-grade systems, as measured from ground surface, shall vary according to soil percolation rate and the level of treatment provided as shown in **Table AG-1**.
    b. **Soil Depth**. Minimum depth of soil, as measured from ground surface to impermeable soil or rock, for At-grade systems shall vary according to soil percolation rate and the level of treatment provided as shown in **Table AG-1**. These soil depth requirements shall apply within the dispersal field and in the adjacent area extending a distance of 25 feet down-slope of the At-grade system on sloping sites, and a distance of 15 feet on all sides on level sites.

Table AG-1

Minimum Vertical Separation Requirements for At-grade System
(feet, below ground surface)

Percolation Rate (MPI)	Depth to Groundwater		Soil Depth	
	Primary Treatment*	Supplemental Treatment**	Primary Treatment*	Supplemental Treatment**
1-5	5	3	3	2
6 – 60	3	2	3	2
61- 120	NA***	2	NA***	2

*Provided by a septic tank sized and constructed in accordance with requirements in Part 3 of this Manual.
** Provided by an approved alternative treatment system identified in this Manual
***Supplemental treatment required where percolation rate is slower than 60 MPI.

3. **Percolation Rate**. Average percolation rate for At-grade systems shall be within the range of 1 to 120 minutes per inch (MPI), as determined from testing at 2 to 3 feet depth below ground surface. Where the percolation rate is in the range of 60 to 120 MPI supplemental treatment shall be required. These percolation requirements shall apply within the dispersal field and in the adjacent area extending a distance of 25 feet down-slope of the At-grade system on sloping sites, and a distance of 15 feet on all sides on level sites.

4. **Ground Slope**. Maximum ground slope for At-grade systems shall be 20%.

5. **Reserve Area/Dual System**. A reserve area having suitable site conditions and sufficient area for full, 100% replacement of the primary At-grade system shall be provided or a complete dual primary and secondary At-grade system shall be installed initially. See D.7 for circumstances requiring the installation of a dual system (and applicable requirements). In determining the necessary space for the primary and secondary (reserve) field, the required gravel distribution bed area (per D.4) of the primary and secondary At-grade shall not overlap. The surplus soil fill run-out may also not overlap unless the primary and secondary At-grades are both installed (i.e., as a dual system).

D. DESIGN CRITERIA

1. **Treatment**. The following treatment requirements shall apply in connection with the use of At-grade systems:

    a. Primary (septic tank) treatment shall be the minimum level of treatment, and shall be acceptable where the average percolation rate is in the range of 1 to 60 MPI and the applicable vertical separation distances are met per **Table AG-1**.

    b. Supplemental treatment, using an approved alternative treatment system identified in this Manual, shall be required where the average percolation rate is between 61 to 120 MPI, and/or to allow compliance with reduced vertical separation distances as provided in **Table AG-1**.

2. **Design Sewage Flow**. At-grade systems shall be designed on the basis of the projected sewage flow for the structure or facility being served, determined in accordance with sewage flow estimation guidelines in Part 3 of this Manual.

3. **Pressure Dosing**. Wastewater effluent, from the septic tank or supplemental treatment system, shall be applied to the At-grade system by pressure dosing, utilizing a pump system. The pressure distribution system shall be designed in accordance with accepted engineering practices to achieve, at a minimum:

    a. Uniform dosing of effluent over the surface application area of the At-grade distribution bed;

    b. Adequate flow rate, screening of effluent and suitable piping network to preclude solids accumulation in the pipes or clogging of discharge orifices;

    c. Suitable access provisions for inspection, testing and adjustment of the pressure distribution system;

    d. Dosing volume to achieve a minimum of 3 to 5 doses per day at design flow conditions; and

    e. At least one distribution lateral for every 36 inches of distribution bed width.

    Additional requirements for design and construction of pressure distribution piping systems contained in "Guidelines for Shallow Pressure Distribution Systems" shall also apply.

4. **Pump System.** The pump system shall be: (a) appropriate for sewage applications; (b) of the size and type to meet the hydraulic design requirements; and (c) designed and constructed in accordance with pump system requirements provided in Part 3 of this Manual.

5. **Gravel Distribution Bed**
    a. **Material.** The distribution bed shall consist of 3/8-inch double-washed pea gravel, substantially free of fines.
    b. **Depth.** Pea gravel shall extend a minimum of 6 inches below the invert and 2 inches above the top of the distribution piping.
    c. **Width.** Maximum width of the distribution bed shall be 10 feet. Long, narrow distribution bed configurations are preferred.
    d. **Wastewater Application Rate**. The wastewater application rate used for sizing the basal surface area of the distribution bed (i.e., soil infiltrative surface) shall vary

according to the soil percolation rate of the native soil and the level of wastewater treatment provided as indicated in **Table AG-2**.

Table AG-2.

Wastewater Application Rates for At-grade System[1]

Percolation Rate (MPI)	Septic Tank Treatment	Supplemental Treatment		
	Standard Rate (gpd/ft^2)	Standard Rate[2] (gpd/ft^2)	Enhanced Rate[3] (gpd/ft^2)	Treatment Multiplier[4]
1-5	1.2	1.2	1.2	0
10	0.8	0.8	1.2	1.5
24	0.60	0.60	1.2	2.0
30	0.56	0.56	1.12	2.0
45	0.45	0.45	0.68	1.5
60	0.35	0.35	0.53	1.5
90	NA	0.20	NA	NA
91-120	NA	0.20	NA	NA

[1] Interpolate between reference values for other percolation rates; see end of Part 4 an expanded table listing interpolated values.
[2] Applies where supplemental treatment is used in connection with reduced depth to groundwater, reduced soil depth, or for mitigation of other site constraints.
[3] Applies where standard vertical separation distances are met.
[4] For reference only.

Reduction in the above wastewater loading rates or other provisions to insure the long-term integrity and performance of the At-grade distribution bed may be required for high strength waste flows, such as from restaurants.

e. Minimum Basal Area Sizing. At a minimum, sizing of the distribution bed basal area shall be determined by dividing the design wastewater flow (in gpd) by the applicable wastewater application rate per **Table AG-2**.

f. Linear Loading Rate Requirements. The length of the distribution bed shall be sized to meet maximum linear loading rate criteria as follows:

(1) **Linear Loading Rate Definition.** Linear loading rate is defined as the volume of wastewater flow (in gpd) divided by the effective length of the dispersal system measured along the slope contour.

(2) **Effective Length**. The effective length (L) of the At-grade system for determining the linear loading rate shall be the length of the gravel distribution bed measured along the down-slope edge. Separate linear loading rate calculations shall be made for the primary and secondary (reserve) systems; however, the effective length of each field may overlap for purposes of determining compliance with linear loading rate criteria.

(3) **Wastewater Flow**. The wastewater flow used for determining the linear loading rate shall be as follows:

- 100 gpd/bedroom for residential systems;
- Design sewage flow rate for commercial, institutional, industrial and multi-residential systems.

(4) **Loading Rate Criteria**. Maximum linear loading rates for At-grade systems vary according to ground slope and percolation rate as indicated in **Table AG-3.** If a variance from these criteria is proposed, it must be supported by detailed groundwater mounding analysis carried out in accordance with accepted methodology and/or scientific references dealing with water movement in soils and utilizing site specific hydraulic conductivity data.

Table AG-3. Maximum Linear Loading Rates* gpd/lineal foot)

Soil Depth (ft)	Ground Slope (%)	Percolation Rate (MPI)		
		1-30	31-60	61-120
2.0 to 3.0	0-10	5	4	3
	11-20	6	5	4
3.0 to 4.0	0-10	7	6	5
	11-20	8	7	6
4.0 to 5.0	0-10	9	8	7
	11-20	10	9	8
>5.0	0-10	11	10	9
	11-20	12	11	10

6. **Silt Barrier**. The gravel distribution bed shall be covered in its entirety with a geotextile ("filter fabric") silt barrier. Filter fabric shall either be polyester, nylon or polypropylene, or any combination thereof, and shall be suitable for underdrain applications. Filter fabric shall be non-woven, shall not act as a wicking agent and shall be permeable.
7. **Soil Cover**
   a. **Material**. A continuous soil cover shall be placed over the entire distribution bed. The soil cover shall consist of a medium, loamy-textured soil.
   b. **Depth**. Soil cover depth shall be a minimum of 12 inches and a maximum of 18 inches over the top of the distribution bed. Soil cover over the distribution bed shall be crowned to promote rainfall runoff, and compacted by track-rolling, minimum two passes.
   c. **Lateral Extension**. The soil cover shall extend a minimum of 4 feet beyond the perimeter edge of the gravel bed in the upslope and sideslope directions. In the

down-slope direction, the soil cover extension beyond the down-slope edge of the gravel bed shall vary according to slope as follows:

Ground Slope (%)	Soil Fill Extension (ft)
0-2	4
3-4	6
5-6	8
7-8	10
9-10	12
11-12	14
13-14	16
15-16	18
17-20	20

8. **Dual At-Grade Systems**

   a. **Dual System Requirement**. Dual At-grade systems shall be required for any system where, due to space constraints, the soil cover run-out of the primary At-grade overlaps the soil cover run-out area of the secondary At-grade.

   b. **Distribution Bed Placement**. Dual At-grade systems shall have at least two distinctly separate distribution beds. The beds may be placed with one continuous soil cover fill or with independent soil cover fill. The distribution beds may be placed end-to-end or upslope/down-slope of one another, subject to meeting minimum sizing requirements determined from basal area and linear loading criteria per D.5(f) above.

   c. **Distribution Bed Separation**. The minimum lateral (i.e., end-to-end) separation between distribution beds for dual At-grade systems shall be six feet.

   d. **Alternate Dosing**. The distribution beds for At-grade systems shall be designed and operated to provide alternate dosing and resting of the beds.

9. **Inspection Wells**. A minimum of three (3) inspection wells shall be installed within and around At-grade systems as follows:

   a. One shall be located near the center of the At-grade system, extending from the fill surface to the bottom of the gravel distribution bed.

   b. One shall be located 5 to 10 feet upslope of the At-grade system, midway along the length of the At-grade, extending from the ground surface to a depth of 5 feet or to contact with an impermeable substratum, whichever is less.

   c. One shall be located midway along the down-slope length of the At-grade, within 5 to 10 feet from the toe of the fill slope, extending from ground surface to a depth of 5 feet or to contact with an impermeable substratum, whichever is less.

   d. Inspection wells shall be constructed of 2" to 4" diameter pipe, equipped with a wrench-tight cap or pipe plug and a bottom cap. All wells shall be perforated

beginning at a depth of 18 inches below grade and extending to the bottom of the pipe. Perforations shall consist of hacksaw slots at nominal 1" spacing, or equivalent commercially-slotted pipe. To prevent surface water infiltration, inspection wells shall be sealed with a bentonite or concrete annular seal (or equivalent), extending from the ground surface to depth of 12 inches, minimum.

E. ENGINEERING PLANS AND CONSTRUCTION

1. **Reference Guidelines**. Construction of At-grade systems shall be in accordance with guidelines contained in the following references:

   a. "Wisconsin At-grade Soil Absorption System Siting, Design and Construction Manual", Small Scale Waste Management Project, University of Wisconsin-Madison, 1990.

   b. "Onsite Wastewater Treatment Systems Manual", U.S. Environmental Protection Agency, February 2002.

   c. "At-grade Component Using Pressure Distribution Manual for Private Onsite Wastewater Treatment Systems", State of Wisconsin, Department of Commerce, 1999.

2. **Engineering Plans.** Engineering plans for At-grade systems shall include:

   a. All relevant elevation data and hydraulic calculations;

   b. Specific step-by-step construction guidelines and notes for use by the installer;

   c. Erosion control plan;

   d. Recommended make and model of all components;

   e. Recommended pump system components, with cut-sheet depicting float settings;

   f. Control panel programming; and

   g. An inspection schedule listing critical control points.

3. Construction Inspection. At a minimum, inspection of the At-grade system installation should include the following. This is in addition to inspection work required for a supplemental treatment system, if used. Joint inspection by the designer, contractor, and DEH may be required.

- Pre-construction inspection where the construction staking or marking of the At-grade system is provided and construction procedures discussed;
- Water tightness of septic tank and dosing (pump) tank;
- Clearing and ripping/plowing of the At-grade basal area soils;
- Pea gravel distribution bed and piping installation;

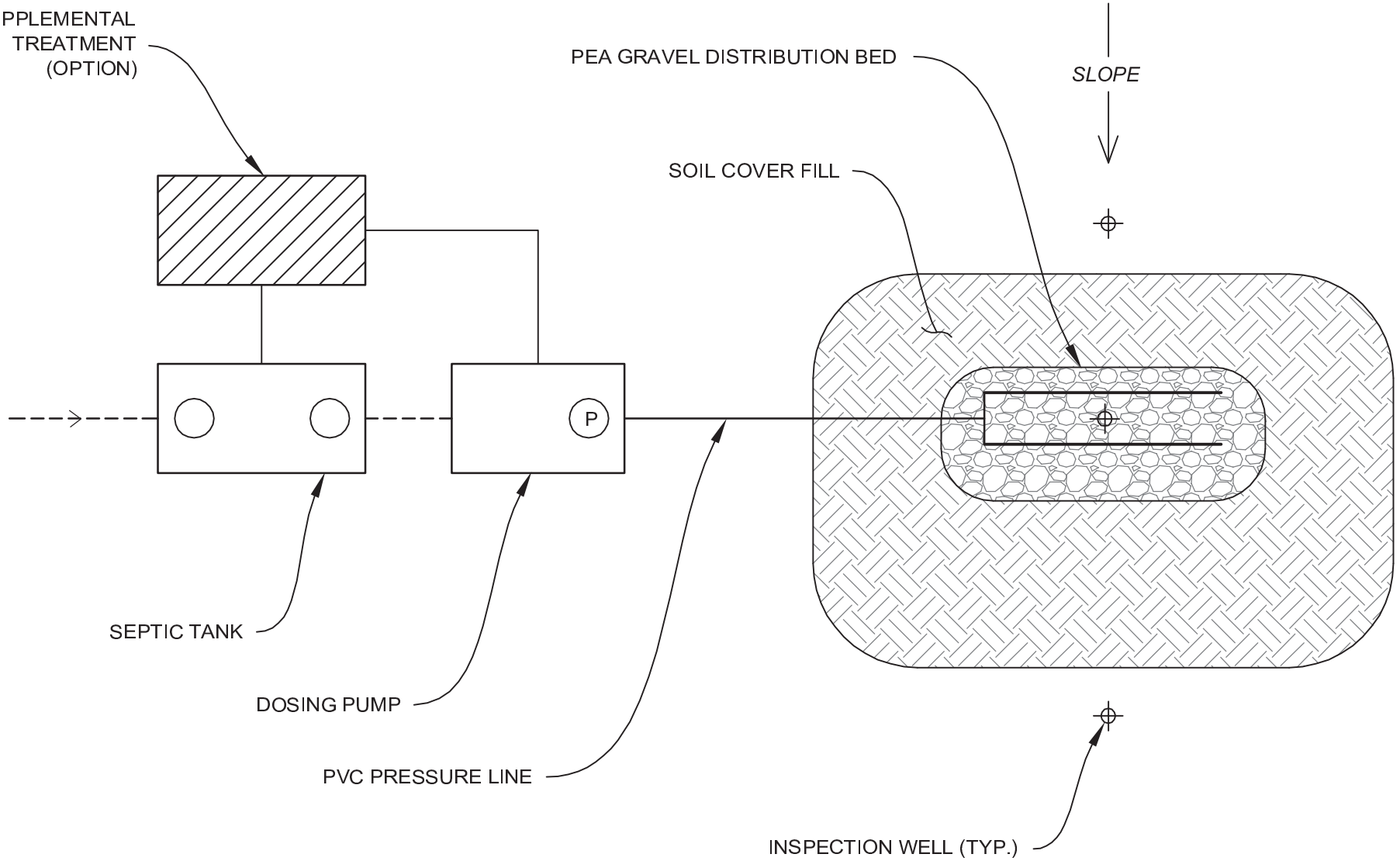
- Hydraulic ("squirt") test of the distribution system;
- Functioning and setting of all control devices;
- Placement of filter fabric silt barrier and soil cover;
- Final Inspection to verify that all construction elements are in conformance with the approved plans and specifications, all inspection wells are installed; and erosion control has been completed.

F. MANAGEMENT REQUIREMENTS

Recommended minimum procedures and frequency for inspection, maintenance, monitoring and reporting activities for At-grade systems are outlined in **Table AG-4**.

Table AG-4. At-grade System Management Requirements

	Work	Frequency
Inspection	• Conduct routine visual observations of At-Grade fill and downslope area and surroundings for wet areas, pipe leaks or damage, soil erosion, drainage issues, abnormal vegetation, gophers or other problems. • Perform all inspections of pump and appurtenances (per O&M manual and Performance Evaluation Guidelines, Part 5 of this Manual). • Record observations.	• Every 6 to 12 months.
Maintenance	• Purge laterals, squirt and balance • Exercise valves to ensure functionality. • Perform all maintenance work as recommended by equipment manufacturer for any special valves or other components. • Maintain fill area landscape vegetation, as applicable and as needed. • Investigate and repair erosion, drainage or other disposal field problems, as needed. • Investigate and perform distribution system corrective work, as needed. • Record work done.	• Distribution system maintenance annually. • Other maintenance as required.
Water Monitoring & Sampling	• Measure and record water levels in observation wells in distribution bed and around system perimeter. • Obtain and analyze water samples from monitoring wells, as applicable, per permit requirements.	• Measure dispersal system water levels annually. • Other monitoring according to permit conditions, as applicable.
Reporting	• Report findings to DEH per permit requirements. • Standard report to include dates, observation and monitoring well readings and other data collected, work performed, corrective actions taken, and performance summary. • Report public health/water quality emergency to DEH immediately.	• According to permit conditions, typically every 1 to 2 years, depending on system size, usage, history, location.



AT-GRADE SYSTEM
SCHEMATIC

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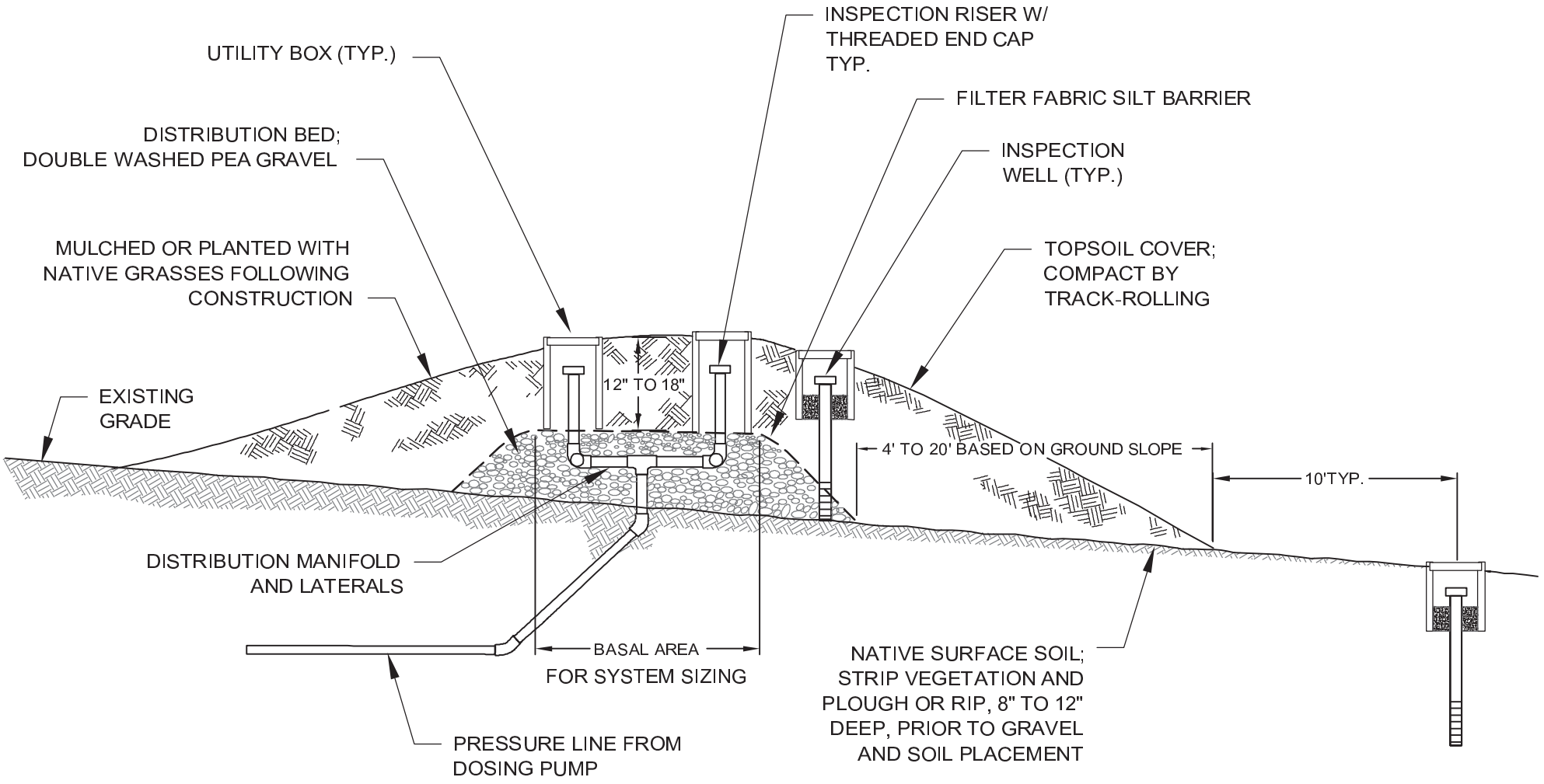

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AT-GRADE SYSTEM
CROSS-SECTION

GUIDELINES FOR
PRESSURE-DOSED SAND TRENCH SYSTEMS

A. DESCRIPTION

Pressure-dosed sand trench (PDST) systems are a variation of a shallow pressure distribution system that utilizes a medium-grade sand in place of a portion of the gravel backfill in the dispersal trench, to improve treatment of effluent and normalize the flow of effluent before it reaches the trench bottom. Treatment occurring in the sand fill can enhance the acceptance rate of native soils beneath the trench. This type of design can also be used with supplemental treatment, and is well suited for conditions where underlying soils are highly permeable and/or groundwater beneath a system is especially vulnerable to wastewater contaminants.

B. CONSTRAINTS ADDRESSED

1. High groundwater; and
2. Rapid percolation.

C. SITING CRITERIA

1. **Setbacks**. Horizontal setback requirements for PDST systems shall be those applicable to conventional dispersal fields, as specified in Santa Clara County Code section B11-67.
2. **Vertical Separation Requirements.**
    a. **Depth to Groundwater.** Minimum depth to seasonal high groundwater for PDST systems, as measured from trench bottom, shall vary according to soil percolation rate, level of treatment provided, and sand fill thickness as shown in **Table PDST-1**.
    b. **Soil Depth**. Minimum depth of soil, as measured from ground surface to impermeable soil or rock, for PDST systems shall be 2 feet.

Table PDST-1
Minimum Groundwater Separation Requirements for Shallow PD System
(feet, below sand-soil interface)

Percolation Rate (MPI)	Depth to Groundwater	
	Primary Treatment	Supplemental Treatment
1-5	3[1]	2[2]
6 - 120	2[2]	2[3]

[1] 24-inch sand thickness
[2] 12-inch sand thickness
[3] 6-inch sand thickness

3. **Percolation Rate**. Average percolation rate for PDST systems shall be within the range of 1 to 120 minutes per inch (MPI), as determined in accordance with standard percolation requirements for conventional dispersal trenches.

4. **Ground Slope**.

    a) Maximum ground slope in areas used for shallow PDST systems shall be 40 percent.

    b) Any PDST system located on slopes greater than 20 percent shall require the completion of a geotechnical report and slope stability analysis as specified in Santa Clara County Code section B11-83.

5. **Dual System**. Per Santa Clara County Code section B11-67(d), two PDST dispersal fields, each one hundred percent of the total size required for the design sewage flow, shall be installed and interconnected with an approved flow diversion device (pressure-rated), intended to allow alternate use of the two fields.

D. DESIGN CRITERIA

1. **Treatment**. The following treatment requirements shall apply in connection with the use of PDST systems:

    a. Primary (septic tank) treatment shall be the minimum level of treatment, and shall be acceptable where the applicable vertical separation distances are met per **Table PDST-1**.

    b. Supplemental treatment, using an approved alternative treatment system identified in this Manual, may be used to allow compliance with reduced vertical separation distances as provided in **Table PDST-1**.

2. **Design Sewage Flow**: PDST systems shall be designed on the basis of the projected sewage flow for the structure or facility being served, determined in accordance with sewage flow estimation guidelines in Part 3 of this Manual.

3. **Pressure Dosing**. Septic tank effluent shall be applied to the PDST system by pressure dosing, utilizing either an automatic dosing siphon or pump system. The pressure distribution system shall be designed in accordance with accepted engineering practices to achieve, at a minimum:

    a. Uniform dosing of septic tank effluent throughout the system of PDST trenches;

b. Adequate flow rate, screening of effluent and suitable piping network to preclude solids accumulation in the pipes or clogging of discharge orifices;

c. Suitable access provisions for inspection, testing and adjustment of the pressure distribution system; and

d. Dosing volume to achieve minimum of 3 to 5 doses per day at design flow conditions.

Additional requirements for design and construction of pressure distribution piping systems contained in "Guidelines for Shallow Pressure Distribution Systems" shall also apply.

4. **Pump System.** The pump system shall be: (a) appropriate for sewage applications; (b) of the size and type to meet the hydraulic design requirements; and (c) designed and constructed in accordance with pump system requirements provided in Part 3 of this Manual.

5. **Drainfield Trenches.** PDST drainfield trenches shall conform to the same design and construction requirements as shallow PD trenches, per this Manual, with the exception that the trench filter material (below the distribution pipe) shall consist of a minimum of 6 inches of double-washed pea gravel underlain by 6 to 24 inches of medium sand fill, per **Table PDST-1** and paragraph D.7.b.

6. **Trench Width.** Trench widths for PDST systems be as follows:

a. For septic tank effluent: 18 to 36 inches

b. With supplemental treatment: 12 to 36 inches

7. **Sand Fill.**

a. **Sand Specifications**. The sand media shall be a medium to coarse sand that meets the following gradation specifications:

Sieve Size	Percent Passing
3/8	100
#4	90 – 100
#10	62 – 100
#16	45 – 82
#30	25 – 55
#50	5 – 20
#60	0 – 10
#100	0 – 4
#200	0 – 2

Documentation of laboratory sieve analysis results for the proposed sand fill material shall be supplied to DEH to verify conformance with the above specifications.

b. **Depth of Sand**. The minimum depth of sand below the drain rock shall be as follows:

i. For septic tank effluent:
- 1-5 MPI percolation: 24”
- 6-120 MPI percolation: 12”

ii. With supplemental treatment:
- 1-5 MPI percolation: 12”
- 6-120 MPI percolation: 6”

8. **Wastewater Application Rates.** Wastewater application rates used for system sizing shall include consideration of both the: (a) pea gravel –sand interface; and (b) sand-soil interface, bottom area only. The more restrictive criterion shall govern system sizing.

a. **Pea Gravel – Sand Interface.** The wastewater application rate used for sizing the pea gravel-sand interface shall be:

i. 1.2 gpd/ft^2 for individual residential OWTS.

ii. 1.0 gpd/ft^2 for commercial, industrial, institutional and multi-residential OWTS.

b. **Sand – Soil Interface.** The wastewater application rate for sizing the sand-soil interface (considering bottom area only) shall be based upon representative percolation test results for the soil zone corresponding with trench bottom depth as shown in **Table PDST-2**.

Table PDST-2. Wastewater Application Rates[1]

Percolation Rate (MPI)	Wastewater Loading Rate (gpd/ft^2)
1-5	1.2
10	1.2
24	1.2
30	1.12
45	0.68
60	0.53
90	0.25
91-120	0.2

[1] Interpolate between reference values for other percolation rates; see end of Part 4 an expanded table listing interpolated values.

Reduction in the above wastewater loading rates or other provisions to insure the long-term integrity and performance of the PDST trenches may be required for high

strength waste flows, such as from restaurants.

9. **Trench Sizing**. The required square footage of trench infiltrative surface shall be calculated based on the design flow and the applicable wastewater application rates per paragraphs 8a and 8b. The required length of trench shall be calculated based on the bottom area only, up to a maximum of 3 square feet of effective infiltrative surface per lineal foot of trench.

10. **Inspection Wells**. A minimum of three (3) inspection wells shall be installed within and around PDST systems for the purpose of checking groundwater levels periodically, and may also be used for water quality sampling, as needed. Inspection wells shall extend to a depth of 3 feet below the bottom of the PDST trenches or to contact with impermeable materials, whichever is less. The inspection wells shall be located and constructed as follows:

    a. One shall be located upslope of the dispersal field, typically 10 to 15 away, to serve as a background or control well;

    b. One shall be located within the dispersal field, typically between trenches near the center of the field;

    c. One shall be located down-slope of the dispersal field, typically 10 to 25 feet horizontally from the lowest trench(es), and positioned to provide a representative point for monitoring the area estimated to be in the probable flow path of percolating wastewater;

    d. Inspection wells shall be constructed of 2" to 4" diameter pipe, equipped with a wrench-tight cap or pipe plug and a bottom cap. All wells shall be perforated beginning at a depth of 18 inches below grade and extending to the bottom of the pipe. Perforations shall consist of hacksaw slots at nominal 1" spacing, or equivalent commercially-slotted pipe. To prevent surface water infiltration, inspection wells shall be sealed with a bentonite or concrete annular seal (or equivalent) to a depth of 12 inches, minimum.

11. **Trench Inspection Wells**. A minimum of two (2) inspection wells shall be installed within each trench for the purpose of checking ponded water levels periodically. One well shall extend to the trench bottom, and a second well shall extend to pea gravel-sand fill interface. The trench inspection wells shall preferably be located at the end of each trench.

E. ENGINEERING PLANS AND CONSTRUCTION

1. **Reference Guidelines**. In addition to the requirements set forth herein, design and construction of PDST systems shall generally follow guidelines contained in the following references:

a. "Onsite Wastewater Treatment Systems Manual", U.S. Environmental Protection Agency, February 2002 and as amended.

b. "Design Manual – Onsite Wastewater Treatment and Disposal Systems", U.S. Environmental Protection Agency, October 1980.

2. **Engineering Plans.** Engineering plans for PDST systems shall include:

   a. All relevant elevation data and hydraulic calculations.

   b. Specific step-by-step construction guidelines and notes for use by the installer.

   c. Erosion control plan for any site over 20% slope, utilizing cover fill or with design flow >1,000 gpd;

   d. Recommended make and model of all components;

   e. Recommended pump system components with cut-sheet depicting float settings;

   f. Control panel programming;

   g. An inspection schedule listing critical control points.

3. **Construction Inspection.** At a minimum, inspection of the PDST system installation should include the following. This is in addition to inspection work required for a supplemental treatment system, if used. Joint inspection by the designer, contractor, and DEH may be required.

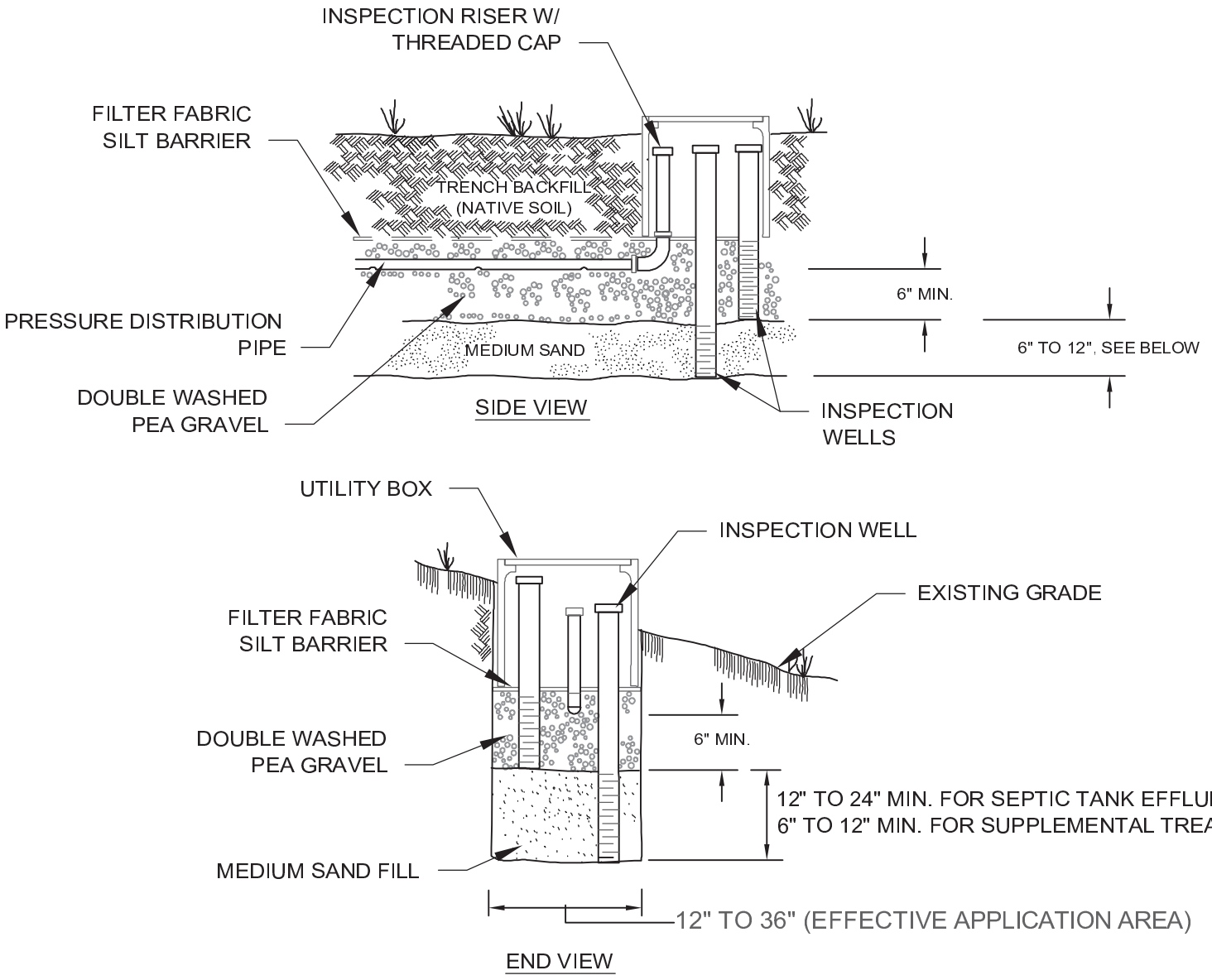
   - Pre-construction inspection where the construction staking or marking of the various system components is provided and construction procedures discussed;
   - Water tightness of septic tank and dosing (pump) tank;
   - Layout and excavation of dispersal trenches and piping;
   - Sand and drain rock materials and placement;
   - Piping installation and hydraulic ("squirt") test of the distribution system;
   - Functioning and setting of all control devices; and
   - Final Inspection to verify that all construction elements are in conformance with the approved plans and specifications, all performance wells are installed; and erosion control has been completed.

F. MANAGEMENT REQUIREMENTS.

Recommended minimum procedures and frequency for inspection, maintenance, monitoring and reporting activities for pressure-dosed sand trench systems are outlined in **Table PDST-3.**

Table PDST-3. Pressure-dosed Sand Trench Management Requirements

	Work	Frequency
Inspection	• Conduct routine visual observations of disposal field and downslope area and surroundings for wet areas, pipe leaks or damage, soil erosion, drainage issues, abnormal vegetation, or other problems. • Perform all inspections of pump and appurtenances (per O&M manual and Performance Evaluation Guidelines, Part 5 of this Manual).	• Every 6 to 12 months.
Maintenance	• Purge laterals, squirt and balance. • Exercise valves to ensure functionality. • Perform all maintenance work as recommended by equipment manufacturer for any special valves or other components. • Investigate and repair erosion, drainage or other disposal field problems, as needed. • Investigate and perform distribution system corrective work, as required. • Record work done.	• Distribution system maintenance annually. • Other maintenance as required.
Water Monitoring & Sampling	• Measure and record water levels in (2) types of trench observation wells: 1) extending to the pea gravel-sand interface; and 2) extending to sand-soil interface. • Measure and record water levels in dispersal field monitoring wells, as applicable, per permit requirements. • Obtain and analyze water samples from monitoring wells, as applicable, per permit requirements.	• Report findings to County per permit requirements. • Report any continuous ponding at sand interface that may indicate the formation of restrictive biomat. • Standard report to include dates, observation well and monitoring well readings and other data collected, work performed, corrective actions taken, and performance summary. • Report public health/water quality emergency to County immediately.
Reporting	• Report findings to DEH per permit requirements. • Standard report to include dates, observation well and monitoring well readings and other data collected, work performed, corrective actions taken, and performance summary. • Report public health/water quality emergency to DEH immediately.	• According to permit conditions, typically every 1 to 2 years, depending on system size, usage, history, location.



PRESSURE DOSED SAND TRENCH

GUIDELINES FOR
RAISED SAND FILTER BED

A. DESCRIPTION

A raised sand filter bed, sometimes referred to as a bottomless sand filter, combines features of an intermittent sand filter and a mound system. It consists of a raised or terraced sand bed, commonly supported by a low retaining wall or bulkhead, where the bottom surface is even with or slightly below ground surface and forms the absorption surface. This alternative is intended to be used only for repair or replacement OWTS, not to serve new construction. The system may be designed for use with or without supplemental treatment ahead of the raised sand bed. The raised sand filter bed provides additional polishing treatment and final dispersal of water into the ground.

B. CONSTRAINTS ADDRESSED

1. High groundwater;
2. Shallow soil over fractured rock or coarse alluvium
3. Shallow soil over impermeable soil or bedrock;
4. Slow percolation at standard dispersal trench depths;
5. Moderately steep slopes; and
6. Limited dispersal area.

C. SITING CRITERIA

1. **Setbacks**. Horizontal setback requirements for raised sand filter beds shall be those applicable to conventional disposal fields, as specified in Santa Clara County Code section B11-67.
2. **Vertical Separation Requirements.**
    a. **Depth to Groundwater.** Minimum depth to seasonal high groundwater shall be 2 feet below ground surface. For percolation rates faster than 5 mpi, depth to groundwater shall be 3 feet.
    b. **Soil Depth**. Minimum depth of soil, as measured from ground surface to impermeable soil or bedrock, shall be 2 feet. This soil depth requirement shall

apply within the disposal field and in the adjacent area extending a distance of 25-feet downslope of the raised sand filter bed.

c. **Depth to Fractured Rock**. Minimum depth of soil, as measured from ground surface to fractured, permeable rock or coarse alluvium, shall be 2 feet. This soil depth requirement shall apply within the disposal field and in the adjacent area extending a distance of 25-feet downslope of the raised sand filter bed.

3. **Percolation Rate**. Average percolation rate for raised sand filter bed systems shall be within the range of 1 to 60 minutes per inch (MPI), as determined from testing at 2 to 3 feet depth. These percolation requirements shall apply within the disposal field and in the adjacent area extending a distance of 25 feet downslope of the raised sand filter bed.

4. **Ground Slope**.

   a. Maximum ground slope for raised sand filter beds shall be 30%.

   b. Any raised sand filter bed system located on slopes greater than 20 percent shall require the completion of a geotechnical report and slope stability analysis as specified in Santa Clara County Code section B11-83.

5. **Dual System**. Per Santa Clara County Code section B11-67(d), two raised sand filter beds, each one hundred percent of the total size required for the design sewage flow, shall be installed and interconnected with an approved flow diversion device, intended to allow alternate use of the two beds.

D. DESIGN CRITERIA

1. **Treatment**. The following treatment requirements shall apply in connection with the use of raised sand filter bed systems:

   a. Primary (septic tank) treatment shall be the minimum level of treatment, and shall be acceptable where the design includes sand fill depth of 24 inches.

   b. Supplemental treatment, using an approved alternative treatment system identified in this Manual, may be used to allow reduction of the sand fill depth to 12 inches.

2. **Design Sewage Flow**. Raised sand filter bed systems shall be designed on the basis of the projected sewage flow, determined in accordance with sewage flow estimation guidelines in Part 3 of this Manual.

3. **Pressure Dosing**. Wastewater effluent from the supplemental treatment system shall be applied to the raised sand filter bed system by pressure dosing, utilizing a pump system. The pressure distribution system shall be designed in accordance with accepted engineering practices to achieve, at a minimum:

    a. Uniform dosing of effluent over the surface application area of the raised sand filter bed;

    b. Adequate flow rate, screening of effluent and suitable piping network to preclude solids accumulation in the pipes or clogging of discharge orifices;

    c. Suitable access provisions for inspection, testing and adjustment of the pressure distribution system;

    d. Dosing volume to achieve a minimum of 3 to 5 doses per day at design flow conditions; and

    e. At least one distribution lateral for every 36 inches of distribution bed width.

    Additional requirements for design and construction of pressure distribution piping systems contained in "Guidelines for Shallow Pressure Distribution Systems" shall also apply.

4. **Pump System.** The pump system shall be: (a) appropriate for sewage applications; (b) of the size and type to meet the hydraulic design requirements; and (c) designed and constructed in accordance with pump system requirements provided in Part 3 of this Manual.

5. **Containment Liner.** The raised sand filter bed shall be provided with an impermeable containment liner along all sides of the filter bed to prevent lateral leakage out of or into the filter. The liner shall extend a minimum of 12 inches below native grade. The liner shall consist of either: (a) 30 mil plastic; (b) reinforced poured-in-placed concrete; or (c) an equivalent impermeable structure.

6. **Finished Grade**. The finished grade of the raised sand filter bed shall be above the surrounding ground elevation. Above-ground installation shall be structurally supported with retaining wall(s), as required.

7. **Bed Width**. Maximum width of the sand bed shall be 10 feet.

8. **Shape**. The raised sand filter bed shall not be restricted as to its shape in plan view.

9. **Multiple Units**. The raised sand filter bed may be divided into compartments or multiple units.

10. **Sand Filter Media.**

a. **Sand Specification**. The sand media shall be a medium to coarse sand that meets the following gradation specifications:

Sieve Size	Percent Passing
3/8	100
#4	90 – 100
#10	62 – 100
#16	45 – 82
#30	25 – 55
#50	5 – 20
#60	0 – 10
#100	0 – 4
#200	0 – 2

Documentation of laboratory sieve analysis results for the proposed sand fill material shall be supplied to DEH to verify conformance with the above specifications.

b. **Sand Depth**. The minimum depth of sand fill, below the gravel distribution bed, shall be 24 inches for septic tank effluent, and 12 inches for supplemental treatment.

11. **Wastewater Application Rate**. The wastewater application rate used for sizing the basal area of the sand filter bed (i.e., sand-soil interface) shall vary according to soil percolation rate of the native soil as follows:

Table RB-1

Basal Wastewater Application Rates for Raised Sand Filter Beds[1]

Percolation Rate (MPI)	Wastewater Application Rate (gpd/ft^2)
1-5	1.2
10	1.2
24	1.2
30	1.12
45	0.68
60	0.53
90	0.25
91-120	0.2

[1] Interpolate between reference values for other percolation rates; See end of Part 4 for an expanded table listing interpolated values.

Reduction in the above wastewater loading rates or other provisions to insure the long-term integrity and performance of the raised sand filter bed may be required for high strength waste flows, such as from restaurants.

12. **Minimum Basal Area Sizing.** Minimum size (ft^2) of the basal area of the raised sand filter bed shall be determined by dividing the design wastewater flow (in gpd) by the applicable wastewater loading rate per **Table RB-1**.

13. **Linear Loading Rate.** The length of the raised bed shall be sized to meet maximum linear loading rate criterion as follows:

    a. **Effective Length**. The effective length (L) of the raised bed for determining the linear loading rate shall be the total length of the raised bed along the downslope edge.

    b. **Wastewater Flow**. The wastewater flow used for determining the linear loading rate shall be as follows:

        - 100 gpd/bedroom for residential septic systems (note: 150 gpd/bedroom used for system design);
        - design sewage flow rate for commercial, institutional, industrial and multi-residential septic systems.

    c. **Loading Rate**. Maximum linear loading rates for raised sand filter bed systems sizing shall vary according to soil depth, ground slope, and percolation rate as indicated in **Table RB-2.** If a variance from these criteria is proposed, it must be supported by detailed groundwater mounding analysis carried out in accordance with accepted methodology and/or scientific references dealing with water movement in soils and utilizing site specific hydraulic conductivity data.

Table RB-2. Maximum Linear Loading Rates (gpd/lineal foot)

Soil Depth (ft)	Ground Slope (%)	Percolation Rate (MPI)		
		1-30	31-60	61-120
2 to 2.5	0-10	5	4	3
	11-20	6	5	4
2.5 to 3	0-10	7	6	5
	11-20	8	7	6
3 to 4	0-10	9	8	7
	11-20	10	9	8
> 4	0-10	11	10	9
	11-20	12	11	10

14. **Gravel Distribution Bed.**
    a. **Material**. The distribution bed shall consist of 3/8-inch double-washed pea gravel, substantially free of fines.

    b. **Depth**. Pea gravel shall extend a minimum of 6 inches below the invert and 2 inches above the top of the distribution piping. If the distribution piping is installed with chambers, the pea gravel depth below the distribution pipe may be reduced from 6 inches to 4 inches, and the 2-inch pea gravel cover may be eliminated.

15. **Silt Barrier**. The gravel distribution bed shall be either polyester, nylon or polypropylene, or any combination thereof, and shall be suitable for underdrain applications. Filter fabric shall be non-woven, shall not act as a wicking agent and shall be permeable.

16. **Soil Cover**.
    a. **Material**. A soil cover shall be placed over the distribution bed, consisting of a medium, loamy-textured soil.

    b. **Depth**. Soil cover depth shall be a minimum of 12 inches and a maximum of 18 inches over the top of the distribution bed. Soil cover shall be crowned or sloped to promote rainfall runoff.

17. **Inspection Wells**. A minimum of four (4) inspection wells shall be installed within and around raised sand filter bed as follows:

    a. One shall be located near the center of the raised bed, extending from the fill surface to the bottom of the gravel distribution bed.

    b. One shall be located near the center of the raised bed, extending from the fill surface to the sand-soil interface.

    c. One shall be located 5 to 10 feet upslope of the raised bed system, midway along the length of the at-grade, extending from the ground surface to a depth of 5 feet or to contact with impermeable materials, whichever is less.

    d. One shall be located midway along the downslope length of the raised bed, within 10 to 15 feet from the edge of the bed, extending from ground surface to a depth of 5 feet or to the depth of impermeable materials, whichever is less.

    e. Inspection wells shall be constructed of 2" to 4" diameter pipe (or equivalent), equipped with a wrench-tight cap or pipe plug and a bottom cap. All wells shall be perforated beginning at a depth of 18 inches below grade and extending to the bottom of the pipe. Perforations shall consist of hacksaw slots at nominal 1" spacing

or commercially-slotted pipe. Inspection wells shall be sealed with a bentonite or concrete annular seal (or equivalent) to prevent surface infiltration.

E. ENGINEERING PLANS AND CONSTRUCTION

1. **Engineering Plans.** Engineering plans for raised sand filter bed systems shall include:
   a. All relevant elevation data and hydraulic calculations;
   b. Design layout and details for sand filter bed construction;
   c. Specific step-by-step construction guidelines and notes for use by the installer;
   d. Erosion control plan;
   e. Recommended make and model of all components;
   f. Recommended pump system components with cut-sheet depicting float settings;
   g. Control panel programming; and
   h. An inspection schedule listing critical control points.

2. **Construction Inspection.** At a minimum, inspection of the raised sand filter bed system installation should include the following. This is in addition to inspection work required for a supplemental treatment system, if used. Joint inspection by the designer, contractor, and DEH may be required.

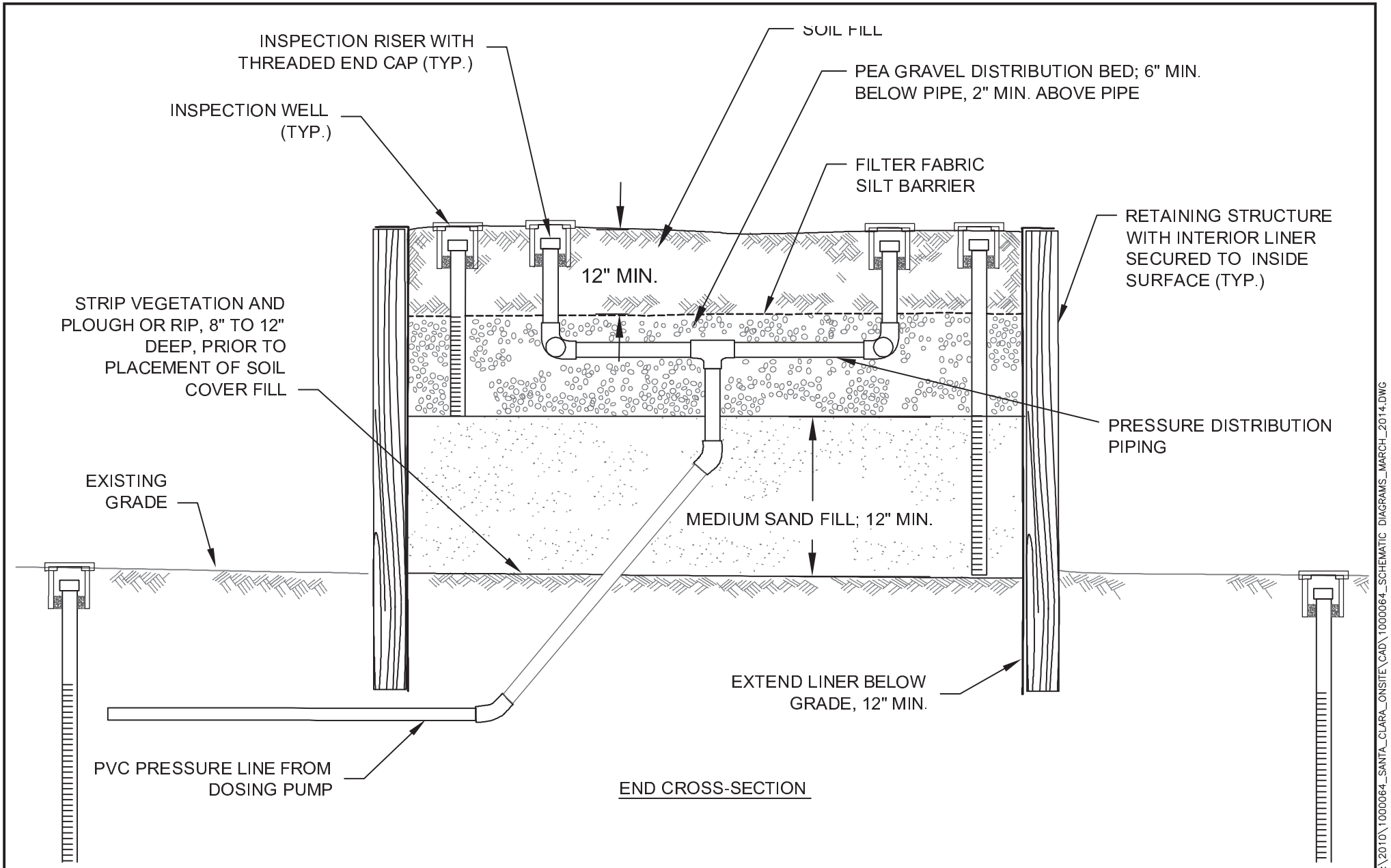
   - Pre-construction inspection where the construction staking or marking of the raised sand filter bed is provided and construction procedures discussed;
   - Water tightness of dosing (pump) tank;
   - Raised sand bed dimensions, structure and liner;
   - Sand material and placement;
   - Piping installation and hydraulic ("squirt") test of the distribution system;
   - Function and setting of all control devices.
   - Final Inspection to verify that all construction elements are in conformance with the approved plans and specifications, all inspection wells are installed, and erosion control has been completed.

F. MANAGEMENT REQUIREMENTS

Recommended minimum procedures and frequency for inspection, maintenance, monitoring and reporting activities for pressure-dosed sand trench systems are outlined in **Table RB-3.**

Table RB-3. Raised Sand Filter Bed System Management Requirements

	Work	Frequency
Inspection	• Conduct routine visual observations of sand filter bed system and perimeter area and surroundings for wet areas, pipe leaks or damage, structural condition of filter bed, soil erosion, drainage issues, abnormal vegetation, gophers or other absorption field problems. • Perform all inspections of pump and appurtenances (per O&M manual and Performance Evaluation Guidelines, Part 5 of this Manual). • Record observations.	• Every 6 to 12 months.
Maintenance	• Purge laterals, squirt and balance. • Exercise valves to ensure functionality. • Perform all maintenance work as recommended by equipment manufacturer for any special valves or other components. • Maintain sand filter bed surface landscape vegetation, as req'd. • Investigate and repair erosion, drainage, structural problems or other problems, as needed. • Investigate and perform distribution system corrective work, as req'd • Record work done.	• Distribution system maintenance annually. • Other maintenance as required.
Water Monitoring & Sampling	• Measure and record water levels in observation wells in distribution bed, sand fill and around system perimeter. • Obtain and analyze water samples from monitoring wells, as applicable, per permit requirements.	• Measure system water levels annually. • Other monitoring according to permit conditions, as applicable.
Reporting	• Report findings to DEH per permit requirements. • Standard report to include dates, observation well and monitoring well readings and other data collected, work performed, corrective actions taken, and performance summary. • Report public health/water quality emergency to DEH immediately.	• According to permit conditions, typically every 1 to 2 years, depending on system size, usage, history, location.



RAISED SAND FILTER BED

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GUIDELINES FOR
SUBSURFACE DRIP DISPERSAL

A. DESCRIPTION

Subsurface drip dispersal is a method for disposal of treated wastewater that uses special drip tubing designed for use with wastewater. The dripline is placed normally 8 to 12 inches below ground surface and makes use of the most biologically active soil zone for distribution, nutrient uptake and evapotranspiration of the wastewater. A drip dispersal system is comprised of small-diameter (½" to 1") laterals ("driplines"), usually spaced about 24 inches apart, with small-diameter emitters (1/8") located at 12 to 24 inches on-center along the dripline. Effluent is conveyed under pressure to the laterals, normally with timed doses. Prior to dispersal the effluent requires supplemental treatment.

Drip dispersal has several advantages, including: (a) it can be effective in very shallow soil conditions since it distributes the wastewater very uniformly to substantially all of the available soil in the field; (b) it can be installed in multiple small discontinuous "zones", allowing the hydraulic load to be spread widely rather than concentrated in one main area; (c) installation on steeper slopes causes less soil disturbance and erosion or slope stability hazards; and (d) water movement away from the drip emitters is substantially by unsaturated/capillary flow, which maximizes contact with and treatment by the soil.

B. CONSTRAINTS ADDRESSED

1. High groundwater;
2. Shallow soil over impermeable soil or bedrock;
3. Shallow soil over fractured rock or coarse alluvium;
4. Slow percolation at standard dispersal trench depths;
5. Steep slopes;
6. Limited dispersal area; and
7. Large and/or dense tree cover.

C. SITING CRITERIA

1. **Setbacks**. Horizontal setback requirements for drip dispersal systems shall be those applicable to conventional disposal fields, as specified in Santa Clara County Code section B11-67.

2. **Vertical Separation Requirements.**

    a. **Depth to Groundwater.** Minimum depth to seasonal high groundwater, as measured from the bottom of the dripline, shall vary according to soil percolation rate as follows:

Percolation Rate, MPI	Depth to Groundwater
1-5	3 feet*
6-120	2 feet

*Note: Where drip dispersal field is combined with a raised sand filter bed, the depth to groundwater may be reduced to 2 feet, as measured from ground surface.

    b. **Soil Depth**. Minimum depth of soil, as measured from the bottom of the dripline to impermeable soil or rock, shall be 2 feet.

3. **Percolation Rate**. Percolation rates for subsurface drip dispersal systems shall be within the range of 1 to 120 minutes per inch (MPI), as determined by testing at depths of 12" to 24".

4. **Ground Slope**.

    a. Maximum ground slope in areas used for drip dispersal shall be 50 percent.

    b. Any drip dispersal system located on slopes greater than 20 percent shall require the completion of a geotechnical report and slope stability analysis as specified in Santa Clara County Code section B11-83.

5. **Dual System**. Per Santa Clara County Code section B11-67(d), two drip dispersal fields, each one hundred percent of the total size required for the design sewage flow, shall be installed and interconnected with an approved flow diversion device (pressure-rated), to allow alternate or combined use of the two fields.

D. DESIGN CRITERIA

1. **Treatment**: The following treatment requirements shall apply in connection with the use of subsurface drip dispersal systems:

    a. Wastewater effluent discharged to any drip dispersal system shall be treated to at least a secondary level through an approved supplemental treatment system, in accordance with applicable guidelines provided in this Manual.

    b. All drip dispersal systems shall include a filtering device capable of filtering particles larger than 100 microns; this device shall be located downstream of the supplemental treatment system.

2. **Design Sewage Flow**: Subsurface drip dispersal systems shall be designed on the basis of the projected sewage flow for the structure or facility being served, determined in accordance with sewage flow estimation guidelines in Part 3 of this Manual.

3. **Wastewater Application Rates:** Wastewater application rates used for sizing drip dispersal fields shall be based on soil percolation rate in accordance with the criteria in **Table DD-1.** In applying these criteria, the wastewater application area refers to the ground surface area encompassed by the drip dispersal field.

Table DD-1. Wastewater Application Rates for Subsurface Drip Dispersal Fields

Soil Type*	Soil Percolation Rate (MPI)	Wastewater Application Rate (gpd/ft^2)
Coarse Sand	1-4	1.4
Fine Sand	5-10	1.2
Sandy Loam	11-20	1.0
Loam	21-30	0.7
Clay Loam	31-45	0.6
Silt-Clay Loam	46-60	0.4
Clay, non-swell	61-90	0.2
Clay, swell	91-120	0.1

*Soil types listed for reference information only; design shall be based on site-specific percolation data.

4. **Dripfield Sizing.**

   a. Minimum sizing of the dripfield area shall be equal to the design wastewater flow divided by the applicable wastewater application rate from **Table DD-1.**

   b. For sizing purposes, effective ground surface area used for drip field sizing calculations shall be limited no more than 4.0 square feet per drip emitter. For example, 200 lineal feet of dripline with emitters at 2-foot spacing would provide a total of 100 emitters (200/2) and could be used for dispersal to an effective area of up to 400 ft^2 (100 emitters x 4 ft^2/emitter). Conversely, if wastewater flow and percolation design information indicate the need for an effective area of 1,000 ft^2, the dripline design and layout would have to be configured to provide a minimum of 250 emitters spaced over the required 1,000 ft^2 dispersal area.

   c. Dripfields may be divided into multiple zones which may be located in different areas of a site, as desired or needed to provide the required dripfield size. A single continuous dripfield area is not required. However, any areas proposed for drip dispersal shall be supported by field observations/measurements to verify conformance with soil suitability and other site requirements. Differences in soil conditions and percolation characteristics from one zone to another may require the use of correspondingly different wastewater application rates and dripfield sizing for each zone.

5. **Pressure Dosing.** Secondary-treated effluent shall be delivered to the dripfield by pressure, employing a pump system and timed dosing. The pressure distribution system shall be designed in accordance with accepted engineering practices and manufacturer recommendations for drip dispersal systems to achieve, at a minimum:

    a. Uniform dosing of treated effluent;

    b. An adequate dosing volume and pressure per manufacturer's guidelines;

    c. Adequate flow rate, final filtering of effluent and suitable piping network to preclude solids accumulation in the pipes and driplines or clogging of discharge emitters;

    d. A means of automatically flushing the filter and driplines at regular intervals; and

    e. Suitable access provisions for inspection, testing and adjustment of the dripfield and components.

    Additional requirements for design and construction of pressure distribution piping systems contained in "Guidelines for Shallow Pressure Distribution Systems" shall also apply.

6. **Pump System:** The pump system shall be: (a) appropriate for sewage applications; (b) of the size and type to meet the hydraulic design requirements; and (c) designed and constructed in accordance with pump system requirements provided in Part 3 of this Manual.

7. **Dripline Material:** Dripline shall be manufactured and intended for use with secondary quality wastewater, with minimum 45 mil tubing wall thickness, bacterial growth inhibitor(s), and means of protection against root intrusion.

8. **Dripfield Layout:** The bottom of each dripline row shall be level and parallel to the slope contour.

9. **Dripline Depth: The** dripline depth shall be installed at a depth between eight and twelve inches below native grade. Deeper placement of driplines may be considered by DEH on a case-by-case basis.

10. **Length of individual driplines**: The maximum dripline length shall be designed in accordance with accepted engineering practices and in accordance with the manufacturer's criteria and recommendations.

11. **Line and Emitter Spacing:** Line and emitter spacing shall be designed as appropriate for soil conditions, slope, and contour. Emitters shall be located at no less than 12" from the supply and return manifolds.

12. **Dual System Operation.** Unless exempted by the Director, all drip dispersal systems shall be installed as dual (200% capacity) drip fields, and shall normally be operated with both fields in use. Doses may be alternated among different zones in both the primary and

secondary fields, or all zones may be dosed simultaneously. Secondary drip fields should not be left dormant for long periods of time (e.g., more than a few weeks at a time).

13. **Inspection Wells**. A minimum of three (3) inspection wells, minimum 3 feet in depth, shall be installed for the purpose of monitoring groundwater levels or for water quality sampling within and around subsurface drip dispersal fields as follows:
    a. One well shall be located within the dripfield area.
    b. One well shall be located 10 to 15 feet up-gradient of the dripfield.
    c. One well shall be located 10 to 15 feet down-gradient of the dripfield.
    d. Inspection wells shall be constructed of 2" to 4" diameter pipe (or equivalent), equipped with a wrench-tight cap or pipe plug and a bottom cap. All wells shall be perforated beginning at a depth of 12 inches below grade and extending to the bottom of the pipe. Perforations shall consist of hacksaw slots at nominal 1" spacing, or equivalent commercially-slotted pipe. Inspection wells shall be sealed with a bentonite or concrete annular seal (or equivalent) to prevent surface infiltration.

E. ENGINEERING PLANS AND CONSTRUCTION

1. **Reference Guidelines.** Installation of subsurface drip dispersal systems shall be in accordance with applicable manufacturer guidelines and recommendations.
2. **Engineering Plans.** Engineering plans for subsurface drip dispersal systems shall include:
    a. All relevant elevation data and hydraulic calculations;
    b. Specific step-by-step construction guidelines and notes for use by the installer;
    c. Erosion control plan for any site over 20%, utilizing cover fill or with design flow >1,000 gpd;
    d. Recommended make and model of all components;
    e. Recommended pump system components, with cut-sheet depicting float settings;
    f. Control panel programming; and
    g. An inspection schedule listing critical control points.
3. **Construction Inspection.** At a minimum, inspection of the drip dispersal system installation should include the following. This is in addition to inspection work required for the treatment system. Joint inspection by the designer, contractor, and DEH may be required.
    - Pre-construction inspection where the construction staking or marking of the drip lines, supply and return piping, pump system and appurtenances is provided and construction procedures discussed;

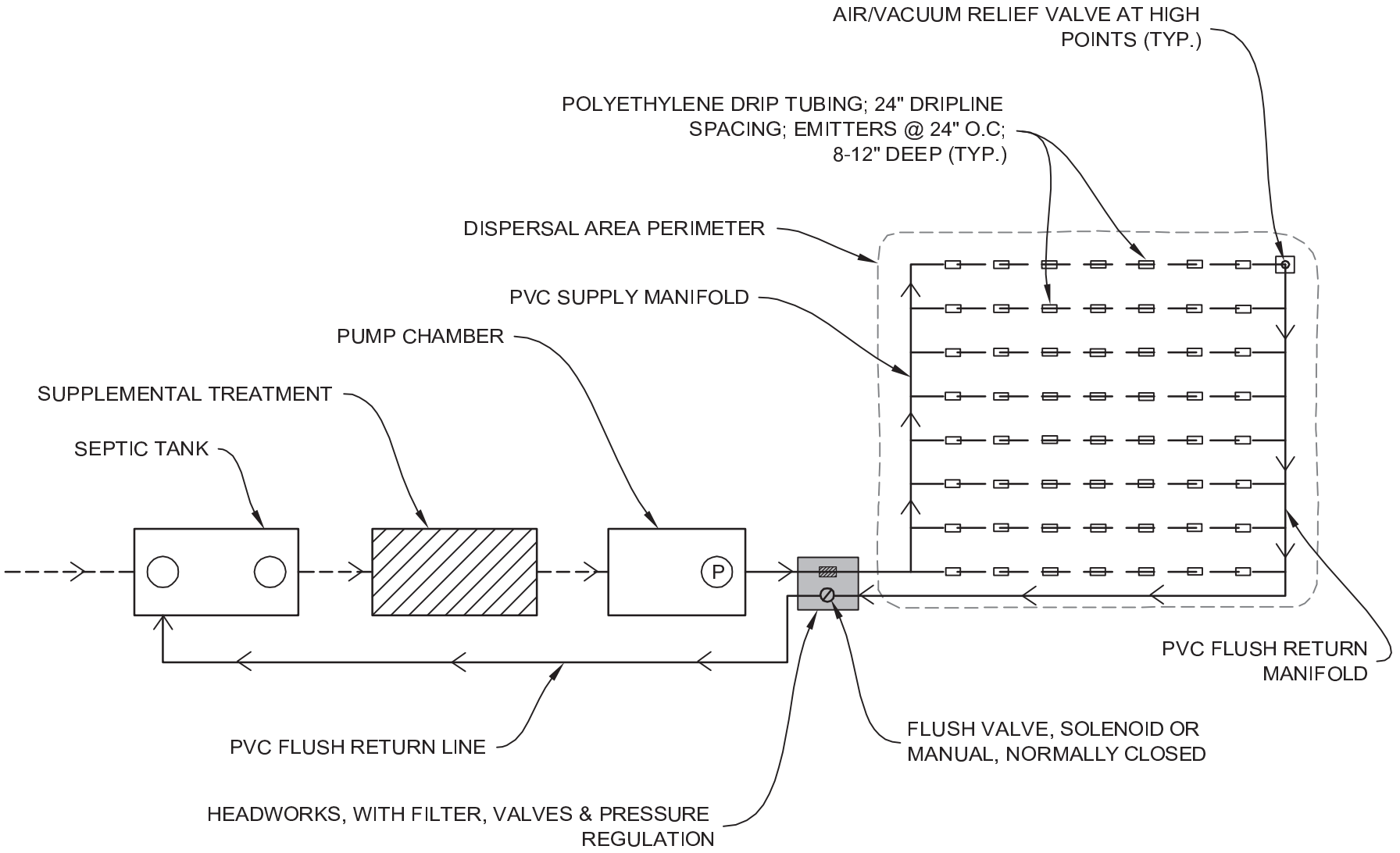
- Water tightness of effluent dosing (pump) tank;
- Drip field layout, piping materials and installation, and all associated valves and connections;
- Hydraulic testing of the drip system;
- Functioning and setting of all control devices; and
- Final Inspection to verify that all construction elements are in conformance with the approved plans, specifications, and manufacture recommendations; all inspection wells are installed; and erosion control has been completed.

F. MANAGEMENT REQUIREMENTS

Recommended minimum procedures and frequency for inspection, maintenance, monitoring and reporting activities for subsurface drip dispersal systems are outlined in **Table DD-2.**

Table DD-2. Drip Dispersal System Management Requirements

	Work	Frequency
Inspection	• Conduct routine visual observations of drip field, downslope area and surroundings for wet areas, pipe leaks or damage, soil erosion, drainage issues, abnormal vegetation, gophers or other problems. • Conduct routine physical inspections of system components, including valves, filters, and headworks box(es). • Perform special inspections of drip field at time of any landscaping work or other digging in drip field area. • Perform inspections of dosing pump(s) and appurtenances (per O&M manual and Performance Evaluation Guidelines, Part 5 of this Manual). • Record observations.	• Every 6 to 12 months.
Maintenance	• Manually remove and clean filter. • Clean and check operation of pressure reducing valves. • Clean flush valves and vacuum release valves.	• Clean filter every 6 months. • Other maintenance annually.
Water Monitoring & Sampling	• Measure and record water levels in dispersal field monitoring wells, as applicable, per permit requirements. • Obtain and analyze water samples from dispersal field monitoring wells, as applicable, per permit requirements.	• According to permit conditions, if applicable.
Reporting	• Report findings to DEH per permit requirements. • Standard report to include dates, monitoring well and other data collected, work performed, corrective actions taken, and performance summary. • Report public health/water quality emergency to DEH immediately.	• According to permit conditions, typically every 1 to 2 years, depending on system size, usage, history, location.



DRIP DISPERSAL SYSTEM SCHEMATIC

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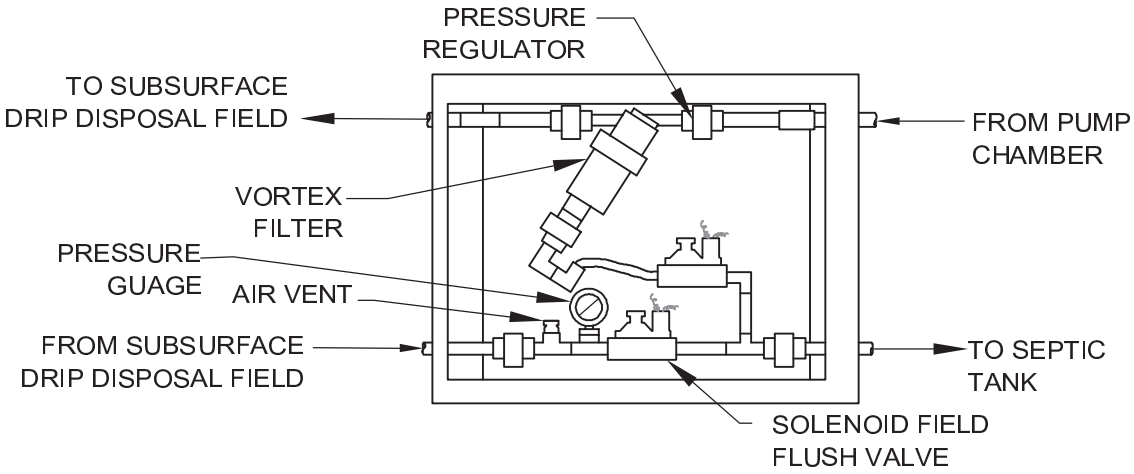
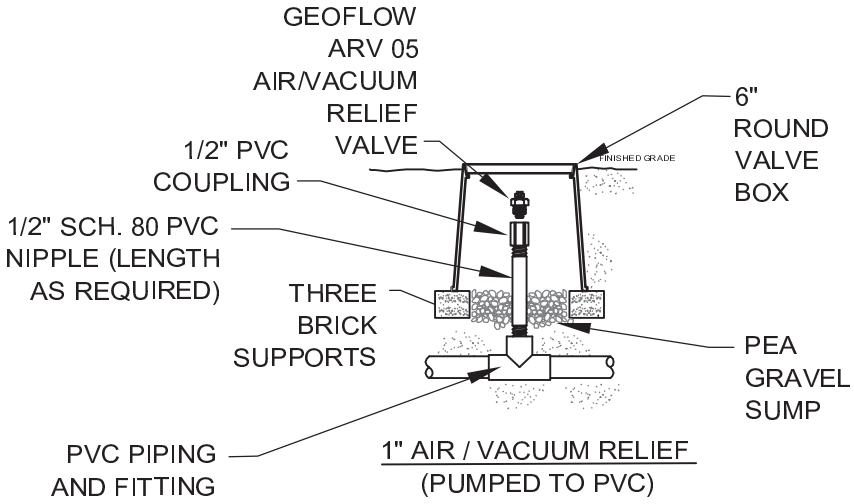
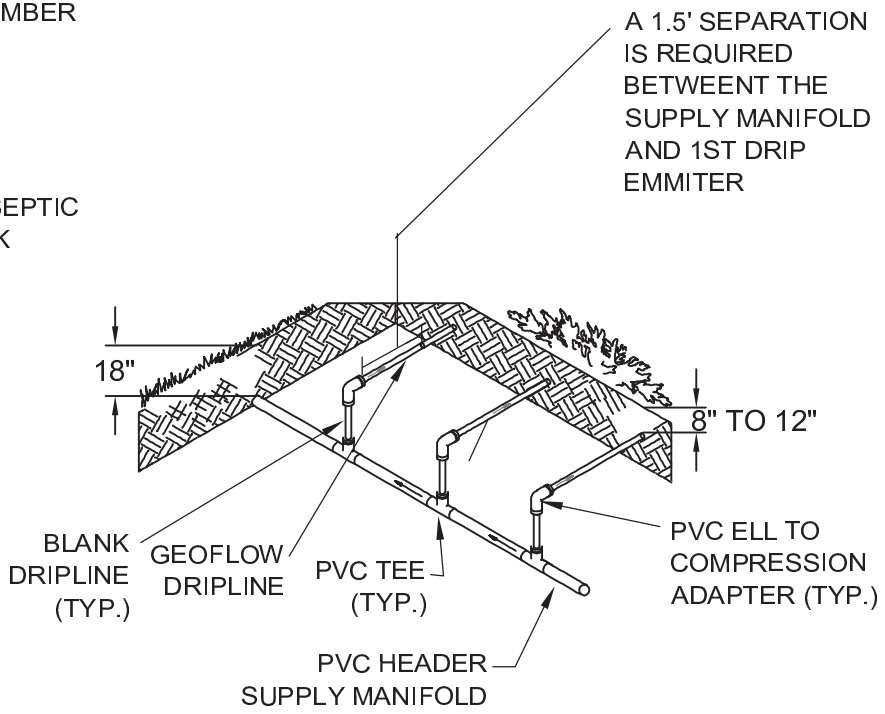


AUTOMATIC HEADWORKS



1" AIR / VACUUM RELIEF
(PUMPED TO PVC)



END FEED/ FLUSH MANIFOLD

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DRIP DISPERSAL DETAILS

ATTACHMENT A

Expanded

Wastewater Application Rate

Tables

Table 1. Standard Wastewater Application Rates - Septic Tank Effluent				
Percolation Rate (MPI)	**Application Rate (gpd/ft^2)**		**Percolation Rate (MPI)**	**Application Rate (gpd/ft^2)**
1 to 5	1.20		51	0.41
6	1.12		52	0.40
7	1.04		53	0.40
8	0.96		54	0.39
9	0.88		55	0.38
10	0.80		56	0.38
11	0.78		57	0.37
12	0.77		58	0.36
13	0.75		59	0.36
14	0.74		60	0.35
15	0.72		61	0.35
16	0.70		62	0.34
17	0.68		63	0.34
18	0.67		64	0.34
19	0.65		65	0.33
20	0.64		66	0.33
21	0.63		67	0.33
22	0.62		68	0.32
23	0.61		69	0.32
24	0.60		70	0.32
25	0.59		71	0.31
26	0.59		72	0.31
27	0.58		73	0.31
28	0.57		74	0.30
29	0.57		75	0.30
30	0.56		76	0.30
31	0.55		77	0.29
4	0.55		78	0.29
33	0.54		79	0.29
34	0.53		80	0.28
35	0.52		81	0.28
36	0.52		82	0.28
37	0.51		83	0.27
38	0.50		84	0.27
39	0.49		85	0.27
40	0.49		86	0.26
41	0.48		87	0.26
42	0.47		88	0.26
43	0.46		89	0.25
44	0.46		90	0.25
45	0.45		91-120	0.20
46	0.44			
47	0.44			
48	0.43			
49	0.43			
50	0.42			

Table 2. Enhanced Wastewater Application Rates - Supplemental Treatment

Percolation Rate (MPI)	Application Rate (gpd/ft^2)	Percolation Rate (MPI)	Application Rate (gpd/ft^2)
1-24	1.20	61	0.52
25	1.19	62	0.51
26	1.17	63	0.50
27	1.16	64	0.49
28	1.15	65	0.48
29	1.13	66	0.47
30	1.12	67	0.46
31	1.09	68	0.46
32	1.06	69	0.45
33	1.03	70	0.44
34	1.00	71	0.43
35	0.97	72	0.42
36	0.94	73	0.41
37	0.91	74	0.40
38	0.89	75	0.39
39	0.86	76	0.38
40	0.83	77	0.37
41	0.80	78	0.36
42	0.77	79	0.35
43	0.74	80	0.34
44	0.71	81	0.33
45	0.68	82	0.32
46	0.67	83	0.31
47	0.66	84	0.31
48	0.65	85	0.30
49	0.64	86	0.29
50	0.63	87	0.28
51	0.62	88	0.27
52	0.61	89	0.26
53	0.60	90	0.25
54	0.59	91-120	0.20
55	0.58		
56	0.57		
57	0.56		
58	0.55		
59	0.54		
60	0.53		

Table 3. Mound System Wastewater Application Rates (Basal Area)

Percolation Rate (MPI)	Application Rate (gpd/ft^2)	Percolation Rate (MPI)	Application Rate (gpd/ft^2)
1-24	1.20	61	0.52
25	1.19	62	0.51
26	1.17	63	0.50
27	1.16	64	0.49
28	1.15	65	0.48
29	1.13	66	0.47
30	1.12	67	0.46
31	1.09	68	0.46
32	1.06	69	0.45
33	1.03	70	0.44
34	1.00	71	0.43
35	0.97	72	0.42
36	0.94	73	0.41
37	0.91	74	0.40
38	0.89	75	0.39
39	0.86	76	0.38
40	0.83	77	0.37
41	0.80	78	0.36
42	0.77	79	0.35
43	0.74	80	0.34
44	0.71	81	0.33
45	0.68	82	0.32
46	0.67	83	0.31
47	0.66	84	0.31
48	0.65	85	0.30
49	0.64	86	0.29
50	0.63	87	0.28
51	0.62	88	0.27
52	0.61	89	0.26
53	0.60	90	0.25
54	0.59	91-120	0.20
55	0.58		
56	0.57		
57	0.56		
58	0.55		
59	0.54		
60	0.53		

Table 4. At Grade System - Wastewater Application Rates (Septic Tank Effluent)

Percolation Rate (MPI)	Application Rate (gpd/ft^2)	Percolation Rate (MPI)	Application Rate (gpd/ft^2)
1 to 5	1.20	51	0.41
6	1.12	52	0.40
7	1.04	53	0.40
8	0.96	54	0.39
9	0.88	55	0.38
10	0.80	56	0.38
11	0.78	57	0.37
12	0.77	58	0.36
13	0.75	59	0.36
14	0.74	60	0.35
15	0.72	61	0.35
16	0.70	62	0.34
17	0.68	63	0.34
18	0.67	64	0.34
19	0.65	65	0.33
20	0.64	66	0.33
21	0.63	67	0.33
22	0.62	68	0.32
23	0.61	69	0.32
24	0.60	70	0.32
25	0.59	71	0.31
26	0.59	72	0.31
27	0.58	73	0.31
28	0.57	74	0.30
29	0.57	75	0.30
30	0.56	76	0.30
31	0.55	77	0.29
4	0.55	78	0.29
33	0.54	79	0.29
34	0.53	80	0.28
35	0.52	81	0.28
36	0.52	82	0.28
37	0.51	83	0.27
38	0.50	84	0.27
39	0.49	85	0.27
40	0.49	86	0.26
41	0.48	87	0.26
42	0.47	88	0.26
43	0.46	89	0.25
44	0.46	90	0.25
45	0.45	91-120	0.20
46	0.44		
47	0.44		
48	0.43		
49	0.43		
50	0.42		

Note: Rates for 61-120 MPI only applicable where supplemental treatment provided.

Table 5. PDST Wastewater Application Rates

Percolation Rate (MPI)	Application Rate (gpd/ft^2)	Percolation Rate (MPI)	Application Rate (gpd/ft^2)
1-24	1.20	61	0.52
25	1.19	62	0.51
26	1.17	63	0.50
27	1.16	64	0.49
28	1.15	65	0.48
29	1.13	66	0.47
30	1.12	67	0.46
31	1.09	68	0.46
32	1.06	69	0.45
33	1.03	70	0.44
34	1.00	71	0.43
35	0.97	72	0.42
36	0.94	73	0.41
37	0.91	74	0.40
38	0.89	75	0.39
39	0.86	76	0.38
40	0.83	77	0.37
41	0.80	78	0.36
42	0.77	79	0.35
43	0.74	80	0.34
44	0.71	81	0.33
45	0.68	82	0.32
46	0.67	83	0.31
47	0.66	84	0.31
48	0.65	85	0.30
49	0.64	86	0.29
50	0.63	87	0.28
51	0.62	88	0.27
52	0.61	89	0.26
53	0.60	90	0.25
54	0.59	91-120	0.20
55	0.58		
56	0.57		
57	0.56		
58	0.55		
59	0.54		
60	0.53		