Santa Clara County Onsite Systems Manual

PART 3

GENERAL
AND
CONVENTIONAL OWTS REQUIREMENTS

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CONTENTS

1. GENERAL REQUIREMENTS

A. OWTS SITE PLANS

Site plans must include the following information and details:

1. Show all proposed and any existing OWTS drawn accurately to a scale of at least 1 inch = 20 feet. Large parcels must also show the entire site in a larger scale.

2. If the slope of the lot is less than 10%, indicate direction and percent of slope with an arrow. If the slope exceeds 10%, show elevation contour lines at 2-foot intervals. Note: If a "grid" dispersal system is proposed, one-foot contours are required to ensure the dispersal area does not exceed 5% slope.

3. Note the assessor's parcel number (APN), site address, County File Number (if applicable), and any subdivision, tract or lot numbers.

4. Show the North arrow and scale.

5. Show the location of all wells, springs, watercourses, drainage swales, cuts, steep slopes, and unstable land masses and other relevant landscape or water features on the property or within 100 feet of the property lines.

6. Show all existing and proposed structures, driveways, culverts, patios, decks, paved areas, swimming pools, large trees, water lines, etc.

7. Show all existing and proposed cuts, slopes or embankments over 50% gradient, slides and flood plain boundaries.

8. Include the name, address, and telephone number of the legal owner and/or applicant.

9. Show the name of adjoining property owners.

10. Show the property boundaries and their recorded lengths.

11. Show all recorded easements and right-of-ways and their purpose.

12. Indicate the name of the water company or the domestic water source (individual well, shared -well, mutual water system, etc).

13. Show all existing or proposed OWTS within 100 feet of an existing or proposed well.

14. Show location of soil profile and percolation test holes.

15. If proposing a grid design, see detailed requirements for "Grid Design Option" provided in Section 2.E.3.f., Part 3 of this Manual.

16. Show the location of all components of the OWTS (septic tank, diversion valve, dispersal trenches, etc).

17. Show the location of all OWTS components on the grading and drainage plan for the project.

B. PROCESSING OF PLANS, CHANGES AND FIELD MODIFICATIONS

1. **General.** Processing and issuance of an OWTS permit will not occur until four (4) complete sets of plans and supporting documentation are received (one copy of geotechnical report is sufficient). It is expected that the OWTS will be installed as designed. If significant changes in design are requested at the time of system installation, it will be necessary to stop work pending submission and approval of revised plans.
2. **Permit Processing**.
    a. If the plan submittal package is incomplete, the applicant will be informed in writing as to what additional information or modifications are required in order to process the OWTS permit.
    b. Plan changes or clarifications must be made by the designer. If changes are not extensive they can be made in pen and initialed by the designer at the time the OWTS permit is issued.
    c. The approving DEH staff member may make minor changes and clarifications to the plans in red pen.
3. **Field Modifications.**
    a. Decisions to accept minor modifications to the design will be the responsibility of field staff. Modifications may include, for example, small unplanned fluctuations in trench depth of a few inches and deviations from dispersal trench locations and lengths of a few feet.

b. Modifications that are not minor may require that the installation be delayed until the designer can modify the design/plans and they are reviewed and approved by DEH.

c. Modifications shall be documented in "As-Built" drawings provided to the DEH and system owner, following system installation.

C. OWTS INSTALLATION REQUIREMENTS

1. The approved, permitted OWTS site plan (wet-stamped by the Department of Environmental Health) must be available at the job site.

2. Per County Ordinance, the contractor must hold the appropriate contractor's license and be registered with the Department of Environmental Health.

3. The appropriate Environmental Health Office or Specialist must be notified at least 48-hours prior to starting construction.

   a. Main Office (1555 Berger Drive, Suite 300, San Jose) 408-918-3400

   b. South County Office (80 Highland Ave, San Martin) 408-918-3400 (office hours between 8:00 am and 9:00 am)

4. Trenches must not be excavated when the soil is wet so that the soil compaction and/or smearing of the trench walls occur. Compaction and smearing are problematic in clay soils and can cause reduced dispersal field efficiency.

5. No part of the septic tank or dispersal field may be covered without approval from the Department of Environmental Health.

6. At completion of construction and prior to receiving final acceptance by the director, the contractor and/or system designer shall provide to the DEH and system owner, a set of "As-Built" drawings of the completed OWTS installation.

D. WASTEWATER FLOWS FOR OWTS DESIGN

1. **Single Family Residences and Second Units.** Wastewater flows used for design of OWTS for single family residences and second units shall be based on a factor of 150 gal/day per bedroom for the first three (3) bedrooms, plus 75 gal/day for each additional bedroom, as indicated in **Table 3-1.** The design flows for a primary residence and secondary dwelling unit shall be determined independently, regardless of whether the flows are treated separately or combined in a single OWTS.

Table 3-1.
Wastewater Design Flows for
Single Family Residences and Second Units

No. of Bedrooms	Design Flow (gal/day)
1	150
2	300
3	450
4	525
5	600
6	675
>6	+ 75 per bedroom

2. **Multiunit Residences and Non-residential Facilities**. Wastewater flows used for the design of OWTS for multiunit residences and non-residential projects shall be developed based on full consideration of projected activities, occupancy, and facilities. **Table 3-2** provides guidelines for use in estimating design wastewater flows. For facilities not listed in **Table 3-2** the wastewater design flow shall be estimated based on either: (a) appropriate literature references (e.g., US EPA) for the type of facility proposed; or (b) documented wastewater flow monitoring data for a comparable facility. Additionally, the director may consider adjustment to the criteria listed in **Table 3-2** for specific facilities based upon documented wastewater flow monitoring data. In all cases, the design proposal shall include sufficient technical information to support the proposed design flow estimate. Notwithstanding the above, minimum design flow for any OWTS shall not be less than 150 gpd.

Table 3-2.
Wastewater Design Flow Guidelines
Multiunit and Non-residential Facilities

Type of Business or Facility	Design Flow (gallons per day)
Assisted living/ residential care home	
- per resident bed space, ambulatory residents	100
- per resident bed space, non-ambulatory residents	125
- live-in caregiver	75
- per employee (day use)	15
Camps (per person)	
- day use	10
- overnight use, with flush toilets, no showers	25
- overnight use, with flush toilet and showers	35
Churches and assembly halls (per seat)	
- without kitchen	5
- with kitchen	15
Country clubs	
- per resident member or caretaker	75
- per guest	25
- per employee	15
Day care (per patron, employee)	15
Detention center	
- per resident bed space	100
- per employee	15
Factories and industrial buildings (toilet wastes only)	
- without showers (per employee)	15
- with showers (per employee)	35
Hotels or motels	
- per guest	50
- per employee	15
- additional for restaurant, spa or other facilities	case-by-case
Laundromat, with self-service washing machines	
- per machine	500
or	
- per customer	50
Mobile home parks (per space)	250
Multiunit residential housing	
- apartments, per bedroom	150
- boarding house and farm labor housing, per bed	50
Offices and stores (per employee)	15

Type of Business or Facility	Design Flow (gallons per day)
Parks with picnic areas (per person)	
- with flush toilets	5
- with flush toilets and showers	10
Recreational vehicle parks	
- without individual sewer hook-ups (per space)	50
- with individual sewer hook-ups (per space)	100
Restaurants and Food Service	
- toilet and kitchen wastes (per patron)	10
- kitchen wastes only (per meal served)	5
- additional for bars (per patron)	2
- per employee	15
Service Station	
- per vehicle served	10
- per employee	15
Schools, boarding	
- student and live-in staff (per person)	75
- daily staff (per person)	15
Schools, day	
- without cafeteria or showers (per student)	15
- with cafeteria (per student)	20
- with cafeteria and showers (per student)	25
- staff (per person)	15
Swimming pools	
- per patron	10
- per employee	15
Theaters	
- per seat	5
- per employee	15
Wineries (sanitary waste only)	
- tasting room, per visitor	2.5
- per employee	15
- special events	case-by-case

3. **Flow Equalization.** Flow equalization may be used for non-residential and mixed use facilities that experience significant, regular and predictable fluctuations in wastewater flows. Examples of applicable facilities include, but are not limited to:

   - Churches
   - Schools
   - Special event venues

Flow equalization is the process of controlling the rate of wastewater flow through an OWTS by providing surge capacity storage and timed-dosing of the incoming flow. Installed following the septic tank, it allows peak surges in wastewater flow (e.g., from a weekend event) to be temporarily stored and metered into the treatment system and/or dispersal field at a relatively even ("average") rate over an extended number of days (e.g., during the subsequent week). This generally aids OWTS performance.

Where flow equalization is proposed to be incorporated in an OWTS the following apply:

a. the septic tank capacity shall be sized based on the peak daily flow for the facility;

b. the design flow used for sizing supplemental treatment unit(s) and/or the dispersal field may be based on the equalized ("average") flow rate rather than the peak daily flow rate for the facility;

c. engineering calculations and specifications must be submitted substantiating the proposed design and operation of the flow equalization system; and

d. an operating permit (per OWTS Ordinance section B11-92) will be required.

E. MATERIALS AND EQUIPMENT

Materials and equipment used in the construction of OWTS will be reviewed and evaluated by the DEH. A list of approved materials and equipment will be posted on the DEH website, and will be updated from time-to-time. New materials and equipment proposed for use will require evaluation and approval by the DEH before they can be added to the posted list.

2. CONVENTIONAL OWTS REQUIREMENTS

A. DESCRIPTION

Per Santa Clara County OWTS Ordinance, a "Conventional OWTS" means a type of OWTS consisting of a septic tank for primary treatment of sewage followed by a system of drainfield trenches for subsurface dispersal of effluent into the soil. A conventional OWTS may utilize gravity flow or a pump system to convey effluent from the septic tank to the drainfield.

B. SITING CRITERIA

The following minimum siting criteria must be met for approval of any conventional OWTS:

1. **Soil Depth.** Minimum depth of permeable soil beneath the bottom of the proposed dispersal field shall be 5 feet. 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 rock formations that contain continuous channels, cracks or fractures.

2. **Soil Fill.** Maximum depth of soil fill covering any portion of the area proposed for installation of a dispersal system shall not exceed twelve inches in depth.

3. **Vertical Groundwater Separation.** Minimum required vertical separation distance between trench bottom and groundwater shall be determined according to the soil percolation rate as follows:

Percolation Rate* (Minutes/Inch)	Vertical Distance (feet)
Less than 1	Not Permitted
1-5	20
6-30	8
31-120	5
More than 120	Not Permitted

*average

4. **Areas of Flooding**. 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. New OWTS that are to be

located in areas of special flood hazard, as identified in division C12 of the County Code, must comply with all relevant provisions of division C12.

5. **Ground Slope.** Maximum ground slope in the dispersal field area shall not exceed thirty percent. Additionally, for any site where the ground slope exceeds twenty percent, approval shall be dependent upon completion of a geotechnical report as provided in Ordinance section B11-83. See **Part 2** of this Manual for geotechnical report requirements.

6. **Horizontal Setbacks.** Minimum horizontal setback distances from various site features to OWTS components shall be as listed in **Table 3-3**:

Table 3-3. Minimum Horizontal Setback Distances

Site Feature	Minimum Setback Distance (feet)	
	To Dispersal Field	To Septic Tank
All wells and springs	100	100
Public water supply wells	150	150
Watercourses • General (from top of bank) • Between 1,200 to 2,500 feet from a public water system intake[1] • Within 1,200 feet from a public water system intake[1]	 100 200 400	 100 100 100
Reservoirs (from highwater mark) • General • Within 1,200 feet from a public water supply intake[1]	 200 400	 200 400
Cuts or steep embankments (from top of cut)	4 X h[2,3]	10 feet
Steep slopes (from break of slope)[4]	4 X h[2,3]	10 feet
Unstable land mass	100[3]	100[3]
Drainageway/drainage swale (from edge of flow path)	50	50
Foundation	10	5
Property line	10	10

Site Feature	Minimum Setback Distance (feet)	
	To Dispersal Field	To Septic Tank
Septic tanks	6	N/A
Swimming pool	25	25
Road easement, pavement, or driveway	5	5

[1] For areas tributary to and upstream of water supply intake; setback distance measured from high water mark. Exceptions allowed per SWRCB OWTS Policy, as follows: (a) for replacement OWTS, comply to the maximum extent practicable and incorporate supplemental treatment unless director finds no impact or significant threat to water source; (b) for new OWTS on pre-existing lot of record (pre-May 2013), comply to maximum extent practicable and incorporate supplemental treatment for pathogens per sections 10.8 and 10.10 of SWRCB OWTS Policy as detailed in the *Onsite Systems Manual*.

[2] h equals the height of cut or embankment, in feet. The required setback distance shall not be less than twenty five feet nor more than one hundred feet.

[3] Setback distance may be reduced in accordance with recommendations provided in a geotechnical report prepared by a civil engineer or professional geologist consistent with section B11-83 and guidelines contained in the *Onsite Systems Manual.*

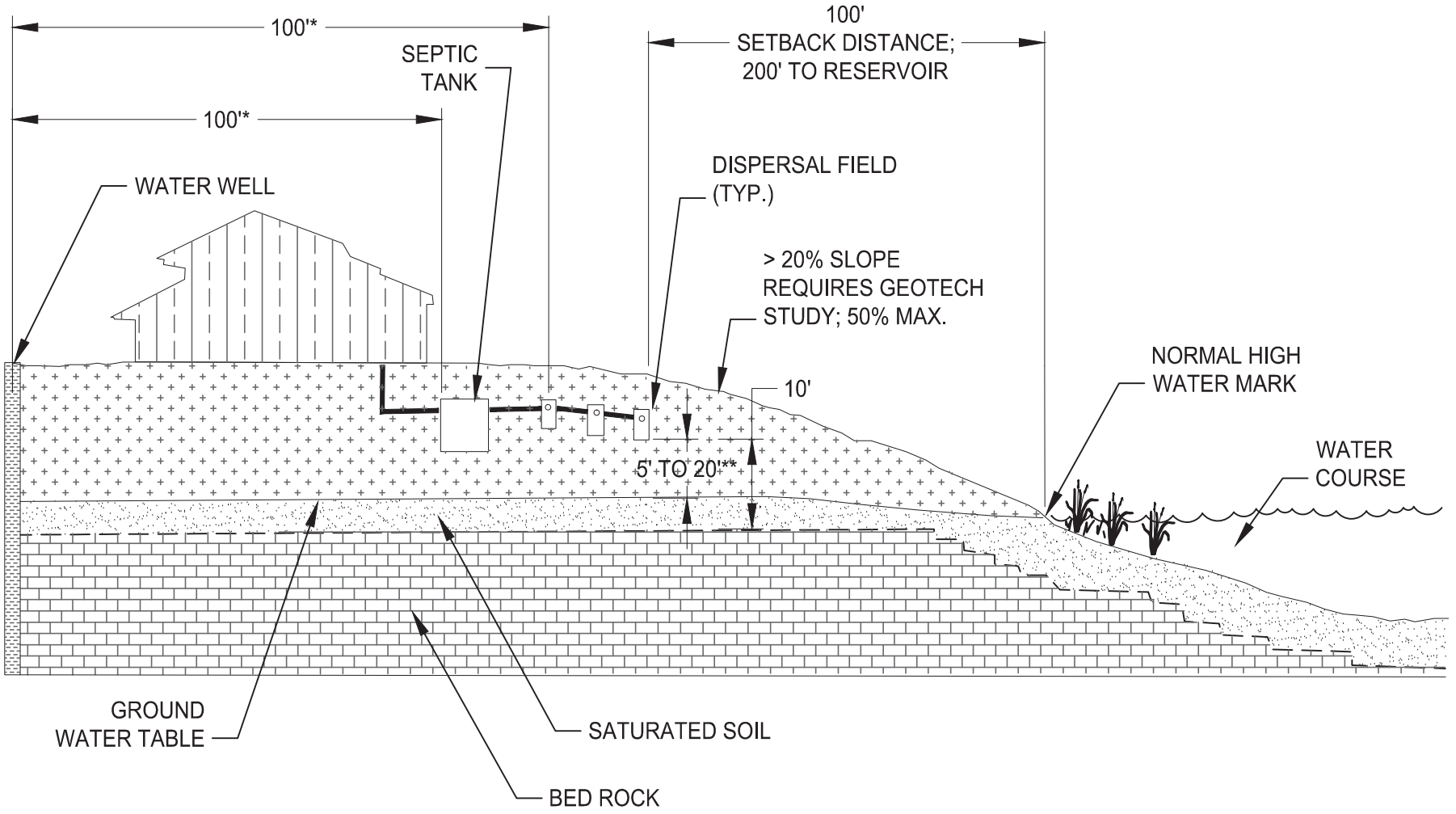
[4] Steep slope is considered to be land with a slope of >50% and distinctly steeper (at least 20% steeper) than the slope of the adjacent tank or dispersal field area.

7. **Additional Setback Considerations**

   a. Site Grading and Drainage. Grading and drainage system drawings will be reviewed by DEH along with OWTS plans to ensure that the drainage system can be installed on the property without adversely affecting any existing or proposed OWTS. In addition to the requirements in **Table 3-3**, the following setback requirements from septic tanks and dispersal trenches will apply to site drainage features:

      - Closed drain pipe or culvert - 10 feet
      - Lined (e.g., concrete, asphalt or equal) drainage ditch – 15 feet
      - Unlined earthen channel or V-ditch, for site drainage only – 25 feet
      - Energy dissipaters – 10 feet downslope and 20 feet to the side

   b. Trees. Refer to the Santa Clara County Ordinance C-16 Tree Preservation and Revision.



*150' TO PUBLIC SUPPLY WELL
**BASED ON PERCOLATION RATE

TYPICAL SITING CONSIDERATION FOR ONSITE WASTEWATER TREATMENT SYSTEMS
SANTA CLARA COUNTY

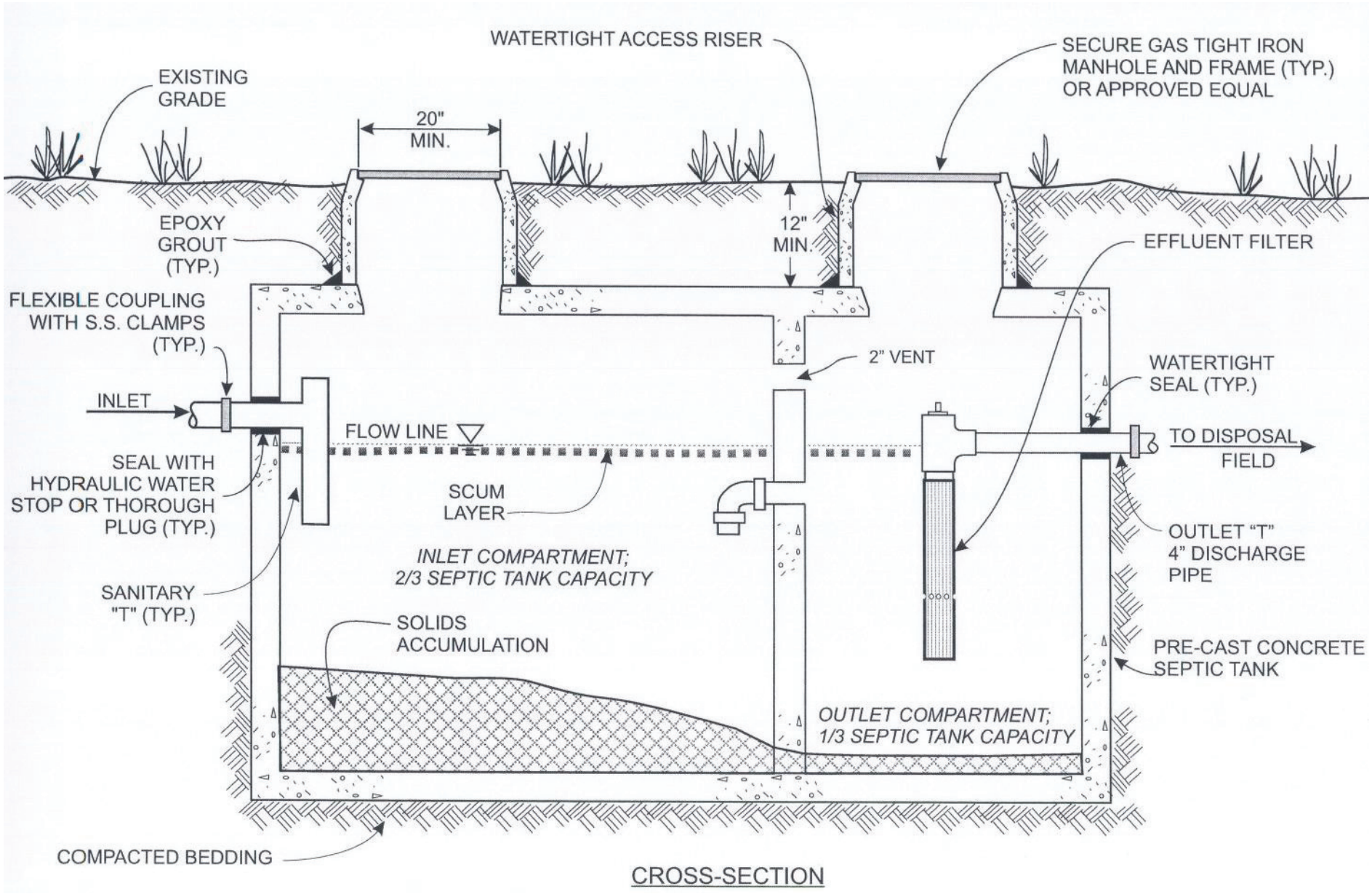
FIGURE
1

8. **Soil Percolation Rate.** The average soil percolation rate in the proposed dispersal field area shall not be faster than one minute per inch (1 mpi) nor slower than one hundred twenty minutes per inch (120 mpi), determined in accordance with procedures prescribed by the director in **Part 2** of this Manual.

9. **Location and Accessibility.** OWTS shall be situated on the same property as the building(s) being served and shall be located to be easily accessible for maintenance and repairs.

C. SEPTIC TANK REQUIREMENTS

1. **Minimum Capacity.** Septic tanks must have a minimum capacity of fifteen hundred (1,500) gallons or twice the peak daily wastewater flow for the facility served, whichever is greater. Minimum septic tank capacity for assisted care facilities shall be equal to three times the peak daily wastewater flow.
2. **Two Compartments.** Septic tanks must be of two-compartment construction, with the first compartment equal to two-thirds the total tank volume. The compartments must be separated by a baffle or equivalent arrangement.
3. **Materials.** Septic tanks must be watertight, properly vented and constructed of reinforced concrete, heavyweight reinforced concrete blocks, fiberglass or other durable, non-corrodible materials as approved by the director. Septic tanks shall be designed to withstand any anticipated weight placed above it. All septic tanks shall be listed and approved by IAPMO or an ANSI accredited testing organization: exception to this requirement may be granted where structural design calculations for the septic tank are provided by a California registered civil engineer.
4. **Access Openings.** Access to each septic tank compartment must be provided by a manhole opening at least twenty inches in diameter.
5. **Access Risers.** A riser must extend from each manhole opening to or above the surface of the ground. The riser must be of a size larger than the manhole opening, be both gas- and water-tight, be constructed of durable material and equipped with a secure cover.
6. **Effluent Filter.** The outlet of the septic tank shall be fitted with an effluent filter capable of screening solids in excess three-sixteenths (3/16) of an inch in diameter and conforming to NSF/ANSI Standard 46 or as otherwise approved by the director.
7. **Tank Connections.** All connections from building to septic tank must conform to construction standards as required by the County building official.



CROSS-SECTION

TYPICAL SEPTIC TANK

FIGURE 2

8. **Water-tightness Testing.** All new septic tank installations and modifications to existing septic tanks shall undergo water-tightness testing as follows:

   a. **New Tanks.** For new tank installations, the testing shall be done with the risers in place and the inlet and outlet pipes plugged. The tank shall be filled with water to a level extending a minimum of two (2) inches into the risers, and monitored for a 1-hour period, with no measurable drop in the water level.
   b. **Existing Tanks.** For existing tanks, the tank shall be filled with water to a level even with the invert of the outlet pipe, and monitored for a 1-hour period, with no measurable drop in water level. However, in cases where there the groundwater level is known or estimated to rise above the level of the outlet pipe during any time of the year, the water-tightness test shall be conducted following the procedure for new tank installations; i.e., by filling the tank with water into the risers.

D. PIPE REQUIREMENTS

1. **Solid pipe, joints and connections.** Solid (non-perforated) pipe for OWTS must conform to the standards of the most recent edition of the Uniform Plumbing Code, which is adopted by reference into the county's building ordinances. Pipe diameter must be four inches. All solid pipe joints and connections must be glued, cemented or made with an elastomeric seal so as to be watertight.

2. **Tightlines under Residential Driveway.** Tightlines in residential traffic areas must be installed with schedule 40 PVC. An alternative is to sleeve (i.e., double pipe) the thin wall tightline pipe within an outer pipe consisting of schedule 40 PVC, ABS or suitable alternative and rated by the Uniform Plumbing Code.

3. **Distribution pipe.** Perforated pipe for conventional OWTS dispersal systems must conform to the most recent edition of the Uniform Plumbing Code, which is adopted by reference into the county's building ordinances. The pipe diameter must be four inches.

DISPERSAL SYSTEM REQUIREMENTS

1. **Trench Specifications.** A conventional subsurface dispersal system must consist of a series of trenches meeting the specifications in **Table 3-4**.

Table 3-4. Conventional OWTS Dispersal Trench Design

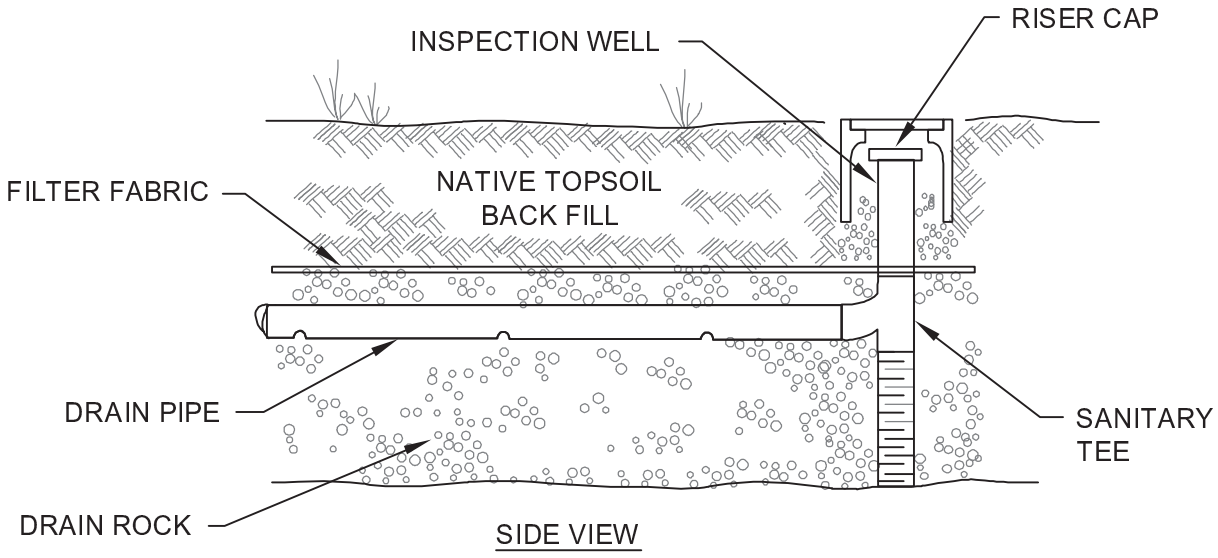
Parameter	Requirement
Trench length	Determined based on design flow and percolation rate; see below Recommended maximum of 100' per trench
Trench width	18 inches minimum; 36 inches maximum
Trench Depth	2.5 feet minimum; 8 feet maximum
Minimum cover over rock, in inches*	12 inches
Depth of rock under pipe (minimum) *	12 inches
Depth of rock over pipe (minimum)*	2 inches
Size of rock *	¾ to 2½ inches
Spacing of trenches, center to center, in feet, minimum	2 times the depth of rock below pipe; 6 feet minimum, plus 1-foot additional spacing for every 5% increase in dispersal area ground slope above 20%

* Other materials may be substituted for drainrock in the dispersal trenches if it is determined by the director that the material will serve the same function as drainrock as follows: 1) support the trench sidewalls and maintain the integrity of the infiltrative surface: and 2) provide adequate storage for septic tank effluent surges. The maximum depth and spacing between trenches may not be modified. Materials approved as drainrock substitutes must provide equivalent effective infiltrative surface consistent with trench sizing requirements per paragraph E3 below. Reduction in trench sizing requirements, up to 30%, may be approved by the director for IAPMO-certified dispersal systems.

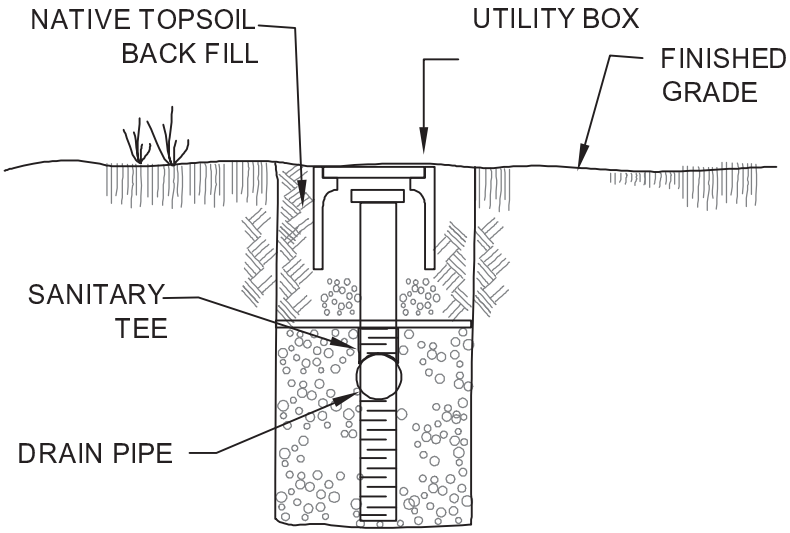
2. **Trench Construction.**

   a. Trenches must be placed in undisturbed earth, in an accessible area, and shall not be covered by paving or other impermeable or compacted surface. Natural topography shall not be graded to modify slope.

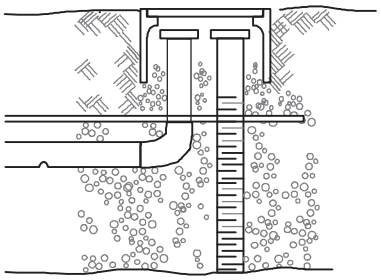
   b. The bottom of a trench must be level, with a variation of no more than 2 inches per 100 lineal feet of trench; trenches shall be aligned parallel to the ground surface contours to the greatest extent practicable.



SIDE VIEW



END VIEW



ALTERNATE END DETAIL

TYPICAL DISPERSALTRENCH

FIGURE
3

c. Adjacent trenches on slopes must be connected with a watertight overflow line ("relief line") in a manner that allows each trench to be filled with sewage effluent to the depth of the rock before the sewage flows to the next lower trench. Alternatively, a distribution box (D-box) may be used to equally divide the flow amongst the trenches, provided the proposed D-box is of a design approved and listed by the DEH per Part 3.1.E (Materials and Equipment) of this Manual. For systems located on sites having slopes of less than 5%, a "grid" design may be used in accordance with guidelines provided under at the end of this section (E.3.f).

d. Trenches must not be excavated when the soil is so wet that smearing or compaction occurs.

e. In clay soils when glazing occurs, the trench surfaces must be scarified to the depth of the glazing and the loose material removed.

f. Rock material in the trench must be washed and free of fines, and must be covered with an approved filter fabric silt barrier (geotextile) prior to backfilling with natural earth.

g. A capped inspection riser shall be installed within each trench to provide a means of observing the effluent level in the trench.

h. Erosion control measures shall be implemented following installation per requirements of Section B11-83(c) for any conventional dispersal system where: (1) ground slope exceeds 20%; (2) above-grade cover fill is added; (3) design flow exceeds 1,000 gpd; or (4) a grading and/or drainage permit is required for project site development per Division C12, Chapter III of the County Code. The plan submittal for the OWTS shall include an erosion control plan in accordance with requirements of Ordinance section B11-83(c).

3. Trench Sizing.

a. **Design Flow.** Design wastewater flow used for determining the required square footage and length of dispersal trench shall be determined in accordance with the criteria in Part 3-1C of this Manual.

b. **Wastewater Application Rates.** The wastewater application rate(s) used for d**etermining the** required infiltrative surface area and overall trench length shall be based upon representative percolation test results for the soil zone corresponding with trench bottom depth, and the criteria in **Table 3-5**.

Table 3-5
Wastewater Application Rates for Conventional Dispersal Trench Sizing[1]

Percolation Rate (MPI)	Wastewater Application Rate (gpd/ft^2)
1-5	1.2
10	0.80
24	0.60
30	0.56
45	0.45
60	0.35
90	0.20
91-120	0.20

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

c. **Effective Infiltrative Area.**

1) **Standard Requirement.** For trench sizing, the "effective infiltrative area" shall be limited to four (4) square feet per lineal foot of trench length, which may include any combination of trench bottom area and trench sidewall area below the invert of the perforated distribution pipe. 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.

2) **Deep Trench Exception.** Under certain (favorable) soil and site conditions where deeper dispersal trench (e.g., up to 8-feet deep) construction is acceptable, the effective infiltrative surface may be increased up to a maximum of eight (8) square feet per lineal foot. This exception is applicable to individual residential OWTS, where the dispersal site meets all conventional OWTS siting criteria, and further limited to sites where: (a) ground slope is <20%; and (b) soil percolation rate is in the range of 5 to 60 mpi.

d. **Trench Length Calculation.** Required trench length for 100% capacity dispersal field shall be calculated as follows:

Trench Length, $L = Q / (R*A)$

Where:

Q = Design wastewater flow, gpd
R = Wastewater application rate, in gpd/ft^2
A = Total infiltrative area per lineal foot of trench, in ft^2 (4 feet standard)

e. **Dual System Requirement.** Total dispersal trench capacity shall be provided for (2) 100% fields (primary and secondary) each sized per (d) above. Both primary and secondary fields shall be installed, and shall be equipped with an approved (manual) diversion device to allow alternating use of the two fields, typically switching between fields every 6 to 12 months.

f. **Grid Design Option.** For dispersal areas where the slope is near level (defined as less than 5%), the dispersal trenches may be designed and installed as a grid system, in accordance with the procedures:

1) For grid designs, the site plan must include the following:

- Contour lines at 2-foot intervals to verify that the slope is less than 5%.
- A cross-section of the entire disposal field area must be shown to verify trench depths. Trench depths must comply with requirements for conventional dispersal trenches as listed in **Table 3-3**, between a minimum of 2.5-feet deep and a maximum of 8-feet deep.
- Drainfield trench bottoms must be installed level, with a tolerance of 0 to 2 inches maximum per 100 lineal feet.

2) For each crossover connection (at the ends of the grid and in the middle of drainlines longer than 100 lineal feet), four (4) lineal feet will be counted towards the required lineal footage of drainlines due to the loss of absorption area in the corners of the grids. For example, with a 10-foot separation between drain lines, only six (6) lineal feet would be counted.

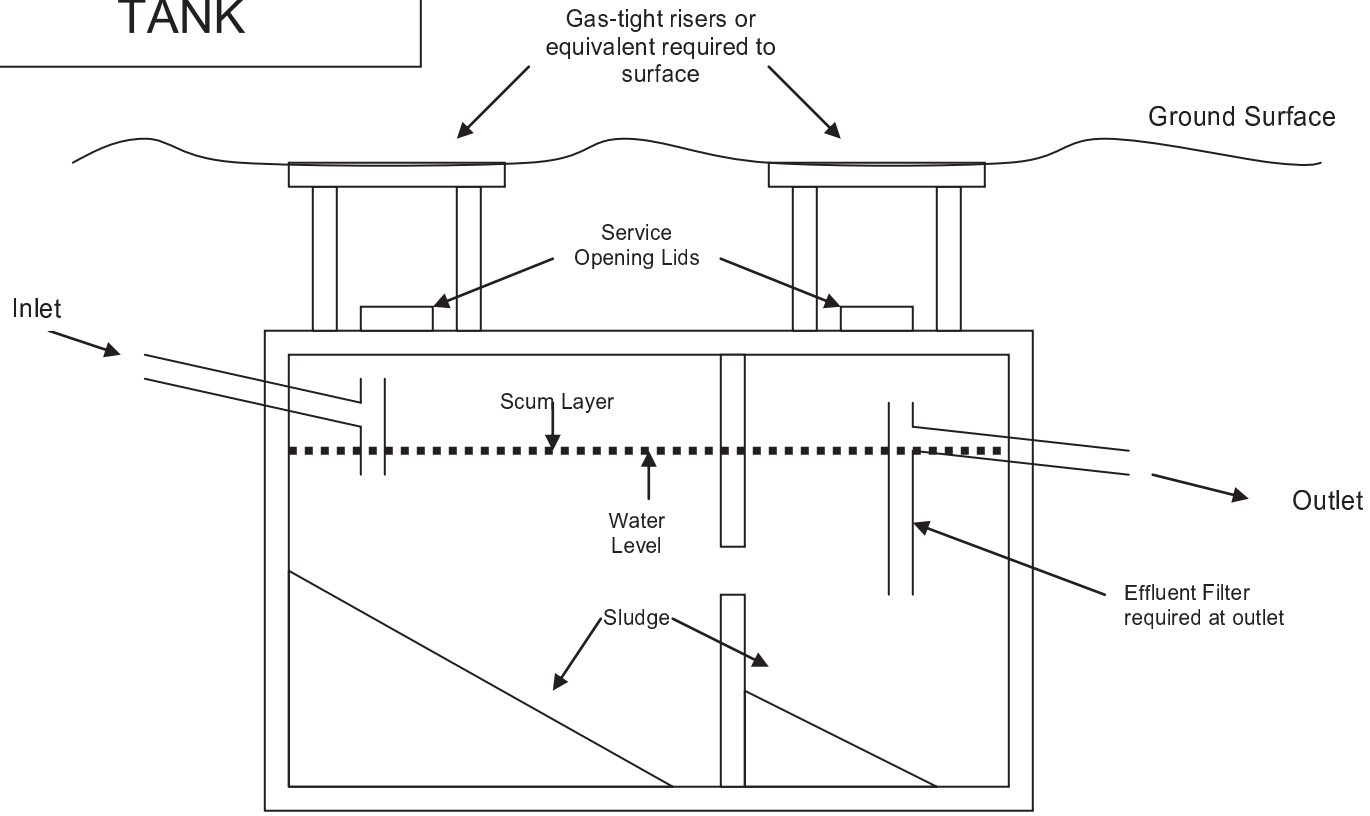
3) Any drainfield proposed in areas where the slope is 5% or more shall utilize relief lines ("popovers") or an approved D-box. This may result in a drainfield design that utilizes both grid and popover (or D-Box) systems on the same side of the diversion valve.

4) All percolation tests must be conducted at the level of the deepest trench depth proposed in the drainfield design. An alternative method would be to allow the percolation test holes to be at a depth midway between the shallowest trench depth proposed and the maximum trench depth proposed, providing the soil is of a consistent type throughout the trench depth range.

5) The area proposed for a grid system may not be graded to achieve a slope of less than 5%. Slope calculations will be based on the original, natural slope.

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			

TYPICAL SEPTIC TANK



Cement/concrete tanks must be used whenever possible.
Alternative materials are approved on a site-specific basis.
The Department of Environmental Health maintains a list of approved septic tanks.

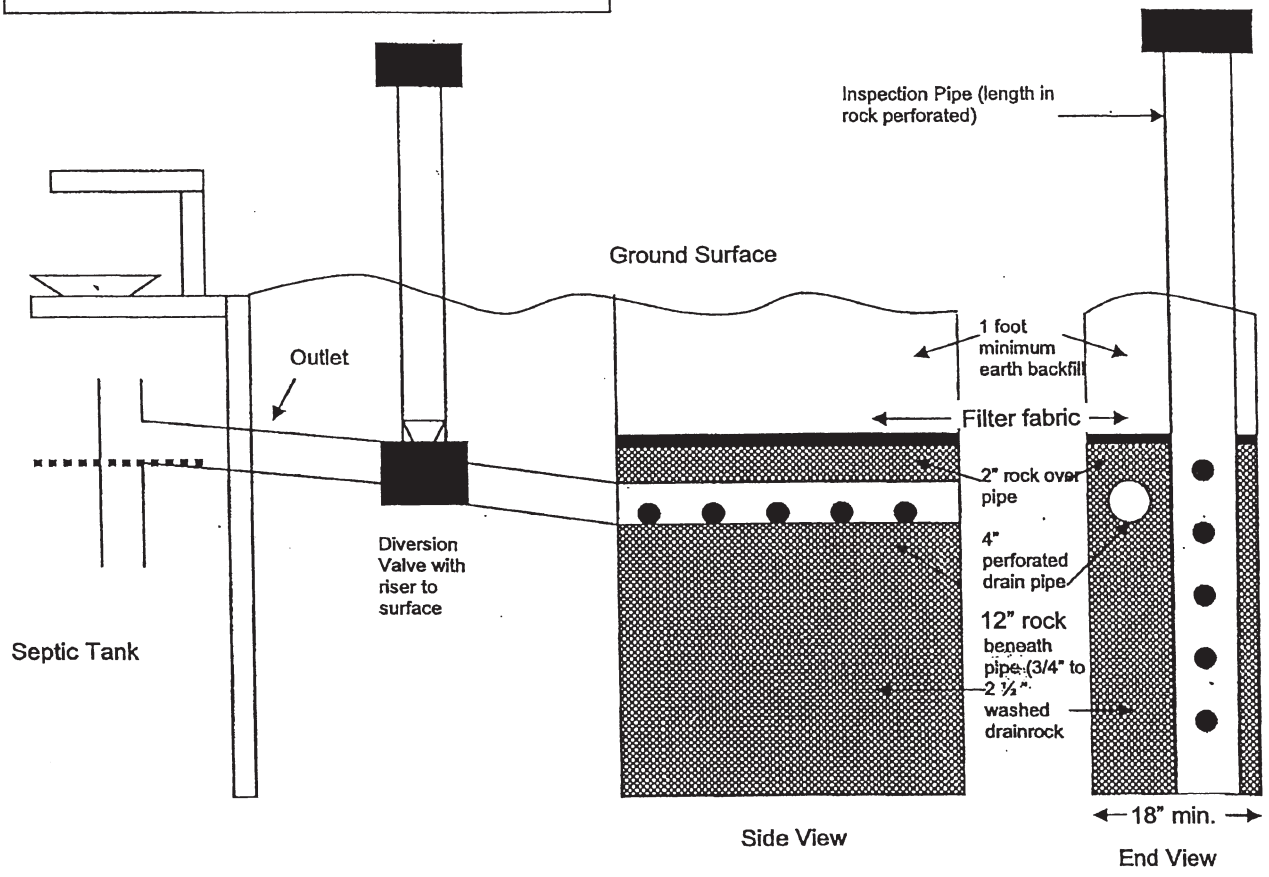
Septic tanks must be a minimum 1,500 gallons with two compartments.
The first compartment must be two-thirds the total tank volume. The compartments must be separated by a baffle or equivalent arrangement.

Septic tanks must be watertight and constructed of reinforced concrete, heavyweight reinforced concrete blocks, or other materials approved by DEH.

Access to each septic tank compartment must be provided by a manhole at least 20 inches in diameter and having a durable handle to facilitate removal.

A riser must extend from each manhole cover to or above the surface of the ground. The riser must be of a size larger than the manhole cover, be both gas- and water-tight, and be constructed of durable material.

DRAINLINE DETAIL



Two drainfields, each 100% of the total size required, shall be installed and interconnected with an approved diversion valve. The valve must be capable of directing the septic tank effluent to one drainfield at a time.

Drainline pipes shall be of approved, perforated pipe, at least 4 inches in diameter.

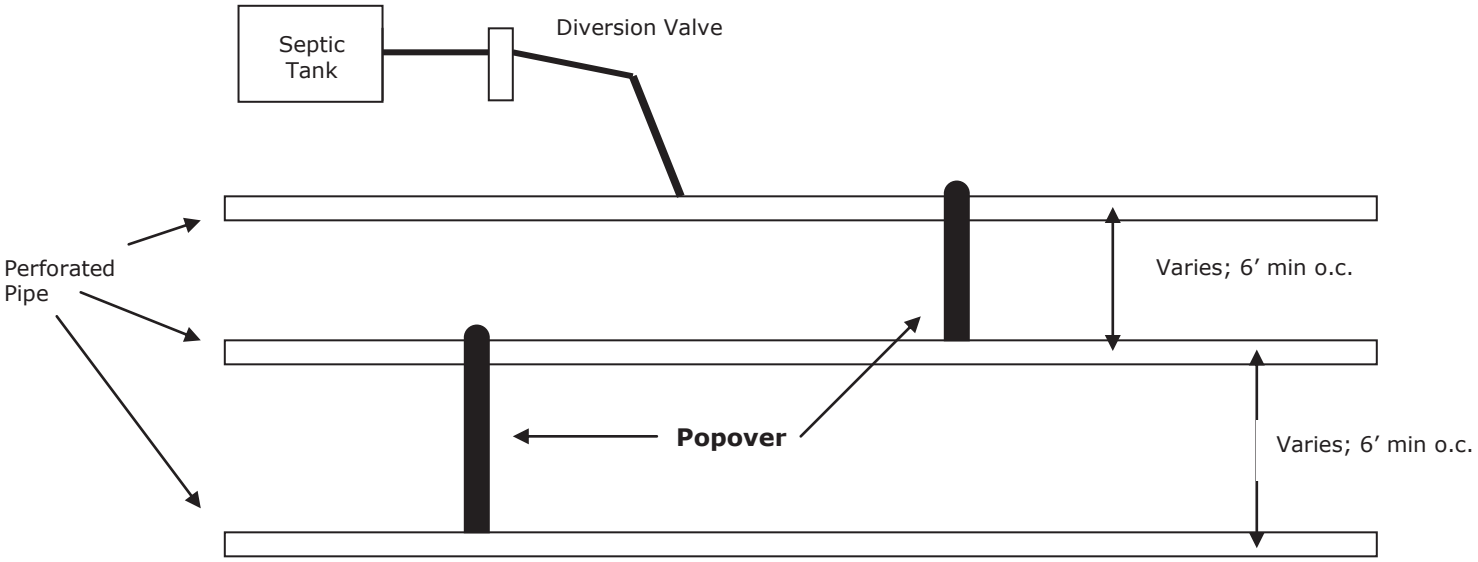
The tightline from the septic tank to the diversion valve must be ABS or schedule 40 PVC joined with glue, cement, or elastometric seal to be watertight.

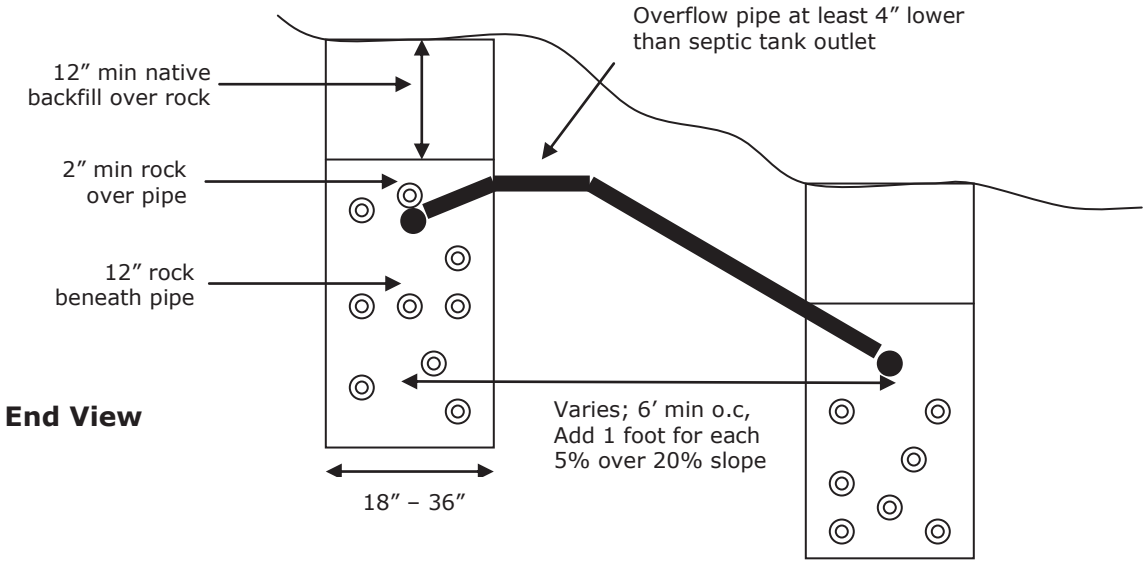
The drainline trench bottom must be level. The trenches must be at least 18 inches wide and 2.5 to 8 feet deep

At least 12 inches of clean, washed drainrock must be placed beneath the drainpipe and filled around and over the pipe at least 2 inches.

The drainrock must be covered with filter fabric to prevent clogging the rock with earth prior to backfilling.

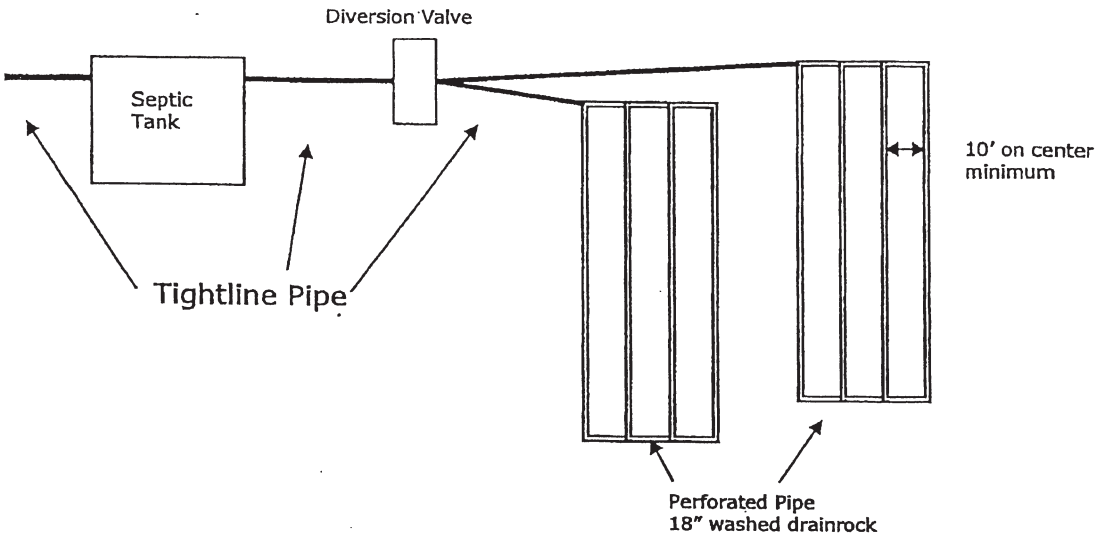
Drainfield System on Hillside or Sloping Land





End View

DRAINFIELD SYSTEM ON LEVEL LAND (LESS THAN 5% SLOPE)



"Grid" System for Leachfields

Distance between each leachline: 10-foot on center minimum

Perforated pipe throughout the "grid" - 6-foot credit for ends of leachlines

Natural terrain must be 5% or less

To ensure even distribution throughout the "grid," the bottom of all trenches must be level

Drainlines must be 50-feet in length minimum, 100' in length maximum

3. SITE AND DESIGN MODIFICATIONS

A. COVER FILL SYSTEMS

1. DESCRIPTION

The term "cover fill" refers to a dispersal trench system where the trenches are excavated entirely below grade, but up to 12 inches of soil fill is placed on top of native grade to provide the required backfill cover over the pipe and drain rock. The wastewater is dispersed into the native soils, not into the fill soil. The purpose is to allow for shallower trench depths where necessary or desirable to meet soil depth and groundwater separation requirements. It provides for improved use of the absorption capacity of the near surface soils, which tend to be most permeable and most effective for absorption and treatment of wastewater effluent. This is a design modification for use with a conventional dispersal trench system. Cover fill also be used in conjunction with certain alternative dispersal systems (shallow pressure distribution, pressure-dosed sand trench, and drip dispersal) presented in Part 4 of this Manual.

2. SITING CRITERIA

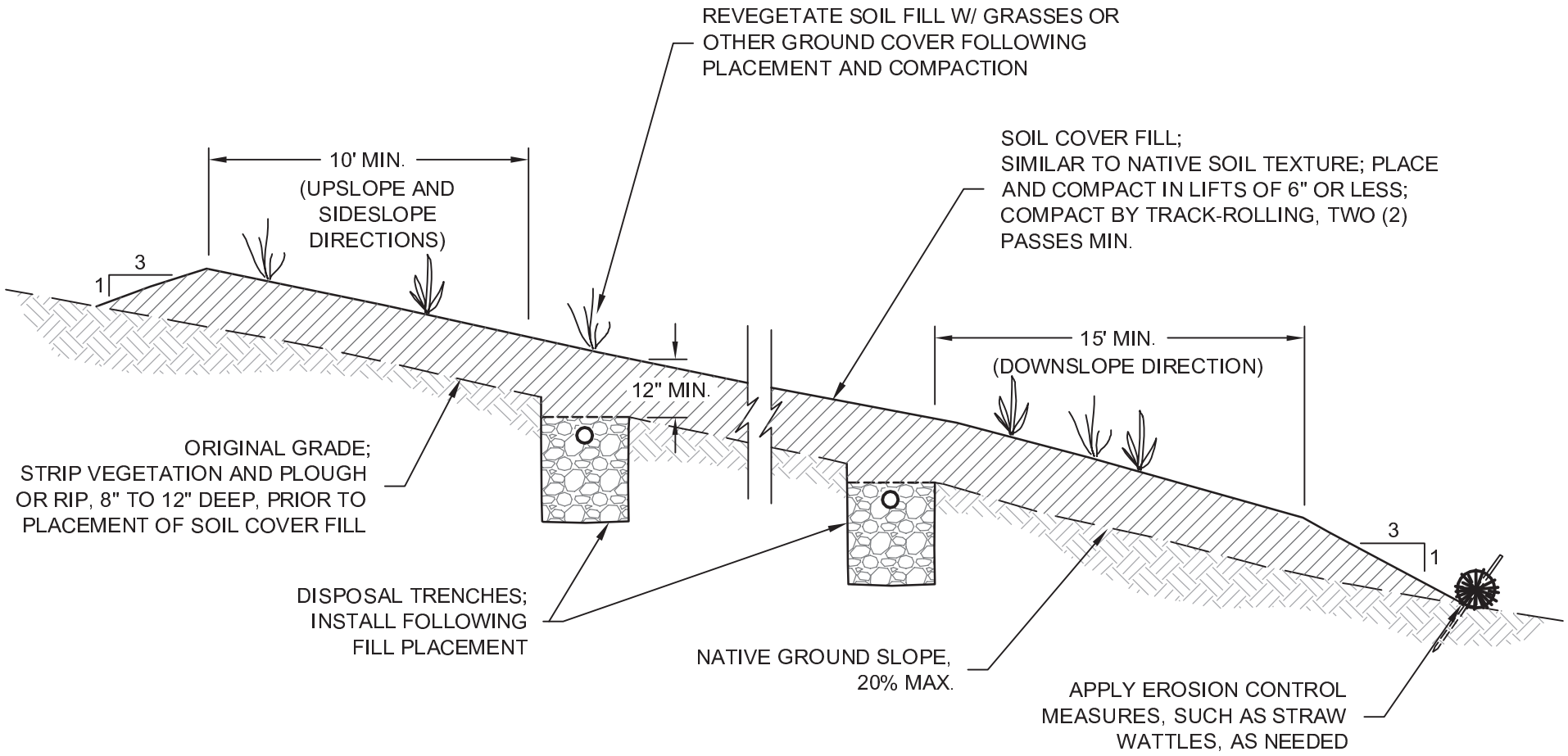
a. **Setbacks.** All horizontal setback siting criteria applicable to conventional OWTS as specified in Ordinance section B11-67 and Part 3-2B of this Manual shall apply to OWTS where cover fill is used. Required setback distances for dispersal trenches shall be measured from the edge of trench, not from the edge of the installed cover fill.

b. **Soil Depth, Groundwater Separation and Percolation.** Soil depth, groundwater separation and percolation shall conform to the requirements applicable to the type and design of the dispersal system proposed.

c. **Ground Slope**. Maximum allowable ground slope for cover fill systems shall be 20%.

3. DESIGN AND CONSTRUCTION REQUIREMENTS

a. **Dispersal Trenches**. The drain rock and perforated pipe sections shall be installed entirely within native soil, and all other aspects of the dispersal trench design shall be in conformance with requirements for conventional dispersal fields, as specified in Part 3-2 of this Manual or, in the case of an alternative dispersal system, in accordance with requirements for the particular type of system (e.g., shallow pressure distribution trench, drip dispersal, etc) and detailed in Part 4 of this Manual.



COVER FILL SYSTEM
CROSS-SECTION

FIGURE
4

P:\2010\1000064_SANTA_CLARA_ONSITE\CAD\1000064_SCHEMATIC DIAGRAMS_MARCH_2014.DWG

b. **Site Preparation.** Prior to placement of fill material, all vegetation shall be removed and the ground surface ripped or ploughed to a depth approximately 6 to 10 inches to permit good mixing of native soil and fill material.

c. **Fill Material.** The soil used for fill shall be similar in texture to the native surface soil in the dispersal field area. Sand, gravel or rock do not qualify as acceptable material for cover fill. Particle size analysis (hydrometer method) of the dispersal site soils and fill soil shall be required for DEH review and acceptance of the proposed fill soil, except in cases where the fill is obtained from similar soils at the project site.

d. **Sequencing.** The fill shall be placed prior to dispersal trench excavation and installation of dispersal piping and appurtenances.

e. **Areal Coverage.** The fill shall be continuous and constructed to provide a uniform soil cover of at least 12 inches over the dispersal trenches. The fill shall extend a minimum distance of 15 feet from the edge of trench in the down-slope direction and 10 feet in the upslope and side-slope directions. On a level site, the fill shall extend a minimum of 10 feet in all directions. The toe of the fill shall be tapered at no less than a 3:1 grade, beginning at the above required 15-foot or 10-foot distance, as applicable. Where the primary and secondary dispersal fields are adjacent to one another, the cover fill should be continuous over both fields.

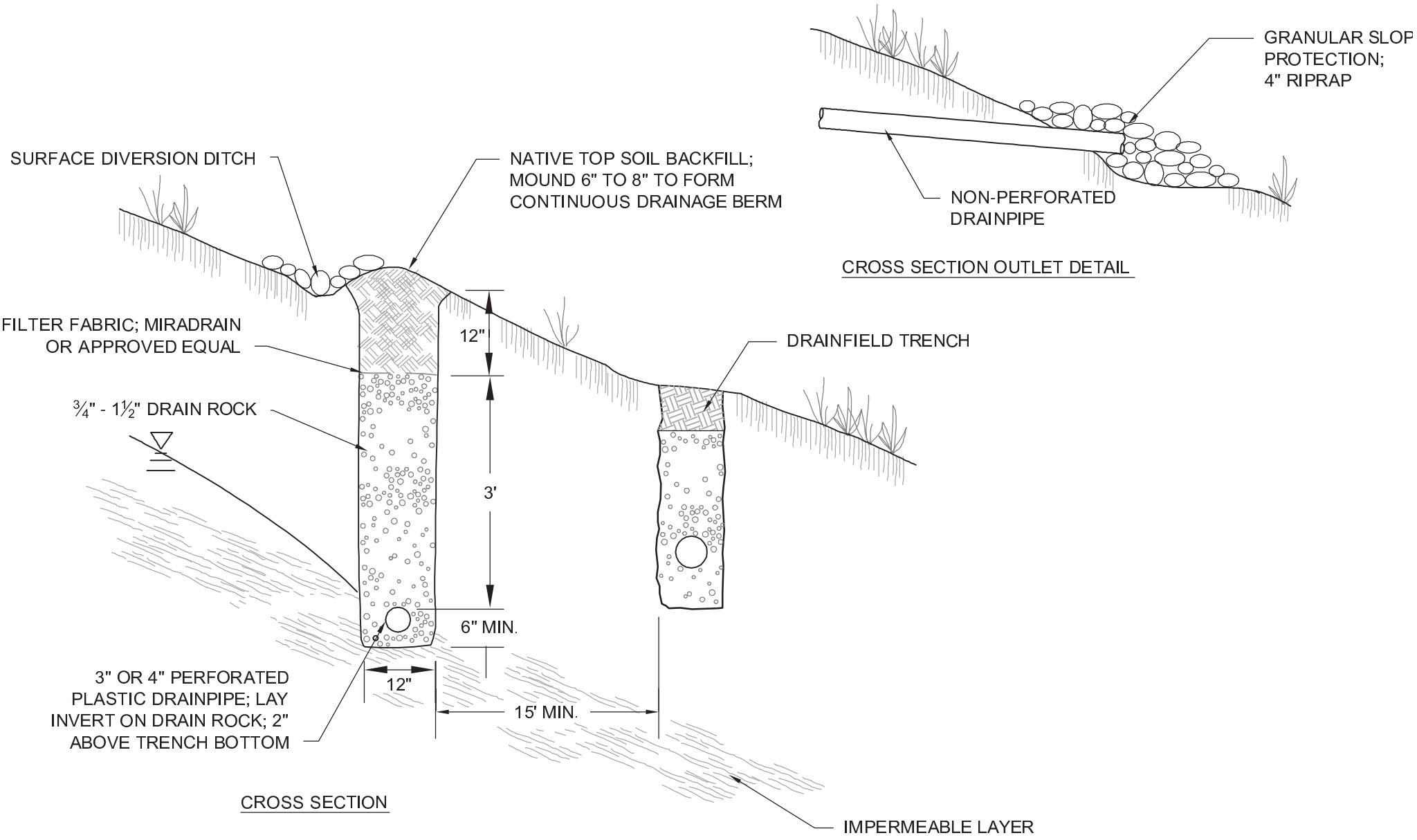
f. **Fill Compaction.** Fill shall be placed in layers ("lifts") of not more than six (6) inches, and compacted to approximately the same dry density as the native soil. Normal compaction procedures to achieve this requirement shall consist of track-rolling each lift, two passes minimum. Alternative compaction procedures may be allowed by DEH in accordance with recommendations and supporting technical data supplied by a registered civil engineer.

g. **Revegetation and Erosion Control.** Following system installation, measures shall be taken to revegetate the soil fill and adjacent disturbed areas, and to apply other erosion control measures, as needed, such as straw mulch, silt fencing, straw wattles, and hay bales. The plan submittal for the OWTS shall include an erosion control plan in accordance with requirements of Ordinance section B11-83(c).

B. CURTAIN DRAINS

1. BACKGROUND

Controlling surface water and shallow perched groundwater may be an essential part of protecting the integrity and performance of OWTS dispersal fields in certain situations. A



5 CURTAIN DRAIN SCHEMATIC DETAIL

particular situation of concern is in areas where rainfall readily percolates through very permeable surface soils and perches along the contact with the less permeable substrata. Dispersal trenches can act as a collection area for this transient subsurface water flow, and in the worst case may be flooded during heavy rain events or throughout the rainy season. This reduces the dispersal capacity during the wet season; and it can also contribute to a long-term decline in the dispersal system effectiveness and potential surface failures. One of the most effective drainage measures is a "curtain drain" (also called "subdrain" or "french drain"), which consists of a gravel-filled trench installed uphill of a drainfield system, designed to intercept shallow perched groundwater flow and divert it away from or around the dispersal field. The installation of curtain drains may be considered for new system installations as well as to rehabilitate a failing system affected by higher than anticipated groundwater.

2. SITING CRITERIA AND INVESTIGATION REQUIREMENTS

a. **Ground Slope.** Curtain drains are only to be used on sites with a slope of greater than 5%. The use of curtain drains to de-water a flat site will not be allowed.

b. **Setbacks.** Curtain drains may be positioned upslope or to the side of a dispersal field to intercept and drain subsurface water away from dispersal trenches. Curtain drains are not to be used as underdrains located downslope from the dispersal field in an attempt to lower the groundwater table. The following horizontal setbacks shall apply to curtain drains. The downslope setback requirement is intended to apply to a curtain drain that may be located on an adjacent (downhill) property.

Horizontal Setbacks Requirements for Curtain Drains

Reference Location	Horizontal Setback Distance* (ft)
Uphill of the dispersal field	15
Lateral of the dispersal field (along slope contour)	25
Downhill of the dispersal field (e.g., adjacent property)	50
Outfall, distance from dispersal field	25**

* measured from edge of dispersal trench to edge of curtain drain trench (perforated pipe section), except as noted.

** measured from edge of nearest dispersal trench to the daylight end of outlet pipe.

c. **Site Investigation and Engineering Plan.** Prior to approval of a curtain drain, a site investigation shall be conducted and an engineering plan for the installation shall be developed by a California Registered Civil Engineer, Professional Geologist, or Registered Environmental Health Specialist. The site investigation shall be conducted to:

(1) prepare a suitable map of the site, including slope contours, drainage and other pertinent site features;

(2) document soil, geologic and groundwater conditions on the site;

(3) assess the subsurface conditions to determine the feasibility and means of controlling groundwater levels with a curtain drain; evaluate whether or not the groundwater of concern is a perched condition above a clearly definable restrictive/impermeable soil layer;

(4) determine the appropriate depth and location for the proposed curtain drain and outlet point, based on soil, groundwater, and other site conditions.

The engineering plan for the curtain drain shall include drawings, supporting data and calculations, as applicable, and a plan for groundwater monitoring, as applicable.

d. **Approval Process.** The process for approval of the curtain drain will depend on the site conditions and the supporting information supplied with the engineering plan, as follows:

(1) **No Field Demonstration Required.** For cases where the site investigation shows the groundwater condition to be mitigated is perched water above a clearly definable restrictive/impermeable layer (e.g., stiff, plastic, clayey subsoil), the curtain drain plan may be approved without the need for field demonstration of its effectiveness.

(2) **Pilot Demonstration Required.** For cases where the site investigation shows the groundwater condition to be mitigated is most probably perched water but there is some level of uncertainty about the extent or degree of impermeability of the identified restrictive layer, then the DEH may require a pilot test of a portion of the proposed curtain drain prior to approval. The pilot test, conducted by the applicant, would involve the installation of a section of curtain in accordance with the proposed design, along with installation of monitoring wells in appropriate locations (upslope and downslope of the drain) as needed to provide evidence of the effectiveness in lowering the water table during the wet season. The system designer/consultant would be responsible for presenting the details of the pilot

demonstration, overseeing the installation, monitoring the performance, and reporting the results to the DEH.

(3) **Full-scale Demonstration Required.** For cases where the site investigation shows limited or questionable evidence that the groundwater condition to be mitigated is perched water above a defined restrictive/impermeable layer, then the DEH may require a full-scale installation and monitoring of the proposed curtain drain prior to approval. The full-scale test, conducted by the applicant, would involve the installation of the entire curtain in accordance with the proposed design, along with installation of monitoring wells in appropriate locations (upslope and downslope of the drain) as needed to provide evidence of the effectiveness in lowering the water table during an entire wet weather season. The system designer/consultant would be responsible for presenting the details of the monitoring plan, overseeing the installation, monitoring the performance, and reporting the results to the DEH.

3. DESIGN AND CONSTRUCTION REQUIREMENTS

A curtain drain shall consist of a gravel-filled trench constructed as shown in the attached schematic diagram and designed in accordance with the following specifications:

a. **Trench Width**: 12 inches minimum.

b. **Trench Depth**: Shall extend to a depth of at least 6 inches into the underlying impermeable layer.

c. **Filter/Backfill Material**: Filter material shall be clean, durable 3/4 to 1½-inch drain rock, extending from trench bottom to within 6 to 12 inches of grade; backfill to grade with native soil.

d. **Filter Fabric**: A geotextile "filter fabric" envelope shall surround the drain rock.

e. **Perforated Collection Pipe**: Collection pipe shall consist of 4-inch diameter perforated drain pipe, oriented with holes down and installed on top of the drain rock, approximately 2 to 4 inches above trench bottom.

f. **Outlet Pipe**: The outlet pipe shall consist of minimum 4-inch diameter solid (non-perforated) drain pipe.

g. **Cleanouts.** Provide cleanouts to grade: (a) at the upslope end of the drain; (b) at bends of 45^{o} or greater; and (c) at least every 400 feet along the length of the drain.

h. **Slope:** The trench and pipe shall be sloped for gravity flow at a minimum 1% gradient throughout the trench and extending to the outlet point. The curtain drain must drain by gravity only.

i. **Outlet.** The outlet must be on the property being developed, and located so the flow does not adversely affect the drainage or any existing or proposed OWTS on the subject parcel or neighboring parcels. Protect downslope outlet against blockage or damage through the use of screening, rock cover, junction box or other suitable means.

j. **Erosion Control.** Provide erosion protection at drain outlet point.

C. PUMP SYSTEMS

The pump systems used in the connection with either conventional or alternative OWTS 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 attached pump system design requirements.

ATTACHMENT A

Effluent Pumping System

Design Guidelines

EFFLUENT PUMPING SYSTEMS
DESIGN GUIDELINES

General Requirements

Effluent pump systems may be considered when they offer a better alternative for the protection of public health and safety or the only safe opportunity for parcel development. Due to the problems inherent in mechanical devices, pump systems are to be considered only after gravity feed options have been explored and shown to be infeasible.

Design Requirements

___ Drainlines must meet all requirements as set forth in the sewage ordinance.
___ Both primary and secondary fields must be fed by the pump.
___ The system must be designed by a qualified state Registered Civil Engineer or Registered Environmental Health Specialist.
___ Upon installation the designer must inspect and test the pump system in the presences of the Department's Environmental Health Specialist.
___ Upon completion the designer must submit a written statement to the Department of Environmental Health certifying that the system has been installed and operates according to the design criteria.
___ The Department's Environmental Health Specialist will sign the final occupancy section of the building permit only upon satisfactory final inspection of the pump system and receipt of the designer's statement of final inspection.
___ Float switches must be used and installed such that the float switches or wires do not become entangled. Clamps must be of non-corrosive material.
___ A Check valve is required at the pump.

Required Materials and Details

___ Provide specification sheets for the pump tank, tank risers, and pump, including the pump performance curve.
___ State the elevation of the pump and drainfield pipe at the highest elevation.
___ Show the calculations for total dynamic head through the effluent piping and valve on the Pump System Work Sheet provided by this department.
___ Provide specification sheets and show the placement of float switches indicating the 1½ days storage capacity, audio/visual alarms and any other materials proposed for use.

Sizing Criteria

Septic Tank

Septic tank must be sized as required for the projected wastewater load. A pump system does not require the use of different sizing methodologies.

Pump Tank

The pump tank must have sufficient capacity to hold the following:

- the dosing volume
- 1½ days storage capacity above the "on" switch
- pump displacement volume
- sufficient distance from the tank bottom to pump inlet to allow space for any solids to settle without interfering with the pump operation

As a general rule, the pump tank volume will be the same as the septic tank volume.

See Diagrams 1 and 2

Pump Sizing

The proposed pump must be able to provide the required gpm at the designed head. See Pump System Work Sheet and friction loss tables provided by this Department.

DEFINITIONS

Dose Volume: Pump on to pump off. The amount of wastewater pumped in one cycle.

High Water Alarm: Float set 2 inches above pump on – alerts user of pump failure, both audio and visual alarms.

Pump On: Float set to turn pump on.

Pump Off: Float set to turn pump off. Lowest water level in pump tank.

Pump Tank: A septic tank without a mid-tank baffle. Use this figure to calculate the appropriate setting for pump switches and alarms.

Storage Capacity: Volume of the pump tank from high water alarm to tank outlet invert.

Total Dynamic Head: A combination of:

1. the difference in elevation from pump "off" to pipe invert at the beginning of the highest drainfield.

2. and the friction loss of delivery pipe and fittings.

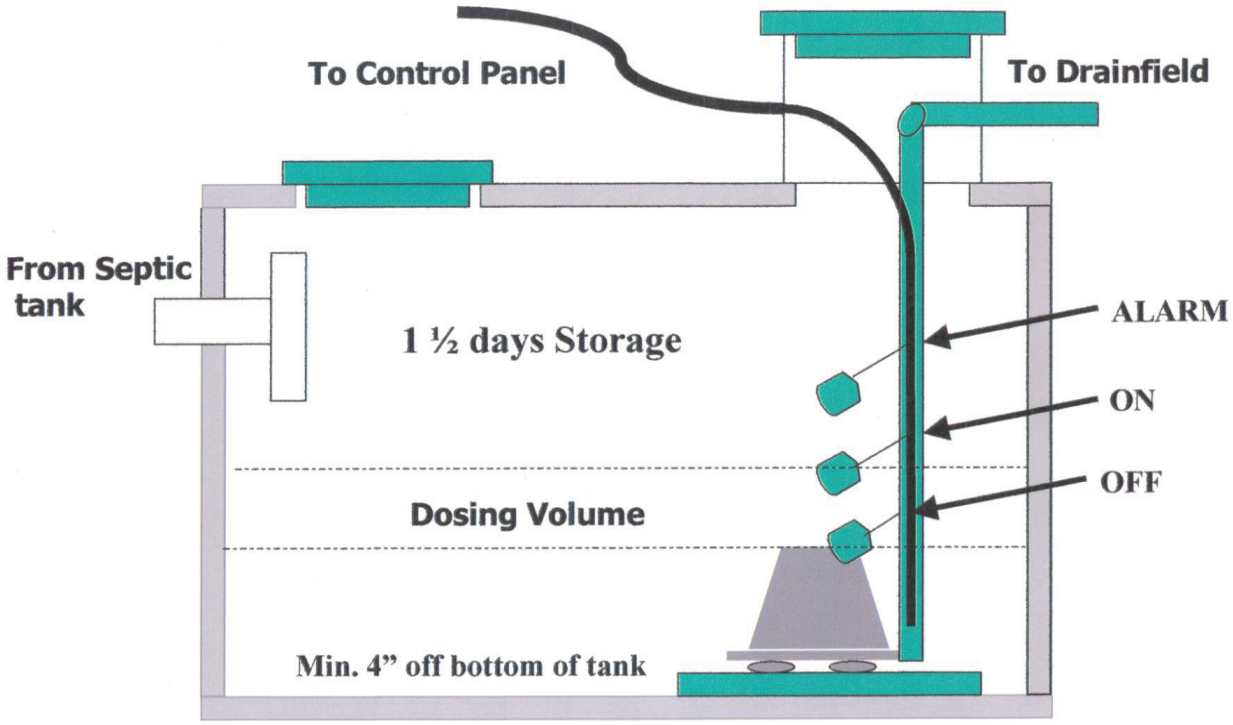


Diagram 1

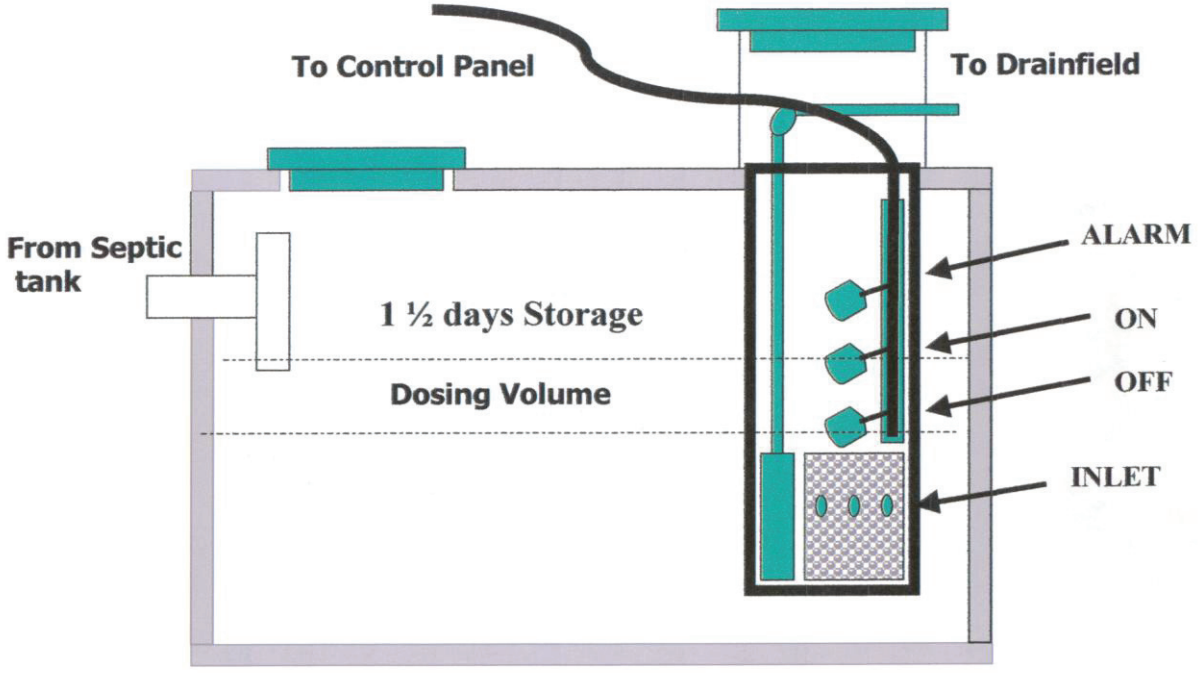
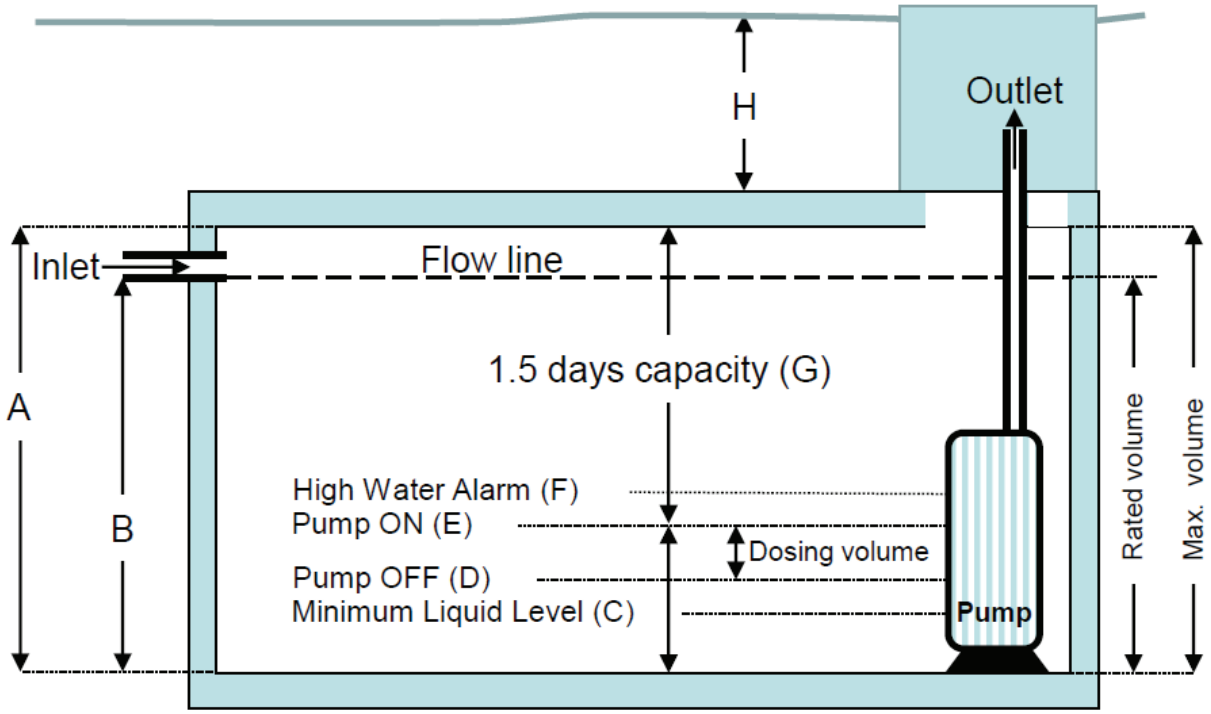


Diagram 2

Pump Tank Diagram

to be included on the design plan



Pump Tank Manufacturer/Model:

_____

A	B	C	D	E	F	G	H

PUMP SYSTEM WORKSHEET

Applicant_____ Date_____
Owner_____ File No._____
Site Address_____ City_____ APN_____
Designer (REHS or RCE) _____
Number of bedrooms_____ Total square footage of living space_____
Septic tank size_____ Installed drainfield_____ Expansion drainfield_____

Elevation of highest drainfield (ft) _____
Elevation of pump off (ft) - _____
Total lift (Ft Head) = _____ (A)

TIGHT LINE
Diameter of tight line (inches) _____
Length of tight line from pump to upper drainfield (ft) _____ (B)

FITTINGS

No. of Fittings		Pipe Length Equivalent (ft) See chart	Total Pipe Equivalent (ft)
___90° standard elbow	X	_____	=_____
___45° standard elbow	X	_____	=_____
___90° long radius elbow	X	_____	=_____
___other fittings	X	_____	=_____
___gate valve (fully open)	X	_____	=_____
___check valve (conventional swing)	x	_____	=_____

TOTAL=_____ (C)

Total Length of Pipe = B + C = _____ (D)

CALCULATIONS:

Friction Loss in Pipes and Fittings:
(D/100 ft) x _____ (friction loss per chart) = _____ (E) Head in Feet

Required Pump Size:
_____ (A) + _____ (E) = _____ (F) Total Pumping Head in Feet

Pump Size:
(F) versus GPM = Pump Size (refer to pump curve)

Pump Model: (Attach Pump Curve)
_____GPM at _____ (G) (ft of head: from pump curve) Manufacturer/Model_____

Required Capacity in Gallons
Dosing Volume _____
Storage Capacity (1 ½ days) _____
Pump Displacement _____
Volume from tank bottle to pump base _____
Total tank capacity _____

Pump Tank Information
Manufacturer_____ Size_____ Gallons per inch_____

Friction Loss per 100 feet of Plastic Pipe
In feet of head

GPM	Pipe Diameter									
	1/2 in.	3/4 in.	1 in.	1 1/4 in.	1 1/2 in.	2 in.	2 1/2 in.	3 in.	4 in.	5 in.
1	2.08	0.51								
2	4.16	1.02	0.55	0.14	0.07					
5	23.44	5.73	1.72	0.44	0.22	0.066	0.038	0.015		
7	43.06	10.52	3.17	0.81	0.38	0.11	0.051	0.021		
10	82.02	20.04	6.02	1.55	0.72	0.21	0.09	0.03		
15		42.46	12.77	3.28	1.53	0.45	0.19	0.07		
20		72.34	21.75	5.59	2.61	0.76	0.32	0.11	0.03	
25			32.88	8.45	3.95	1.15	0.49	0.17	0.04	
30			46.08	11.85	5.53	1.62	0.68	0.23	0.06	0.02
35				15.76	7.36	2.15	0.91	0.31	0.08	0.03
40				20.18	9.43	2.75	1.16	0.40	0.11	0.03
45				25.10	11.73	3.43	1.44	0.50	0.13	0.04
50				30.51	14.25	4.16	1.75	0.60	0.16	0.05
60					19.98	5.84	2.46	0.85	0.22	0.07
70						7.76	3.27	1.13	0.30	0.10
75						8.82	3.71	1.28	0.34	0.11
80						9.94	4.19	1.44	0.38	0.13
90						12.37	5.21	1.80	0.47	0.16
100						15.03	6.33	2.18	0.58	0.19
125							9.58	3.31	0.88	0.29
150							13.41	4.63	1.22	0.40
175								6.16	1.63	0.54
200								7.88	2.08	0.69
250								11.93	3.15	1.05
300									4.41	1.46

Friction Loss in PVC Fittings

The follow table lists friction loss in PVC pipe fittings as a measure of the amount of friction in an equivalent length (ft) of straight pipe.

PVC Part	Normal Pipe Size (in)								
	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"
90° elbow, standard	1.5	2.0	2.25	4.0	4.0	6.0	8.0	8.0	12.0
45° elbow, standard	0.75	1.0	1.4	1.75	2.0	2.5	3.0	4.0	5.0
Insert Coupling	0.5	0.75	1.0	1.25	1.5	2.0	3.0	3.0	4.0
Gate Value	0.3	0.4	0.6	0.8	1.0	1.5	1.6	2.0	3.0
Male-Female Adapter	1.0	1.5	2.0	2.75	3.5	4.5	-	6.5	9.0
Tee-Flow through Run	1.0	1.4	1.7	2.3	2.7	4.3	5.1	6.3	8.3
Tee-Flow through Branch	4.0	5.0	6.0	7.0	8.0	12.0	15.0	16.0	22.0