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METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

Karen E. Dorff
RECUTIVE SECRETARY

May 25, 1994

To: Board of Directors (Water Problems Committee--Information)

From: General Manager

Subject: Statewide Legalization of Graywater Use

Report

Assembly Bill 3518, chaptered into law on July 14, 1992, directed the Department of Water Resources (DWR) to develop state plumbing code standards to permit the installation of residential graywater systems. Graywater is defined as untreated household wastewater which has not come into contact with toilet waste. Graywater includes used water from bathtubs, showers, bathroom washbasins, and water from clothes washing machines and laundry tubs. Wastewater form kitchen sinks, dishwashers or laundry water from soiled diapers are not considered graywater.

Subsequently, DWR, in cooperation with the Department of Health Services and other concerned organizations and individuals, developed a uniform set of statewide standards for the use of graywater for subsurface landscape irrigation in single family dwellings (Graywater Standards). In March, the California Building Standards Commission approved the Graywater Standards as part of the California Plumbing Code. These standards will take effect throughout the State after November 9, 1994. The new standards will assure public health protection, availability of high quality graywater systems and products, ease of widespread public education, and effective education of local government plan checkers and building inspectors. A copy of the Graywater Standards is attached for your information.

To date many California cities and counties have adopted local graywater use regulations for landscape irrigation purposes. However, when the new Graywater Standards take effect, they will supersede local graywater regulations. Local regulations must be set at levels equal to or more stringent than the State standards.

The California Association of Building Officials and DWR will be offering training courses in graywater system design, installation, inspection, and maintenance. DWR will also be providing the local building departments with a model homeowner graywater use brochure.

Board Committee assignments

This letter is referred for information to:

The Water Problems Committee because of its authority to study, advise, and make recommendations regarding policies dealing with the sale and delivery of water for various use, and water reclamation and reuse, pursuant to Administrative Code Section 2481(d)(i).

Recommendation

For information only.

for John R. Wodraska

RM:bvf

Attachments

California Plumbing Code
Title 24, Part 5, California Administrative Code

APPENDIX J GRAYWATER SYSTEMS FOR SINGLE FAMILY DWELLINGS

Section J-1 Graywater Systems. (General)

(a) The provisions of this Appendix shall apply to the construction, alteration and repair of graywater systems for subsurface landscape irrigation. Installations shall be allowed only in single family dwellings. The system shall have no connection to any potable water system and shall not result in any surfacing of the graywater. Except as otherwise provided for in this Appendix, the provisions of the Uniform Plumbing Code (UPC) shall be applicable to graywater installations.

(b) The type of system shall be determined on the basis of location, soil type, and ground water level and shall be designed to accept all graywater connected to the system from the residential building. The system shall discharge into subsurface irrigation fields and may include surge tank(s) and appurtenances, as required by the Administrative Authority.

(c) No graywater system, or part thereof, shall be located on any lot other than the lot which is the site of the building or structure which discharges the graywater; nor shall any graywater system or part thereof be located at any point having less than the minimum distances indicated in Table J-1.

(d) No permit for any graywater system shall be issued until a plot plan with appropriate data satisfactory to the Administrative Authority has been submitted and approved. When there is insufficient lot area or inappropriate soil conditions for adequate absorption of the graywater, as determined by the Administrative Authority, no graywater system shall be permitted. The Administrative Authority is a city or county.

(e) No permit shall be issued for a graywater system which would adversely impact a geologically sensitive area, as determined by the Administrative Authority.

(f) Private sewage disposal systems existing or to be constructed on the premises shall comply with Appendix I of this code or applicable local ordinance. When abandoning underground tanks, Section 1119 of the UPC shall apply. Also, appropriate clearances from graywater systems shall be maintained as provided in Table J-1. The capacity of the private sewage disposal system, including required future areas, shall not be decreased by the existence or proposed installation of a graywater system servicing the premises.

(g) Installers of graywater systems shall provide an operation and maintenance manual, acceptable to the Administrative Authority, to the owner of each system. Graywater systems require regular or periodic maintenance.

(h) The Administrative Authority shall provide the applicant a copy of this Appendix.

Section J-2 Definitions.

Graywater is untreated household waste water which has not come into contact with toilet waste. Graywater includes used water from bathtubs, showers, bathroom wash basins, and water from clothes washing machines and laundry tubs. It shall not include waste water from kitchen sinks, dishwashers or laundry water from soiled diapers.

Surfacing of graywater means the ponding, running off, or other release of graywater from the land surface.

Section J-3 Permit.

It shall be unlawful for any person to construct, install or alter, or cause to be constructed, installed or altered any graywater system in a building or on a premises without first obtaining a permit to do such work from the Administrative Authority.

Section J-4 Drawings and Specifications.

The Administrative Authority may require any or all of the following information to be included with or in the plot plan before a permit is issued for a graywater system:

(a) Plot plan drawn to scale completely dimensioned, showing lot lines and structures, direction and approximate slope of surface, location of all present or proposed retaining walls, drainage channels, water supply lines, wells, paved areas and structures on the plot, number of bedrooms and plumbing fixtures in each structure, location of private sewage disposal system and 100% expansion area or building sewer connecting to public sewer, and location of the proposed graywater system.

(b) Details of construction necessary to ensure compliance with the requirements of this Appendix together with a full description of the complete installation including installation methods, construction and materials as required by the Administrative Authority.

(c) A log of soil formations and ground water level as determined by test holes dug in close proximity to any proposed irrigation area, together with a statement of water absorption characteristics of the soil at the proposed site as determined by approved percolation tests. In lieu of percolation tests, the Administrative Authority may allow the use of Table J-2, an infiltration rate designated by the Administrative Authority, or an infiltration rate determined by a test approved by the Administrative Authority.

Section J-5 Inspection and Testing.

(a) Inspection
1. All applicable provisions of this Appendix and of Section 318 of the UPC shall be complied with.
2. System components shall be properly identified as to manufacturer.
3. Surge tanks shall be installed on dry, level, well-compacted soil if in a drywell, or on a level, 3" concrete slab or equivalent, if above ground.
4. Surge tanks shall be anchored against overturning.
5. If the irrigation design is predicated on soil tests, the irrigation field shall be installed at the same location and depth as the tested area.
6. Installation shall conform with the equipment and installation methods identified in the approved plans.
7. Graywater stub-out plumbing may be allowed for future connection prior to the installation of irrigation lines and landscaping. Stub-out shall be permanently marked "GRAYWATER STUB-OUT, DANGER - UNSAFE WATER"

(b) Testing
1. Surge tanks shall be filled with water to the overflow line prior to and during inspection. All seams and joints shall be left exposed and the tank shall remain watertight.
2. A flow test shall be performed through the system to the point of graywater irrigation. All lines and components shall be watertight.

Section J-6 Procedure for Estimating Graywater Discharge.

The Administrative Authority may utilize the graywater discharge procedure listed below, water use records, or calculations of local daily per person interior water use:

(a) The number of occupants of each dwelling unit shall be calculated as follows:

First Bedroom	2 occupants
Each additional bedroom	1 occupant

(b) The estimated graywater flows for each occupant shall be calculated as follows:

Showers, bathtubs and wash basins	25 GPD/occupant.
Laundry	15 GPD/occupant.

(c) The total number of occupants shall be multiplied by the applicable estimated graywater discharge as provided above and the type of fixtures connected to the graywater system.

Section J-7 Required Area of Subsurface Irrigation.

Each irrigation zone shall have a minimum effective irrigation area for the type of soil and infiltration rate to distribute all graywater produced daily, pursuant to Section J-6, without surfacing. The required irrigation area shall be based on the estimated graywater discharge, pursuant to Section J-6 of this Appendix, size of surge tank, or a method determined by the Administrative Authority. Each proposed graywater system shall include at least two irrigation zones and each irrigation zone shall be in compliance with the provisions of this Section.

If the mini-leachfield irrigation system is used, the required square footage shall be determined from Table J-2, or equivalent, for the type of soil found in the excavation. The area of the irrigation field shall be equal to the aggregate length of the perforated pipe sections within the irrigation zone times the width of the proposed mini-leachfield trench.

No irrigation point shall be within five vertical feet of highest known seasonal groundwater nor where graywater may contaminate the ground water or ocean water. The applicant shall supply evidence of ground water depth to the satisfaction of the Administrative Authority.

Section J-8 Determination of Irrigation Capacity.

(a) In order to determine the absorption quantities of questionable soils other than those listed in Table J-2, the proposed site may be subjected to percolation tests acceptable to the Administrative Authority or determined by the Administrative Authority.

(b) When a percolation test is required, no mini-leachfield system or subsurface drip irrigation system shall be permitted if the test shows the absorption capacity of the soil is less than 60 minutes/inch or more rapid than 5 minutes/inch, unless otherwise permitted by the Administrative Authority.

(c) The irrigation field size may be computed from Table J-2, or determined by the Administrative Authority or a designee of the Administrative Authority.

Section J-9 Surge Tank Construction. (FIG. 1, 2, 3 & 4)

(a) Plans for surge tanks shall be submitted to the Administrative Authority for approval. The plans shall show the data required by the Administrative Authority and may include dimensions, structural calculations, and bracing details.

(b) Surge tanks shall be constructed of solid, durable materials, not subject to excessive corrosion or decay and shall be watertight.

(c) Surge tanks shall be vented as required by Chapter 5 of this Code and shall have a locking, gasketed access opening, or approved equivalent, to allow for inspection and cleaning.

(d) Surge tanks shall have the rated capacity permanently marked on the unit. In addition, "GRAYWATER IRRIGATION SYSTEM, DANGER - UNSAFE WATER" shall be permanently marked on the surge tank.

(e) Surge tanks installed above ground shall have a drain and overflow, separate from the line connecting the tank with the irrigation fields. The drain and overflow shall have a permanent connection to a sewer or to a septic tank, and shall be protected against sewer line backflow by a backwater valve. The overflow shall not be equipped with a shut-off valve.

(f) The overflow and drain pipes shall not be less in diameter than the inlet pipe. The vent size shall be based on the total graywater fixture units, as outlined in UPC Table 4-3 or local equivalent. Unions or equally effective fittings shall be provided for all piping connected to the surge tank.

(g) Surge tanks shall be structurally designed to withstand anticipated loads. Surge tank covers shall be capable of supporting an earth load of not less than 300 pounds per square foot when the tank is designed for underground installation.

(h) Surge tanks may be installed below ground in a dry well on compacted soil, or buried if the tank design is approved by the Administrative Authority. The system shall be designed so that the tank overflow will gravity drain to a sanitary sewer line or septic tank. The tank must be protected against sewer line backflow by a backwater valve.

(i) Materials
1. Surge tanks shall meet nationally recognized standards for non-potable water and shall be approved by the Administrative Authority.
2. Steel surge tanks shall be protected from corrosion, both externally and internally, by an approved coating or by other acceptable means,

Section J-10 Valves and Piping. (FIG. 1, 2, 3 & 4)

Graywater piping discharging into a surge tank or having a direct connection to a sanitary drain or sewer piping shall be downstream of an approved waterseal type trap(s). If no such trap(s) exists, an approved vented running trap shall be installed upstream of the connection to protect the building from any possible waste or sewer gasses. All graywater piping shall be marked or shall have a continuous tape marked with the words "DANGER - UNSAFE WATER." All valves, including the three-way valve, shall be readily accessible and shall be approved by the Administrative Authority. A backwater valve, installed pursuant to this Code, shall be provided on all surge tank drain connections to the sanitary drain or sewer piping.

Section J-11 Irrigation Field Construction.

The Administrative Authority may permit subsurface drip irrigation, mini-leachfield or other equivalent irrigation methods which discharge graywater in a manner which ensures that the graywater does not surface. Design standards for subsurface drip irrigation systems and mini-leachfield irrigation systems follow:

(a) Standards for a subsurface drip irrigation system are:
1. Minimum 140 mesh (115 micron) one inch filter with a capacity of 25 gallons per minute, or equivalent, filtration shall be used. The filter back-wash and flush discharge shall be caught, contained and disposed of to the sewer system, septic tank, or with approval of the Administrative Authority, a separate mini-leachfield sized to accept all the back-wash and flush discharge water. Filter backwash water and flush water shall not be used for any purpose. Sanitary procedures shall be followed when handling filter back-wash and flush discharge or graywater.

2. Emitters shall have a minimum flow path of 1200 microns and shall have a coefficient of manufacturing variation (Cv) of no more than seven percent. Irrigation system design

shall be such that emitter flow variation shall not exceed plus or minus ten percent. Emitters shall be recommended by the manufacturer for subsurface use and graywater use, and shall have demonstrated resistance to root intrusion. For emitter ratings refer to: Irrigation Equipment Performance Report, Drip Emitters and Micro-Sprinklers, Center for Irrigation Technology, California State University, 5730 N. Chestnut Avenue, Fresno, California 93740-0018.

3. Each irrigation zone shall be designed to include no less than the number of emitters specified in Table J-3, or through a procedure designated by the Administrative Authority. Minimum spacing between emitters is 14 inches in any direction.

4. The system design shall provide user controls, such as valves, switches, timers, and other controllers as appropriate, to rotate the distribution of graywater between irrigation zones.

5. All drip irrigation supply lines shall be PVC class 200 pipe or better and schedule 40 fittings. All joints shall be properly glued, inspected and pressure tested at 40 psi, and shown to be drip tight for five minutes, before burial. All supply lines will be buried at least eight inches deep. Drip feeder lines can be poly or flexible PVC tubing and shall be covered to a minimum depth of nine inches.

6. Where pressure at the discharge side of the pump exceeds 20 pounds per square inch (psi), a pressure reducing valve able to maintain downstream pressure no greater than 20 psi shall be installed downstream from the pump and before any emission device.

7. Each irrigation zone shall include an automatic flush valve/vacuum breaker to prevent back syphonage of water and soil.

(b) Standards for the mini-leachfield system are: (FIG. 5)

1. Perforated sections shall be a minimum 3-inch diameter and shall be constructed of perforated high density polyethylene pipe, perforated ABS pipe, perforated PVC pipe, or other approved materials, provided that sufficient openings are available for distribution of the graywater into the trench area. Material, construction and perforation of the piping shall be in compliance with the appropriate absorption field drainage piping standards and shall be approved by the Administrative Authority.

2. Clean stone, gravel, or similar filter material acceptable to the Administrative Authority, and varying in size between 3/4 inch to 2 1/2 inches shall be placed in the trench to the depth and grade required by this Section. Perforated sections shall be laid on the filter material in an approved manner. The perforated sections shall then be covered with filter material to the minimum depth required by this Section. The filter material shall then be covered with landscape filter fabric or similar porous material to prevent closure of voids with earth backfill. No earth backfill shall be placed over the filter material cover until after inspections and acceptance.

3. Irrigation fields shall be constructed as follows:

	MINIMUM	MAXIMUM
Number of drain lines per irrigation zone	1	---
Length of each perforated line	---	100 feet
Bottom width of trench	6 inches	18 inches
Total depth of trench	17 inches	18 inches
Spacing of lines, center to center	4 feet	---
Depth of earth cover of lines	9 inches	---
Depth of filter material cover of lines	2 inches	---
Depth of filter material beneath lines	3 inches	---
Grade of perforated lines	level	3 inches/100 feet

Section J-12 Special Provisions

(a) Other collection and distribution systems may be approved by the Administrative Authority as allowed by Section 201 of the UPC.

(b) Nothing contained in this Appendix shall be construed to prevent the Administrative Authority from requiring compliance with stricter requirements than those contained herein, where such stricter requirements are essential in maintaining safe and sanitary conditions or from prohibiting graywater systems.

Section J-13 Health and Safety

(a) Graywater may contain fecal matter as a result of bathing and/or washing of diapers and undergarments. Water containing fecal matter, if swallowed, can cause illness in a susceptible person.

(b) Graywater shall not include laundry water from soiled diapers.

(c) Graywater shall not be applied above the land surface or allowed to surface and shall not be discharged directly into or reach any storm sewer system or any water of the United States.

(d) Graywater shall be not be contacted by humans, except as required to maintain the graywater treatment and distribution system.

(e) Graywater shall not be used for vegetable gardens.

Table J-1 Location of Graywater System

Minimum Horizontal Distance (in feet) From	Surge Tank	Irrigation Field
Buildings or structures[1]	5 ft[2]	8 ft[3]
Property line adjoining private property	5 ft	5 ft
Water supply wells[4]	50 ft	100 ft
Streams and lakes[4]	50 ft	50 ft
Seepage pits or cesspools	5 ft	5 ft
Disposal field & 100% expansion area	5 ft	4 ft[5]
Septic tank	0 ft	5 ft[6]
On-site domestic water service line	5 ft	5 ft[7]
Pressure public water main	10 ft	10 ft[8]
Water ditches	50 ft	50 ft

Notes: When mini-leach fields are installed in sloping ground, the minimum horizontal distance between any part of the distribution system and ground surface shall be fifteen feet.

1. Including porches and steps, whether covered or uncovered, but does not include car ports, covered walks, driveways and similar structures.
2. The distance may be reduced to zero feet for above ground tanks if approved by the Administrative Authority.
3. The distance may be reduced to two feet, with a water barrier, by the Administrative Authority, upon consideration of the soil expansion index.
4. Where special hazards are involved, the distance may be increased by the Administrative Authority.
5. Applies to the mini-leachfield type system only. Plus two feet for each additional foot of depth in excess of one foot below the bottom of the drain line.
6. Applies to mini-leachfield type system only.
7. A two foot separation is required for subsurface drip systems.
8. For parallel construction or for crossings, approval by the Administrative Authority shall be required.

Table J-2 Mini-Leach Field Design Criteria of Six Typical Soils.

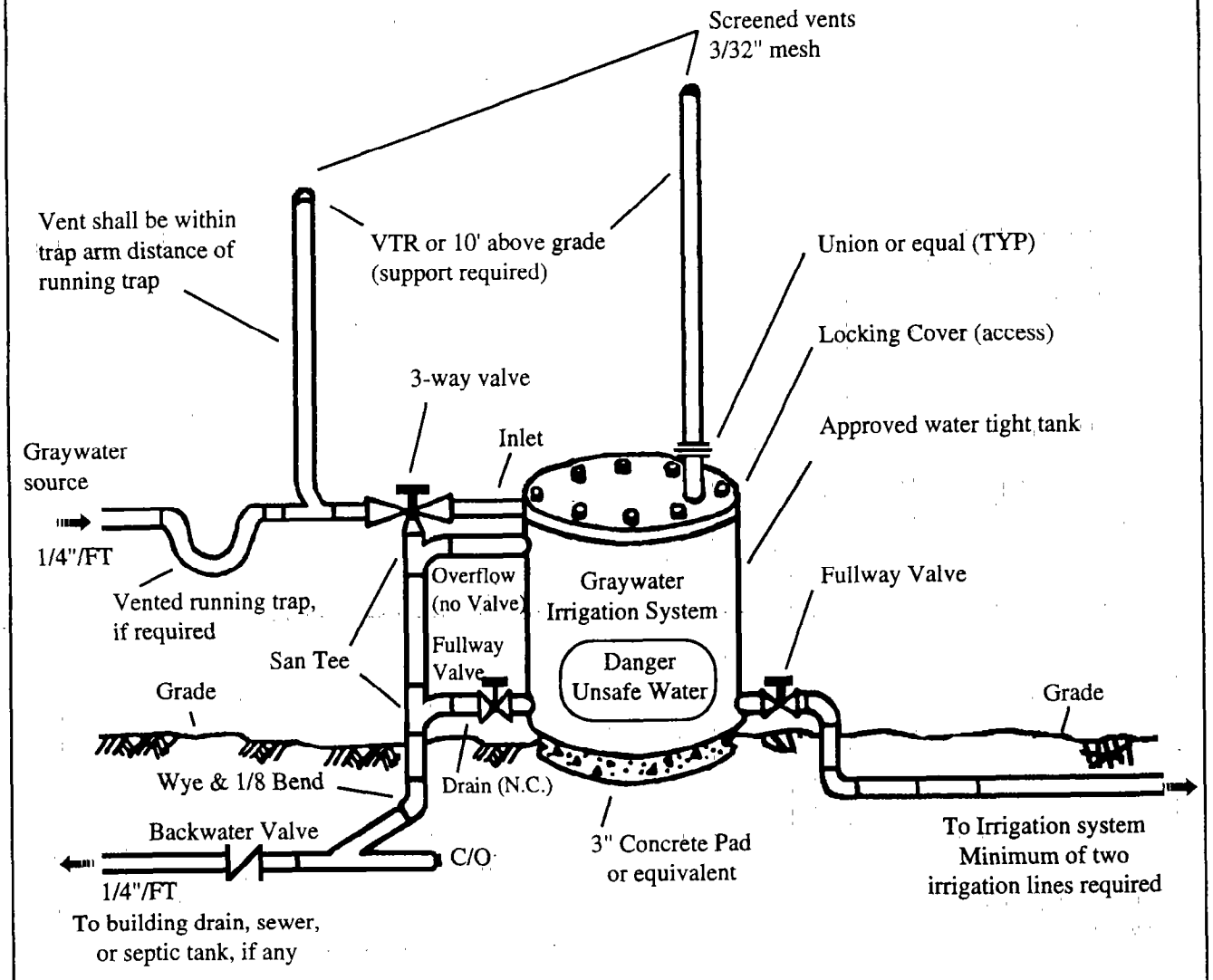
Type of Soil	Minimum sq. ft. of irrigation area per 100 gallons of estimated graywater discharge per day.	Maximum absorption capacity, minutes per inch, of irrigation area for a 24-hour period.
1. Coarse sand or gravel	20	5
2. Fine sand	25	12
3. Sandy loam	40	18
4. Sandy clay	60	24
5. Clay with considerable sand or gravel	90	48
6. Clay with small amount of sand or gravel	120	60

Table J-3 Subsurface Drip Design Criteria of Six Typical Soils.

Type of Soil	Maximum emitter discharge (gal/day)	Minimum number of emitters per gpd of graywater production
1. Sand	1.8	.6
2. Sandy loam	1.4	.7
3. Loam	1.2	.9
4. Clay loam	.9	1.1
5. Silty clay	.6	1.6
6. Clay	.5	2.0

Use the daily graywater flow calculated in Section J-6 to determine the number of emitters per line

GRAYWATER SYSTEM
Single Tank - Gravity (conceptual)



Abbreviations

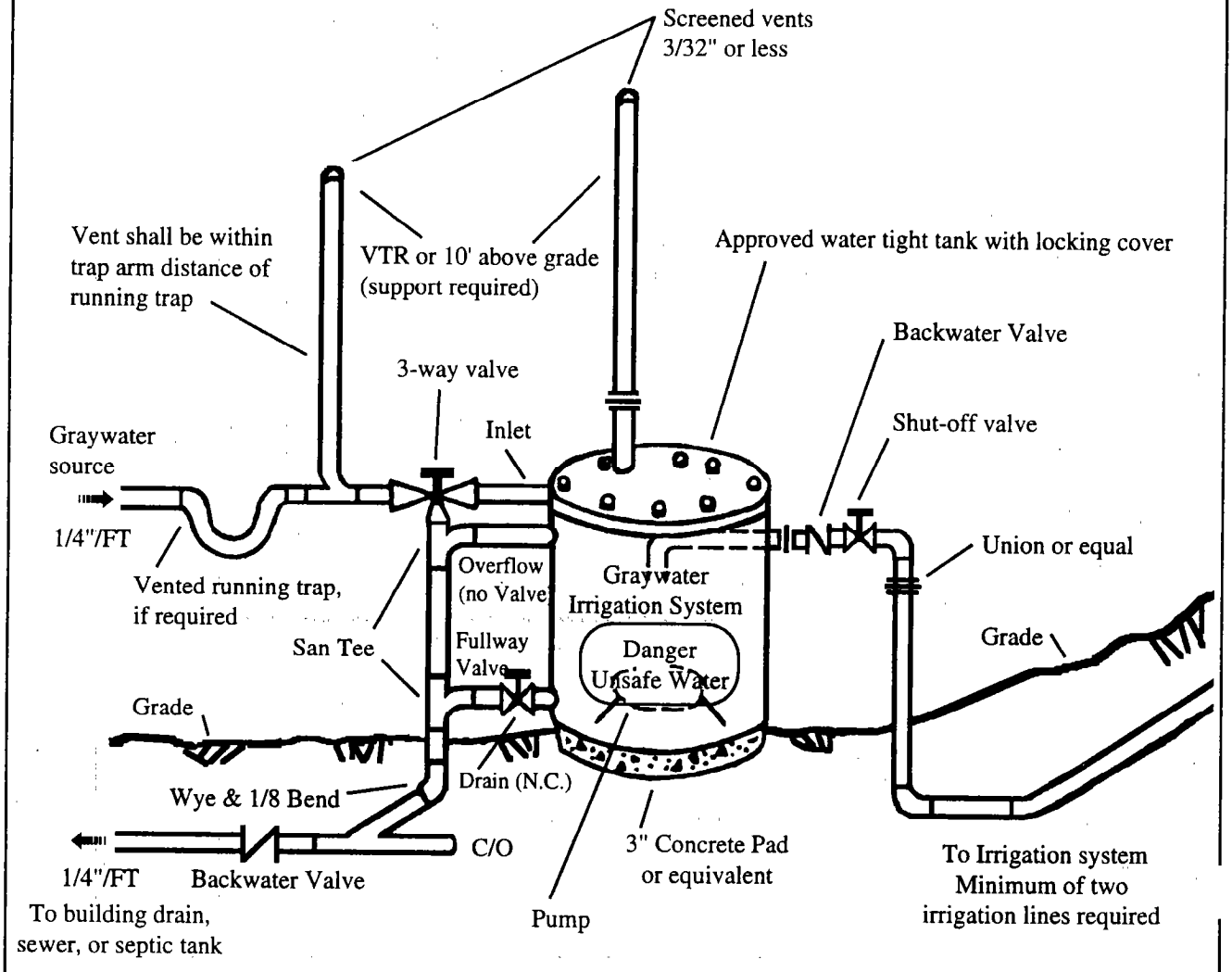
C/O	Cleanout
N.C.	Normally Closed
VTR	Vent Thru Roof

California Plumbing Code
Appendix J

Figure 1

Date: March 1994
Revised: Final

GRAYWATER SYSTEM
Single Tank - Pumped (conceptual)



Abbreviations

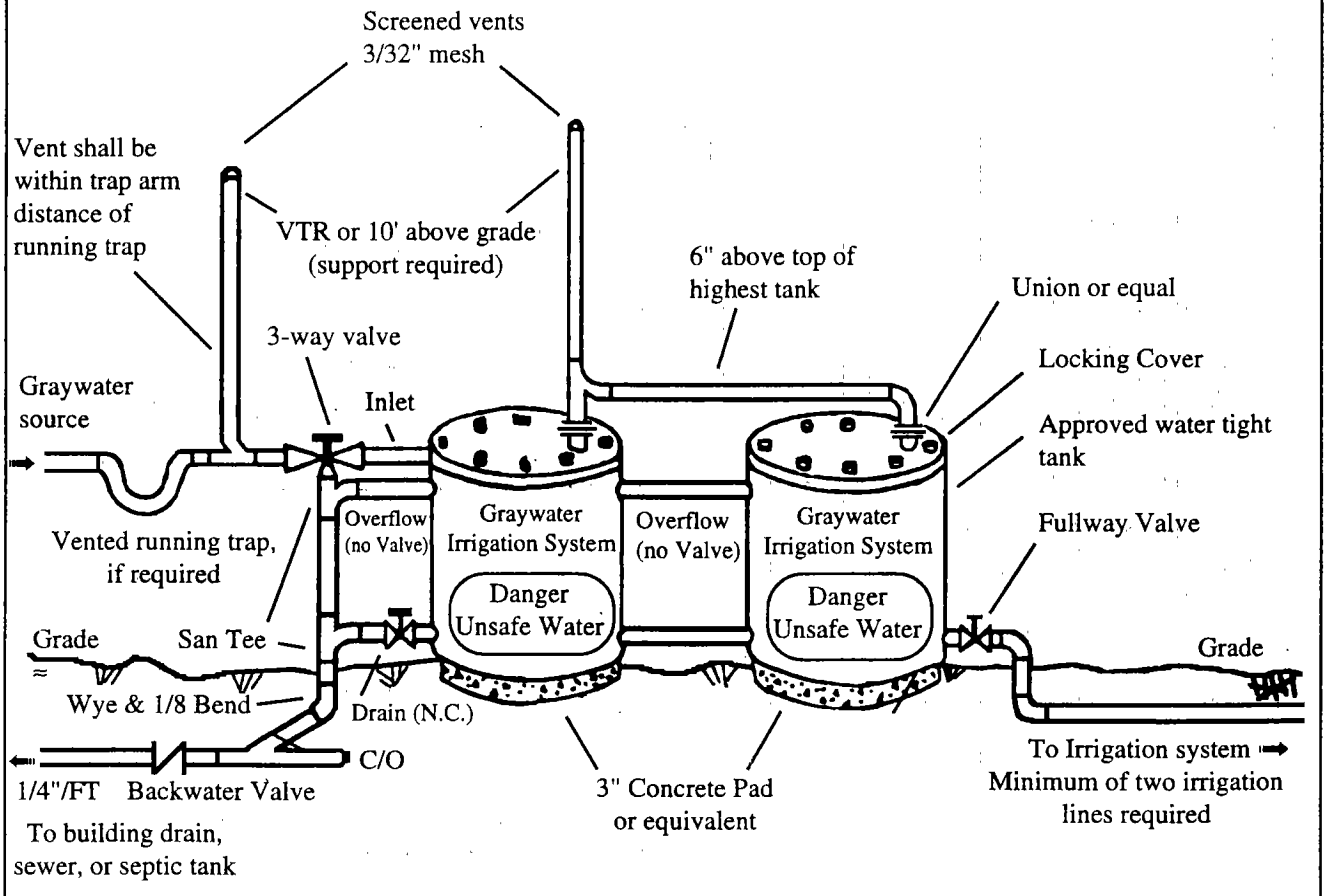
C/O	Cleanout
N.C.	Normally Closed
VTR	Vent Thru Roof

California Plumbing Code
Appendix J

Figure 2

Date: March 1994
Revised: Final

GRAYWATER SYSTEM
Multiple Tank (conceptual)



Abbreviations

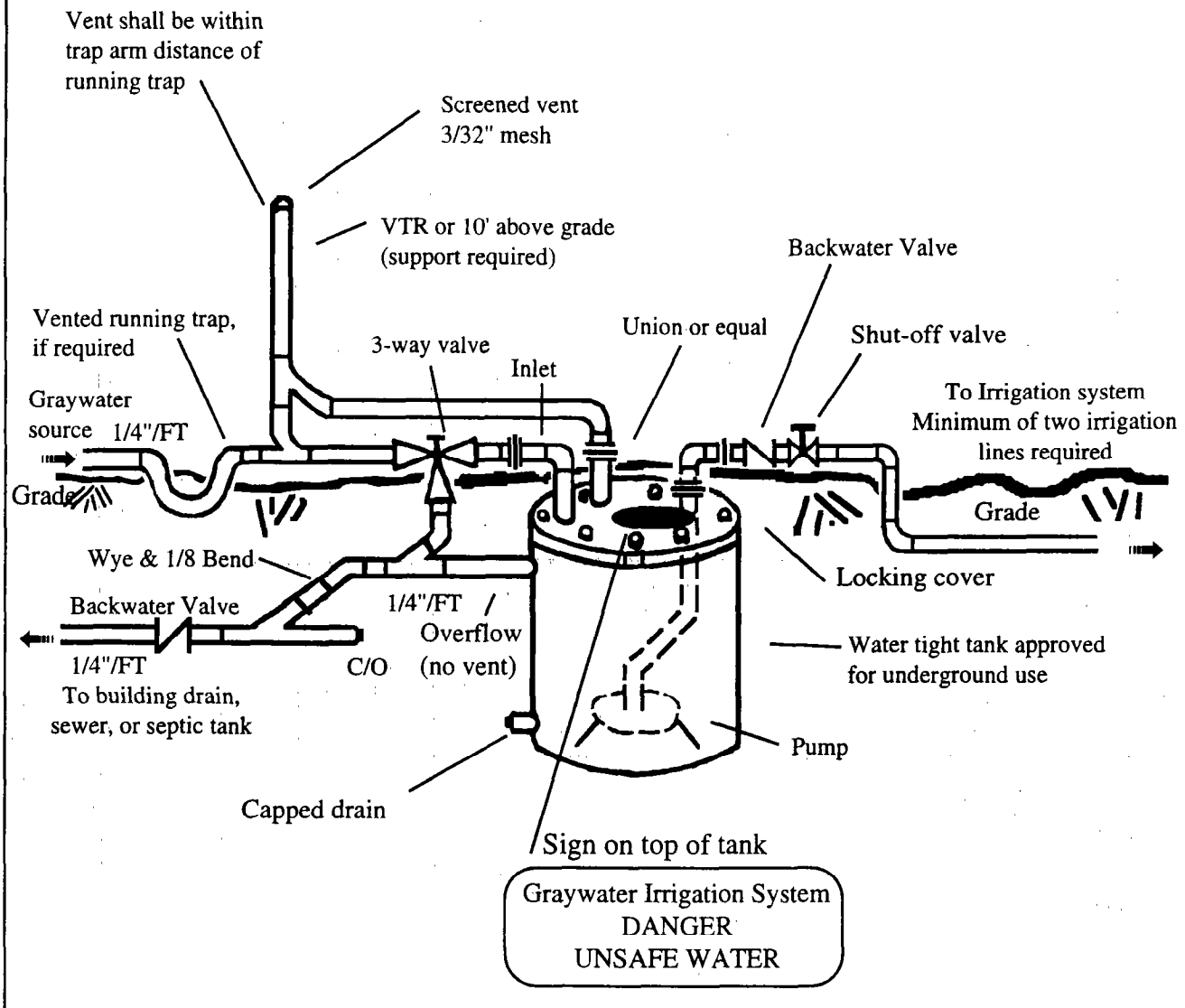
C/O	Cleanout
N.C.	Normally Closed
VTR	Vent Thru Roof

California Plumbing Code
Appendix J

Figure 3

Date: March 1994
Revised: Final

GRAYWATER SYSTEM
Underground Tank (conceptual)



Abbreviations

C/O Cleanout

VTR Vent Thru Roof

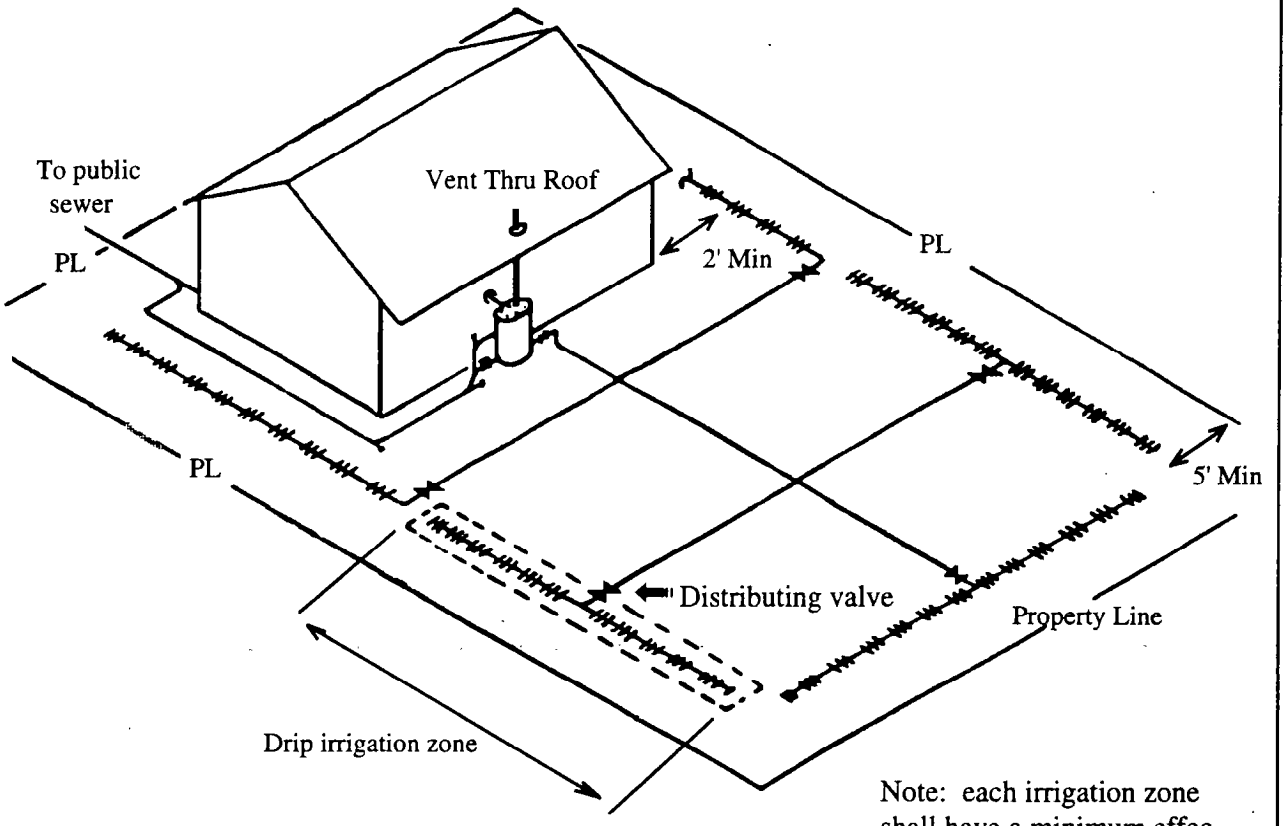
California Plumbing Code Appendix J

Figure 4

Date: March 1994

Revised: Final

GRAYWATER SYSTEM
Irrigation Layout (conceptual)



Note: each irrigation zone shall have a minimum effective irrigation area based on Section J-7..

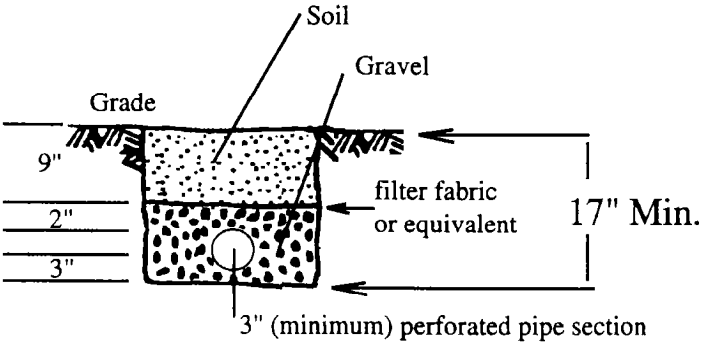


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Figure 5

Date: March 1994
Revised: Final