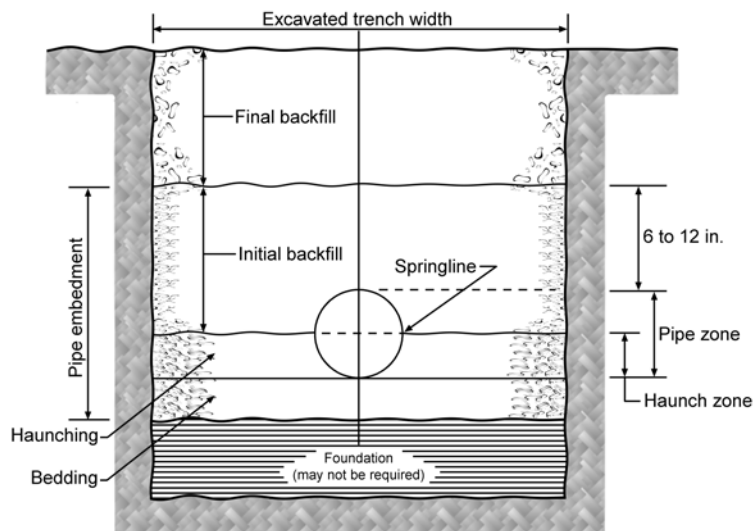


Decentralized Wastewater Glossary

Second Edition

Compiled by

The Consortium of Institutes for Decentralized Wastewater Treatment



Introduction to the Second Edition

As with any glossary, it is important to maintain a current status. Upon completion of the original Decentralized Wastewater Glossary in 2007, the CIDWT began to document small errors and omissions in terms, definitions and diagrams brought to light in the process of using the document. Additionally, the CIDWT began development of a National Installer Training Program with funding provided from the US EPA through WERF. The Installer Training Program project provided another opportunity to expand the original document using terms definitions and associated diagrams specific to installation. The 2009 Second Edition reflects these changes.

The CIDWT welcomes input from field professionals regarding the content of this Glossary. Documentation of use of the Glossary in its entirety by reference or through use of one or more terms is appreciated. Comments and suggestions should be forwarded to the organization at: cidwt@ncsu.edu. For more information regarding CIDWT go to <http://www.onsiteconsortium.org>.

CIDWT
October 2009

Introduction to the First Edition (2007)

The definitions provided in this glossary were specifically chosen for their usefulness to professionals in the field of decentralized wastewater treatment. The philosophy behind the document is that in order for decentralized wastewater treatment to remain a permanent component of our water treatment infrastructure, we in the industry must define the associated and all-encompassing management requirements for sustainable long term performance. This document provides the foundation for doing so. The writers consulted many existing glossaries and acknowledge the considerable value of those sources. The final definitions were chosen on the basis of the best fit to the industry as a whole as determined by a wide group of stakeholders and the result is a collection of terms that illustrates the broad landscape of decentralized wastewater treatment.

In addition to definitions, “*See*”, “*see also*” and “*also known as*” references are included. A “*See*” reference directs the reader to either the preferred term (as identified during the review process) or to the appropriate alphabetical location based upon the core term. For example, “active aeration” is defined under “aeration, active”. A “*see also*” reference directs the reader to terms that are closely related and provides a broader perspective or supplemental information. An “*also known as*” reference indicates that the terms are used synonymously. The authors intentionally chose “preferred” definitions based upon a positive connotation. References to the diagrams are also included where appropriate.

The authors believe that this glossary will move the field of decentralized wastewater treatment forward in a positive, proactive manner. This terminology will undoubtedly evolve over time as professionals use and refine the language.

CIDWT acknowledges the tremendous contribution of reviewers, both individual and organizational, who have invested time and effort over the course of this project. The group also acknowledges the financial support of the US Environmental Protection Agency through the Water Environment Research Foundation.

*CIDWT Glossary Writing Team
December 2007*

CIDWT Glossary Writing Team:

Bruce J. Lesikar, PhD, PE
Texas Cooperative Extension
Nancy Deal, MS, REHS,
North Carolina State University
John Buchanan, PhD, PE
University of Tennessee
Kitt Farrell-Poe, PhD
University of Arizona
Mark Gross, PhD
University of Arkansas
Dave Gustafson, PE
University of Minnesota
David Kalen, MS
University of Rhode Island
David Lindbo, PhD, LSS
North Carolina State University
George Loomis, MS
University of Rhode Island
Randall Miles, PhD
University of Missouri

Graphic and Editorial Assistance by:

Janet Hygnstrom
University of Nebraska
Justin K. Mechell
Texas Cooperative Extension
Nicholas Kaechler
Texas Cooperative Extension
Melinda White
NC State University

Organizational reviewers:

American Society of Civil Engineers
National Association of Wastewater Transporters
National Environmental Health Association
National Onsite Wastewater Recycling Association
National Precast Concrete Association
State Onsite Regulators Alliance
Soil Science Society of America
Water Environment Federation
Washington On-site Sewage Association

Individual Reviewers:

James Anderson
University of Minnesota

Gene Bassett
E.C. Bassett Construction, Inc.

Allison Blodig
Bio-Microbics, Inc.

Gary Buttermore
Nebraska Department of Environmental Quality

Matt Byers
Zoeller Co. Inc.

Paul Chase
State Onsite Regulators Alliance

Edward J. Corriveau
Penna. Department of Environmental Protection

Victor D'Amato
ARCADIS, Inc.

Kenneth R. Davis
Coastal Plains Environmental Group

Stephen Dix
Septic Solutions, LLC

Tom Ferrero
National Association of Wastewater Transporters

Mark Hooks
Florida Dept. of Health

Janet Hygnstrom
University of Nebraska

Terrell Jones
NC DENR Onsite Wastewater Section

Daniel Larubio
Southern Nevada Health District

Robert E. Lee
Loudoun County (VA) Health Department

Robert B. Mayer
American Manufacturing

John McCray
Colorado School of Mines

Del Mokma
Michigan State University

Janet Murray
Missouri Small Flows Organization

Brent Parker
Iowa Department of Natural Resources

Christl Pokorney
National Environmental Health Association

Morgan Powell
Kansas State Univ. Research and Extension

Barbara Rich
Deschutes Co. (OR) Environmental Health Division

Dennis Sievers
University of Missouri

Individual Reviewers (continued):

Tony Smithson

Lake County (IL) Environmental Health

Shanin Speas-Frost

Florida Dept. of Environmental Protection

Bill Stuth, Sr.

Aqua Test, Inc.

Theo B. Terry, III

Ring Industrial Group

John Thomas

Washington On-site Sewage Association

Jerry Tyler

University of Wisconsin (Retired)

Eric W. Valentine

American Manufacturing, Inc.

Dan Wellington

City of Bangor, ME

David Wilson

David R. Wilson, P.E.

Citation

CIDWT Decentralized Wastewater Glossary. Available online at:
<http://www.onsiteconsortium.org/glossary.html> (Date verified).

Table of Contents

Page	Contents
1	Decentralized Wastewater Glossary
112	References
	Appendices
115	Appendix A: Types of Soil Treatment Areas
116	Appendix B: Reference Tables
117	1. Conversion Factors
118	2. Friction Losses for Schedule 40 PVC Pipe
119	3. Friction Loss Equivalent in Piping Length (Feet)
120	4a. Pipeline Volume (Gallons) per Foot of Piping
120	4b. Pipeline Volume (Gallons) per 100 Feet of Piping
121	5. Orifice Flow for Low-Pressure Distribution Applications
122	6. Orifice Flow for Pressure-Dosed Gravity Manifold Applications
123	7. Required Flow Rate to Achieve Two feet per Second Velocity

List of Figures and Tables

Page	Figure or Table
1	Absorption area of an above-grade soil treatment area on a level site
2	Absorption area of an above-grade soil treatment area on a sloping site
5	Soil treatment area with areal fill trenches (shown in section view)
6	Soil treatment areas with at-grade trenches (shown in section views)
9	Cross-section of an excavation
15	Clear zone of a two-compartment septic tank
17	Free water surface constructed wetland system
17	Submerged flow constructed wetland system
20	Discharge assembly showing associated components
21	Drip distribution treatment train (typical)
22	Trenches with gravity parallel distribution using a distribution box
22	Below-grade soil treatment area using trenches with low-pressure distribution
23	Trenches with pressure-dosed gravity parallel distribution
23	Trenches with gravity sequential distribution
23	Trenches with gravity serial distribution
25	Interceptor drain installed upslope of a soil treatment area
26	Perimeter drain (section and plan view) around a septic tank and soil treatment area
28	Drop box
30	Evapotranspiration (ET) bed
31	Evapotranspiration/absorption (ETA) bed
35	Graphic representation of daily flow, average daily flow and peak flow
42	Invert of a pipe
44	Landscape position
44	Landscape position descriptors (landscape features)
47	Contour loading rate for trenches
51	Mound soil treatment areas showing gravel trenches in cross section.
52	Modified mound soil treatment areas showing gravel trenches in cross section
57	Peak enable operating parameter in a timed-dosing configuration
58	Typical pH of selected liquids
59	Piggyback plug assembly

List of Figures and Tables (continued)

Page	Figure or Table
63	Pump installed within a pump basin
64	Pump installed within a pump vault
66	Redundant off operating parameter in a three-float timed dosing configuration
69	Rotating biological contactor (RBC)
69	Illustrations of runs in various drip distribution configurations
72	Suspended-growth processes within a sequencing batch reactor (SBR)
73	Shallow narrow pressurized trench using 12-inch PVC half pipe
75	Slope shape descriptors
77	Types of soil structure with possible size classes and grades
77	Diagram of types of soil structure
78	Size class descriptors and criteria for various types of soil structure
78	USDA Soil Textural Triangle
80	Spray dispersal soil treatment area and typical associated components
81	Stepdown (section view)
85	Timer enable operating parameter: three-float configuration with redundant off and a two-float configuration using a single differential switch
89	Soil treatment areas with shallow trenches
93	Globe valve
95	Alarm activation volume, reserve volume, dose volume, minimum volume and operating volume within a demand-dosing tank
96	Average daily volume, surge volume, minimum volume, operating volume and reserve volume within a flow equalization tank
97	Graphic illustration of surge volume compared to average daily flow

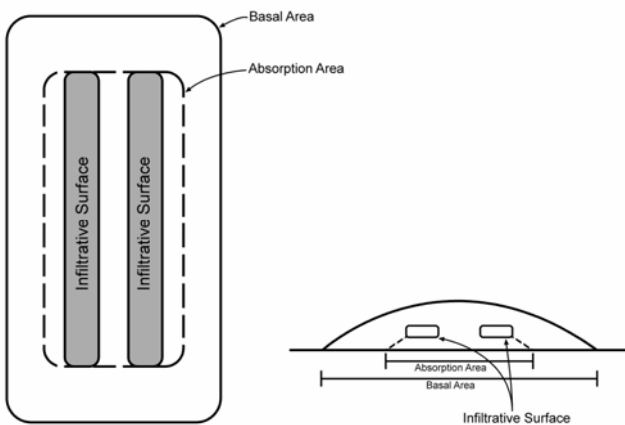
A

Abandonment: discontinued use of a system component or components by removing them or rendering them inaccessible and inoperable.

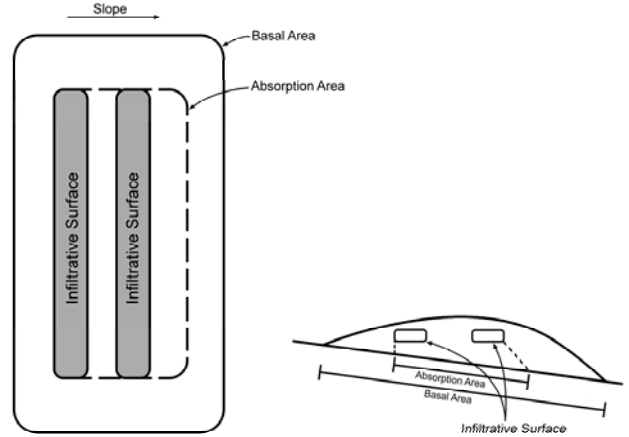
Above-grade: soil treatment area designed and installed such that all or part of the infiltrative surface is located at or above original ground elevation using appropriate imported material; a final cover of suitable soil stabilizes the completed installation and supports vegetative growth; includes mounds, areal fill and at-grade; see also **at-grade** and **below-grade**.

Absorption: process of incorporation or assimilation by which one substance is physically taken into and included with another substance; for example, bacteria assimilating nutrients from effluent

Absorption area: design parameter described by the square footage of an absorptive surface that is associated with the hydraulic acceptance of effluent; see also **absorptive surface**; **basal area**; and **infiltrative surface**.



Absorption area of an above-grade soil treatment area on a level site



Absorption area of an above-grade soil treatment area on a sloping site

Absorptive surface: plane of native soil where hydraulic properties change.

Acceptable: condition in which a component is performing its intended purpose and is considered to be in an operable state.

Acceptance rate: infiltration of effluent into a designated media expressed as a rate (e.g., cm/day); see also **long-term acceptance rate**.

Accepted engineering practices: those requirements which are compatible with standards of practice required of a registered professional engineer.

Access riser: see **riser**, **access**.

Accepted engineering practices: those requirements which are compatible with standards of practice required by a registered professional engineer.

Activated sludge: highly concentrated mass of live organisms in a suspended-growth aerated and mixed environment.

Activated-sludge process: wastewater treatment process that uses activated sludge to biologically convert non-settleable (suspended, dissolved, and

colloidal) organic materials to a settleable product using aerobic and facultative microorganisms; typically followed by clarification and sludge return.

Active aeration: *see aeration, active.*

Additive: product added to a sewage treatment system marketed to improve performance.

Adsorption: adhesion of a substance to the surface of solid bodies or liquids with which it is in contact.

Aeration, active: introduction of air via either mechanical means or diffused aeration; *see also aeration, passive.*

Aeration, diffused: process of introducing air bubbles under pressure into a treatment unit using a compressor or blower and a diffuser.

Aeration, mechanical: process of introducing air into a treatment component by physical agitation using a device such as a paddle, paddle wheel, spray nozzle or turbine.

Aeration, passive: process of introducing air into a treatment component without mechanical means; *see also aeration, active.*

Aeration chamber: chamber or tank in which wastewater is brought into contact with air to facilitate biological degradation such as in (but not limited to) the activated sludge process.

Aeration system: piping, diffusers, air source, vents, and all other necessary devices for an active aeration process.

Aerobic: having molecular oxygen (O₂) as a part of the environment, or a biological process that occurs only in the presence of molecular oxygen; *see also anaerobic and anoxic.*

Aerobic treatment: *see treatment, aerobic.*

Aerobic treatment unit (ATU): 1. treatment component that utilizes oxygen to degrade or decompose wastewater, with or without mechanical means; 2. term traditionally used to describe proprietary devices that use direct introduction of air into wastewater by mechanical means to maintain aerobic conditions within the pretreatment component.

Aggregate: 1. primary soil particles that cohere to each other more strongly than other surrounding particles; 2. naturally-occurring inorganic material (crushed rock or gravel) screened to sizes for various uses; *see also media.*

Aggregation: *see soil structure.*

Air: colorless, odorless, and tasteless gaseous mixture of nitrogen (78%), oxygen (21%) and trace amounts of other gases.

Air line: *see line, air.*

Air lock: 1. condition in a pressurized distribution system where the presence of air or other gases prevents flow; 2. condition where air or other gases collect at a high point in a gravity distribution system and prevent or restrict flow.

Air release: allowing air to escape during pressurization of a distribution system using an air/vacuum release valve.

Air source: device which supplies air to a treatment process.

Alarm: device that provides information on the status of a component using a visual and/or audible device; can either be on site or remotely located.

Alarm activation volume: *see volume, alarm activation.*

Alluvial: pertaining to processes or materials associated with transportation or deposition of sediment by water.

Alluvial soil: **1.** soil developing from sediments (alluvium) recently deposited by running water of streams and rivers and exhibiting essentially no horizon development or modification of the recently deposited materials; **2.** when capitalized, it refers to a great soil group of the azonal order consisting of soils with little or no modification of the recent sediment in which they are forming.

Alluvium: sediments deposited by running water of streams and rivers; may occur on terraces well above present streams, on the present flood plains or deltas, or as a fan at the base of a slope.

Alteration: modification of a wastewater treatment system on the basis of: an increase in the volume of permitted flow; a change in the nature of permitted influent; a change from the planning materials approved by the permitting authority; a change in construction; or an increase, lengthening, or expansion of the treatment or dispersal system.

Alternating drainfields: final treatment and dispersal component that is comprised of multiple soil treatment areas which are independently dosed.

Alternative onsite wastewater treatment system: onsite wastewater treatment system that is not a conventional system as described by local regulatory code.

Alternating valve: *see valve, alternating.*

Ammonia: (NH₃): *see nitrogen, ammonia.*

Ammonium (NH₄⁺): *see nitrogen, ammonium.*

Anaerobic: absence of molecular oxygen (O₂) as a part of the environment, or a biological process that occurs in the absence of molecular oxygen; bound oxygen is present in other molecules, such as nitrate (NO₃⁻) sulfate (SO₄⁺) and carbon dioxide CO₂; *see also aerobic and anoxic.*

Anoxic: condition in which all constituents are in their reduced form (no oxidants present); conditions in a septic tank are generally anaerobic, but not anoxic; *see also aerobic and anaerobic.*

Anthric saturation: variation of episaturation associated with controlled flooding, which causes a reduced environment in a soil layer and oxidation of mobilized iron and manganese in a deeper unsaturated subsoil; *see also endosaturation and episaturation.*

Anti-siphon device: any device in a supply line designed to return pressure to atmospheric conditions in order to prevent undesired water movement (such as water siphoning out of pump tank); includes valves, vent holes, spit tubes, etc.

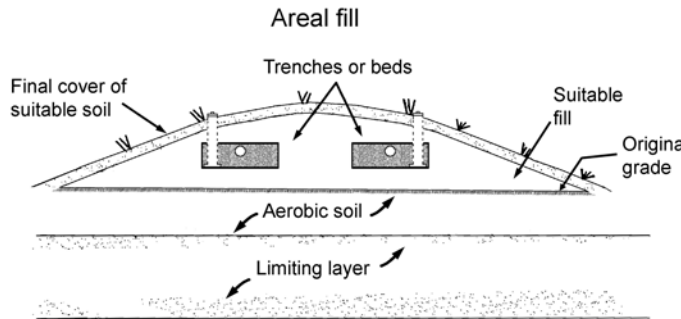
Aquic moisture regime: mostly reducing soil moisture regime nearly free of dissolved oxygen due to saturation by groundwater or its capillary fringe and occurring during periods when the soil temperature 50 cm (20 inches) below the surface is greater than 5°C (41°F).

Aquic conditions: continuous or periodic saturation and reduction indicated by redoximorphic features (RSFs) and verified by measuring saturation and reduction of the soil.

Aquifer: geologic formation, group of formations, or part of a formation that is

saturated and sufficiently permeable to transmit water.

Areal fill: above-grade soil treatment area designed and installed such that the entire infiltrative surface is located above the original ground elevation using suitable imported soil material for fill; utilizes gravity, pressure-dosed gravity or low-pressure distribution; a final cover of suitable soil stabilizes the completed installation and supports vegetative growth; *see also mound.*



Soil treatment area with **areal fill** trenches (shown in section view)

Areal loading rate: *see loading rate, areal.*

As-built: written plan prepared after system installation that reflects the actual construction and indicates differences from the original design.

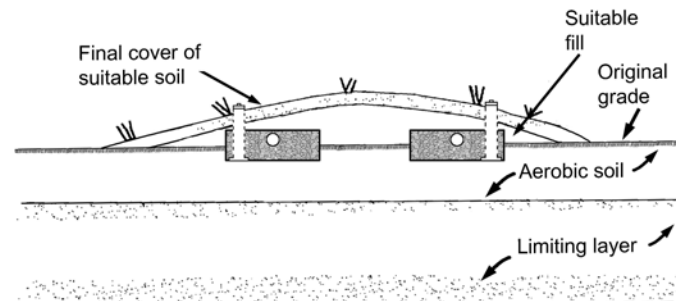
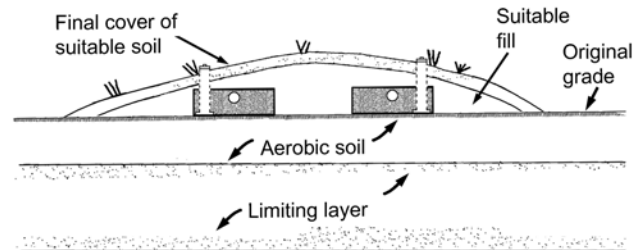
Aspirator: device which moves fluid (liquid or gas) by developing a vacuum.

Assimilation: conversion of absorbed wastewater constituents into living tissue.

Attached-growth process: configuration wherein the microorganisms responsible for treatment colonize a fixed medium; *see also suspended-growth process.*

At-grade: above-grade soil treatment area designed and installed such that

some part of the infiltrative surface is located at the original ground elevation using suitable imported soil material for fill; excavation is 0 to 6" into native soil; utilizes gravity, pressure-dosed gravity or low-pressure distribution with the orifices of the distribution pipe above the original ground elevation; a final cover of suitable soil stabilizes the completed installation and supports vegetative growth; *see also above-grade, below-grade and trench, shallow.*



Soil treatment areas with **at-grade** trenches (shown in section views): excavation is 0 to 6 inches into original grade and some part of the infiltrative surface is located at the original ground elevation. Distribution may be gravity, pressure-dosed gravity or low-pressure distribution to a trench or bed; alternatively, drip distribution may be used.

Authorization for construction: approval to begin the system installation process.

Axial pump: *see pump, axial.*

B

BNR: *see Biological nutrient removal:*

BOD₅: *see* **biochemical oxygen demand, five day.**

Backfill: **1.** material placed in an excavation; **2.** to place material in an excavation; **3.** portion of an excavation above the haunch zone; for straight-walled tanks or structures, that portion of an excavation above the bedding.

Backfill, initial: portion of an excavation above the haunch zone or bedding with a depth of 6-12 inches (15 to 30 cm) above the pipe, conduit tank, or structure; *see diagram at bedding.*

Backfill final: portion of an excavation extending from above the initial backfill to final grade; *see diagram at bedding.*

Backflow: reverse direction of flow, with liquid returning to the source.

Backflow prevention device: any device, method, or configuration used to prevent a reversal of flow.

Backflush: to reverse the direction of flow to clean laterals or filter media; *see also backwash.*

Backsight (BS or +): rod reading taken on a point of known or assumed elevation (where establishing the first bench mark, usually assumed as 100.00); the backsight reading is added to the elevation to determine the Height of Instrument (HI); *see also height of instrument (HI).*

Back siphonage: a form of backflow which occurs as a result of negative pressure; *see also backflow; anti-siphon device.*

Backwash: to reverse the direction of flow through a filter, ion exchange column, or membrane for cleaning purposes; *see also backflush.*

Bacteria, aerobic: bacteria that can metabolize only in the presence of molecular oxygen.

Bacteria, anaerobic: bacteria that is able to metabolize in the absence of molecular oxygen.

Bacteria, coliform: *see coliform bacteria, fecal and coliform bacteria, total.*

Bacteria, facultative: bacteria that can metabolize with or without molecular oxygen present in the environment.

Bacteria, mesophilic: bacteria which grow best at temperatures between 20 and 50 degrees C (68 and 122 degrees F) with optimum growth between 25 and 40 degrees C (77 and 104 degrees F).

Bacteria, psychrophilic: bacteria which grow best at temperatures between 10 and 30 degrees C (50 and 86 degrees F) with optimum growth between 12 and 18 degrees C (54 and 64 degrees F).

Bacteria, thermophilic: bacteria which grow best at temperatures between 35 and 75 degrees C (95 and 167 degrees F) with optimum growth between 55 and 65 degrees C (131 and 149 F).

Baffle: physical barrier placed in a component to dissipate energy, direct flow, retain solids and FOG, and/or draw water from a specific depth.

Baffle, cargo tank: one or more partitions installed across the shortest dimension of a cargo tank that partially restrict the free flow of liquid from end to end in the tank; designed to reduce liquid surge and increase vehicle handling safety.

Baffle, flow restrictor: baffle designed to moderate discharge rate.

Baffle, gas deflector: baffle designed to direct gases and rising solids away from the bottom of the outlet.

Baffle, inlet: pipe tee or wall segment at or near the inlet pipe of a tank which is designed to dissipate energy, direct flow below the wastewater surface, isolate scum from the inlet pipe, and allow ventilation.

Baffle, outlet: pipe tee or wall segment at or near the outlet pipe of a tank designed to collect flow from the clear zone, isolate scum from the outlet pipe, and allow ventilation.

Ball valve: *see valve, ball.*

Basal area: total area of an above-grade soil treatment area (mound, modified mound, or areal fill) including the absorption area; perimeter is measured at the interface of imported fill material and original grade; *see also absorption area and infiltrative surface; see diagram at absorption area.*

Batch process: configuration in which flow is controlled so that effluent is neither entering nor leaving the treatment component while a specific operation is being performed; *see diagram at sequencing batch reactor.*

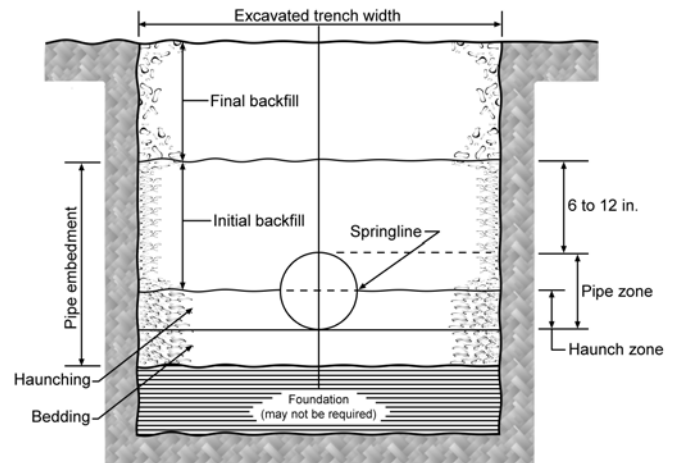
Bed: below-grade soil treatment area consisting of an excavation greater than three feet wide containing distribution media and more than one lateral; typically installed in an excavation 18 to 36 inches below original ground elevation; utilizes pressure or gravity distribution; a final cover of suitable soil stabilizes the completed installation, supports vegetative growth, and sheds runoff; *see also trench.*

Bed, deep: bed installed in an excavation greater than 36 inches deep.

Bed, shallow: bed installed in an excavation less than 18 inches deep such that the entire infiltrative surface is below the original ground elevation.

Bed, seepage: *see bed.*

Bedding: 1. process of laying a pipe, conduit or other structure in a trench shaped to the appropriate contour; 2. tamping earth around a pipe, conduit, or other structure to provide support; 3. material placed under a pipe, conduit, tank, or component for uniform structural support.



Cross-section of an excavation for piping showing location of bedding

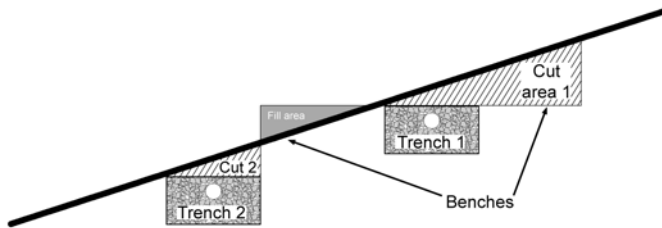
Bedrock: general term for the rock that underlies the soil and other unconsolidated material or any rock strata that is exposed at the surface.

Bell-bottom pier hole: a type of shaft or footing excavation, the bottom of which is made larger than the cross section above to form a belled shape.

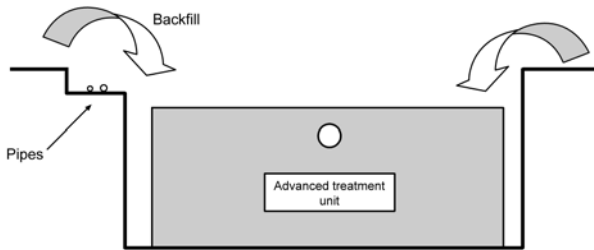
Below-grade: soil treatment area designed and installed such that the infiltrative surface and most of the sidewall are below the original ground elevation; a final cover of suitable soil stabilizes the completed installation, supports vegetative growth, and sheds

runoff; *see also above-grade and at-grade.*

Bench: 1. soil placed downslope of an excavation to create a level surface on which to work; 2. shallow excavation next to a tank excavation that allows installation of associated piping on undisturbed soil.



Benches constructed by placing soil downslope of an excavation.



Bench excavated next to a deeper excavation and used to install piping on undisturbed soil

Bench level: surveying with a level to establish elevations on bench marks; usually run as part of a cross section, profile, or topographic survey.

Bench mark (BM): reference point of known elevation; a permanent bench mark can be established with a brass pin or cap set in concrete, a long metal stake driven in the ground, or a specific point on a concrete bridge or other solid object; a temporary bench mark (needed for only a few days or weeks until a job is completed) could be a wooden stake driven in the ground, or a nail driven in a tree or post; for many temporary bench marks the elevation may be assumed (usually 100.00 feet); permanent bench

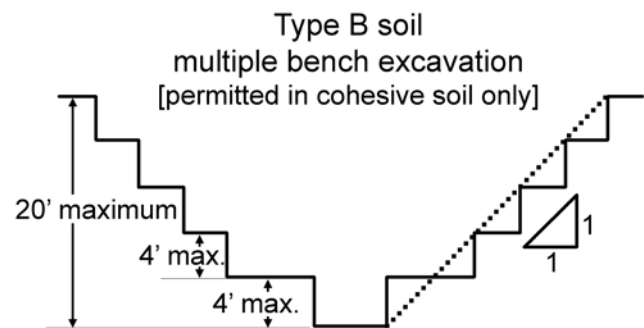
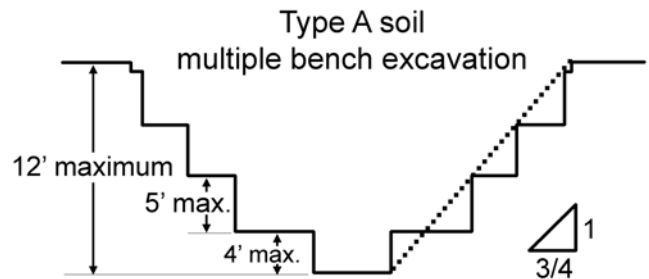
mark locations should be accurately described in the field book so that a person who had never been to the area could find them.

Bench mark, assumed: temporary bench mark used as a reference; typically assigned an elevation of 100.00 feet.

Bench mark, referenced: official, permanent point of known elevation; *see also monument.*

Bench mark, transfer: local bench mark established from a referenced bench mark.

Benching (benching system) : method of protecting employees from cave-ins by excavating to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels in accordance with OSHA safety standards for protective systems;



Protective system using **benching systems** to protect workers from cave-in

Berm: 1. natural or constructed raised drainage feature used to divert runoff of stormwater and direct the flow to an effective outlet; may be used in conjunction with a swale; 2. raised earthen structure designed to contain wastewater such as in a lagoon; *see also* **swale**.

Biochemical oxygen demand (BOD): amount of oxygen required by bacteria while stabilizing, digesting, or treating wastewater under aerobic conditions; an indirect measure of the amount of organic matter in wastewater; a measure of the relative strength of wastewater expressed in mg/L.

Biochemical oxygen demand, five-day (BOD₅): quantitative measure of the amount of oxygen consumed by bacteria while stabilizing, digesting, or treating biodegradable organic matter under aerobic conditions over a five-day incubation period; expressed in milligrams per liter (mg/L).

Biochemical oxygen demand, carbonaceous (cBOD): quantitative measure of the amount of oxygen consumed by bacteria while stabilizing, digesting, or treating the organic matter under aerobic conditions over a five-day incubation period while in the presence of a chemical inhibitor to block nitrification; cBOD is expressed in milligrams per liter (mg/L); *see also* **biochemical oxygen demand, nitrogenous; and nitrification**.

Biochemical oxygen demand, nitrogenous (nBOD): quantitative measure of the amount of oxygen required for the biological oxidation of nitrogenous material (such as ammonia nitrogen and organic nitrogen) in wastewater; typically measured after the carbonaceous oxygen demand has been satisfied; nitrification fraction of the BOD₅ test; *see also* **biochemical oxygen**

demand, five-day; biochemical oxygen demand, carbonaceous; and nitrification.

Biochemical oxygen demand, ultimate (uBOD): oxygen required to complete the oxidation, synthesis, and endogenous respiration in a sample of wastewater; *see also* **biochemical oxygen demand, five day**.

Biofilter: a media filter in which the media used is biological in origin (i.e., peat or coir).

Biological loading rate: *see* **loading rate, biological**.

Biological nutrient removal (BNR): use of microbiological activity for removal of nitrogen and phosphorus in a wastewater treatment system.

Biological treatment: *see* **treatment, biological**.

Biomass: total mass of living organisms.

Biomat: layer of biological growth and inorganic residue that develops at the infiltrative surface.

Biofilm: thin coating of microbial growth, organic matter, and microbial secretions on a solid substrate particle.

Biosolids: dewatered, primarily nutrient-rich organic material generated as a by-product of biological wastewater treatment processes that can be recycled (such as for use as a soil amendment); *see also* **residuals and septage**.

Biozone: zone of biologically active treatment in soil, fill, or other media; *see also* **zone of treatment**.

Blackwater: portion of the wastewater stream that originates from toilet fixtures,

dishwashers, and food preparation sinks;
see also **graywater**.

Bleed: to drain a liquid or gas, as in bleeding accumulated air from a water line or bleeding (draining) a trap of accumulated water.

Blower, air: device that uses a fan to deliver air to a component; does not substantially compress air.

Boot: flexible device attached to piping to provide a watertight seal.

Bottomless media filter: *see* **filter, bottomless media**.

Bubble, coarse: bubble of 3 to 8 mm diameter generated by an air diffuser.

Bubble, fine: bubble of 0.2 to 3 mm diameter generated by an air diffuser.

Bubble, micro: bubble of less than 0.2 mm diameter generated by an air diffuser.

Bulking: inability of sludge solids to separate from the liquid under quiescent conditions; under aerobic conditions may be associated with the growth of filamentous organisms, low DO, or high sludge loading rates; under anaerobic conditions, may be associated with attachment of gas bubbles to solids.

Building sewer: pipe that conveys wastewater to the first system component or the sewer main

Bundled pipe: distribution media consisting of two or more co-joined perforated pipes.

Buoyancy: tendency of a body to float in water or other liquid; upward force that a fluid exerts on an object that is less dense than itself.

Buoyancy valve: *see* **valve, buoyancy**.

Bury depth: depth from the surface of the finished grade to the top of a component.

C

CBOD: *see* **biochemical oxygen demand, carbonaceous**.

COD: *see* **chemical oxygen demand**.

Cargo tank: *see* **tank, cargo**.

Cargo tank baffle: *see* **baffle, cargo tank**.

Cave-in: separation of a mass of soil or rock material from the side of an excavation, or the loss of soil from under a trench shield or support system, and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, or otherwise injure and immobilize a person.

Cavitation: phenomenon that may occur when a centrifugal pump attempts to discharge more flow than it is pulling in through the suction; reduced internal pressure causes gases to expand and form bubbles around the impeller; and the bubbles violently implode, potentially causing damage to the pump.

Centrifugal pump: *see* **pump, centrifugal**.

Certificate of completion: documentation of the proper construction of the system.

Certification: program to substantiate the capabilities of personnel by documentation of experience and learning in a defined area of endeavor.

Cess pit: *see* **cesspool**.

Cesspool: underground pit into which raw household wastewater is discharged and from which the liquid seeps into the surrounding soil; may or may not be partially lined; if septic tank effluent is discharged to such a component it is considered a seepage pit.

Chain trencher: *see* **trencher**.

Chamber: pre-formed manufactured distribution medium with an open-bottom configuration commonly used in soil treatment areas.

Check valve: *see* **valve, check**.

Chemical oxygen demand (COD): amount of the organic matter in wastewater that can be oxidized by a very strong chemical oxidant; typically measured by a standard test using dichromic acid as the oxidant.

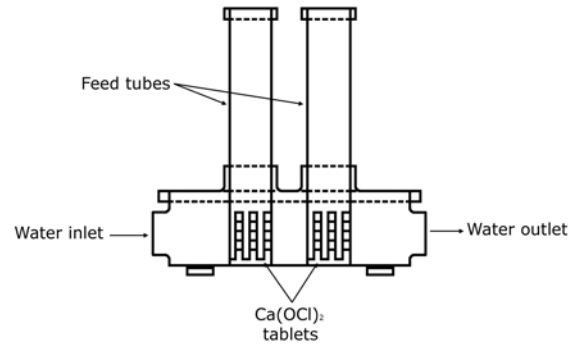
Chemical treatment: *see* **treatment, chemical**.

Chisel plow: *see* **plow, chisel**.

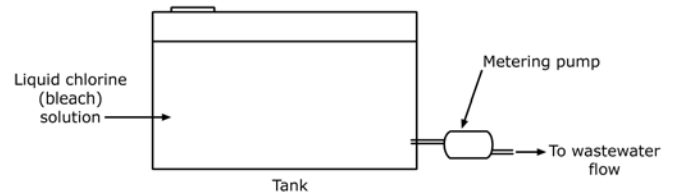
Chloramine: chemical compound present as a result of the chlorine disinfection process when the effluent contains ammonia; chloramines are relatively persistent in the environment and toxic to fish and amphibians.

Chlorination: *see* **disinfection, chlorine**.

Chlorinator: component that delivers chlorine (liquid, tablet, or gas) as an agent for disinfection.



Tablet chlorinator



Liquid chlorinator

Chlorine: term commonly used to describe a chlorine source such as sodium hypochlorite, a highly reactive chemical used as a disinfectant and oxidizing agent.

Chlorine, combined available: chlorine that has combined with ammonia in wastewater to form chloramines; although they are slow-reacting, chloramines also serve as disinfectants.

Chlorine, free available: quantity of hypochlorous acid (HOCl) and hypochlorite ions (OCl^-) present after the introduction of chlorine for disinfection purposes; the relative distribution of these is affected by pH and temperature with lower pH favoring hypochlorous acid which has significantly higher germicidal efficiency than hypochlorite ions.

Chlorine disinfection: *see* **disinfection, chlorine**.

Chlorine residual: total amount of chlorine (free and combined available)

forms) remaining in water, sewage, or industrial wastes at the end of a specified contact period after the chlorination process.

Chroma: relative purity, strength, or saturation of a color; directly related to the dominance of the determining wavelength of the light and inversely related to grayness; one of the three variables of color; *see also* **Munsell Color System**; **hue**; *and* **value**.

Clarification: process or combination of processes that uses separation (settling and flotation) to remove suspended solids from wastewater.

Clarifier: component or tank that uses separation to remove suspended solids from wastewater.

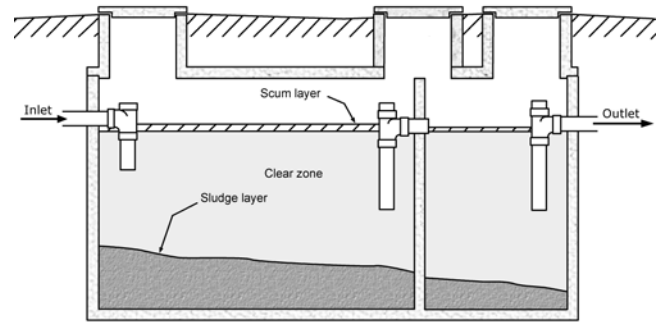
Clay: 1. soil separate consisting of particles <0.002 mm in equivalent diameter; 2. in reference to clay mineralogy, a naturally occurring material composed primarily of fine-grained minerals, which is generally plastic at appropriate water content and will harden when dried or fired; *see also* **soil separate**, **soil textural class** *and* **soil texture**.

Cleanout: device designed to provide access for removal of deposited or accumulated materials, generally from a pipe.

Clear water: fraction of the wastewater stream including, but not limited to surface water, groundwater, condensate, ice machine drainage, and/or discharge from swimming pools, hot tubs, and water treatment devices; *see also* **wastewater**.

Clear zone: volume or zone within a component that contains clarified wastewater; for example, after wastewater has had sufficient detention

time in a septic tank, the clear zone lies between the scum and sludge layers.



Cross-section of a two-compartment septic tank illustrating development of a clear zone as a result of solids separation of floating scum and settled sludge

Clogging mat: *see* **biomat**.

Cluster system: *see* **wastewater treatment system, cluster**.

Coagulation: the process by which colloidal particles come together irreversibly to form larger masses.

Coir filter: *see* **filter, coir**.

Coarse fragments: *see* **rock fragments**

Coliform bacteria: group of bacteria that constitute most of the intestinal flora of warm blooded animals (including the genera *Klebsiella sp.*, *Enterobacter sp.*, *Citrobacter sp.*, or *Escherichia sp.*) and are used as water pollution indicator organisms.

Coliform bacteria, fecal: indicator bacteria common to the digestive systems of warm-blooded animals that is cultured in standard tests to indicate either contamination from sewage or the level of disinfection; generally measured as number of colonies/100 mL or most probable number (MPN); *see also* **most probable number**.

Coliform, total (TC): measurement of water quality expressed as the number of

colony-forming units (cfu) of coliform bacteria per unit volume; *see also* **colony-forming unit (cfu)** and **heterotrophic plate count**.

Coliphage: virus which uses coliform bacteria as its host cell; *also known as* a bacteriophage.

Collection system: *see* **sewage collection system**.

Colloids: very fine solid particles (typically between 0.1 and .001 microns in diameter) which are suspended in a liquid or gas, do not settle out of solution, and cannot be removed by conventional filtration alone.

Colony-forming unit (cfu): term used to report the estimated number of live nonphotosynthetic bacteria in a water sample; *see also* **coliform bacteria, fecal; coliform, total (TC); and heterotrophic plate count**.

Color: *see* **Munsell Color System**.

Commercial kitchen: food preparation center that prepares multiple meals or food products and typically generates high-strength wastewater; *see also* **wastewater, high-strength**.

Compaction: rearrangement of soil grain particles that decrease void space and result in the degradation of soil structure and/or water infiltrative capacity.

Compactor, vibratory: mechanical device such as a jumping jack that consolidates loose soil material.

Compartment: space created by a physical partition within a pretreatment component.

Compensation: payment for services rendered.

Competent person: in accordance with OSHA standards, one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them; *see also* **qualified person**.

Component: subsection of a treatment train or system; a component may include multiple devices; *see also* **part** and **device**.

Composite sample: *see* **sample, composite**.

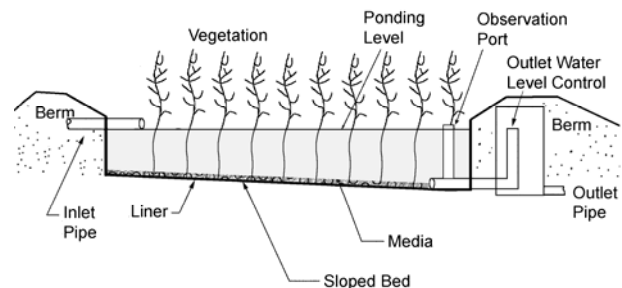
Compressor, air: device that delivers pressurized air to a component.

Conductivity, hydraulic: *see* **hydraulic conductivity**.

Consistence: *see* **soil consistence**.

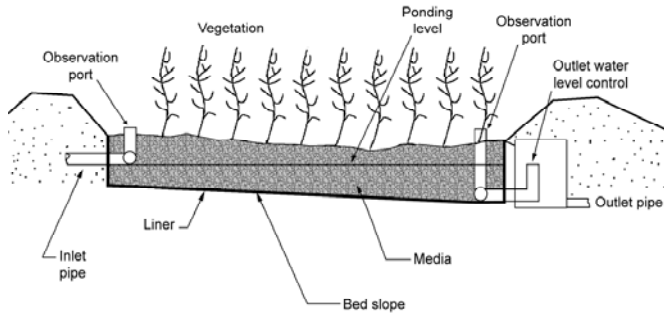
Constructed wetland: pretreatment component that incorporates appropriate moisture tolerant vegetation and consists of one or more lined basins where wastewater undergoes some combination of physical, chemical, and/or biological treatment; configurations include free surface and submerged flow configurations.

Constructed wetland system, free water surface: constructed wetland in which wastewater is exposed at the surface of the media.



Free water surface constructed wetland system

Constructed wetland system, submerged flow: constructed wetland in which wastewater passes through the component below the surface of the media.



Submerged flow constructed wetland system

Construction: any activity related to the installation, alteration, extension, or repair of a wastewater treatment system, including all activities from disturbing the soils through connecting the system to the building or property served by the wastewater treatment system.

Construction zone: physical area occupied by personnel, equipment, and materials during the installation, alteration, extension, or repair of a wastewater treatment system; *see also* **limit of disturbance**.

Contact time: time during which a chemical or constituent is in contact with another reacting chemical or constituent such as during chlorine, ozone, or UV disinfection.

Contour: multiple points on the land surface that are of equal elevation.

Contour interval: vertical distance between level surfaces forming the contours.

Contour line: line drawn on a map that connects points having the same elevation.

Contour loading rate: *see* **loading rate, contour**.

Contour map: map consisting of contour lines that illustrate the irregularities of the land surface; *also known as a* **topographic map**.

Contractor-assembled: built or put together by the entity who is installing a system; *see also* **manufacturer-assembled**.

Control panel: component that contains electrical devices that provide information on system operation and may allow adjustment of settings for operation of electrical devices.

Controls: group of sensors that provide information on and allow adjustment of system settings.

Conventional system: refers to a typical onsite wastewater treatment system (OWTS) as defined at the local or regional level; *see also* **wastewater treatment system, onsite**.

Corrosion: 1. condition in which the surface of a component is chemically degraded; 2. condition in which the surface of a concrete component is chemically degraded (dissolving) exposing aggregate and/or structural reinforcement materials; *see also* **spalling**.

Counter, alarm: device used to record the number of times an alarm has been activated.

Counter, cycle: device used to record the number of times a component or device has been activated (e.g., activation of a pump followed by deactivation is one cycle).

Counter, event: device used to record the number of times a component or device has been activated or deactivated

(e.g., pump activation is one event and pump deactivation is a second event).

Cover: specific material placed over system components.

Cross braces: horizontal members of a shoring system installed perpendicular to the sides of the excavation, the ends of which bear against either uprights or wales.

Cross section: vertical section of the surface of the ground at right angles to a base line or center line; side view of a cutaway of the earth's surface.

Cross-over pipe: non-perforated pipe used in serial or sequential distribution to connect a series of trenches at the same elevation; *see also* **stepdown** and **relief device**.

Curtain drain: *see* **drain, interceptor**.

Cut and fill: process of using excavated material removed from one location as fill material in another location on the same site.

D

D-box: *see* **distribution box**.

DO: dissolved oxygen.

DWV (Drain-waste-vent): 1. assembly of pipes which facilitates the removal of liquid and solid wastes as well as the dissipation of sewer gases; 2. pipe specified for use in the removal of liquid and solid wastes and for the dissipation of sewer gases.

Daily flow: *see* **flow, daily**.

Datum: level surface to which elevations are referenced; for example, mean sea level.

Daylight: come to grade, as with drainage piping.

Decant: act of transferring effluent slowly so as to separate liquid from solid after a previous settling process.

Decentralized wastewater treatment system: *see* **wastewater treatment system, decentralized**.

Dechlorination: removal of the free and combined chlorine residual to reduce the potentially toxic effects of chlorinated effluents.

Deflection: any change in the inside diameter of a pipe resulting from installation and imposed loads; deflection may be either vertical or horizontal and is usually reported as a percentage of the base (undeflected) inside pipe diameter.

Denitrification: biochemical reduction of nitrate (NO_3^-) or nitrite (NO_2^-) to gaseous molecular nitrogen (N_2) or an oxide of nitrogen.

Deodorizer: concentrated scented liquid introduced to the exhaust air at the muffler or into the vacuum pump oil reservoir to reduce odors.

Depressurized flow: *see* **flow, depressurized**.

Design: 1. process of selecting, sizing, locating, specifying, and configuring treatment train components that match site characteristics and facility use as well as creating the associated written documentation; 2. written documentation of size, location, specification and configuration of a system.

Design flow: *see* **flow, design**.

Designer: service provider who creates plans for the installation, alteration, extension, or repair of a wastewater

treatment system; *see also* **service provider**.

Detention time: average length of time a unit volume of wastewater or a suspended particle remains in a tank or chamber; mathematically, it is the volume of water in the tank divided by the flow rate through the tank (assuming ideal hydraulic conditions).

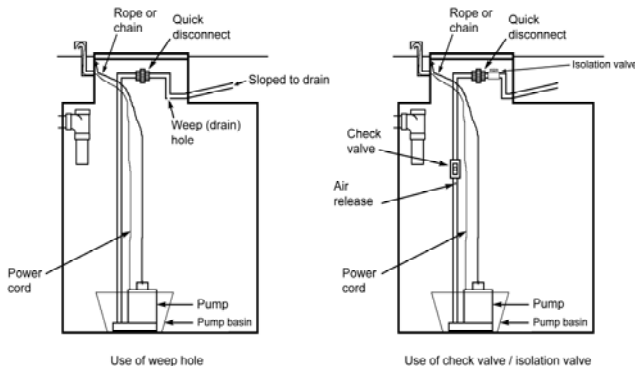
Device: subunit of a component; a device often includes multiple components; *see also* **part and component**.

Dewater: 1. to partially remove water from a slurry; 2. to remove water from a basin, tank, reservoir, or other storage unit; 3. to remove water from a site to facilitate construction and installation of components.

Differential leveling: method of leveling used to find the difference in elevation (vertical distance) between two points.

Diffuser: part or device that injects air under pressure into wastewater (e.g., submerged porous plate, perforated pipe, or orifice).

Discharge assembly: all piping and parts between the point of pump discharge to the point at which the supply line exits the tank.



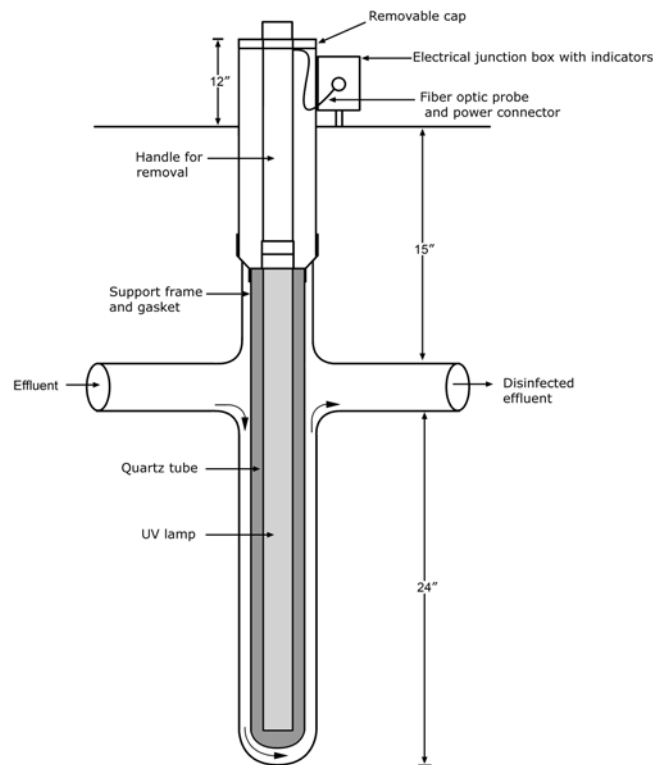
Examples of discharge assembly configurations showing associated components

Disinfection: process used to destroy or inactivate pathogenic microorganisms in wastewater to render them non-infectious; *see also* **disinfection, chlorine; disinfection, ozone; and disinfection, ultraviolet (UV)**.

Disinfection, chlorine: process used to inactivate microorganisms by the addition of chlorine in the form of sodium hypochlorite; *see also* **chlorinator and chlorine**.

Disinfection, ozone: process used to inactivate microorganisms via the application of ozone to wastewater; *see also* **ozone**.

Disinfection, ultraviolet (UV): process used to inactivate microorganisms by irradiating them with ultraviolet light to disrupt their metabolic activity, thus rendering them incapable of reproduction; *see also* **ultraviolet**.



Typical ultraviolet disinfection unit

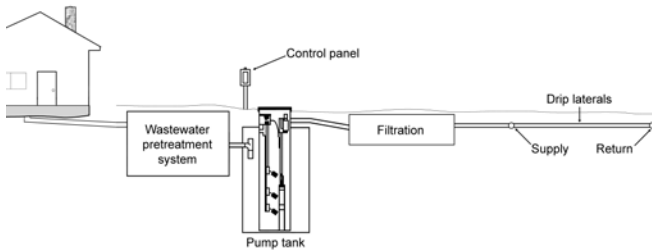
Dispersal: spreading of effluent over and into the final receiving environment.

Dispersion: 1. scattering and mixing; 2. repellent action of an electric potential on fine particles in suspension in water, as in a stream carrying clay.

Dissolved oxygen (DO): amount of molecular oxygen (O₂) dissolved in water, wastewater, or other liquid; commonly expressed as a concentration in milligrams per liter (mg/L), parts per million (ppm), or percent of saturation.

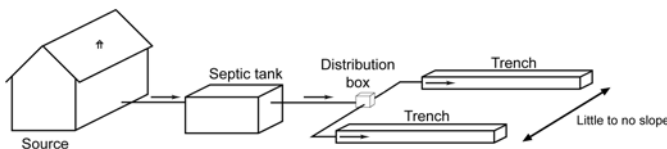
Distribution: the process of conveying wastewater or effluent to one or more components or devices.

Distribution, drip: application of effluent over an infiltrative surface via pressurized emitters and associated devices and parts (pump, filters, controls, and piping).



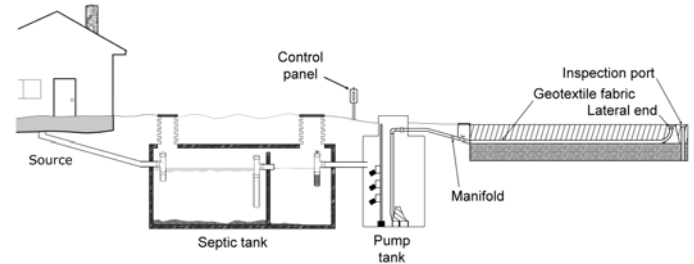
Drip distribution treatment train (typical)

Distribution, gravity: using the force of gravity to convey wastewater or effluent to one or more components or devices; gravity distribution to trenches may be parallel, sequential or serial; *see also* **distribution, parallel**; **distribution, sequential**; and **distribution, serial**.



Trenches with **gravity parallel** distribution using a distribution box

Distribution, low pressure (LPD): 1. application of effluent over an infiltrative surface via pressurized orifices and associated devices and parts (including pump, filters, controls, and piping). 2. distribution via a network of small diameter laterals (typically 1 ¼-inch) with small orifices (typically 1/8- to 3/16-inch) installed in a soil treatment area; also called low-pressure-pipe (LPP) distribution.

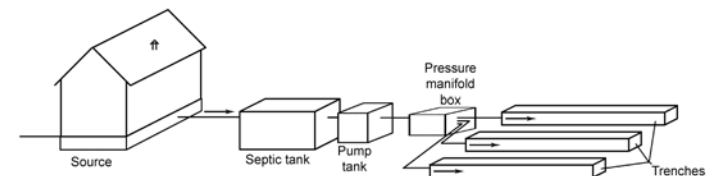


*Below-grade soil treatment using trenches with **low-pressure distribution (LPD)***

Distribution, parallel: pressure or gravity distribution of effluent that proportionally and simultaneously loads multiple sections of a final treatment and dispersal component.

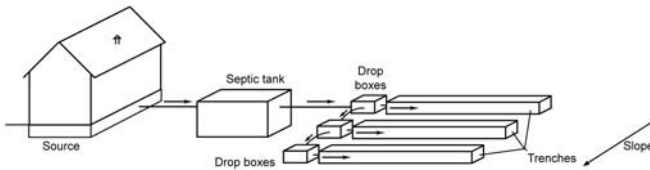
Distribution, pressure: using a pump or siphon to convey wastewater effluent under pressure to one or more components or devices.

Distribution, pressure-dosed gravity: gravity distribution of effluent over an infiltrative surface via one or more trenches or a bed following pressure dosing to a manifold or other flow splitter; *also known as* 'pump to gravity'.



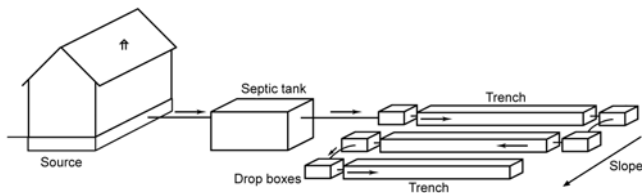
Trenches with **pressure-dosed gravity parallel** distribution

Distribution, sequential: distribution method in which effluent is loaded into one trench and fills it to a predetermined level before passing through a relief line or device to the succeeding trench; the effluent does not pass through the distribution media before it enters succeeding trenches; *see also* **distribution, serial.**



Trenches with gravity sequential distribution

Distribution, serial: distribution method in which effluent is loaded into one trench and fills it to a predetermined level before passing through a relief line or device to the succeeding trench; effluent passes through the distribution media before entering succeeding trenches which may be connected to provide a single uninterrupted flow path; *see also* **distribution, sequential.**



Trenches with gravity serial distribution

Distribution, spray: application of effluent over an infiltrative surface via pressurized nozzles and associated devices and parts (including pump, filters, controls and piping).

Distribution box (D-box): level, watertight structure that receives septic tank effluent and distributes it via gravity in approximately equal portions to two or more trenches or two or more laterals in a bed.

Distribution device: device that receives effluent from one component, and conveys it to a subsequent component(s), (e.g., a distribution box, drop box, or manifold).

Distribution lateral: *see* **lateral.**

Distribution media: *see* **media, distribution.**

Distribution rock: clean graded rock or gravel of specified size range, offering a minimum specified void space, having a hardness value of three or greater on the Moh's Scale of Hardness (can scratch a copper penny), washed or prepared to be relatively free of fine materials that might otherwise impair absorption area performance; placed on the infiltrative surface.

Distribution system: entire network of components that transport wastewater or effluent within a system.

Distribution uniformity: variability of effluent delivery.

Diversion valve: *see* **valve, alternating.**

Domestic wastewater: *see* **wastewater, residential strength.**

Dose: *see* **dosing event or volume, dose.**

Dose cycle: period between the initiation of one dosing event and the next; the period includes both the time "on" and the time "off".

Dose volume: *see* **volume, dose.**

Dosing, demand: configuration in which a specific volume of effluent is delivered to a component based upon patterns of wastewater generation from the source.

Dosing, timed: configuration in which a specific volume of effluent is delivered to a component based upon a prescribed interval, regardless of facility water use; *see also* **flow equalization**.

Dosing chamber: *see* **tank, dosing**.

Dosing device: pump, siphon, or other device that delivers effluent to a subsequent component in a treatment train.

Dosing event: occurrence of effluent delivery after a rest period.

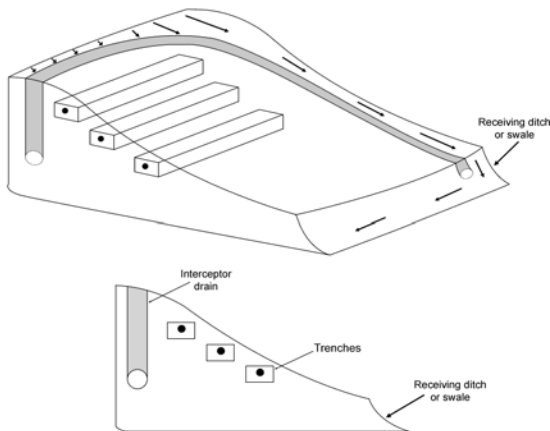
Dosing tank: *see* **tank, dosing**.

Down-gradient: 1. direction water flows by gravity; 2. location down-slope.

Drain, curtain: *see* **drain, interceptor**.

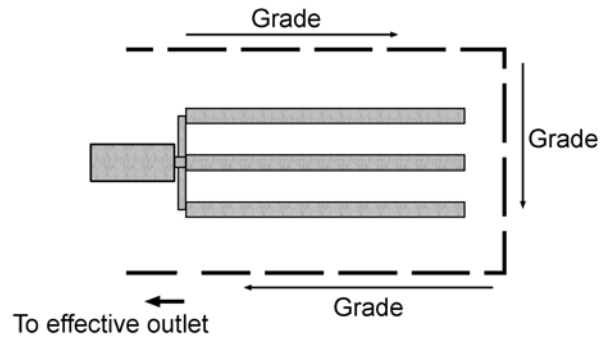
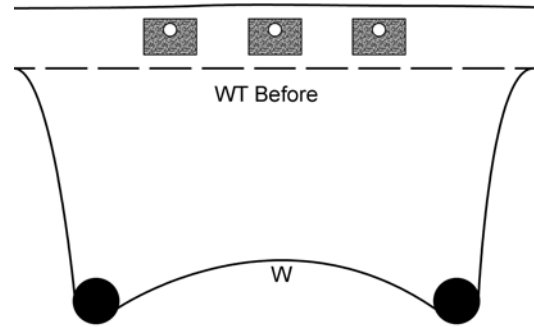
Drain, French: *see* **drain, interceptor**.

Drain, interceptor: subsurface drain used to intercept and divert laterally moving groundwater or perched water away from the soil treatment area or other system component to an effective outlet; *see also* **drain, perimeter**.



Interceptor drain installed upslope of a soil treatment area showing outlet to grade at an elevation below that of the deepest trench

Drain, perimeter: subsurface drain installed around and outside of an individual soil treatment area or zone and designed to actively or passively lower the water table.



Perimeter drain (section and plan view) around a septic tank and soil treatment area

Drainage: network of natural or artificial groundwater or surface water features including agricultural drain tile, cut banks, and ditches which intercept and divert surface water and/or lower groundwater.

Drainage class (natural): group of soils defined by frequency and duration of wet periods similar to those under which the soil developed.

Drainage, tile: large-scale subsurface drainage system designed for lowering groundwater for agricultural purposes.

Drainback: backflow of effluent into a pump tank after a dosing event; *see also* **volume, drainback**.

Drainback volume: *see volume, drainback.*

Draindown: movement of effluent out of a lateral by infiltration into the soil treatment area following a dosing event.

Drainfield: *see soil treatment area.*

Drainline: **1.** regarding collection of soil water to reduce saturation; *see drain tile*; **2.** regarding collection of effluent in the bottom of a media filter, *see underdrain.*

Drain tile: terracotta or perforated plastic pipe or other conduit that is used as part of a drainage system.

Drain valve: *see valve, drain.*

Drawdown: drop in the liquid level of a tank as a result of some phase of operation.

Drawdown test: measurement of the drop in liquid level in a dosing tank measured over time to calculate dosing/delivery rate; may be expressed as a pump delivery rate (PDR) or siphon delivery rate.

Drip emitter: drip distribution device that dispenses effluent to the infiltrative surface at a predictable rate; *see also emitter, non-pressure compensating and emitter, pressure compensating.*

Drip field: above or below grade soil treatment area where final treatment and dispersal occurs via application of effluent to the infiltrative surface via pressurized drip tubing utilizing emitters; *see also drip field, surface; drip field, subsurface; and drip tubing.*

Drip field, subsurface: drip field designed and installed such that the drip tubing is located at least 6" below finished grade of native soil.

Drip field, surface: drip field designed and installed such that the drip tubing is located at the finished grade of the soil surface.

Drip tubing: small diameter flexible plastic tubing manufactured with emitters uniformly spaced along its length; *see also drip emitter.*

Drip irrigation: system that is designed to meet the needs of the receiving vegetation using drip distribution technology.

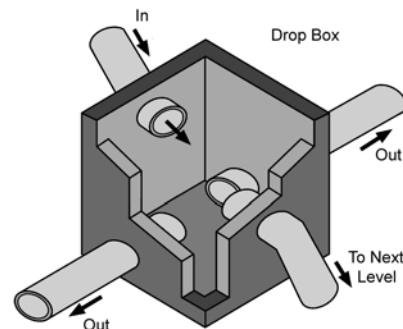
Drip lateral: length of drip tubing extending from the supply manifold to the return manifold.

Drip line: *see drip tubing.*

Drip zone: component of a drip distribution system made up of a group of drip laterals that is managed as a single unit.

Dripper loading: *see loading rate, instantaneous.*

Drop box: **1.** device used for serial or sequential distribution of effluent by gravity flow to a lateral of a final treatment and dispersal component; addition of such a device adds a means of system management; **2.** device used to lower pipe elevation.



Example of one type of drop box

Dry soil: soil that exhibits no visible signs of moisture content.

Drywell: partially lined underground pit (regardless of geometry) into which drainage from roofs, basement floors or other such sources is discharged and from which the liquid seeps into the surrounding soil; if effluent (such as that from a septic tank) is discharged to such a component, it is considered a seepage pit.

Dual fields: *see* **alternating drainfields**.

Duplex system: control that operates two usually identical devices in a system (e.g., a duplex pump system).

Dwelling: structure or building, or any portion thereof which is used, intended, or designed to be occupied for temporary or permanent human living purposes including, but not limited to: houses, houseboats, mobile homes, motor homes, travel trailers, hotels, motels, and apartments.

Dynamic head: *see* **head, dynamic**.

E

E. coli: *see* **Escherichia coli**.

ET bed: *see* **evapotranspiration bed**.

ETA bed: *see* **evapotranspiration/adsorption bed**.

ETI bed: *see* **evapotranspiration/adsorption bed**.

ETM: *see* **meter, elapsed time**.

Effective capacity: *see* **tank capacity**.

Effective depth: depth of liquid below the head space in a tank; *see also* **head space** *and* **operating level**.

Effective rainfall: amount of precipitation that infiltrates and is held in surface storage.

Effective size: in a sieve analysis, the particle diameter of which 10 percent of the sample is finer by weight; *also known as* D_{10} .

Effluent: liquid flowing out of an component or device.

Effluent filter: *see* **effluent screen**.

Effluent screen: removable, cleanable (or disposable) device installed on the outlet piping of a septic tank for the purpose of retaining solids larger than a specific size and/or modulating effluent flow rate.

Effluent quality: physical, biological, and chemical characteristics of a liquid flowing from a component or device.

Elapsed time meter (ETM): *see* **meter, elapsed time**.

Elevation: **1.** height relative to a fixed point of known elevation such as sea level or a bench mark; **2.** high place or position; **3.** drawing or diagram made by projection on a vertical plane; a two-dimensional drawing of the front, side, or back of a building.

Elevation head: *see* **head, elevation**.

Emerging contaminants: newly identified compounds or substances that have the potential to adversely affect public health or the environment and for which there is no currently published health standard; *see also* **trace organic contaminants**.

Emitter, non-pressure compensating (non-PC): emitter that discharges effluent at rates dependent upon operating pressure.

Emitter, pressure compensating (PC): emitter designed to deliver effluent at a consistent flow rate under a range of operating pressures above a threshold.

Emulsification: suspension of solids as a result of decreased surface tension due to the presence of an emulsifying agent or some substance that alters or prohibits normal microbial activity; *see also* **emulsification** and **emulsifying agent**.

Emulsifying agent: agent capable of modifying the surface tension of emulsion droplets to prevent coalescence; examples are soap and other surface-active agents, certain proteins and gums, water-soluble cellulose derivatives, and polyhydric alcohol esters and ethers; *see also* **emulsification** and **emulsion**.

Emulsion: heterogeneous liquid mixture of two or more liquids not typically dissolved in one another, but held in suspension by forceful agitation or by emulsifying agents that modify the surface tension of the droplets to prevent coalescence; *see also* **emulsification** and **emulsifying agent**.

Endogenous respiration: auto-oxidation by organisms in biological processes.

Endosaturation: a condition in which the soil is saturated with water in all layers from the upper boundary of saturation to a depth of 200 cm or more from the mineral soil surface; *see also* **anthric saturation** and **episaturation**.

Environmental sensitivity: relative susceptibility of the natural environment to adverse impacts from an outside constituent.

Episaturation: zone of saturation held above the main groundwater body by a slowly-permeable layer, or by impermeable rock or sediment; *see also*

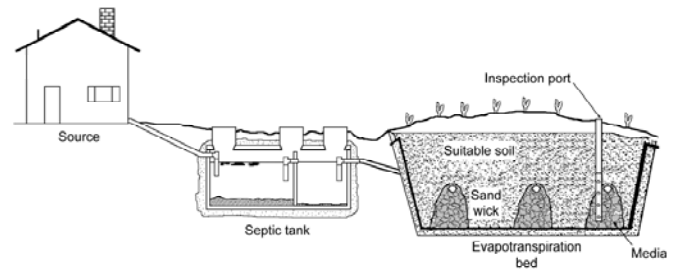
anthric saturation; and **endosaturation**.

Equivalent Dwelling Units (EDUs): units of measure that standardize all land use types (housing, retail, office, etc.) to the level of demand created by one single-family housing unit.

Escherichia coli (E. coli): member of the coliform bacteria group normally present in human and animal intestines; indicator organism for fecal contamination in water; *see also* **coliform bacteria, fecal;** **coliform bacteria, total;** and **indicator organism**.

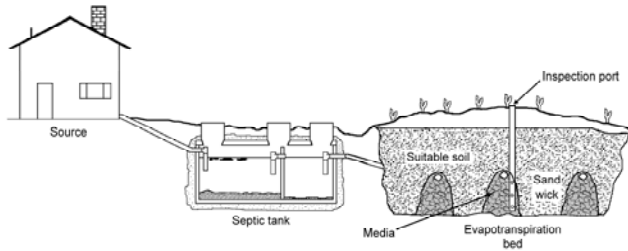
Eutrophication: nutrient enrichment of a lake or other water body typically characterized by increased growth of planktonic algae and rooted plants; can be accelerated by wastewater discharges and polluted runoff.

Evapotranspiration (ET) bed: dispersal component with a continuous, impermeable bed liner that uses evaporation and transpiration for dispersal of effluent.



Evapotranspiration (ET) bed

Evapotranspiration/adsorption (ETA) bed: dispersal component with an unlined bed using evaporation, transpiration, and adsorption for dispersal of effluent with an unlined bed; sometimes called an evapotranspiration/infiltration (ETI) bed.



Evapotranspiration/absorption (ETA) bed

Excavation: any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.

Exfiltration: unintended/undesirable outflow of effluent from a component into the environment.

Existing grade: *see grade, existing.*

Expansion: increasing the capacity of a wastewater treatment system.

Expansive clay mineralogy: soil in which the clay fraction is dominated by expansive 2:1 clay minerals, such as smectite or vermiculite.

Expansive soil: soil that undergoes significant volume change upon wetting and drying, usually because of a high content of expansive clay minerals; *see also expansive clay mineralogy.*

Extension: alteration of a wastewater treatment system resulting in an increase in capacity, lengthening, or expansion of the existing collection, treatment or dispersal component.

F

FOG (fats, oils, and grease): constituent of sewage typically originating from foodstuffs (animal fats or vegetable oils) or consisting of compounds of alcohol or glycerol with fatty acids (soaps and lotions), typically measured in mg/L.

Faces: vertical or inclined earth surfaces formed as a result of excavation work; *also known as sides.*

Failure: 1. term commonly used in regulation to describe a system malfunction; *see also malfunction;* 2. breakage, displacement, or permanent deformation of a structural member or connection so as to reduce its structural integrity and its supportive capabilities.

Fecal coliform bacteria: *see coliform bacteria, fecal.*

Feed: parameter that describes the orientation of the manifold relative to the supply line and/or laterals in a system.

Field capacity: amount of water in a soil after drainage due to gravity following a thorough wetting event.

Field flush: act of opening a cleanout or valve to allow the movement of effluent to scour accumulated materials out of a pipe or pipes.

Field pressure: *see operating pressure.*

Fill: 1. unconsolidated material that meets specific textural criteria and is used as part of a dispersal component; 2. unconsolidated material used to change grade or to enhance surface water diversion; 3. any other human-transported unconsolidated soil material; *see also cut and fill.*

Fill system: *see areal fill.*

Filter: device that removes constituents through processes such as sieving, stagnation, adsorption, or absorption; a filter has both area and depth with respect to flow; *see also screen.*

Filter, activated carbon: device filled with a porous form of carbon that is used

to decolorize liquids, recover solvents, and remove toxins and odors from water and air.

Filter, bottomless media: media filter that does not incorporate a liner or other physical barrier between the media and the existing soil on which it has been placed; used as a final treatment and dispersal component.

Filter, coir: media filter that uses organic fibric material (coir) from outer husk of coconut.

Filter, disc: device consisting of concentrically grooved discs stacked one upon the other and used for removal of particles larger than a specific size; typically used in drip distribution systems.

Filter, effluent: *see* **effluent screen**.

Filter, foam: media filter that utilizes an open-cell polyurethane foam material that is randomly arranged in prefabricated modular units.

Filter, in-line: device installed as a part of the piping in a system, operated under pressure and designed to remove suspended solids from wastewater.

Filter, media: device that uses materials designed to treat effluent by reducing BOD and/or removing suspended solids in an unsaturated environment; biological treatment is facilitated via microbial growth on the surface of the media.

Filter, peat: media filter that uses appropriate organic fibric material (peat) as the media; typically packaged as pre-fabricated modular units with the media in a container; a type of biofilter.

Filter, sand: media filter which uses sand of particular specifications as the media.

Filter, screen: filter consisting of a mesh material configured as a cylinder and used to remove particles larger than a specific size in pressurized systems.

Filter, spin: *see* **filter, screen**.

Filter, textile: type of media filter which uses non-rigid, synthetic material of varying shapes and configurations; typically packaged as pre-fabricated modular units.

Filter, trickling: type of media filter which uses a variety of media such as rigid plastics of varying shapes, stone, or tire chips; includes a clarifier in its configuration and may include a recirculation mode.

Filter, upflow: media filter through which wastewater flows from a lower to a higher elevation; usually characterized by an anaerobic environment.

Filtration: removal of suspended materials using processes such as sieving, stagnation, adsorption, absorption, and possibly biochemical degradation.

Final cover: soil with characteristics suitable for stabilizing the surface of system components, supporting vegetative growth and (in some cases) facilitating gas exchange.

Final treatment and dispersal: last treatment component (or combination of components) through which effluent is returned to the hydrologic cycle via a soil treatment area or a discharging outfall.

Fine bubble diffuser: diffused aeration device that disperses very small air bubbles into mixed liquor in an aerobic treatment unit aerobic process; often

described in relative sizes (e.g., micro-, fine, etc.).

Fixed-film process: *see attached-growth process.*

Fissured: description of a soil material that has a tendency to break along definite planes of fracture with little resistance, or a material that exhibits open cracks, such as tension cracks, in an exposed surface.

Fixture unit: relative estimate of discharge into a system by various types of plumbing fixtures; used in the determination of design flow.

Float: sensor installed in a pump vault or tank which opens or closes an electrical circuit in response to changing liquid levels, thereby controlling equipment operation.

Float tree: removable device located within a pump vault or pump tank to which floats are attached.

Floatable: material in wastewater with a density less than that of water.

Floc: collection of smaller particles agglomerated into larger particles as a result of chemical, physical, or biological treatment; the larger particles can be more readily settled or filtered out of the effluent; *see flocculation.*

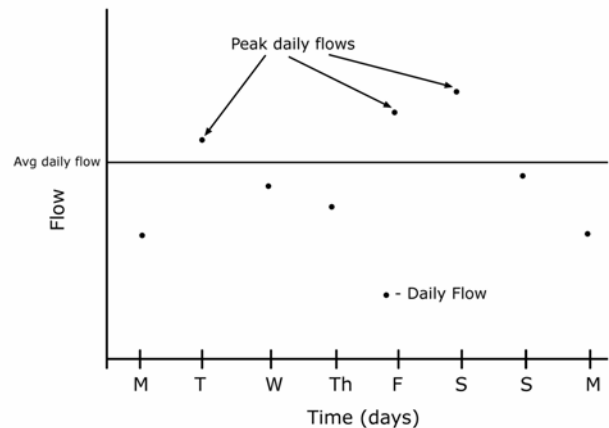
Flocculants: water-soluble organic polyelectrolytes that are used alone or in conjunction with inorganic coagulants to agglomerate the solids present in water; this process forms large, dense floc particles that settle rapidly.

Flocculation: agglomeration of colloids and finely divided suspended matter by biological, chemical, hydraulic and/or mechanical means.

Floodplain (100-year): any area susceptible to inundation by flood waters from any source and subject to the statistical 100-year flood; such an area has a one percent chance of flooding each year.

Floodway: channel of a watercourse and the adjacent land areas (within a portion of the 100-year floodplain) that must be reserved in order to discharge the 100-year flood without cumulatively increasing the water surface elevation more than one foot above the 100 year flood elevation before encroachment into the 100-year floodplain.

Flow, average daily: average volume of wastewater in a 24-hour period; calculated from values measured over a period of time (e.g., week, month, year, etc.).



Graphic representation of **daily flow**, **average daily flow** and **peak flow** (measured daily)

Flow, daily: measured volume of wastewater generated from a facility in a 24-hour period; expressed as a volume per day.

Flow, daily design: estimated volume of wastewater for any 24-hour period; parameter used to size systems.

Flow, design: estimated volume of wastewater per unit of time for which a component or system is designed.

Flow, depressurized: portion of a dosing event during which the distribution system is draining.

Flow, estimated: *see flow, design.*

Flow, instantaneous: highest recorded flow occurring within a short, specific period of time (expressed in gallons per minute).

Flow, peak: highest flow occurring within a specified time (minutes, hours, days, etc.); may be further expressed as peak hourly flow, peak daily flow, peak monthly flow, peak seasonal flow, etc.

Flow, surge: flow of effluent that occurs in a short enough period of time that it upsets the function of one or more components of the treatment train.

Flow, measured: *see flow, daily; and flow, average daily.*

Flow, pressurized: portion of a dosing event during which the distribution system is full and thus at operating pressure.

Flow, pressurizing: portion of a dosing event during which the distribution system is being filled and thus is not yet at operating pressure.

Flow equalization: system configuration that includes sufficient effluent storage capacity to allow for uniform flow to a subsequent component despite variable flow from the source; *see also dosing, timed.*

Flow equalization tank: *see tank, flow equalization.*

Flow measurement: any method used to accurately quantify the flow of liquid.

Flow splitter: device used to divide effluent and direct flow to multiple

components (e.g., a distribution box, drop box, or manifold).

Flowage: body of water that has been created by deliberately flooding an area.

Flush: process of using effluent to scour a component and transport accumulated materials.

Flush valve: *see valve, flush.*

Footprint: plan view of the area and geometry of a system.

Force main: part of a collection system consisting of the pipe that conveys sewage under pressure from a lift station to a location where gravity flow can again be utilized.

Foresight (FS or -): rod reading taken on a point of unknown elevation; foresight reading is subtracted from the Height of Instrument (HI) to determine the elevation of the desired point.

Foundation: natural or prepared ground or base on which some structure rests.

Fragipan: dense, brittle, usually acid subsoil horizon which limits the movement of water, air, and roots; extreme density and compactness is not a result of high clay content but of a dense soil fabric arrangement and/or cementation by various chemical constituents.

Freeboard: *see head space.*

French drain: *see drain, interceptor.*

Friction head: *see head, friction.*

Friction loss: reduction in pressure of liquid flowing through pipe and associated devices as a result of contact between the liquid and the pipe walls, valves, and fittings.

G

Gas deflector baffle: *see* **baffle, gas deflector**.

Gate valve: *see* **valve, gate**.

Geotextile fabric: **1.** synthetic fabric installed over distribution media to prevent migration of fine material; **2.** synthetic fabric used to control soil erosion and/or weed growth.

Grab sample: *see* **sample, grab**.

Gradation curve: graphical representation of the results of a sieve analysis; *see also* **sieve analysis**.

Grade: rate of rise or fall along a specified line; grade is the same as slope; can be expressed in percent (as feet of rise or fall per 100 feet of horizontal distance), as a decimal equivalent as feet of rise or fall per foot or horizontal distance, or as a ratio.

Grade, existing: natural, unaltered land surface; also referred to as original ground surface.

Grade, finish: final earth grade required by specifications.

Grade, proposed: finish grade as specified on a plan.

Grade elevation: elevation of the bottom of an excavated trench, ditch, or other finished surface; the term 'grade' is sometimes used to denote the elevation of the finished surface of an engineering project.

Grade stake: *see* **stake, grade**.

Granular soil: gravel, sand, or silt, (coarse grained soil) with little or no clay content. Granular soil has no cohesive

strength; some moist granular soils exhibit apparent cohesion; granular soil cannot be molded when moist and crumbles easily when dry.

Grassed waterway: natural or constructed watercourse or outlet that is shaped or graded and established with suitable vegetation to minimize erosion during periods of surface water runoff.

Gravel: rounded or subrounded rock fragment that is between 0.1 inch (2 millimeters) and 3 inches (76 millimeters) in diameter.

Gravelless pipe: distribution medium consisting of perforated, corrugated pipe encased in a geotextile wrap.

Gravimetric: of or pertaining to measurement by weight.

Gravity main: primary collection pipe placed on a carefully controlled grade; used for conveyance of wastewater via gravitational force.

Gravity-flow distribution: *see* **distribution, gravity-flow**.

Graywater: water captured from non-food preparation sinks, showers, baths, spa baths, clothes washing machines, and laundry tubs; *see also* **blackwater**.

Grease interceptor: watertight device designed to intercept, congeal, and retain or remove fats, oils, and grease (FOGs) from food-service wastewaters; may be located inside (grease separator) or outside (grease tank or grease trap) of a facility that generates commercial food service wastewater.

Grease interceptor, gravity: *see* **grease trap**.

Grease interceptor, hydro mechanical: *see* **grease separator**.

Grease separator: mechanical grease interceptor that is usually associated with a plumbing unit and located within a facility that generates commercial wastewater.

Grease trap: relatively large device similar to a septic tank located outside a facility that generates commercial food service wastewater and is designed to intercept, congeal, and retain or remove fats, oils, and grease (FOGs); *see also* **grease interceptor**.

Grease tank: *see* **grease trap**.

Greywater: *see* **graywater**.

Grinder pump: *see* **pump, grinder**.

Groundwater: portion of the water below the surface of the ground at a pressure equal to or greater than atmospheric; *see also* **water table**.

Groundwater interceptor: *see* **drain, interceptor**.

Groundwater lowering system: assembly of components and devices designed to actively or passively lower the water table beneath a soil treatment area.

Groundwater mounding: localized increase in the elevation of a water table that results from the downward percolation of additional liquid toward groundwater.

Guard stake: *see* **stake, guard**.

H

Haunch: **1.** portion of a pipe or conduit extending from its bottom to the spring line; **2.** lower third of the circumference of a cylindrical tank; **3.** portion of non-straight-walled tank below the horizontal

plane defined by its greatest width; *see diagram at* **bedding**.

Haunch zone: portion of an excavation where the haunch of a pipe, conduit, tank or structure is located; *see diagram at* **bedding**.

Haunching: material placed around a pipe, conduit, tank, or component for uniform structural support within the haunch zone; **(2)** placing backfill or embedment around a conduit or structure in an excavation such that the void area is stabilized; *see diagram at* **bedding**.

Hazardous atmosphere: atmosphere which by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic, or otherwise harmful, may cause death, illness, or injury.

Head: energy, either velocity or potential, possessed by each unit weight of a liquid, expressed as the vertical height through which a unit weight would have to fall to release the average energy possessed; used in various compound terms such as pressure head, elevation head, velocity head, and friction head; typically measured in feet of liquid or pounds per square inch (psi).

Head, dynamic: variable component of total dynamic head (TDH); comprised of friction head which fluctuates with pipe diameter, system configuration, and flow rate; *see also* **head, static**; *and* **head, total dynamic**

Head, elevation: a component of total dynamic head (TDH) described as the difference in elevation between the lowest effluent operational level in the dosing tank and the discharge point; the sum of elevation head and operating pressure constitutes the static head component of total dynamic head (TDH).

Head, friction: a component of total dynamic head (TDH) described as the sum of all friction loss in the piping network and associated devices; *see also* **friction loss**.

Head, operating: *see* **operating pressure**.

Head, static: fixed component of total dynamic head (TDH); expressed as the sum of elevation head and operating pressure; *see also* **operating pressure**.

Head, total dynamic (TDH): measure of the cumulative energy that a pump must impart to a liquid to move it from one point to another, consisting of the sum of friction head (as based upon pipe diameter, system configuration, and flow rate) and static head (the sum of elevation head and operating pressure); *see also* **head, friction; head, static; and operating pressure**.

Head loss: change in pressure between two points in an operating system as a result of friction and/or a change in elevation; also called **pressure loss**.

Head space: **(1)** in a septic tank, the volume between the invert of the outlet and the inside top of the tank; **(2)** in a dosing tank, the volume between the alarm elevation and the inside top the tank which constitutes reserve volume; *see also* **volume, reserve**.

Header pipe: *see* **manifold**.

Headworks: all parts and/or devices between the discharge assembly and the distribution laterals (including filtration devices, valves, gauges, and pressure regulators), used to control the quality, rate, pressure, and direction of flow of effluent; typically used in a drip distribution system.

Height of instrument (HI): elevation of the line of sight of the surveying instrument; determined by adding the Backsight (BS or +) to the known elevation of the point upon which the rod reading was taken, usually a bench mark or turning point.

Heterotrophic plate count: standard procedure for estimating the total number of live nonphotosynthetic bacteria in water; colony-forming units (cfu) are counted after spreading an aliquot of a sample over a membrane or pour plate and incubating in an amiable growth medium (agar) at an amiable temperature; *see also* **colony-forming unit (cfu)**.

Holding tank sewage system: system which combines or utilizes a holding tank with alarm, the services of a sewage pumper/hauler, and off-site treatment of the collected sewage.

Horizon: *see* **soil horizon**.

Hub stake: *see* **stake, hub**.

Hue: measure of the chromatic composition (wavelength) of light that reaches the eye; one of the three variables of color; *see also* **Munsell Color System, chroma, and value**.

Hydraulic conductivity: a measurement of the flow of liquid through an area perpendicular to the flow direction.

Hydraulic loading rate: *see* **loading rate, hydraulic**.

I

I and I: infiltration and inflow; term used to describe the combined undesirable entry of extraneous water into a system component; *see also* **infiltration and inflow**.

Impermeable: not permitting the passage of fluid through pores; in practical terms, some small level of hydraulic conductivity may occur, but at so low a level (e.g., 1×10^{-7} cm/s) that it is considered to be negligible.

Impervious: resistant to penetration or passage by fluids or by roots.

Indicator organism: organism that can be readily detected, the presence of which infers the presence of other microorganisms (e.g., fecal coliform bacteria is an indicator of probable presence of pathogens); *see also coliform bacteria, fecal and coliform bacteria, total.*

Industrial wastewater: *see wastewater, industrial.*

Infective dose: number of microorganisms that would initiate an immunological response by a host.

Infiltration: 1. entry of water or effluent into the soil; 2. undesirable inflow or seepage of water into a system component; for example, infiltration of surface water into a tank through a leaking pipe, pipe penetration, or through an access riser/tank seam that is not water-tight.

Infiltrative surface: designated interface where effluent moves from distribution media or a distribution device into treatment media.

Inflow: extraneous water directly entering a component, such as via a sump pump, foundation drain, or condensate line.

Influent: liquid entering a component or device.

Influent quality: physical, biological, and chemical characteristics of the liquid

flowing into a system component or device.

In-ground system: *see below-grade.*

Injection well: well by which effluent is transmitted to an underground formation; in most cases these are regulated and require a permit from a regulatory authority.

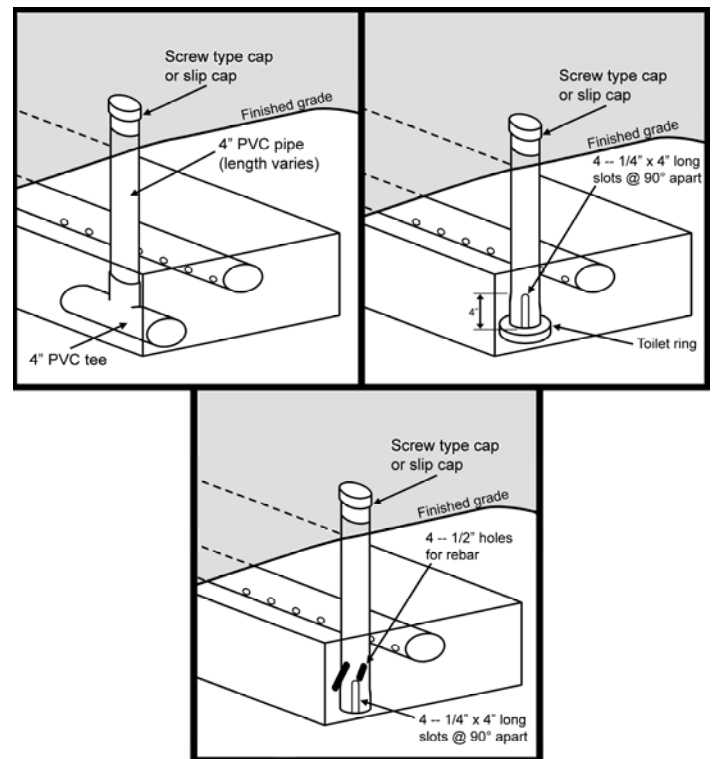
Inlet baffle: *see baffle, inlet.*

In-line filter: *see filter, in-line.*

Inorganic: non carbon-based molecules such as minerals and salts present in wastewater.

Inspection: evaluation of and reporting on the status of a wastewater treatment system.

Inspection port: access point in a system component that enables inspection, operation and maintenance.



Examples of **Inspection ports** installed in trenches showing various methods of stabilization

Inspector: service provider who evaluates and reports upon the status of a wastewater treatment system.

Install: to put in place or construct any portion of a wastewater treatment system.

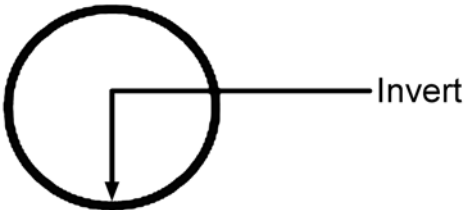
Installation: assembly and placement of components of a system, including final site grading and establishment of an appropriate cover.

Installer: service provider who is compensated to construct a wastewater treatment system.

Instantaneous loading rate: *see* loading rate, instantaneous.

Interceptor drain: *see* drain, interceptor.

Invert: elevation of the bottom of the inside pipe wall or fitting.



Invert of a pipe

Ion exchange: reversible chemical process in which ions are exchanged between a solution and a solid.

J

Jetter: device that uses pressurized water conveyed through a hose with a special nozzle to dislodge and break up foreign material.

Junction box: metal or hard plastic electrical box, housing only wire or cable connections; in exterior locations, must be watertight.

K

Kickout: accidental release or failure of a cross brace.

Kjeldahl nitrogen: *see* nitrogen, Kjeldahl.

L

LPD: *see* low pressure pipe/low pressure distribution.

LPP: *see* low pressure pipe/low pressure distribution.

LTAR: *see* long-term acceptance rate.

Lacustrine: of or pertaining to a lake.

Lagoon: constructed basin lined with either soils with very low permeability or a synthetic material, surrounded with berms and which contains at least three feet of wastewater which utilizes sunlight, wind or mechanical aeration, and natural bacteria to break down waste via physical, chemical, and biological processes.

Lagoon, evaporation: lagoon where wastewater is stored and the water is allowed to evaporate over time.

Lagoon, storage: lagoon where some form of wastewater is stored before it is either conveyed to another component for further processing or is reused.

Land application: process in which biosolids or liquid waste treatment residuals are spread over, sprayed onto, or injected into the soil.

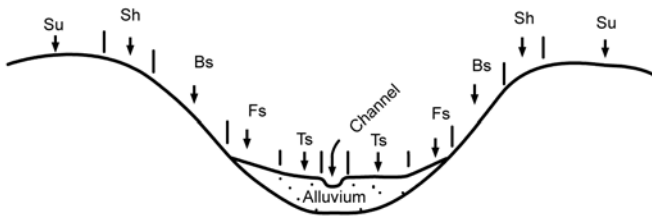
Land clearing: removal of vegetation including root mass.

Landform: physical, recognizable forms or features on the earth surface, having a characteristic shape and produced by natural causes.

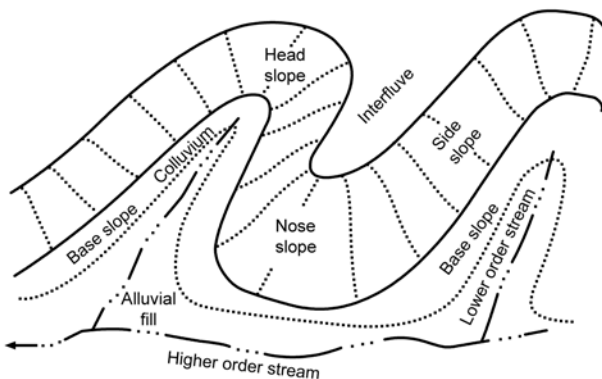
Landscape: portion of the land surface that the eye can comprehend in a single view.

Landscape loading rate: *see loading rate, contour.*

Landscape position: specific geomorphic component of the landscape in which a site is located; two-dimensional landscape positions may be summit, shoulder, backslope, sideslope, footslope, or toeslope; three dimensional views of geomorphic landscape position can be described as headslope, noseslope, sideslope, base slope, etc.



Landscape positions: *Su (summit), Sh (shoulder), Bs (backslope), Fs (fotslope) and Ts (toeslope).*



Geomorphic landscape positions and associated descriptors (landscape features)

Lateral: pipe, tubing or other conveyance used to carry and distribute effluent.

Lateral volume: amount of liquid required to fill a lateral.

Layered system: two or more distinctly different soil or rock types arranged in layers; micaceous seams or weakened planes in rock or shale are considered layered.

Layout: staking out the system on the site, including staging areas required for completion of the project.

Leach field: *see soil treatment area.*

Leaching pit: *see seepage pit.*

Level: **1.** instrument for observing levels, having a sighting device (usually telescopic) and capable of being made precisely horizontal; also called a surveyor's level; **2.** observation made with such an instrument.

Level, laser: level that employs the use of a laser projected on a target.

Level, optical: level consisting of a high-powered telescope with a spirit level attached to it in such a manner that when its bubble is centered, the line of sight is horizontal.

Level, rotating-beam laser: laser level providing a plane of reference over open areas.

Level, self-leveling: optical level with a prismatic device suspended on fine, nonmagnetic wires, such that when it is approximately centered the force of gravity on the prismatic device causes the optical system to swing into a position so that the line of sight is horizontal.

Level, single-beam laser: laser level projecting a string line that can be seen on a target regardless of lighting conditions.

Level, spirit: device for determining true horizontal or vertical directions by the centering of a bubble in a slightly curved glass tube or tubes filled with alcohol or ether.

Licensure: granting of licenses especially to practice a profession; the state of being licensed.

Lifecycle cost: total cost of a system over its design period including capital costs and ongoing operation and maintenance costs; expressed as a total present value or a monthly value over the expected life; costs in future years are discounted to the present.

Lift station: structure containing relatively large pumps and associated piping, valves, and other mechanical and electrical equipment for pumping liquid.

Limit of disturbance: line drawn on a plan that differentiates between the construction, clearing and traffic area required for the completion of an installation and the area that is to be left as found; the area is delineated on the site using a silt fence or haybales that prevent the transportation of any fines outside the construction area as a result of surface runoff.

Limiting condition: soil or site characteristic that reduces efficacy of soil treatment and thus restricts design options for a system; typically defined from a regulatory standpoint.

Limiting layer: *see restrictive layer.*

Line, air: piping that conveys air from the source to the point of diffusion.

Line, main: supply line in a spray dispersal system between a pump discharge assembly and a flow splitter; *see also line, supply.*

Line, sub-main: portion of the main line located after a flow splitter that carries a portion of flow to a spray dispersal field.

Line, supply: pipe between a source of effluent and the associated gravity-flow or pressure distribution system.

Line of sight: straight line passing through the center of the barrel of a telescope used in surveying; always parallel to the datum.

Liner: impermeable synthetic or natural material used to prevent or restrict infiltration and/or exfiltration.

Linear loading rate: *see loading rate, linear.*

Liquid capacity: *see tank capacity.*

Liquid limit: moisture content at which soil becomes unstable and will flow; measured by ASTM Standard Test Method ASTM D4318 (2005).

Load level indicator: device that enables a service provider to monitor the liquid level in a cargo tank.

Loading rate, areal: quantity of effluent applied to the footprint of the soil treatment area (or the absorption area of an above-grade soil treatment area) expressed as volume per area per unit time, e.g., gallons per day per square foot (gpd/sq. ft.).

Loading rate, biochemical: quantity of BOD₅ delivered to a treatment component expressed as mass per time (e.g., pounds of BOD₅ per day).

Loading rate, biological: quantity of organic matter delivered to a treatment component expressed mass per time (e.g., pounds per day).

Loading rate, contour: cumulative total of effluent applied to the soil profile at the down gradient end of a dispersal system installed on a slope, expressed as volume per unit length per unit time along the contour (e.g., gpd/ft.).

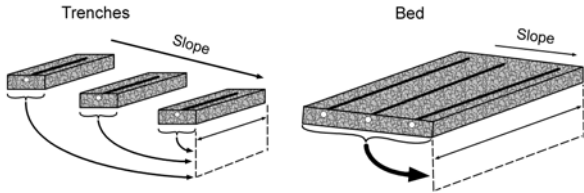


Illustration of contour loading rate for trenches (left) and a bed (right)

Loading rate, hydraulic: quantity of water applied to a given treatment component, usually expressed as volume per unit of infiltrative surface area per unit time, e.g., gallons per day per square foot (gpd/ft²).

Loading rate, instantaneous: quantity of effluent discharged to a unit area of the infiltrative surface during a dosing event expressed as volume per unit time, e.g., gallons per minute per square foot (gpm/ft²).

Loading rate, landscape: *see* loading rate, contour.

Loading rate, linear: quantity of effluent applied along the length of a lateral, trench or bed, typically expressed as volume per unit length per unit time (e.g. gallons per foot per day).

Loading rate, mass: sum of organic and inorganic effluent constituents delivered to a treatment component in a time interval, expressed as mass per time.

Loading rate, nutrient: sum of organic and inorganic nutrients (primarily nitrogen and phosphorus) delivered to a treatment component in a specified time interval expressed as mass per time.

Loading rate, organic: biodegradable fraction of chemical oxygen demand (biochemical oxygen demand, biodegradable FOG, and volatile solids) delivered to a treatment component in a specified time interval expressed as mass per time or area; e.g., pounds per day or pounds per cubic foot per day (pretreatment); pounds per square foot per day (infiltrative surface or pretreatment); typical residential system designs assume biochemical loading equals organic loading; *see also* biochemical oxygen demand; chemical oxygen demand; and FOG.

Low-head pump: *see* pump, centrifugal.

Long-term acceptance rate (LTAR): design parameter expressing the rate that effluent enters the infiltrative surface of the soil treatment area at equilibrium, measured in volume per area per time, e.g. gallons per square foot per day (g/ft²/day).

Low pressure pipe/low pressure distribution (LPP/LPD): *see* distribution, low pressure.

M

MPN: *see* most probable number.

Main line: *see* line, main.

Maintenance: routine or periodic action taken to assure proper system performance, extend system longevity, and/or assure a system meets performance requirements.

Maintenance entity: *see* management entity; and management entity, responsible.

Malfunction: condition in which a component is not performing as

designed/installed; *see also* **malfunction, hard**; *and* **malfunction, soft**.

Malfunction, hard: component malfunction that constitutes an imminent health risk.

Malfunction, soft: component malfunction that can typically be corrected via maintenance or operational activities.

Management, distributed: method to manage wastewater infrastructure where a responsible management entity combines onsite, cluster, and centralized treatment in a cost effective and sustainable structure.

Management, system: complete range of activities necessary to conduct operational services on wastewater treatment systems, including operation, maintenance, monitoring, and compensation.

Management entity: person or organization that administers a set of activities associated with system management (e.g., the owner, homeowners' association, contracted management service); the owner is ultimately responsible; *see also* **management, system**; **management entity, responsible**; *and* **management program**.

Management entity, responsible (RME): 1. person or organization that administers and conducts a comprehensive set of activities recognized by the regulatory authority; 2. legal entity that has the managerial, financial, and technical capacity to ensure the long-term, cost-effective operation of onsite and/or cluster wastewater treatment systems in accordance with applicable regulations and performance requirements (e.g., a wastewater utility or wastewater management district).

Management information system: computer-based system capable of capturing, storing, analyzing, and displaying specifically referenced information.

Management program: comprehensive, life-cycle series of elements and activities that address issues critical to wastewater treatment systems, including planning, education, maintenance, residuals management, training certification, licensing, inspections, monitoring, corrective action and enforcement, recordkeeping, inventorying, reporting, financial assistance, and funding.

Management service: provision of one or more activities required to ensure that the wastewater treatment performance requirements established by the regulatory authority are achieved; may include planning, design, permitting, inspection, construction/installation, operation, maintenance, monitoring, enforcement, etc.; ideally, management services are provided by properly trained personnel and tracked by means of a management information system; *see also* **management information system**.

Manhole: opening in a component through which physical access is gained for service; incorporates a cover that can be secured.

Manifold: pipe network having several outlets or inlets through which a liquid or gas is distributed or collected.

Manifold, bottom feed: manifold configuration in which a short manifold is located at the lower elevation of a soil treatment area.

Manifold, center feed: manifold configuration in which a long manifold is installed perpendicular to two sets of distribution laterals that extend in opposite directions along the slope; the

supply line may connect to the manifold in the center or at one end; used on level or nearly-level sites.

Manifold, dual: manifold configuration in which the supply line is connected to a manifold at two points.

Manifold, looped: manifold configuration in which the supply line connects to the manifold and a return line is installed to create a complete connection; used in drip distribution.

Manifold, return: manifold that allows effluent from two or more laterals to be collected and conveyed to a return line.

Manifold, side feed: manifold configuration in which a long manifold is installed perpendicular to one set of distribution laterals that extend in one direction along the slope; the supply line may connect to the manifold in the center or at one end; used on level or nearly-level sites.

Manifold, supply: manifold that allows effluent to be distributed to two or more laterals.

Manifold, top feed: manifold configuration in which a short manifold is installed at the higher elevation of a soil treatment area.

Manufacturer-assembled: provided to the contractor in an operable condition ready for final plumbing and/or electrical connections at the site; *see also* **contractor-assembled**.

Manway: main portal for human entry into a cargo tank; access is usually at the highest point in the tank shell.

Mass loading rate: *see* **loading rate, mass**.

Mastic: tar-like (asphalt or bituminous) material used to establish a watertight seal between parts of a device or component, such as between a septic tank and access riser, between riser sections or between the tank and lid.

Massive structure: *see* **soil structure**.

Mean high water (MHW): tidal datum described by the average of all the high water heights observed over the National Tidal Datum Epoch (the specific 19-year period adopted by the National Ocean Service as the official time segment over which tide observations are taken and reduced to obtain mean values for tidal data).

Mean tide level (MTL): tidal datum described as the arithmetic mean of mean high water and mean low water; half-tide level.

Mean sea level (MSL): tidal datum described as the arithmetic mean of hourly heights observed over the National Tidal Datum Epoch.

Mechanical aeration: *see* **aeration, mechanical**.

Media: solid material that can be described by shape, dimensions, surface area, void space, and application.

Media, distribution: media used to provide void space (usually in a dispersal component) through which effluent flows and is stored prior to infiltration (e.g., washed rock, aggregate, polystyrene blocks or beads, chambers, pipe, etc.).

Media, treatment: non- or slowly-degradable media used for physical, chemical, and/or biological treatment in a wastewater treatment component.

Media filter: *see* **filter, media**.

Meter, elapsed time: device used to detect an electrical signal in order to measure and record the total length of time a component has been in the operation phase.

Meter, flow: device that measures the instantaneous and/or cumulative amount of liquid that passes a designated point and is delivered to the next component.

Minimum liquid level: 1. distance from the bottom of a dosing tank to pump off elevation; coincides with the minimum volume required to maintain pump submergence; 2. elevation at which a siphon completes a dose.

Mitigation: act of fixing a system that has malfunctioned, preceded by an evaluation of all the components (source, collection and storage, pretreatment, final treatment, and dispersal) to determine the reason for the malfunction; certain jurisdictions may require a permit before mitigation occurs.

Mixed liquor: suspended mixture of activated sludge, dissolved gasses (e.g. DO) and wastewater undergoing treatment in the activated-sludge process; energy is required to maintain the condition.

Mixed liquor suspended solids (MLSS): concentration of suspended solids in mixed liquor, expressed in milligrams per liter (mg/L); *see also* **solids, suspended**.

Mixed liquor volatile suspended solids (MLVSS): fraction of the suspended solids in activated sludge mixed liquor that can be driven off by combustion at 550 degrees Celsius; indicates the concentration of microorganisms available for biological oxidation; *see also* **solids, suspended**.

Moist soil: condition in which a soil looks and feels damp; moist, cohesive soil can easily be shaped into a ball and rolled into small diameter threads before crumbling. Moist granular soil that contains some cohesive material will exhibit signs of cohesion between particles.

Monitoring: act of verifying performance for a regulatory authority or a manufacturer (e.g., qualitative or quantitative monitoring as part of service visit).

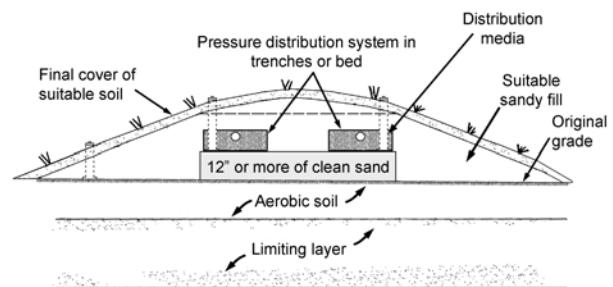
Monument: permanent surveyor's bench mark.

Most probable number (MPN): estimate of the density of microorganisms in a sample based on certain growth rates and statistical formulas, commonly used for coliform bacteria.

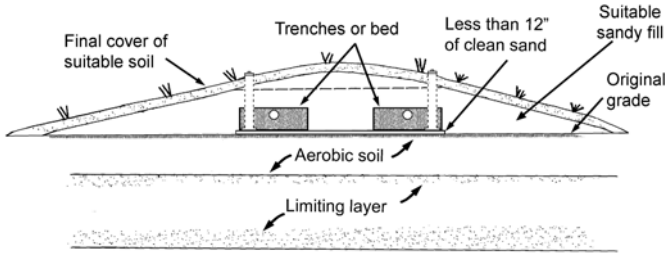
Mottles, soil: subordinate color in a soil horizon of a differing Munsell color system notation; *see also* **redoximorphic feature**.

Mottling: *see* **mottles, soil**

Mound: above-grade soil treatment area designed and installed with at least 12 inches of clean sand (ASTM C-33) between the bottom of the infiltrative surface and the original ground elevation; utilizes pressure distribution; a final cover of suitable soil material stabilizes the surface and supports vegetative growth.



Cross-section of a mound soil treatment area using washed rock trenches



Cross-section of a **modified mound** soil treatment area using washed rock trenches

Mound, mini: *see mound, modified.*

Mound, modified: above-grade soil treatment area designed and installed with greater than 0 and less than 12 inches of clean sand (ASTM C-33) between the bottom of the infiltrative surface and the original ground elevation; utilizes pressure distribution; a final cover of suitable soil material stabilizes the surface and supports vegetative growth.

Mound, Wisconsin: *see mound.*

Multi-stage pump: *see pump, multi-stage.*

Munsell Color System: color designation system that specifies the relative degrees of the three variables of color: hue, value, and chroma; for example: 10YR 6/4 is the color called 'strong brown' with a hue = 10YR, value = 6, and chroma = 4; part of the classification system is commonly used to specify soil color; *see also chroma; hue; and value.*

N

NSF Standard 40: National Sanitation Foundation standard applied to certain residential wastewater treatment systems having rated capacities between 400 gallons (1,514 Liters) and 1,500 gallons (5,978 Liters) per day.

NSF Standard 41: National Sanitation Foundation standard applied to certain treatment systems (such as composting toilets and similar technologies) that do not utilize a liquid saturated media as a primary means of storing or treating human excreta or human excreta mixed with other organic household materials.

NSF Standard 46: National Sanitation Foundation standard applied to filtration devices for residential gravity flow septic tanks (effluent screens).

NTU: *see nephelometric turbidity unit.*

NBOD: *see biochemical oxygen demand, nitrogenous.*

Nephelometric turbidity unit (NTU): standard unit of measurement used in water analysis to estimate the clarity of water; a nephelometer passes light through a sample and measures the amount of light deflected (usually, that light deflected at a 90 degree angle).

Nitrate (NO₃⁻): *see nitrogen, nitrate.*

Nitrification: biological oxidation of ammonium (NH₄⁺) to nitrite (NO₂⁻) and nitrate (NO₃⁻), or a biologically induced increase in the oxidation state of nitrogen.

Nitrification line: *see trench.*

Nitrogen (N): essential chemical element and nutrient for all life forms; molecular formula (N₂), constitutes 78 percent of the atmosphere by volume; nitrogen is present in surface water and groundwater as ammonia (NH₃), nitrite (NO₂⁻), nitrate (NO₃⁻), and organic nitrogen; excess levels of nitrogen in marine areas may contribute to eutrophication; *see also nitrogen, ammonia; nitrogen, nitrate; nitrogen, nitrite; and nitrogen, organic.*

Nitrogen, ammonia (NH₃): non-ionized form of reduced nitrogen.

Nitrogen, ammonium (NH₄⁺): ionized form of reduced nitrogen usable by plants.

Nitrogen, Kjeldahl: combination of ammonia nitrogen (NH₃) and organic nitrogen in a wastewater sample; total Kjeldahl nitrogen is operationally defined by a method that involves digestion of a sample followed by distillation and determination of ammonia (NH₃) in the distillate; *see also* **nitrogen, ammonia; nitrogen, organic; and nitrogen, total Kjeldahl (TKN).**

Nitrogen, nitrate (NO₃⁻): stable oxidized form of nitrogen; nitrifying bacteria can convert nitrite (NO₂⁻) to nitrate (NO₃⁻) in the nitrogen cycle.

Nitrogen, nitrite (NO₂⁻): unstable oxidized form of nitrogen.

Nitrogen, organic: nitrogen bound in plant and animal matter, primarily amino acids and proteins; the amount of organic nitrogen can be obtained by separately measuring the ammonia nitrogen and subtracting that value from the total Kjeldahl nitrogen.

Nitrogen, total: measure of the complete nitrogen content in wastewater including nitrate (NO₃⁻), nitrite (NO₂⁻), ammonia (NH₃), ammonium (NH₄⁺), and organic nitrogen, expressed as mg/L of N; all these forms of nitrogen, (as well as nitrogen gas [N₂]), can be biochemically converted from one form to another and are constituents of the nitrogen cycle.

Nitrogen, total Kjeldahl (TKN): measure of the total concentration of organic nitrogen, ammonia, and ammonium nitrogen.

Non-potable: water that is not known to be safe to drink because it may either

contain pollutants, contaminants, minerals, or infectious agents or may contain harmful constituents due to it not being a “permitted” source of drinking water; *see also* **potable water.**

Nutrient: element or compound essential as a raw material for growth and development of an organism; nitrogen, phosphorus, and potassium are primary nutrients.

Nutrient loading rate: *see* **loading rate, nutrient.**

O

OWTS: *see* **wastewater treatment system, onsite.**

Observation port: *see* **inspection port.**

O-ring: circular, rubber-material gasket that is used to seal the connection between two circular objects, such as the ends of pipe.

Onsite wastewater treatment system (OWTS): *see* **wastewater treatment system, onsite.**

Operating head: *see* **operating pressure.**

Operating level: elevation of effluent in a tank; for a septic tank, operating level is determined by the invert of the outlet; for a pump tank, operating level is determined by the elevation of operational controls; *see also* **effective depth.**

Operating pressure: 1. design parameter described as the pressure required for a component or device to operate properly (e.g., orifices, emitters, and sprayers must have the correct pressure to produce the correct flow rate and/or spray pattern); the sum of operating pressure and elevation head constitutes the static head component of

total dynamic head (TDH); **2.** operational parameter described as the pressure measurement at a predefined location; *see also* **head, static**; *and* **head, total dynamic**.

Operation: action of determining if a component or device is functional.

Operation-based performance standards: *see* **performance standards, operation-based**.

Ordinary high water level: elevation delineating the highest water level that has been maintained for a sufficient period of time to leave evidence upon the landscape; commonly the point where the natural vegetation changes from predominantly aquatic to predominantly terrestrial.

Orientation: position relative to true north, to points on the compass, or to a specific place or object.

Organic loading rate: *see* **loading rate, organic**.

Organic matter: material substances derived from organisms (plants or animals); containing carbon.

Organic micropollutants: *see* **trace organic contaminants**.

Organic nitrogen: *see* **nitrogen, organic**.

Organic phosphorus: *see* **phosphorus, organic**.

Orifice: discharge hole in a distribution system.

Orifice shield: part or device used to protect an orifice from external blockage.

Outfall: above-grade pipe outlet designed and installed to convey high

quality effluent or intercepted groundwater to the receiving environment.

Outhouse: *see* **toilet, pit**.

Outlet baffle: *see* **baffle, outlet**.

Override: **1.** operating parameter that allows for pump activation when the effluent level reaches a preset, excessively high level and allows continued operation until the level of effluent is below alarm activation level; **2.** an override sensor; **3.** act of manually initiating an event that normally occurs automatically.

Oxidation: **1.** chemical reaction in which a loss of electrons results in an increase in oxidation number (valence) of an element; occurs concurrently with reduction of the associated reactant; **2.** chemical or biological conversion of organic matter to simpler, more stable forms in the presence of oxygen with a concurrent release of energy; **3.** process of a substance combining with oxygen.

Oxygen transfer ratio: amount of oxygen absorbed by a liquid compared to the amount delivered into the liquid through an aeration or oxygenation device, usually expressed as the percentage equivalent; used to compare performance of aeration systems;

Ozone: unstable form of oxygen (O₃) used as an oxidizing, deodorizing, or bleaching agent, and is sometimes used for disinfection.

Ozonation: *see* **disinfection, ozone**.

P

PPCP: *see* **pharmaceutical and personal care products**.

PRV: *see* **valve, pressure-regulating**.

PTO: *see* **power take-off**.

Package plant: term commonly used to describe a modular aerobic treatment system unit serving multiple dwellings or establishments with relatively large flows (greater than 1,500 gallons per day).

Packed bed filter: *see* **filter, media**.

Parallel distribution: *see* **distribution, parallel**.

Part: subunit of a device; *see also* **device and component**.

Particle size analysis: determination of the various amounts of the different soil separates in a soil sample, usually by sedimentation, sieving, micrometry, or combinations of these methods.

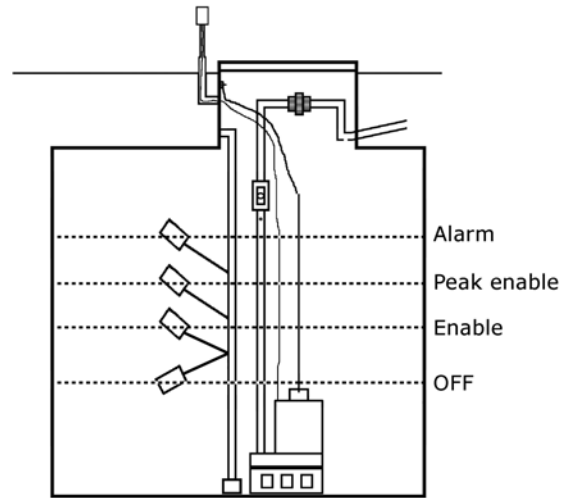
Particle size distribution: relative amounts or proportions based on size, of various inorganic separates in a sample, often expressed as mass percentages.

Passive aeration: *see* **aeration, passive**.

Pathogens: organisms that cause infectious disease.

Pathogenic: capable of causing disease; commonly applied to organisms that cause infectious diseases.

Peak enable: 1. operating parameter that increases the frequency of timer operation of a pump to result in effluent delivery equal to design flow rate; 2. a sensor that controls the peak enable function in a timed dose system; *see also* **redundant off and timer enable**.



Timed dose configuration using a Peak enable sensor

Peat: 1. organic soil material in which the original plant parts are recognizable; 2. fibrous organic material that may be used in a media filter.

Peat filter: *see* **filter, peat**.

Penetration: opening in the wall of a container through which a pipe or electrical conduit enters.

Perched water: *see* **episaturation**.

Percolation test: usually called a "perk test"; measurement of the drop in water level in a boring as water moves into the surrounding soil material.

Performance standard, operation-based: specific, measurable, and enforceable standard that establishes minimum frequency of and requirements for operation and maintenance activities and reporting the operational status of a system; *see also* **operation; and maintenance**.

Performance standard, water quality-based: specific, measurable, and enforceable standard that establishes limits and measurement frequency for pollutant concentrations or mass loads in

treated wastewater discharged to groundwater or surface water.

Performance standards: minimum performance criteria established by the regulatory or proprietary authority to ensure compliance with the public health and environmental goals of the state or community.

Permeability: ability of a porous medium such as soil to transmit fluids (liquids or gases).

Permit: authorization, license, or equivalent control document issued by the appropriate regulatory authority to implement the requirements of a regulation.

Piezometer: instrument for estimating hydraulic pressure in a conduit, tank, or soil by determining the location of the free water surface.

pH: measure of the acid or base quality of water that is the negative log of the hydrogen ion concentration; the scale ranges from 1-14, with a pH of 7.0 equal to neutral, 14.0 being strongly alkaline (basic), and 1.0 being strongly acidic.

Increasing hydrogen ion concentration	0	Strong acid
	1	
	2	Lemon juice
	3	
	4	Tomato juice
	5	Coffee
	6	
Neutral	7	Pure water
	8	Baking soda
Decreasing Hydrogen ion concentration ↓	9	
	10	
	11	
	12	Ammonia
	13	
	14	Strong base

Typical pH of selected liquids

Pharmaceutical and personal care products (PPCP): chemical substances such as prescription or over-the-counter therapeutic drugs, fragrances, cosmetic, sunscreen agents, diagnostic agents, among others; *see also* **trace organic contaminants**.

Phosphorus (P): chemical element and nutrient essential for all life forms, occurring as orthophosphate, pyrophosphate ($P_2O_7^{-4}$), triphosphate ($P_3O_{10}^{5-}$), and organic phosphate forms; each of these forms, as well as their sum (total phosphorus), is expressed in terms of milligrams per liter (mg/L) elemental phosphorus; occurs in natural waters and wastewater almost solely as phosphates; excess levels of phosphorous in fresh surface waters may contribute to eutrophication.

Phosphorus, inorganic: forms of phosphorus from mineral sources, such as orthophosphate, pyrophosphate ($P_2O_7^{-4}$), and triphosphate ($P_3O_{10}^{5-}$).

Phosphorus, organic: phosphorus formed primarily by biological processes; sources of organic phosphorus in sewage include bodily wastes, food residues, and the conversion of orthophosphates in biological treatment processes.

Phosphorus, total (TP): sum of all forms of phosphorus in effluent.

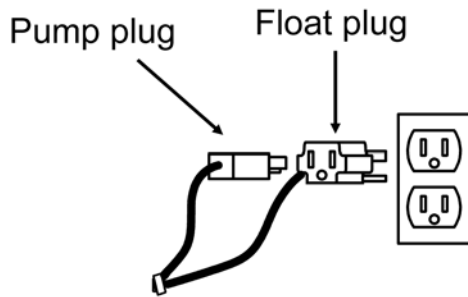
Physical feature, manmade: prominent or conspicuous part or characteristic of a site that is created by humans.

Physical feature, natural: prominent or conspicuous part or characteristic of a site that is not created by humans.

Physical treatment: *see* **treatment, physical**.

Piggy back: electrical plug configuration wherein a float switch plugs into an outlet

and a pump plugs into the back of the float switch plug.



Piggyback plug assembly

Pipe embedment: portion of an excavation that includes the bedding, haunching and initial backfill of piping; *see diagram at bedding.*

Pipe zone: portion of an excavation where a pipe or other conduit is located; *see diagram at bedding.*

Pit run: unprocessed sand or gravel found in natural deposits; also known as bank gravel or bank run.

Plan: drawing or diagram made by projection on a horizontal plane.

Plan view: view from above; also known as bird's-eye or aerial view.

Planning: process of reviewing proposed actions and associated impacts to ensure that community values and long-term sustainability are incorporated.

Planimetric: two-dimensional details that reflect accurate dimensions of and horizontal distances between features on a site.

Plans: drawings showing locations and details of a system and its components, specifications, and other information as needed for bidding, staging, installation, inspection, and operation and maintenance of a system.

Plastic limit: moisture content at which soil can be rolled into 1/8 inch diameter wire without breaking; represents the soil moisture content above which manipulation will cause compaction or smearing; measured by ASTM Standard Test Method ASTM D4318 (2005).

Plasticity: 1. degree to which a soil can be molded or deformed continuously and permanently using relatively moderate pressure without appreciable volume change or rupture; 2. soil consistence term defined under wet conditions.

Plasticity index: the numerical difference between the liquid limit and plastic limit of a soil; measured by ASTM Standard Test Method ASTM D4318 (2005).

Plow, chisel: 1. shank tillage implement that disrupts the soil to loosen and roughen the surface 2. static plow shank used to slice the soil during installation of subsurface drip tubing.

Plow, parabolic: curved tillage implement used to disrupt a hardpan or plowman.

Plow, static: plow shank used for installing subsurface drip tubing; typically a disc leads the shank to cut the soil, grass, and other debris prior to shank passage.

Plow, vibratory: oscillating plow shank used for installing subsurface drip tubing and utility lines.

Plug flow: process in which fluid particles pass through a treatment device and are discharged in the same sequence in which they enter; the particles remain in the tank for a time equal to the theoretical detention time.

Ponding: accumulation of liquid on an infiltrative surface.

Poorly-sorted: material of variable size with minimum pore space; *also known as* well-graded.

Poorly-graded: material of uniform size with maximum void space; *also known as* well-sorted.

Porosity: 1. open space or interstices in rock, other earth materials or synthetic media; 2. ratio of the open space to the total volume often described as a percentage

Porosity, soil: volume percentage of the total bulk not occupied by solid particles.

Portable toilet: *see* toilet, chemical.

Positive displacement pump: *see* pump, positive displacement.

Pot-holing: process of locating and excavating buried utilities.

Potable water: water that is safe for human consumption; presumed to meet safe drinking water standards.

Power take-off (PTO): device that conveys the power from the vehicle's main motor to the drive mechanism of an implement; e.g., the vacuum pump on a cargo tank.

Prescriptive requirements: minimum specific physical standards or specifications for design, siting, and construction of system components.

Pressure loss: change in pressure between two points in an operating system as a result of friction and/or a change in elevation; *also known as* head loss.

Pressure main: primary supply line for pressurized transport or distribution of water or effluent; *see also* line, supply.

Pressure-dosed: delivery of effluent under pressure to a component or device; *see also* distribution, pressure-dosed gravity.

Pressure-regulating valve (PRV): *see* valve, pressure-regulating.

Pressure transducer: device that senses pressure, converting that information to an electrical signal; an associated microprocessor can then convert the signal to a measurement of pressure, depth, or flow.

Pressurized flow: *see* flow, pressurized.

Pressurizing flow: *see* flow, pressurizing.

Pretreatment: any component or combination of components that provides treatment of wastewater prior to conveyance to a final treatment and dispersal component or reuse; often, this treatment is designed to meet primary, secondary, tertiary, and/or disinfection treatment standards..

Primary shut-off: first of two automatic shut-off valves that prevent the tank from being overfilled.

Primary treatment: *see* treatment, primary.

Prime: 1. act of initiating pump operation by filling the pump housing with liquid; 2. air pressure under the bell of a siphon that allows it to operate properly.

Privy: *see* toilet, pit.

Profile: *see* soil profile.

Profile leveling: method of finding the elevations of a series of points at measured, horizontal distances along a

line or path; process used in the development of a topographic map.

Property line: legal boundary defining land parcels.

Proprietary: held under a patent, trademark, or copyright.

Protective system (soil): method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

Pump: mechanical device for driving fluid flow or for raising or lifting a fluid by either suction or pressure or both.

Pump, axial: centrifugal pump that incorporates an impeller that resembles a propeller and is used for pumping treated effluent or clean water; less useful for raw wastewater or sludge because the tight tolerances of the impellers cannot easily handle solids or stringy material.

Pump, centrifugal: pump consisting of a rotating vane(s) [impeller(s)] enclosed in a housing (volute); the impeller draws liquid in and discharges it from the pump under pressure.

Pump, grinder: pump that shreds solids in a waste stream and conveys the resulting mixture under pressure to a subsequent system component.

Pump, low-head: *see pump, centrifugal.*

Pump, multi-stage: centrifugal pump with multiple, small diameter impellers in series within a casing that enables the liquid to be delivered at a relatively high pressure; *see also pump, centrifugal.*

Pump, positive displacement: pump in which liquid is induced to flow from the supply source through an inlet pipe and inlet valve; water is brought into the pump chamber by a vacuum created by the withdrawal of a piston or piston like device, which, on its return, displaces a certain volume of water contained in the chamber and forces it to flow through the discharge valve and pipe.

Pump, radial: pump in which the impeller is a turbulent mixer that causes tank liquid to flow perpendicular to the impeller's axis of rotation; types of radial flow impellers include disk-style flat blade turbines and curved blade turbines; used in applications where high shear rates are needed, such as in dispersion processes.

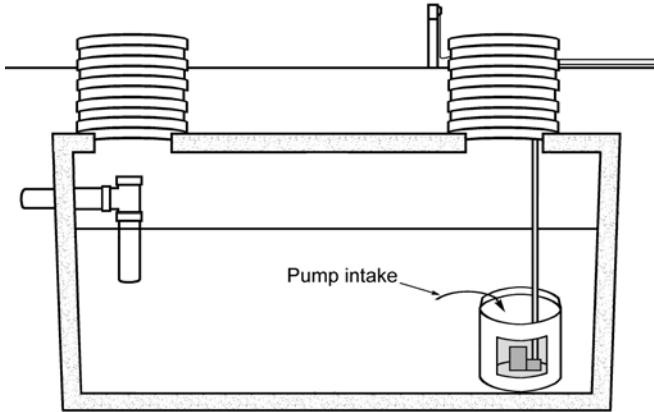
Pump, self-priming: pump that is designed such that a small amount of liquid retained in the housing enables the pump to initiate operation without additional liquid.

Pump, submersible: pump with a hermetically sealed motor close-coupled to the pump housing, designed to be placed entirely below the surface of the liquid to be pumped.

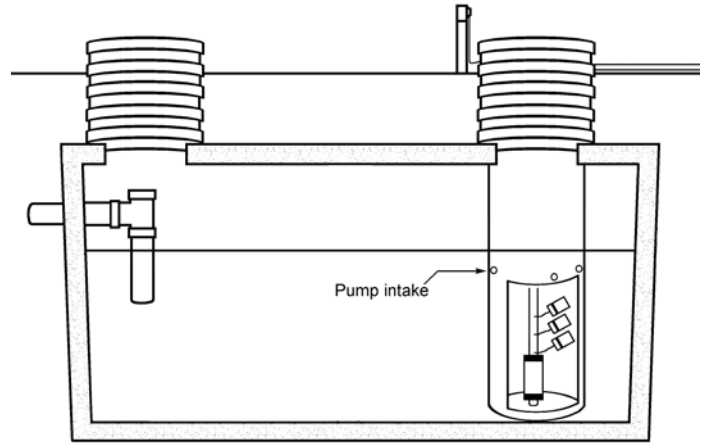
Pump, turbine: *see pump, multi stage.*

Pump, vacuum: pump that removes air from a cargo tank to create a vacuum (or partial vacuum); may also be operated in reverse mode to produce pressure.

Pump basin: shallow open container installed in a pump tank; the container houses the pump and effectively raises the pump intake level to the lip of the basin; *see also pump vault.*



Pump installed within a pump basin



Pump installed within a pump vault

Pump capacity: flow (gpm) a pump can deliver at a certain pressure (head).

Pump curve: graphical method that describes the relationship between the total dynamic head (TDH) and the capacity of particular pumps using various size impellers; the curve also includes information about efficiency and horse power consumption.

Pump delivery rate: flow delivered by a pump at a specified total dynamic head expressed as volume per unit time.

Pump station: *see lift station.*

Pump tank: *see tank, pump*

Pump vault: device installed in a septic or pump tank that houses a pump and screens effluent before it enters the pump.

Pumper: service provider who removes septage from a wastewater treatment component and disposes of it according to specific regulatory parameters.

Pumping: 1. act of removing septage from a wastewater treatment system component; 2. conveying effluent under pressure.

Q

Qualified person: one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, work, or project; *see also competent person.*

Quick-disconnect: 1. device that allows removal of another device without cutting the associated pipe; 2. mechanical device that allows interruption of electrical power.

R

RBC: *see rotating biological contactor.*

RME: *see management entity, responsible.*

RSV: *see valve, recirculating splitter.*

Radial pump: *see pump, radial.*

Rail: device located within a pump tank that supports the pump and facilitates its removal or replacement.

Ramp: inclined walking or working surface that is used to gain access to one point from another, and is constructed from earth or from structural materials such as steel or wood.

Range pole: long pole with painted red and white delineations of one foot each; used to mark points that are difficult to see from a distance.

Raw sewage: *see sewage.*

Reactor: container or tank in which controlled chemical and biological reactions used for the treatment of wastewater are carried out.

Reactor, batch: reactor in which flow is neither entering nor leaving.

Reactor, complete-mix: *see reactor, continuous-stirred tank.*

Reactor, continuous-stirred tank (CSTR): reactor in which complete mixing occurs; constituents entering the tank are immediately and evenly dispersed throughout the tank while chemical and biological reactions take place.

Reactor, plug flow: reactor in which fluid particles pass through the tank and are discharged in the same sequence in which they enter; *see also plug flow.*

Recirculating: design configuration wherein a portion of effluent is returned to

a component for further treatment or to facilitate a treatment process.

Recirculation ratio: proportion of effluent returned to the treatment component compared to the amount of forward flow to the next component of the treatment train.

Reclamation: *see wastewater reclamation.*

Recycling: *see wastewater recycling.*

Redox concentrations: zones of apparent accumulation of Fe (iron) and/or Mn (manganese) oxides in soils.

Redox depletions: zones of low chroma where Fe (iron) and/or Mn (manganese) oxides and/or clay have been stripped out of the soil.

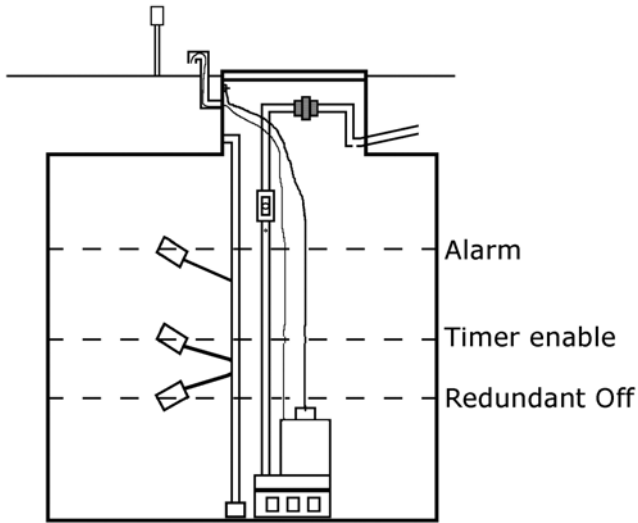
Redox potential (oxidation-reduction potential [ORP]): electrical potential (measured in volts or millivolts) of a system due to the tendency of the substances in it to give up or acquire electrons.

Redoximorphic feature: soil property that results from the reduction and oxidation of iron and manganese compounds in the soil after saturation with water and subsequent desaturation; *see also redox concentration and redox depletion.*

Reduction: addition of electrons to a chemical entity decreasing its valence or oxidation number; for example under anaerobic conditions (no dissolved or molecular oxygen (O₂) present), sulfur compounds are reduced to produce hydrogen sulfide (H₂S) and other compounds; *see also oxidation.*

Redundant off: 1. optional operating parameter in a timed dosed configuration that acts as a fail-safe by preventing

pump operation when effluent levels reach a specified level below the normal off level; **2.** a sensor that controls the redundant off function in a timed dose system; typically, this sensor is directly wired into the pump circuit, thus bypassing the timer or control circuits.



*Timed dosing configuration using a **redundant off** sensor*

Relief device: configuration of non-perforated pipe (such as a cross-over pipe or a stepdown) and/or a drop box that conveys effluent to the next trench; *see also **cross-over pipe** and **stepdown**.*

Relief line: device used to convey effluent to succeeding trenches in systems using serial or sequential distribution; *see also **stepdown** and **cross-over pipe**.*

Registered professional engineer: person who is registered as a professional engineer in the state where the work is to be performed; a professional engineer, registered in any state is deemed to be a "registered professional engineer" within the meaning of this standard when approving designs for "manufactured protective systems" or "tabulated data" to be used in interstate commerce.

Remediation: act or process of correcting a fault or deficiency without changing system structure or form.

Repair: action of fixing or replacing substandard or damaged components; repairs can be categorized as required repairs, recommended repairs, and upgrades.

Repair area: *see **reserve area**.*

Replacement: process of exchanging a component with an equivalent component.

Reporting: act of submitting a detailed report of inspection, monitoring or operation and maintenance activities performed on a wastewater treatment system.

Reserve area: area of land with demonstrated capacity for use as a final treatment and dispersal component upon which no permanent structure should be constructed and which is intended for replacement of the original system if needed.

Reserve capacity: extra treatment capacity built into wastewater collection, treatment, and dispersal components or systems to accommodate projected increases in flow.

Reserve volume: *see **volume, reserve**.*

Residence time: *see **detention time**.*

Residential strength wastewater: *see **wastewater, residential strength**.*

Residuals: solids generated and retained in wastewater treatment components during the treatment of sewage, including sludge, scum, and pumpings from grease interceptors, septic tanks, aerobic treatment units, or other components; *see also **biosolids** and **septage**.*

Responsible management entity (RME): *see* **management entity, responsible.**

Restrictive layer: horizon or condition in the soil profile or underlying strata that restricts movement of fluids; a restrictive layer may constitute a limiting soil/site condition; examples include fragipan, spodic horizons, massive structural grade, or certain bedrock, etc.; *see also* **limiting condition.**

Retention time: *see* **detention time.**

Return line: **1.** portion of the distribution system through which effluent is routed back to a pretreatment component such as in a drip distribution system; **2.** portion of a treatment component that conveys effluent back to an upstream component such as an activated sludge return or a recirculating media filter.

Return flow: **1.** volume of effluent returned to a previous component of a treatment train configured with a recirculation mode; **2.** volume of effluent used to backflush a component.

Reuse: *see* **wastewater reuse.**

Riser: **1.** regarding spray dispersal systems, the vertical pipe that begins at the lateral and terminates in a spray distribution head; **2.** regarding tanks, *see* **riser, access.**

Riser, access: conduit facilitating access to subsurface components of a wastewater treatment system.

Riser, flexible: polyethylene fitting for connection of spray distribution heads to laterals using flexible pipe as a riser; allows proper installation of the distribution head in a location that may be both vertically and horizontally remote

from the lateral; helps protect and isolate the lateral from damage.

Riser, swing joint: piping and connections used to adjust the elevation of and isolate spray distribution heads from the lateral in a spray dispersal system.

Riser, universal: piping for connection of spray distribution heads to laterals, allowing installation of the distribution head at the soil surface via multiple threaded sections that can be cut to the appropriate length.

Riser pipe: pipe connected to the loading pipe valve and projecting into a cargo tank; facilitates distribution of material within the tank during loading.

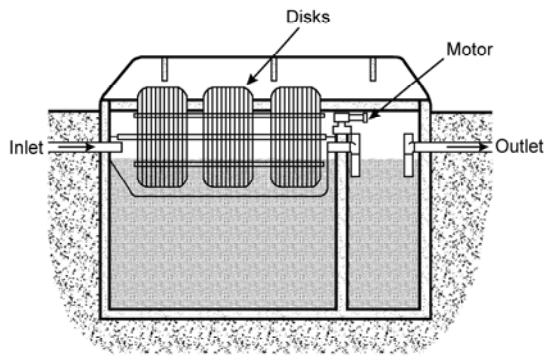
Rock: **1.** naturally occurring inorganic material with a defined structure and mineralogical composition; **2.** clean, graded aggregate used as distribution media in a wastewater treatment system and/or dispersal component.

Rock fragments: unattached pieces of rock 2 mm in diameter or larger.

Rod, level: pole marked with a gradation facilitating the determination of a relative elevation for a point, typically constructed of wood and graduated in feet and tenths and hundredths of a foot; *also known as* a stadia rod.

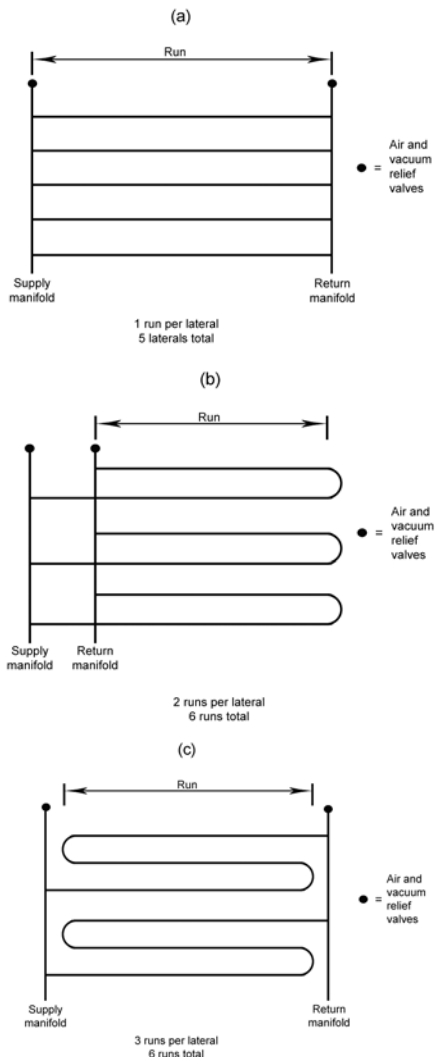
Rod reading: reading taken on a leveling rod when sighting through the telescope of an optical leveling instrument.

Rotating biological contactor (RBC): type of attached growth pretreatment component consisting of disks mounted on a drive shaft which rotates; microorganisms attached to the discs are alternately exposed to free oxygen in the atmosphere and the wastewater.



Rotating biological contactor (RBC)

Run: for a drip distribution lateral, the length of drip tubing placed on a single contour.



Illustrations of runs in various drip distribution configurations

Runoff: precipitation, snow melt, or irrigation in excess of what can infiltrate the soil surface in an area and thus flows on the surface.

Runoff volume: amount of precipitation (and/or irrigation) minus surface storage, infiltration, evapotranspiration, and interception, that exits a defined area

Runon: surface water from upslope that enters an area.

S

SBR: *see sequencing batch reactor.*

SDR (Standard dimensional ratio): ratio of pipe or tubing diameter to wall thickness.

STEG: *see septic tank effluent gravity.*

STEP: *see septic tank effluent pump.*

Sample, composite: commingled individual samples collected from the same point at different times; samples may be of equal volume or may be proportional to the flow at time of sampling.

Sample, grab: discrete sample collected at a particular time and location.

Sample, integrated: combination of grab samples collected at a similar time but at different locations.

Sampling port: part or device at a particular location in a component that allows a sample to be collected for analysis.

Sand: soil particle between 0.05 and 2.0 millimeters in diameter; *see also soil separate; soil textural class; and soil texture.*

Sand filter: *see filter, sand.*

Sanitary tee: pipe fitting in the shape of a "T" with a long-sweep radius; commonly used as a part of an inlet or outlet baffle in a septic tank.

Saturated: condition wherein all available soil pore space is occupied by water.

Saturated soil: soil in which the voids are filled with water. Saturation does not require flow. Saturation, or near saturation, is necessary for the proper use of instruments such as a pocket penetrometer or shear vane.

Scarify: process of abrading or scratching the infiltrative surface prior to installation of a final treatment and dispersal component.

Scale: **1.** proportion between two sets of dimensions, as between those of a drawing and its original; for example, the scale of a drawing may be expressed as 1/4 inch = one foot; **2.** measuring tool used by architects and engineers in preparing drawings to a proportionate scale; **3.** to measure a drawing with a scale. **4.** either pan or tray of a balance; **5.** to climb, as a ladder; **6.** series of graduated marked spaces for measuring something, as on a thermometer; **7.** rust occurring in thin layers; **8.** hard deposit of minerals on heater coils and pool surfaces.

Screen: **1.** porous material or mesh configured as a plate or cylinder that allows the passage of particles smaller than particular size, (e.g., an effluent screen) according to a specific flow/pressure relationship; a screen has area but no depth with respect to flow; **2.** use of a porous material or mesh in order to separate particles by size; *see also filter.*

Scum: layer of floating material on a liquid surface.

Secondary shut-off: second of two automatic shut-off valves that prevent a cargo tank from being overfilled and possibly causing ejection of material from the tank through the pump.

Secondary treatment: *see treatment, secondary.*

Secondary treatment, advanced: *see treatment, advanced secondary.*

Sedimentation: settling of solid material out of a liquid, typically accomplished by reducing the velocity of the liquid below the point at which it can transport the suspended material; may be enhanced by coagulation and flocculation; *also known as settling.*

Seepage bed: *see bed.*

Seepage pit: excavation (deeper than it is wide) which receives septic tank effluent and from which the effluent seeps into the surrounding soil through the bottom and openings in the side of the pit; emphasis is on disposal rather than treatment; *see also cesspool.*

Self-priming pump: *see pump, self-priming.*

Sensor: part or device that detects a chemical, physical, or mechanical signal and converts it into an electronic one.

Separation distance: minimum vertical or horizontal space required between specified components, between components and physical features, or between components and legally-defined boundaries.

Septage: liquid and residuals removed from a septic tank or other pretreatment device, seepage pit, cesspool, portable

toilet, type III marine sanitation device, or similar domestic wastewater treatment works that receives only domestic wastewater; *see also* **biosolids** and **residuals**.

Septic system: *see* **wastewater treatment system, onsite (OWTS)**.

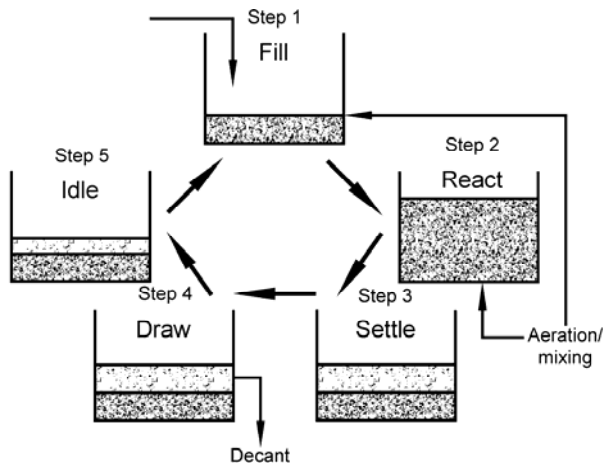
Septic tank: *see* **tank, septic**

Septic tank effluent: partially treated sewage that is discharged from a septic tank.

Septic tank effluent gravity (STEG): collection system that uses septic tanks to separate solids and allow gravity flow of effluent to a subsequent component.

Septic tank effluent pump (STEP): collection system that uses septic tanks to separate solids and incorporates a pump vault, a pump and associated devices to convey effluent under pressure to a subsequent component.

Sequencing batch reactor (SBR): component in which batch type suspended-growth (activated sludge) processes are carried out in the same tank in stepwise order (e.g. fill, treat, settle, decant, draw).



Suspended-growth processes within a sequencing batch reactor (SBR)

Sequencing valve: *see* **valve, sequencing**.

Sequential distribution: *see* **distribution, sequential**.

Serial distribution: *see* **distribution, serial**.

Service: action of performing various activities related to wastewater treatment systems, including installation, inspection, operation, maintenance, assessment, and mitigation.

Service provider: any person who performs work in relation to wastewater treatment systems; may include site evaluators, designers, inspectors, installers, O&M service providers, and pumpers.

Service provider, O&M: professional who performs operation and maintenance on a wastewater treatment system.

Setback: minimum horizontal separation distance between system components and site/facility features; typically defined by code or regulation.

Settling: process of subsidence and deposition of suspended matter carried by a liquid; typically accomplished by reducing the velocity of the liquid below the point at which it can transport the suspended material; *see also* **sedimentation**.

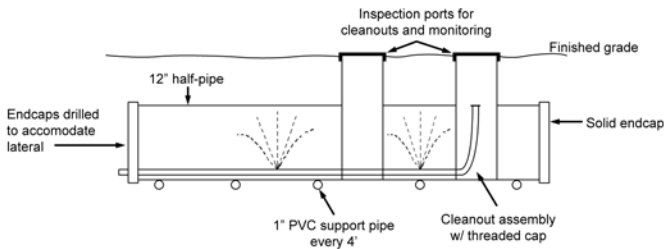
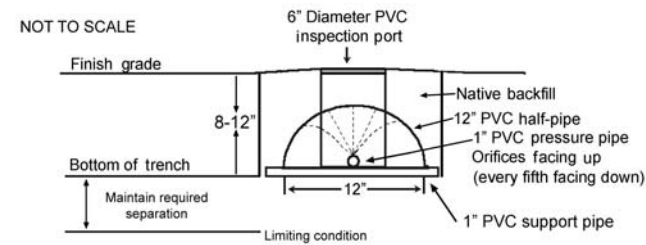
Settling time: time during which suspended, aggregated, precipitated, or colloidal substances settle by gravity.

Sewage: untreated wastes consisting of blackwater and graywater from toilets, baths, sinks, lavatories, laundries, and other plumbing fixtures in places of human habitation, employment, or recreation.

Sewage collection system: system of pipes, lift stations, and other appurtenances that receives and conveys wastewater either by gravity or pressure.

Sewer: *see* sewage collection system.

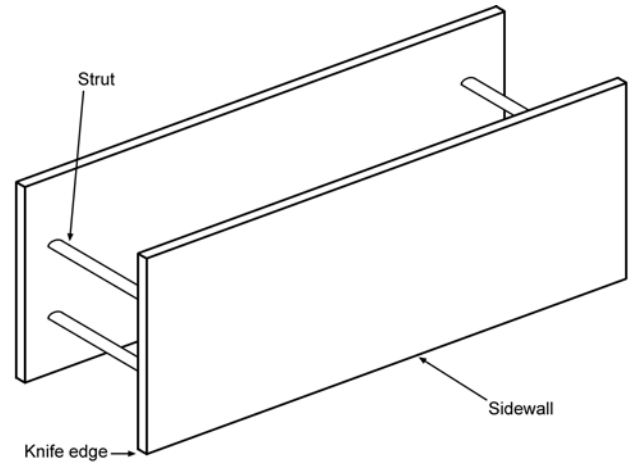
Shallow narrow pressurized trench: final treatment and dispersal component in which highly-treated effluent is distributed into trenches installed in the upper portion (8 to 12 inches) of the soil profile and dosed via low-pressure distribution laterals.



Two views of low pressure distribution (LPD) in a **shallow narrow pressurized trench**

Sheeting: members of a shoring system that retain the earth in position and in turn are supported by other members of the shoring system.

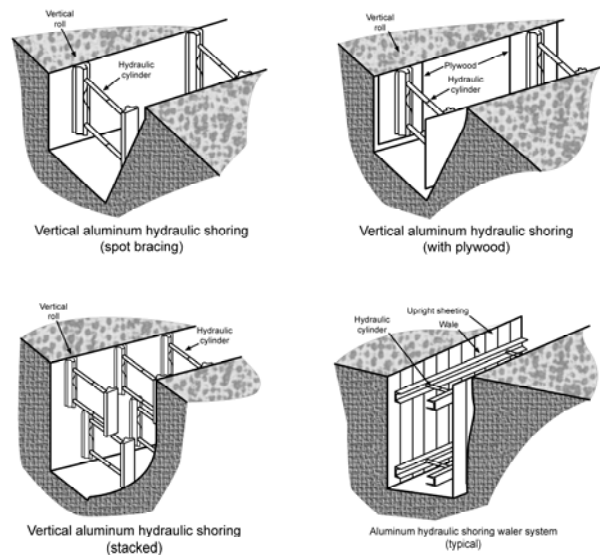
Shield (Shield system): structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structure; can be permanent structures or can be designed to be portable and moved along as work progresses; additionally, shields can be either pre-manufactured or job-built in accordance with OSHA 1926.652(c)(3) or (c)(4). Shields used in trenches are usually referred to as "trench boxes" or "trench shields."



Example of a trench shield or trench box that may be used in shield system

Shoring (Shoring system): structure such as a metal hydraulic, mechanical or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.

Shoring, aluminum hydraulic: pre-engineered shoring system comprised of aluminum hydraulic cylinders (cross braces) used in conjunction with vertical rails (uprights) or horizontal rails (wales); designed specifically to support the sidewalls of an excavation and prevent cave-ins.



Examples of **aluminum hydraulic shoring configurations**

Shrink/swell clay: *see* **expansive clay mineralogy**.

Sides: *see* **faces**.

Sideslope: physical landscape feature; *see also* **landscape position**.

Sieve analysis: use of specific size sieves to determine the gradation (the distribution of aggregate particles, by size, within a given sample) in order to determine compliance with design, production control requirements, and verification specifications.

Silt: mineral particles that range in diameter from 0.02-0.002 mm in the International System or 0.05-0.002 mm in the USDA-NRCS system; *see also* **soil separate, soil textural class and soil texture**.

Site evaluation: comprehensive analysis of soil and site conditions for a given land use.

Site evaluator: service provider who conducts preconstruction site evaluations, including visiting a site and performing soil analysis, a site survey, or other activities necessary to determine the suitability of a site for an onsite wastewater treatment system.

Site plan: plan-view drawing that provides a graphical representation of existing and proposed natural and manmade physical features on a site.

Simplex system: control that operates a single device (e.g., a simplex pump system).

Single pass: flow configuration wherein effluent moves through a treatment component only once.

Siphon: device used for demand dosing effluent from a tank at a given elevation

to a component at a lower elevation, accomplished by means of suction created by the weight of the liquid in the conveying pipe.

Siphon tank: *see* **tank, siphon**.

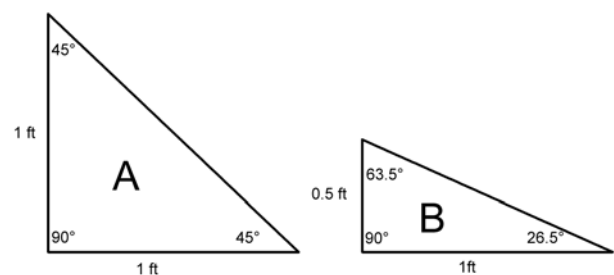
Site plan: plan drawing showing all relevant aspects of the site.

Site restoration: reconstitution of the surface of a site to approach as nearly as possible the original grade and vegetative cover.

Slag: bottom ash (a by-product of coal-fired power plants); coarse fraction may be used as distribution media.

Slickensides: stress surfaces in soil that are polished and striated and are produced by one mass sliding past another.

Slope: 1. ratio of the rise divided by the run between two points, typically described as a percentage (rise/run multiplied by 100). 2. landscape form or feature; *see also* **slope, concave; slope, convex; and slope, linear**.



$$\begin{aligned} \% \text{ slope} &= (\text{rise} \div \text{run}) \times 100 \\ \text{Triangle A slope} &= (1\text{ft}/1\text{ft}) \times 100 = 100\% \\ \text{Triangle B slope} &= (0.5\text{ft}/1\text{ft}) \times 100 = 50\% \\ 45^\circ \text{ slope} &= 100\% \text{ slope} \\ 22.5^\circ \text{ slope} &= 50\% \text{ slope} \end{aligned}$$

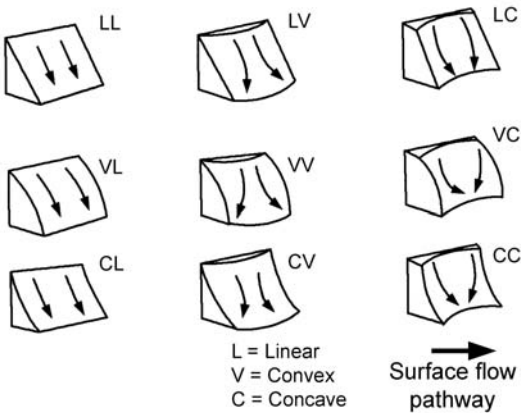
Examples of slope calculations

Slope, concave: landscape form or feature that is curved or rounded inward such as a segment of the interior of a hollow sphere; slope becomes

progressively flatter as one moves downslope.

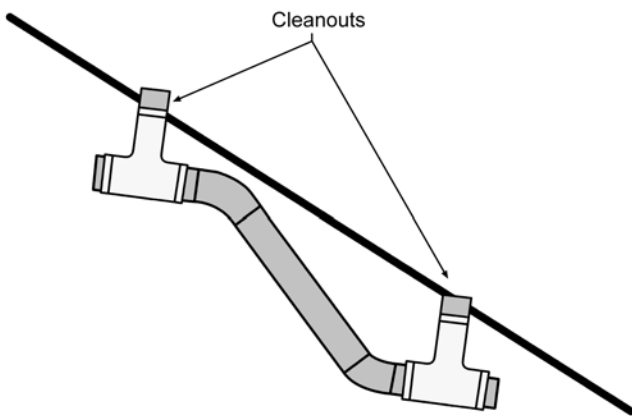
Slope, convex: landscape form or feature that has a surface that is curved or rounded outward; slope becomes progressively steeper as one moves downslope.

Slope, linear: landscape form or feature that is narrow and elongated; the slope is uniform as one moves downslope.



Slope shape descriptors

Slope break: configuration for piping installed on steep slopes to slow the flow coming from the structure to the first tank; typically includes the installation of cleanouts to prevent obstruction.



Example of a slope break configuration for piping installed on a steep slope

Sloping (Sloping system): method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

Sloughing: shedding of material (typically biofilm) off of a surface.

Sludge: accumulated solids and associated entrained water within a pretreatment component, generated during the biological, physical, or chemical treatment; coagulation; or clarification of wastewater.

Sludge return: process that sends the material (sludge) settled in a clarifier back to a septic or processing tank for further treatment or to maintain adequate microbial populations for treatment.

Smear: degradation of the infiltrative surface through the sealing of soil pores.

Soil: 1. unconsolidated mineral and/or organic material on the immediate surface of the earth that serves as a medium for the growth of plants; 2. unconsolidated mineral or organic matter on the surface of the earth that has been subjected to and shows effects of pedogenic and environmental factors of climate (including water and temperature effects), and macro- and microorganisms, conditioned by relief, acting on parent material over a period of time.

Soil classification system, OSHA: method of categorizing soil and rock deposits in a hierarchy of stable rock, Type A, Type B, and Type C, in decreasing order of stability; categories are determined based on an analysis of the properties and performance characteristics

of the deposits and the environmental conditions of exposure; *see also* **soil textural class**.

Soil consistence: attribute of soil expressed in degree of cohesion and adhesion, or in resistance to deformation or rupture; consistence includes: the resistance of soil material to rupture, resistance to penetration, the plasticity, toughness, or stickiness of puddled soil material, and the manner in which the soil material behaves when subjected to compression; general classifications of soil consistence include loose, friable, very friable, firm, very firm, and extremely firm.

Soil horizon: layer of soil or soil material approximately parallel to the land surface and differing from adjacent related layers in physical, chemical, and biological properties or characteristics such as color, structure, texture, consistence, kinds and number of organisms present, degree of acidity or alkalinity, etc.

Soil morphology: 1. physical constitution of a soil profile as exhibited by the kinds, thickness, and arrangement of the horizons in the profile; and by the texture, structure, consistence, and porosity of each horizon; 2. visible characteristics of the soil or any of its parts.

Soil profile: vertical section of the soil through all its horizons and extending into the parent material.

Soil separate: mineral particle that is sand-, silt-, or clay-sized.

Soil smearing: *see* **smear**.

Soil structure: combination or arrangement of primary soil particles into secondary units or peds; secondary units are characterized on the basis of shape,

size class, and grade (degree of distinctness); *see also* **structureless**.

TYPE (SHAPE)	SIZE CLASS	GRADE
granular	very fine (very thin)	0 - structureless*
angular blocky	fine (thin)	1 - weak
subangular blocky	medium	2 - moderate
platy	coarse (thick)	3 - strong
wedge	very coarse (very thick)	
prismatic		
columnar		*Structureless
		single-grained
		massive
		rock-controlled fabric

Types of soil structure with possible size classes and grades

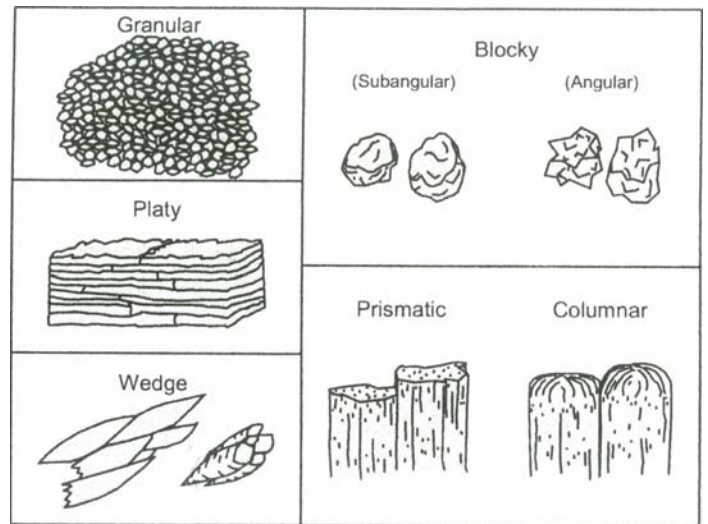


Diagram of types of soil structure (Schoenberger, et al., [eds.] 2002)

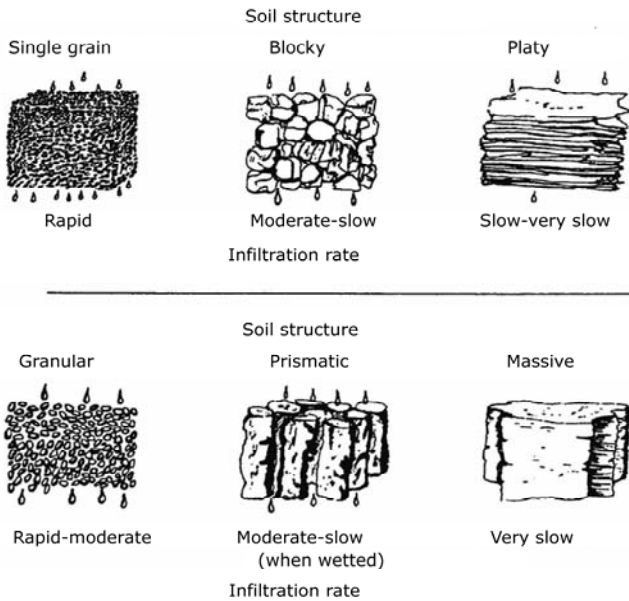


Diagram of types of soil structure and relative rate of associated water movement (Shoenberger, et al., [eds.] 2002)

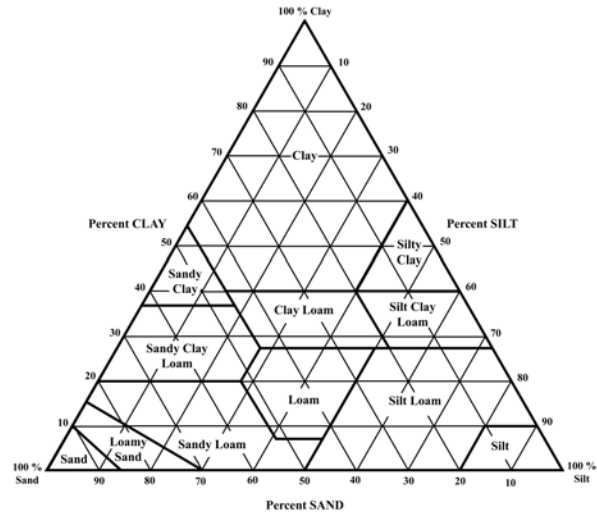
Size class	Criteria: structural unit size (mm)		
	Granular Platy	Columnar Prismatic Wedge	Angular & Subangular Blocky
Very Fine (Very thin)	<1	<10	<5
Fine (thin)	1 to <2	10 to <20	5 to <10
Medium	2 to <5	20 to <50	10 to <20
Coarse (thick)	5 to <10	50 to <100	20 to <50
Very coarse (Very thick)	≥10	100 to 500	≥50

Size class descriptors and criteria for various types of soil structure

Soil substitution: trench or bed installed after native soil is excavated and replaced with approved soil material; configurations and terminology vary among jurisdictions; may be referred to locally as sand-lined trenches, liner systems, etc.

Soil textural class: percentage by weight of sand, silt, and clay such that each class possesses unique physical characteristics and management relative to the other textural classes; textural class names are modified by the addition

of suitable adjectives when rock fragments are present in substantial amounts (for example, 'stony silt loam'); see also soil classification system, OSHA.



Soil textural classes as illustrated in the USDA Soil Textural Triangle

Soil texture: relative proportions by weight of the various inorganic primary particles in a soil as described by the classes of soil texture.

Soil treatment area: physical location where final treatment and dispersal of effluent occurs; includes drainfields, drip fields and spray fields.

Solids, dissolved: that portion of total solids that passes through a filter of 2.0 µm (or smaller) nominal pore sized under specified conditions.

Solids, fixed: residue of total, suspended, or dissolved solids (mineral fraction) after heating to dryness for a specified time at a specified temperature.

Solids, settleable: suspended solids that will settle out of suspension within a specified period of time, expressed in milliliters per liter (mL/L).

Solids, suspended: that portion of total solids that is retained on a filter of 2.0 µm

(or smaller) nominal pore sized under specified conditions.

Solids, total (TS): material residue left in a vessel after evaporation of a sample subsequent to drying to a constant weight in an oven at 217 to 221 degrees F (103 to 105 degrees C); includes total suspended solids (TSS) and total dissolved solids (TDS); typically expressed in mg/L.

Solids, total dissolved (TDS): material that passes through a filter of 2.0 µm (or smaller) nominal pore size, evaporated to dryness in a weighed dish and subsequently dried to constant weight at 180 degrees C; typically expressed in mg/L.

Solids, total suspended (TSS): measure of all suspended solids in a liquid, typically expressed in mg/L; to measure, a well-mixed sample is filtered through a standard glass fiber filter and the residue retained on the filter is dried to a constant weight at 217 to 221 degrees F (103 to 105 degrees C); the increase in the weight of the filter represents the amount of total suspended solids.

Solids, volatile: weight loss on ignition of total solids, not distinguishing between inorganic and organic matter, and including loss due to decomposition or volatilization of some mineral salts at 1,022 degrees F (550 degrees C).

Solenoid: electro-magnetically operated mechanical device (electric coil); *see also valve, solenoid*

Sorption: the removal of an ion or molecule from solution by adsorption and/or absorption; term often used when the exact nature of the mechanism of removal is not known.

Source: location at which wastewater is generated.

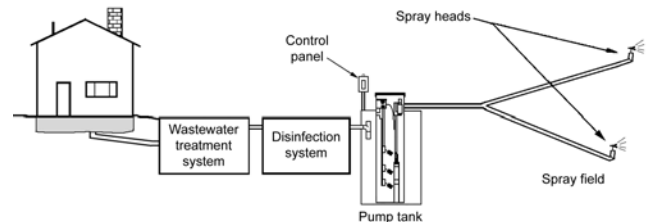
Spalling: condition in which the surface of a concrete component is physically degraded (flaking), exposing aggregate and/or structural reinforcement materials.

Spodic horizon: diagnostic subsurface horizon characterized by the illuvial accumulation of amorphous materials composed of aluminum and organic carbon with or without iron.

Spoil: soil removed from its original location, typically stacked in a pile and may be reused.

Spray field: above-grade soil treatment area where final treatment and dispersal occurs via application of effluent to the infiltrative surface via pressurized distribution heads utilizing nozzles.

Spray dispersal: application of effluent over a soil treatment area via spray heads and associated devices and parts (including pump, filters, controls, and piping).



Spray dispersal soil treatment area and typical associated components

Spring: groundwater seeping out of the earth where the water table intersects the ground surface.

Spring line: horizontal axis defined by the greatest width dimension of a pipe, conduit, tank, or other structure; *see diagram at bedding*.

Squirt height: height achieved by the liquid in a pressurized lateral when an orifice is positioned such that the

discharge is vertical into the atmosphere, typically expressed in feet of height.

Stable rock: natural solid mineral material that can be excavated with vertical sides and will remain intact while exposed; unstable rock is considered to be stable when the rock material on the side or sides of the excavation is secured against caving-in or movement by rock bolts or by another protective system that has been designed by a registered professional engineer.

Stake: stout stick or post sharpened at one end and driven into the earth as a support or boundary marker.

Stake, grade: stake indicating the amount of cut or fill required to bring the ground to a specified level.

Stake, guard: stake, strip, or lath placed beside a hub stake to identify it.

Stake, hub: short stake placed at a station and driven almost flush with the ground; hub stakes are used to obtain station elevations in drainage and other kinds of elevation work; also called a hub.

Stake, slope: in earthwork, a stake marking the line where a cut or fill meets the original grade.

Standard Methods: shortened title for the *Standard Methods for the Examination of Water and Waste Water*, a joint publication of the American Public Health Association, American Water Works Association, and Water Pollution Control Federation; widely-used manual that outlines the procedures used to analyze water and wastewater impurities and characteristics.

Startup: setting of operational controls, verification of component function, documentation of initial operating conditions of a system, and establishment

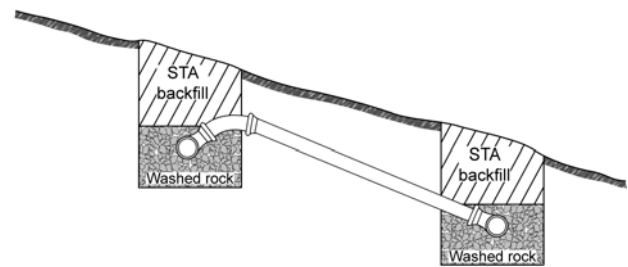
of microbial populations for biological treatment.

Static head: *see head, static.*

Static plow: *see plow, static.*

Station (Sta): point where a rod reading is taken; points along the line of a survey; stations are usually marked with a peg or wood stake, or in grade settling, marked with a grade stake.

Stepdown: device used to connect a trench at a certain elevation to the next trench at a lower elevation; can be used as a relief line in sequential or serial distribution; *see also cross-over pipe and relief device.*



Stepdown (section view)

Stormwater: runoff resulting from precipitation.

Straight pipe: conduit used to convey wastewater either directly from the source or following septic tank pretreatment to the land surface or a water body; term that often indicates an illegal discharge without treatment.

Structural ramp: ramp built of steel or wood, usually used for vehicle access; ramps made of soil or rock are not considered structural ramps.

Structureless: group of soil structures recognized in the *Field Book for Describing and Sampling Soils* (Schoenberger, et al, 2002); includes three subcategories that

essentially have no structural units: single grain (entirely non-coherent; e.g. loose sand), massive (material is a coherent mass {not necessarily cemented}, no secondary pores), and massive - rock controlled fabric (coherent mass with the original rock fabric still identifiable).

Subsurface drain: underground conduit used to collect and convey surface or groundwater.

Submerged soil: soil which is underwater or is freely seeping.

Submersible pump: *see pump, submersible.*

Subsurface wastewater infiltration system (SWIS): *see soil treatment area.*

Sub-main line: *see line, sub-main.*

Sump tank: *see tank, sump.*

Supply line: *see line, supply.*

Support system: structure such as underpinning, bracing, or shoring, which provides support to an adjacent structure, underground installation, or the sides of an excavation.

Surface runoff: *see runoff.*

Surface water: any body of water, whether fresh or marine, flowing or contained in natural or artificial, lined or unlined depressions for significant periods of the year; includes natural and artificial lakes, ponds, springs, rivers, streams, wetlands, and tidal waters.

Surface diversion: natural or constructed drainage feature used to divert runoff and/or collect runoff and direct it to an effective outlet; *see also swale and berm.*

Surge flow: *see flow, surge.*

Surge tank: *see tank, flow equalization.*

Survey, construction: survey used to locate structures and provide required elevation points during their construction.

Survey, land: plane survey made for locating property lines, subdividing land into smaller parts, and determining land areas and other information involving the transfer of land from one owner to another; also known as a property survey, boundary survey, or cadastral survey.

Survey, topographic: a survey made for locating objects and measuring the relief, roughness, or three-dimensional variations of the earth's surface; detailed information is obtained pertaining to elevations as well as to the locations of man-made and natural features (buildings, roads, streams, etc); *also known as a topographic map.*

Surveying: determining the dimensions and contour (or three-dimensional characteristics) of the earth's surface by the measurement of distances, directions and elevations.

Suspended-growth process: configuration wherein the microorganisms responsible for treatment are maintained in suspension within a liquid; *see also attached-growth process.*

Suspended solids: *see solids, suspended.*

Swale: natural or constructed elongated, sloped depressional drainage feature used to collect runoff and direct the flow to an effective outlet to prevent runoff downslope; often used in conjunction with a berm; *see also berm.*

Swing ties: distance from two fixed points to locate a system component.

System: assembly of components and processes; *see also* **treatment train**.

System curve: graphical method that describes the relationship between total dynamic head and flow in a system under operating conditions.

T

TC: *see* **coliform, total**.

TDH: *see* **head, total dynamic**.

TDS: *see* **solids, total dissolved**.

TOC: *see* **total organic carbon**.

TOrCs: *see* **trace organic contaminants**.

TS: *see* **solids, total**.

TSS: *see* **solids, total suspended**.

Tabulated data: information displayed in tables and charts, approved by a registered professional engineer, and used to design and construct a protective system.

Take-off: activities related to preparing to bid a system installation including reading blueprints and specifications; making notes of special details concerning the project after gathering the necessary information; and estimating the quantities of labor, materials, equipment and special items needed to complete the job.

Tank: watertight structure or container used to hold wastewater for such purposes as aeration, equalization, holding, sedimentation, treatment, mixing, dilution, or addition of chemicals, or disinfection

Tank, cargo: enclosed space (tank) mounted on a truck, trailer, or skid which is intended to receive and contain material for transport from the source facility to the receiving facility.

Tank, dosing: tank or compartment which provides storage of effluent and contains a device (pump or siphon) and associated appurtenances used to convey effluent to another pretreatment process or a final treatment and dispersal component; *see also* **tank, pump and tank, siphon**.

Tank, flow equalization: dosing tank that provides storage of effluent and uses timed dosing to allow for uniform delivery to a subsequent component over time, usually a day or more; *also known as a* surge tank.

Tank, grease: *see* **grease trap**.

Tank, holding: 1. watertight receptacle for the collection and holding of wastewater; 2. sewage tank in arecreational vehicle, motor coach, trailer, camper, or boat, whether mobile or stationary; *see also* **holding tank sewage system**.

Tank, processing: term applied to a septic tank when it is configured to receive a combination of raw sewage and recirculated effluent in order to enhance nitrogen removal.

Tank, pump: dosing tank which provides storage of effluent and houses a pump and associated appurtenances used to convey effluent to another pretreatment process or a final treatment and dispersal component. *See also* **tank, siphon**.

Tank, recirculation: dosing tank that mixes effluent from two or more components within the treatment train and allows a portion of partially treated

effluent to pass through one or more treatment components again.

Tank, septic: water-tight, covered receptacle for treatment of sewage; receives the discharge of sewage from a building, separates settleable and floating solids from the liquid, digests organic matter by anaerobic bacterial action, stores digested solids through a period of detention, allows clarified liquids to discharge for additional treatment and final dispersal, and attenuates flows.

Tank, siphon: dosing tank or compartment which provides storage of effluent, and contains a siphon to convey effluent from the tank to another pretreatment process or to a final treatment and dispersal component; *see also tank, pump.*

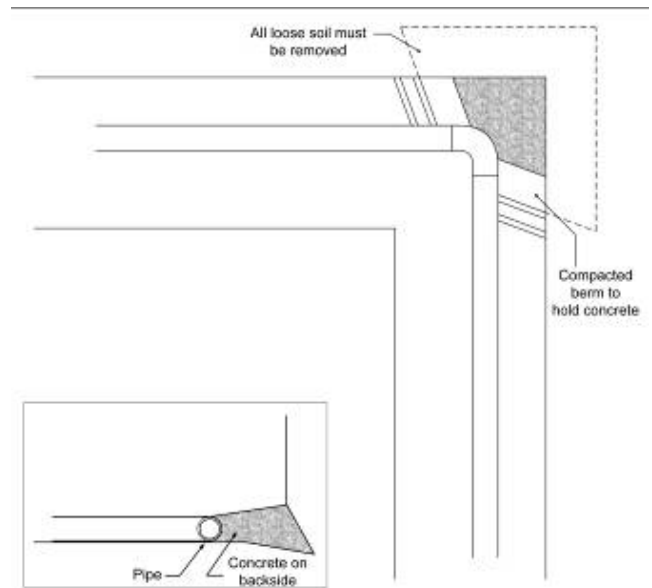
Tank, sump: tank or pit that receives drainage of groundwater or runoff, stores it temporarily, and from which the discharge is pumped.

Tank, surge: *see tank, flow equalization.*

Tank capacity: 1. regarding a septic tank, volume in gallons as measured from the bottom of the tank to the invert of the outlet pipe; 2. regarding a dosing tank, volume as measured from the bottom of the tank to the invert of the inlet.

Tertiary treatment: *see treatment, tertiary.*

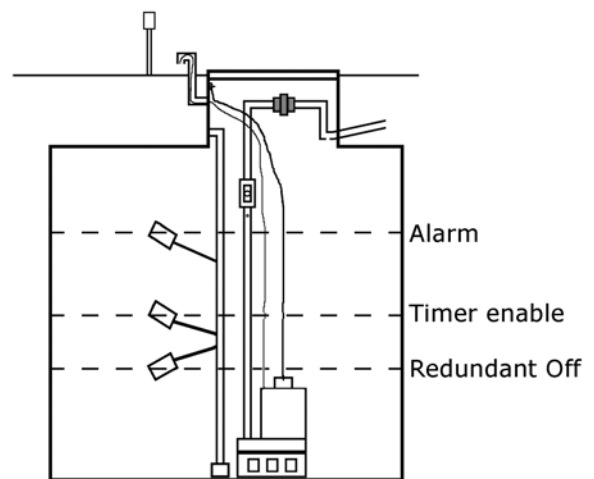
Thrust block: rough pore of concrete installed on the outside of an angled fitting (tee, cross, elbow or valve) that extends back to the native soil to provide a greater bearing surface and prevent loosening of joints due to stress created in pressurized applications.



Thrust block for supporting piping subjected to force that may loosen fittings

Timer: controller for automatically starting and/or stopping a device at a given interval.

Timer enable: operating parameter that allows pump operation via a specified schedule; *see also peak enable and redundant off.*



Timed dosing configuration using a timer enable sensor

Timer override: *see override.*

Toilet: fixture used for defecation and urination.

Toilet, chemical: waterless toilet with a tank that contains a chemical to limit decomposition of non-water-carried human waste during storage prior to offsite treatment.

Toilet, composting: self-contained waterless toilet designed to decompose non-water-carried human wastes through microbial action on a carbon source and store the resulting matter for further treatment and reuse/disposal.

Toilet, flush: toilet consisting of a bowl (for receiving human waste) and a water-flushing device.

Toilet, pit: self-contained waterless toilet used for disposal of non water-carried human waste; consists of a shelter built above a pit in the ground into which human waste falls.

Toilet, portable: *see* **toilet, chemical**.

Toilet, vault: waterless toilet mounted on a vented holding tank designed to store non-water-carried human waste prior to offsite treatment.

Toilet, waterless: toilet specifically designed to receive non-water-carried human waste; includes chemical, composting, pit, and vault toilets.

Topography: physical features of the land surface including relative elevations and geometry.

Topographic plan: *see* **survey, topographic**.

Topographic map: plotted form of information gained through a topographic survey.

Total coliform (TC): *see* **coliform, total**.

Total coliform bacteria: *see* **coliform bacteria, total**.

Total dynamic head (TDH): *see* **head, total dynamic**.

Total organic carbon (TOC): measure of the concentration of organic carbon determined by oxidation of the organic matter into carbon dioxide (CO₂) typically expressed in mg/L.

Total nitrogen: *see* **nitrogen, total**.

Toxic event: sudden introduction of a substance or substances that impair or destroy biological activity within a wastewater treatment process.

Trace organic contaminants (TOrcs): organic compounds originating from residential and non-residential sources, such as ingredients in drugs, pesticides, consumer products, and industrial process agents (usually present in concentrations much lower than one mg/L) which may have adverse ecological and/or human health effects; *see also* **pharmaceutical and personal care products**

Transpiration: process by which plants release water vapor to the air.

Trash tank: *see* **trash trap**.

Trash trap: optional first component of a wastewater treatment system, often used with a proprietary aerobic treatment unit (ATU), typically having a limited detention time, and used to remove larger items or inorganic material in the wastewater stream; trash traps also may provide a certain level of anaerobic treatment.

Treatment: method, technique, or process designed to remove solids and/or pollutants from wastewater.

Treatment, aerobic: digestion of organic matter in an environment containing molecular (or dissolved) oxygen (O₂).

Treatment, advanced secondary: level of treatment that achieves 95% reduction in BOD and TSS, generally to levels below 10 mg/L.

Treatment, anaerobic: digestion of organic matter in an environment without molecular (or dissolved) oxygen (O₂).

Treatment, biological: process involving the metabolic activities of bacteria and other microorganisms in the breakdown of complex organic materials into simpler, more stable substances.

Treatment, chemical: process involving the addition of chemicals to obtain a desired result, such as precipitation, coagulation, flocculation, pH adjustment, disinfection, or sludge conditioning.

Treatment, physical: treatment which involves only physical means of solid-liquid separation, such as filtration, flotation, and sedimentation; chemical and biological reactions do not play an important role in physical treatment.

Treatment, primary: physical treatment processes involving removal of particles, typically by settling and flotation with or without the use of coagulants; (e.g. a grease interceptor or a septic tank provides primary treatment); *see also* **treatment, physical**.

Treatment, secondary: biological and chemical treatment processes designed to remove organic matter; a typical standard for secondary effluent is BOD and TSS less than or equal to 20 mg/L each on a 30-day average basis.

Treatment, tertiary: advanced treatment of wastewater for enhanced

organic matter removal, pathogen reduction, and nutrient removal; typical standards for tertiary effluent vary according to regulatory requirements.

Treatment train: site-specific combination of components that make up a wastewater treatment system; a simple example of a treatment train is a septic tank and a soil treatment area.

Trench: **1.** excavation with a width of 3 feet or less containing distribution media and one lateral; **2.** below-grade soil treatment area consisting of one or more trenches installed in an excavation such that the bottom of the infiltrative surface is typically 18 to 36 inches below original ground elevation; utilizes pressure or gravity distribution; a final cover of suitable soil stabilizes the completed installation, supports vegetative growth, and sheds runoff; **3.** excavation in the soil for drainage diversion; **4.** excavation for placement of pipe or installation of electrical wire or conduit; *see also* **trench excavation**.

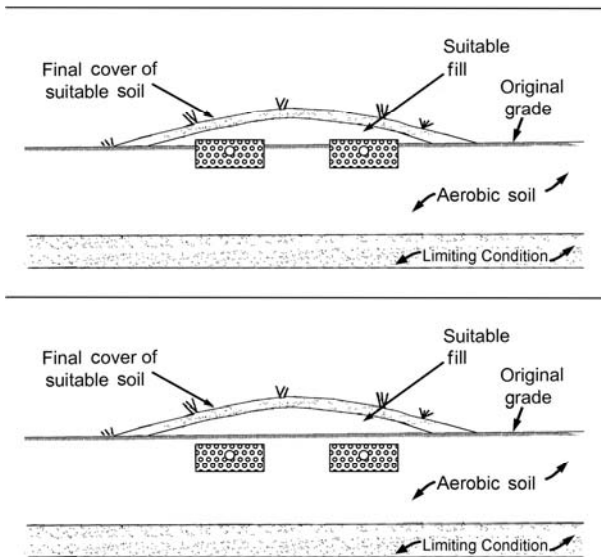
Trench (Trench excavation): narrow excavation (in relation to its length) made below the surface of the ground; in general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet (4.6 m). If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet (4.6 m) or less (measured at the bottom of the excavation), the excavation is also considered to be a trench.

Trench shield: *see* **shield, trench**.

Trench, deep: trench installed in an excavation greater than 36 inches deep.

Trench, shallow: trench installed in an excavation typically greater than 6 but

less than 18 inches deep such that most of the entire infiltrative surface is below the original ground elevation; the orifices in the distribution pipe are at or below original ground elevation.



Soil treatment areas with **shallow trenches** (section views) excavated to greater than 6 but less than 18 inches deep

Trench, vertical: trench installed with 4 or more feet of distribution media below the lateral.

Trench box: *see shield.*

Trench shield: *see shield.*

Trencher: machine that uses a chain with attached cutters to open a trench by cutting, removing, and depositing spoil to the side of the trench or onto a discharge conveyor.

Trickling filter: *see filter, trickling.*

Troubleshooting: act of identifying causes of system malfunction.

Turbidity: relative clarity of effluent as a result of the presence of varying amounts of suspended organic and inorganic materials or color.

Turbine pump: *see pump, multi-stage.*

Turning point (TP): temporary point on which rod readings are taken to move the leveling instrument along a survey path; a Foresight (FS or +) is taken on the turning point to obtain its elevation (initially, elevation of turning point is unknown); the instrument is then moved from its position and set up at a new position beyond the turning point; a backsight (BS or +) is then taken on the turning point to determine the height of the instrument (HI); the turning point must be a firm object, such as a stone, stake, pipe, fence post, or axe head so that the elevation will not change while the instrument is being moved; if the turning point is altered while the instrument is being moved, the survey must go back to the last permanent point of known elevation (i.e., a bench mark).

Turn-up: 90- or 45-degree change in pipe orientation from horizontal to diagonal and/or vertical at the end of a pressure distribution line; effectively brings the pipe to or above grade, facilitating periodic flushing of the lateral and enabling certain operational activities.

Type A: OSHA soil classification that includes cohesive soils with an unconfined compressive strength of 1.5 ton per square foot (tsf) (144 kPa) or greater; examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam; cemented soils such as caliche and hardpan are also considered Type A; however, no soil is Type A if: (i) the soil is fissured; or (ii) the soil is subject to vibration from heavy traffic, pile driving, or similar effects; or (iii) the soil has been previously disturbed; or (iv) the soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater; or (v) the material is

subject to other factors that would require it to be classified as a less stable material.

Type B: OSHA soil classification that includes cohesive soil with (i) an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa); or (ii) granular cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam. (iii) previously disturbed soils except those which would otherwise be classed as Type C soil. (iv) soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; or (v) dry rock that is not stable; or (vi) material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

Type C: OSHA soil classification that includes cohesive soil with (i) an unconfined compressive strength of 0.5 tsf (48 kPa) or less; or (ii) granular soils including gravel, sand, and loamy sand; or (iii) submerged soil or soil from which water is freely seeping; or (iv) Submerged rock that is not stable, or (v) material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4H:1V) or steeper.

Type III MSD: a US Coast Guard approved Marine Sanitation Device that is designed to simply hold waste material for pump-out into a shore-based facility, *also known as* a holding tank which performs no treatment; *see also* **tank, holding**.

U

UBOD: *see* **biochemical oxygen demand, ultimate**.

Ultrasonic sensor: device that measures depth to liquid level by transmitting and receiving sound waves.

Ultraviolet: light waves beyond the visible spectrum; used for disinfection of water and wastewater; *see also* **disinfection; and disinfection, ultraviolet**.

Ultraviolet (UV) light disinfection: *see* **disinfection, ultraviolet (UV)**.

UV disinfection: *see* **disinfection, ultraviolet (UV)**.

Unacceptable: condition in which a component is not operating as intended, indicating the need for implementing maintenance, upgrades, repairs, or further investigation; an unacceptable condition may or may not be a failure from a regulatory perspective; *see also* **malfunction**.

Unconfined compressive strength: load per unit area at which a soil will fail in compression; determined by laboratory testing, field estimation using a pocket penetrometer, thumb penetration tests, and other methods.

Underdrain: perforated pipe located below the media of a media filter; designed to collect treated effluent.

Uniform distribution: concept of distributing effluent evenly over the surface of a component over both time and space.

Uniformity coefficient: description or specification of particle size distribution calculated by dividing the diameter of particle (millimeters) of which 60% by weight is smaller, by the diameter of particle (millimeters) of which 10% by weight is smaller; expressed mathematically as D_{60}/D_{10} ; *see also* **particle size distribution**.

Unit operations, physical: treatment methods in which the application of physical forces predominate as a means for removal of wastewater constituents; includes flocculation, sedimentation, flotation, filtration, screening, mixing and gas transfer.

Unit processes, biological: treatment methods in which the removal or conversion of constituents is brought about by biological activity; primarily used to remove the biodegradable organic constituents through conversion to cell tissue or gases; also used to remove nutrients (nitrogen and phosphorous).

Unit processes, chemical: treatment methods in which the removal or conversion of constituents is brought about through the the addition of chemicals or by other chemical reactions; includes precipitation, adsorption and disinfection.

Unsaturated flow: movement of water in a porous soil or media that is not filled to capacity with water; the water flow is along the surface of the particles, allowing air and gases to move through the interior of the larger pore space.

Unsaturated soil: soil in which the pore spaces contain water at less than atmospheric pressure; typically, smaller pore spaces contain water because of tension and larger pore spaces contain air and other gases.

Upflow filter: *see filter, upflow.*

Upgrade: action of creating a better system by adding a device or component (or replacing a given device or component with one of higher quality) to increase the system's effectiveness.

Uprights: vertical members of a trench shoring system placed in contact with the earth and usually positioned so that

individual members do not contact each other. Uprights placed so that individual members are closely spaced, in contact with or interconnected to each other, are often called "sheeting."

Urine: aqueous fluid containing urea and other materials generally exiting via the human urogenital pathway.

Urine-separating device: toilet fixture designed to separate urine from other waste materials.

V

VOC: *see volatile organic compound.*

Vacuum breaker: device used to facilitate air entry during depressurization; also called an air/vacuum release valve; *see also valve, air/vacuum release.*

Vacuum inches: measurement of the suction produced in a vacuum system relative to ambient atmospheric pressure.

Vacuum truck: motorized vehicle equipped with a vacuum system consisting of vacuum pump, cargo tank and associated equipment.

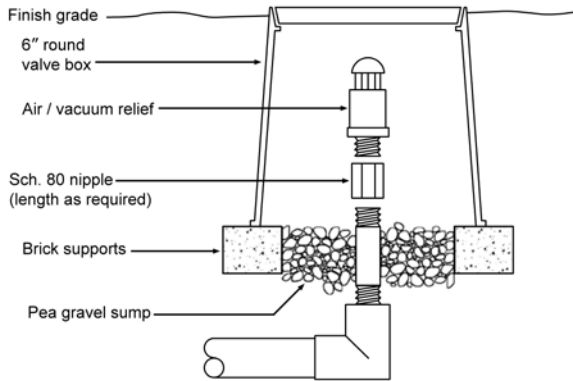
Vadose zone: aerated, unsaturated region of soil above the zone of saturation.

Value: one of the three variables of color, described as the degree of lightness or darkness of the color in relation to a neutral gray scale; on a neutral gray scale, value extends from pure black to pure white; *see also Munsell Color System; hue; and chroma.*

Valve: mechanical device used to close off, regulate, or divert the flow of fluid.

Valve, air/vacuum release: valve that allows air in the lines to be purged during

pressurizing flow, and allows air to enter during depressurized flow.



Typical installation of an air/vacuum release valve

Valve, alternating: valve used to manually or automatically direct flow from one final treatment and dispersal component to another.

Valve, ball: valve with the closing and opening mechanism formed in the shape of a ball with a hole; rotating the ball orients the hole so that it is either parallel to the flow, allowing unrestricted passage of fluid or perpendicular to the flow, shutting it off.

Valve, ball check: non-return valve in which a ball sits within a cylindrical fluid line.

Valve, Bull-run®: see valve, alternating

Valve, buoyancy: see valve, recirculating splitter

Valve, check: valve that allows flow in only one direction by closing when the flow direction reverses.

Valve, diaphragm: valve employing a stem that depresses a diaphragm (membrane) to control flow, typically used in treatment of industrial wastewater.

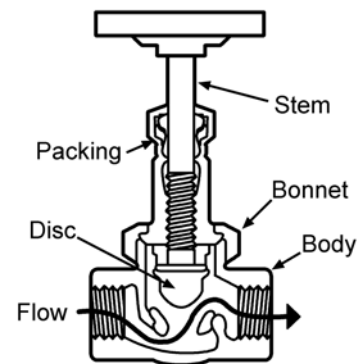
Valve, drain: valve that allows drainage of a distribution system.

Valve, four-way: valve that controls the effective action of the pump associated with a cargo tank; valve either directs the air flow into the cargo tank to create pressure or it directs the flow out of the cargo tank to create a vacuum.

Valve, flush: valve used to control the expelling of effluent and accumulated materials from a distribution system.

Valve, gate: valve employing a gating mechanism to control flow of fluid; gates may be of a plate design located in slots and opened either fully or partially.

Valve, globe: valve consisting of a movable disk-type element and a stationary ring seat in a generally spherical body; often used for throttling.



Globe valve

Valve, isolation: valve that is placed before or after a piece of equipment in case that equipment may need to be removed from service.

Valve, pressure-regulating (PRV): valve designed to maintain a set pressure on the downstream side of the valve regardless of pressure changes on the upstream or source side.

Valve, pressure relief: valve that limits pressure to a preset level by exhausting surplus air or water volume, thereby assuring that the permissible operating pressure is not exceeded.

Valve, recirculating splitter: valve that contains a floating ball that rises when the tank level rises, and prevents more water from entering the tank; when the water level drops, the ball drops and allows water to flow into the tank again.

Valve, sequencing: valve used to automatically direct flow to two or more final treatment and dispersal components, one or more at a time, and in a prescribed order.

Valve, shut off: valve that prevents flow from entering a component.

Valve, solenoid: valve that uses an electro-magnetically operated mechanical device (electric coil) to turn on, shut off, or regulate the flow of effluent.

Valve, splitter ball: *see* **valve, recirculating splitter**.

Valve, spring check: non-return valve in which a spring causes a disc to seat against an opening within a cylindrical fluid line and stops flow.

Valve, swing check: non-return valve in which a hinged flapper seats against an opening within a cylindrical fluid line and stops flow.

Valve, switching: valve used to dose multiple components one at a time.

Valve, vacuum breaker: valve that serves as a type of backflow-prevention device that prevents cross-contamination by reverse flow; *see also* **valve, air/vacuum release**.

Valve, vacuum relief: valve that limits the vacuum level in a vacuum cargo tank (or suction line) to a preset level by allowing air to enter, thereby assuring that the operating vacuum level is not exceeded.

Valve, zone: valve that mechanically and sequentially diverts the flow of fluid to multiple zones within a soil treatment area.

Valve box: housing that encloses an operating component or device and extends to the ground surface, allowing access for component inspection, operation, etc.

Valve throttling: controlling or modulating flow through a system by manually or automatically opening or closing a valve to various degrees; in a pump system, changing the valve to various positions between full open and full closed regulates the amount of flow delivered and the operating pressure or head.

Vent: device that allows the active or passive entrance or exit of gases from a component.

Vertical separation: vertical distance between the infiltrative surface and a limiting condition, such as highest groundwater level, bedrock, etc.

Vertical trench: *see* **trench, vertical**.

Vibratory compactor: *see* **compactor, vibratory**.

Vibratory plow: *see* **plow, vibratory**.

Virus: organism too small to be seen by light microscopy; an obligate parasite dependent on a host cell for its metabolic and reproductive needs.

Volatile: capable of evaporating at relatively low temperatures.

Volatile organic compound (VOC): class of organic compounds that readily evaporates; includes liquids and solids at natural environmental temperature; examples include solvents, adhesives and fuels).

Volume, alarm activation: volume between 'pump on' level and 'alarm on' level in a demand dosing configuration.

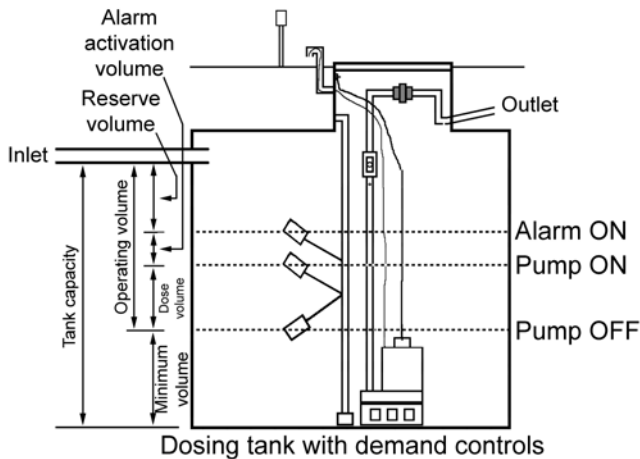


Illustration of alarm activation volume, reserve volume, dose volume, minimum volume and operating volume within a dosing tank configured for demand dosing

Volume, average daily: volume dosed within a 24-hour period using a flow-equalization configuration.

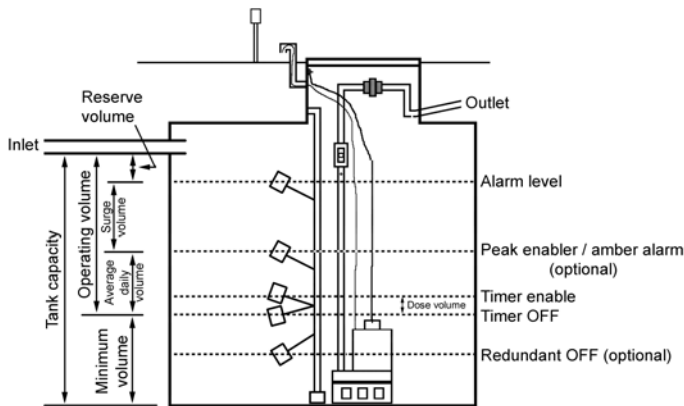


Illustration of average daily volume, surge volume, minimum volume, operating volume and reserve volume within a flow equalization tank

Volume, delivered dose: net amount of effluent applied to a component in a dose or unit time; includes the dose volume minus drainback volume and pipe fill volume; *see also* **volume, dose**; **volume, drainback**; *and* **volume, pipe fill**.

Volume, dose: 1. amount of effluent delivered to the distribution system during a dosing event including the drainback volume, pipe fill volume and the delivered dose volume; 2. amount of effluent delivered as determined by the pump on and pump off levels in a demand dosed system.

Volume, drainback: amount of effluent that flows back into a pump tank after a dosing event.

Volume, operating: amount of effluent contained in a tank under normal operating conditions; for a septic tank, operating volume is determined relative to the invert of the outlet; for a dosing tank, operating volume under normal conditions is determined relative to the invert of the inlet and the control off level; *see also* **operating level**.

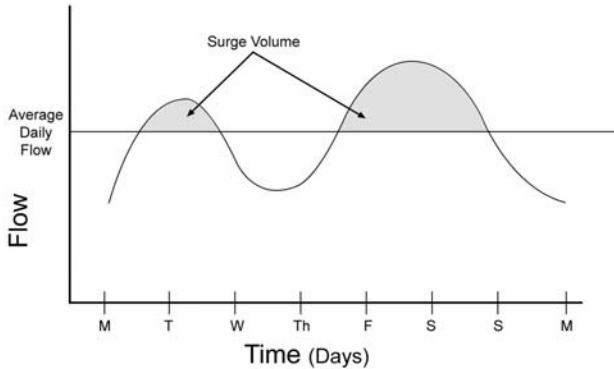
Volume, minimum: smallest amount of effluent in a dosing tank (with either demand or timed dosing) required to maintain pump submergence.

Volume, minimum dose: design parameter that specifies the smallest amount of effluent to be delivered to a component during a dosing event.

Volume, pipe fill: amount of effluent necessary to fill a supply line and distribution system.

Volume, reserve: volume in the head space of a dosing tank between alarm on level and the inside top of the tank; intended for temporary storage of effluent in the event of component malfunction or excessive flow.

Volume, surge: 1. in a flow equalization tank, the volume above the average daily volume and below the reserve volume; 2. volume of effluent in excess of average daily flow.



Graphic illustration of surge volume compared to average daily flow

Volume, tank: total volume of a tank from the inside bottom of the tank to the inside top of the tank; *see also* **tank capacity**.

Volumetric: of or pertaining to measurement by volume.

W

Wales: horizontal members of a shoring system placed parallel to the excavation face whose sides bear against the vertical members of the shoring system or earth.

Wastewater: clear water, stormwater, industrial, sewage (domestic or commercial), or any combination thereof, carried by water.

Wastewater stabilization pond: constructed basin lined with either soil with very low permeability or a synthetic material, surrounded with berms and which contains at least three feet of wastewater which utilizes sunlight, wind or mechanical aeration, and natural bacteria to break down waste via physical, chemical and biological processes to

stabilize wastewater; typically consists of two or more basins with operational controls allowing or facilitating flow through the basins.

Wastewater, clear: *see* **clear water**.

Wastewater, commercial: non-toxic, non-hazardous wastewater from commercial establishments, including but not limited to commercial food preparation operations, that is similar in composition to domestic wastewater, but which may have one or more of its constituents exceed typical domestic ranges.

Wastewater, domestic: water or liquid-carried waste from plumbing fixtures, appliances and devices such as toilets, bath, laundry, and dishwashers; *see also*, **wastewater, residential-strength**.

Wastewater, high-strength: 1. influent having BOD₅ greater than 300 mg/L; and/or TSS greater than 200 mg/L; and/or fats, oils, and grease greater than 50 mg/L entering a pretreatment component (as defined by NSF Standard 40 testing protocol); 2. effluent from a septic tank or other pretreatment component that has BOD₅ greater than 170 mg/L; and/or TSS greater than 60 mg/L; and/or fats, oils, and grease greater than 25 mg/L and is applied to an infiltrative surface.

Wastewater, industrial: water or liquid-carried waste from an industrial process resulting from industry, manufacture, trade, automotive repair, vehicle wash, business or medical, activity; this wastewater may contain toxic or hazardous constituents.

Wastewater, residential strength: effluent from a septic tank or other treatment device with a BOD₅ less than or equal to 170 mg/L; TSS less than or equal to 60 mg/L; and fats, oils, and grease less than or equal to 25 mg/L.

Wastewater, raw: any wastewater leaving a source; *see also* **sewage**.

Wastewater reclamation: treatment or processing of wastewater to produce water of a quality appropriate for another use, including recycling or reuse; *see also* **wastewater recycling and wastewater reuse**.

Wastewater recycling: reclamation process of collection and treatment of wastewater on-site for return and use back into the same site; for example, collection and reclamation of graywater from an establishment for subsequent toilet flushing in that same establishment; *see also* **wastewater reuse**.

Wastewater reuse: reclamation process of collection and treatment of wastewater for the deliberate application of that treated wastewater for a beneficial purpose such as turf irrigation; *see also* **wastewater recycling**.

Wastewater treatment system: assembly of components for collection, treatment and dispersal of sewage or effluent.

Wastewater treatment system, cluster: wastewater treatment systems designed to serve two or more sewage-generating dwellings or facilities with multiple ownership; typically includes a comprehensive, sequential land-use planning component and private ownership.

Wastewater treatment system, collector: wastewater treatment system that conveys sewage or effluent from multiple sources to a location where treatment and dispersal occurs; *see also* **wastewater treatment system, cluster**.

Wastewater treatment system, community: publicly owned wastewater

treatment system for collection, treatment and dispersal of wastewater from two or more lots, or two or more equivalent dwelling units.

Wastewater treatment system, decentralized: wastewater treatment system for collection, treatment, and dispersal/reuse of wastewater from individual homes, clusters of homes, isolated communities, industries, or institutional facilities, at or near the point of waste generation.

Wastewater treatment system, individual: wastewater treatment system designed to serve one sewage-generating dwelling or facility.

Wastewater treatment system, onsite (OWTS): wastewater treatment system relying on natural processes and/or mechanical components to collect and treat sewage from one or more dwellings, buildings, or structures and disperse the resulting effluent on property owned by the individual or entity.

Wasting: process of removing biomass from activated sludge in the pretreatment process.

Water conservation: management of water resources so as to eliminate waste or maximize efficiency utilizing such methods as using the same water again before it becomes wastewater, installing water-efficient plumbing, or wastewater recycling and reuse.

Water packing: method of settling backfill using water.

Water-quality-based performance standard: *see* **performance standard, water-quality based**.

Water softening: reduction in the number of and/or removal of polyvalent

cations which are the principal cause of hardness in water.

Water table: upper surface of groundwater or that level in the ground where the water is at atmospheric pressure.

Water treatment discharge: by-product from a water treatment device, such as regeneration water from an ion-exchange unit, reject water from a reverse-osmosis unit, or the backwash from an iron filter.

Watershed: drainage basin area contained within the bounds specified by a divide and above a specified point such as a lake, wetland, or stream.

Watertight: condition ascribed to a device that is constructed so that no water can move into or out of it except by design through inlets and outlets.

Weep hole: 1. drain hole to allow moisture or air to escape, such as a weep hole in a concrete tank that allows water to drain out of tanks while they are in storage; 2. drain hole in the discharge assembly that allows drainback to the tank after a dosing event.

Weir: device designed to measure or control flow; consists of a wall or obstruction of known geometric shape placed perpendicular to the direction of flow.

Well: a hole bored or drilled into the ground.

Well, monitoring: well constructed for the purpose of determining groundwater level or constituents.

Well, water: well constructed for the purpose of extracting potable water.

Well-sorted: material of uniform size with maximum void space; *also known as* poorly-graded.

Well-graded: material of variable size with minimum pore space; *also known as* poorly-sorted.

Wet soil: soil that contains significantly more moisture than moist soil, but in such a range of values that cohesive material will slump or begin to flow when vibrated; granular material that would exhibit cohesive properties when moist will lose those cohesive properties when wet.

Wetlands: areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions; wetlands generally include swamps, marshes, bogs, and similar areas; constructed wetlands used in wastewater treatment are purposely excluded.

X

Y

Yellow water: isolated waste stream consisting of urine collected from specific fixtures and not contaminated by feces or diluted by graywater sources; *see also* **urine separating device**.

Z

Zone: portion of a component that is separately managed as a single unit.

Zone of aeration: *see* **vadose zone**.

Zone of dispersal: layers of soil or rock material surrounding the zone of treatment through which the effluent

moves away from the final treatment and dispersal component.

Zone of saturation: layer in the ground in which interstitial voids (cracks, crevices, holes, etc.) are filled with water; the level at the top of this zone is the water table.

Zone of treatment: soil or fill material which removes pollutants from pretreated effluent by processes which include physical filtration of bacteria and other constituents, adsorption of viruses and bacteria by clay and organic matter, biological destruction of pathogens by soil microorganisms, sorption or precipitation of phosphorus, biochemical transformations of nitrogen compounds, and biological assimilation of phosphorus and nitrogen; *also known as* **biozone**.

REFERENCES

- Arizona Department of Environmental Quality. Aquifer Protection Permits. R18-9-101. January 1, 2001. ADEQ. Phoenix, AZ.
- Banathy, Tibor, ed. 2002. On-site Wastewater Glossary (unpublished).
- Brady, Nyle C. 1974. The Nature and Property of Soils, 8th Edition. Macmillan Publishing Co., Inc. New York.
- Brady, N. C. and R.R. Weil. 2002. The Nature and Property of Soils, 13th Edition. Prentice Hall, Upper Saddle River, NJ.
- Burks, B.D. and M.M. Minnis. 1994. Onsite Wastewater Treatment Systems. Hogarth House, Ltd. Madison, WI.
- CIDWT. 2006. *Residential Onsite Wastewater Treatment Systems: An Operation and Maintenance Service Provider Program*. Developed by Consortium of Institutes for Decentralized Wastewater Treatment (CIDWT). Midwest Plan Service. Iowa State University. Ames, IA. January 2006.
- CIDWT Decentralized Wastewater Treatment Glossary (Online) available at: http://www.onsiteconsortium.org/files/Glossary_Phase_II_for_Review.pdf (verified December 7, 2007).
- Contractor Glossary of Terms. <http://contractorsglossary.com/> (verified December 6, 2007.)
- Crites, R. and G. Tchobanoglous. 1998. Small and Decentralized Wastewater Management Systems. McGraw-Hill. Boston, MA.
- Deere and Co., 1971. Factors in Earthmoving. Deere & Co. Industrial Marketing Division, Moline, Illinois.
- Dictionary.com. *The American Heritage® Dictionary of the English Language, Fourth Edition*. Houghton Mifflin Company, 2004. <http://dictionary.reference.com/browse/BUOYANCY> (accessed: December 06, 2007).
- Dictionary.com. *WordNet® 3.0*. Princeton University. [http://dictionary.reference.com/browse/pit run](http://dictionary.reference.com/browse/pit%20run) (accessed: September 10, 2007).
- Eaton, Andrew D., Lenore S. Clesceria, Arnold E. Greenberg. 2005. Standard Methods for the Examination of Water and Wastewater. American Public Health Association. Port City Press, Inc. Baltimore, MD.
- Eaton, Andrew D., Lenore S. Clesceria, Arnold E. Greenberg. 1995. Standard Methods for the Examination of Water and Wastewater. American Public Health Association. United Book Press, Inc. Baltimore, MD.
- Gross, M.A. and N.E. Deal, eds. 2005. *University Curriculum Development for Decentralized Wastewater Management*. National Decentralized Water Resources Capacity Development Project. University of Arkansas, Fayetteville, AR.
- Gross, M.A., N.E. Deal, J. R. Buchanan, A. Kenimer, B.J. Lesikar, T.L. Loudon, S. Oakley, R.W. Seabloom, P. Trotta, and S.D. Wallace. 2005. *University Curriculum Development for Decentralized Wastewater Management*. Project No. WU-HT-01-06. Prepared for the National Decentralized Water Resources Capacity Development Project, Washington University, St. Louis, MO, by the University of Arkansas, Fayetteville, AR.
- Happe, D. A., 2006. Soil and Water Conservation Society Environmental Management Glossary, Fourth Edition. Ankeny, IA.
- Harrison, Robert B. (ed.) 1997. University of Washington Soils Glossary (Online). available at <http://soilslab.cfr.washington.edu/s-7/soilglossary.html>. (verified July 2007).
- Harrison, J.F. and W McGowan (eds.) 2000. Water Quality Association Glossary of Terms, Fourth Edition. WQA. Lisle, IL.

- Hicks, S. D., (ed.) 1999. Tide and Current Glossary. National Ocean Service. <http://co-ops.nos.noaa.gov/publications/glossary2.pdf> (accessed September 11, 2007).
- Hoover, M.T., T.A. Disy, M. A. Pfeiffer, N. Dudley, R. B. Mayer, and B. Buffington. 1996. North Carolina Subsurface Wastewater System Operator's Training School Manual. Soil Science Department, College of Agriculture and Life Sciences, North Carolina State University, Raleigh, NC and North Carolina Department of Environment, Health, and Natural Resources, Raleigh, NC.
- Kahn, L., B. Allen, and J Jones. 2000. The Septic System Owner's Manual. Shelter Publications. Bolinas, CA.
- Lesikar, B. J., Deal, N. E., Gustafson, D.G., Lindbo, D.L., Loomis, G., Kalen, D., and O'Neill, C. 2005. Decentralized Wastewater Treatment O&M Service Provider Training Program. Consortium of Institutes for Decentralized Wastewater Treatment, Project Report WPA No. X-83085101-0.
- Lindbo, D.L. and N.E. Deal, eds. 2005. Model Decentralized Wastewater Practitioner Curriculum. National Decentralized Water Resources Capacity Development Project. Communications Services, North Carolina State University, Raleigh, NC.
- Lindbo, D. L., N. Deal, J. Anderson, D. Gustafson, W. Hart, M. T. Hoover, D. Lenning, T. Loudon, and J. Mooers. 2005. Model Decentralized Wastewater Practitioner Curriculum. Project No. WU-HT-01-05. Prepared for the National Decentralized Water Resources Capacity Development Project, Washington University, St. Louis, MO, by North Carolina State University, Raleigh, NC.
- Martin, E., E. Holmes and M. Ruse (eds.) 1996. Oxford Dictionary of Biology, 3rd Edition. Oxford University Press. Oxford, NY.
- McCormac, J.C. 1983. Surveying Fundamentals. Prentice-Hall, Inc. Englewood Cliffs, New Jersey 07632 ISBN 0-13-878843-X
- McGraw-Hill Dictionary of Architecture and Construction, McGraw-Hill Companies, Inc., 2003. <http://www.answers.com/topic/haunch>, accessed November 20, 2007.
- Neufeldt, Victoria, Ed. Webster's New World Dictionary, Third College Edition. 1988. Simon & Schuster, Inc. New York, NY.
- Schoenberger, P.J., D.A. Wysocki, E.C. Benham, and W.D Broderson (eds.) 2002. Field Book for Describing and Sampling Soils, Version 2.0. Natural Resources Conservation Service, National Soil Survey Center, Lincoln, NE
- Senese, Fred. 2001. General Chemistry Glossary (Online). available at: <http://antoine.frostburg.edu/chem/senese/101/environmental/glossary.shtml>. (verified July 2007).
- Soil Science Society of America (SSSA) Internet Glossary of Soil Science Terms. 2007. (Online). available at: <http://www.soils.org/ssagloss/> (verified July 2007).
- Symons, James M. Lee C. Bradley, Jr. and Theodore C. Cleveland. 2000. Drinking Water Dictionary. American Water Works Association. Denver, CO.
- Trotta, P., J. Ramsey, and S. Hoban. 2000. The Basics and Fundamentals of Onsite Wastewater Treatment course. Northern Arizona University. Flagstaff, AZ.
- U.S. Department of Labor. Occupational Safety and Health Administration. 29 CFR Standard Number 1926.650. Safety and Health Regulations for Construction: Scope, application, and definitions applicable to this subpart. Available at: <http://www.osha.gov/>. (verified December 6, 2007).
- U.S. Environmental Protection Agency. 2000. Draft EPA Guidelines for Management of Onsite/Decentralized Wastewater Systems. USEPA. available at: http://www.epa.gov/owm/septic/pubs/septic_management_handbook.pdf (verified July 2007).
- Water Environment Federation. Glossary of Wastewater Terms (Online). 2007. available at:

<http://www.wef.org/ScienceTechnologyResources/TechnicalInformation/GlossaryofWastewaterTerms/> (Verified July 2007).

Appendix A: Descriptions of Soil Treatment Areas

Above-grade	Energy	Config.	Structure	Distribution	Verbal description
<ul style="list-style-type: none"> • Mound • Mound, modified 	<ul style="list-style-type: none"> • Pressure 	<ul style="list-style-type: none"> • Parallel 	<ul style="list-style-type: none"> • Trench • Bed • Drip tubing 	<ul style="list-style-type: none"> • Low-pressure • Drip 	<ul style="list-style-type: none"> • Low pressure distribution mound (or modified mound) with trenches • Low pressure distribution mound (or modified mound) with a bed • Drip distribution mound
<ul style="list-style-type: none"> • Areal Fill • At-grade 	<ul style="list-style-type: none"> • Gravity • Pressure 	<ul style="list-style-type: none"> • Parallel • Serial • Sequential 	<ul style="list-style-type: none"> • Trench • Bed • Drip tubing 	<ul style="list-style-type: none"> • Gravity • Pressure-dosed gravity • Low pressure • Drip 	<ul style="list-style-type: none"> • Areal fill (or at-grade) trenches with gravity parallel, serial or sequential distribution • Areal fill (or at-grade) trenches with pressure-dosed gravity parallel, serial or sequential distribution • Areal fill (or at-grade) trenches with low pressure distribution • Areal fill (or at-grade) bed with gravity parallel distribution • Areal fill (or at-grade) bed with pressure-dosed gravity parallel distribution • Areal fill (or at-grade) bed with low pressure distribution • Areal fill (or at-grade) drip distribution
<ul style="list-style-type: none"> • Surface drip field 	<ul style="list-style-type: none"> • Pressure 	<ul style="list-style-type: none"> • Parallel 	<ul style="list-style-type: none"> • Drip tubing 	<ul style="list-style-type: none"> • Drip 	<ul style="list-style-type: none"> • Surface drip field
<ul style="list-style-type: none"> • Spray field 	<ul style="list-style-type: none"> • Pressure 	<ul style="list-style-type: none"> • Parallel 	<ul style="list-style-type: none"> • Distribution head with nozzle 	<ul style="list-style-type: none"> • Spray 	<ul style="list-style-type: none"> • Spray field
Below-grade	Energy	Config.	Structure	Distribution	Verbal description
<ul style="list-style-type: none"> • Trench • Shallow trench • Deep trench • Vertical trench 	<ul style="list-style-type: none"> • Gravity • Pressure 	<ul style="list-style-type: none"> • Parallel • Serial • Sequential 	<ul style="list-style-type: none"> • Trench 	<ul style="list-style-type: none"> • Gravity • Pressure-dosed gravity • Low pressure 	<ul style="list-style-type: none"> • Trenches (plain, shallow, deep or vertical) with gravity parallel, serial or sequential distribution • Trenches (plain, shallow, deep or vertical) with pressure-dosed gravity parallel, serial or sequential distribution • Trenches (plain, shallow, deep or vertical) with low-pressure distribution
<ul style="list-style-type: none"> • Bed • Shallow bed • Deep bed 	<ul style="list-style-type: none"> • Gravity • Pressure 	<ul style="list-style-type: none"> • Parallel 	<ul style="list-style-type: none"> • Bed 	<ul style="list-style-type: none"> • Gravity • Pressure-dosed gravity • Low pressure 	<ul style="list-style-type: none"> • Bed (plain, shallow or deep) with gravity parallel distribution • Bed (plain, shallow or deep) with pressure-dosed gravity parallel distribution • Bed (plain, shallow or deep) with low pressure distribution
<ul style="list-style-type: none"> • Subsurface drip field 	<ul style="list-style-type: none"> • Pressure 	<ul style="list-style-type: none"> • Parallel 	<ul style="list-style-type: none"> • Drip tubing 	<ul style="list-style-type: none"> • Drip 	<ul style="list-style-type: none"> • Subsurface drip field

Appendix B: Reference Tables

1. Conversion Factors	107
2. Friction Losses for Schedule 40 PVC Pipe	108
3. Friction Loss Equivalent as Pipe Length	109
4. Pipeline Volumes for Rigid and Flexible PVC Pipe	110
5. Orifice Flow for Low Pressure Distribution Applications	111
6. Orifice Flow for Pressure Manifold Applications	112
7. Required Flow Rate to Achieve Two Feet per Second Velocity through Rigid and Flexible PVC Pipe	113

Table 1: Conversion Factors

MULTIPLY	BY	TO OBTAIN
Acres	43560	Square Feet
Atmospheres	33.9	Feet of water
Centimeters	0.3937	Inches
Cubic Feet	7.48052	Gallons
Cubic Feet	28.32	Liters
Cubic Feet/sec.	449	Gallons/Min.
Cubic Meters	35.31	Cubic Feet
Cubic Meters	264.2	Gallons
Cubic Meters	10 ³	Liters
Cubic yards	27	Cubic Feet
Cubic yards	202	Gallons
Feet	30.48	Centimeters
Feet	0.3048	Meters
Feet of Water	62.43	Lbs/sq. ft.
Feet of Water	0.434	PSI (lbs/sq. in.)
Gallons	3785	Cubic Centimeters
Gallons	0.1337	Cubic Feet
Gallons	3.785	Liters
Gallons water	8.3453	Pounds of water
Gallons/min.	2.228 x 10 ⁻³	Cubic feet/sec.
Gallons/min.	1440	Gallons/day
Gallons/min.	0.06308	Liters/sec.
Gallons/day	6.944 x 10 ⁻⁴	Gallons/min.
Gallons/day/sq.ft.	1.604	Inches/day
Grams	2.205 x 10 ⁻³	Pounds
Grams/liter	1000	Parts/million
Hectares	2.471	Acres
Horsepower	33,000	Foot-Lbs/min.
Horsepower	0.7457	Kilowatts
Inches	2.54	Centimeters
Inches/day	0.6234	Gallons/day/sq.ft.
Kilograms	2.205	Lbs.
Kilowatts	1.341	Horsepower
Kilowatt-hours	2.655 x 10 ⁶	Foot-Lbs.
Liters	103	Cubic Centimeters
Liters	0.03531	Cubic Feet
Liters	0.2642	Gallons
Meters	3.281	Feet
Milligrams/liters	1	Parts/million
Million gals./day	1.54723	Cubic ft./sec.
Parts/million	8.345	Lbs/million gal.
Pounds	453.5024	Grams
Pounds of water	0.1198	Gallons
psi (lbs/sq.in.)	2.31	Feet of water
Square feet	2.296 x 10 ⁻⁵	Acres
Temp. (°C) + 17.78	1.8	Temp. (°F)
Temp. (°F) - 32	5/9	Temp. (°C)

Table 2: Friction Losses for Schedule 40 PVC Pipe

	Pipe Nominal Size and Inside Diameter (inches)					
Flow (GPM)	1" (1.049")	1-1/4" (1.38")	1-1/2" (1.61")	2" (2.067")	3" (3.068")	4" (4.026")
1	0.09					
2	0.32	0.09				
3	0.68	0.18	0.08			
4	1.17	0.31	0.14			
5	1.76	0.46	0.22	0.06		
6	2.47	0.65	0.31	0.09		
7	3.28	0.86	0.41	0.12		
8	4.2	1.1	0.52	0.15		
9	5.22	1.37	0.65	0.19		
10	6.35	1.67	0.79	0.23		
11	7.57	1.99	0.94	0.28		
12		2.34	1.1	0.33		
13		2.71	1.28	0.38		
14		3.11	1.47	0.43	0.06	
15		3.54	1.67	0.49	0.07	
16		3.98	1.88	0.56	0.08	
17		4.46	2.1	0.62	0.09	
19		5.47	2.58	0.77	0.11	
20		6.02	2.84	0.84	0.12	
25			4.29	1.27	0.19	
30			6.02	1.78	0.26	0.07
35				2.37	0.35	0.09
45				3.77	0.55	0.15
50				4.58	0.67	0.25
60				6.42	0.94	0.33
70					1.25	0.43
80					1.6	0.53
90					1.99	0.64
100					2.41	0.97
125					3.65	1.36
150					5.11	1.81
175					6.8	2.32
200						2.88
225						3.5
250						4.18
275						4.91
300						5.69
350						6.53
375						7.41

$H_f = (0.00113 \times L \times Q^{1.85}) / d^{4.87}$
 Where: H_f =head loss (feet)
 L=pipe length (feet)
 Q = flow (gpm)
 d=pipe inside diameter (inches)

Table 3: Friction Loss Equivalent as Pipe Length (feet)

DIAMETER OF FITTING (Inches)	90. DEG. STANDARD ELL	45 DEG. STANDARD ELL	90 DEG. STANDARD TEE	COUPLING OR STRAIGHT RUN OF TEE	GATE VALVE	GLOBE VALVE	CHECK VALVE
	Friction Loss Equivalent as Pipe Length (feet)						
3/8	1	0.6	1.5	0.3	0.2	8	3
1/2	2	1.2	3	0.6	0.4	15	5
3/4	2.5	1.5	4	0.8	0.5	20	7
1	3	1.8	5	0.9	0.6	25	8
1 1/4	4	2.4	6	1.2	0.8	35	11
1 1/2	5	3	7	1.5	1	45	14
2	7	4	10	2	1.3	55	19
2 1/2	8	5	12	2.5	1.6	65	22
3	10	6	15	3	2	80	27
3 1/2	12	7	18	3.6	2.4	100	32
4	14	8	21	4	2.7	125	38
5	17	10	25	5	3.3	140	46
6	20	12	30	6	4	165	54

Table 4A: Pipe Volume (gallons) per Foot of Pipe

	Pipe Size (inches)	Type of Pipe				
		SDR 26 (Class 160)	SDR 21 (Class 200)	Sch 40	Sch 80	Corrugated Tubing
Volume (gallons per foot of pipe)	0.75			0.028	0.022	
	1	0.058	0.058	0.045	0.037	
	1.25	0.096	0.092	0.078	0.067	
	1.5	0.126	0.121	0.106	0.092	
	2	0.196	0.188	0.174	0.153	
	3	0.426	0.409	0.384	0.343	
	4	0.704	0.677	0.66	0.597	0.653
	6	1.53	1.47	1.5	1.35	1.47
	8	2.59	2.49	2.6	2.37	

Table 4B: Pipe Volume (gallons) per 100 feet of Pipe

	Pipe Size (inches)	Type of Pipe				
		SDR 26 (Class 160)	SDR 21 (Class 200)	Sch 40	Sch 80	Corrugated Tubing
Volume (gallons per 100 feet of pipe)	0.75			2.8	2.2	
	1	5.8	5.8	4.5	3.7	
	1.25	9.6	9.2	7.8	6.7	
	1.5	12.6	12.1	10.6	9.2	
	2	19.6	18.8	17.4	15.3	
	3	42.6	40.9	38.4	34.3	
	4	70.4	67.7	66	59.7	65.3
	6	153	147	150	135	147
	8	259	249	260	237	

Table 5: Orifice Flow (gallons per minute) for Low-pressure distribution applications

Operating pressure (feet)	Orifice Size (inches)									
	3/32" 0.094"	1/8" 0.125"	5/32" 0.156"	3/16" 0.188"	7/32" 0.219"	1/4" 0.25"	9/32" 0.281"	5/16" 0.313"	11/32" 0.344"	3/8" 0.375"
2.0	0.15	0.26	0.41	0.59	0.80	1.04	1.32	1.63	1.97	2.34
2.1	0.15	0.27	0.42	0.60	0.82	1.07	1.35	1.67	2.02	2.40
2.2	0.15	0.27	0.43	0.61	0.84	1.09	1.38	1.71	2.07	2.46
2.3	0.16	0.28	0.44	0.63	0.86	1.12	1.41	1.75	2.11	2.51
2.4	0.16	0.29	0.45	0.64	0.87	1.14	1.44	1.78	2.16	2.57
2.5	0.16	0.29	0.46	0.66	0.89	1.17	1.47	1.82	2.20	2.62
2.6	0.17	0.30	0.46	0.67	0.91	1.19	1.50	1.86	2.25	2.67
2.7	0.17	0.30	0.47	0.68	0.93	1.21	1.53	1.89	2.29	2.72
2.8	0.17	0.31	0.48	0.69	0.94	1.23	1.56	1.93	2.33	2.77
2.9	0.18	0.31	0.49	0.71	0.96	1.25	1.59	1.96	2.37	2.82
3.0	0.18	0.32	0.50	0.72	0.98	1.28	1.62	1.99	2.41	2.87
3.1	0.18	0.32	0.51	0.73	0.99	1.30	1.64	2.03	2.45	2.92
3.2	0.19	0.33	0.51	0.74	1.01	1.32	1.67	2.06	2.49	2.97
3.3	0.19	0.33	0.52	0.75	1.02	1.34	1.69	2.09	2.53	3.01
3.4	0.19	0.34	0.53	0.76	1.04	1.36	1.72	2.12	2.57	3.06
3.5	0.19	0.34	0.54	0.78	1.06	1.38	1.74	2.15	2.61	3.10
3.6	0.20	0.35	0.55	0.79	1.07	1.40	1.77	2.18	2.64	3.15
3.7	0.20	0.35	0.55	0.80	1.09	1.42	1.79	2.21	2.68	3.19
3.8	0.20	0.36	0.56	0.81	1.10	1.44	1.82	2.24	2.72	3.23
3.9	0.20	0.36	0.57	0.82	1.11	1.46	1.84	2.27	2.75	3.27
4.0	0.21	0.37	0.58	0.83	1.13	1.47	1.87	2.30	2.79	3.32
4.1	0.21	0.37	0.58	0.84	1.14	1.49	1.89	2.33	2.82	3.36
4.2	0.21	0.38	0.59	0.85	1.16	1.51	1.91	2.36	2.86	3.40
4.3	0.21	0.38	0.60	0.86	1.17	1.53	1.93	2.39	2.89	3.44
4.4	0.22	0.39	0.60	0.87	1.18	1.55	1.96	2.42	2.92	3.48
4.5	0.22	0.39	0.61	0.88	1.20	1.56	1.98	2.44	2.96	3.52
4.6	0.22	0.40	0.62	0.89	1.21	1.58	2.00	2.47	2.99	3.56
4.7	0.22	0.40	0.62	0.90	1.22	1.60	2.02	2.50	3.02	3.59
4.8	0.23	0.40	0.63	0.91	1.24	1.61	2.04	2.52	3.05	3.63
4.9	0.23	0.41	0.64	0.92	1.25	1.63	2.06	2.55	3.08	3.67
5.0	0.23	0.41	0.64	0.93	1.26	1.65	2.09	2.57	3.12	3.71

Note: Figures Based on Orifice Equation:

$$Q=11.79d^{2h^{0.5}}$$

Where:

Q=flow per orifice (gpm)

d=diameter of orifice (inches)

h= operating pressure or head (feet)

Table 6: Orifice Flow for Pressure Manifold Applications

A. Orifice Flow in gallons per minute (Schedule 40 taps)

Operating Pressure (feet)	Orifice Size (inches)					
	1/2" (0.622")	3/4" (0.824")	1" (1.049")	1-1/4" (1.38")	1-1/2" (1.61")	2" (2.067")
1.5	6.16	10.8	17.5	30.3	41.3	68
2	7.11	12.5	20.2	35	47.7	78.5
2.5	7.95	14	22.6	39.1	53.3	87.8
3	8.71	15.3	24.8	42.9	58.4	96.2
3.5	9.41	16.5	26.8	46.3	63	104
4	10.1	17.7	28.6	49.5	67.4	111

B. Orifice Flow in gallons per minute (Schedule 80 taps)

Operating Pressure (feet)	Orifice Size (inches)					
	1/2" (0.546")	3/4" (0.742")	1" (0.957")	1-1/4" (1.278")	1-1/2" (1.50")	2" (1.939")
1.5	4.75	8.77	14.6	26	35.8	59.9
2	5.48	10.1	16.8	30	41.4	69.1
2.5	6.13	11.3	18.8	33.6	46.2	77.3
3	6.71	12.4	20.6	36.8	50.7	84.7
3.5	7.25	13.4	22.3	39.7	54.7	91.4
4	7.75	14.3	23.8	42.5	58.5	97.8

$$Q=13d^2h^{1/2}$$

Where

Q=flow per orifice (gpm)

d=diameter of orifice (inches)

h= operating pressure or head (feet)

Table 7: Required Flow Rate (gallons per minute) to Achieve Two Feet per Second Velocity through Rigid and Flexible PVC Pipe

Schedule 40 PVC		Schedule 80 PVC		SDR 21		SDR 26	
Nominal Dia.	Flow Rate	Nominal Dia.	Flow Rate	Nominal Dia.	Flow Rate	Nominal Dia.	Flow Rate
(inches)	(gpm)	(inches)	(gpm)	(inches)	(gpm)	(inches)	(gpm)
1	5.4	1	4.5	1	7.2	1	7
1 1/4	9.3	1 1/4	8	1 1/4	11.1	1 1/4	11.5
1 1/2	14.2	1 1/2	12.4	1 1/2	14.5	1 1/2	15.1
2	20.9	2	18.4	2	22.6	2	23.5
2 1/2	29.8	2 1/2	26.4	2 1/2	33.1	2 1/2	39.9
3	46.1	3	41.2	3	49.1	3	51.1
4	79.4	4	71.7	4	82.2	4	84.5
6	180	6	162.5	6	175.8	6	183.1