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ASABE, 2950 Niles Road, St. Joseph, MI 49085-9659, USA, phone 269-429-0300, fax 269-429-3852, hq@asabe.org



Soil and Water Terminology

Proposed by the ASAE Soil and Water Steering Committee; prepared by the ASAE Soil and Water Nomenclature Committee; approved by the ASAE Soil and Water Division Standards Committee; adopted by ASAE March 1992; revised March 1995, January 2001; reaffirmed February 2006; revised September 2007; periodic review extended for two years April 2013; revised September 2015.

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Purpose and Scope

- 1 This Standard establishes preferred terminology for use in soil and water engineering and defines terms which may not have soil and water related definitions in a desk-top dictionary.
- 2 Preferred terms and definitions are intended for use in all standards, technical journals, magazines, textbooks, and extension bulletins pertaining to soil and water engineering. Some of the terms are used in other agricultural engineering specialties and may be defined differently in other standards pertaining to that specialty.
- 3 Soil terms are from Glossary of Soil Science Terms, July 1987, Soil Science Society of America, used by its permission.

Definitions

- 1 **aboteau:**
 - a. Dike and drainage structure protecting marshlands.
 - b. Outlet structure with flap gate which permits outflow of fresh water, but prevents inflow of tidal salt water (no longer in common use).
- 2 **acid mine drainage:** Water draining from areas that have been mined for coal or other mineral ores. The drainage water is acidic, sometimes having a pH less than 2.0, because of its contact with sulfur-bearing material.
- 3 **acid rain:** Precipitation that has a low pH (less than 5.6, which is normal for “natural” precipitation). The precipitation becomes acidic when moisture in the air reacts with sulfur and nitrogen pollutants in the atmosphere. Acid rain has a harmful effect on some plants, aquatic organisms, soils, and buildings.
- 4 **adapter:** A coupler fabricated for attachment of hose, threaded pipe, or other devices to pipe used for irrigation or other purposes, or for connecting pipes of different sizes.
- 5 **advance time:** Time required for a given stream of surface irrigated water to move from the upper end of a field to the lower end.
- 6 **aeration:**
 - a. soil: A diffusion process by which air in soil pore spaces is replaced by air from the atmosphere, replenishing soil oxygen and removing excess soil carbon dioxide.
 - b. water: A process by which oxygen from the atmosphere is added to water bodies or flowing water.

- 7 aerobic decomposition:** The decay of organic matter by microorganisms in the presence of oxygen.
- 8 air counterflow:** Upward movement of air through soil during downward flow (percolation) of water.
- 9 air drainage (soil):** Renewal of soil air by diffusion.
- 10 air lift pump:** An apparatus for lifting water by using the buoyancy of injected air.
- 11 alfalfa valve:** An outlet valve attached to the top of a pipeline riser with an opening equal in diameter to the inside diameter of the riser pipe and an adjustable lid or cover to control water flow. A ring around the outside of the valve frame provides a seat and seal for a portable hydrant.
- 12 algal bloom:** Large, visible, masses of algae that develop in bodies of water. May occur in response to additions of plant nutrients (especially nitrogen and/or phosphorus) to the aquatic system.
- 13 algicide:** Any substance that will kill or control algal growth.
- 14 alkali soil:** (See saline-sodic soil.)
- 15 allowable depletion:** That part of soil water stored in the plant root zone managed for use by plants, usually expressed as equivalent depth of water in mm (acre-inches per acre, or inches).
- 16 alternate set irrigation:** A method of managing irrigation whereby, at every other irrigation, alternate furrows are irrigated, or sprinklers are placed midway between their locations during the previous irrigation.
- 17 alternate side irrigation:** The practice of furrow irrigating one side of a crop row (for row crops or orchards) and then, at about half the irrigation time, irrigating the other side.
- 18 anaerobic decomposition:** The decay of organic matter by microorganisms in the absence of oxygen.
- 19 anisotropic soils:** Soils not having the same physical properties when the direction of measurement is changed. Commonly used in reference to permeability changes with direction of measurement.
- 20 anti-seep collars:** A panel of concrete or other impervious material placed on the outside surface of underground conduits to lengthen the flow path and thus impede seepage.
- 21 apparent flow velocity (porous media flow):** Flow rate of water passing through a unit cross section of porous media.
- 22 application efficiency (E_a):** The ratio of the average depth of irrigation water infiltrated and stored in the root zone to the average depth of irrigation water applied, expressed as a percentage. Also referred to as AE.
- 23 application efficiency low half (E_h):** The ratio of the average of the low one-half of measurements of irrigation water infiltrated and stored in the root zone to the average depth of irrigation water applied, expressed as a percentage. Also referred to as AELH.
- 24 application efficiency of low quarter:** The ratio of the average depth of irrigation water infiltrated and stored in the root zone as determined from the lowest 25% of the area, to the average depth of irrigation water applied, expressed as a percent.
- 25 application rate:** Rate that water is applied to a given area. Usually expressed in units of depth per time.
- 26 application time, set time:** The amount of time that water is applied to an irrigation set.
- 27 appropriation doctrine:** See doctrine of appropriation.
- 28 apron:** Floor or lining extending downstream from a hydraulic structure to protect the structure from erosion and scour.

- 29 aquiclude:** Underground geologic formation that neither yields nor allows the passage of an appreciable quantity of water, although it may be saturated with water itself.
- 30 aquifer:** A geologic formation that holds and yields useable amounts of water. Aquifers can be classified as confined or unconfined.
- 31 aquitard:** Underground geologic formation that is slightly permeable and yields inappreciable amounts of water when compared to an aquifer.
- 32 arched dam:** Curved masonry or concrete dam, convex upstream, that depends on arch action for its stability. The load is transferred by the arch to canyon walls and bottom or other abutments.
- 33 arid climates:** Climate characterized by low rainfall and high evaporation potential. A region is usually considered as arid when precipitation averages less than 250 mm (10 in.) per year.
- 34 artesian aquifer:** Aquifer that contains water under pressure as a result of hydrostatic head. For artesian conditions to exist, an aquifer must be overlain by a confining material or aquiclude and receive a supply of water. The free water surface stands at a higher elevation than the top confining layer.
- 35 aspect:** Compass direction that a slope faces in a catchment area.
- 36 assimilative capacity:** Natural ability of soil, air, or water to accept and/or degrade potential pollutants without harmful effects to the environment.
- 37 auxiliary pump:** Any pump designed to perform a service to the main pump or power unit, such as a cooling water pump or a standby pump to supplement the system for peaking requirements.
- 38 auxiliary spillway:** The spillway designed to convey excess floodwater exceeding the capacity of the principal spillway through, over, or around a dam.
- 39 available soil water:** (See available water capacity.)
- 40 available water capacity, AWC:** The portion of soil water that can be readily absorbed by plant roots of most crops, expressed in mm water per mm soil (inches per inch, inches per foot, or total inches) for a specific soil depth. It is the amount of water stored in the soil between field capacity (FC) and permanent wilting point (WP). It is typically adjusted for salinity (electrical conductivity) and rock fragment content. Also called available water holding capacity (AWHC), or available soil water.
- 41 available water holding capacity (AWHC):** (See available water capacity.)
- 42 average annual precipitation:** The long-term or historic arithmetic mean of annual precipitation (rain, snow, dew) received by an area.
- 43 average daily use rate:** Calculated or measured water used by plants in one day through evapotranspiration, expressed as an equivalent depth, mm per day (inches per day).
- 44 axial-flow pump:** A rotary pump that develops head mostly by the propelling or lifting action of the vanes on water, commonly referred to as a propeller pump.
- 45 backfilling (drainage):** The replacement of the excavated material after drain placement and blinding, or envelope installation.
- 46 backflow prevention device:** Safety device which prevents the flow of water from the water distribution system back to the water source.
- 47 backfurrow:** A ridge formed by a plow when soil is moved together or on top of undisturbed soil. It is the opposite of a dead furrow.

- 48 backhoe:** An excavator that pulls a bucket mounted on an arm toward the power unit to lift and carry spoil to the side of the trench or excavation.
- 49 backpressure:** Increase of pressure in the downstream piping system above the supply pressure at the point of consideration which would cause, or tend to cause, a reversal of the normal direction of flow.
- 50 backsiphonage:** Reversal of flow (backflow) due to a reduction in system pressure which causes a negative or subatmospheric pressure to exist at a site in the water system.
- 51 backslope:** Land area on the downhill side of a terrace ridge or earth embankment.
- 52 backwash:** A procedure that flushes clean water through a filter tank in reverse direction to the normal operating direction so as to remove captured organic and inorganic particulates from the filter media (also referred to as backflush and/or reverse flushing).
- 53 baffles:** Vanes, guides, grids, grating, or similar devices placed in a conduit to regulate water flow, effect a more uniform distribution of velocities, reduce pressure losses, deflect or create mixing.
- 54 bank advance:** Net linear streamward change in bank surface position, as a result of deposition of sediment or in situ swelling of bank materials. The opposite of bank retreat.
- 55 bank erodibility:** The ease with which bank material particles and aggregates can be detached, entrained, and removed (normally by flow processes).
- 56 bank erosion:** Detachment, entrainment and removal of bank material as individual grains or aggregates by fluvial and subaerial processes.
- 57 bank failure:** Collapse of all or part of the bank en masse, in response to geotechnical instability processes.
- 58 bank retreat:** Net linear landward recession of stream or lakeshore banks as a result of erosion and/or failure.
- 59 bank stabilization:** Erosion prevention and stabilization by use of vegetation, soil bio-engineering or structural measures, alone or in combination.
- 60 bank storage:** Water leaving a stream channel during rising stages of streamflow, most of which returns to stream flow during falling stages. (See floodplain storage.)
- 61 base area:** The cross-sectional area of the base of a cone penetrometer; contact area of a dam with original surface.
- 62 base flow:** Water in a stream that results predominantly from groundwater inflow and upstream contributions, i.e. with little or no contributions from storm events.
- 63 base line:** A reference line from which measurements are taken; a parallel of latitude for public land surveys.
- 64 base saturation:** Extent to which a material is saturated with exchangeable cations other than hydrogen, expressed as a percentage of the cation-exchange capacity.
- 65 basic intake rate:** Rate at which water percolates into soil after infiltration has decreased to a low and nearly constant value.
- 66 basin:**
- a. hydrology: The area (both surface and subsurface) that is drained by a river and its tributaries.
 - b. irrigation or recharge: Level plot or field, surrounded by dikes, which may be flooded.

- 67 basin irrigation:** Irrigation by flooding areas of level land surrounded by dikes. Used interchangeably with level border irrigation, but usually refers to smaller areas.
- 68 batter board:** One of a series of horizontal boards set across or to one side of a trench line to indicate a desired elevation or reference grade from which trench bottom elevations are determined.
- 69 bed forms:** Ripples, dunes, antidunes, bars, and combinations of the above in alluvial channels. The absence of the above features in an alluvial channel implies a plane bed.
- 70 bed load:** Coarse sediment or material moving on or near the bottom of a flowing channel by rolling, sliding, or bouncing.
- 71 bedding:**
- a. A surface drainage method accomplished by plowing land to form a series of low narrow ridges separated by parallel dead furrows. The ridges are oriented in the direction of the greatest land slope (crowning or ridging).
 - b. Preparation of furrow-irrigated row cropped field with wide, flattened ridges between furrows on which one or more crop rows are planted.
 - c. The process of laying a pipe or other conduit in a trench with the bottom shaped to the contour of the conduit or tamping earth around the conduit to form its bed. The manner of bedding may be specified to conform to the earth load and conduit strength.
 - d. Material placed under a pipe or other conduit for mechanical support.
- 72 bedding angle:** The acute angle of a V-groove in the bottom of a trench for support of pipe drains.
- 73 bedding ditch:** A dead furrow used as a surface drainage ditch in a bedding system.
- 74 beds-in-basins:** Ridges raised above the ponded water surface of a level basin, with channels between (dead level furrows or basin furrows).
- 75 beehive:** Dome-shaped grating placed on surface inlets to subsurface drains to exclude trash rack (See trash rack.)
- 76 bench flume:** A water conducting channel built on constructed terraces along hillsides or around mountain slopes when the ground is too rough, steep, or rocky to permit an excavated canal.
- 77 berm:**
- a. Strip or area of land, usually level, between the edge of spoil bank and edge of a ditch or canal.
 - b. A small embankment or ridge for controlling surface water flow.
- 78 best management practice, BMP:** Structural, nonstructural, and management technique recognized to be one of the most effective and practical means to reduce surface and groundwater contamination while still allowing the productive use of resources.
- 79 biodegradation:** Breaking down of natural or synthetic organic materials by microorganisms in soils, natural bodies of water, or wastewater treatment systems.
- 80 black alkali soil:** A soil with a high pH and chemistry dominated by sodium carbonate. Dissolved organic matter may be deposited on the soil surface as soil water evaporates. (See saline-sodic soil.)
- 81 black water:** Water containing liquid and solid human body waste generated through toilet usage.

- 82 Blaney-Criddle Method:** An air temperature based method to estimate crop evapotranspiration. (See FAO Blaney-Criddle Method.)
- 83 blind drain:** Type of drain consisting of an excavated trench, refilled with pervious materials such as coarse sand, gravel, or crushed stones, through whose voids water percolates and flows toward an outlet (also called a French drain).
- 84 blind inlet:** Surface water inlet to a drain in which water enters by percolation rather than through open flow conduits.
- 85 blinding:** Material placed on top of and around a drain tile or conduit to improve the flow of water to the drain and to prevent displacement during backfilling of the trench.
- 86 blow-off valve:** Controlled pipeline outlet used to discharge water. Typically used to flush sediment from the pipeline system and to drain the pipeline system in advance of freezing conditions.
- 87 blowout:** A rupture in a subsurface drain, underground outlet, or pipe drain usually attributed to hydraulic pressure from within the line and resulting in displacement of the pipe and in washout of earth materials.
- 88 border dike:** Earth ridge or small levee built to guide or to hold irrigation or recharge water in a field.
- 89 border ditch:** Small excavation used as a border of an irrigated strip or plot with water being spread from one or both sides.
- 90 border irrigation:** Irrigation by flooding strips of land, rectangular in shape and cross leveled, bordered by dikes. Water is applied at a rate sufficient to move it down the strip in a uniform sheet. Border strips having no downfield slope are referred to as level border systems. Border systems constructed on terraced lands are commonly referred to as benched borders.
- 91 break grade:** Change in the slope of a pipe drain, ditch, field or channel.
- 92 broad-crested weir:** Weir for water measurement or grade control, having a rounded or wide crest in the direction of the stream flow.
- 93 brush dam:** Dam constructed of brush, in gullies or small channels, to retard flow of water and sediment.
- 94 brush drain:** Covered field drain consisting of a trench, the lower part of each section being filled with brush to form the drainage channel.
- 95 bubbler irrigation:** The application of water to flood the soil surface using a small stream or fountain. The discharge rates for point-source bubbler emitters are greater than for drip or subsurface emitters but generally less than 225 L/h (1 gpm). A small basin is usually required to contain or control the water.
- 96 buffer strip:** A permanent or semi-permanent strip of grass or other close-growing perennial vegetation, usually grass that separates areas of cultivated crops. (See filter strip.)
- 97 buffer strip cropping:** An erosion control practice in which different crops are grown in consecutive strips across the slope and grass or close-growing vegetation is grown between the cultivated strips. Differs from rotational strip cropping in that the strips are narrow and are generally permanent or semipermanent.
- 98 bulk density (soil):** The mass of dry soil per unit bulk volume. The bulk volume is determined before drying.
- 99 bullet (drainage):** Round-nosed cylindrical point of a mole drain plow which forms a cavity as the plow is drawn through the soil (also referred to as a torpedo).
- 100 bypass ditch:** A waterway for carrying water from a drainage area directly to a gravity outlet, bypassing any pumping plants.

101 cablegation: A method of surface irrigation that uses gated pipe to both transmit and distribute water to furrows or border strips. A plug, moving at a controlled rate through the pipe, causes irrigation to progress along the field and causes flow rates from any one gate to decrease continuously from some maximum rate to zero.

102 canal: A channel constructed to convey irrigation or drainage water by gravity flow.

103 canopy: Vegetative cover over the land surface of a catchment area.

104 canopy inlet: Entrance to a closed conduit that has been covered or shielded to induce priming at minimum submergence.

105 canopy interception: (See interception.)

106 capillary fringe: A zone in the soil just above the water table that remains saturated or almost saturated. The extent depends upon the soil particle size-distribution.

107 capillary pressure: (See soil-water pressure.)

108 capillary pressure head: Height water will rise by surface tension above a free water surface in the soil, expressed as length unit of water. Sometimes called "capillary rise."

109 capillary soil moisture: (See soil-water potential.)

110 capillary zone: (See capillary fringe.)

111 capped riser or pot: An irrigation pipeline riser extending above ground, with a watertight cap over its top and outlet gates on its sides slightly above the ground surface (capped riser). To accommodate more outlet gates, a cap with a diameter larger than that of the riser pipe is sometimes installed on the top of the riser (capped pot).

112 carryover soil water: Water stored in the root zone between crops, during periods of crop dormancy, or before the crop is planted.

113 catch basin: Basin designed to catch or trap water and sediment. (See sediment basin.)

114 catchment area or basin: The land area over which precipitation falls and outflows from one outlet.

115 cation exchange capacity (CEC): The sum of exchangeable cations (usually Ca, Mg, K, Na, Al, H) that the soil constituent or other material can adsorb at a specific pH, usually expressed in centimoles of charge per Kg of exchanger (cmol/Kg), or milliequivalents per 100 grams of soil at neutrality (pH 7.0), meq/100g).

116 centrifugal pump: Pump consisting of rotating vanes (impeller) enclosed in a housing and used to impart energy to a fluid through centrifugal force.

117 chain trencher: An excavator that uses a chain with cutters attached to cut, remove, and deposit spoil to the side of the trench or on to a discharge conveyor.

118 channel capacity: Flow rate in a ditch, canal, or natural channel when flowing full.

119 channel erosion: The processes of scour, entrainment, and deposition of channel bottom, or bed, sediment within a given channel segment.

120 channel storage:

a. drainage: The volume of water that can be stored above the start pumping level in ditches or floodways without flooding cropland.

b. hydrology: Water temporarily stored in channels while en route to an outlet.

121 check: Structure to control water depth in a canal, ditch, or irrigated field.

122 check dam: Small barrier constructed in a gully or other small watercourse to decrease flow velocity, minimize channel scour, and promote deposition of sediment.

123 check drain: Conventional drain altered by use of checks so that it can be used as a subirrigation system.

124 check irrigation: Modification of a border strip with small earth ridges or checks constructed at intervals to retain water as the water flows down the strip.

125 chemical water treatment:

a. drinking water: Addition of chemicals to disinfect, adjust pH, or sequester contaminants in drinking water.

b. irrigation: Addition of acids, fungicides, and bactericides to prevent emitter clogging, adjust pH, or otherwise make the water acceptable for use in microirrigation systems.

126 chemigation: Application of chemicals to crops through an irrigation system by mixing them with the irrigation water.

127 chisel plowing: Cropland preparation by a special tillage implement (chisel) that minimizes inversion of the soil and leaves the soil surface and surface vegetative residues relatively undisturbed.

128 chlorinated hydrocarbon: Synthetic compound that contains chlorine, hydrogen, and carbon; a main ingredient in some pesticides.

129 chlorination: The application of chlorine to water, sewage, or industrial wastes, generally to disinfect, to oxidize, or to improve settling.

130 chlorine residual: The concentration of chlorine remaining in water, sewage, or industrial wastewater following chlorination.

131 Christiansen's uniformity coefficient: A measure of the uniformity of irrigation water application. The average depth of irrigation water infiltrated minus the average absolute deviation from this depth, all divided by the average depth infiltrated. (See uniformity coefficient and distribution uniformity.)

132 chute spillway: Lined open channel constructed with a steep slope to convey water to a lower level without erosion.

133 Cipolletti weir: A sharp-crested trapezoidal weir with 1 (horizontal) to 4 (vertical) side slopes.

134 civil-law drainage rule: Drainage law stating that the owners of higher land are entitled to the natural advantage that the elevation of their land gives them and owners of lower lying land must receive surface water flowing to them through natural channels.

135 clay: A soil separate consisting of particles less than 2 μm in equivalent diameter, USDA textural soil classification.

136 clay tile: Short lengths of pipe, made from shale or clay, used for subsurface drains.

137 claypan: A dense, compact layer in the subsoil having a much higher clay content than the overlying material, separated by a sharply defined boundary. Claypans are usually hard when dry, and plastic and sticky when wet. Also, they usually impede the movement of water and air, and the growth of plant roots.

138 closed drain: Subsurface drain, tile or perforated pipe, which may also receive surface water through surface inlets.

139 colloids: Negatively charged soil mineral or organic particles smaller than 1 μm in diameter.

- 140 colter slit:** Knife-like cut or slit through the soil surface made when a mole plow is drawn through the soil or by a rolling disk.
- 141 combined sewer:** A sewer that receives storm water runoff as well as transports sewage.
- 142 compensating emitter:** Microirrigation system emitters designed to discharge water at a near constant rate over a wide range of pressures.
- 143 composting:** Controlled microbial degradation of organic waste yielding an environmentally safe and nuisance-free soil conditioner and fertilizer.
- 144 cone index:** The force per unit basal area required to push a cone penetrometer through a specified increment of soil.
- 145 cone of depression or influence:** The water table or piezometric surface, roughly conical in shape, produced by the extraction of water from a well.
- 146 cone penetrometer:** An instrument in the form of a cylindrical rod with a cone-shaped tip designed for penetrating soil and for measuring the end-bearing component of penetration resistance.
- 147 confined aquifer:** An aquifer whose upper, and perhaps lower, boundary is defined by a layer of natural material that does not transmit water readily.
- 148 conservancy district:** A legal enterprise, organized for the purpose of accomplishing soil and water management and flood control. Sometimes called a “natural resources district.”
- 149 conservation tillage:** A tillage practice that leaves plant residues on the soil surface for erosion control and moisture conservation. This is sometimes defined as tillage that leaves at least 30% residue cover on the surface after the planting operation.
- 150 consumptive use:** The total amount of water taken up by vegetation for transpiration or building of plant tissue, plus the evaporation of soil moisture, snow, and intercepted precipitation associated with vegetal growth.
- 151 continuous-flow irrigation:** System of irrigation water delivery where each irrigator receives the allotted quantity of water continuously.
- 152 continuous flushing emitter:** Microirrigation system emitter designed to continuously permit passage of large solid particles while operating at a trickle or drip flow, thus reducing filtration requirements.
- 153 contour farming:** System of farming used for erosion control and moisture conservation whereby field operations are performed approximately on the contour.
- 154 contour furrows:** Furrows plowed approximately on the contour to reduce soil loss and increase infiltration.
- 155 contour-strip cropping:** A modification of contour farming in which alternating crops are planted in strips, usually includes strips of close growing, erosion-resistant forage (grass, grain, or hay) crops.
- 156 contracted weir:** Weir having sufficiently sharp upstream edges and slow approach velocity to cause the nappe to contract. Sometimes called a “sharp-crested weir.”
- 157 control station (microirrigation):** Facilities upstream of microirrigation distribution and application piping for purposes that may include water measurement, filtration, treatment, flow and pressure control, timing of application, and/or backflow prevention. Sometimes called a “control head.”
- 158 control structure:** Water regulating structure, usually for open conduits.

159 controlled drainage: Regulation of the soil water table by means of pumps, control dams, or check drains, or a combination of these, for maintaining the water table at a depth favorable to crop growth and/or for minimizing the effects of drainage during the fallow season to prevent nutrient loss. Also called “drainage water management.”

160 convective storm: Rainfall caused by condensation of warm moist air that moves upward, being cooled both by the surrounding air and by expansion.

161 conventional tillage: The traditional tillage practice that involves inverting the tillage layer, burying most of the plant residues, and leaving the soil relatively bare.

162 conveyance efficiency (E_c): The ratio of the water delivered to the total water supplied to an open channel or pipeline at the upstream end, expressed as a percentage.

163 conveyance loss: Loss of water from a channel or pipe during transport, including losses due to seepage, leakage, evaporation, and transpiration by plants growing in or near the channel.

164 core trench: Excavation of a trench in the foundation material under an earth embankment or dam in which special material is placed to reduce permeability.

165 core wall: Masonry, sheet piling, concrete, or compacted earth placed near the center of a dam or embankment in the form of a wall to reduce permeability.

166 correction strip: The irregular width strips of land lying between uniform width strips in strip cropping systems with irregular topography.

167 corrugated plastic tubing: Extruded plastic tubing with a corrugated wall and when perforated, used for subsurface drains.

168 corrugation irrigation: A method of surface irrigation similar to furrow irrigation, in which small channels, called corrugations, are used to guide water across a field. No attempt is made to confine the water entirely to the corrugations.

169 coupler (sprinkler): Device, either self-sealed or mechanically sealed, that connects the ends of two lengths of pipe or pipe to hose.

170 cover crop: Close-growing crop, that provides soil protection, seeding protection, and soil improvement between periods of normal crop production, or between trees in orchards and vines in vineyards. When plowed under and incorporated into the soil, cover crops may be referred to as green manure crops.

171 crack width: Space between the ends of adjacent clay or concrete drain tile; joint spacing.

172 cradle: A support made of rigid material, such as concrete, wood, or steel, used to maintain horizontal and vertical alignment of tile, tubing or conduit.

173 creep distance: The longitudinal length along the outer surface of a pipe or conduit plus the length along antiseep collars within an earth embankment. Also called “seepage path.”

174 crest:

- a. Top of a dam, dike, spillway, or weir.
- b. Summit of a wave or peak of a flood.

175 crestboard: (See flashboard.)

176 critical depth: Depth of flow in a channel at which specific energy is a minimum for a given discharge. (See hydraulic jump.)

177 critical suction head: (See net positive suction head.)

178 critical velocity: Flow velocity at which a given discharge changes from tranquil (subcritical) to rapid (supercritical) or the reverse. That velocity in an open channel for which the specific energy is a minimum for a given discharge.

179 crop coefficient (K_c): The ratio of the actual crop evapotranspiration to reference evapotranspiration.

180 crop evapotranspiration (ET_c): The amount of water used by the crop in transpiration and building of plant tissue, and that evaporated from adjacent soil or was intercepted by plant foliage. It is expressed as depth in mm (inches, or as the volume-depth ratio of acre-inches per acre) and can refer to daily, peak, design, monthly or seasonal quantities. Sometimes referred to as consumptive use, CU.

181 crop irrigation requirement: Quantity of water, exclusive of effective precipitation, that is needed for crop production.

182 crop residue: Portion of a plant, or crop, left in the field after harvest.

183 crop rooting depth: Crop rooting depth is typically taken as the soil depth containing 80% of plant roots, measured in meters (ft or in.).

184 crop rotation: A system of farming in which a succession of different crops are planted on the same land area, as opposed to growing the same crop time after time (monoculture).

185 crop water use: Calculated or measured water used by plants, expressed in mm per day (inches per day). Same as ET_c except it is expressed as daily use only.

186 cross slope: Slope of a field, measured at right angles to the row direction, irrigation or drainage direction.

187 cross (sprinkler): Pipe fitting with four outlets or connections each 90 degrees apart.

188 crowning: The process of forming the surface of land into a series of broad, low ridges, separated by parallel field drains.

189 cumulative intake: The depth of water infiltrated into the soil from the time of initial water application to the specified elapsed time.

190 curve number: An index of the runoff potential which is related to the soil, land use and vegetation conditions of the site. Used in SCS (now the Natural Resources Conservation Service) Runoff Equation.

191 cut: Portion of land surface or area from which earth or rock has been removed or will be removed by excavation; the depth below original ground surface to excavated surface.

192 cut-and-fill: Process of earthmoving by excavating part of an area and using the excavated material for adjacent embankments or fill areas.

193 cutback irrigation: The reduction of the furrow or border inflow stream after water has advanced partially or completely through the field in order to reduce runoff.

194 cutback stream: Reducing surface irrigation inflow stream size (usually a half or a third) when a specified time period has elapsed or when water has advanced a designated distance down the furrow, corrugation or border.

195 cutoff:

- a. Wall, collar, or other subsurface structure such as a trench filled with relatively impervious material intended to reduce percolation of water along otherwise smooth surfaces, or through porous strata (see core trench and core wall).
- b. A channel formed by a stream breaking through the neck of an oxbow.

196 cutoff drain: (See interceptor drain.)

197 cutslope:

- a. The uphill side slope of a terrace channel.
- b. The exposed surface of an excavation.

198 cutthroat flume: Open-channel water flow measuring device that is part of a group of short-throated flumes that control discharge by achieving critical flow with curving streamlines through contraction. The flume is rectangular in cross section, has two main parts resembling a Parshall flume with the contracted throat removed or cut out (hence its name), and has a flat floor throughout. Calibrations depend on laboratory ratings.

199 dam: A barrier constructed across a waterway, channel, or valley to impede the flow of water, often to create a reservoir or impoundment.

200 Darcy's law: A concept formulated by Henry Darcy in 1856 to describe the rate of flow of water through porous media. The rate of flow of water in porous media is proportional to, and in the direction of, the hydraulic gradient and inversely proportional to the thickness of the bed.

201 day of year: Sequential numbering of days starting January 1 as day one and continuing until the end of the year, December 31, as day 365 or leap year day 366. (See Julian day, Julian date.)

202 daylight (colloquial): The extension of a subsurface grade line or pipe to the point where it exits the ground surface.

203 dead furrow: Empty furrow left when plowing. May be a single furrow when plowing in one direction or a double furrow when plowing in opposite directions.

204 debris basin: Surface reservoir designed to trap sediment and debris. (See sediment basin.)

205 debris cone: Fan-shaped deposit of debris including soil, sand, gravel, and boulders built up at the point where a mountain stream meets a valley, or where the velocity of a stream is reduced sufficiently to cause such deposits.

206 deep percolation: Water that moves downward through the soil profile below the root zone and cannot be used by plants.

207 deep percolation percentage: The ratio of the average depth of irrigation water infiltrated and drained out of the root zone to the average depth of irrigation water applied, expressed as a percentage.

208 deficit irrigation: An irrigation water management alternative where the soil in the plant root zone is not refilled to field capacity in all or part of the field.

209 delivery box (irrigation): Structure diverting water from a canal to a farm unit often including measuring devices. Also called "turnout."

210 delivery loss: (See conveyance loss.)

211 demand irrigation system: Irrigation water delivery procedure where each irrigator may request irrigation water in the amount needed and at the time desired.

212 depletion curve: Recession curve for soil water, streamflow, groundwater, etc., usually shown as a decay function with time.

213 deposition: Transported material deposited because of decreased transport capacity of water or wind.

214 depression storage: Water stored in surface depressions and therefore not contributing to surface runoff.

215 design application efficiency: Computed water application efficiency when water is applied at design rate and design time. (See water application efficiency.)

216 design runoff rate: Maximum runoff rate expected for a design storm event of given return period and duration.

217 desilting area: Vegetative area used to remove sediment and debris from flowing water. (Preferred term is filter strip, also buffer strip, vegetative buffer strip.)

218 detention dam: Dam constructed for the temporary storage of surface runoff and for releasing the stored water at controlled rates.

219 detention storage: Water in excess of depression storage which is temporarily stored in the watershed while en route to streams. Most eventually runs off but some may infiltrate or evaporate.

220 D_i size: The particle size diameter such that i% (by weight) of a granular material is of smaller diameter. Example: D₅₀ represents the particle size of the granular material where 50% (by weight) is smaller.

221 diameter of coverage: Average diameter of the area wetted by an irrigation sprinkler operating in still air.

222 diffuse springs: Natural springs in which flow is not concentrated at one outlet.

223 digestion: The microbial decomposition of organic matter under saturated conditions resulting in sludge that is a humus-like mass and somewhat stable. (Aerobic or anaerobic.)

224 dimension ratio: The ratio of the average pipe diameter to the minimum wall thickness. The pipe diameter may be either outside or inside diameter. Also standard dimension ratio (SDR).

225 dipper dredge: Excavating machine using a boom-type shovel.

226 discharge: Volume flux or flow rate of water, measured in units of volume per unit time. Discharge can be used to describe water flow in pipes, streams or groundwater.

227 discharge bay: Enlarged channel section for collecting the discharge of a pumping plant.

228 discharge coefficient: Ratio of observed flow to theoretical flow.

229 discharge curve: Rating curve showing the relationship between stage and volumetric flow rate of a stream, channel, or conduit. Also called "stage-discharge curve."

230 displacement meter: Meter that measures the quantity of flow by recording the number of times a container of known volume is filled and emptied. Used primarily for low flow measurement.

231 distributary:

- a. Small conduit or channel taking water from a canal for delivery to farms.
- b. Any system of secondary conduits.
- c. River channel flowing away from the mainstream and not rejoining it, as contrasted to a tributary.

232 distribution system: System of ditches, or conduits and their controls, which conveys water from the supply canal to the farm points of delivery.

233 distribution uniformity (DU): Measure of the uniformity of irrigation water distribution over a field.

234 distribution uniformity of low quarter: The ratio of the average of the lowest one-fourth of measurements of irrigation water infiltrated to the average depth of irrigation water infiltrated, expressed as a percent.

235 ditch storage: (See channel storage.)

236 diversion: A channel or ridge constructed across a slope to intercept surface runoff and direct it to a safe or convenient discharge point. Usually placed above the area to be protected.

237 diversion box: Structure built into a canal or ditch for dividing the water into predetermined portions and diverting it to other canals or ditches.

238 diversion dam: Barrier built in a stream for the purpose of diverting part or all of the water from the stream into a canal.

239 doctrine of appropriation: Water law developed in the arid Western states, where water supplies are limited and often inadequate (also known as the Appropriation Doctrine). This doctrine is essentially a rule of capture (first in time of use is first in right), where application of the water to a beneficial use is the basis and measure of the right.

240 double ditch or drain: (See w-ditch.)

241 double-main system: Gridiron layout of subsurface drains with two closely-spaced parallel main conduits.

242 drain: Any closed conduit (perforated tubing or tile) or open channel, used for removal of surplus ground or surface water.

243 drain inlet structure: (See surface inlet.)

244 drain plow: A machine with a vertical blade, chisel point, and shield or boot used to install corrugated plastic tubing or drain tile.

245 drain tile: Short length of pipe made of burned clay, concrete, or similar material, usually laid with open joints, to collect and remove subsurface water. Sometimes also used to mean "drain tubing."

246 drain tubing: Corrugated plastic tubing laid to collect and remove subsurface water.

247 drainage: Process of removing surface or subsurface water from a soil profile or area.

248 drainage basin: The area from which runoff is collected and delivered to an outlet; catchment; watershed.

249 drainage coefficient: Rate at which water is to be removed from a drainage area, expressed as depth per day or flow rate per unit of area. Sometimes called "drainage modulus."

250 drainage curves: Flow rate versus drainage area curves giving prescribed rates of runoff for different levels of crop protection.

251 drainage density: The length of perennial stream channel divided by the area of the watershed that it drains.

252 drainage pattern:

a. Arrangement of a system of surface or subsurface drains.

b. Arrangement of tributaries within a watershed.

253 drainage pumping plant: Pumps, power units, and appurtenances for lifting drainage water from a collecting basin to an outlet.

254 drainage system: Collection of surface and/or subsurface drains and canals, together with structures and pumps, used to remove surface or groundwater.

255 drainage well:

- a. A well pumped in order to lower water tables;
- b. Vertical shaft to a permeable substratum into which surface and subsurface drainage water is channeled (now illegal).

256 drawdown:

- a. Lowering of the water surface, water table, or piezometric surface resulting from the withdrawal of water from a well or drain or principal spillway;
- b. The elevation of the static water level in a well minus the elevation of the pumping water level (at the well) at a given discharge rate. (See cone of depression.)

257 drip irrigation: A method of microirrigation wherein water is applied to the soil surface as drops or small streams through emitters. Discharge rates are generally less than 8 L/h (2 gal/h) for single-outlet emitters and 12 L/h (3 gal/h) per meter for line-source emitters.

258 drop spillway: Overfall hydraulic structure in which the water drops over a vertical wall onto an apron.

259 drop structure: Hydraulic structure for safely transferring water in a channel to a lower level channel without causing erosion.

260 drop-inlet spillway: Overfall hydraulic structure in which water is discharged through a vertical riser conduit that leads to a horizontal conduit. Sometimes called a “pipe drop structure.”

261 duty of water: (See crop irrigation requirement.)

262 dynamic head: Specific energy in a flow system.

263 effective precipitation: That portion of total precipitation which becomes available for plant growth.

264 effective rainfall: (See effective precipitation.)

265 effective rooting depth: The depth from which roots extract water.

266 effluent irrigation: Land application of wastewater for irrigation and beneficial use of nutrients.

267 effluent stream: (See gaining stream.)

268 electrical conductivity (EC): A measure of the ability of the water to transfer an electrical charge. Used as an indicator for the estimation of salt concentration, measured in dS/m (mmhos/cm), at 25 °C (77 °F).

- a. EC_e = Electrical conductivity of soil water extract.
- b. EC_i = Electrical conductivity of irrigation water.
- c. EC_{aw} = Electrical conductivity of applied water.

269 electrical resistance block: Small block consisting of electrodes set in an absorbent material, such as gypsum, used to estimate soil water content.

270 elevation head: Energy possessed by a fluid due to its position above some datum.

271 emission point: The location where water is discharged from an emitter.

272 emission uniformity: An index of the uniformity of emitter discharge rates throughout a microirrigation system. Takes account of both variations in emitters and variations in the pressure under which they operate.

273 emitter: A small microirrigation dispensing device designed to dissipate pressure and discharge a small uniform flow or trickle of water at a constant discharge, which does not vary significantly because of minor differences in pressure head. Also called a “dripper” or “trickler.”

a. compensating emitter: Designed to discharge water at a constant rate over a wide range of lateral line pressures.

b. continuous flushing emitter: Designed to continuously permit passage of large solid particles while operating at a trickle or drip flow thus reducing filter fineness requirements.

c. flushing emitter: Designed to have a flushing flow of water to clear the discharge opening every time the system is turned on.

d. line-source emitter: Water is discharged from closely spaced perforations, emitters, or a porous wall along the tubing.

e. long path emitter: Employs a long capillary sized tube or channel to dissipate pressure.

f. multi-outlet emitter: Supplies water to two or more points through small diameter auxiliary tubing.

g. orifice emitter: Employs a series of orifices to dissipate pressure.

h. vortex emitter: Employs a vortex effect to dissipate pressure.

274 energy grade line (EGL): A graphical representation of the kinetic head of water flowing in a pipe, conduit or channel. The line is plotted above the hydraulic grade line a distance equal to the velocity head ($V^2/2g$) of the water flowing at each section or point along the pipe or channel line. (See energy gradient, hydraulic grade line (HGL), and hydraulic gradient.)

275 energy gradient: The energy gradient is the slope of the energy grade line (See energy grade line (EGL), hydraulic grade line (HGL), hydraulic gradient).

276 entrance head: Head required to establish flow into a conduit or structure.

277 entrance loss: Energy lost in eddies and friction at the inlet to a conduit or structure.

278 envelope filter: Granular material or geotextile fabric which surrounds a subsurface pipe drain to prevent soil inflow and enhance water entry.

279 environmental control: Controlling air temperature and humidity or soil water conditions to minimize effects of low and high air temperatures on crop quality and quantity.

280 ephemeral gully: Small channels eroded by runoff which can be easily filled and removed by normal tillage, only to reform again in the same location.

281 equalizing ditch: Secondary ditch, usually parallel to a field ditch, used to furnish irrigation water to two or more furrows.

282 erodibility: (See soil erodibility.)