

**GLOSSARY OF TERMS**

The definitions in this Glossary are for use with this Chapter and the references cited. They are not necessarily definitions as established by case or statutory law.

<u>Acre-Foot:</u>	A unit of measurement for volume of water. It is equal to the quantity of water required to cover one acre to a depth of one foot and is equal to 43,560 cubic feet or 325,851 gallons. The term is commonly used in measuring volumes of water used or stored.
<u>Annual Flood:</u>	The highest peak discharge in a water year.
<u>Antecedent Precipitation Index:</u>	An index of moisture stored within a drainage basin before a storm (Linsley and others, 1949, p. 414).
<u>Area-Capacity Curve:</u>	A graph showing the relation between the surface area of the water in a reservoir and the corresponding volume.
<u>Average Discharge:</u>	In the annual series of the Geological Survey's reports on surface water supply, the arithmetic average of all complete water years of record, whether or not they are consecutive. Average discharge is not published for less than five years of record. The term "average" is generally reserved for averages of record and "mean" is used for averages of shorter periods, namely, daily mean discharge.
<u>Backwater:</u>	An unnaturally high stage in a stream caused by obstruction or confinement of flow, as by a dam, bridge, or levee. Its measure is the excess of unnatural over natural stage, not the difference in stage upstream and downstream from its cause.
<u>Bank:</u>	The lateral boundary of a stream confining water flow. The bank on the left side of a channel looking downstream is called the left bank, etc.
<u>Bank Storage:</u>	The water absorbed into the banks of a stream channel when the stages rise above the water table in the bank formations, then returns to the channel as effluent seepage when the stages fall below the water table (After Houk, 1951, p. 179.).
<u>Base Flow:</u>	See "Base Runoff."
<u>Base Runoff:</u>	Sustained or fair-weather runoff. In most streams, base runoff is composed largely of groundwater effluent (Langbein and others, 1947, p. 6). The term "base flow" is often used in the same sense as base runoff. However, the distinction is the same as that between stream flow and runoff. When the concept in the terms "base flow" and base runoff is that of the natural flow in a stream, base runoff is the logical term (also see "Groundwater Runoff" and "Direct Runoff").
<u>Bulking:</u>	The increase in volume of flow due to air entrainment, debris, bedload, or sediment in suspension.
<u>Capacity:</u>	The effective carrying ability of a drainage structure. Generally measured in cubic feet per second.
<u>Catch Basin:</u>	A drainage structure that collects water. May be either a structure where water enters from the side or through a grating.
<u>Cfs:</u>	Abbreviation of cubic feet per second.
<u>Cfs-Day:</u>	The volume of water represented by a flow of one cubic foot per second for 24 hours. It equals 86,400 cubic feet, 1.983471 acre-feet, or 646,317 gallons.
<u>Cfsm (cubic feet per second per square mile):</u>	The average number of cubic feet of water per second flowing from each square mile of area drained by a stream, assuming that the runoff is distributed uniformly in time and area.
<u>Channel Storage:</u>	The volume of water at a given time in the channel or over the floodplain of the streams in a drainage basin or river reach. Channel storage is great during the progress of a flood event (see Horton, 1935, p. 3).
<u>Coefficient Runoff:</u>	Percentage of gross rainfall that appears as runoff.
<u>Concentrated Flow:</u>	Flowing water that has been accumulated into a single, fairly narrow stream.
<u>Concentration:</u>	In addition to its general sense, means the unnatural collection or convergence of waters so as to discharge in a narrower width and at greater depth or velocity.

<u>Control:</u>	A natural constriction of the channel, a long reach of the channel, a stretch of rapids, or an artificial structure downstream from a gaging station that determines the stage-discharge relation at the gage. That section which determines the stage for a particular reach of a drainage system.
<u>Critical Depth</u> (depth at which specific energy is a minimum):	The depth of water in a conduit at which under certain other conditions the maximum flow will occur. These other conditions are when the conduit is on the critical slope with the water flowing at its critical velocity and when there is an adequate supply of water. The depth of water flowing in an open channel or a conduit partially filled for which the velocity head equals one-half the hydraulic mean depth.
<u>Critical Flow:</u>	A condition that exists at the critical depth. Under this condition, the sum of the velocity head and static head is a minimum.
<u>Critical Slope:</u>	That slope at which the maximum flow will occur at the minimum velocity. The slope or grade that is exactly equal to the loss of head per foot resulting from flow at a depth that will give uniform flow at critical depth; the slope of a conduit that will produce critical flow.
<u>Critical Velocity:</u>	Mean velocity of flow when flow is at critical depth.
<u>Cubic Feet Per Second:</u>	A unit expressing rates of discharge. One cubic foot per second is equal to the discharge of a stream of rectangular cross section, one foot wide and one foot deep, flowing water an average velocity of one foot per second.
<u>Culvert:</u>	A closed conduit, other than a bridge, that allows water to pass under a highway. A culvert has a span of 20 feet or less as measured between the interior walls of the outside bents.
<u>Depression Storage:</u>	The volume of water contained in natural depressions in the land surface, such as puddles (After Horton, 1935, p. 2).
<u>Design Discharge:</u>	The quantity of flow that is expected at a certain point as a result of a design storm. Usually expressed as a rate of flow in cubic feet per second.
<u>Design Frequency:</u>	The recurrence interval for hydrologic events used for design purposes. As an example, a design frequency of 50 years means a storm of a magnitude that would be expected to recur on the average of once every 50 years.
<u>Design Storm:</u>	That particular storm that contributes runoff that the drainage facilities were designed to handle. This storm is selected for design on the basis of its probable recurrence; i.e., a 50-year design storm would be a storm for which its maximum runoff would occur on the average of once every 50 years.
<u>Direct Runoff:</u>	The runoff entering stream channels promptly after rainfall or snowmelt. Superposed on base runoff, it forms the bulk of the hydrograph of a flood. Also see "Surface Runoff." The terms base runoff and direct runoff are time classifications of runoff. The terms groundwater runoff and surface runoff are classifications according to source.
<u>Discharge:</u>	A volume of water flowing out of a drainage structure or facility. Measured in cubic feet per second.
<u>Discharge Rating Curve:</u>	See "Stage-Discharge Relation."
<u>Drainage:</u>	(1) The process of removing surplus groundwater or surface water by artificial means. (2) The system by which the waters of an area are removed. (3) The area from which waters are drained; a drainage basin.
<u>Drainage Area</u> (Drainage Basin) (Basin):	That portion of the earth's surface upon which falling precipitation flows to a given location. With respect to a highway, this location may be either a culvert, the farthest point of a channel, or an inlet to a roadway drainage system.
<u>Drainage Divide:</u>	The rim of a drainage basin. A series of high points from which water flows in two directions, into the basin and away from the basin.
<u>Drainage System:</u>	Usually a system of underground conduits and collector structures that flow to a single point of discharge.
<u>Eddy Loss:</u>	The energy lost (converted into heat) by swirls, eddies, and impact, as distinguished from friction loss.

Effective Precipitation - (rainfall):

(1) That part of the precipitation that produces runoff. (2) A weighted average of current and antecedent precipitation that is "effective" in correlating with runoff. (3) As described by U.S. Bureau of Reclamation (1952, p. 4), that part of the precipitation falling on an irrigated area that is effective in meeting the consumptive use requirements.

Energy Grade Line:

A hydraulic term used to define a line representing the total amount of energy available at any point along a watercourse, pipe, or drainage structure. Where the water is motionless, the water surface would coincide with the point or the energy grade line. As the flow of water is accelerated, the water surface drops further away from the energy grade line. If the flow is stopped at any point, the water surface jumps back to the energy grade line.

Energy Head:

The elevation of the hydraulic grade line at any section plus the velocity head of the mean velocity of the water in that section.

Entrance Head:

The head required to cause flow into a conduit or other structure. It includes both entrance loss and velocity head.

Entrance Loss:

The head lost in eddies and friction at the inlet to a conduit or structure.

Equalizer:

A drainage structure similar to a culvert but different in that it is not intended to pass a design flow in a given direction. Instead, it is often placed level so as to permit passage of water in either direction. It is generally used where there is no place for the water to go. Its purpose is to maintain the same water surface elevation on both sides of the highway embankment.

Evaporation:

A process whereby water as a liquid is changed into water vapor through heat supplied by the sun.

Flood-Frequency Curve:

(1) A graph showing the number of times per year on the average, plotted as abscissa, that floods of magnitude, indicated by the ordinate, are equaled or exceeded. (2) A similar graph but with recurrence intervals of floods plotted as abscissa (see Dalrymple, 1960).

Flood Peak:

The highest value of the stage or discharge attained by a flood, thus peak stage or peak discharge. Flood crest has nearly the same meaning, but since it connotes the top of the flood wave, it is properly used only in referring to stage, thus crest stage but not crest discharge.

Floodplain:

Strip of land adjacent to a river or channel that has a history of overflow.

Flood Profile:

A graph of elevation of the water surface of a river in flood, plotted as ordinate, against distance, measured in the downstream direction, plotted as abscissa. A flood profile may be drawn to show elevation at a given time, crests during a particular flood, or to show stages of concordant flows.

Flood Routing:

The process of determining progressively the timing and shape of a flood wave at successive points along a river (see Carter and Godfrey, 1960).

Flood Stage:

The elevation at which overflow of the natural banks of a stream begins to cause damage in the reach in which the elevation is measured.

Flow Line:

A term used to describe the line connecting the low points in a watercourse.

Freeboard :

The distance between the normal operating level and the top of the sides of an open conduit; the crest of a dam, etc., designed to allow for wave action, floating debris, or any other condition or emergency, without overtopping the structure.

Flow-Duration Curve:

A cumulative frequency curve that shows the percentage of time that specified discharges are equaled or exceeded.

Free Outlet:

A condition under which water discharges with no interference such as a pipe discharging into open air.

Gage Height:

The water surface elevation referred to some arbitrary gage datum. Gage height is often used interchangeably with the more general term stage, although gage height is more appropriate when used with a reading on a gage.

Gaging Station:

A particular site on a stream, canal, lake, or reservoir where systematic observations of gage height or discharge are obtained (also see "Stream Gaging Station").

Grade to Drain:

A construction note often inserted on a plan for the purpose of directing the contractor to slope a certain area in a specific direction so that the storm waters will flow to a designated location.

<u>Gradient (Slope):</u>	The rate of ascent or descent, expressed as a percent or as a decimal as determined by the ratio of the change in elevation to the length.
<u>Groundwater Runoff :</u>	That part of the runoff that passed into the ground, has become groundwater, and has been discharged into a stream channel as spring or seepage water (also see "Base Runoff" and "Direct Runoff").
<u>Head:</u>	When used as a hydraulic term, this represents an available force equivalent to a certain depth of water. This is the motivating force in effecting the movement of water. The height of water above any point or plane of reference. Used also in various compound expressions, such as energy head, entrance head, friction head, static head, pressure head, lost head, etc.
<u>Hydraulic Gradient:</u>	A line which represents the relative force available due to the potential energy available. This is a combination of energy due to the height of the water and the internal pressure. In any open channel, this line corresponds to the water surface. In a closed conduit, if several openings were placed along the top of the pipe and open tubes inserted, a line connecting the water surface in each of these tubes would represent the hydraulic grade line.
<u>Hydraulic Jump (or Jump):</u>	Transition of flow from the rapid to the tranquil state. A varied flow phenomenon producing a rise in elevation of water surface. A sudden transition from supercritical flow to the complementary subcritical flow, conserving momentum and dissipating energy.
<u>Hydraulic Mean Depth:</u>	The area of the flow cross section divided by the water surface width.
<u>Hydraulic Radius:</u>	The cross-sectional area of a stream of water divided by the length of that part of its periphery in contact with its containing conduit; the ratio of area to wetted perimeter.
<u>Hydrograph:</u>	A graph showing stage, flow, velocity, or other properties of water with respect to time.
<u>Hydrography:</u>	Water surveys. The art of measuring, recording, and analyzing the flow of water, and of measuring and mapping watercourses, shorelines, and navigable waters.
<u>Hydrology:</u>	The science dealing with the occurrence and movement of water upon and beneath the land areas of the earth. Overlaps and includes portions of other sciences such as meteorology and geology. The particular branch of hydrology that a drainage section is generally interested in is surface runoff that is the result of excessive precipitation.
<u>Hyetograph:</u>	Graphical representation of rainfall intensity against time.
<u>Infall:</u>	Point of entrance into a storm sewer system through an apron endwall or pipe opening.
<u>Infiltration:</u>	The passage of water through the soil surface into the ground.
<u>Infiltration Capacity:</u>	The maximum rate at which the soil, when in a given condition, can absorb falling rain or melting snow (After Horton, 1935, p. 2).
<u>Infiltration Index:</u>	An average rate of infiltration, in inches per hour, equal to the average rate of rainfall such that the volume of rainfall at greater rates equals the total direct runoff (Langbein and others, 1947, p. 11).
<u>Inlet Time (i.e., Time of Concentration):</u>	The time required for storm runoff to flow from the most remote point, in flow time, of a drainage area to the point where it enters a drain or culvert.
<u>Interception:</u>	The process and the amount of rain or snow stored on leaves and branches and eventually evaporated back to the air. Interception equals the precipitation on the vegetation minus stemflow and throughfall (after Hoover, 1953, p. 1).
<u>Invert:</u>	The bottom of a drainage facility along which the lowest flows would pass.
<u>Isohyetal Line:</u>	A line drawn on a map or chart joining points that receive the same amount of precipitation.
<u>Isohyetal Map:</u>	A map containing isohyetal lines and showing rainfall intensities.
<u>Isovel:</u>	Line on a diagram of a channel connecting points of equal velocity.
<u>Lag:</u>	Variously defined as time from beginning (or center of mass) of rainfall to peak (or center of mass) of runoff.
<u>Laminar Flow:</u>	That type of flow in which each particle moves in a direction parallel to every other particle and in which the head loss is approximately proportional to the velocity (as opposed to turbulent flow).
<u>Mass Curve:</u>	A graph of the cumulative values of hydrologic quantity (such as precipitation or runoff), generally as ordinate, plotted against time or date as abscissa (see "Double-Mass Curve" and "Residual-Mass Curve").

<u>Mean Velocity:</u>	Average velocity within a cross section.
<u>Meander:</u>	The winding of a stream channel.
<u>Normal:</u>	A central value (such as arithmetic average or median) of annual quantities for a 30-year period ending with an even 10-year period, thus 1921-50, 1931-60, and so forth. This definition accords with that recommended by the Subcommittee on Hydrology of the Federal Inter-Agency Committee on Water Resources.
<u>Normal Depth:</u>	The depth at which flow is steady and hydraulic characteristics are uniform.
<u>Outfall:</u>	Discharge or point of discharge of a culvert or other closed conduit.
<u>Partial-Duration Flood Series:</u>	A list of all flood peaks that exceed a chosen base stage or discharge, regardless of the number of peaks occurring in a year (also called basic stage flood series or floods above a base).
<u>Peak Flow:</u>	Maximum momentary stage or discharge of a stream in flood. Design discharge.
<u>Perched Water:</u>	Groundwater located above the level of the water table and separated from it by a zone of impermeable material.
<u>Percolating Waters:</u>	Waters that have infiltrated the surface of the land and moved slowly downward and outward through devious channels (aquifers) unrelated to stream waters until they reach an underground lake or regain and spring from the land surface at a lower point.
<u>Permeability:</u>	The property of soils that permits the passage of any fluid. Permeability depends on grain size, void ratio, shape, and arrangement of pores.
<u>Point of Concentration:</u>	That point at which the water flowing from a given drainage area concentrates. With reference to a highway, this would generally be either a culvert entrance or some point in a roadway drainage system.
<u>Potamology:</u>	The hydrology of streams.
<u>Precipitation:</u>	Rainfall, snow, sleet, fog, dew, and frost.
<u>Rainfall:</u>	Point Precipitation: That which registers at a single gauge. Area Precipitation: Adjusted point rainfall for area size.
<u>Rainfall Excess:</u>	The volume of rainfall available for direct runoff. It is equal to the total rainfall minus interception, depression storage and absorption (see American Society of Civil Engineers, 1949, p. 106).
<u>Rainfall, Excessive:</u>	Rainfall in which the rate of fall is greater than certain adopted limits, chosen with regard to the normal precipitation (excluding snow) of a given place or area. In the U.S. Weather Bureau, it is defined for states along the southern Atlantic Coast and the Gulf Coast as rainfall in which the depth of precipitation is 0.90 inch at the end of 30 minutes and 1.50 inches at the end of an hour, and for the rest of the country as rainfall in which the depth of precipitation at the end of each of the same periods is 0.50 inch and 0.80 inch, respectively.
<u>Reach:</u>	The length of a channel uniform with respect to discharge, depth, area, and slope. More generally, any length of a river or drainage course.
<u>Recession Curve:</u>	A hydrograph showing the decreasing rate of runoff following a period of rain or snowmelt. Since direct runoff and base runoff recede at different rates, separate curves, called direct runoff recession curves or base runoff recession curves, are generally drawn. The term "depletion curve" in the sense of base runoff recession is not recommended.
<u>Recurrence Interval (return period):</u>	The average interval of time within which the given flood will be equaled or exceeded once (American Society of Civil Engineers, 1953, p. 1221).
<u>Regimen:</u>	The characteristic behavior of a stream during ordinary cycles of flow.
<u>Runoff:</u>	The portion of precipitation that appears as flow in streams. Drainage or flood discharge which leaves an area as surface flow or as pipeline flow, having reached a channel or pipeline by either surface or subsurface routes, and includes underflow in some cases.
<u>Scour:</u>	Wearing of the bed of a stream by entrainment of alluvium and erosion of native rock. Also caused by excessive velocities at the entrance of a concentrated stream of water onto unstable material. Wearing away by abrasive action.
<u>Second-Foot:</u>	Same as cfs. This term is no longer used in published reports of the U.S. Geological Survey.

<u>Silt:</u>	(1) Water-Borne Sediment: Detritus carried in suspension or deposited by flowing water, ranging in diameter from 0.0002 to 0.002 inch. The term is generally confined to fine earth, sand, or mud, but is sometime's broadened to include all material carried, including both suspended and bed load. (2) Deposits of Water-Borne Material: As in a reservoir, on a delta, or on floodplains.
<u>Skew:</u>	When a drainage structure is not normal (perpendicular) to the longitudinal axis of the highway, it is said to be on a skew. The skew angle is the smallest angle between the perpendicular and the axis of the structure.
<u>Slope:</u>	(1) Gradient of a stream. (2) Inclination of the face of an embankment, expressed as the ratio of horizontal to vertical projection. (3) The face of an inclined embankment or cut slope. In hydraulics it is expressed as percent or in decimal form.
<u>Slugflow :</u>	Flow in culvert or drainage structure that alternates between full and partly full. Pulsating flow--mixed water and air.
<u>Soffit:</u>	The bottom of the top - (1) With reference to a bridge, the low point on the underside of the suspended portion of the structure. (2) In a culvert, the uppermost point on the inside of the structure.
<u>Specific Energy:</u>	The energy of a stream referred to its bed, namely, depth plus velocity head of mean velocity.
<u>Stage:</u>	The elevation of a water surface above its minimum; also above or below an established "low water" plane; hence above or below any datum of reference; gage height.
<u>Stage-Capacity Curve:</u>	A graph showing the relation between the surface elevation of the water in a reservoir, usually plotted as ordinate, against the volume below that elevation, plotted as abscissa.
<u>Stage-Discharge Curve (rating curve):</u>	A graph showing the relation between the gage height, usually plotted as ordinate, and the amount of water flowing in a channel, expressed as volume per unit of time, plotted as abscissa.
<u>Storage:</u>	Detention or retention of water for future flow, naturally in channel and marginal soils or artificially in reservoirs.
<u>Storage Basin:</u>	Space for detention or retention of water for future flow, naturally in channel and marginal soils or artifically in reservoirs.
Relation to time:	
<u>Perennial:</u>	One that flows continuously.
<u>Intermittent or Seasonal:</u>	One that flows only at certain times of the year when it receives water from springs or from some surface source, such as melting snow in mountainous areas.
<u>Ephemeral:</u>	One that flows only in direct response to precipitation and whose channel is above the water table at all times.
Relation to space:	
<u>Continuous:</u>	One that does not have interruptions in space.
<u>Interrupted:</u>	One that contains alternating reaches that are either perennial, intermittent, or ephemeral.
Relation to groundwater:	
<u>Gaining:</u>	A stream or reach of a stream that receives water from the zone of saturation.
<u>Losing:</u>	A stream or reach of a stream that contributes water to the zone of saturation.
<u>Insulated:</u>	A stream of reach of a stream that neither contributes water to the zone of saturation nor receives water from it. It is separated from the zones of saturation by an impermeable bed.
<u>Perched:</u>	A perched stream is either a losing stream or an insulated stream that is separated from the underlying groundwater by a zone of saturation.
<u>Stream Gaging:</u>	The process and art of measuring the depths, areas, velocities, and rates of flow in natural or artificial channels (see Corbett and others, 1943).
<u>Stream Gaging Station:</u>	A gaging station where a record of discharge of a stream is obtained. Within the Geological Survey this term is used only for those gaging stations where a continuous record of discharge is obtained.
<u>Subcritical Flow:</u>	Flow with a velocity head less than half the hydraulic mean depth of water.

<u>Supercritical Flow:</u>	Flow with a velocity head more than half the hydraulic mean depth of the water.
<u>Surface Runoff:</u>	The movement of water on the earth's surface, whether flow is over surface of ground or in channels.
<u>Tapered Inlet:</u>	A transition to direct the flow of water into a channel or culvert. A smooth transition to increase hydraulic efficiency of an inlet structure.
<u>Time of Concentration:</u>	The time required for storm runoff to flow from the most remote point, in flow time, of a drainage area to the point under consideration. It is usually associated with the design storm (see Inlet Time).
<u>Total Storage:</u>	The volume of reservoir below the maximum controllable level, including dead storage (Thomas and Harbeck, 1956, p. 13).
<u>Trunk (or Trunk Line):</u>	In a roadway drainage system, the main conduit for transporting the storm waters. This main line is generally quite deep in the ground so that laterals coming from fairly long distances can drain by gravity into the trunk line.
<u>Turbulent Flow:</u>	That type of flow in which any particle may move in any direction with respect to any other particle, and in which the head loss is approximately proportional to the square of the velocity.
<u>Unit Hydrograph:</u>	The hydrograph of direct runoff from a storm uniformly distributed over the drainage basin during a specified unit of time; the hydrograph is reduced in vertical scale to correspond to a volume of runoff of one inch from the drainage basin (after American Society of Civil Engineer, 1949, p. 105). The hydrograph of surface runoff (not including groundwater runoff) on a given basin due to an effective rain falling for a unit of time (Sherman, 1949, p. 514) (also see Hoyt and others, 1936, p. 124).
<u>Velocity Head:</u>	A term used in hydraulics to represent the kinetic energy of flowing water. This "head" is represented by a column of standing water equivalent in potential energy to the kinetic energy of the moving water calculated as $V^2/2g$ , where "V" represents velocity in feet per second and "g" represents potential acceleration due to gravity in feet per second per second.
<u>Watershed:</u>	The area drained by a stream or stream system.
<u>Water Year:</u>	In Geological Survey reports dealing with surface water supply, the 12-month period, October 1 through September 30. The water year is designated by the calendar year in which it ends and which includes nine of the 12 months. Thus, the year ended September 30, 1959, is called the "1959 water year."