9. GLOSSARY

Glossary [1]

ACCURACY Degree of conformity of a measure to a standard or true value.

ACTIVE BED The active bed is the layer of material between the bed surface and a hypothetical depth at which no transport will occur for the given gradation of bed material and flow conditions. See also, ACTIVE LAYER.

ACTIVE LAYER The depth of material from bed surface to equilibrium depth continually mixed by the flow, but it can have a surface of slow moving particles that shield the finer particles from being entrained by the flow. See Figure B-1.

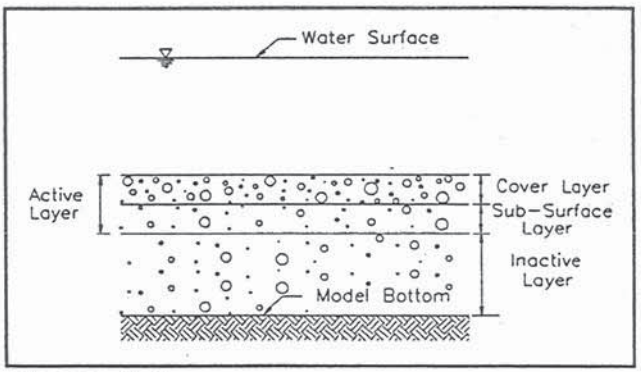

Figure B-1
Composition of the Active Layer

AGGRADATION The geologic process by which stream beds, floodplains, and the bottoms of other water bodies are raised in elevation by the deposition of material eroded and transported from other areas. It is the opposite of degradation.

ALGORITHM A procedure for solving a mathematical problem in a finite number of steps that frequently involves repetition of an operation. A step by step procedure for solving a problem or accomplishing an end. A set of numerical steps or routines to obtain a numerical output from a numerical input.

ALLUVIAL Pertains to alluvium deposited by a stream or flowing water.

ALLUVIAL DEPOSIT Clay, silt, sand, gravel, or other sediment deposited by the action of running or receding water.

ALLUVIAL FAN An outspread, gently sloping mass of alluvium deposited by a stream flowing from a narrow canyon onto a plain or valley floor. Viewed from above, it has the shape of an open fan, the apex being at the valley mouth.

ALLUVIAL REACH A reach of river with a sediment bed composed of the same type of sediment material as that moving in the stream.

ALLUVIAL STREAM A stream whose channel boundary is composed of appreciable quantities of the sediments transported by the flow, and which generally changes its bed forms as the rate of flow changes.

ALLUVIUM A general term for all detrital deposits resulting directly or indirectly from the sediment transported by (modern) streams, thus including the sediments laid down in riverbeds, floodplains, lakes, fans, and estuaries.

ANTICLINE A fold, generally convex upward, whose core contains the stratigraphically older rocks.

ARMOR LAYER See ARMORING.

ARMORING The process of progressive coarsening of the bed layer by removal of fine particles until it becomes resistant to scour. The coarse layer that remains on the surface is termed the "armor layer". Armoring is a temporary condition; higher flows may destroy an armor layer and it may re-form as flows

1 Modified from USACOE, "Application of Methods and Models for Prediction of Land Surface Erosion and Yield," 1995.

decrease. Or simply, the formation of a resistant layer of relatively large particles resulting from removal of finer particles by erosion.

AVERAGE ANNUAL QUANTITY The average volume or mass of sediment which passes a specified point over a one year period.

AVERAGE END CONCEPT The averaging of the two end cross sections of a reach in order to smooth the numerical results.

BACKWATER PROFILE Longitudinal profile of the water surface in a stream where the water surface is raised above its normal level by a natural or artificial obstruction.

BANK SEDIMENT RESERVOIR The portion of the alluvium on the sides of a channel. See Figure B-2. (Note: HEC-6 only uses the BED SEDIMENT RESERVOIR as the source-sink of material.)

BASE LEVEL The theoretical limit on lowest level at which a stream is neither aggrading or degrading.

BED FORMS Irregularities found on the bottom (bed) of a stream that are related to flow characteristics. They are given names such as "dunes", "ripples", and "antidunes". They are related to the transport of sediment and interact with the flow because they change the roughness of the stream bed. An analog to stream bed forms are desert sand dunes (although the physical mechanisms for their creation and movement may be different).

BED LAYER An arbitrary term used in various procedures for computation of sediment transport. From observation of slow motion movies of laboratory flume experiments, H. Einstein defined the "bed layer" as: "A flow layer, 2 grain diameters thick, immediately above the bed. The thickness of the bed layer varies with the particle size."

BED LOAD Material moving on or near the stream bed by rolling, sliding, and sometimes making brief excursions into the flow a few diameters above the bed, i.e. jumping. The term "saltation" is sometimes used in place of "jumping". Bed load is bed material that moves in continuous contact with the bed; contrast with SUSPENDED LOAD.

BED LOAD DISCHARGE The quantity of bed load passing a cross section in a unit of time, i.e. the rate. Usually presented in units of tons per day. May be measured or computed. See BED LOAD.

BED MATERIAL The sediment mixture of which the moving bed is composed. In alluvial streams, bed material particles are likely to be moved at any moment or during some future flow condition. Bed material consists of both bed load and suspended load. Contrast with WASH LOAD.

BED MATERIAL DISCHARGE The total rate (tons/day) at which bed material (see BED MATERIAL) is transported by a given flow at a given location on a stream.

BED MATERIAL LOAD The total rate (tons/day) at which bed material is transported by a given location on a stream. It consists of bed material moving both as bed load and suspended load. Contrast with WASH LOAD.

BEDROCK A general term for the rock, usually solid, that underlies soil or other unconsolidated, bed material.

BED SEDIMENT CONTROL VOLUME The source-sink component of sediment sources in a river system (the other component is the

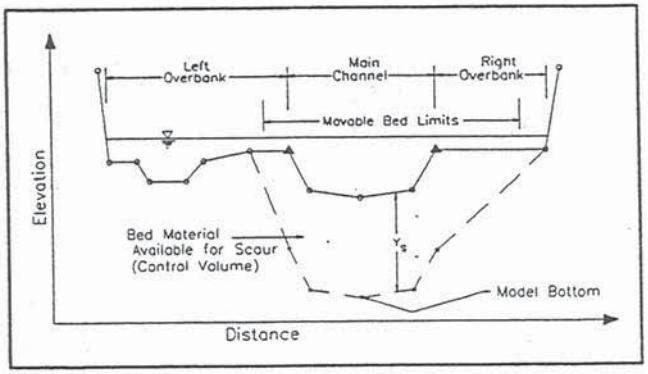

Figure B-2
Sediment Material in the Streambed

suspended sediment in the inflowing discharge). Its user-defined dimensions are the movable bed width and depth, and the average reach length.

BIFURCATION A forking or division into two branches.

BLOCK/SLAB FAILURE Failure by gravity of a coherent mass of material by vertical fall or topple where the underlying support has been removed (in this case, where a bank has been undercut by a stream channel).

BOUNDARY CONDITIONS Definition or statement of conditions or phenomena at the boundaries. Water surface elevations, flows, sediment concentrations, etc., that are specified at the boundaries of the area being modeled. The downstream water surface elevation and the incoming upstream water and sediment discharges are the standard HEC-6 boundary conditions.

BOUNDARY ROUGHNESS The roughness of the bed and banks of a stream or river. The greater the roughness, the greater the frictional resistance to flows; and, hence, the greater the water surface elevation for any given discharge.

BRAIDED CHANNEL A stream that is characterized by random interconnected channels divided by islands or bars. Bars which divide the stream into separate channels at low flows are often submerged at high flow.

CHANNEL A natural or artificial waterway which periodically or continuously contains moving water.

CHANNEL INVERT The lowest point in the channel.

CHANNEL STABILIZATION A stable channel is neither progressively aggrading nor degrading, or changing its cross-sectional area through time. It could aggrade or degrade slightly, but over the period of a year, the channel would remain similar in shape and dimensions and position to previous times. Unstable channels are depositing or eroding in response to some exterior conditions. Stabilization techniques consist of bank protection and other measures that work to transform an unstable channel into a stable one.

CHUTE A narrow channel through which water flows rapidly.

CLAY See Table B-1.

CLASTIC Pertaining to a rock or sediment composed principally of fragments derived from pre-existing rocks or minerals and transported some distance from their places of origin.

COBBLES See Table B-1.

Table B-1[1]
Scale for Size Classification of Sediment Particles

Class Name	Millimeters	Feet	PHI Value
Boulders	> 256	--	< -8
Cobbles	256 - 64	--	-8 to -6

[1] Portions of Table B-1 are taken from EM 1110-2-4000, March 1988.

Very Coarse Gravel	64 - 32	.148596	-6 to -5
Coarse Gravel	32 - 16	.074216	-5 to -4
Medium Gravel	16 - 8	.037120	-4 to -3
Fine Gravel	8 - 4	.018560	-3 to -2
Very Fine Gravel	4 - 2	.009279	-2 to -1
Very Coarse Sand	2.0 - 1.0	.004639	-1 to 0
Coarse Sand	1.0 - 0.50	.002319	0 to +1
Medium Sand	0.50 - 0.25	.001160	+1 to +2
Fine Sand	0.25 - 0.125	.000580	+2 to +3
Very Fine Sand	0.125 - 0.0625	.000288	+3 to +4
Coarse Silt	0.0625 - 0.031	.000144	+4 to +5
Medium Silt	0.031 - 0.016	.000072	+5 to +6
Fine Silt	0.016 - 0.008	.000036	+6 to +7
Very Fine Silt	0.008 - 0.004	.000018	+7 to +8
Coarse Clay	0.004 - 0.0020	.000009	+8 to +9
Medium Clay	0.0020 - 0.0010	–	+9 to +10
Fine Clay	0.0010 - 0.0005	–	+10 to +11
Very Fine Clay	0.005 - 0.00024	–	+11 to +12
Colloids	<0.00024	–	> +12

COHESIVE SEDIMENTS Sediments whose resistance to initial movement or erosion is affected mostly by cohesive bonds between particles.

COLLUVIUM A general term applied to loose and incoherent deposits on hill slopes.

COMPUTATIONAL HYDROGRAPH A sequence of discrete steady flows, each having a specified duration in days, is used to represent the continuous discharge hydrograph. This is done to minimize the number of time steps needed to simulate a given time period, and, thus minimize computer time. See Figure B-3.

CONCAVE BANK The bank on the outside of a bendway.

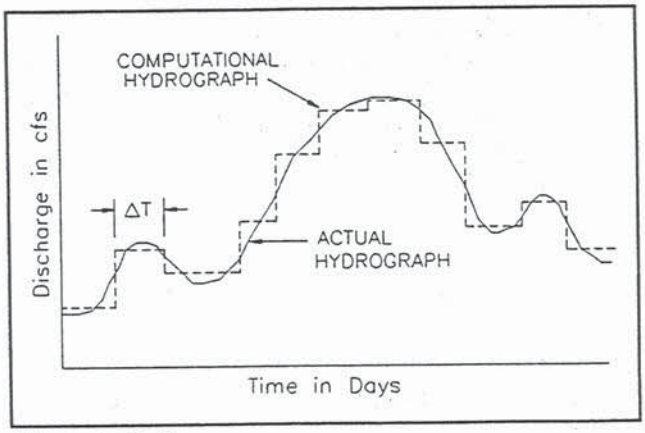

Figure B-3
Computational Hydrograph

CONCENTRATION OF SEDIMENT The dry weight of sediment per unit volume of water-sediment mixture, i.e. mg/ℓ. (Note: In earlier writings, concentration was calculated as the ratio of the dry weight of sediment in a water-sediment mixture to the total weight of the mixture multiplied by 1,000,000. It was expressed as parts per million, i.e. ppm. Either method gives the same result, within one percent, for concentrations up to 16,000 mg/ℓ. A correction is needed for concentrations in excess of that value.) The conversion to mg/ℓ (milligrams per liter) from ppm (parts per million) is as follows:

$$mg/\ell = K \cdot (ppm) = K \cdot \frac{\text{weight of sediment} \cdot 1{,}000{,}000}{\text{weight of water - sediment mixture}}$$

where: K = correction factor

CONCEPTUAL MODEL A simplification of prototype behavior used to demonstrate concepts.

CONSOLIDATION The compaction of deposited sediments caused by grain reorientation and by the squeezing out of water trapped in the pores.

CONTROL POINT The downstream boundary of the main river segment and the junction point of each tributary. In Figure B-4, each control point is designated by a circled number.

CONVERGENCE The state of tending to a unique solution. A given scheme is convergent if an increasingly finer computational grid leads to a more accurate solution.

CONVEYANCE A measure of the carrying capacity of the channel section. Flow is directly proportional to conveyance for steady flow. From Manning's equation, the proportionality factor is the square root of the energy slope.

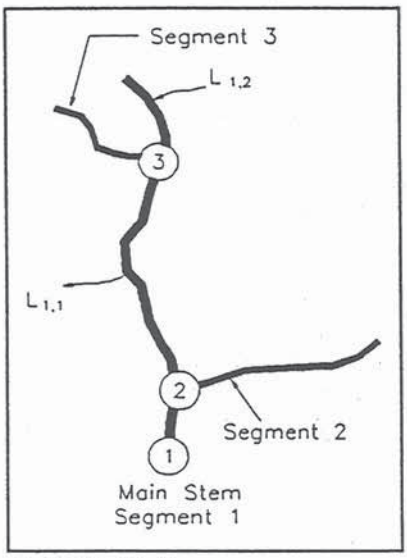

Figure B-4
Control Point Numbering

COVER LAYER One of the two sublayers of the active layer. It lies above the sub-surface layer (the second sublayer in the active layer). See Figure B-1.

CRITICAL BED SHEAR STRESS See CRITICAL TRACTIVE FORCE.

CRITICAL DEPTH If discharge is held constant and the water depth allowed to decrease, as in the case of water approaching a free overfall, velocity head will increase, pressure head will decrease, and total energy will decrease toward a minimum value where the rate of decrease in the pressure head is just counter-balanced by the rate of increase in velocity head. This is the critical depth. More generally, the critical depth is the depth of flow that would produce the minimum total energy head.

CRITICAL FLOW The state of flow where the water depth is at the critical depth and when the inertial and gravitational forces are equal.

CRITICAL TRACTIVE FORCE The critical tractive force is the maximum unit tractive force that will not cause serious erosion of the material forming the channel bed on a level surface.

CROSS SECTION Depicts the shape of the channel in which a stream flows. Measured by surveying the stream bed elevation across the stream on a line perpendicular to the flow. Necessary data for the computation of hydraulic and sediment transport information.

CROSS-SECTIONAL AREA The area of a cross section between the stream bed and the water surface.

D_{50} The median grain size diameter. An expression of the average particle size of a sediment or rock,

obtained graphically by locating the diameter associated with the midpoint of the particle-size distribution; the middlemost diameter that is larger than 50 percent of the diameters in the distribution and smaller than the other 50 percent.

DEGRADATION The geologic process by which stream beds, floodplains, and the bottoms of other water bodies are lowered in elevation by the removal of material from the boundary. It is the opposite of aggradation.

DEPOSITION The mechanical or chemical processes through which sediments accumulate in a (temporary) resting place. The raising of the stream bed by settlement of moving sediment that may be due to local changes in the flow, or during a single flood event.

DEPTH OF FLOW The depth of flow is the vertical distance from the bed of a stream to the water surface.

DETRITUS Loose rock and mineral material produced by mechanical disintegration or abrasion, and removed from its place of origin.

DISCHARGE The discharge (Q) is the volume of a fluid or solid passing a cross section of a stream per unit time.

DISTRIBUTARIES Diverging streams which do not return to the main stream, but discharge into another stream or the ocean.

DOMINANT DISCHARGE A particular magnitude of flow which is sometimes referred to as the "channel forming" discharge. Empirical relations have been developed between "equilibrium" stream width, depth, and slope and dominant discharge. It has been variously defined as the bank full flow, mean annual discharge, etc.

DRAFT DEPTH The depth measured perpendicularly from the water surface to the bottom of a boat, ship, etc. (i.e., a "clearance" depth).

DRAINAGE DENSITY The length of drainage courses divided by the land area over which the drainage network extends.

DROP A structure in an open conduit or canal installed for the purpose of dropping the water to a lower level and dissipating its energy. It may be vertical or inclined; in the latter case it is usually called a chute.

EARTH FLOW A mass-movement process and landform characterized by downslope sliding of soil and weathered rock over a discrete basal shear surface within well-defined lateral boundaries. Earthflows terminate in lobelike forms. They grade into mudflows through a continuous range in morphology associated with increasing fluidity.

EFFECTIVE (GRAIN) SIZE The diameter of the particles in an assumed rock or soil that would transmit water at the same rate as the rock or soil under consideration, and that is composed of spherical particles of equal size and arranged in a specific manner. The effective grain size is that single particle diameter that best depicts the bed material properties. The D_{50} grain size is often used as the effective grain size.

EQUILIBRIUM DEPTH The minimum water depth for the condition of no sediment transport.

ENTRAINMENT The carrying away of bed material produced by erosive action of moving water.

EQUILIBRIUM LOAD The amount of sediment that a system can carry for a given discharge without an overall accumulation (deposit) or scour (degradation).

EROSION The wearing away of the land surface by detachment and movement of soil and rock fragments through the action of moving water and other geological agents.

FAILURE PLANE The surface or contact of a mass failure at which shear is initiated in soils and weathered rock.

FALL VELOCITY The falling or settling rate of a particle in a given medium.

FAULT A fracture or fracture zone along which there has been displacement of the sides relative to one another parallel to the fracture.

FIXED BED MODEL Model in which the bed and side materials are non-erodible. Deposition does not occur as well.

FLOODPLAIN That portion of a river valley, adjacent to the channel, which is built of sediments deposited during the present regimen of the stream and is covered with water when the river overflows its banks at flood stages.

FLOW DURATION CURVE A measure of the range and variability of a stream's flow. The flow duration curve represents the percent of time during which specified flow rates are exceeded at a given location. This is usually presented as a graph of flow rate (discharge) versus percent of time that flows are greater than, or equal to, that flow.

FLUVIAL Of or pertaining to rivers or produced by the action of a stream or river.

FOLD A bend in bedding, foliation, cleavage, or other planar features in rocks. A fold is usually a produce of deformation.

FREQUENCY The number of repetitions of a periodic process in a certain time period.

GEOLOGIC CONTROL A local rock formation or clay layer that limits (within the engineering time frame) the vertical and/or lateral movement of a stream at a particular point. Note that man-made controls such as drop structures also exist.

GEOMORPHOLOGY The study of the classification, description, nature, origin and development of landforms and their relationships to underlying structures, and the history of geologic changes as recorded by these surface features.

GRADATION The proportion of material of each particle size, or the frequency distribution of various sizes, constituting a particulate material such as a soil, sediment, or sedimentary rock. The limits of each size are chosen arbitrarily. Four different gradations are significant: the gradation of the suspended load, the gradation of the bed load, the gradation of the material comprising the bed surface, and the gradation of material beneath the bed surface.

GRADATION CURVE Sediment samples usually contain a range of grain sizes, and it is customary to break this range into classes of percentages of the total sample weight contained in each class. After the individual percentages are accumulated, a

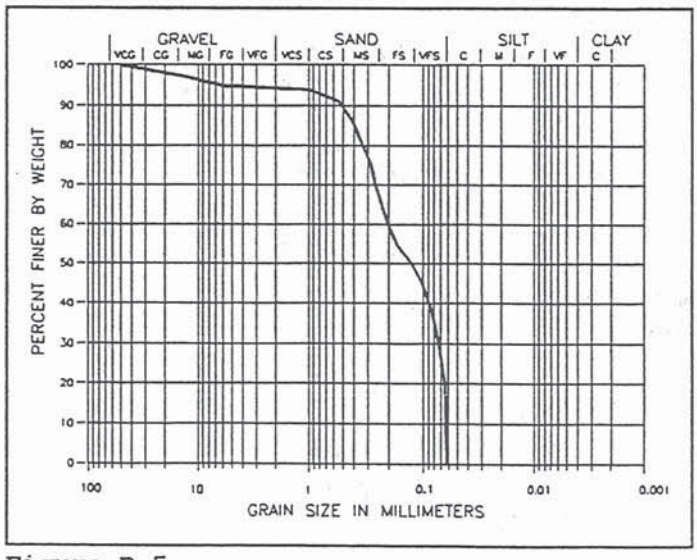

Figure B-5
Sample Gradation Curve

graph, the "gradation curve", shows the grain size versus the accumulated percent of material that is finer than that grain size. These curves are used by movable boundary models to depict the bed sediment material properties (e.g., grain size distribution of the bed material). See Figure B-5.

GRAIN SHAPE FACTOR See PARTICLE SHAPE FACTOR.

GRAIN SIZE See PARTICLE SIZE.

GRAIN SIZE DISTRIBUTION (GRADATION) A measure of the variation in grain (particle) sizes within a mixture. Usually presented as a graph of grain diameter versus percent of the mixture that is finer than that diameter. See Figure B-5.

GRAVEL See Table B-1.

HISTORIC FLOWS The collection of recorded flow data for a stream during the period of time in which steam gages were in operation.

HYDRAULIC MODEL A physical scale model of a river used for engineering studies.

HYDRAULICS The study and computation of the characteristics, e.g. depth (water surface elevation), velocity and slope, of water flowing in a stream or river.

HYDROGRAPH A graph showing, for a given point on a stream or conduit, the discharge,water surface elevation, stage, velocity, available power, or other property of water with respect to time.

HYDROLOGY The study of the properties, distribution, and circulation of water on the surface of the land, in the soil, and in the atmosphere.

IMBRICATED Overlapping, as shingles or tiles on a roof.

IMPINGE To collide, strike or encroach.

INACTIVE LAYER The depth of material beneath the active layer. See Figure B-1.

INCIPIENT MOTION The flow condition at which a given size bed particle just begins to move. Usually related to a "threshold" shear stress.

INCISED Cut down into or entrenched.

INEFFECTIVE FLOW When high ground or some other obstruction such as a levee prevents water from flowing into a subsection, the area up to that point is ineffective for conveying flow and is not used for hydraulic computations until the water surface exceeds the top elevation of the obstruction. The barrier can be a natural levee, man-made levee or some other structure.

INFLOWING LOAD CURVE See SEDIMENT RATING CURVE.

INITIAL CONDITIONS The value of water levels, velocities, concentrations, etc., that are specified everywhere in the mesh at the beginning of a model run. For an iterative solution, the initial conditions represent the first estimate of the variables the model is trying to solve.

INTERCALATED Said of layered material that exists or is

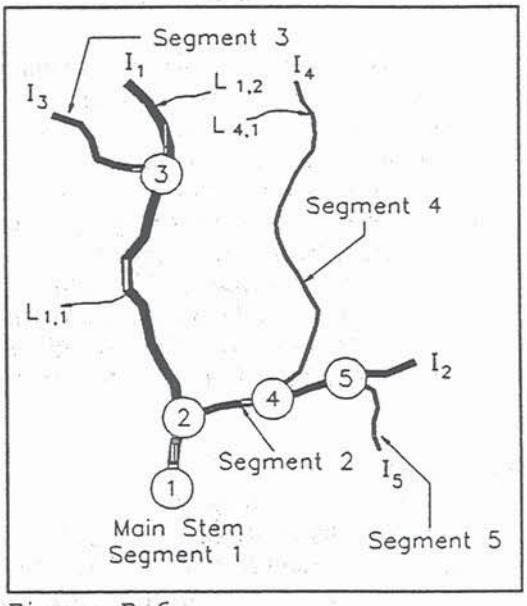

Figure B-6
Local Inflow/Outflow Points

introduced between layers of a different character.

INTERRILL The area between drainage rills, usually referring to an area of sheet erosion.

INTRUSIVE Of or pertaining to the process and rock formed by the emplacement of molten rock material in pre-existing rock.

IN SITU In (its original) place.

LAG The coarse-grained material that is left behind after flow has washed away the finer material.

LATERAL MIGRATION Movement of a channel perpendicular to the direction of flow.

LEFT OVERBANK See OVERBANK.

LOCAL INFLOW/OUTFLOW POINT Points along any river segment at which water and sediment enter or exit that segment as a local flow. Each local inflow/outflow point is designated by an arrow and $L_{n,m}$ where *n* is the segment number and m is the sequence number (going upstream) of the local inflow/outflow points located along segment n, as shown in Figure B-6.

LOCAL SCOUR Erosion caused by an abrupt change in flow direction or velocity. Examples include erosion around bridge piers, downstream of stilling basins, at the ends of dikes, and near snags.

M1 AND M2 CURVES M1 and M2 curves represent mild sloping water surface profiles.

MAIN STEM The primary river segment with its outflow at the downstream end of the model.

MANNING'S EQUATION The empirical Manning's equation commonly applied in water surface profile calculations defines the relationship between surface roughness, discharge, flow geometry, and rate of friction loss for a given stream location.

MANNING'S *n* VALUE *n* is the coefficient of roughness with the dimensions of $T \cdot L^{-1/3}$. *n* accounts for energy loss due to the friction between the bed and the water. In fluvial hydraulics (movable boundary hydraulics), the Manning's *n* value includes the effects of all losses, such as grain roughness of the movable bed, form roughness of the movable bed, bank irregularities, vegetation, bend losses, and junction losses. Contraction and expansion losses are not included in Manning's *n*, but are typically accounted for separately.

MASS FAILURE Unit downslope movement of a portion of the land surface, as in creep, landslide, or slip.

MASS WASTING The downslope movement of soil and rock material under the direct influence of gravity.

MATHEMATICAL MODEL A model that uses mathematical expressions (i.e., a set of equations, usually based upon fundamental physical principles) to represent a physical process.

MEANDERING STREAM An alluvial stream characterized in planform by a series of pronounced alternating bends. The shape and existence of the bends in a meandering stream are a result of alluvial processes and not determined by the nature of the terrain (geology) through which the stream flows.

METAMORPHISM The mineralogical, chemical, and structural adjustment of solid rocks to physical and chemical conditions imposed at depth below the surface zones of weathering and cementation, which differ from the conditions under which the rocks originated.

MITIGATION The act of alleviation; to render less severe.

MODEL A representation of a physical process or thing that can be used to predict the process's or thing's behavior or state.

Examples: A conceptual model: If I throw a rock harder, it will go faster.
A mathematical model: $F = m \cdot a$
A hydraulic model: Columbia River physical model.

MORPHOLOGY The shape of the earth's surface.

MOVABLE BED That portion of a river channel cross section that is considered to be subject to erosion or deposition.

MOVABLE BED LIMITS The lateral limits of the movable bed that define where scour or deposition occur. See Figure B-2.

MOVABLE BED MODEL Model in which the bed and/or side material is erodible and transported in a manner similar to the prototype.

NETWORK MODEL A network model is a network of main stem, tributary, and local inflow/outflow points that can be simulated simultaneously and in which tributary sediment transport can be calculated.

NORMAL DEPTH The depth that would exist if the flow were uniform is called normal depth.

NUMERICAL EXPERIMENTS Varying the input data, or internal parameters, of a numerical model to ascertain the impact on the output.

NUMERICAL MODEL A numerical model is the representation of a mathematical model as a sequence of instructions (program) for a computer. Given approximate data, the execution of this sequence of instructions yields an approximate solution to the set of equations that comprise the mathematical model.

ONE-DIMENSIONAL ENERGY EQUATION This equation has the same form as the Bernoulli Equation and the same terms are present. In addition, an α term has been added to correct for velocity distribution.

OPERATING POLICY See OPERATING RULE.

OPERATING RULE The rule that specifies how water is managed throughout a water resource system. Often they are defined to include target system states, such as storage, above which one course of action is implemented and below which another course is taken.

OUTCROP The part of a geologic formation or structure that appears at the surface of the earth; also, bedrock that is covered by surficial deposits such as alluvium.

OVERBANK In a river reach, the surface area between the bank on the main channel and the limits of the floodplain. See Figure B-7.

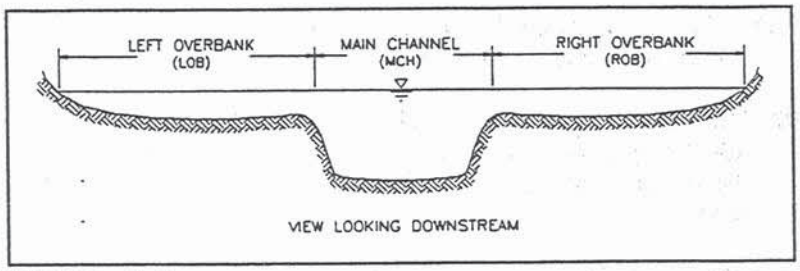

Figure B-7
Examples of Overbanks

OVERDREDGING The additional depth dredged beyond the minimum dredging depth used to provide sufficient navigational depth, to minimize redredging, and to help compensate for the sloughing off and resettling of sediment after dredging occurs

OVERLAND A term used to describe flow across a surface without defined channels.

PARAMETER Any set of physical properties whose values determine the characteristics or behavior of something.

PARTICLE SHAPE FACTOR The particle shape factor of a perfect sphere is 1.0 and can be as low as 0.1 for very irregular shapes. It is defined by:

$$SF = \frac{c}{(a \cdot b)^{1/2}}$$

where: a,b,c = the lengths of the longest, intermediate, and shortest, respectively, mutually perpendicular axes on a sediment particle.

PARTICLE SIZE A linear dimension, usually designated as "diameter", used to characterize the size of a particle. The dimension may be determined by any of several different techniques, including sedimentation sieving, micrometric measurement, or direct measurement.

PEDIMENT A broad gently sloping erosion surface or plain of low relief, typically developed by running water, at the base of an abrupt and receding mountain front; it is underlain by bedrock that may be bare but is more often mantled with a thin discontinuous veneer of alluvium derived from upland masses.

PERMEABILITY The property of a soil that permits the passage of water under a gradient of force.

PHREATOPHYTE A deep rooted plant that obtains its water from the water table or the soil layer just above it.

PLANFORM The shape and size of channel and overbank features as viewed from directly above.

POINT BAR The depositional surface on the inside of a bendway composed of coarser grained accreted sediments.

PRIMARY TRIBUTARY A tributary that is directly connected to or that joins with the main river segment.

PROTOTYPE The full-sized structure, system process, or phenomenon being modeled.

PROXIMAL Said of a sedimentary deposit consisting of coarse clastics, formed nearest to the source area.

QUALITATIVE Relating to or involving quality or kind.

RADIUS OF CURVATURE The measure of the curvature of a bendway.

RATING CURVE See STAGE-DISCHARGE CURVE.

REACH (1) The length of a channel, uniform with respect to discharge, depth, area, and slope, e.g., "study reach", "typical channel reach" or "degrading reach", etc. (2) The length of a stream between two specified gaging stations.

RIGHT OVERBANK See OVERBANK.

RILL One of a set of well-defined subparallel channels varying in size with the rodibility of the soil. Generally these channels are only a few inches wide and deep.

RIPARIAN Pertaining to or situated on the bank of a river.

RIPPLES Small triangular-shaped bed forms, similar to dunes but have much smaller heights and are 0.3m or less in length. They develop when the Froude number is less than 0.3.

RIVER SEGMENT See STREAM SEGMENT.

ROTATIONAL SLIDE A landslide in which shearing takes place on a well defined, curved surface, concave upward, producing a backward rotation in the displaced mass.

S1 AND S2 CURVES S1 and S2 curves represent steep sloping water surface profiles.

SAND See Table B-1.

SATURATION The degree to which voids in soil are filled with water.

SCOUR The enlargement of a flow section by the removal of bed material through the action of moving water.

SECONDARY CURRENTS (OR FLOW) The movement of water particles on a cross section normal to the longitudinal direction of the channel.

SEDIMENT (1) Particles derived from rocks or biological materials that have been transported by a fluid. (2) Solid material (sludges) suspended in or settled from water. A collective term meaning an accumulation of soil, rock and mineral particles transported or deposited by flowing water.

SEDIMENT DISCHARGE The mass or volume of sediment (usually mass) passing a stream cross section in a unit of time. The term may be qualified, for example; as suspended-sediment discharge, bed load discharge, or total-sediment discharge. See SEDIMENT LOAD.

SEDIMENT-DISCHARGE RELATIONSHIP Tables which relate inflowing sediment loads to water discharge for the upstream ends of the main stem, tributaries, and local inflows.

SEDIMENT BUDGET A quantitative system of accounting for the production, transport and storage of various size classes of sediment through specific locations in the watershed and fluvial system.

SEDIMENT BULKING FACTOR The ratio between the volume of sediment and water versus water only in a discharge, or measurement of the increased discharge volume due to transport of sediment.

SEDIMENT CONCENTRATION DATA Measurements of suspended sediment concentration in a stream.

SEDIMENT DELIVERY RATIO The ratio between the sediment produced by watershed processes and that actually transported past a specified discharge point.

SEDIMENT LOAD A general term that refers to material in suspension and/or in transport. It is not synonymous with either discharge or concentration. It may also refer to a particular type of load; e.g. total, suspended, wash, bed, or material.

SEDIMENT PARTICLE Fragments of mineral or organic material in either a singular or aggregate state.

SEDIMENT PRODUCTION The amount of sediment mobilized from the land surface by all erosive and mass wasting processes in a watershed.

SEDIMENT TRANSPORT (RATE) See SEDIMENT DISCHARGE.

SEDIMENT TRANSPORT CAPACITY The capability of a channel to carry a given volume of sediment based on local hydraulic and geometric parameters.

SEDIMENT TRANSPORT FUNCTION A formula or algorithm for calculating the sediment transport rate given the hydraulics and bed material at a cross section. Most sediment transport functions compute the bed material load capacity. The actual transport may be less than the computed capacity due to

armoring, geologic controls, etc.

SEDIMENT TRANSPORT ROUTING The computation of sediment movement for a selected length of stream (reach) for a period of time with varying flows. Application of sediment continuity relations allow the computation of aggradation and deposition as functions of time.

SEDIMENT TRAP EFFICIENCY See TRAP EFFICIENCY.

SEDIMENT YIELD The volume or mass of sediment transported past a specified discharge point over a specified time. Yield is also often expressed as a mass or volume per unit of drainage area over a specified time.

SEDIMENTATION A broad term that pertains to the five fundamental process responsible for the formation of sedimentary rocks: (1) weathering, (2) detachment, (3) transportation, (4) deposition (sedimentation), and (5) diagenesis; and to the gravitational settling of suspended particles that are heavier than water.

SEDIMENTATION DIAMETER The diameter of a sphere of the same specific weight and the same terminal settling velocity as the given particle in the same fluid.

SEISMIC Pertaining to an earthquake or earth vibration which may be natural or artificial.

SETTLING VELOCITY See FALL VELOCITY.

SHAPE FACTOR See PARTICLE SHAPE FACTOR.

SHEAR INTENSITY A dimensionless number that is taken from Einstein's bed load function. It is the inverse of Shield's parameter.

SHEAR STRESS Frictional force per unit of bed area exerted on the bed by the flowing water. An important factor in the movement of bed material.

SHIELD'S DETERMINISTIC CURVE A curve of the dimensionless tractive force plotted against the grain Reynolds number (i.e., $U_Q \cdot D_s/v$ where, U_Q = turbulent shear velocity, D_s = characteristic or effective size of the grains or roughness elements, v = kinematic viscosity) and which is used to help determine the CRITICAL TRACTIVE FORCE.

SHIELD'S PARAMETER A dimensionless number referred to as a dimensionless shear stress. The beginning of motion of bed material is a function of this dimensionless number.

$$\frac{\tau_c}{(\gamma_s - \gamma)\ D_s}$$

where: τ_c = critical tractive force
γ_s = specific weight of the particle
γ = specific weight of water
D_s = characteristic or effective size of the grains or roughness elements

SIEVE DIAMETER The smallest standard sieve opening size through which a given particle of sediment will pass.

SILT See Table B-1.

SILTATION An unacceptable term. Use sediment deposition, sediment discharge, or sediment yield as

appropriate.

SIMULATE To express a physical system in mathematical terms.

SINUOSITY A measure of meander "intensity". Computed as the ratio of the length of a stream measured along its thalweg (or centerline) to the length of the valley through which the stream flows.

SLUMP The downward slipping of a mass of rock or unconsolidated material, moving as a unit, usually with backward rotation on a more or less horizontal axis parallel to the slope from which it descends.

SOIL EROSION Movement of soil through the action of natural physical processes, primarily associated with the action of wind and water, from their position on the earth's surface. Soil erosion includes detachment, transport and subsequent deposition of soil particles.

SOIL EVENT QUANTITY The quantity of sediment transported past a specified point in a single runoff event.

SORTING The dynamic process by which sedimentary particles having some particular characteristic (such as similarity of size, shape, or specific gravity) are naturally selected and separated from associated but dissimilar particles by the agents of transportation. Also, see GRADATION.

SPLIT FLOW Flow that leaves the main river flow and takes a completely different path from the main river [Case (a)]. Split flow can also occur in the case of flow bifurcation around an island [Case (b)]. See Figure B-8.

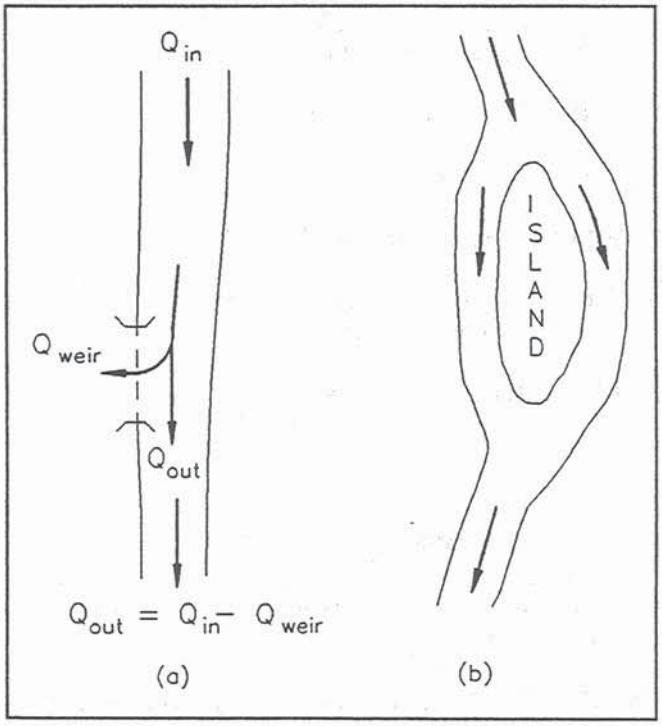

Figure B-8
Split Flow

STABLE CHANNEL A stream channel that does not change in planform or bed profile during a particular period of time. For purposes of this glossary the time period is years to tens of years.

STAGE-DISCHARGE (RATING) CURVE Defines a relationship between discharge and water surface elevation at a given location.

STANDARD STEP METHOD Method where the total distance is divided into reaches by cross sections at fixed locations along the channel and, starting from one control, profile calculations proceed in steps from cross section to cross section to the next control.

STEADY STATE MODEL Model in which the variables being investigated do not change with time.

STRATH TERRACE A surface cut on bedrock along a valley floor representing al local base level, the top of which has been formed by primarily lateral erosion and usually is covered by a veneer of alluvium.

STREAM GAGE A device that measures and records flow characteristics such as water discharge and water surface elevation at a specific location on a stream. Sediment transport measurements are usually made at stream gage sites.

STREAM POWER The product of bed shear stress and mean cross-sectional velocity at a cross section for a given flow.

STREAM PROFILE A plot of the elevation of a stream bed versus distance along the stream.

STREAM SEGMENT A stream segment is a specified portion of a river with an upstream inflow point and with a downstream termination at a control point. Primary Inflow points are designated by I_n, where *n* is the segment number. Primary inflow points are always at the upstream most end of a tributary or main stem segment. See Figure 3-7.

SUBARMOR Those sediments lying below and protected from erosion by an overlying or surficial armor layer such as gravel or cobbles.

SUBCRITICAL FLOW The state of flow where the water depth is above the critical depth. Here, the influence of gravity forces dominate the influences of inertial forces, and flow, having a low velocity, is often described as tranquil.

SUBDUCTION The process of one of the earths surface plates descending beneath the other. Here, oceanic crust is descending below continental crust.

SUB-SURFACE LAYER The sub-surface layer is composed of well mixed sediments brought up from the inactive layer plus sediment which has deposited from the water column. It will replenish the cover layer and thereby supply bed sediment as required to meet sediment transport capacity. When the weight in the sub-surface layer becomes less than the weight required to cover 100% of the bed surface to a depth of two times the size of the largest particle in transport, a new sub-surface layer is brought up from the inactive layer. See Figure B-1.

SUPERCRITICAL FLOW The state of flow where the water depth is below the critical depth, inertial forces dominate the gravitational forces, and the flow is described as rapid or shooting.

SUSPENDED BED MATERIAL LOAD That portion of the suspended load that is composed of particle sizes found in the bed material.

SUSPENDED LOAD Includes both suspended bed material load and wash load. Sediment that moves in suspension is continuously supported in the water column by fluid turbulence. Contrast with BED LOAD.

SUSPENDED SEDIMENT Those sediments that are part of the total stream load that is carried for a considerable period of time in suspension, free from contact with the stream bed; it consists mainly of clay and silt.

SUSPENDED-SEDIMENT DISCHARGE The quantity of suspended sediment passing a cross section in a unit of time usually given in tons/day. See SUSPENDED LOAD.

SUSPENDED SEDIMENT LOAD See SUSPENDED LOAD.

SUSPENDED SEDIMENT LOAD RATING CURVE A curve which relates suspended sediment load to discharge.

SYNCLINE A fold, generally concave upward, whose core contains the stratigraphically younger rocks.

TAIL WATER The water surface elevation downstream from a structure, such as below a dam, weir or drop structure.

TECTONIC Major structural or deformational forces and features of the earth's crust.

TERRACE A relatively level bench or steplike surface breaking the continuity of a slope.

THALWEG The line following the lowest part of a valley, whether under water or not. Usually the line following the deepest part or middle of the bed or channel of a river.

TOTAL SEDIMENT DISCHARGE The total rate at which sediment passes a given point on the stream (tons/day). See TOTAL SEDIMENT LOAD.

TOTAL SEDIMENT LOAD (TOTAL LOAD) Includes bed load, suspended bed material load, and wash load. In general, total sediment load cannot be calculated or directly measured.

TRACTIVE FORCE When water flows in a channel, a force is developed that acts in the direction of flow on the channel bed. This force, which is simply the pull of water on the wetted area, is known as the tractive force. In a uniform flow, the equation for the unit tractive force (i.e., the average value to the tractive force per unit wetted area) is:

$$\tau_0 = \gamma RS$$

where: τ_0 = unit tractive force
γ = unit weight of water
R = the hydraulic radius
S = the slope of the channel

TRANSMISSIVE BOUNDARY A boundary (cross section) that will allow sediment that reaches it to pass without changing that cross section.

TRANSPORTATION (SEDIMENT) The complex processes of moving sediment particles from place to place. The principal transporting agents are flowing water and wind.

TRANSPORT CAPACITY The ability of the stream to transport a given volume or weight of sediment material of a specific size per time for a given flow condition. The units of transport capacity are usually given in Tons per day of sediment transported passed a given cross section for a given flow. Transport capacity for each sediment grain size is the transport potential for that size material multiplied by the actual fraction of each size class present in the bed and bank material.

TRANSPORT POTENTIAL Transport potential is the rate at which a stream could transport sediment of a given grain size for given hydraulic conditions if the bed and banks were composed entirely of material of that size.

TRAP EFFICIENCY Proportion of sediment inflow to a stream reach (or reservoir) that is retained within that reach (or reservoir). Computed as inflowing sediment volume minus outflowing sediment volume divided by inflowing sediment volume. Positive values indicate aggradation; negative values, degradation.

TRIBUTARY A river segment other than the main stem in which sediment transport is calculated. More generally, a stream or other body of water, surface or underground, that contributes its water to another and larger stream or body of water.

TURBULENCE In general terms, the irregular motion of a flowing fluid.

VERTICAL ACCRETION Growth of a sedimentary deposit by upward deposition.

WASH LOAD That part of the suspended load that is finer than the bed material. Wash load is limited by supply rather than hydraulics. What grain sizes constitute wash load varies with flow and location in a stream. Sampling procedures that measure suspended load will include both wash load and suspended bed material load. Normally, that is of sediment particles smaller than 0.062 mm.

WATER BUDGET A quantitative system of accounting for sources, storage locations and losses of water in a basin.

WATER COLUMN An imaginary vertical column of water used as a control volume for computational purposes. Usually the size of a unit area and as deep as the depth of water at that location in the river.

WATER DISCHARGE See STREAM DISCHARGE.

WATERSHED A topographically defined area drained by a river/stream or system of connecting rivers/streams such that all outflow is discharged through a single outlet. Also called a drainage area.

WEIR A small dam in a stream, designed to raise the water level or to divert its flow through a desired channel. A diversion dam.

WETTED PERIMETER The wetted perimeter is the length of the wetted contact between a stream of flowing water and its containing channel, measured in a direction normal to the flow.

WOLMAN COUNT A fixed interval method of field sampling of the coarse bed and bar materials using a template that is calibrated in the same intervals as standard laboratory sieves (from 2 to 256 millimeters).