D.2.16 Glossary

Most of the coastal engineering terms in this glossary are from the Shore Protection Manual (USACE, 1984) and Coastal Engineering Manual (USACE, 2002) and are supplemented with additional terms relevant to hazard mapping. FEMA has an extensive glossary posted on the FEMA website at <http://www.fema.gov/fhm/dl_cgs.shtm> Glossary.

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ACCRETION May be either natural or artificial. Natural accretion is the buildup of land, solely by the action of the forces of nature, on a beach by deposition of water- or airborne material. Artificial accretion is a similar buildup of land by reason of an act of man, such as the accretion formed by a GROIN, BREAKWATER, or beach fill deposited by mechanical means. Also AGGRADATION.

ADJUSTABLE GROIN A GROIN whose permeability can be changed, usually with gates or removable sections.

ADVANCE (of a beach) (1) A continuing seaward movement of the shoreline. (2) A net seaward movement of the shoreline over a specified time. Also PROGRESSION.

AEOLIAN See EOLIAN.

ALIGNMENT The course along which the center line of a channel, canal or drain is located.

ALLUVIAL DEPOSITS Detrital material which is transported by a river and deposited—usually temporarily—at points along the flood plain of a river. Commonly composed of sands and gravels.

ALLUVIAL PLAIN A plain bordering a river, formed by the deposition of material eroded from areas of higher elevation.

ALLUVIUM Soil (sand, mud, or similar detrital material) deposited by streams, or the deposits formed.

ALONGSHORE Parallel to and near the shoreline; LONGSHORE.

AMPLITUDE, WAVE (1) The magnitude of the displacement of a wave from a mean value. An ocean wave has an amplitude equal to the vertical distance from still-water level to wave crest. For a sinusoidal wave, the amplitude is one-half the wave height. (2) The semirange of a constituent tide.

ANGLE OF REPOSE The maximum slope (measured from the horizontal) at which soils and loose materials on the banks of canals, rivers or embankments will stay stable.

ANISOTROPIC Having properties that change with changing directions.

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ANOXIC Refers to an environment that contains little or no dissolved oxygen and hence little or no benthic marine life. These conditions arise in some basins or fjords where physical circulation of seawater is limited.

ANTIDUNES BED FORMS that occur in trains and are in phase with, and strongly interact with, gravity water-surface waves.

APRON Layer of stone, concrete or other material to protect the toe of a structure.

AQUIFER A geologic formation that is water-bearing, and which transmits water from one point in the formation to another.

ARCHIPELAGO A sea that contains numerous islands; also the island group itself.

ARMOR LAYER Protective layer on a BREAKWATER or SEAWALL composed of armor units.

ARMOR UNIT A relatively large quarrystone or concrete shape that is selected to fit specified geometric characteristics and density. It is usually of nearly uniform size and usually large enough to require individual placement. In normal cases it is used as primary wave protection and is placed in thicknesses of at least two units.

ARTIFICIAL NOURISHMENT The process of replenishing a beach with material (usually sand) obtained from another location.

ASTRONOMICAL TIDE The tidal levels and character which would result from gravitational effects, e.g. of the Earth, Sun, and Moon, without any atmospheric influences.

ATTENUATION (1) A lessening of the amplitude of a wave with distance from the origin. (2) The decrease of water-particle motion with increasing depth. Particle motion resulting from surface oscillatory waves attenuates rapidly with depth, and practically disappears at a depth equal to a surface wavelength.

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BACKRUSH The seaward return of the water following the uprush of the waves. For any given tide stage the point of farthest return seaward of the backrush is known as the limit of backrush or limit backwash.

BACKSHORE That zone of the shore or beach lying behind the upper swash zone.

BACKWASH RIPPLES Low amplitude ripple marks formed on fine sand beaches by the backwash of the waves.

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BANK (1) The rising ground bordering a lake, river, or sea or of a river or channel, for which it is designated as right or left as the observer is facing downstream. (2) An elevation of the sea floor or large area, located on a continental (or island) shelf and over which the depth is relatively shallow but sufficient for safe surface navigation (e.g., Georges Bank); a group of shoals. (3) In its secondary sense, used only with a qualifying word such as "sand bank" or "gravel bank," a shallow area consisting of shifting forms of silt, sand, mud, and gravel.

BAR A submerged or emerged embankment of sand, gravel, or other unconsolidated material built on the sea floor in shallow water by waves and currents.

BARRIER SPIT Similar to a barrier island, but connected to the mainland.

BASIN A depressed area with no surface outlet, such as a lake basin or an enclosed sea.

BASIN, BOAT A naturally or artificially enclosed or nearly enclosed harbor area for small craft.

BATHYMETRIC CHART A topographic map of the bed of the ocean, with depths indicated by contours (isobaths) drawn at regular intervals.

BATHYMETRY The measurement of depths of water in oceans, seas, and lakes; also information derived from such measurements.

BAY A recess in the shore or an inlet of a sea between two capes or headlands, not as large as a gulf but larger than a cove.

BAYMOUTH BAR A bar extending partly or entirely across the mouth of a bay.

BEACH The zone of unconsolidated material that extends landward from the low water line to the place where there is marked change in material or physiographic form, or to the line of permanent vegetation (usually the effective limit of storm waves). The seaward limit of a beach—unless otherwise specified—is the mean low water line. A beach includes foreshore and backshore. See also SHORE, SUSTAINABLE BEACH, AND SELF-SUSTAINING BEACH.

BEACH BERM A nearly horizontal part of the BEACH or BACKSHORE formed by the deposit of material by wave action. Some beaches have no BERMS, others have one or several.

BEACH CREST The point representing the limit of normal high tide wave run-up (see BERM CREST).

BEACH EROSION The carrying away of beach materials by wave action, tidal currents, littoral currents, or wind.

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BEACH FACE The section of the beach normally exposed to the action of the wave uprush. The FORESHORE of a BEACH. (Not synonymous with SHOREFACE.)

BEACH FILL Material placed on a beach to renourish eroding shores.

BEACH HEAD The cliff, dune or seawall looming above the landward limit of the active beach.

BEACH MATERIAL Granular sediments, usually sand or shingle moved by the sea.

BEACH PLAN SHAPE The shape of the beach in plan, usually shown as a contour line, combination of contour lines, or recognizable features such as beach crest and/or the still water line.

BEACH PROFILE A cross-section taken perpendicular to a given beach contour; the profile may include the face of a dune or seawall, extend over the backshore, across the foreshore, and seaward underwater into the nearshore zone.

BEACH RIDGE See RIDGE, BEACH.

BEACH SCARP See SCARP, BEACH.

BEACH WIDTH The horizontal dimension of the beach measured normal to the shoreline and landward of the higher-high tide line (on oceanic coasts) or from the still water level (on lake coasts).

BED The bottom of a watercourse or any body of water.

BED FORMS Any deviation from a flat bed that is readily detectable by eye and higher than the largest sediment size present in the parent bed material; generated on the bed of an alluvial channel by the flow.

BED LOAD Sediment transport mode in which individual particles either roll or slide along the bed as a shallow, mobile layer a few particle diameters deep, the part of the load that is not continuously in suspension.

BED PROTECTION A (rock) structure on the bed that protects the underlying bed against erosion due to current and/or wave action.

BED SHEAR STRESS The way in which waves (or currents) transfer energy to the sea bed.

BEDDING PLANE A surface parallel to the surface of deposition, which may or may not have a physical expression. The original attitude of a bedding plane should not be assumed to have been horizontal.

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BEDROCK The solid rock that underlies gravel, soil, and other superficial material. Bedrock may be exposed at the surface (an outcrop) or it may be buried under a few centimeters to thousands of meters of unconsolidated material.

BENCH (1) A level or gently sloping erosion plane inclined seaward. (2) A nearly horizontal area at about the level of maximum high water on the sea side of a dike.

BENCHMARK A permanently fixed point of known elevation. A primary bench mark is one close to a tide station to which the tide staff and tidal datum originally are referenced.

BENCHMARK, TIDAL A bench mark whose elevation has been determined with respect to mean sea level at a nearby tide gage; the tidal bench mark is used as reference for that tide gage.

BENEFITS The asset value of a scheme, usually measured in terms of the cost of damages avoided by the scheme, or the valuation of perceived amenity or environmental improvements

BENTHIC Pertaining to the sub-aquatic bottom.

BENTHOS Those animals who live on the sediments of the sea floor, including both mobile and non-mobile forms.

BERM (1) On a beach, a nearly horizontal plateau on the beach face or backshore, formed by the deposition of beach material by wave action or by means of a mechanical plant as part of a beach renourishment scheme. Some natural beaches have no berm, others have several. (2) On a structure: a nearly horizontal area, often built to support or key-in an armor layer.

BERM, BEACH See BEACH BERM.

BERM BREAKWATER Rubble mound structure with horizontal berm of armor stones at about sea level, which is allowed to be (re)shaped by the waves.

BERM CREST The seaward limit of a BERM. Also called BERM EDGE.

BIFURCATION Location where a river separates in two or more reaches or branches (the opposite of a confluence).

BIGHT A bend in a coastline forming an open bay. A bay formed by such a bend.

BIOTURBATION The disturbance of sediment bedding by the activities of burrowing organisms.

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BIRDFOOT DELTA A river delta formed by many levee-bordered distributaries extending seaward and resembling in plan the outstretched claws of a bird. Example: Mississippi River delta.

BLANKET (FOUNDATION or BEDDING) A layer or layers of graded fine stones underlying a BREAKWATER, GROIN or rock embankment to prevent the natural bed material from being washed away.

BLOWOUT A depression on the land surface caused by wind erosion.

BLUFF A high, steep bank or cliff.

BOG A wet, spongy, poorly drained area which is usually rich in very specialized plants, contains a high percentage of organic remnants and residues and frequently is associated with a spring, seepage area, or other subsurface water source. A bog sometimes represents the final stage of the natural processes of eutrophication by which lakes and other bodies of water are very slowly transformed into land areas.

BOIL An upward flow of water in a sandy formation due to an unbalanced hydrostatic pressure resulting from a rise in a nearby stream, or from removing the overburden in making excavations.

BOLD COAST A prominent landmass that rises steeply from the sea.

BORE A very rapid rise of the tide in which the advancing water presents an abrupt front of considerable height. In shallow estuaries where the range of tide is large, the high water is propagated inward faster than the low water because of the greater depth at high water. If the high water overtakes the low water, an abrupt front is presented, with the high-water crest finally falling forward as the tide continues to advance. Also EAGER.

BOTTOM (nature of) The composition or character of the bed of an ocean or other body of water (e.g., clay, coral, gravel, mud, ooze, pebbles, rock, shell, shingle, hard, or soft).

BOTTOM BOUNDARY LAYER The lower portion of the water flow that experiences frictional retardation based on its proximity to the bed.

BOTTOMSET One of the horizontal or gently inclined sediment layers deposited in front of the advancing forest beds of a delta.

BOULDER A rounded rock more than 256 mm (10 inch) in diameter; larger than a cobblestone. See SOIL CLASSIFICATION.

BOUNDARY CONDITIONS Environmental conditions, e.g. waves, currents, drifts, etc. used as boundary input to physical or numerical models.

BRAIDED RIVER A river type with multiple channels separated by shoals, bars and islands.

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BREACHING Failure of the beach head or a dike allowing flooding by tidal action.

BREAKER A wave breaking on a shore, over a REEF, etc. Breakers may be classified into four types: COLLAPSING--breaking occurs over lower half of wave, with minimal air pocket and usually no splash-up. Bubbles and foam present. PLUNGING--crest curls over air pocket; breaking is usually with a crash. Smooth splash-up usually follows. SPILLING--bubbles and turbulent water spill down front face of wave. The upper 25 percent of the front face may become vertical before breaking. Breaking generally occurs over quite a distance. SURGING--wave peaks up, but bottom rushes forward from under wave, and wave slides up beach face with little or no bubble production. Water surface remains almost plane except where ripples may be produced on the beachface during runback.

BREAKER DEPTH The still-water depth at the point where a wave breaks. Also called BREAKING DEPTH.

BREAKER INDEX Ratio of breaking wave height to deepwater wave height.

BREAKER ZONE The zone within which waves approaching the coastline commence breaking, typically in water depths of between 5 and 10 meters.

BREAKING Reduction in wave energy and height in the surf zone due to limited water depth.

BREAKWATER A structure protecting a shore area, harbor, anchorage, or basin from waves.

BUFFER AREA A parcel or strip of land that is designed and designated to permanently remain vegetated in an undisturbed and natural condition to protect an adjacent aquatic or wetland site from upland impacts, to provide habitat for wildlife and to afford limited public access.

BULKHEAD A structure or partition to retain or prevent sliding of the land. A secondary purpose is to protect the upland against damage from wave action.

BUOY A float; especially a floating object moored to the bottom, to mark a channel, anchor, shoal rock, etc. Some common types include: a nun or nut buoy is conical in shape; a can buoy is squat and cylindrical above water and conical below water; a spar buoy is a vertical, slender spar anchored at one end; a bell buoy, bearing a bell, runs mechanically or by the action of waves, usually marks shoals or rocks; a whistling buoy, similarly operated, marks shoals or channel entrances; a dan buoy carries a pole with a flag or light on it.

BUOYANCY The resultant of upward forces, exerted by the water on a submerged or floating body, equal to the weight of the water displaced by this body.

BYPASSING, SAND Hydraulic or mechanical movement of sand from the accreting updrift side to the eroding downdrift side of an inlet or harbor entrance. The hydraulic movement may include natural movement as well as movement caused by man.

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CAISSON Concrete box-type structure.

CALIFORNIA CURRENT A deep-ocean boundary current that flows south-southeasterly along the U.S. west coast. The current is shallow, broad and slow moving carrying cold, nutrient poor waters toward the equator.

CALCAREOUS Containing calcium carbonate (C_aCO_3), chiefly as the minerals calcite and aragonite. When applied to rock, it implies that as much as 50 percent of the rock is carbonate (e.g., calcareous sand).

CALM The condition of the water surface when there is no wind waves or swell.

CANAL An artificial watercourse cut through a land area for such uses as navigation and irrigation.

CANYON A relatively narrow, deep depression with steep slopes, the bottom of which grades continuously downward. May be underwater (submarine) or on land (SUBAERIAL).

CAPE A land area jutting seaward from a continent or large island which prominently marks a change in, or interrupts notably, the coastal trend; a prominent feature. Examples: Cape Cod, Massachusetts; Cape Hatteras, North Carolina.

CAPILLARY WAVE A wave whose velocity of propagation is controlled primarily by the surface tension of the liquid in which the wave is traveling. Water waves of length less than about 1 inch are considered capillary waves. Waves longer than 1 inch and shorter than 2 inches are in an indeterminate zone between capillary and gravity waves.

CARTOGRAPHY The science and art of making maps.

CATCHMENT AREA The area which drains naturally to a particular point on a river, thus contributing to its natural discharge.

CAUSEWAY A raised road across wet or marshy ground, or across water.

CAUSTIC In refraction of waves, the name given to the curve to which adjacent orthogonals of waves refracted by a bottom whose contour lines are curved, are tangents. The occurrence of a caustic always marks a region of crossed orthogonals and high wave convergence.

CELERITY Wave speed.

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CHANNEL (1) A natural or artificial waterway of perceptible extent which either periodically or continuously contains moving water, or which forms a connecting link between two bodies of water. (2) The part of a body of water deep enough to be used for navigation through an area otherwise too shallow for navigation. (3) A large strait, as the English Channel. (4) The deepest part of a stream, bay, or strait through which the main volume or current of water flows.

CHANNEL CAPACITY The maximum flow which a channel is capable of transmitting without its banks being overtopped.

CHANNEL-MOUTH BAR A bar built where a stream enters a body of standing water, resulting from decreased flow velocity.

CHART A special-purpose map, esp. one designed for navigation such as a bathymetric chart.

CHART DATUM The plane or level to which soundings (or elevations) or tide heights are referenced (usually LOW WATER DATUM). The surface is called a tidal datum when referred to a certain phase of tide. To provide a safety factor for navigation, some level lower than MEAN SEA LEVEL is generally selected for hydrographic charts, such as MEAN LOW WATER or MEAN LOWER LOW WATER. See DATUM PLANE.

CHEMICAL WEATHERING Disintegration of rocks and sediments by chemical alteration of the constituent minerals or of the cementing matrix. It is caused by exposure, oxidation, temperature changes, and biological processes.

CHOP The short-crested waves that may spring up quickly in a moderate breeze, and which break easily at the crest. Also WIND CHOP.

CHOPPY SEA Short, rough waves tumbling with a short and quick motion. Short-crested waves that may spring up quickly in a moderate breeze, and break easily at the crest.

CLAPOTIS The French equivalent for a type of STANDING WAVE. In American usage it is usually associated with the standing wave phenomenon caused by the reflection of a nonbreaking wave train from a structure with a face that is vertical or nearly vertical. Full clapotis is one with 100 percent reflection of the incident wave; partial clapotis is one with less than 100 percent reflection.

CLASTIC ROCKS Rocks built up of fragments which have been produced by weathering and erosion of pre-existing rocks and minerals and, typically, transported mechanically to their point of deposition.

CLAY A fine grained, plastic, sediment with a typical grain size less than 0.004 mm. Possesses electromagnetic properties which bind the grains together to give a bulk strength or cohesion. See SOIL CLASSIFICATION.

CLIFF A high, steep face of rock; a precipice. See also SEA CLIFF.

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CLIMATE The characteristic weather of a region, particularly regarding temperature and precipitation, averaged over some significant internal of time (years).

CLOSURE DEPTH The water depth beyond which repetitive profile surveys (collected over several years) do not detect vertical sea bed changes, generally considered the seaward limit of littoral transport. The depth can be determined from repeated cross-shore profile surveys or estimated using formulas based on wave statistics. Note that this does not imply the lack of sediment motion beyond this depth.

CNOIDAL WAVE A type of wave in shallow water (i.e., where the depth of water is less than 1/8 to 1/10 the wavelength). The surface profile is expressed in terms of the Jacobian elliptic function cn u; hence the term cnoidal.

CO-TIDAL LINES Lines which link all the points where the tide is at the same stage (or phase) of its cycle.

COAST (1) A strip of land of indefinite width (may be several kilometers) that extends from the shoreline inland to the first major change in terrain features. (2) The part of a country regarded as near the coast.

COASTAL AREA The land and sea area bordering the shoreline.

COASTAL CURRENTS (1) Those currents which flow roughly parallel to the shore and constitute a relatively uniform drift in the deeper water adjacent to the surf zone. These currents may be tidal currents, transient, wind-driven currents, or currents associated with the distribution of mass in local waters. (2) For navigational purposes, the term is used to designate a current in coastwise shipping lanes where the tidal current is frequently rotary.

COASTAL DEFENSE General term used to encompass both coast protection against erosion and sea defense against flooding.

COASTAL FORCING The natural processes which drive coastal hydro- and morphodynamics (e.g. winds, waves, tides, etc).

COASTAL PLAIN The plain composed of horizontal or gently sloping strata of clastic materials, generally representing a strip of sea bottom that has emerged from the sea in recent geologic time.

COASTAL PROCESSES Collective term covering the action of natural forces on the shoreline, and near shore seabed.

COASTAL STRIP A zone directly adjacent to the waterline, where only coast related activities take place. Usually this is a strip of some 100 m wide. In this strip the coastal defense activities take place. In this strip often there are restrictions to land use.

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COASTAL ZONE The transition zone where the land meets water, the region that is directly influenced by marine and lacustrine hydrodynamic processes. Extends offshore to the continental shelf break and onshore to the first major change in topography above the reach of major storm waves. On barrier coasts, includes the bays and lagoons between the barrier and the mainland.

COASTAL ZONE MANAGEMENT The integrated and general development of the coastal zone. Coastal Zone Management is not restricted to coastal defense works, but includes also a development in economical, ecological and social terms. Coastline Management is a part of Coastal Zone Management.

COASTLINE (1) Technically, the line that forms the boundary between the coast and the shore. (2) Commonly, the line that forms the boundary between the land and the water, esp. the water of a sea or ocean.

COBBLE A rock fragment between 64 and 256 mm in diameter, usually rounded. See SOIL CLASSIFICATION.

COFFERDAM A temporary watertight structure enclosing all or part of the construction area so that construction can proceed in the dry.

COHESIVE SEDIMENT Sediment containing significant proportion of clays, the electromagnetic properties of which cause the sediment to bind together.

COLLOID As a size term refers to particles smaller than 0.00024 mm, smaller than clay size.

COMBER (1) A deepwater wave whose crest is pushed forward by a strong wind; much larger than a whitecap. (2) A long-period breaker.

COMPETENCE The ability of a wind or water current to transport detritus, in terms of particle size rather than amount, measured as the diameter of the largest particles.

COMPLEX SPIT A large RECURVED SPIT with secondary spits developed at its end. Example: Sandy Hook, New Jersey.

CONFLUENCE The junction of two or more river reaches or branches (the opposite of a bifurcation).

CONSOLIDATION The gradual, slow compression of a cohesive soil due to weight acting on it, which occurs as water is driven out of the voids in the soil. Consolidation only occurs in clays or other soils of low permeability.

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CONTINENTAL SHELF (1) The zone bordering a continent extending from the line of permanent immersion to the depth, usually about 100 m to 200 m, where there is a marked or rather steep descent toward the great depths of the ocean. (2) The area under active littoral processes during the HOLOCENE period. (3) The region of the oceanic bottom that extends outward from the shoreline with an average slope of less than 1:100, to a line where the gradient begins to exceed 1:40 (the CONTINENTAL SLOPE).

CONTINENTAL SLOPE The declivity from the offshore border of the CONTINENTAL SHELF to oceanic depths. It is characterized by a marked increase in slope.

CONTOUR A line on a map or chart representing points of equal elevation with relation to a DATUM. It is called an ISOBATH when connecting points of equal depth below a datum. Also called DEPTH CONTOUR.

CONTROLLING DEPTH The least depth in the navigable parts of a waterway, governing the maximum draft of vessels that can enter.

CONVERGENCE (1) In refraction phenomena, the decreasing of the distance between orthogonals in the direction of wave travel. Denotes an area of increasing wave height and energy concentration. (2) In wind-setup phenomena, the increase in setup observed over that which would occur in an equivalent rectangular basin of uniform depth, caused by changes in planform or depth; also the decrease in basin width or depth causing such increase in setup.

CORE (1) A cylindrical sample extracted from a beach or seabed to investigate the types and depths of sediment layers. (2) An inner, often much less permeable portion of a BREAKWATER or BARRIER BEACH.

CORIOLIS EFFECT Force due to the Earth's rotation, capable of generating currents. It causes moving bodies to be deflected to the right in the Northern Hemisphere and to the left in the Southern Hemisphere. The "force" is proportional to the speed and latitude of the moving object. It is zero at the equator and maximum at the poles.

COVE A small, sheltered recess in a coast, often inside a larger embayment.

COVER LAYER The outer layer used in a rubble system as protection against external hydraulic loads.

CREEK (1) A stream, less predominant than a river, and generally tributary to a river. (2) A small tidal Channel through a coastal MARSH.

CREEP Very slow, continuous downslope movement of soil or debris.

CRENULATE An indented or wavy shoreline beach form, with the regular seaward- pointing parts rounded rather than sharp, as in the cuspate type.

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CREST Highest point on a beach face, BREAKWATER, or seawall.

CREST LENGTH, WAVE The length of a wave along its crest. Sometimes called CREST WIDTH.

CREST OF WAVE (1) the highest part of a wave. (2) That part of the wave above still-water level.

CREST OF BERM The seaward limit of a berm. Also called BERM EDGE.

CROSS-BEDDING An arrangement of relatively thin layers of rock inclined at an angle to the more nearly horizontal BEDDING PLANES of the larger rock unit. Also referred to as cross-stratification.

CROSS-SHORE Perpendicular to the shoreline.

CROWN WALL Concrete superstructure on a rubble mound.

CURRENT (1) The flowing of water, or other liquid or gas. (2) That portion of a stream of water which is moving with a velocity much greater than the average or in which the progress of the water is principally concentrated. (3) Ocean currents can be classified in a number of different ways. Some important types include the following: (1) Periodic - due to the effect of the tides; such Currents may be rotating rather than having a simple back and forth motion. The currents accompanying tides are known as tidal currents; (2) Temporary - due to seasonal winds; (3) Permanent or ocean - constitute a part of the general ocean circulation. The term DRIFT CURRENT is often applied to a slow broad movement of the oceanic water; (4) Nearshore - caused principally by waves breaking along a shore.

CURRENT, COASTAL One of the offshore currents flowing generally parallel to the shoreline in the deeper water beyond and near the surf zone; these are not related genetically to waves and resulting surf, but may be related to tides, winds, or distribution of mass.

CURRENT, DRIFT A broad, shallow, slow-moving ocean or lake current. Opposite of CURRENT, STREAM.

CURRENT, EBB The tidal current away from shore or down a tidal stream. Usually associated with the decrease in the height of the tide.

CURRENT, EDDY See EDDY.

CURRENT, FEEDER Any of the parts of the nearshore current system that flow parallel to shore before converging and forming the neck of the RIP CURRENT.

CURRENT, FLOOD The tidal current toward shore or up a tidal stream. Usually associated with the increase in the height of the tide.

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CURRENT, INSHORE See INSHORE CURRENT.

CURRENT, LITTORAL Any current in the littoral zone caused primarily by wave action; e.g., LONGSHORE CURRENT, RIP CURRENT. See also CURRENT, NEARSHORE.

CURRENT, LONGSHORE The littoral current in the breaker zone moving essentially parallel to the shore, usually generated by waves breaking at an angle to the shoreline.

CURRENT METER An instrument for measuring the velocity of a current.

CURRENT, NEARSHORE A current in the NEARSHORE ZONE.

CURRENT, OFFSHORE See OFFSHORE CURRENT.

CURRENT, PERIODIC See CURRENT, TIDAL.

CURRENT, PERMANENT See PERMANENT CURRENT.

CURRENT, RIP See RIP CURRENT.

CURRENT, STREAM A narrow, deep, and swift ocean current, as the Gulf Stream. CURRENT, DRIFT.

CURRENT SYSTEM, NEARSHORE See NEARSHORE CURRENT SYSTEM.

CURRENT, TIDAL The alternating horizontal movement of water associated with the rise and fall of the tide caused by the astronomical tide-producing forces. Also CURRENT, PERIODIC. See also CURRENT, FLOOD and CURRENT, EBB.

CURRENT-REFRACTION Process by which wave velocity, height, and direction are affected by a current.

CUSP One of a series of short ridges on the FORESHORE separated by crescent-shaped troughs spaced at more or less regular intervals. Between these cusps are hollows. The cusps are spaced at somewhat uniform distances along beaches. They represent a combination of constructive and destructive processes. Also BEACH CUSP.

CUSPATE BAR A crescent-shaped bar uniting with the shore at each end. It may be formed by a single spit growing from shore and then turning back to again meet the shore, or by two spits growing from the shore and uniting to form a bar of sharply cuspate form.

CUSPATE SPIT The spit that forms in the lee of a shoal or offshore feature (BREAKWATER, island, rock outcrop) by waves that are refracted and/or diffracted around the offshore feature. It may eventually grow into a TOMBOLO linking the feature to the mainland.

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CYCLOIDAL WAVE A steep, symmetrical wave whose crest forms an angle of 120 degrees and whose form is that of a cycloid. A trochoidal wave of maximum steepness. See also TROCHOIDAL WAVE.

CYCLONE A system of winds that rotates about a center of low atmospheric pressure. Rotation is clockwise in the Southern Hemisphere and anti-clockwise in the Northern Hemisphere. In the Indian Ocean, the term refers to the powerful storms called HURRICANES in the Atlantic.

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DAM Structure built in rivers or estuaries, basically to separate water at both sides and/or to retain water at one side.

DATUM Any permanent line, plane or surface used as a reference datum to which elevations are referred.

DATUM, CHART See CHART DATUM.

DATUM, PLANE The horizontal plane to which soundings, ground elevations, or water surface elevations are referred. Also REFERENCE PLANE. The plane is called a TIDAL DATUM when defined by a certain phase of the tide. The following datums are ordinarily used on hydrographic charts: MEAN LOW WATER--Atlantic coast (U. S.), Argentina, Sweden, and Norway. MEAN LOWER LOW WATER--Pacific coast (U. S.). LOW WATER DATUM--Great Lakes (U. S. and Canada). A common datum used on United States topographic maps is MEAN SEA LEVEL. See also BENCH MARK.

DAVIDSON CURRENT Deep-ocean boundary current off the west coast of the U.S. which brings warmer, saltier, low oxygen, high phosphate equatorial type water from low to high latitudes.

DEBRIS LINE A line near the limit of storm wave uprush marking the landward limit of debris deposits.

DECAY AREA Area of relative CALM through which waves travel after emerging from the generating area.

DECAY DISTANCE The distance waves travel after leaving the generating area (FETCH).

DECAY OF WAVES The change waves undergo after they leave a generating area (FETCH) and pass through a calm, or region of lighter winds. In the process of decay, the significant wave height decreases and the significant wavelength increases.

DEEP WATER Water so deep that surface waves are little affected by the ocean bottom. Generally, water deeper than one-half the surface wavelength is considered deep water. Compare SHALLOW WATER.

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DEEP WATER WAVES A wave in water the depth of which is greater than one-half the WAVE LENGTH.

DEFLATION The removal of loose material from a beach or other land surface by wind action.

DEGRADATION The geologic process by means of which various parts of the surface of the earth are worn away and their general level lowered, by the action of wind and water.

DELTA (1) An ALLUVIAL DEPOSIT, usually triangular or semicircular, at the mouth of a river or stream. The delta is normally built up only where there is no tidal or current action capable of removing the sediment at the same rate as it is deposited, and hence the delta builds forward from the coastline. (2) A TIDAL DELTA is a similar deposit at the mouth of a tidal INLET, put there by TIDAL CURRENTS.

DELTA PLAIN The nearly-level surface composing the landward portion of a large DELTA.

DENSITY Mass (in kg) per unit of volume of a substance; kg/m3. For pure water, the density is 1,000 kg/m^3, for seawater the density is usually more. Density increases with increasing salinity, and decreases with increasing temperature. More information can be found in "properties of seawater". For stone and sand, usually a density of 2,600 kg/m^3 is assumed. Concrete is less dense, in the order of 2,400 kg/m^3. Some types of basalt may reach 2,800 kg/m^3. For sand, including the voids, one may use 1,600 kg/m^3, while mud often has a density of 1,100 – 1,200 kg/m^3.

DENSITY CURRENT Phenomenon of relative flow within water due to difference in density. For example, the salt-water wedge is a density current, as is a volcanic nuée ardente.

DENSITY STRATIFICATION The lateral expansion of a sediment plume as it moves out of the distributary mouth, where salt and fresh water mix. This is most likely to occur where the speed of the river flow is moderate to low and the distributary mouth is relatively deep.

DENSITY-DRIVEN CIRCULATION Variations in salinity create variations in density in estuaries. These variations in density create horizontal pressure gradients, which drive estuarine circulation.

DEPRESSION A general term signifying any depressed or lower area in the ocean floor.

DEPTH The vertical distance from a specified datum to the sea floor.

DEPTH CONTOUR See CONTOUR., also isobath.

DEPTH, CONTROLLING See CONTROLLING DEPTH.

DEPTH FACTOR See SHOALING COEFFICIENT.

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DEPTH OF BREAKING The still-water depth at the point where the wave breaks. Also BREAKER DEPTH.

DERRICK STONE See STONE, DERRICK.

DESIGN HURRICANE See HYPOTHETICAL HURRICANE.

DESIGN STORM A hypothetical extreme storm whose waves coastal protection structures will often be designed to withstand. The severity of the storm (i.e. return period) is chosen in view of the acceptable level of risk of damage or failure. A DESIGN STORM consists of a DESIGN WAVE condition, a design water level and a duration.

DESIGN WAVE In the design of HARBORS, harbor works, etc., the type or types of waves selected as having the characteristics against which protection is desired.

DESIGN WAVE CONDITION Usually an extreme wave condition with a specified return period used in the design of coastal works.

DETACHED BREAKWATER A BREAKWATER without any SUBAERIAL connection to the shore.

DETRITUS Small fragments of rock which have been worn or broken away from a mass by the action of water or waves.

DIFFERENTIAL EROSION / WEATHERING These features develop in rocks which have varying resistance to the agencies of erosion and/or weathering so that parts of the rock are removed at greater rates than others. A typical example is the removal of soft beds from between harder beds in a series of sedimentary rocks. The term may be applied to any size of feature, from small-scale etching to the regional development of hills and valleys controlled by hard and soft rocks.

DIFFRACTION (of water waves) The phenomenon by which energy is transmitted laterally along a wave crest. When a part of a train of waves is interrupted by a barrier, such as a BREAKWATER, the effect of diffraction is manifested by propagation of waves into the sheltered region within the barrier's geometric shadow.

DIFFRACTION COEFFICIENT Ratio of diffracted wave height to deep water wave height.

DIKE Earth structure along sea or river in order to protect low lands from flooding by high water; dikes along rivers are sometimes called levees. Sometimes written as DYKE.

DISCHARGE The volume of water per unit of time flowing along a pipe or channel.

DITCH A channel to convey water for irrigation or drainage.

DIURNAL Having a period or cycle of approximately one TIDAL DAY.

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DIURNAL CURRENT The type of tidal current having only one flood and one ebb period in the tidal day. A ROTARY CURRENT is diurnal if it changes its direction through all points of the compass once each tidal day.

DIURNAL INEQUALITY The difference in height of the two high waters or of the two low waters of each day. Also, the difference in velocity between the two daily flood or EBB CURRENTS of each day.

DIURNAL TIDE A tide with one high water and one low water in a tidal day.

DIVERGENCE (1) In refraction phenomena, the increasing of distance between orthogonals in the direction of wave travel. Denotes an area of decreasing wave height and energy concentration. (2) In wind-setup phenomena, the decrease in setup observed under that which would occur in an equivalent rectangular basin of uniform depth, caused by changes in planform or depth. Also the increase in basin width or depth causing such decrease in setup.

DIVERGING WAVE Waves that move obliquely out from a vessel's sailing line.

DIVERSION CHANNEL A waterway used to divert water from its natural course. The term is generally applied to a temporary arrangement e.g. to by-pass water around a dam site during construction.

DOCK The slip or waterway between two piers, or cut into the land, for the reception of ships.

DOLPHIN A cluster of piles.

DOWNDRIFT The direction of predominant movement of littoral materials.

DOWNSTREAM Along coasts with obliquely approaching waves there is a longshore (wave-driven) current. For this current, one can define an upstream and a DOWNSTREAM direction. For example, on a beach with an orientation west-east, the sea is to the north. Suppose the waves come from NW, then the current flows from West to East. Here, UPSTREAM is west of the observer, and east is downstream of the observer.

DOWNWELLING A downward movement (sinking) of surface water caused by onshore Ekman transport, converging CURRENTS, or when a water mass becomes more dense than the surrounding water.

DRAINAGE BASIN Total area drained by a stream and its tributaries.

DREDGING Excavation or displacement of the bottom or shoreline of a water body. Dredging can be accomplished with mechanical or hydraulic machines. Most is done to maintain channel depths or berths for navigational purposes; other dredging is for shellfish harvesting, for cleanup of polluted sediments, and for placement of sand on beaches.

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DRIFT (noun) (1) Sometimes used as a short form for LITTORAL DRIFT. (2) The speed at which a current runs. (3) Floating material deposited on a beach (driftwood). (4) A deposit of a continental ice sheet; e.g., a DRUMLIN.

DRIFT CURRENT A broad, shallow, slow-moving ocean or lake current.

DRIFT SECTOR A particular reach of marine shore in which LITTORAL DRIFT may occur without significant interruption, and which contain any and all natural sources of such drift, and also any accretion shore forms accreted by such drift.

DROMOND A large medieval fast-sailing galley or cutter.

DROWNED COAST A shore with long, narrow channels, implying that subsidence of the coast has transformed the lower portions of river valleys into tidal estuaries.

DRUMLIN A low, smoothly-rounded, elongate hill of compact glacial till built under the margin of the ice and shaped by its flow.

DRYING BEACH That part of the beach which is uncovered by water (e.g. at low tide). Sometimes referred to as 'SUBAERIAL' beach.

DUNES (1) Ridges or mounds of loose, wind-blown material, usually sand. (2) Bed forms smaller than bars but larger than ripples that are out of phase with any water-surface gravity waves associated with them.

DURABILITY The ability of a rock to retain its physical and mechanical properties (i.e. resist degradation) in engineering service.

DURATION In wave forecasting, the length of time the wind blows in nearly the same direction over the FETCH (generating area).

DURATION, MINIMUM The time necessary for steady-state wave conditions to develop for a given wind velocity over a given fetch length.

DURATION OF EBB The interval of time in which a tidal current is ebbing, determined from the middle of the slack waters.

DURATION OF FALL The interval from high water to low water.

DURATION OF FLOOD The interval of time in which a tidal current is flooding, determined from the middle of slack waters.

DURATION OF RISE The interval from low water to high water.

DYNAMIC EQUILIBRIUM Short term morphological changes that do not affect the morphology over a long period.

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DYNAMIC VISCOSITY In fluid dynamics, the ratio between the shear stress acting along any plane between neighboring fluid elements and the rate of deformation of the velocity gradient perpendicular to this plane.

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EAGER See BORE.

EBB Period when tide level is falling; often taken to mean the ebb current which occurs during this period.

EBB CURRENT The movement of a tidal current away from shore or down a tidal stream. In the semidiurnal type of reversing current, the terms greater ebb and lesser ebb are applied respectively to the ebb currents of greater and lesser velocity of each day. The terms of maximum ebb and minimum ebb are applied to the maximum and minimum velocities of a continuously running ebb current, the velocity alternately increasing and decreasing without coming to a slack or reversing. The expression maximum ebb is also applicable to any ebb current at the time of greatest velocity.

EBB INTERVAL The interval between the transit of the moon over the meridian of a place and the time of the following strength of ebb.

EBB SHIELD High, landward margin of a flood-tidal shoal that helps divert ebb-tide currents around the shoal.

EBB STRENGTH The EBB CURRENT at the time of maximum velocity.

EBB TIDAL DELTA The bulge of sand formed at the seaward mouth of TIDAL INLETS as a result of interaction between tidal currents and waves. Also called inlet-associated bars and estuary entrance shoals.

EBB TIDE The period of tide between high water and the succeeding low water; a falling tide.

ECHO SOUNDER An electronic instrument used to determine the depth of water by measuring the time interval between the emission of a sonic or ultrasonic signal and the return of its echo from the bottom.

ECOSYSTEM The living organisms and the nonliving environment interacting in a given area, encompassing the relationships between biological, geochemical, and geophysical systems.

EDDY A circular movement of water formed on the side of a main current. Eddies may be created at points where the main stream passes projecting obstructions or where two adjacent currents flow counter to each other.

EDDY CURRENT See EDDY.

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EDGE WAVE An ocean wave parallel to a coast, with crests normal to the shoreline. An edge wave may be STANDING or PROGRESSIVE. Its height diminishes rapidly seaward and is negligible at a distance of one wavelength offshore.

EKMAN TRANSPORT Resultant flow at right angles to and to the right of the wind direction (in the northern hemisphere) referred to as UPWELLING and DOWNWELLING.

ELEVATION The vertical distance from mean sea level or other established datum plane to a point on the earth's surface; height above sea level. Although sea floor elevation below msl should be marked as a negative value, many charts show positive numerals for water depth.

EL NIÑO Warm equatorial water which flows southward along the coast of Peru and Ecuador during February and March of certain years. It is caused by poleward motions of air and unusual water temperature patterns in the Pacific Ocean, which cause coastal downwelling, leading to the reversal in the normal north-flowing cold coastal currents. During many El Niño years, storms, rainfall, and other meteorological phenomena in the Western Hemisphere are measurably different than during non-El Niño years. (See La Niña).

ELUTRIATION The process by which a granular material can be sorted into its constituent particle sizes by means of a moving stream of fluid (usually air or water). Elutriators are extensively used in studies of sediments for determining Particle size distribution. Under certain circumstances wind, rivers and streams may act as elutriating agents.

EMBANKMENT Fill material, usually earth or rock, placed with sloping sides and with a length greater than its height. Usually an embankment is wider than a dike.

EMBAYMENT An indentation in the shoreline forming an open bay.

EMERGENT COAST A coast in which land formerly under water has recently been exposed above sea level, either by uplift of the land or by a drop in sea level.

ENDEMIC Native or confined to a specific geographic area.

ENERGY COEFFICIENT The ratio of the energy in a wave per unit crest length transmitted forward with the wave at a point in shallow water to the energy in a wave per unit crest length transmitted forward with the wave in deep water. On refraction diagrams this is equal to the ratio of the distance between a pair of orthogonals at a selected shallow-water point to the distance between the same pair of orthogonals in deep water. Also the square of the REFRACTION COEFFICIENT.

ENTRANCE The avenue of access or opening to a navigable channel or inlet.

EOLIAN (also AEOLIAN) Pertaining to the wind, esp. used with deposits such as loess and dune sand, and sedimentary structures like wind-formed ripple marks.

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EOLIAN SANDS Sediments of sand size or smaller which have been transported by winds. They may be recognized in marine deposits off desert coasts by the greater angularity of the grains compared with waterborne particles.

EQUATORIAL CURRENTS (1) Ocean currents flowing westerly near the equator. There are two such currents in both the Atlantic and Pacific Oceans. The one to the north of the equator is called the North Equatorial Current and the one to the south is called the South Equatorial Current. Between these two currents there is an easterly flowing stream known as the Equatorial Countercurrent. (2) Tidal currents occurring semimonthly as a result of the moon being over the equator. At these times the tendency of the moon to produce DIURNAL INEQUALITY in the current is at a minimum.

EQUATORIAL TIDES Tides occurring semimonthly as the result of the moon being over the equator. At these times the tendency of the moon to produce a DIURNAL INEQUALITY in the tide is at a minimum.

EROSION The wearing away of land by the action of natural forces. On a beach, the carrying away of beach material by wave action, tidal currents, littoral currents, or by deflation.

ESCARPMENT A more or less continuous line of cliffs or steep slopes facing in one general direction which are caused by erosion or faulting. Also SCARP.

ESTUARY (1) The part of a river that is affected by tides. (2) The region near a river mouth in which the fresh water of the river mixes with the salt water of the sea and which received both fluvial and littoral sediment influx.

EUSTATIC SEA LEVEL CHANGE Change in the relative volume of the world=s ocean basins and the total amount of ocean water.

EYE In meteorology, usually the "eye of the storm" (hurricane): the roughly circular area of comparatively light winds and fair weather found at the center of a severe tropical cyclone.

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FAIRWAY The parts of a waterway that are open and unobstructed for navigation. The main traveled part of a waterway; a marine thoroughfare.

FAR-INFRAGRAVITY The frequency band (nominally 0.001 - 0.02 Hz) occupied by SHEAR INSTABILITIES of the longshore current. This band falls both below and in the lower part of the Infragravity band occupied by Infragravity waves.

FATHOM A unit of measurement used for soundings equal to 1.83 meters (6 feet).

FATHOMETER The copyrighted trademark for a type of ECHO SOUNDER.

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FAULT A fracture in rock along which there has been an observable amount of displacement. Faults are rarely single planar units; normally they occur as parallel to sub-parallel sets of planes along which movement has taken place to a greater or lesser extent. Such sets are called fault or fracture-zones.

FAUNA The entire group of animals found in an area.

FEEDER BEACH An artificially widened beach serving to nourish downdrift beaches by natural littoral currents or forces.

FEEDER CURRENT The currents which flow parallel to shore before converging and forming the neck of a RIP CURRENT.

FEEDER CURRENT See CURRENT, FEEDER.

FEELING BOTTOM The initial action of a deepwater wave, in response to the bottom, upon running into shoal water.

FETCH The area in which SEAS are generated by a wind having a fairly constant direction and speed. Sometimes used synonymously with FETCH LENGTH. Also GENERATING AREA.

FETCH LENGTH The horizontal distance (in the direction of the wind) over which a wind generates seas or creates a WIND SETUP.

FETCH-LIMITED Situation in which wave energy (or wave height) is limited by the size of the wave generation area (fetch).

FILTER Intermediate layer, preventing fine materials of an underlayer from being washed through the voids of an upper layer.

FIORD (FJORD) A narrow, deep, steep-walled inlet of the sea, usually formed by entrance of the sea into a deep glacial trough.

FIRTH A narrow arm of the sea; also, the opening of a river into the sea.

FLOOD (1) Period when tide level is rising; often taken to mean the flood current which occurs during this period (2) A flow beyond the carrying capacity of a channel.

FLOOD CHANNEL Channel located on ebb-tidal shoal that carries the flood tide over the tidal flat into the back bay or lagoon.

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FLOOD CURRENT The movement of a tidal current toward the shore or up a tidal stream. In the semidiurnal type of reversing current, the terms greater flood and lesser flood are applied respectively to the flood currents of greater and lesser velocity each day. The terms maximum flood and minimum flood are applied to the maximum and minimum velocities of a flood current the velocity of which alternately increases and decreases without coming to slack or reversing. The expression maximum flood is also applicable to any flood current at the time of greatest velocity.

FLOOD GATE A gravity outlet fitted with vertically-hinged doors, opening if the inner water level is higher than the outer water level, so that drainage takes place during low water.

FLOOD INTERVAL The interval between the transit of the moon over the meridian of a place and the time of the following flood.

FLOOD MARK Proof of any kind on the shoreline, or on structures like bridge abutments, used to determine the highest level attained by the water surface during the flood (note: the height of the flood mark usually includes the wave run-up).

FLOOD PLAIN (1) A flat tract of land bordering a river, mainly in its lower reaches, and consisting of ALLUVIUM deposited by the river. It is formed by the sweeping of the meander belts downstream, thus widening the valley, the sides of which may become some kilometers apart. In time of flood, when the river overflows its banks, sediment is deposited along the valley banks and plains. (2) Synonymous with 100-year floodplain. The land area susceptible to being inundated by stream derived waters with a 1 percent chance of being equaled or exceeded in any given year.

FLOOD RAMP Seaward-dipping sand platform dominated by flood-tidal currents, located on ebb-tidal shoal near the opening to the inlet.

FLOOD ROUTING The determination of the attenuating effect of storage on a river-flood passing through a valley by reason of a feature acting as control (e.g. a reservoir with a spillway capacity less than the flood inflow, or the widening or narrowing of a valley).

FLOOD TIDAL DELTA The bulge of sand formed at the landward mouth of TIDAL INLETS as a result of flow expansion.

FLOOD TIDE The period of tide between low water and the succeeding high water; a rising tide.

FLOODWALL, SPLASH WALL Wall, retired from the seaward edge of the seawall crest, to prevent water from flowing onto the land behind.

FLORA The entire group of plants found in an area.

FLUVIAL Of or pertaining to rivers; produced by the action of a river or stream (e.g., fluvial sediment).

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FLUSHING TIME The time required to replace all the water in an ESTUARY, HARBOR, etc., by action of current and tide.

FOAM LINE (1) The front of a wave as it advances shoreward, after it has broken. (2) Lines of foam such as those which move around the head of a RIP.

FOLLOWING WIND Generally, the same as a tailwind; in wave forecasting, wind blowing in the direction of ocean-wave advance.

FOREDUNE The front DUNE immediately behind the backshore.

FORERUNNER Low, long-period ocean SWELL which commonly precedes the main swell from a distant storm, especially a tropical cyclone.

FORESHORE The part of the shore, lying between the crest of the seaward berm (or upper limit of wave wash at high tide) and the ordinary low-water mark, that is ordinarily traversed by the uprush and backrush of the waves as the tides rise and fall. See BEACH FACE.

FORE REEF The seaward side of a REEF (usually coral); in places a steep slope covered with reef talus.

FORWARD SPEED (hurricane)Rate of movement (propagation) of the hurricane eye in meters per second, knots, or miles per hour.

FREEBOARD At a given time, the vertical distance between the water level and the top of the structure. On a ship, the distance from the waterline to main deck or gunwale.

FRINGING REEF A coral REEF attached directly to an insular or continental shore. There may be a shallow channel or lagoon between the reef and the adjacent mainland.

FRONT OF THE FETCH In wave forecasting, the end of the generating area toward which the wind is blowing.

FROUDE NUMBER The dimensionless ratio of the inertial force to the force of gravity for a given fluid flow. It may be given as $Fr = V/Lg$ where V is a characteristic velocity, is a characteristic length, and g the acceleration of gravity - or as the square root of this number.

FULLY-DEVELOPED SEA The waves that form when wind blows for a sufficient period of time across the open ocean. The waves of a fully developed sea have the maximum height possible for a given windspeed, FETCH and duration of wind.

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GABION (1) Steel wire-mesh basket to hold stones or crushed rock to protect a bank or bottom from erosion. (2) Structures composed of masses of rocks, rubble or masonry held tightly together usually by wire mesh so as to form blocks or walls. Sometimes used on heavy erosion areas to retard wave action or as a foundation for BREAKWATERS or JETTIES.

GALE A wind between a strong breeze and a storm. A continuous wind blowing in degrees of moderate, fresh, strong, or whole gale and varying in velocity from 28 to 47 nautical miles per hour (see BEAUFORT SCALE).

GAGE (GAGE) Instrument for measuring the water level relative to a datum.

GENERATING AREA In wave forecasting, the continuous area of water surface over which the wind blows in nearly a constant direction. Sometimes used synonymously with FETCH LENGTH. Also FETCH.

GEOGRAPHICAL INFORMATION SYSTEM (GIS) Database of information which is geographically referenced, usually with an associated visualization system.

GEOMETRIC MEAN DIAMETER The diameter equivalent of the arithmetic mean of the logarithmic frequency distribution. In the analysis of beach sands, it is taken as that grain diameter determined graphically by the intersection of a straight line through selected boundary sizes, (generally points on the distribution curve where 16 and 84 percent of the sample is coarser by weight) and a vertical line through the median diameter of the sample.

GEOMETRIC SHADOW In wave diffraction theory, the area outlined by drawing straight lines paralleling the direction of wave approach through the extremities of a protective structure. It differs from the actual protected area to the extent that the diffraction and refraction effects modify the wave pattern.

GEOMORPHOLOGY (1) That branch of physical geography which deals with the form of the Earth, the general configuration of its surface, the distribution of the land, water, etc. (2) The investigation of the history of geologic changes through the interpretation of topographic forms.

GEOPHYSICS The study of the physical characteristics and properties of the earth, usually employing quantitative physical methods.

GEOTEXTILE A synthetic fabric which may be woven or non-woven used as a filter.

GLACIER A large body of ice moving slowly down a slope of valley or spreading outward on a land surface (e.g., Greenland, Antarctica) and surviving from year to year.

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GLACIO-ISOSTACY The state of hydrostatic equilibrium of the earth=s crust as influenced by the weight of glacier ice.

GLOBAL POSITIONING SYSTEM (GPS) A navigational and positioning system developed by the U.S. Department of Defense, by which the location of a position on or above the Earth can be determined by a special receiver at that point interpreting signals received simultaneously from several of a constellation of special satellites.

GORGE (1) The deepest portion of an inlet, the THROAT. (2) A narrow, deep valley with nearly vertical rock walls.

GRADED BEDDING An arrangement of particle sizes within a single bed, with coarse grains at the bottom of the bed and progressively finer grains toward the top of the bed.

GRADIENT (1) A measure of slope (soil- or water-surface) in meters of rise or fall per meter of horizontal distance. (2) More general, a change of a value per unit of distance, e.g. the gradient in longshore transport causes erosion or accretion. (3) With reference to winds or currents, the rate of increase or decrease in speed, usually in the vertical; or the curve that represents this rate.

GRADING Distribution with regard to size or weight, of individual stones within a bulk volume; heavy, light and fine grading are distinguished.

GRADUAL CLOSURE METHOD Method in which the final closure gap in a dam is closed gradually either by the vertical or horizontal closure method; this in contradiction with a sudden closure.

GRANULAR FILTER A layer of granular material which is incorporated in an embankment, dam, dike, or bottom protection and is graded so as to allow seepage to flow across or down the filter zone without causing the migration of the material adjacent to the filter.

GRAVEL Unconsolidated natural accumulation of rounded rock fragments coarser than sand but finer than pebbles (2-4 mm diameter).

GRAVITY WAVE A wave whose velocity of propagation is controlled primarily by gravity. Water waves more than 5 cm long are considered gravity waves. Waves longer than 2.5 cm and shorter than 5 cm are in an indeterminate zone between CAPILLARY and GRAVITY WAVES. See RIPPLE.

GROIN (British, GROYNE) Narrow, roughly shore-normal structure built to reduce longshore currents, and/or to trap and retain littoral material. Most groins are of timber or rock and extend from a SEAWALL, or the backshore, well onto the foreshore and rarely even further offshore. See T-GROIN, PERMEABLE GROIN, IMPERMEABLE GROIN.

GROIN BAY The beach compartment between two groins.

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GROIN SYSTEM A series of groins acting together to protect a section of beach. Commonly called a GROIN field.

GULF A relatively large portion of the ocean or sea extending far into land; the largest of various forms of inlets of the sea (e.g., Gulf of Mexico, Gulf of Aqaba).

GUT A tidal stream connecting two larger waterways.

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HALCOCLINE A zone in which salinity changes rapidly.

HALF-TIDE LEVEL A plane midway between MEAN HIGH WATER and MEAN LOW WATER, also called MEAN TIDE LEVEL.

HARBOR (British, HARBOUR) Any protected water area affording a place of safety for vessels. See also PORT.

HARBOR OSCILLATION (HARBOR SURGING) The nontidal vertical water movement in a harbor or bay. Usually the vertical motions are low; but when oscillations are excited by a tsunami or storm surge, they may be quite large. Variable winds, air oscillations, or surf beat also may cause oscillations. See SEICHE.

HARD DEFENSES General term applied to impermeable coastal defense structures of concrete, timber, steel, masonry, etc, which reflect a high proportion of incident wave energy.

HEAD OF RIP The part of a rip current that has widened out seaward of the breakers. See also CURRENT, RIP; CURRENT, FEEDER; and NECK (RIP).

HEADLAND (HEAD) (1) A comparatively high promontory with either a CLIFF or steep face extending out into a body of water, such as a sea or lake. An unnamed HEAD is usually called a headland. (2) The section of RIP CURRENT which has widened out seaward of the BREAKERS, also called HEAD OF RIP. (3) Seaward end of BREAKWATER or dam.

HEADWATER LEVEL The level of water in the reservoir.

HEAVE (1) The vertical rise or fall of the waves or the sea. (2) The translational movement of a craft parallel to its vertical axis. (3) The net transport of a floating body resulting from wave action.

HIGH SEAS This term, in municipal and international law, denotes the continuous body of salt water in the world that is navigable in its character and that lies outside territorial waters and maritime belts of the various countries.

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HIGH TIDE, HIGH WATER (HW) The maximum elevation reached by each rising tide. See TIDE.

HIGH WATER (HW) Maximum height reached by a rising tide. The height may be solely due to the periodic tidal forces or it may have superimposed upon it the effects of prevailing meteorological conditions. Nontechnically, also called the HIGH TIDE.

HIGH WATER LINE In strictness, the intersection of the plane of mean high water with the shore. The shoreline delineated on the nautical charts of the National Ocean Service is an approximation of the high water line. For specific occurrences, the highest elevation on the shore reached during a storm or rising tide, including meteorological effects.

HIGH-WATER MARK A reference mark on a structure or natural object, indicating the maximum stage of tide or flood.

HIGH WATER OF ORDINARY SPRING TIDES (HWOST) A tidal datum appearing in some British publications, based on high water of ordinary spring tides.

HIGHER HIGH WATER (HHW) The higher of the two high waters of any tidal day. The single high water occurring daily during periods when the tide is diurnal is considered to be a higher high water.

HIGHER LOW WATER (HLW) The higher of two low waters of any tidal day.

HINDCASTING In wave prediction, the retrospective forecasting of waves using measured wind information.

HINTERLAND The region lying inland from the coast. Also the inland area served by a port.

HISTORIC EVENT ANALYSIS Extreme analysis based on hindcasting typically ten events over a period of 100 years.

HOLOCENE An epoch of the QUATERNARY period, from the end of the PLEISTOCENE, about 8,000 years ago, to the present time.

HOMOPYCNAL FLOW A condition in which the outflow jet from a river or coastal inlet and the water in the receiving basin are of the same density or are vertically mixed.

HOOK A spit or narrow cape of sand or gravel which turns landward at the outer end; a RECURVED SPIT.

HORIZONTAL CLOSURE METHOD Construction of a dam by dumping the materials from one or both banks, thus constricting the channel progressively laterally until the dam is closed. This method is also known as end dumping and point tipping.

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HURRICANE An intense tropical cyclone in which winds tend to spiral inward toward a core of low pressure, with maximum surface wind velocities that equal or exceed 33.5 m/sec (75 mph or 65 knots) for several minutes or longer at some points. TROPICAL STORM is the term applied if maximum winds are less than 33.5 m/sec but greater than a whole gale (63 mph or 55 knots). Term is used in the Atlantic, Gulf, and eastern Pacific.

HURRICANE PATH or TRACK Line of movement (propagation) of the eye through an area.

HURRICANE STAGE HYDROGRAPH A continuous graph representing water level stages that would be recorded in a gage well located at a specified point of interest during the passage of a particular hurricane, assuming that effects of relatively short-period waves are eliminated from the record by damping features of the gage well. Unless specifically excluded and separately accounted for, hurricane surge hydrographs are assumed to include effects of astronomical tides, barometric pressure differences, and all other factors that influence water level stages within a properly designed gage well located at a specified point.

HURRICANE WIND PATTERN or ISOVEL PATTERN An actual or graphical representation of near-surface wind velocities covering the entire area of a hurricane at a particular instant. Isovels are lines connecting points of simultaneous equal wind velocities, usually referenced 9 meters (30 feet) above the surface, in meters per second, knots, or meters per hour; wind directions at various points are indicated by arrows or deflection angles on the isovel charts. Isovel charts are usually prepared at each hour during a hurricane, but for each half hour during critical periods.

HYDRAULIC RADIUS Quotient of the wetted cross-sectional area and the wetted perimeter.

HYDRAULICALLY EQUIVALENT GRAINS Sedimentary particles that settle at the same rate under the same conditions.

HYDROGRAPHY (1) The description and study of seas, lakes, rivers and other waters. (2) The science of locating aids and dangers to navigation. (3) The description of physical properties of the waters of a region.

HYDROGRAPHIC PRESSURE The pressure exerted by water at any given point in a body of water at rest.

HYPOPYCNAL FLOW Outflow from a river or coastal inlet in which a wedge of less dense water flows over the denser sea water.

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HYPOTHETICAL HURRICANE ("HYPOHURRICANE") A representation of a hurricane, with specified characteristics, that is assumed to occur in a particular study area, following a specified path and timing sequence. TRANSPOSED--A hypohurricane based on the storm transposition principle, assumed to have wind patterns and other characteristics basically comparable to a specified hurricane of record, but transposed to follow a new path to serve as a basis for computing a hurricane surge hydrograph that would be expected at a selected point. Moderate adjustments in timing or rate of forward movement may also be made, if these are compatible with meteorological considerations and study objectives. HYPOHURRICANE BASED ON GENERALIZED PARAMETERS--Hypohurricane estimates based on various logical combinations of hurricane characteristics used in estimating hurricane surge magnitudes corresponding to a range of probabilities and potentialities. The STANDARD PROJECT HURRICANE is most commonly used for this purpose, but estimates corresponding to more severe or less severe assumptions are important in some project investigations. STANDARD PROJECT HURRICANE (SPH)--A hypothetical hurricane intended to represent the most severe combination of hurricane parameters that is reasonably characteristic of a specified region, excluding extremely rare combinations. It is further assumed that the SPH would approach a given project site from such direction, and at such rate of movement, to produce the highest HURRICANE SURGE HYDROGRAPH, considering pertinent hydraulic characteristics of the area. Based on this concept, and on extensive meteorological studies and probability analyses, a tabulation of "Standard Project Hurricane Index Characteristics" mutually agreed upon by representatives of the U. S. Weather Service and the Corps of Engineers, is available. PROBABLE MAXIMUM HURRICANE--A hypohurricane that might result from the most severe combination of hurricane parameters that is considered reasonably possible in the region involved, if the hurricane should approach the point under study along a critical path and at optimum rate of movement. This estimate is substantially more severe than the SPH criteria. DESIGN HURRICANE--A representation of a hurricane with specified characteristics that would produce HURRICANE SURGE HYDROGRAPHS and coincident wave effects at various key locations along a proposed project alignment. It governs the project design after economics and other factors have been duly considered. The design hurricane may be more or less severe than the SPH, depending on economics, risk, and local considerations.

---------- I ----------

ICE AGE A loosely-used synonym of glacial epoch, or time of extensive glacial activity; specifically of the latest period of widespread continental glaciers, the PLEISTOCENE Epoch.

ICE FRONT The floating vertical cliff forming the seaward edge of an ICE SHELF or other glacier that enters the sea.

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ICE SHELF A extensive sheet of ice which is attached to the land along one side but most of which is afloat and bounded on the seaward side by a steep cliff (ICE FRONT) rising 2 tp 50+ m above sea level. Common along polar coasts (Antarctica, Greenland), and generally of great breadth and sometimes extending tens or hundreds of km seaward from the continental coastline.

IMPERMEABLE GROIN A GROIN constructed such that sand cannot pass through the structure (but sand may still move over or around it).

INCIDENT WAVE Wave moving landward.

INFRAGRAVITY WAVE Long waves with periods of 30 seconds to several minutes.

INLET (1) A short, narrow waterway connecting a bay, lagoon, or similar body of water with a large parent body of water. (2) An arm of the sea (or other body of water) that is long compared to its width and may extend a considerable distance inland. See also TIDAL INLET.

INLET GORGE Generally, the deepest region of an inlet channel.

INSHORE (ZONE) In beach terminology, the zone of variable width extending from the low water line through the breaker zone. Also SHOREFACE.

INSHORE CURRENT Any current in or landward of the breaker zone.

INSULAR SHELF The zone surrounding an island extending from the low water line to the depth (usually about 183 m; 100 fathoms) where there is a marked or rather steep descent toward the great depths.

INTERNAL WAVES Waves that occur within a fluid whose density changes with depth, either abruptly at a sharp surface of discontinuity (an interface), or gradually. Their amplitude is greatest at the density discontinuity or, in the case of a gradual density change, somewhere in the interior of the fluid and not at the free upper surface where the surface waves have their maximum amplitude.

INTERTIDAL The zone between the high and low water tides.

IRREGULAR WAVES Waves with random wave periods (and in practice, also heights), which are typical for natural wind-induced waves.

IRROTATIONAL WAVE A wave with fluid particles that do not revolve around an axis through their centers, although the particles themselves may travel in circular or nearly circular orbits. Irrotational waves may be PROGRESSIVE, STANDING, OSCILLATORY, or TRANSLATORY. For example, the Airy, Stokes, cnoidal, and solitary wave theories describe irrotational waves. Compare TROCHOIDAL WAVE.

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ISOBATH A contour line connecting points of equal water depths on a chart.

ISOPACHYTE Line connecting points on the seabed with an equal depth of sediment.

ISOVEL PATTERN See HURRICANE WIND PATTERN.

ISTHMUS A narrow strip of land, bordered on both sides by water, that connects two larger bodies of land.

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JET To place (a pile, slab, or pipe) in the ground by means of a jet of water acting at the lower end.

JETTY On open seacoasts, a structure extending into a body of water, which is designed to prevent shoaling of a channel by littoral materials and to direct and confine the stream or tidal flow. Jetties are built at the mouths of rivers or tidal inlets to help deepen and stabilize a channel.

JOINT PROBABILITY The probability of two (or more) things occurring together.

JOINT PROBABILITY DENSITY Function specifying the joint distribution of two (or more) variables.

JOINT RETURN PERIOD Average period of time between occurrences of a given joint probability event.

JONSWAP SPECTRUM Wave spectrum typical of growing deep water waves developed from field experiments and measurements of waves and wave spectra in the Joint North Sea Wave Project

---------- K ----------

KATABATIC WIND Wind caused by cold air flowing down slopes due to gravitational acceleration.

KEY A cay, esp. one of the low, insular banks of sand, coral, and limestone off the southern coast of Florida.

KINEMATIC VISCOSITY The dynamic viscosity divided by the fluid density.

KINETIC ENERGY (OF WAVES) In a progressive oscillatory wave, a summation of the energy of motion of the particles within the wave.

KNOLL A submerged elevation of rounded shape rising less than 1000 meters from the ocean floor and of limited extent across the summit. Compare SEAMOUNT.

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KNOT The unit of speed used in navigation equal to 1 nautical mile (6,076.115 ft or 1,852 m) per hour.

---------- L ----------

LAGGING OF TIDE The periodic retardation in the time of occurrence of high and low water due to changes in the relative positions of the moon and sun.

LAGOON A shallow body of water, like a pond or sound, partly or completely separated from the sea by a barrier island or REEF. Sometimes connected to the sea via an INLET.

LAMINAR FLOW Slow, smooth flow, with each drop of water traveling a smooth path parallel to its neighboring drops. Laminar flow is characteristic of low velocities, and particles of sediment in the flow zones are moved by rolling or SALTATION.

LAND BREEZE A light wind blowing from the land to the sea, caused by unequal cooling of land and water masses.

LAND-SEA BREEZE The combination of a land breeze and a sea breeze as a diurnal phenomenon.

LANDLOCKED Enclosed, or nearly enclosed, by land--thus protected from the sea, as a bay or a harbor.

LANDMARK A conspicuous object, natural or artificial, located near or on land, which aids in fixing the position of an observer.

LEAD LINE A line, wire, or cord used in sounding (to obtain water depth). It is weighted at one end with a plummet (sounding lead). Also SOUNDING LINE.

LEDGE A rocky formation forming a ridge or REEF, especially one underwater or near shore.

LEE (1) Shelter, or the part or side sheltered or turned away from the wind or waves. (2) (Chiefly nautical) the quarter or region toward which the wind blows.

LEEWARD The direction toward which the wind is blowing; the direction toward which waves are traveling.

LENGTH OF WAVE The horizontal distance between similar points on two successive waves measured perpendicularly to the crest.

LEVEE (1) A ridge or EMBANKMENT of sand and silt, built up by a stream on its flood plain along both banks of its channel. (2) A large DIKE or artificial EMBANKMENT, often having an access road along the top, which is designed as part of a system to protect land from floods.

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LIGHT BREEZE A wind with velocity from 4 to 6 KNOTS.

LIMIT OF BACKRUSH (LIMIT OF BACKWASH) See BACKRUSH, BACKWASH.

LITTORAL Of or pertaining to a shore, especially of the sea.

LITTORAL CELL A reach of the coast that is isolated sedimentologically from adjacent coastal reaches and that features its own sources and sinks. Isolation is typically caused by protruding headlands, submarine canyons, inlets, and some river mouths that prevent littoral sediment from one cell to pass into the next. Cells may range in size from a multi-hundred meter POCKET BEACH in a rocky coast to a BARRIER ISLAND many tens of kilometers long.

LITTORAL CURRENT See CURRENT, LITTORAL.

LITTORAL DEPOSITS Deposits of littoral drift.

LITTORAL DRIFT, LITTORAL TRANSPORT The movement of beach material in the littoral zone by waves and currents. Includes movement parallel (long shore drift) and sometimes also perpendicular (cross-shore transport) to the shore.

LITTORAL TRANSPORT RATE Rate of transport of sedimentary material parallel or perpendicular to the shore in the littoral zone. Usually expressed in cubic meters (cubic yards) per year. Commonly synonymous with LONGSHORE TRANSPORT RATE.

LITTORAL ZONE In beach terminology, an indefinite zone extending seaward from the shoreline to just beyond the breaker zone.

LOAD The quantity of sediment transported by a current. It includes the suspended load of small particles and the bedload of large particles that move along the bottom.

LONG WAVES Waves with periods above about 30 seconds; can be generated by wave groups breaking in the surf zone. See also INFRAGRAVITY WAVES.

LONGSHORE Parallel to and near the shoreline; ALONGSHORE.

LONGSHORE BAR A sand ridge or ridges, running roughly parallel to the shoreline and extending along the shore outside the trough, that may be exposed at low tide or may occur below the water level in the offshore.

LONGSHORE CURRENT See CURRENT, LONGSHORE.

LONGSHORE DRIFT Movement of (beach) sediments approximately parallel to the coastline.

LONGSHORE TRANSPORT RATE See LITTORAL TRANSPORT RATE.

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LONGSHORE TROUGH An elongate DEPRESSION or series of depressions extending along the lower BEACH or in the offshore zone inside the BREAKERS.

LOOP That part of a STANDING WAVE where the vertical motion is greatest and the horizontal velocities are least. Loops (sometimes called ANTINODES) are associated with CLAPOTIS and with SEICHE action resulting from wave reflections. Compare NODE.

LOW TIDE (LOW WATER, LW) The minimum elevation reached by each falling tide. See TIDE.

LOW TIDE TERRACE A flat zone of the beach near the low water level.

LOW WATER (LW) The minimum height reached by each falling tide. Nontechnically, also called LOW TIDE.

LOW WATER DATUM An approximation to the plane of mean low water that has been adopted as a standard reference plane. See also DATUM, PLANE and CHART DATUM.

LOW WATER LINE The line where the established LOW WATER DATUM intersects the shore. The plane of reference that constitutes the LOW WATER DATUM differs in different regions.

LOW WATER OF ORDINARY SPRING TIDES (LWOST) A tidal datum appearing in some British publications, based on low water of ordinary spring tides.

LOWER HIGH WATER (LHW) The lower of the two high waters of any tidal day.

LOWER LOW WATER DATUM An approximation to the plane of MEAN LOWER LOW WATER that has been adopted as a standard reference plane for a limited area and is retained for an indefinite period regardless of the fact that it may differ slightly from a better determination of MEAN LOWER LOW WATER from a subsequent series of observations.

LOWER LOW WATER (LLW) The lower of the two low waters of any tidal day. The single low water occurring daily during periods when the tide is diurnal is considered to be a lower low water.

LUNAR DAY The time of rotation of the Earth with respect to the moon, or the interval between two successive upper transits of the moon over the meridian of a place. The mean lunar day is approximately 24.84 solar hours in length, or 1.035 times as great as the mean solar day. Also called TIDAL DAY.

LUNAR TIDE The portion of the tide that can be attributed directly to attraction to the moon.

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MACH-STEM WAVE Higher-than-normal wave generated when waves strike a structure at an oblique angle.

MACRO-TIDAL Tidal range greater than 4 m.

MANAGED RETREAT The deliberate setting back (moving landward) of the existing line of sea defense in order to obtain engineering or environmental advantages - also referred to as managed landward realignment. Sometimes refers to moving roads and utilities landward in the face of shore retreat.

MANGROVE A tropical tree with interlacing prop roots, confined to low-lying brackish areas.

MARGIN, CONTINENTAL A zone separating a continent from the deep-sea bottom.

MARGINAL PROBABILITY The probability of a single variable in the context of a joint probability analysis.

MARGINAL RETURN PERIOD The return period of a single variable in the context of a joint probability analysis.

MARIGRAM A graphic record of the rise and fall of the tide. The record is in the form of a curve in which time is represented by abscissas and the height of the tide by ordinates.

MARKER, REFERENCE A mark of permanent character close to a survey station, to which it is related by an accurately measured distance and azimuth (or bearing).

MARKER, SURVEY An object placed at the site of a station to identify the surveyed location of that station.

MARSH (1) A tract of soft, wet land, usually vegetated by reeds, grasses and occasionally small shrubs. (2) Soft, wet area periodically or continuously flooded to a shallow depth, usually characterized by a particular subclass of grasses, cattails and other low plants.

MARSH, DIKED A former salt marsh which has been protected by a DIKE.

MARSH, SALT A marsh periodically flooded by salt water.

MASS TRANSPORT, SHOREWARD The movement of water due to wave motion, which carries water through the BREAKER ZONE in the direction of wave propagation. Part of the NEARSHORE CURRENT SYSTEM.

MATTRESS A blanket of brushwood or bamboo, poles, geotextile and reed lashed together to protect a shoreline, embankment or river/sea bed against erosion. Sometimes placed on the sea bed during JETTY construction to prevent stone from settling into soft bottom.

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MEAN DEPTH The average DEPTH of the water area between the still water level and the SHOREFACE profile from the waterline to any chosen distance seaward.

MEAN DIAMETER, GEOMETRIC See GEOMETRIC MEAN DIAMETER.

MEAN HIGH WATER SPRINGS (MHWS) The average height of the high water occurring at the time of spring tides.

MEAN HIGH WATER (MHW) The average height of the high waters over a 19-year period. For shorter periods of observations, corrections are applied to eliminate known variations and reduce the results to the equivalent of a mean 19-year value. All high water heights are included in the average where the type of tide is either semidiurnal or mixed. Only the higher high water heights are included in the average where the type of tide is diurnal. So determined, mean high water in the latter case is the same as mean higher high water.

MEAN HIGHER HIGH WATER (MHHW) The average height of the higher high waters over a 19-year period. For shorter periods of observation, corrections are applied to eliminate known variations and reduce the result to the equivalent of a mean 19-year value.

MEAN LOW WATER (MLW) The average height of the low waters over a 19-year period. For shorter periods of observations, corrections are applied to eliminate known variations and reduce the results to the equivalent of a mean 19-year value. All low water heights are included in the average where the type of tide is either semidiurnal or mixed. Only lower low water heights are included in the average where the type of tide is diurnal. So determined, mean low water in the latter case is the same as mean lower low water.

MEAN LOW WATER SPRINGS The average height of low waters occurring at the time of the spring tides. It is usually derived by taking a plane depressed below the half-tide level by an amount equal to one-half the spring range of tide, necessary corrections being applied to reduce the result to a mean value. This plane is used to a considerable extent for hydrographic work outside of the United States and is the plane of reference for the Pacific approaches to the Panama Canal. Frequently abbreviated to LOW WATER SPRINGS.

MEAN LOWER LOW WATER (MLLW) The average height of the lower low waters over a 19-year period. For shorter periods of observations, corrections are applied to eliminate known variations and reduce the results to the equivalent of a mean 19-year value. Frequently abbreviated to LOWER LOW WATER.

MEAN RANGE OF TIDE The difference in height between MEAN HIGH WATER and MEAN LOW WATER.

MEAN RISE OF THE TIDE The height of MEAN HIGH WATER above the plane of reference or DATUM of chart.

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MEAN SEA LEVEL The average height of the surface of the sea for all stages of the tide over a 19-year period, usually determined from hourly height readings. Not necessarily equal to MEAN TIDE LEVEL.

MEAN STEEPNESS The ratio of the MEAN DEPTH to the horizontal distance over which the MEAN DEPTH was determined.

MEAN TIDE LEVEL A plane midway between MEAN HIGH WATER and MEAN LOW WATER. Not necessarily equal to MEAN SEA LEVEL. Also HALF-TIDE LEVEL.

MEAN WATER LEVEL The mean water surface level as determined by averaging the heights of the water at equal intervals of time, usually at hourly intervals. The mean water level includes all components contributing to the stillwater level, including astronomical tides, storm surge, wave setup and freshwater input. Also called the "total stillwater level".

MEAN WAVE HEIGHT The mean of all individual waves in an observation interval of approximately half an hour. In case of a Rayleigh distribution 63 percent of the significant wave height.

MEANDERING A single channel having a pattern of successive deviations in alignment which results in a more or less sinusoidal course.

MEDIAN DIAMETER The diameter which marks the division of a given sand sample into two equal parts by weight, one part containing all grains larger than that diameter and the other part containing all grains smaller.

MEGARIPPLE See SAND WAVE.

MESO-TIDAL Tidal range between 2 m and 4 m.

METEOROLOGICAL TIDES Tidal constituents having their origin in the daily or seasonal variation in weather conditions which may occur with some degree of periodicity.

MICRO-TIDAL Tidal range less than 2 m.

MID-EXTREME TIDE A plane midway between the extreme high water and the extreme LOW WATER occurring in any locality.

MIDDLE-GROUND SHOAL A shoal formed by ebb and flood tides in the middle of the channel of the LAGOON or estuary end of an inlet.

MINERAL A naturally occurring, inorganic, crystalline solid that has a definite chemical composition and possesses characteristic physical properties.

MINIMUM DURATION See DURATION, MINIMUM.

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MINIMUM FETCH The least distance in which steady-state wave conditions will develop for a wind of given speed blowing a given duration of time.

MIST Water vapor suspended in the air in very small drops finer than rain, larger than fog.

MIXED CURRENT Type of tidal current characterized by a conspicuous velocity difference between the two floods or two ebbs usually occurring each tidal day.

MIXED TIDE A type of tide in which the presence of a diurnal wave is conspicuous by a large inequality in either the high or low water heights, with two high waters and two low waters usually occurring each tidal day. In strictness, all tides are mixed, but the name is usually applied without definite limits to the tide intermediate to those predominantly semidiurnal and those predominantly diurnal.

MOLE In coastal terminology, a massive land-connected, solid-fill structure of earth (generally revetted), masonry, or large stone, which may serve as a breakwater or pier.

MONOCHROMATIC WAVES A series of waves generated in a laboratory, each of which has the same length and period.

MONOLITHIC Like a single stone or block. In coastal structures, the type of construction in which the structure's component parts are bound together to act as one.

MORAINE An accumulation of earth, stones, etc., deposited by a glacier, usually in the form of a mound, ridge or other prominence on the terrain.

MORPHODYNAMICS (1) The mutual interaction and adjustment of the seafloor topography and fluid dynamics involving the motion of sediment. (2) The coupled suite of mutually interdependent hydrodynamic processes, seafloor morphologies, and sequences of change.

MORPHOLOGICALLY AVERAGED Single wave condition producing the same net longshore drift as a given proportion of the annual wave climate.

MORPHOLOGY River/estuary/lake/seabed form and its change with time.

MUD A fluid-to-plastic mixture of finely divided particles of solid material and water.

MUD FLAT A level area of fine silt and clay along a shore alternately covered or uncovered by the tide or covered by shallow water.

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NATIONAL TIDAL DATUM EPOCH (NTDE) A period of 19 years adopted by the National Ocean Service as the period over which observations of tides are to be taken and reduced to average values for tidal datums.

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NATURAL TRACER A component of a sediment deposit that is unique to a particular source and can be used to identify the source and transport routes to a place of deposition.

NAUTICAL MILE The length of a minute of arc, 1/21,600 of an average great circle of the Earth. Generally one minute of latitude is considered equal to one nautical mile. The accepted United States value as of 1 July 1959 is 1,852 meters (6,076.115 feet), approximately 1.15 times as long as the U.S. statute mile of 5,280 feet. Also geographical mile.

NEAP HIGH WATER See NEAP TIDE.

NEAP LOW WATER See NEAP TIDE.

NEAP RANGE See NEAP TIDE.

NEAP TIDAL CURRENT Tidal current of decreased velocity occurring semimonthly as the result of the moon being in quadrature.

NEAP TIDE Tide of decreased range occurring semimonthly as the result of the moon being in quadrature. The NEAP RANGE of the tide is the average semidiurnal range occurring at the time of neap tides and is most conveniently computed from the harmonic constants. The NEAP RANGE is typically 10 to 30 percent smaller than the mean range where the type of tide is either semidiurnal or mixed and is of no practical significance where the type of tide is DIURNAL. The average height of the high waters of the neap tide is called NEAP HIGH WATER or HIGH WATER NEAPS (MHWN), and the average height of the corresponding LOW WATER is called NEAP LOW WATER or LOW WATER NEAPS (MLWN).

NEARSHORE (1) In beach terminology an indefinite zone extending seaward from the SHORELINE well beyond the BREAKER ZONE. (2) The zone which extends from the swash zone to the position marking the start of the offshore zone, typically at water depths of the order of 20 m.

NEARSHORE CIRCULATION The ocean circulation pattern composed of the NEARSHORE CURRENTS and the COASTAL CURRENTS.

NEARSHORE CURRENT SYSTEM The current system caused primarily by wave action in and near the breaker zone, and which consists of four parts: the shoreward mass transport of water; longshore currents; seaward return flow, including rip currents; and the longshore movement of the expanding heads of rip currents. See also NEARSHORE CIRCULATION.

NECK (1) The narrow strip of land which connects a peninsula with the mainland, or connects two ridges. (2) The narrow band (rip) of water flowing seaward through the surf. See also RIP CURRENT.

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NESS Roughly triangular promontory of land jutting into the sea, often consisting of mobile material, i.e. a beach form.

NETWORK A set consisting of: (a) stations for which geometric relationships have been determined and which are so related that removal of one station from the set will affect the relationships (distances, directions, coordinates, etc.) between the other stations; and (b) lines connecting the stations to show this interdependence.

NIP The cut made by waves in a shoreline of emergence.

NODAL ZONE An area in which the predominant direction of the LONGSHORE TRANSPORT changes.

NODE That part of a STANDING WAVE where the vertical motion is least and the horizontal velocities are greatest. Nodes are associated with CLAPOTIS and with SEICHE action resulting from wave reflections. Compare LOOP.

NOURISHMENTT he process of replenishing a beach. It may occur naturally by longshore transport, or be brought about artificially by the deposition of dredged materials or of materials trucked in from upland sites.

NUMERICAL MODELING Refers to analysis of coastal processes using computational models.

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OCEANOGRAPHY The study of the sea, embracing and indicating all knowledge pertaining to the sea's physical boundaries, the chemistry and physics of seawater, marine biology, and marine geology.

OFFSHORE (1) In beach terminology, the comparatively flat zone of variable width, extending from the SHOREFACE to the edge of the CONTINENTAL SHELF. It is continually submerged. (2) The direction seaward from the shore. (3) The zone beyond the nearshore zone where sediment motion induced by waves alone effectively ceases and where the influence of the sea bed on wave action is small in comparison with the effect of wind. (4) The breaker zone directly seaward of the low tide line.

OFFSHORE BARRIER See BARRIER BEACH.

OFFSHORE BREAKWATER A BREAKWATER built towards the seaward limit of the littoral zone, parallel (or nearly parallel) to the shore.

OFFSHORE CURRENT (1) Any current in the offshore zone. (2) Any current flowing away from shore.

OFFSHORE WIND A wind blowing seaward from the land in the coastal area.

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ONSHORE A direction landward from the sea.

ONSHORE WIND A wind blowing landward from the sea in the coastal area.

OPPOSING WIND In wave forecasting, a wind blowing in a direction opposite to the ocean-wave advance; generally, a headwind.

ORBIT In water waves, the path of a water particle affected by the wave motion. In deepwater waves the orbit is nearly circular, and in shallow-water waves the orbit is nearly elliptical. In general, the orbits are slightly open in the direction of wave motion, giving rise to MASS TRANSPORT.

ORBITAL CURRENT The flow of water accompanying the orbital movement of the water particles in a wave. Not to be confused with wave-generated LITTORAL CURRENTS.

ORDINARY HIGH-WATER MARK (OHWM) That mark that will be found by examining the bed and banks and ascertaining where the presence and action of waters are so common and usual, and so long continued in all ordinary years, as to mark upon the soil a character distinct from that of the abutting upland, in respect to vegetation as that condition exists on June 1, 1971, as it may naturally change thereafter, or as it may change thereafter in accordance with permits issued by a local government. Also defined as MEAN HIGH WATER LINE.

ORDINARY TIDE This expression is not used in a technical sense by the U.S. Coast and Geodetic Survey, but the word "ordinary" when applied to tides, may be taken as the equivalent of the word "mean". Thus "ordinary HIGH WATER LINE" may be assumed to be the same as "mean high water line".

ORTHOGONAL On a wave-refraction diagram, a line drawn perpendicularly to the wave crests. Also called WAVE RAY.

OSCILLATION (1) A periodic motion backward and forward. (2) Vibration or variance above and below a mean value.

OSCILLATORY WAVE A wave in which each individual particle oscillates about a point with little or no permanent change in mean position. The term is commonly applied to progressive oscillatory waves in which only the form advances, the individual particles moving in closed or nearly closed orbits. Compare WAVE OF TRANSLATION. See also ORBIT.

OUTCROP A surface exposure of bare rock, not covered by soil or vegetation.

OUTFALL A structure extending into a body of water for the purpose of discharging sewage, storm runoff, or cooling water.

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OUTFLANKING EROSION behind or around the land-based end of a GROIN, JETTY, or BREAKWATER or the terminus of a BULKHEAD, REVETMENT, or SEAWALL, usually causing failure of the structure or its function

OVERSPLASH The water that splashes over the top of a BREAKWATER, SEAWALL, etc.

OVERTOPPING Passing of water over the top of a structure as a result of wave runup or surge action.

OVERWASH (1) The part of the UPRUSH that runs over the crest of a BERM or structure and does not flow directly back to the ocean or lake. (2) The effect of waves overtopping a COASTAL DEFENSE, often carrying sediment landwards which is then lost to the beach system.

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PARAPET A low wall built along the edge of a structure such as a SEAWALL or QUAY.

PARTICLE VELOCITY The velocity induced by wave motion with which a specific water particle moves within a wave.

PATCH REEF A moundlike or flat-topped organic REEF, generally less than 1 km across, frequently forming part of a larger reef complex.

PASS In hydrographic usage, a navigable channel through a bar, REEF, or shoal, or between closely adjacent islands. On the Gulf coast, inlets are often known as passes (e.g., Sabine Pass).

PEAK PERIOD The wave period determined by the inverse of the frequency at which the wave energy spectrum reaches its maximum.

PEBBLES Beach material usually well-rounded and between about 4 mm to 64 mm diameter. See SOIL CLASSIFICATION.

PENINSULA An elongated body of land nearly surrounded by water and connected to a larger body of land by a neck or isthmus.

PERCHED BEACH A beach or fillet of sand retained above the otherwise normal profile level by a submerged dike.

PERCOLATION The process by which water flows through the interstices of a sediment. Specifically, in wave phenomena, the process by which wave action forces water through the interstices of the bottom sediment and which tends to reduce wave heights.

PERIGEAN RANGE The average semidiurnal range occurring at the time of the PERIGEAN TIDES and most conveniently computed from the harmonic constants. It is larger than

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the mean range where the type of tide is either semidiurnal or mixed and is of no practical significance where the type of tide is diurnal.

PERIGEAN TIDAL CURRENTS Tidal currents of increased velocity occurring monthly as the result of the moon being in perigee (i.e., at the point in its orbit nearest the Earth).

PERIGEAN TIDES Tides of increased range occurring monthly as the result of the moon being in perigee.

PERIODIC CURRENT A current caused by the tide-producing forces of the moon and the sun; a part of the same general movement of the sea that is manifested in the vertical rise and fall of the tides. See also CURRENT, FLOOD and CURRENT, EBB.

PERMANENT CURRENT A current that runs continuously, independent of the tides and temporary causes. Permanent currents include the freshwater discharge of a river and the currents that form the general circulatory systems of the oceans.

PERMEABILITY The property of bulk material (sand, crushed rock, soft rock in situ) which permit movement of water through its pores.

PERMEABLE GROIN A GROIN with openings or voids large enough to permit passage of appreciable quantities of LITTORAL DRIFT through the structure.

PETROGRAPHY The systematic description and classification of rocks.

PETROLOGY That branch of geology which treats the scientific study of rocks.

PHASE In surface wave motion, a point in the period to which the wave motion has advanced with respect to a given initial reference point.

PHASE INEQUALITY Variations in the tides or tidal currents associated with changes in the phase of the Moon in relation to the Sun.

PHASE VELOCITY Propagation velocity of an individual wave as opposed to the velocity of a wave group.

PHI GRADE SCALE A logarithmic transformation of the Wentworth grade scale for size classifications of sediment grains based on the negative logarithm to the base 2 of the particle diameter: $= -\log_2 d$. See SOIL CLASSIFICATION.

PHOTIC ZONE The zone extending downward from the ocean surface within which the light is sufficient to sustain photosynthesis. The depth of this layer varies with water clarity, time of year and cloud cover, but is about 100 m in the open ocean. It may be considered the Depth to which all light is filtered out except for about one percent and may be calculated as about two and one-half times the depth of a SECCHI DISK reading.

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PHOTOGRAMMETRY The science of deducing the physical dimensions of objects from measurements on images (usually photographs) of the objects.

PHOTOMOSAIC An assemblage of photographs, each of which shows part of a region, put together in such a way that each point in the region appears once and only once in the assemblage, and scale variation is minimized.

PHREATIC LEVEL Upper surface of an unconfined aquifer (e.g. the top sand layer in a dike) at which the pressure in the groundwater is equal to atmospheric pressure.

PHYSICAL GEOLOGY A large division of Geology concerned with earth materials, changes of the surface and interior of the earth, and the forces that cause those changes.

PHYSICAL MODELING Refers to the investigation of coastal or riverine processes using a scaled model.

PIER A structure, usually of open construction, extending out into the water from the shore, to serve as a landing place, recreational facility, etc., rather than to afford coastal protection. In the Great Lakes, a term sometimes improperly applied to jetties.

PIERSON-MOSKOWITZ SPECTRUM Wave spectrum typical of fully-developed deep water waves.

PIEZOMETRIC SURFACE The level at which the hydrostatic water pressure in an aquifer will stand if it is free to seek equilibrium with the atmosphere. For artesian wells, this is above the ground surface.

PILE A long, heavy timber or section of concrete or metal that is driven or jetted into the earth or seabed to serve as a support or protection.

PILING A group of piles.

PIPING Erosion of closed flow channels (tunnels) by the passage of water through soil; flow underneath structures, carrying away particles, may endanger the stability of the structure.

PLACER DEPOSITS Mineral deposits consisting of dense, resistant and often economically valuable minerals which have been weathered from TERRIGENOUS rocks, transported to the sea and concentrated in marine sediments by wave or current action.

PLACER MINE Surface mines in which valuable mineral grains are extracted from stream bar or beach deposits.

PLAIN, COASTAL See COASTAL PLAIN.

PLANFORM The outline or shape of a body of water as determined by the still-water line.

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PLATEAU A land area (usually extensive) having a relatively level surface raised sharply above adjacent land on at least one side; table land. A similar undersea feature.

PLEISTOCENE An epoch of the Quaternary Period characterized by several glacial ages.

PLUNGE POINT (1) For a plunging wave, the point at which the wave curls over and falls. (2) The final breaking point of the waves just before they rush up on the beach.

PLUNGING BREAKER See BREAKER.

POCKET BEACH A beach, usually small, in a coastal reentrant or between two littoral barriers.

POINT (1) The extreme end of a CAPE, or the outer end of any land area protruding into the water, usually less prominent than a CAPE. (2) A low profile shoreline promontory of more or less triangular shape, the top of which extends seaward.

POORLY-SORTED (POORLY-GRADED) Said of a clastic sediment or rock that consists of particles of many sizes mixed together in an unsystematic manner so that no one size class predominates.

PORE PRESSURE The interstitial pressure of water within a mass of soil or rock.

POROSITY Percentage of the total volume of a soil not occupied by solid particles but by air and water.

PORT A place where vessels may discharge or receive cargo; it may be the entire harbor including its approaches and anchorages, or only the commercial part of a harbor where the QUAYS, WHARVES, facilities for transfer of cargo, docks, and repair shops are situated.

POTENTIAL ENERGY OF WAVES In a progressive oscillatory wave, the energy resulting from the elevation or depression of the water surface from the undisturbed level.

PRISM See TIDAL PRISM.

PROBABILITY The chance that a prescribed event will occur, represented by a number (p) in the range 0 - 1. It can be estimated empirically from the relative frequency (i.e. the number of times the particular event occurs, divided by the total count of all events in the class considered).

PROBABILITY DENSITY Function specifying the distribution of a variable.

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PROBABLE MAXIMUM WATER LEVEL A hypothetical water level (exclusive of wave runup from normal wind-generated waves) that might result from the most severe combination of hydrometeorological, geoseismic, and other geophysical factors and that is considered reasonably possible in the region involved, with each of these factors considered as affecting the locality in a maximum manner. This level represents the physical response of a body of water to maximum applied phenomena such as hurricanes, moving squall lines, other cyclonic meteorological events, tsunamis, and astronomical tide combined with maximum probable ambient hydrological conditions such as wave setup, rainfall, runoff, and river flow. It is a water level with virtually no risk of being exceeded.

PRODELTA The part of a DELTA that is below the effective depth of wave erosion, lying beyond the delta front and sloping down into the basin into which the delta is advancing.

PROFILE, BEACH The intersection of the ground surface with a vertical plane; may extend from the behind the DUNE line or the top of a bluff to well seaward of the breaker zone.

PROGRESSION (of a beach) See ADVANCE.

PROGRESSIVE WAVE A wave that moves relative to a fixed coordinate system in a fluid. The direction in which it moves is termed the direction of wave propagation.

PROMONTORY A high point of land projecting into a body of water; a HEADLAND.

PROPAGATION OF WAVES The transmission of waves through water.

PROTOTYPE In laboratory usage, the full-scale structure, concept, or phenomenon used as a basis for constructing a scale model or copy.

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QUARRY RUN Waste of generally small material, in a quarry, left after selection of larger grading.

QUARRYSTONE Any stone processed from a quarry.

QUATERNARY (1) The youngest geologic period; includes the present time. (2) The latest period of time in the stratigraphic column, 0 B 2 million years, represented by local accumulations of glacial (PLEISTOCENE) and post-glacial (HOLOCENE) deposits which continue, without change of fauna, from the top of the Pliocene (Tertiary). The quaternary appears to be an artificial division of time to separate pre-human from post-human sedimentation. As thus defined, the quaternary is increasing in duration as man's ancestry becomes better understood.

QUAY (pronounced KEY) A stretch of paved bank, or a solid artificial landing place parallel to the navigable waterway, for use in loading and unloading vessels.

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QUICKSAND Loose, yielding, wet sand which offers no support to heavy objects. The upward flow of the water has a velocity that eliminates contact pressures between the sand grains and causes the sand-water mass to behave like a fluid that yields easily to pressure and tends to suck down heavy objects.

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RADAR An instrument for determining the distance and direction to an object by measuring the time needed for radio signals to travel from the instrument to the object and back, and by measuring the angle through which the instrument's antenna has traveled.

RADIOACTIVE DATING (RADIOMETRIC DATING) Calculating an age in years for geologic materials by measuring the presence of a short-life radioactive element (e.g., carbon-14) or a long-life element (e.g., potassium-40/argon-40). The term applies to all methods of age determination based on nuclear decay of naturally-occurring radioactive isotopes. Carbon-14 methods are often used to determine the age of peat or wood found in BARRIER ISLANDS.

RADIUS OF MAXIMUM WINDS Distance from the eye of a hurricane, where surface and wind velocities are zero, to the place where surface windspeeds are maximum.

RAISED BEACH A wave-cut platform, with or without a covering of beach materials, which is now raised above the present sea-level.

RANDOM WAVES The laboratory simulation of irregular sea states that occur in nature.

RANGE OF TIDE The difference in height between consecutive high and low waters. The MEAN RANGE is the difference between MEAN HIGH WATER and MEAN LOW WATER. The GREAT DIURNAL RANGE or DIURNAL RANGE is the difference in height between MEAN HIGHER HIGH WATER (MHHW) and MEAN LOWER LOW WATER (MLLW). Where the type of tide is diurnal, the mean range is the same as the diurnal range.

RAY, WAVE See ORTHOGONAL.

RAYLEIGH DISTRIBUTION A model probability distribution, commonly used in analysis of waves.

REACH (1) An arm of the ocean extending into the land, e.g., an ESTUARY. (2) A straight section of restricted waterway that is uniform with respect to discharge, slope, and cross-section.

RECENT(Geological) A synonym of HOLOCENE. See also QUATERNARY.

RECESSION (1) A continuing landward movement of the shoreline. (2) A net landward movement of the shoreline over a specified time.

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RECHARGE The addition of new water to an AQUIFER or to the zone of saturation.

RECTIFICATION The process of producing, from a tilted or oblique photograph, a photograph from which displacement caused by tilt has been removed.

RECURVED SPIT A spit whose outer end in turned landward by current deflection, by the opposing action of two or more currents, or by WAVE REFRACTION; a HOOK.

RED TIDE Discoloration of surface waters, most frequently in COASTAL ZONES, caused by large concentrations of microorganisms.

REEF An offshore consolidated rock hazard to navigation, with a least depth of about 20 meters (10 fathoms) or less. Often refers to coral FRINGING REEFS in tropical waters.

REEF, ATOLL See ATOLL.

REEF, BARRIER See BARRIER REEF.

REEF BREAKWATER Rubble mound of single-sized stones with a crest at or below sea level which is allowed to be (re)shaped by the waves.

REEF, FRINGING See FRINGING REEF.

REFERENCE PLANE The plane to which sounding and tidal data are referred. See DATUM PLANE.

REFERENCE POINT (1) A specified location (in plan elevation) to which measurements are referred. (2) In beach material studies, a specified point within the REFERENCE ZONE.

REFERENCE STATION A place for which tidal constants have previously been determined and which is used as a standard for the comparison of simultaneous observations at a second station. Also, a station for which independent daily predictions are given in the tide or current tables from which corresponding predictions are obtained for other stations by means of differences or factors.

REFERENCE ZONE In regard to beach measuring procedure, the part of the FORESHORE subject to wave action (between the Limit of UPRUSH and the Limit of BACKWASH) at mid-tide stage. In areas of great tidal range a more complex definition is needed.

REFLECTED WAVE That part of an incident wave that is returned seaward when a wave impinges on a steep beach, barrier, or other reflecting surface.

REFLECTION The process by which the energy of the wave is returned seaward.

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REFRACTION (of water waves) (1) The process by which the direction of a wave moving in shallow water at an angle to the contours is changed: the part of the wave advancing in shallower water moves more slowly than that part still advancing in deeper water, causing the wave crest to bend toward alignment with the underwater contours. (2) The bending of wave crests by currents.

REFRACTION COEFFICIENT The square root of the ratio of the distance between adjacent orthogonals in deep water to their distance apart in shallow water at a selected point. When multiplied by the SHOALING FACTOR and a factor for friction and percolation, this becomes the WAVE HEIGHT COEFFICIENT or the ratio of the refracted wave height at any point to the deepwater wave height. Also, the square root of the ENERGY COEFFICIENT.

REFRACTION DIAGRAM A drawing showing positions of wave crests and/or orthogonals in a given area for a specific deepwater wave period and direction.

REGULAR WAVES Waves with a single height, period, and direction.

RESERVOIR An artificial lake, basin or tank in which a large quantity of water can be stored.

RESIDUAL (WATER LEVEL) The components of water level not attributable to astronomical effects.

RESONANCE The phenomenon of amplification of a free wave or oscillation of a system by a forced wave or oscillation of exactly equal period. The forced wave may arise from an impressed force upon the system or from a boundary condition.

RETARDATION The amount of time by which corresponding tidal phases grow later day by day (about 50 minutes).

RETROGRESSION (of a beach) See RECESSION.

RETURN PERIOD Average period of time between occurrences of a given event.

REVERSING TIDAL CURRENT A tidal current that flows alternately in approximately opposite directions with a SLACK WATER at each reversal of direction. Currents of this type usually occur in rivers and straits where the direction of flow is more or less restricted to certain channels. When the movement is towards the shore, the current is said to be flooding, and when in the opposite direction it is said to be ebbing.

REVETMENT (1) A facing of stone, concrete, etc., to protect an EMBANKMENT, or shore structure, against erosion by wave action or currents. (2) A retaining wall. (3) Facing of stone, concrete, etc., built to protect a SCARP, EMBANKMENT or shore structure against erosion by waves of currents.

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REYNOLDS NUMBER The dimensionless ratio of the inertial force to the viscous force in fluid motion, Re = VL/v where L is a characteristic length, v the kinematic viscosity, and V a characteristic velocity. The Reynolds number is of importance in the theory of hydrodynamic stability and the origin of turbulence.

RIA A long, narrow inlet, with depth gradually diminishing inward. Shorter and shallower than a FJORD.

RIDGE AND RUNNEL Beach topography consisting of sand bars that have welded to the shore during the recovery stage after a storm. At low tide, water ponds in the runnels and flows seaward through gaps in the ridge.

RIDGE, BEACH A nearly continuous mound of beach material that has been shaped by wave or other action. Ridges may occur singly or as a series of approximately parallel deposits.

RILL MARKS Tiny drainage channels in a beach caused by the flow seaward of water left in the sands of the upper part of the beach after the retreat of the tide or after the dying down of storm waves.

RIP A body of water made rough by waves meeting an opposing current, particularly a tidal current; often found where tidal currents are converging and sinking.

RIP CHANNEL A channel cut by seaward flow of RIP CURRENT, usually crosses a LONGSHORE BAR.

RIP CURRENT A strong surface current flowing seaward from the shore. It usually appears as a visible band of agitated water and is the return movement of water piled up on the shore by incoming waves and wind. With the seaward movement concentrated in a limited band its velocity is somewhat accentuated. A rip consists of three parts: the FEEDER CURRENTS flowing parallel to the shore inside the breakers; the NECK, where the feeder currents converge and flow through the breakers in a narrow band or "rip"; and the HEAD OF RIP, where the current widens and slackens outside the breaker line. A rip current is often miscalled a rip tide. Also called RIP SURF.

RIP SURF See RIP CURRENT.

RIP TIDE Incorrect term for RIP CURRENT.

RIPARIAN (1) Pertaining to the banks of a body of water. (2) Of, on or pertaining to the banks of a river.

RIPPLE (1) The ruffling of the surface of water; hence, a little curling wave or undulation. (2) A wave less than 0.05 meter (2 inches) long controlled to a significant degree by both surface tension and gravity. See CAPILLARY WAVE and GRAVITY WAVE.

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RIPPLE MARKS Undulations produced by fluid movement over sediments. Oscillatory currents produce symmetric ripples whereas a well-defined current direction produces asymmetrical ripples. The crest line of ripples may be straight or sinuous. The characteristic features of ripples depend upon current velocity, particle size, persistence of current direction and whether the fluid is air or water. Sand DUNES may be regarded as a special kind of super-ripple.

RIPPLES (bed forms) Small bed forms with wavelengths less than 0.3 m (1 foot) and heights less than 0.03 m (0.1 foot).

RIPRAP A protective layer or facing of quarrystone, usually well graded within wide size limit, randomly placed to prevent erosion, scour, or sloughing of an embankment or bluff; also the stone so used. The quarrystone is placed in a layer at least twice the thickness of the 50 percent size, or 1.25 times the thickness of the largest size stone in the gradation.

RISK ANALYSIS Assessment of the total risk due to all possible environmental inputs and all possible mechanisms.

ROCK WEATHERING Physical and mineralogical decay processes in rock brought about by exposure to climatic conditions either at the present time or in the geological past.

ROCK (1) An aggregate of one or more minerals; or a body of undifferentiated mineral matter (e.g., obsidian). The three classes of rocks are: (a) Igneous B crystalline rocks formed from molten material. Examples are granite and basalt. (b) Sedimentary B resulting from the consolidation of loose sediment that has accumulated in layers. Examples are sandstone, shale and limestone. (c) Metamorphic B formed from preexisting rock as a result of burial, heat, and pressure. (2) A rocky mass lying at or near the surface of the water or along a jagged coastline, especially where dangerous to shipping.

ROLLER An indefinite term, sometimes considered to denote one of a series of long-crested, large waves which roll in on a shore, as after a storm.

ROTARY CURRENT, TIDAL A tidal current that flows continually with the direction of flow changing through all points of the compass during the tidal period. Rotary currents are usually found offshore where the direction of flow is not restricted by any barriers. The tendency for the rotation in direction has its origin in the deflecting force of the earth's rotation and, unless modified by local conditions, the change is clockwise in the Northern Hemisphere and counterclockwise in the Southern Hemisphere. The velocity of the current usually varies throughout the tidal cycle, passing through two maxima in approximately opposite directions and two minima with the direction of the current at approximately ninety degrees from the direction at the time of maximum velocity.

RUBBLE (1) Loose angular waterworn stones along a beach. (2) Rough, irregular fragments of broken rock.

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RUBBLE-MOUND STRUCTURE A mound of random-shaped and random-placed stones protected with a cover layer of selected stones or specially shaped concrete armor units. (Armor units in a primary cover layer may be placed in an orderly manner or dumped at random.)

RUN-UP, RUN-DOWN The upper and lower levels reached by a wave on a beach or coastal structure, relative to still-water level.

RUNNEL A corrugation or trough formed in the foreshore or in the bottom just offshore by waves or tidal currents.

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S-SLOPE BREAKWATER Rubble mound with gentle slope around still-water level and steeper slopes above and below.

SALIENT Coastal formation of beach material developed by WAVE REFRACTION and diffraction and long shore drift comprising of a bulge in the coastline towards an offshore island or breakwater, but not connected to it as in the case of a TOMBOLO - see also Ness and Cusp.

SALINITY Number of grams of salt per thousand grams of sea water, usually expressed in parts per thousand (ppt).

SALINITY GRADIENT Change in salinity with expressed in parts per thousand per foot.

SALT MARSH A marsh periodically flooded by salt water (also tidal marsh; sea marsh).

SALT-WEDGE ESTUARY In this circulation type, the density-driven component dominates and two well-mixed layers are separated by a sharp HALOCLINE. The seawater entering the channel appears as a tongue or wedge.

SALTATION That method of sand movement in a fluid in which individual particles leave the bed by bounding nearly vertically and, because the motion of the fluid is not strong or turbulent enough to retain them in suspension, return to the bed at some distance downstream. The travel path of the particles is a series of hops and bounds.

SAND Sediment particles, often largely composed of quartz, with a diameter of between 0.062 mm and 2 mm, generally classified as fine, medium, coarse or very coarse. Beach sand may sometimes be composed of organic sediments such as calcareous reef debris or shell fragments.

SAND BAR (1) See BAR. (2) In a river, a ridge of sand built to or near the surface by river currents.

SAND BYPASSING See BYPASSING, SAND.

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SAND DUNE A DUNE formed of sand.

SAND REEF See BAR.

SAND SPIT A narrow sand EMBANKMENT, created by an excess of deposition at its seaward terminus, with its distal end (the end away from the point of origin) terminating in open water.

SAND WAVES (1) Longshore sand waves are large-scale features that maintain form while migrating along the shore with speeds on the order of kilometers per year. (2) Large-scale asymmetrical bedforms in sandy river beds having high length to height ratios and continuous crestlines.

SCARP, BEACH An almost vertical slope along the beach caused by erosion by wave action. It may vary in height from a few cm to a meter or so, depending on wave action and the nature and composition of the beach. See also ESCARPMENT.

SCATTER DIAGRAM A two-dimensional histogram showing the joint probability density of two variables within a data sample.

SCOUR Removal of underwater material by waves and currents, especially at the base or toe of a shore structure.

SCOUR PROTECTION Protection against erosion of the seabed in front of the toe.

SEA (1) A large body of salt water, second in rank to an ocean, more or less landlocked and generally part of, or connected with, an ocean or a larger sea. Examples: Mediterranean Sea; South China Sea. (2) Waves caused by wind at the place and time of observation. (3) State of the ocean or lake surface, in regard to waves.

SEA BREEZE A light wind blowing from the sea toward the land caused by unequal heating of land and water masses.

SEA CHANGE (1) A change wrought by the sea. (2) A marked transformation.

SEA CLIFF A cliff situated at the seaward edge of the coast.

SEA GRASS Members of marine seed plants that grow chiefly on sand or sand-mud bottom. They are most abundant in water less than 9 m deep. The common types are: Eel grass (Zostera), Turtle grass (Thallasia), and Manatee grass (Syringodium).

SEA LEVEL See MEAN SEA LEVEL.

SEA LEVEL RISE The long-term trend in MEAN SEA LEVEL.

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SEA PUSS A dangerous longshore current; a rip current caused by return flow; loosely, the submerged channel or inlet through a bar caused by those currents.

SEA STATE Description of the sea surface with regard to wave action. Also called state of sea.

SEACOAST The coast adjacent to the sea or ocean.

SEAMOUNT An elevation rising more than 1000 meters above the ocean floor, and of limited extent across the summit. Compare KNOLL.

SEAS Waves caused by wind at the place and time of observation.

SEASHORE (1) (Law) All ground between the ordinary high-water and low-water mark. (2) The shore of the sea or ocean, often used in a general sense (e.g., to visit the seashore).

SEAWALL (1) A structure, often concrete or stone, built along a portion of a coast to prevent erosion and other damage by wave action. Often it retains earth against its shoreward face. (2) A structure separating land and water areas to alleviate the risk of flooding by the sea. Generally shore-parallel, although some reclamation SEAWALLS may include lengths that are normal or oblique to the (original) shoreline. A SEAWALL is typically more massive and capable of resisting greater wave forces than a BULKHEAD.

SECHHI DISK Visibility disk (white and black, 30 cm diameter) used to measure the transparency of the water.

SEDIMENT (1) Loose, fragments of rocks, minerals or organic material which are transported from their source for varying distances and deposited by air, wind, ice and water. Other sediments are precipitated from the overlying water or form chemically, in place. Sediment includes all the unconsolidated materials on the sea floor. (2) The fine grained material deposited by water or wind.

SEDIMENT CELL In the context of a strategic approach to coastal management, a length of coastline in which interruptions to the movement of sand or shingle along the beaches or near shore sea bed do not significantly affect beaches in the adjacent lengths of coastline.

SEDIMENT SINK Point or area at which beach material is irretrievably lost from a coastal cell, such as an estuary, or a deep channel in the seabed.

SEDIMENT SOURCE Point or area on a coast from which beach material is supplied, such as an eroding cliff, or river mouth.

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SEDIMENT TRANSPORT The main agencies by which sedimentary materials are moved are: gravity (gravity transport); running water (rivers and streams); ice (glaciers); wind; the sea (currents and LONGSHORE DRIFT). Running water and wind are the most widespread transporting agents. In both cases, three mechanisms operate, although the particle size of the transported material involved is very different, owing to the differences in density and viscosity of air and water. The three processes are: rolling or traction, in which the particle moves along the bed but is too heavy to be lifted from it; SALTATION; and suspension, in which particles remain permanently above the bed, sustained there by the turbulent flow of the air or water.

SEDIMENT TRANSPORT PATHS The routes along which net sediment movement occurs.

SEEPAGE The movement of water through small cracks, pores, interstices, out of a body of surface of subsurface water. The loss of water by infiltration from a canal, reservoir or other body of water or from a field. It is generally expressed as flow volume per unit of time.

SEICHE (1) A standing wave oscillation of an enclosed waterbody that continues, pendulum fashion, after the cessation of the originating force, which may have been either seismic or atmospheric. (2) An oscillation of a fluid body in response to a disturbing force having the same frequency as the natural frequency of the fluid system. Tides are now considered to be seiches induced primarily by the periodic forces caused by the Sun and Moon. (3) In the Great Lakes area, any sudden rise in the water of a harbor or a lake whether or not it is oscillatory (although inaccurate in a strict sense, this usage is well established in the Great Lakes area).

SEISMIC REFLECTION The return of part of the energy of seismic waves to the earth=s surface after the waves bounce off an acoustic boundary (typically rock or material of different density).

SEISMIC REFRACTION The bending of seismic waves as they pass from one material to another.

SEISMIC SEA WAVE See TSUNAMI.

SELECTIVE SORTING A process occurring during sediment transport that tends to separate particles according to their size, density, and shape. A well-sorted distribution contains a limited range of grain sizes and usually indicates that the depositional environment contains a narrow range of sediment sizes or a narrow band of depositional energy. A poorly-sorted distribution contains a wide range of grain sizes indicating multiple sources of sediment or a wide range of deposition energies.

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SELF-SUSTAINING BEACH A BEACH that has either natural or engineered sand retention and that can be stable through the continued supply of natural sediment sources, without any mechanical nourishment over a long period. Subsets include: Natural or Geomorphically Self-sustaining Beaches: self-sustaining naturally without the construction of retaining structures and with no continued mechanical sand nourishment. Anthropogenically Self-sustaining Beaches: self-sustaining by the construction of retaining structure(s) with or without initial beach fill but with no continued mechanical sand nourishment.

SEMIDIURNAL Having a period or cycle of approximately one-half of a tidal day (12.4 hours). The predominating type of tide throughout the world is semidiurnal, with two high waters and two low waters each tidal day. The tidal current is said to be semidiurnal when there are two flood and two ebb periods each day.

SENSING, REMOTE The response of an instrument or organism to stimuli from a distant source.

SETBACK A required open space, specified in shoreline master programs, measured horizontally upland from an perpendicular to the ordinary high-water mark.

SETUP, WAVE Superelevation of the water surface over normal surge elevation due to onshore mass transport of the water by wave action alone.

SETUP, WIND See WIND SETUP.

SHALLOW WATER (1) Commonly, water of such a depth that surface waves are noticeably affected by bottom topography. It is customary to consider water of depths less than one-half the surface wavelength as shallow water. See TRANSITIONAL ZONE and DEEP WATER. (2) More strictly, in hydrodynamics with regard to progressive gravity waves, water in which the depth is less than 1/25 the wavelength.

SHALLOW WATER WAVE A PROGRESSIVE WAVE which is in water less than 1/25 the wave length in depth.

SHEAR INSTABILITIES Instabilities of the surf zone longshore current commonly found on beaches with barred depth profiles. These instabilities are vertical motions with little surface elevation expression. Conservation of vorticity is the restoring mechanism.

SHEAR WAVES See SHEAR INSTABILITIES

SHEET EROSION The removal of a thin layer of surface material, usually topsoil, by a flowing sheet of water.

SHEET FLOW Sediment grains under high sheer stress moving as a layer that extends from the bed surface to some distance below (on the order of a few cm). Grains are transported in the direction of fluid flow.

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SHEET PILE See PILE, SHEET.

SHEET, SMOOTH A sheet on which field control and hydrographic data such as soundings, depth curves, and regions surveyed with a wire drag are finally plotted before being used in making a final chart.

SHELF, CONTINENTAL See CONTINENTAL SHELF.

SHELF, INSULAR See INSULAR SHELF.

SHINGLE (1) Loosely and commonly, any beach material coarser than ordinary gravel, especially any having flat or flattish pebbles. (2) Strictly and accurately, beach material of smooth, well-rounded pebbles that are roughly the same size. The spaces between pebbles are not filled with finer materials. Shingle often gives out a musical sound when stepped on. The term is more widely used in Great Britain than in the U.S.

SHOAL (1) (noun) A detached area of any material except rock or coral. The depths over it are a danger to surface navigation. Similar continental or insular shelf features of greater depths are usually termed BANKS. (2) (verb) To become shallow gradually. (3) To cause to become shallow. (4) To proceed from a greater to a lesser depth of water.

SHOALING Decrease in water depth. The transformation of wave profile as they propagate inshore.

SHOALING COEFFICIENT The ratio of the height of a wave in water of any depth to its height in deep water with the effects of refraction, friction, and percolation eliminated. Sometimes SHOALING FACTOR or DEPTH FACTOR. See also ENERGY COEFFICIENT and REFRACTION COEFFICIENT.

SHOALING FACTOR See SHOALING COEFFICIENT.

SHORE The narrow strip of land in immediate contact with the sea, including the zone between high and low water lines. A shore of unconsolidated material is usually called a BEACH. Also used in a general sense to mean the coastal area (e.g., to live at the shore).

SHORE NORMAL A line at right-angles to the contours in the surf zone.

SHORE TERRACE A terrace made along a COAST by the action of waves and shore currents; it may become dry land by the uplifting of the shore or the lowering of the water. Also known as shore platform or wave-cut platform.

SHOREFACE The narrow zone seaward from the low tide SHORELINE, covered by water, over which the beach sands and gravels actively oscillate with changing wave conditions. See INSHORE (ZONE).

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SHORELINE The intersection of a specified plane of water with the shore or beach (e.g., the high water shoreline would be the intersection of the plane of mean high water with the shore or beach). The line delineating the shoreline on National Ocean Service nautical charts and surveys approximates the mean high water line.

SHORELINE MANAGEMENT The development of strategic, long-term and sustainable Coastal defense and land-use policy within a sediment cell.

SHORT-CRESTED WAVE A wave, the crest length of which is of the same order of magnitude as the wave length. A system of short-crested waves has the appearance of hills being separated by troughs.

SIGNIFICANT WAVE A statistical term relating to the one-third highest waves of a given wave group and defined by the average of their heights and periods. The composition of the higher waves depends upon the extent to which the lower waves are considered. Experience indicates that a careful observer who attempts to establish the character of the higher waves will record values which approximately fit the definition of the significant wave.

SIGNIFICANT WAVE HEIGHT The average height of the one-third highest waves of a given wave group. Note that the composition of the highest waves depends upon the extent to which the lower waves are considered. In wave record analysis, the average height of the highest one-third of a selected number of waves, this number being determined by dividing the time of record by the significant period. Also CHARACTERISTIC WAVE HEIGHT.

SIGNIFICANT WAVE PERIOD An arbitrary period generally taken as the period of the one-third highest waves within a given group. Note that the composition of the highest waves depends upon the extent to which the lower waves are considered. In wave record analysis, this is determined as the average period of the most frequently recurring of the larger well-defined waves in the record under study.

SILL (1) A submerged structure across a river to control the water level upstream. (2) The crest of a spillway.

SILT Sediment particles with a grain size between 0.004 mm and 0.062 mm, i.e. coarser than clay particles but finer than sand. See SOIL CLASSIFICATION.

SINUSOIDAL WAVE An oscillatory wave having the form of a sinusoid.

SLACK TIDE (SLACK WATER) The state of a tidal current when its velocity is near zero, especially the moment when a reversing current changes direction and its velocity is zero. Sometimes considered the intermediate period between ebb and flood currents during which the velocity of the currents is less than 0.05 meter per second (0.1 knot). See STAND OF TIDE.

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SLIDE In mass wasting, movement of a descending mass along a plane approximately parallel to the slope of the surface.

SLIP A berthing space between two piers.

SLIP FACE The steep, downwind slope of a DUNE; formed from loose, cascading sand that generally keeps the slope at the ANGLE OF REPOSE (about 34 deg.).

SLOPE The degree of inclination to the horizontal. Usually expressed as a ratio, such as 1:25, indicating one unit rise in 25 units of horizontal distance; or in a decimal fraction (0.04). Also called GRADIENT.

SLOUGH A small muddy marshland or tidal waterway which usually connects other tidal areas. See BAYOU.

SLUICE A structure containing a gate to control the flow of water from one area to another.

SLUMP In mass wasting, movement along a curved surface in which the upper part moves vertically downward while the lower part moves outward.

SOFT DEFENSES Usually refers to beaches (natural or designed) but may also relate to energy-absorbing beach-control structures, including those constructed of rock, where these are used to control or redirect coastal processes rather than opposing or preventing them.

SOIL A layer of weathered, unconsolidated material on top of bed rock; in geologic usage, usually defined as containing organic matter and being capable of supporting plant growth.

SOIL CLASSIFICATION (size) An arbitrary division of a continuous scale of grain sizes such that each scale unit or grade may serve as a convenient class interval for conducting the analysis or for expressing the results of an analysis. There are many classifications used.

SOLITARY WAVE A wave consisting of a single elevation (above the original water surface), whose height is not necessarily small compared to the depth, and neither followed nor preceded by another elevation or depression of the water surfaces.

SORTING Process of selection and separation of sediment grains according to their grain size (or grain shape or specific gravity).

SORTING COEFFICIENT A coefficient used in describing the distribution of grain sizes in a sample of unconsolidated material. It is defined as $So = Q_1/Q_3$, where Q_1 is the diameter (in millimeters) which has 75 percent of the cumulative size-frequency (by weight) distribution smaller than itself and 25 percent larger than itself, and Q_3 is that diameter having 25 percent smaller and 75 percent larger than itself.

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SOUND (1) (noun) a relatively long arm of the sea or ocean forming a channel between an island and a mainland or connecting two larger bodies, as a sea and the ocean, or two parts of the same body; usually wider and more extensive than a STRAIT. Example: Long Island Sound. (2) (verb) To measure the depth of the water.

SOUNDING A measured depth of water. On hydrographic charts the soundings are adjusted to a specific plane of reference (SOUNDING DATUM).

SOUNDING DATUM The plane to which soundings are referred. See also CHART DATUM.

SOUNDING LINE A line, wire, or cord used in sounding, which is weighted at one end with a plummet (sounding lead). Also LEAD LINE.

SPILLING BREAKER See BREAKER.

SPILLOVER LOBE Linguoid, bar-like feature formed by ebb tidal current flow over a low area of an ebb shield.

SPILLWAY A structure over or through a dam for discharging flood flows.

SPIT A small point of land or a narrow shoal projecting into a body of water from the shore.

SPOIL Overburden or other waste material removed in mining, dredging, and quarrying.

SPRING RANGE The average SEMIDIURNAL range occurring at the time of SPRING TIDES and most conveniently computed from the harmonic constants. It is larger than the MEAN RANGE where the type of tide is either SEMIDIURNAL or MIXED, and is of no practical significance where the type of tide is DIURNAL.

SPRING TIDAL CURRENTS Tidal currents of increased velocity occurring semimonthly as the result of the moon being new or full.

SPRING TIDE A tide that occurs at or near the time of new or full moon (SYZYGY) and which rises highest and falls lowest from the mean sea level.

SPUR-DIKE See GROIN.

STACK An isolated, pillar-like rocky island isolated from a nearby headland by wave erosion; a needle or chimney rock.

STAND OF TIDE A interval at high or low water when there is no sensible change in the height of the tide. The water level is stationary at high and low water for only an instant, but the change in level near these times is so slow that it is not usually perceptible. See SLACK TIDE.

STANDARD PROJECT HURRICANE See HYPOTHETICAL HURRICANE.

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STANDING WAVE A type of wave in which the surface of the water oscillates vertically between fixed points, called nodes, without progression. The points of maximum vertical rise and fall are called antinodes or loops. At the nodes, the underlying water particles exhibit no vertical motion, but maximum horizontal motion. At the antinodes, the underlying water particles have no horizontal motion, but maximum vertical motion. They may be the result of two equal progressive wave trains traveling through each other in opposite directions. Sometimes called CLAPOTIS or STATIONARY WAVE.

STATION, CONTROL A point on the ground whose horizontal or vertical location is used as a basis for obtaining locations of other points.

STATIONARY WAVE A wave of essentially stable form which does not move with respect to a selected reference point; a fixed swelling. Sometimes called STANDING WAVE.

STEP The nearly horizontal section which more or less divides the BEACH from the SHOREFACE.

STILLWATER LEVEL (SWL or SWEL) The surface of the water resulting from astronomical tides, storm surge and freshwater inputs, but excluding wave setup contributions. In deep water this level approximates the midpoint of the wave height. In shallow water it is nearer to the trough than the crest. Also called the UNDISTURBED WATER LEVEL.

STOCHASTIC Having random variation in statistics.

STOCKPILE Sand piled on a beach foreshore to nourish downdrift beaches by natural littoral currents or forces. See FEEDER BEACH.

STONE Quarried or artificially-broken rock for use in construction, either as aggregate or cut into shaped blocks as dimension stone.

STONE, DERRICK Stone heavy enough to require handling individual pieces by mechanical means, generally weighing 900 kg (1 ton) and up.

STORM SURGE A rise above normal water level on the open coast due to the action of wind stress on the water surface. Storm surge resulting from a hurricane also includes that rise in level due to atmospheric pressure reduction as well as that due to wind stress. See WIND SETUP.

STORM TIDE See STORM SURGE.

STRAIT A relatively narrow waterway between two larger bodies of water (e.g., Strait of Gibraltar). See also SOUND.

STRAND (1) The shore or beach of the ocean or a large lake. The land bordering any large body of water, especially a sea or an arm of the ocean. (2) WHARF, QUAY, or roadway along a water body, esp. in a city.

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STRAND PLAIN A prograded shore built seawards by waves and currents.

STRANDFLAT A wave-cut platform; an elevated wave-cut terrace

STRANDING The running aground of a ship upon a STRAND, ROCK, or bottom so that it is fast for a time.

STRANDLINE An accumulation of debris (e.g. seaweed, driftwood and litter) cast up onto a beach, and lying along the limit of wave up rush. A shoreline above the present water level.

STRATIGRAPHY (1) The study of stratified rocks (sediments and volcanics) especially their sequence in time. (2) The character of the rocks and the correlation of beds in different localities.

STREAM (1) A course of water flowing along a bed in the Earth. (2) A current in the sea formed by wind action, water density differences, etc.; e.g. the Gulf Stream. See also CURRENT, STREAM.

STREAM CURRENT A narrow, deep and swift ocean current, such as the Gulf Stream. Opposite of DRIFT CURRENT.

STRUCTURAL GEOLOGY The branch of geology concerned with the internal structure of bed rock and the shapes, arrangement, and interrelationships of rock units.

SUBAERIAL Situated or occurring on or adjacent to the surface of the earth, usually meaning above the water surface.

SUBAERIAL BEACH That part of the beach which is uncovered by water (e.g. at low tide sometimes referred to as drying beach).

SUBAQUEOUS Existing, formed, or taking place under water; submerged.

SUB-TIDAL BEACH The part or the beach (where it exists) which extends from low water out to the approximate limit of storm erosion. The latter is typically located at a maximum water depth of 8 to 10 meters and is often identifiable on surveys by a break in the slope of the bed.

SUBCRITICAL FLOW Flow for which the Froude number is less than unity; surface disturbances can travel upstream.

SUBDUCTION ZONE Elongate region in which the sea floor slides beneath a continent or island arc.

SUBMARINE CANYON V-shaped valleys that run across the CONTINENTAL SHELF and down the CONTINENTAL SLOPE.

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SUBMERGENT COAST A COAST in which formerly dry land has been recently drowned, either by land subsidence or a rise in seal level.

SUBORDINATE STATION A tide or current station at which a short series of observations has been obtained, which is to be reduced by comparison with simultaneous observations at another station having well-determined tidal or current constants.

SUBSIDENCE Sinking or downwarping of a part of the earth's surface.

SUBTIDAL Below the low-water datum; thus permanently.

SUPER-CRITICAL FLOW Flow for which the Froude number is greater than unity; surface disturbances will not travel upstream.

SURF (1) Collective term for BREAKERS. (2) The wave activity in the area between the shoreline and the outermost limit of breakers. (3) In literature, the term surf usually refers to the breaking waves on shore and on reefs when accompanied by a roaring noise caused by the larger waves breaking.

SURF BEAT Irregular oscillations of the nearshore water level with periods on the order of several minutes.

SURF ZONE The zone of wave action extending from the water line (which varies with tide, surge, set-up, etc.) out to the most seaward point of the zone (breaker zone) at which waves approaching the coastline commence breaking, typically in water depths of between 5 to 10 meters.

SURFACE GRAVITY WAVE (PROGRESSIVE) (1) this is the term which applies to the WIND WAVES and SWELL of lakes and oceans, also called SURFACE WATER WAVE, SURFACE WAVE or DEEP WATER WAVE, (2) a progressive GRAVITY WAVE in which the disturbance is confined to the upper limits of a body of water. Strictly speaking this term applies to those progressive GRAVITY WAVES whose celerity depends only upon the wave length.

SURFACE WATER WAVE See SURFACE GRAVITY WAVE (PROGRESSIVE).

SURGE (1) The name applied to wave motion with a period intermediate between that of the ordinary wind wave and that of the tide, say from 2 to 60 min. It is low height, usually less than 0.9 m (3 ft). See also SEICHE. (2) In fluid flow, long interval variations in velocity and pressure, not necessarily periodic, perhaps even transient in nature. (3) see STORM SURGE.

SURGING BREAKER See BREAKER.

SURVEY, CONTROL A survey that provides coordinates (horizontal or vertical) of points to which supplementary surveys are adjusted.

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SURVEY, HYDROGRAPHIC A survey that has as its principal purpose the determination of geometric and dynamic characteristics of bodies of water.

SURVEY, PHOTOGRAMMETRIC A survey in which monuments are placed at points that have been determined photogrammetrically.

SURVEY, TOPOGRAPHIC A survey which has, for its major purpose, the determination of the configuration (relief) of the surface of the land and the location of natural and artificial objects thereon.

SUSPENDED LOAD (1) The material moving in suspension in a fluid, kept up by the upward components of the turbulent currents or by colloidal suspension. (2) The material collected in or computed from samples collected with a SUSPENDED LOAD SAMPLER. Where it is necessary to distinguish between the two meanings given above, the first one may be called the "true suspended load."

SUSPENDED LOAD SAMPLER A sampler which attempts to secure a sample of the water with its sediment load without separating the sediment from the water.

SUSTAINABLE BEACH A beach area that is now and will continue to receive sufficient sediment input over a long period (years or decades) to remain stable. Such sediment input can be through either natural supplies of sediment or various forms of mechanical beach nourishment (placement by hydraulic dredge, land haul of material, nearshore deposition, etc.)

SWALE The depression between two beach ridges.

SWASH The rush of water up onto the beach face following the breaking of a wave. Also UPRUSH, RUNUP.

SWASH BARS Low broad sandy bars formed by sediment in the surf and swash zones, separated by linear depressions, or RUNNELS, running parallel to the shore. Sand bodies that form and migrate across ebb-tidal shoals because of currents generated by breaking waves.

SWASH CHANNEL (1) On the open shore, a channel cut by flowing water in its return to the present body (e.g., a rip channel). (2) A secondary channel passing through or shoreward of an inlet or river bar.

SWASH MARK The thin wavy line of fine sand, mica scales, bits of seaweed, etc., left by the uprush when it recedes from its upward limit of movement on the beach face.

SWASH PLATFORM Sand sheet located between the main ebb channel of a coastal inlet and an adjacent barrier island.

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SWASH ZONE The zone of wave action on the beach, which moves as water levels vary, extending from the limit of run-down to the limit of run-up.

SWELL Wind-generated waves that have traveled out of their generating area. Swell characteristically exhibits a more regular and longer period and has flatter crests than waves within their fetch (SEAS).

SYNOPTIC CHART A chart showing the distribution of meteorological conditions over a given area at a given time. Popularly called a weather map.

SYZYGY The two points in the Moon's orbit when the Moon is in conjunction or opposition to the Sun relative to the Earth; time of new or full Moon in the cycle of phases.

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T-GROIN A GROIN built in the shape of a letter T with the trunk section connected to land.

TECTONIC FORCES Forces generated from within the earth that result in uplift, movement, or deformation of part of the earth's crust.

TECTONICS The study of the major structural features of the Earth's crust or the broad structure of a region.

TERMINAL GROIN A GROIN, often at the end of a barrier spit, intended to prevent sediment passage into the channel beyond.

TERRACE A horizontal or nearly horizontal natural or artificial topographic feature interrupting a steeper slope, sometimes occurring in a series.

TERRIGENOUS SEDIMENTS Literally land-formed sediment that has found its way to the sea floor. The term is applied (a) to sediments formed and deposited on land (e.g., soils, sand DUNES), and (b) to material derived from the land when mixed in with purely marine material (e.g., sand or clay in a shelly limestone).

THALWEG In hydraulics, the line joining the deepest points of an inlet or stream channel.

THRESHOLD OF MOTION The point at which the forces imposed on a sediment particle overcome its inertia and it starts to move.

THRESHOLD VELOCITY The maximum orbital velocity at which the sediment on the BED begins to move as waves approach shallow water.

TIDAL CREEK A creek draining back-barrier areas with a current generated by the rise and fall of the tide.

TIDAL CURRENT See CURRENT, TIDAL.

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TIDAL DATUM See CHART DATUM and DATUM PLANE.

TIDAL DAY The time of the rotation of the Earth with respect to the Moon, or the interval between two successive upper transits of the Moon over the meridian of a place, approximately 24.84 solar hours (24 hours and 50 minutes) or 1.035 times the mean solar day. Also called lunar day.

TIDAL DELTA See DELTA.

TIDAL FLATS (1) Marshy or muddy areas covered and uncovered by the rise and fall of the tide. A TIDAL MARSH. (2) Marshy or muddy areas of the seabed which are covered and uncovered by the rise and fall of tidal water.

TIDAL INLET (1) A natural inlet maintained by tidal flow. (2) Loosely, any inlet in which the tide ebbs and flows. Also TIDAL OUTLET.

TIDAL MARSH Same as TIDAL FLATS.

TIDAL PERIOD The interval of time between two consecutive, like phases of the tide.

TIDAL POOL A pool of water remaining on a beach or reef after recession of the tide.

TIDAL PRISM (1) The total amount of water that flows into a harbor or out again with movement of the tide, excluding any fresh water flow. (2) The volume of water present between MEAN LOW and MEAN HIGH TIDE.

TIDAL RANGE The difference in height between consecutive high and low (or higher high and lower low) waters.

TIDAL RISE The height of tide as referred to the datum of a chart.

TIDAL RIVER That part of a river where the water level is influenced by the tide.

TIDAL SHOALS Shoals that accumulate near inlets due to the transport of sediments by tidal currents associated with the inlet.

TIDAL STAND An interval at high or low water when there is no observable change in the height of the tide. The water level is stationary at high and Low water for only an instant, but the change in level near these times is so slow that it is not usually perceptible.

TIDAL WAVE (1) The wave motion of the tides. (2) In popular usage, any unusually high and destructive water level along a shore. It usually refers to STORM SURGE or TSUNAMI.

TIDALLY DRIVEN CIRCULATION The movement of fresh water and seawater that are mixed by the sloshing back and forth of the ESTUARY in response to ocean tides.

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TIDE The periodic rising and falling of the water that results from gravitational attraction of the Moon and Sun and other astronomical bodies acting upon the rotating Earth. Although the accompanying horizontal movement of the water resulting from the same cause is also sometimes called the tide, it is preferable to designate the latter as TIDAL CURRENT, reserving the name TIDE for the vertical movement.

TIDE, DAILY RETARDATION OF The amount of time by which corresponding tides grow later day by day (about 50 minutes). Also LAGGING.

TIDE, DIURNAL A tide with one high water and one low water in a day.

TIDE, EBB See EBB TIDE.

TIDE, FLOOD See FLOOD TIDE.

TIDE, MIXED See MIXED TIDE.

TIDE, NEAP See NEAP TIDE.

TIDE, SEMIDIURNAL See SEMIDIURNAL TIDE.

TIDE, SLACK See SLACK TIDE.

TIDE, SPRING See SPRING TIDE.

TIDE STAFF A tide gage consisting of a vertical graduated staff from which the height of the tide can be read directly. It is called a fixed staff when it is secured in place so that it cannot be easily removed. A portable staff is designed for removal from the water when not in use.

TIDE STATION A place at which tide observations are being taken. It is called a primary tide station when continuous observations are to be taken over a number of years to obtain basic tidal data for the locality. A secondary tide station is one operated over a short period of time to obtain data for a specific purpose.

TIDE, STORM See STORM SURGE.

TIDE TABLES Tables which give daily predictions of the times and heights of the tide. These predictions are usually supplemented by tidal differences and constants by means of which additional predictions can be obtained for numerous other places.

TIDE, WIND See WIND TIDE.

TIDES, RIP See RIP.

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TOE Lowest part of sea- and portside BREAKWATER slope, generally forming the transition to the seabed.

TOMBOLO A bar or spit that connects or "ties" an island to the mainland or to another island. See CUSPATE SPIT. Also applied to sand accumulation between land and a DETACHED BREAKWATER.

TONGUE A long narrow strip of land, projecting into a body of water.

TOPOGRAPHIC MAP A map on which elevations are shown by means of contour lines.

TOPOGRAPHY The configuration of a surface, including its relief and the positions of its streams, roads, building, etc.

TOTAL STILLWATER LEVEL See MEAN WATER LEVEL.

TRAINING WALL A wall or jetty to direct current flow.

TRANSGRESSION, MARINE The invasion of a large area of land by the sea in a relatively short space of time (geologically speaking). Although the observable result of a marine transgression may suggest an almost instantaneous process, it is probable that the time taken is in reality is thousands or millions of years. The plane of marine transgression is a plane of UNCONFORMITY.

TRANSITIONAL ZONE (TRANSITIONAL WATER) In regard to progressive gravity waves, water whose depth is less than 2 but more than 1/25 the wavelength. Often called shallow water.

TRANSLATORY WAVE See WAVE OF TRANSLATION.

TRANSPOSED HURRICANE See HYPOTHETICAL HURRICANE.

TRANSVERSE BAR A bar which extends approximately right angles to shorelines.

TRANSVERSE WAVE Waves that propagate along a sailing line of a vessel.

TRENCH A long narrow submarine depression with relatively steep sides.

TROCHOIDAL WAVE A theoretical, progressive oscillatory wave first proposed by Gerstner in 1802 to describe the surface profile and particle orbits of finite amplitude, nonsinusoidal waves. The wave form is that of a prolate cycloid or trochoid, and the fluid particle motion is rotational as opposed to the usual irrotational particle motion for waves generated by normal forces. Compare IRROTATIONAL WAVE.

TROPICAL CYCLONE See HURRICANE.

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TROPICAL STORM A tropical cyclone with maximum winds less than 34 m/sec (75 mile per hour). Compare with HURRICANE or TYPHOON (winds greater than 34 m/sec).

TROUGH A long and broad submarine DEPRESSION with gently sloping sides.

TROUGH OF WAVE The lowest part of a waveform between successive crests. Also, that part of a wave below still-water level.

TRUNCATED LANDFORM A landform cut off, especially by EROSION, and forming a steep side or CLIFF.

TSUNAMI A long-period wave caused by an underwater disturbance such as a volcanic eruption or earthquake. Also SEISMIC SEA WAVE. Commonly miscalled "tidal wave."

TURBIDITY (1) A condition of a liquid due to fine visible material in suspension, which may not be of sufficient size to be seen as individual particles by the naked eye but which prevents the passage of light through the liquid. (2) A measure of fine suspended matter in liquids.

TURBIDITY CURRENT A flowing mass of sediment-laden water that is heavier than clear water and therefore flows downslope along the bottom of the sea or a lake.

TURBULENT FLOW Any flow which is not LAMINAR, i.e., the stream lines of the fluid, instead of remaining parallel, become confused and intermingled.

TYPHOON See HURRICANE. The term typhoon is applied to tropical cyclones in the western Pacific Ocean.

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UNCONFORMITY A surface that represents a break in the geologic record, with the rock unit immediately above it being considerably younger than the rock beneath. There are three major aspects to consider: (1) Time. An unconformity develops during a period of time in which no sediment is deposited. This concept equates deposition and time, and an unconformity represents unrecorded time. (2) Deposition. Any interruption of deposition, whether large or small in extent, is an unconformity. This aspect of unconformity pre-supposes a standard scale of deposition which is complete. Major breaks in sedimentation can usually be demonstrated easily, but minor breaks may go unrecorded until highly detailed investigations are made. (3) Structure. Structurally, unconformity may be regarded as planar structures separating older rocks below from younger rocks above, representing the break as defined in (1) and (2) above. A plane of unconformity may be a surface of weathering, Erosion or denudation, or a surface of non-deposition, or possibly some combination of these factors. It may be parallel to the upper strata, make an angle with the upper strata, or be irregular. Subsequent Earth movements may have folded or faulted it.

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UNCONSOLIDATED In referring to sediment grains, loose, separate, or unattached to one another.

UNDERCUTTING Erosion of material at the foot of a Cliff or bank, e.g., a sea cliff, or river bank on the outside of a meander. Ultimately, the overhang collapses, and the process is repeated.

UNDERTOW (1) A current below water surface flowing seaward; the receding water below the surface from waves breaking on a shelving beach. (2) Actually undertow is largely mythical. As the BACKWASH of each wave flows down the BEACH, a current is formed which flows seaward. However, it is a periodic phenomenon. The most common phenomena expressed as undertow are actually RIP CURRENTS.

UNDERWATER GRADIENT The slope of the sea bottom. See SLOPE.

UNDEVELOPED COASTAL BARRIER A depositional geologic feature that is subject to wave, tidal, and wind energies, and protects landward aquatic habitats from direct wave attack, and all associated aquatic habitats, including adjacent wetlands, marshes, estuaries, inlets, and Nearshore waters, but only if there are few manmade structures and human activities do not significantly impede geomorphic and ecological processes.

UNDISTURBED WATER LEVEL Same as STILL WATER LEVEL.

UNDULATION A continuously propagated motion to and fro, in any fluid or elastic medium, with no permanent translation of the particles themselves.

UPCOAST In United States usage, the coastal direction generally trending toward the north.

UPDRIFT The direction opposite that of the predominant movement of littoral materials.

UPLAND Dry land area above and landward of the ORDINARY HIGH-WATER MARK (OHWM). Often used as a general term to mean high land far from the COAST and in the interior of the country.

UPLIFT The upward water pressure on the base of a structure or pavement.

UPRUSH The rush of water up the FORESHORE following the breaking of a wave, also called SWASH or RUNUP.

UPSTREAM Along coasts with obliquely approaching waves there is a longshore (wave-driven) current. For this current one can define an upstream and a DOWNSTREAM direction. For example, on a beach with an orientation west-east with the sea to the north, the waves come from NW. Then the current flows from West to East. Here, upstream is West of the observer, and East is DOWNSTREAM of the observer.

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UPWELLING The process by which water rises from a deeper to a shallower depth, usually as a result of offshore surface water flow. It is most prominent where persistent wind blows parallel to a coastline so that the resultant Ekman transport moves surface water away from the coast.

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VALLEY An elongated depression, usually with an outlet, between BLUFFS or between ranges of hills or mountains.

VALLEY, SEA A submarine depression of broad valley form without the steep side slopes which characterize a canyon.

VALLEY, SUBMARINE A prolongation of a land valley into or across a continental or insular shelf, which generally gives evidence of having been formed by stream erosion.

VELOCITY OF WAVES The speed at which an individual wave advances. See WAVE CELERITY.

VELOCITY PROFILE The velocity gradient within the BOTTOM BOUNDARY LAYER, displayed as a graph of height above the bed against the velocity of the flow.

VISCOSITY (or internal friction) That molecular property of a fluid that enables it to support tangential stresses for a finite time and thus to resist deformation. Resistance to flow.

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WASH LOAD Part of the suspended load with particle sizes smaller than found in the bed; it is in near-permanent suspension and transported without deposition; the amount of wash load transported through a reach does not depend on the transport capacity of the flow; the load is expressed in mass or volume per unit of time.

WASHOVER Sediment deposited inland of a beach by overwash processes.

WATER DEPTH Distance between the seabed and the still water level.

WATER LEVEL Elevation of still water level relative to some datum.

WATERLINE A juncture of land and sea. This line migrates, changing with the tide or other fluctuation in the water level. Where waves are present on the beach, this line is also known as the limit of backrush (approximately, the intersection of the land with the still-water level.)

WAVE A ridge, deformation, or undulation of the surface of a liquid.

WAVE AGE The ratio of wave speed to windspeed.

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WAVE, CAPILLARY See CAPILLARY WAVE.

WAVE CELERITY The speed of wave propagation.

WAVE CLIMATE The seasonal and annual distribution of wave height, period and direction.

WAVE CLIMATE ATLAS Series of maps showing the variability of wave conditions over a long coastline.

WAVE CREST See CREST OF WAVE.

WAVE CREST LENGTH See CREST LENGTH, WAVE.

WAVE, CYCLOIDAL See CYCLOIDAL WAVE.

WAVE DECAY See DECAY OF WAVES.

WAVE DIRECTION The direction from which a wave approaches.

WAVE DIRECTIONAL SPECTRUM Distribution of wave energy as a function of wave frequency and direction.

WAVE FORECASTING The theoretical determination of future wave characteristics, usually from observed or predicted meteorological phenomena.

WAVE FREQUENCY The inverse of wave period.

WAVE FREQUENCY SPECTRUM Distribution of wave energy as a function of frequency.

WAVE, GRAVITY See GRAVITY WAVE.

WAVE GROUP A series of waves in which the wave direction, wavelength, and wave height vary only slightly. See also GROUP VELOCITY.

WAVE HEIGHT The vertical distance between a crest and the preceding trough. See also SIGNIFICANT WAVE HEIGHT.

WAVE HEIGHT COEFFICIENT The ratio of the wave height at a selected point to the deepwater wave height. The REFRACTION COEFFICIENT multiplied by the shoaling factor.

WAVE HINDCASTING See HINDCASTING, WAVE.

WAVE, INFRAGRAVITY See INFRAGRAVITY WAVE.

WAVE, IRROTATIONAL See IRROTATIONAL WAVE.

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WAVE, MONOCHROMATIC See MONOCHROMATIC WAVES.

WAVE OF TRANSLATION A wave in which the water particles are permanently displaced to a significant degree in the direction of wave travel. Distinguished from an OSCILLATORY WAVE.

WAVE, OSCILLATORY See OSCILLATORY WAVE.

WAVE PEAK FREQUENCY The inverse of wave peak period.

WAVE PERIOD The time for a wave crest to traverse a distance equal to one wavelength. The time for two successive wave crests to pass a fixed point. See also SIGNIFICANT WAVE PERIOD.

WAVE, PROGRESSIVE See PROGRESSIVE WAVE.

WAVE PROPAGATION The transmission of waves through water.

WAVE RAY See ORTHOGONAL.

WAVE, REFLECTED That part of an incident wave that is returned seaward when a wave impinges on a steep beach, barrier, or other reflecting surface.

WAVE REFRACTION See REFRACTION (of water waves).

WAVE ROSE Diagram showing the long-term distribution of wave height and direction.

WAVE SETDOWN Drop in water level outside of the breaker zone to conserve momentum as wave particle velocities and pressures change prior to wave breaking.

WAVE SETUP See SETUP, WAVE.

WAVE, SINUSOIDAL An oscillatory wave having the form of a sinusoid.

WAVE, SOLITARY See SOLITARY WAVE.

WAVE SPECTRUM In ocean wave studies, a graph, table, or mathematical equation showing the distribution of wave energy as a function of wave frequency. The spectrum may be based on observations or theoretical considerations. Several forms of graphical display are widely used.

WAVE, STANDING See STANDING WAVE.

WAVE STEEPNESS The ratio or wave height to wavelength also known as sea steepness.

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WAVE TRAIN A series of waves from the same direction.

WAVE TRANSFORMATION Change in wave energy due to the action of physical processes.

WAVE, TROCHOIDAL See TROCHOIDAL WAVE.

WAVE TROUGH The lowest part of a wave form between successive crests. Also that part of a wave below still-water level.

WAVE VELOCITY The speed at which an individual wave advances.

WAVE, WIND See WIND WAVES.

WAVELENGTH The horizontal distance between similar points on two successive waves measured perpendicular to the crest.

WAVES, INTERNAL See INTERNAL WAVES.

WEIBULL DISTRIBUTION A model probability distribution, commonly used in wave analysis.

WEIR A low dam or wall across a stream to raise the upstream water level. Termed fixed crest weir when uncontrolled.

WEIR JETTY A jetty with a low section or weir over which littoral drift moves into a predredged deposition basin which is then dredged periodically.

WETLANDS Lands whose saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities that live in the soil and on its surface (e.g. Mangrove forests).

WELL-SORTED Clastic sediment or rock that consists of particles all having approximately the same size. Example: sand dunes.

WHARF A structure built on the shore of a harbor, river, or canal, so that vessels may lie alongside to receive and discharge cargo and passengers.

WHITECAP On the crest of a wave, the white froth caused by wind.

WICKER FAGGOT Bundles of twigs or sticks, often willow, used in building earthworks or levees (traditional practice in Holland and China.). Alternate term: fascine

WIND CHOP See CHOP.

WIND, FOLLOWING See FOLLOWING WIND.

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WIND, KATABATIC See KATABATIC WIND

WIND, OFFSHORE A wind blowing seaward from the land in a coastal area.

WIND, ONSHORE A wind blowing landward from the sea in a coastal area.

WIND, OPPOSING See OPPOSING WIND.

WIND ROSE Diagram showing the long-term distribution of windspeed and direction.

WIND SEA Wave conditions directly attributable to recent winds, as opposed to swell.

WIND SETDOWN Drop in water level below the still water level on the windward ends of enclosed bodies of water and semi- enclosed bays.

WIND SETUP On reservoirs and smaller bodies of water (1) the vertical rise in the still-water level on the leeward side of a body of water caused by wind stresses on the surface of the water; (2) the difference in still-water levels on the windward and the leeward sides of a body of water caused by wind stresses on the surface of the water. STORM SURGE (usually reserved for use on the ocean and large bodies of water).

WIND STRESS The way in which wind transfers energy to the sea surface.

WIND TIDE See WIND SETUP, STORM SURGE.

WIND WAVES (1) Waves being formed and built up by the wind. (2) Loosely, any wave generated by wind.

WINDWARD The direction from which the wind is blowing.

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