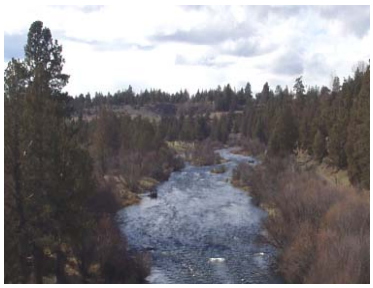
Central Oregon
Stormwater Manual





Updated August 2010

CENTRAL OREGON
INTERGOVERNMENTAL
COUNCIL

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Central Oregon Stormwater Manual

Developed in Conjunction With:

Crook County
Deschutes County
City of Bend
City of Madras
City of Prineville
City of Redmond
City of Sisters
Oregon Association of Clean Water Agencies
Central Oregon Community Investment Board

Updated August 2010

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FOREWORD

OBJECTIVE AND PURPOSE

Urban development has been shown to cause changes in patterns of stormwater runoff that can affect water quality through sediment and pollutant transport into streams, wetlands, lakes and groundwater, and can also lead to negative downstream and onsite impacts if not managed properly.

The development of the Central Oregon Stormwater Manual (COSM) has been organized by the Central Oregon Intergovernmental Council and sponsored by the Cities of Bend, Madras, Prineville, Redmond and Sisters, and Crook and Deschutes Counties. Representatives from each agency have taken an active role in outlining goals for the COSM, reviewing technical content, and writing manual chapters in a process that has spanned more than five years and two editions. It is our hope that this collaborative process between Central Oregon cities and counties will provide regional standardization of stormwater design processes, and in turn protect the water quality of our streams, rivers and regional aquifer.

Pioneering work was done in the State of Washington resulting in the Eastern Washington Stormwater Manual, and then in the development of the Spokane Regional Stormwater Manual. The Spokane Regional Stormwater Manual was the starting point for the COSM. We are deeply grateful to all of those who contributed to the work in Washington State and made preparation of the COSM so much easier. In addition, we greatly appreciate the hard work and expert advice of Otak, our consultant on the COSM project, in guiding the adaptation of the Spokane Manual and producing the August 2010 update to the COSM.

The goal of this stormwater manual is to provide local engineers, developers, builders and agencies clear guidance and design standards on stormwater conveyance and treatment systems that are appropriate to our local climate, hydrogeology and geology. For example, required hydrology calculations include a snowmelt/frozen ground factor that results in larger sized facilities than would be found in more temperate areas.

The manual is intended to assist the development community with meeting the requirements for stormwater surface discharge and Underground Injection Control (UIC) water quality requirements outlined by the Oregon Department of Environmental Quality (DEQ). DEQ Stormwater and UIC staff conducted a full review of the manual and provided valuable comments and guidance towards the completion of the August 2010 update. Please see attached letter of review from DEQ.

The COSM contains minimum local requirements and standards for designing stormwater management systems within Central Oregon. The requirements apply to land development and municipal road and drainage projects in both urban and rural settings. The COSM contains procedures and assistance in the design of stormwater management facilities. It is not intended to be a textbook on hydrology or hydraulic engineering, nor is it an attempt to cover every scenario that may arise. It is intended to be sufficiently comprehensive so that its contents, along with good engineering judgment, will address the myriad drainage concerns in Central Oregon.

Where applicable, the COSM is intended to meet the intent of DEQ's design criteria for both underground injection control and discharge to waters of the state. It provides guidance on how to design stormwater management systems that meet DEQ's rule authorization requirements for underground injection of stormwater and reduce, to the maximum extent practicable (MEP), pollutants discharged to surface waters.

However, this Manual only addresses an important subset of DEQ requirements related to stormwater and underground injection. This manual is a reference to help facilitate regulatory approval. Compliance with the requirements in this Manual does not guarantee DEQ approval of projects. Project proponents should still familiarize themselves with all DEQ requirements and be prepared to comply with those requirements. DEQ's UIC rules are found in OAR 340-044.

As of August 2010, the City of Bend is the only municipality in Central Oregon subject to federal NPDES Phase II permit requirements for stormwater discharges to the Deschutes River. For at least the term of this Phase II NPDES MS4 Permit (i.e. until March 2012), the City of Bend has determined that the same requirements that apply to stormwater discharges underground will apply to river discharges. Therefore, compliance with this Manual should ensure compliance with both the UIC and Phase II Permit requirements.

The purpose of this Manual is to assist the community in achieving the overall goal of protecting water quality and receiving waters, and managing stormwater runoff to prevent adverse impacts from flooding and increased flows. It is presumed that when the criteria and standards found in this Manual are applied (which may require exceeding the minimums stated), runoff should comply with water quality standards and receiving waters should be protected against adverse impacts. Project proponents always have the option of pursuing other stormwater management practices not found in this Manual. However, the project proponent may be required to demonstrate that the stormwater management facilities proposed for the project will be able to achieve or exceed the goals set forth in the COSM.

Cities across the United States are using Low Impact Development (LID) techniques to reduce the discharge of contaminated stormwater to local water bodies and to maintain natural drainage patterns and hydrographs. LID facilities can frequently be less costly and less space consuming to construct and less costly to operate and maintain than traditional stormwater management facilities. The cities and counties of Central Oregon encourage project proponents to consider ways to incorporate LID techniques into their project designs. Chapter 11 has been included in the COSM to assist with adoption of LID techniques.

VISION STATEMENT

Our vision is to provide a document with clearly defined stormwater management design and maintenance criteria that will serve the current and future stormwater needs in Central Oregon. The criteria in this document are meant to enhance and promote future development in a way that reasonably protects the health, safety, and welfare of current and future property owners while at the same time preserving and/or enhancing the existing natural drainage systems.

MANUAL UPDATES

The Manual is a living document. Comments and suggestions are welcome and should be sent by e-mail to Phil Chang, COIC Program Administrator, at pchang@coic.org. The Manual will be updated periodically as new information becomes available. Visit www.coic.org/stormwater for update information.

The August 2010 update was completed following a public survey to solicit comments from the local engineering and development community. At the same time, DEQ staff in the Stormwater and UIC programs conducted a full review of the manual and provided valuable comments and guidance toward the completion of this update. DEQ's letter of review is attached.

Significant changes were made during this update to better define the requirements and regulations for underground injection control facilities. The current version of the manual also includes a drainage submittal checklist (Chapter 3), updated intensity-duration-frequency curves for Bend, Redmond, and Prineville developed by the Oregon Climate Service (Chapter 5), a new plant selection appendix (Chapter 7), an erosion and sediment control inspection checklist (Chapter 9), and new maintenance standards checklists (Chapter 12). A more comprehensive summary of the changes made during this manual update can be found on the COIC website.

CENTRAL OREGON STORMWATER COMMITTEE

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December 23, 2010

Mr. Phil Chang
Program Administrator
Central Oregon Intergovernmental Council
2363 SW Glacier Place
Redmond, OR 97756

Re: Central Oregon Stormwater Manual

Dear Mr. Chang:

We wanted to write and congratulate you on finalization of the *Central Oregon Stormwater Manual - Final Revised, August 2010.* As you know, our staff provided comments on earlier versions regarding both stormwater and underground injection and control measures included in the manual. We believe that the manual is an excellent compendium of practices and approaches for controlling pollutants contained in stormwater and is designed to comply with applicable federal and state regulations, while being tailored to the unique climatic and hydro-geologic conditions of the region.

We appreciate that the manual is the result of a regional collaborative effort to provide technically sound, consistent stormwater design guidance throughout Central Oregon. The manual was completed as a partnership with the Cities of Bend, Redmond, Prineville, Madras, and Sisters, along with Crook and Deschutes Counties providing oversight and funding for the regional manual project. We also appreciate the funding and technical assistance role of the Oregon Association of Clean Water Agencies and State Lottery funds provided through the Central Oregon Community Investment Board for the purpose of promoting economic and community development.

Overall, the manual provides valuable reference for engineers, builders, and local government staff regarding environmentally-sound principles and practical tips for the design and construction of stormwater runoff treatment and flow control facilities to protect both water quality and natural runoff patterns. While the Department is not in a position to approve the manual as agency guidance to municipalities, counties and contractors, we do acknowledge the manual includes appropriate information and stormwater management controls to facilitate stormwater permit and underground injection control authorization applications submitted to DEQ. We do expect that the document will be revised as time and experience provide new opportunities for pollutant control measures.

Again, we applaud your efforts and look forward to working with you and Central Oregon Communities as they implement stormwater management controls under this new manual. If you have any questions or would like to further discuss stormwater management in Central Oregon, please call either Eric Nigg or Rodney Weick (503-229-5886).

Sincerely,

Eric Nigg
Water Quality Manager – Bend

Rodney Weick
Water Quality Manager – Portland

Cc: Keith Bedell, City of Madras
Penny Keller, Crook County
Shannon Taylor, City of Redmond
Larry Morse, City of Redmond
Paul Bertagna, City of Sisters
Scott Smith, City of Prineville
Wendy Edde, City of Bend
George Kolb, Deschutes County
Janet Gillaspie, Executive Director, Oregon Association of Clean Water Agencies

GLOSSARY

Absorption	Taking in of something in, as through pores or interstices.
Antecedent Moisture	The moisture within the soil at the beginning of a storm.
Aquifer	A geologic stratum containing ground water that can be withdrawn and used for human purposes.
Arid	Excessively dry; having insufficient rainfall to support agriculture without irrigation.
Arterial	A road or street primarily for through traffic.
Average Daily Traffic (ADT)	The expected number of vehicles using a roadway in an average day. (A round trip equals two ADT)
Backwater	Is an unnaturally high stage in a stream caused by obstruction or confinement of flow. Measured as the difference between the natural water surface elevation and the unnaturally high stage.
Bank	Lateral boundary of a stream; limits confining water flow.
Bank Protection	Revetment or other armor protecting stream or channel bank against erosion. Includes devices used to deflect the forces of erosion away from the bank.
Basic Requirements	See Chapter 2.
Basin	See Drainage Basin.
Bedrock	The more or less solid rock in place, either on or beneath the surface of the earth. It may be soft, medium, or hard and have a smooth or irregular surface.
Berm	A constructed barrier of compacted earth, rock, or gravel, typically mounded in shape. In a stormwater facility, a berm may serve as a vertical divider.
Best Management Practices (BMPs)	The activities, prohibitions of practices, maintenance procedures, and structural and/or managerial practices that, when used singly or in combination, prevent or reduce the release of pollutants and other adverse impacts to downstream or down gradient systems.
Buffer Zone	The area adjacent to a critical or sensitive area for which location and limits are described by federal, state or local governments. Aids in protecting the critical area by separating incompatible use from the critical or sensitive area.
Capacity	The effective carrying ability of a drainage structure. Generally measured in cubic feet per second.
Catch Basin	A drainage structure which collects water. May be either a structure where water enters from the side or through a grate.
Cation Exchange Capacity (CEC)	The amount of exchangeable cations that a soil can absorb at pH 7.0.

Channel	A depression in the earth's surface which conveys water from one location to another. May be either a natural or man made facility.
Channel Stabilization	Erosion prevention in a channel using vegetation, jetties, drops, revetments, or other devices.
Check Dam	Small dam constructed in a ditch, swale, or other small watercourse to decrease the stream flow velocity, minimize channel scour, and promote deposition of sediment.
Cleanout	An access opening to a storm drain system. Usually consists of a manhole shaft, a special chamber or an opening into a shallow culvert or drain.
Coefficient of Runoff	Percentage of gross rain fall which appears as runoff.
Concentrated Flow	Flowing water that has been accumulated into a single fairly narrow stream.
Concept Drainage Report	See Chapter 3.
Conveyance System	The drainage facilities, both natural and man-made which collect and carry surface and stormwater flow. Includes gutters, drainage inlets, pipes, catch basins, manholes, channels, swales, ditches, small drainage courses, streams, and rivers. See Chapter 8.
Critical Area	Any of the following areas and ecosystems: wetlands, areas with a critical recharging effect on aquifers used for potable water, fish and wildlife habitat conservation areas, frequently flooded areas, and geologically hazardous areas.
Critical Depth	The depth of water in a conduit at which the total energy head is at a minimum for a given flow rate. Distinguishes the breakpoint between subcritical and supercritical flow. At critical depth, the Froude number is equal to 1.0.
Critical Velocity	The velocity when flow is at critical depth.
Culvert	A conduit for allowing water to pass under a roadway or embankment.
Design Frequency	The recurrence interval for hydrologic events used for design purposes.
Design Storm	The storm associated with a given recurrence interval used for design purposes.
Detention Facility	An above ground or below ground facility, such as a pond or tank, that temporarily stores stormwater runoff and subsequently releases it at a slower rate than it is collected by the drainage facility system. There is little or no infiltration of stored stormwater. See Chapter 7.
Development	Conversion of a property from a less intense to more intense use. Typically involves the addition of new structures and/or impervious area.
Discharge	The volume of water flowing out of a drainage structure or facility; typically measured in cubic feet per second.

Dispersion	Release of surface stormwater runoff from a drainage facility system such that the flow spreads over a wide area. See Chapter 7.
Ditch	A long narrow excavation dug in the earth for drainage.
Diversion	The change in character, location or direction of flow of a natural drainage course.
Drainage Basin	That portion of the earth's surface upon which all falling precipitation flows to a given location.
Drainage Submittal	The submittal of documentation including narrative, basin maps, plans, calculations and other supporting documentation to demonstrate that the proposed project will adequately treat and dispose of the stormwater. See Chapter 3.
Drywell	A stormwater disposal system designed to disperse water below the land surface. See Chapter 7.
Easement	A legal right to use the land of others. The right may be from the common law or be acquired, usually by purchase or condemnation, but occasionally by prescription or inverse condemnation. The right is not exclusive, but subject to rights of others in the same land, the lesser right being subservient to a prior right which is dominant. Easements for drainage may give rights to impound, divert, discharge, concentrate, extend pipelines, deposit slit, erode, scour, or any other necessary consequence of a development.
Energy Dissipator	A structure for the purpose of slowing the flow of water and reducing the erosive forces present in any rapid flowing body of water.
Energy Grade Line	The total amount of energy available at any point along a water course. Where the water is stagnant, the water surface would coincide with the energy grade line. As the flow of water is accelerated, the water surface drops further away from the energy grade line as energy is converted into velocity.
Energy Head	The elevation of the energy grade line. Equals the hydraulic grade line at any section plus the velocity head of the mean velocity of the water in that section.
Engineer	Professional Engineer, currently licensed in the State of Oregon
Entrance Head	The head required to cause flow into a conduit or other structure.
Entrance Loss	The head lost in eddies and friction at the inlet to a conduit or structure.
Erosion	The wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep.
Erosion and Sedimentation Control (ESC)	Any temporary or permanent measures taken to reduce erosion, control siltation and sedimentation, and ensure that sediment-laden water does not leave the site. See Chapter 9.
Evapotranspiration	The collective term for the processes of evaporation and plant transpiration by which water is returned to the atmosphere.

Exception	An approval by the local jurisdiction of design elements that do no conform to the requirements of this manual. A deviation from the standards outlined in this manual.
Exemption	A case or condition that allows a development or project to avoid one or more requirements of this manual. In contrast to exceptions, exemptions do not require separate approval by the local jurisdiction.
Floodplain	Strip of land adjacent to a river or channel which has a history of overflow.
Floodway	The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.
Flow	A term used to define the movement of water, silt, sand, etc; discharge; total quantity carried by a stream.
Freeboard	The distance between the water surface elevation and the top of the sides of a facility (channel, pond, ditch, etc).
Geotechnical Engineer	A professional Engineer, currently licensed in the State of Oregon with training or acquired knowledge in geotechnical analysis.
Groundwater	Water in a saturated zone or stratum beneath the land surface.
Groundwater Recharge	Inflow to a groundwater reservoir or aquifer.
Groundwater Table	The free surface of the ground water, subject to atmospheric pressure under the ground, generally rising and falling with the season, the rate of withdrawal, the rate of restoration, and other conditions. It is seldom static.
Head	When used as a hydraulic term, the height of water above any point or plan or reference. Represents an available force in effecting the movement of water. Used also in various compounds, such as energy head, entrance head, friction head, static head, pressure head, lost head, etc.
Hydraulic Grade Line	A line which represents the relative force available due to the potential energy available. This is a combination of energy due to the height of the water and the internal pressure. In any open channel, this line corresponds to the water surface.
Hydraulic Jump	Sudden transition from supercritical flow to the complementary subcritical flow, conserving momentum and dissipating energy.
Hydraulic Radius	The cross-sectional area of a stream of water divided by the length of the perimeter of that cross section in contact with the conduit, channel bed, or ground surface. Also the ratio of the area to wetted perimeter. $R = A/P$
Hydraulically Connected	Refers to impervious areas that stormwater flows directly onto another impervious area without traveling over a pervious area. May include driveway or sidewalk areas adjacent to curbs from which stormwater collects in the gutter.

Hydraulically Isolated	Refers to impervious areas where surface runoff is contained through grading, berms, or drains to prevent inflow from or outflow to other areas.
Hydrograph	A graph showing stage, flow, velocity, or other property of water with respect to time.
Hydrologic Soil Groups	A soil characteristic classification system defined by the U.S. Soil Conservation Service in which a soil may be categorized into one of four soil groups (A, B, C, or D) based upon infiltration rate and other properties.
Hydrology	The science dealing with the occurrence and movement of water upon and beneath the land areas of the earth.
Hyetograph	A graph or table of percentages of total precipitation for a series of time steps representing the total time in which precipitation occurs.
Impervious Surface	A hard surface area which either prevents or retards the entry of water into the soil mantle. Common impervious surfaces include, building roofs, walkways, patios, driveways, parking lots, concrete or asphalt paving, gravel roads, and packed earthen materials.
Infiltration	The passage of water through the soil surface into the underlying geologic material.
Inlet	That portion of a drainage facility through which stormwater enters.
Intermittent Stream or Channel	A stream or portion of a stream that flows only in direct response to precipitation. Intermittent streams receive little or no water from springs, groundwater, melting snow or other sources and are dry for a large part of the year.
Invert	The bottom of a drainage facility along which the lowest flows would pass.
Isopluvial map	A map with lines representing constant depth of total precipitation for a given return frequency.
Land Disturbing Activity	Any activity that results in movement of earth or a change in the existing soil cover (both vegetative and non-vegetative) and or the existing soil topography. Land disturbing activities include, but are not limited to clearing, grading, filling, and excavation. Compaction associated with stabilization of structures and road construction shall also be considered a land disturbing activity. Vegetation maintenance practices are not considered land-disturbing activity.
Level Pool Routing	The basic technique of storage routing used for sizing and analyzing flow control facilities and determining water levels for ponding water bodies. The level pool routing technique is based on the continuity equation: inflow - outflow = change in storage.
Local Jurisdiction	Any county, city, town or special purpose district having its own incorporated government for local affairs.
Low Permeability Liner	A layer of compacted till or clay, or a geomembrane.

Maintenance	Activities conducted to extend the life cycle and ensure proper operation of existing facilities. Maintenance should not expand the use or capacity of a facility beyond the existing or designed use and results in no significant adverse hydrologic impact.
Manhole	An entrance provided to a drainage facility for the purpose of inspection and cleaning. This may consist of a circular manhole shaft, frame and round cover or an opening into a structure where the top of the structure is at the surface. The opening may be round or rectangular.
Manning's Number ("n" value)	A number used in a mathematical formula to determine the theoretical velocity in a drainage facility. This number varies according to the roughness of the material through or over which the water is flowing. Often referred to as a roughness coefficient.
Natural Conditions	Condition before any human caused development or alteration.
New Development	Is the conversion of undeveloped or permeable surfaces to impervious surfaces. New development occurs on vacant land or removes existing structures to create a different site use.
Non-flooded Road Width	That portion of a road which is not used to carry water during a storm. See Chapter 8.
Non-pollutant generating impervious surfaces (NPGS)	NPGS are considered to be insignificant or low sources of pollutants in stormwater runoff. Roofs that are subject only to atmospheric deposition or normal heating, ventilation and air conditioning vents are considered NPGS. The following may also be considered NPGS: paved bicycle pathways and pedestrian sidewalks that are separated from and not subject to drainage from roads for motor vehicles, fenced fire lanes, and infrequently used maintenance access roads. See Chapter 2.
Normal Depth	The depth at which flow is steady and hydraulic characteristics are uniform.
NPDES	National Pollutant Discharge Elimination System. A provision of the federal Clean Water Act which prohibits point source discharges of pollutants into water of the United States unless a special permit is issued and administered by the U.S. Environmental Protection Agency or by DEQ as the delegated authority in Oregon State.
Offsite Drainage	Runoff which originates outside the development.
Oil/Water Separator	A vault, usually underground, designed to provide a quiescent environment to separate oil from water.
Onsite Drainage	Runoff that originates within the development.
Open Channel	A drainage course that is open to the atmosphere, including ditches, channels, canals, streams, and rivers.

Ordinary High Water Mark	The line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank; shelving; changes in the character of soil destruction on terrestrial vegetation, or the presence of letter and debris; or other appropriate means that consider the characteristics of the surrounding area.
Orifice	An opening with closed perimeter of regular or circular form through which water flows.
Outlet	That portion of a drainage system through which the stormwater exits.
Overflow	1) Flow beyond the capacity of a given system. 2) A path or device allowing for the flow of excess water.
Overland Flow	Flow of water across the ground surface before concentrating or reaching a natural water course.
Peak Flow	Maximum momentary stage or discharge of a stream or flood.
Percolation	The movement of water through soil.
Perennial Stream	A stream reach that does not go dry during a year of normal precipitation.
Permeable soils	Soil materials with a sufficiently rapid infiltration rate so as to greatly reduce or eliminate surface and stormwater runoff. These soils are generally classified as SCS hydrologic soil types A and B.
Plat	A map or representation of a subdivision showing the division of a tract or parcel of land into lots, blocks, streets, or other divisions and dedications.
Point Discharge	The release of collected and/or concentrated surface and stormwater runoff from a pipe, culvert, or channel.
Pollutant Generating Surface (PGS)	PGS are considered to be significant sources of pollutants in stormwater runoff. Such surfaces include those that are subject to vehicular use, industrial activities, or storage of erodible or leachable materials that receive direct rainfall, or run-on or blow-in of rainfall. Metal roofs are considered to be PGS unless coated with an inert, non-leachable material. Roofs that are subject to venting of manufacturing, commercial, or other indoor pollutants are also considered PGS. A surface, whether paved or not, shall be considered PGS if it is regularly used by motor vehicles. The following are considered regularly-used surfaces: roads, unvegetated road shoulders, bike lanes within the traveled lane of a roadway, driveways, parking lots, unfenced fire lanes, vehicular equipment storage yards, and airport runways. See Chapter 2.
Precipitation	Rainfall, snow, sleet, fog, hail, dew and frost.
Pre-Developed Condition	The native vegetation and soils that existed at a site prior to the proposed development activity.
Project Proponent	The owner or owner's agent legally responsible for the development or project.

Rational Method	A means of estimating the amount of stormwater arriving at a given point. See Chapter 5.
Reach	The length of a channel uniform with respect to discharge, depth, area and slope.
Redevelopment	The replacement or expansion of impervious surfaces on a developed site. Redevelopment occurs when existing facilities are demolished and rebuilt or substantially improved through reconstruction.
Retention	The process of collecting and holding surface and stormwater runoff with no surface outflow.
Rip Rap	Protection against erosion consisting of broken concrete, sacked concrete, or rock.
Runoff	The portion of precipitation that appears as overland or concentrated flow.
Scour	Wearing of the bed of the stream; by entrainment of alluvium and corrosion of native rock. Also caused by excessive velocities at the outlet of a concentrated stream of water onto unstable material.
SCS Method	A single event hydrologic analysis technique for estimating runoff based on the Curve Number method. May also be referred to as the NRCS Method. See Chapter 5.
Seasonal Stream	A stream or segments of a stream that normally goes dry during a year of normal rainfall. Seasonal streams often receive water from springs and/or long-continued water supply from melting snow or other sources.
Sedimentation	Gravitational deposit of transported material in flowing or standing water.
Sheet Flow	Any flow spread out and not confined, i.e. flow across a flat open field.
Silt	(1) Water borne sediment carried in suspension or deposited by flowing water, ranging in diameter from 0.0002 to 0.002 inches. The term is generally confined to fine earth, sand, or mud, but is sometimes broadened to include all material carried, including both suspended and bed load. (2) Deposits of water borne material as in a reservoir, on a delta, or on flood plains.
Special Drainage Area (SDA)	An area with unique drainage characteristics, typically requiring additional analysis or evaluation. SDAs typically have shallow soils, bedrock near the surface of the land and soils or geological features that may make long term infiltration of stormwater difficult or create potential problems for adjacent properties. These areas may also contain steep slopes where infiltration of stormwater may be difficult and the potential for erosion is high. SDAs are defined by the local jurisdiction.
Spillway	A passage for spilling water; a wasteway.
Stabilization	The use of concrete or asphalt paving, crushed aggregate, matting, fabric, vegetation, or other methods to inhibit soil erosion.

Storm Drain	Any conveyor of stormwater.
Stormwater	That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows, via overland flow, interflow, pipes and other features of a stormwater drainage system, into a defined surface water body or constructed infiltration facility.
Stormwater Management	The all encompassing process that include volume and rate control, water quality treatment and conveyance systems.
Subcritical flow	Flow in which the velocity is less than the critical velocity.
Sump	A low spot that does not permit the escape of water.
Supercritical flow	Flow in which the velocity higher than the critical velocity.
Surveyor	A professional surveyor, currently licensed in the State of Oregon.
Swale	A shallow drainage conveyance with relatively gentle side slopes, generally manmade.
Target Soils	The strata of soil where stormwater will be infiltrated.
Time of concentration	Time required for discharge from the most distant point in a drainage area to reach the concentration point.
Travel time	The estimated time for surface water to flow between two points of interest.
Treatment Zone	The soil in an infiltration swale where water quality treatment occurs. See Chapter 4.
Trip End	The expected number of vehicles using a parking area. Trip end counts are estimated by using the *Trip Generation Manual* published by the Institute of Transportation Engineers
Water Budget Calculations	An analysis used in the design of an evaporation pond. See Chapter 5.
Water surface	Top of water in lake, channel, reservoir, river, pond, pipe, etc.
Water table	The upper surface or top of the saturated portion of the soil or bedrock layer, indicating the uppermost extent of groundwater.
Weir	A low overflow dam or sill for measuring, diverting, or controlling flow.
Wetlands	Areas characterized by saturated or nearly saturated soils most of the year that form an interface between terrestrial (land based) and aquatic environments.

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ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
ADT	Average Daily Traffic
API	American Petroleum Institute
ARC	Antecedent Runoff Condition
ASTM	American Society for Testing and Materials
BASMAA	Bay Area Stormwater Management Agencies Association
BMPs	Best Management Practices
BST	Bituminous Surface Treatment
CC&R's	Conditions, Covenants and Restrictions
CDR	Concept Drainage Report(s)
CEC	Cation Exchange Capacity
CFS	Cubic Feet per Second
CN	Curve Number
DEQ	Department of Environmental Quality
CFR	Code of Federal Regulations
DSL	Department of State Lands
EPA	Environmental Protection Agency
ESC	Erosion & Sediment Control
FEMA	Federal Emergency Management Act
FHWA	Federal Highway Administration
GSC	Geotechnical Site Characterization
HGL	Hydraulic Grade Line
HOA	Homeowner's Association
IBC	International Building Code
I-D-F	Intensity-Duration-Frequency
I-D-R	Intensity-Duration-Recurrence
ITE	Institute of Transportation Engineers
LID	Low Impact Development
NLDS	Natural Location of Drainage Systems
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPGS	Non-Pollutant Generating Impervious Surface
NRCS	National Resource Conservation Service
MCL	Maximum Contaminant Level
O&M	Operation and Maintenance
OCS	Oregon Climate Service

ODFW	Oregon Department of Fish & Wildlife
ODOT	Oregon Department of Transportation
PGS	Pollutant Generating Impervious Surface
POA	Property Owners Association
RCRA	Resource conservation and Recovery Act
ROD	Record of Decision
ROW	Right-of-Way
SBUH	Santa Barbara Urban Hydrograph
SCS	Soil Conservation Service
SDA	Special Drainage Areas
SDWA	Safe Drinking Water Act
SWMP	Surface Water Management Plan
TMDL	Total Maximum Daily Load
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
UIC	Underground Injection Control
USBR	United States Bureau of Reclamation
USGS	United States Geological Survey
WPCF	Water Pollution Control Facility
WRCC	Western Region Climate Center
WRD	Water Resources Department