

2.0 Introduction

The provisions for adequate stormwater management are necessary to preserve and promote the general health, welfare, and economic well being of the region. Drainage affects all governmental jurisdictions and parcels of property. This characteristic makes it necessary to formulate a program that balances both public and private involvement. The governmental agencies most directly involved must provide coordination and master planning, but stormwater management must also be integrated on a regional basis.

When planning stormwater management facilities, certain underlying principles provide direction for the effort. The principles are made operational through policy statements. The application of the policy is, in turn, facilitated by technical criteria and data. When considered in a comprehensive manner, on a regional level with public and private involvement, stormwater management facilities can be provided in a manner that will enhance the general health and welfare of the region and assure optimum economic and social relationships.

2.1 Principles

The following principles for urban stormwater management are based on those outlined in the *UDFCD Manual*.

- 2.1.1 Drainage is a regional phenomenon that does not respect the boundaries between government jurisdictions or between properties.** This makes it necessary to formulate programs that include both public and private involvement. Overall, the governmental agencies most directly involved must provide coordination and master planning, but drainage planning must be integrated on a regional level if optimum results are to be achieved.
- 2.1.2 A stormwater management system is a subsystem of the total urban water resource system.** Stormwater management system planning and design for any site must be compatible with regional comprehensive plans, and should be coordinated with planning for land use, open space, and transportation corridors. Urban stormwater management must consider and address the interrelated issues of erosion and sedimentation control, flood control, site grading, and regional water quality.
- 2.1.3 Every urban area has an initial (i.e., minor) and a major drainage system, whether or not they are actually planned and designed.** The initial drainage system, sometimes referred to as the “minor system”, is designed to provide public convenience and to accommodate moderate, frequently occurring flows. The major system carries more water and operates when the rate or volume of runoff exceeds the capacity of the minor system. To provide for orderly urban growth, reduce costs to future generations, and avoid loss of life and major property damage, both systems must be planned and properly engineered.

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- 2.1.4 Runoff routing is primarily a space allocation problem.** The volume of water present at a given point in time in an urban region cannot be compressed or diminished. Adequate space must be provided, during initial planning stages, for storm drainage runoff conveyance, quality enhancement, and storage, if not, stormwater runoff will conflict with other land uses, resulting in damages and the disruption of other urban systems.
- 2.1.5 Planning and design of stormwater management systems generally shall not be based on the premise that problems can be transferred from one location to another.** Urbanization tends to increase downstream peak flows by increasing runoff volumes and the speed of runoff conveyance. Stormwater management systems shall be designed and detention storage shall be provided so as not to adversely impact downstream properties.
- 2.1.6 An urban storm drainage strategy should be a multi-objective and multi-means effort.** The many competing demands placed upon space and resources require a stormwater management strategy that meets a number of objectives, including water quality enhancement, groundwater recharge, recreation, wetland creation, protection of landmarks/amenities, control of erosion and sediment deposition, and creation of open spaces.
- 2.1.7 Design of the stormwater management system shall consider the features, capacity, and function of the existing drainage system.** Good designs incorporate the effectiveness of the natural systems rather than negate, replace or ignore them. Existing features such as natural drainageways, depressions, wetlands, floodplains, permeable soils, and vegetation provide for infiltration, help control the velocity of runoff, extend the time of concentration, filter sediments and other pollutants, and recycle nutrients.
- 2.1.8 In new developments and redevelopment, attempts should be made to reduce stormwater runoff rates and pollutant load increases after development to the maximum extent practicable.** To the extent feasible, the imperviousness of the site should be minimized, the rate of runoff should be slowed by maximizing vegetative and porous land cover, and a series of Best Management Practices must be provided for water quality enhancement and protection.
- 2.1.9 The stormwater management system shall be designed, beginning with the outlet or point of outflow from the project, giving full consideration to downstream effects and the effects of off-site flows entering the system.** The design of the stormwater management system shall take into account runoff from upstream sites, assuming fully developed conditions, and shall evaluate the downstream conveyance system to ensure that it has sufficient capacity to accept design discharges without adverse backwater or downstream impacts such as flooding, stream bank erosion, channel degradation, and sediment deposition.

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2.1.10 The stormwater management system must receive regular maintenance to ensure long-term function and effectiveness and stormwater management facilities shall be designed with ease of maintenance, long-term function, and accessibility as primary considerations. Operation and maintenance procedures and activities must be developed and documented with the facility design. Clear assignment of maintenance responsibilities shall be identified, and assigned to an established agency with the resources and understanding, which are required to ensure proper maintenance.

2.1.11 Floodplains need to be preserved where feasible and practicable. Preservation of floodplains serves to minimize hazards, preserve habitat and open space, creates a more livable urban environment, and protects the public health, safety, and welfare. Floodplain encroachment is highly discouraged and will only be considered on a case-by-case basis.

2.1.12 Reserve sufficient Right-of-Way for lateral channel movement of incised floodplains. Whenever a floodplain is contained within a narrow (i.e., degraded) channel, the channel should be provided with grade control structures and a Right-of-Way corridor to account for lateral movement. Lateral movement over time can cause extensive damage to public and private structures and facilities.

2.1.13 Subdivision water quality capture volume facilities. Regional or subregional water quality capture volume facilities shall be designed and constructed at the time of subdivision to serve all parcels or lots within the subdivision boundary.

2.2 Planning Policy

2.2.1 All land development proposals shall receive full site planning and engineering analyses. A drainage report and plan consistent with the submittal requirements in these *Criteria* shall be required for all new development and redevelopment within the County's jurisdiction.

2.2.2 Stormwater management planning shall be required in the initial planning stages, for all developments, to ensure that adequate space is allocated for the required stormwater management facilities.

2.2.3 The County supports and will pursue a jurisdictionally unified approach to drainage to ensure an integrated comprehensive regional drainage plan.

2.2.4 The County will continue to participate in, and encourage the development of detailed regional master plans, which will set forth site requirements for development and identify the required public improvements. Master plans will be approved, adopted, and revised as necessary to accommodate changes that occur within the specific drainage basin.

2.2.5 Where practicable and feasible, site planning and design techniques shall be incorporated, which promote the concept of minimizing directly connected

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impervious areas in order to decrease the volume and velocity of stormwater runoff from a site.

- 2.2.6** The County shall encourage the development of multipurpose, aesthetic detention facilities that are safe, maintainable, and community assets.
- 2.2.7** The definition of a major drainageway is necessary for the clarification and administration of these *Criteria*. The County defines a major drainageway as any drainage flow path with a tributary area of 130 acres or more.
- 2.2.8** The County considers stormwater runoff to be an integral part of the County's surface and groundwater resource and recognizes its potential for other uses.
- 2.2.9** The County recognizes that some intra-watershed transfer or diversion of runoff occurs within major drainageway watersheds, as sub-watershed boundaries are changed with development. Those diversions and transfers should be minimized, to the extent possible, historic outfall locations to natural drainageways shall be maintained, and any potential adverse impacts that result shall be mitigated with the stormwater management design.
- 2.2.10** Inter-watershed transfer or diversion of runoff from one major drainageway watershed to another major drainageway watershed shall be avoided unless specific and prudent reasons justify and dictate a transfer.
- 2.2.11** There are areas within the County defined by specific drainage or water quality concerns. The County will require additional jurisdictional cooperation and drainage analysis in the specified areas. In some cases, additional improvements may be required.
- 2.2.12** Encroachment into the 100-year floodplain through floodplain filling is strongly discouraged. When considering requests for floodplain fringe filling, the County shall consider the impacts to adjacent properties, the channel hydraulics and design and the channel aesthetics and adjacent land use. The County Floodplain Administrator shall make final decisions regarding floodplain filling.
- 2.2.13** When developing adjacent to major drainageway floodplains, a minimum of 2-feet of freeboard shall be provided between the 100-year base flood elevation and the lowest finished floor elevation of all structures
- 2.2.14** Groundwater or sub-surface water can adversely impact the construction, capacity, long-term function, and maintainability of stormwater management facilities. Those potential impacts shall be quantified, to the extent possible, and considered during the design of stormwater management facilities.

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2.3 Design Policy

- 2.3.1** Stormwater management planning and design within the County shall adhere to the criteria developed and presented in these *Criteria*, and in accordance with the criteria established in the *UDFCD Manual*.
- 2.3.2** All development, redevelopment and expansion must include planning and design for both the initial and major drainage systems. The initial drainage system shall be designed for the 5-year storm recurrence interval. The major drainage system shall be designed for the 100-year storm recurrence interval.
- 2.3.3** The initial drainage system, as a minimum, shall be designed to transport runoff with minimum disruption to the urban environment. Minor storm drainage can be conveyed in the curb and gutter area of the street or roadside ditch (subject to street classification and capacity, as defined herein), by storm sewer, (without surcharge), channel, or other conveyance facility, provided that capacity exists when future development is considered. The initial drainage system shall be sized without accounting for peak flow reductions from upstream detention.
- 2.3.4** The major drainage system shall be designed to convey runoff in a manner, which minimizes health and life hazards, damage to structures, and interruption to traffic and services. When major storm flows can be carried in the urban street system (within acceptable depth criteria as provided herein), channels, storm sewers and other facilities, provided that capacity exists when future development is considered.
- 2.3.5** Determination of rainfall values and runoff quantities shall be based on the information and methodologies presented in Chapter 6, Hydrology.
- 2.3.6** The County requires that stormwater detention storage be provided for all new development, redevelopment, or expansion, as defined in these *Criteria*. Storage volume and release rate criteria are based on the 2-year and the 100-year recurrence interval storm events or “Full Spectrum” detention.
- 2.3.7** For new subdivisions, regional or sub-regional detention, as defined in Chapter 13, Storage, shall be provided in lieu of on-site detention for individual lots or parcels.
- 2.3.8** Underground detention is prohibited in the County.
- 2.3.9** Stormwater retention shall not be permitted, except as approved on a case-by-case basis by the County as an interim solution and as permitted by law. Stormwater retention may be used temporarily in areas where an outfall storm sewer system has been planned, but has not been constructed. Retention shall be converted to detention when the outfall system is available.
- 2.3.10** Rooftop detention is prohibited in the County.

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- 2.3.11** Major drainageways within the County shall be preserved in their natural state, to the extent possible, and stabilization measures shall be designed to complement and enhance the natural character. Improvements are generally needed to mitigate adverse impacts associated with development, but they can be designed to maintain or enhance the natural environment. Major drainageway runoff shall not be conveyed in storm sewer pipes or culverts, except for the use of culverts at roadway crossings.
- 2.3.12** In order to preserve the natural character of major drainageways, excessive velocities shall be limited, future rehabilitation and maintenance costs shall be minimized and potential safety hazards shall be eliminated. Major drainageway channels shall be constructed to provide a natural, smooth transition from the channel to the natural topography. The County will not allow the use of constructed retaining walls, and/or bank slopes greater than 4:1 for major drainageway channels. Varying of side slopes throughout the channels is encouraged, to provide a less structural, more natural appearance.
- 2.3.13** The County encourages the application of the major drainageway standards and criteria to minor drainageways. Alternative treatments for minor drainageways will be considered consistent with the criteria provided in Chapter 12, Open Channel Design.
- 2.3.14** Design of stormwater facilities shall consider the potential impacts of groundwater. Investigations shall be performed and improvements constructed as needed to avoid and/or mitigate the potential impacts of groundwater on the stormwater facilities and the subdivision.
- 2.3.15** The County requires the implementation of permanent Best Management Practices for enhancement of stormwater quality with all development, redevelopment and expansion within the County.
- 2.3.16** Underground permanent Best Management Practices for enhancement of stormwater quality are prohibited.

2.4 Operations and Maintenance Policy

- 2.4.1** All major drainageway improvements and regional detention or water quality enhancement facilities within the UDFCD boundary shall be made eligible for UDFCD maintenance assistance through the UDFCD Maintenance Eligibility Program. Design and construction must be approved by the UDFCD.
- 2.4.2** The design of all stormwater management facilities within the County must be performed with access and long-term operation and maintenance being priority considerations. An Operation and Maintenance Manual must be developed concurrent with the design and accepted by the County. See Section 4.6 of this *Criteria* for additional information.

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- 2.4.3** The property owner shall be responsible for the maintenance of all stormwater facilities located on the property unless another party accepts such responsibility.
- 2.4.4** Drainage easements or tracts and access easements shall be provided for all stormwater management facilities.
- 2.4.5** Developing properties shall convey runoff from upstream properties across their site within dedicated drainage easements or tracts.

2.5 Construction of Public Improvements Policy

- 2.5.1** Water quality Best Management Practices as defined by the accepted Phase III Drainage Report and Plan must be designed and constructed with all new development and redevelopment.
- 2.5.2** The local on-site drainage system, as defined by the accepted Phase III Drainage Report and Plan, including provisions necessary to convey developed flows from upstream properties must be designed and constructed with all new development and redevelopment. Conveyance of off site runoff is discussed in detail in Chapter 6, Hydrology.
- 2.5.3** The connection of the local drainage system to a major drainageway of adequate conveyance capacity, such as a master planned outfall, storm sewer, or drainageway, as defined by the accepted Phase III Drainage Report and Plan must be designed and constructed with all new development and redevelopment.
- 2.5.4** The major drainageway system and stabilization improvements, within the development, as defined by Master Drainage Plans, UDFCD Outfall Systems Planning Studies or as required by the County, as defined by the accepted Phase III Drainage Report and Plan must be designed and constructed with all new development and redevelopment.

2.6 Regulatory/Legal Policy

- 2.6.1** The County is a permittee under Phase II of the National Pollutant Discharge Elimination System Program requirements of the Federal Clean Water Act, and regulations promulgated by the Colorado Department of Public Health and Environment– Water Quality Control Division in its Stormwater Phase II Program. The County is required to comply with permit requirements to the maximum extent practicable, which includes requiring permanent water quality enhancement Best Management Practices with all development or redevelopment.
- 2.6.2** The County is subject to the requirements of the Cherry Creek Reservoir Control Regulation. The Colorado Department of Public Health and Environment – Water Quality Control Commission Regulation No. 72, Cherry Creek Control Regulation outlines additional requirements, related to the protection of

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stormwater runoff quality, for Stormwater Permit holders within the Cherry Creek Reservoir watershed.

- 2.6.3** The County is subject to the requirements of the Chatfield Reservoir Control Regulation. The Colorado Department of Public Health and Environment – Water Quality Control Commission, Regulation No. 73, Chatfield Reservoir Control Regulation requires that water quality enhancement Best Management Practices be implemented within the County to control non-point source pollution of stormwater runoff within the Chatfield Reservoir watershed.
- 2.6.4** The County is a participant in the National Flood Insurance Program (NFIP) and will implement and enforce floodplain development regulations that meet or exceed the minimum standards provided in 44 Code of Federal Regulations, Part 60. The County floodplain development regulations are part of the Douglas County Zoning Resolution.
- 2.6.5** It is recognized that certain stormwater management facilities may impact water rights. The County’s policy shall be to preserve the integrity of water rights in the planning, design, and construction of stormwater drainage facilities.

2.7 Hazard Minimization & Public Safety Policy

- 2.7.1** Public safety shall be an essential objective when planning, designing and maintaining stormwater facilities.
- 2.7.2** Stormwater facilities within the County shall be designed with careful consideration of the potential hazards associated with the use, operation and maintenance of the facility. The design phase of all projects shall analyze the potential risks associated with the facility, and include appropriate design features to minimize these risks.

2.8 Miscellaneous Policy

- 2.8.1** Stormwater runoff shall be directed into historic and natural drainageways and avoid discharging into an irrigation canal or ditch, except as required by water rights. Where irrigation ditches cross major drainageways, the developer may be required to design and construct the appropriate structures to separate stormwater runoff from ditch flows. Whenever new development will increase flow rates, volumes, or change the manner or points of discharge into irrigation ditches, the written consent from the ditch owner/operator shall be submitted with the development application.
- 2.8.2** There is potential for problems relative to dam safety and the hazards associated with breaching, failure, and emergency spillway locations and downstream flow paths. In general, development shall be restricted to areas outside of a reservoir’s high water line created by operation of the emergency spillway.