Section 1200 Detention and Permanent Water Quality
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1201 INTRODUCTION

This section presents the criteria for design and evaluation of all detention and water quality facilities for Boulder County. The main purpose of a detention facility has historically been to store the excess storm runoff associated with increased basin imperviousness and discharge this excess at a rate similar to the rate experienced before development. In recent years, detention facilities have also frequently been viewed as a unique opportunity to improve the water quality of runoff coming from developed areas. This runoff typically carries higher levels of nitrogen, phosphorus, and sediment that can damage the ecosystems of the natural streams downstream of the development.

This section discusses detention both with and without a water quality component; water quality facilities located outside a detention basin, including proprietary facilities; and when detention and water quality are required.

1202 LOW IMPACT DEVELOPMENT

Boulder County requires low impact development (LID) principles to be followed for all new and redevelopment by minimizing directly connected impervious areas (MDCIA). MDCIA can be accomplished by routing runoff from impervious surfaces over pervious areas to decrease runoff velocities and promote infiltration. At least 20 percent of the total impervious area of all new development and redevelopment sites must first drain to a pervious area equal to at least 10 percent of the total impervious surface area of the development site, prior to discharging from the site.

In addition to the benefits of decreasing runoff velocities and promoting infiltration, the Water Quality Capture Volume (WQCV), Excess Urban Runoff Volume (EURV), and 100-year detention volume can all be calculated using the effective imperviousness value that results from the use of LID. Effective imperviousness shall be calculated in accordance with the USDCM (UDFCD, 2016). A lower effective imperviousness will then result in smaller required water quality and detention volumes.

1203 DETENTION

This section presents circumstances under which stormwater detention is required with development, the criteria for detention basin design, and maintenance requirements of detention basins.

1203.1 Detention and Development

Full-spectrum detention is required for all new development and redevelopment. Subdivided development may use a single detention facility provided it captures runoff from the entire

development. Exceptions to the detention requirement may be granted if the project has any of the following characteristics, provided the new or additional undetained runoff will cause no adverse impacts to any downstream properties.

1. Parcels that are 3 acres or larger, have one single-family dwelling, and have a total imperviousness of less than 10 percent
2. Additions to buildings where the total impervious area, both existing and proposed, covers less than 5,000 square feet of impervious paved and roof surfaces
3. Fill areas that are not paved over or otherwise made impervious
4. Other situations as may be determined by the County Engineer to be in the best interest of the county.

Exceptions may also be granted for slightly smaller single-family residential parcels provided low-impact development principles are included in the design. These may include using pervious pavers or pavement for driveways and walkways and routing roof drainage across a vegetated pervious area prior to discharging it to a roadside ditch or stream. An exemption to provide detention issued by Boulder County does not eliminate potential liability to others. All detention facilities in the county are subject to oversight by the county.

1203.2 Design of Detention Facilities

The UDFCD has invested a significant amount of energy into developing detailed design guidance for detention basins. The USDCM (UDFCD, 2016) provides discussion on the applicability of regional, subregional, and on site detention; an explanation for why full-spectrum detention is the preferred approach; and calculations for sizing the pond volume and designing the outlet structure. The USDCM shall be used for sizing and designing all detention basins for full-spectrum detention in Boulder County. Detention facilities may include extended detention basins, constructed wetlands, sand filters, and rain gardens. The USDCM also includes weir and orifice equations for the design of detention basin outlets that may also be used for other applications within this MANUAL as needed.

1203.3 Maintenance of Detention Facilities

The performance of detention facilities is extremely sensitive to a lack of maintenance. Detention facility outlets in particular must be regularly maintained to ensure the basins meet the requirements of Colorado water law and do not detain water longer than allowable. If detention is to be constructed, Boulder County requires an enforceable maintenance agreement to be in place before issuing any applicable local permits. The agreement must include the party responsible for maintaining the facility, inspection frequency, and proposed maintenance activities.

1203.4 Detention and Water Rights

Senate Bill 15-212 became effective on August 5, 2015, as Colorado Revised Statute (CRS) §37-92-602 (8), *Concerning a Determination that Water Detention Facilities Designed to Mitigate the Adverse Effects of Storm Water Runoff Do Not Materially Injure Water Rights*. This statute provides legal protection for any stormwater detention and infiltration facility in Colorado, provided the facility does not materially injure water rights and meets the following criteria that are applicable in Boulder County.

1. It is owned or operated by a governmental entity or is subject to oversight by a governmental entity.
2. It continuously releases or infiltrates at least 97 percent of all of the runoff from a rainfall event that is less than or equal to a 5-year storm within 72 hours after the end of the event.
3. It continuously releases or infiltrates as quickly as practicable, but in all cases releases or infiltrates at least 99 percent of the runoff within 120 hours after the end of events greater than a 5-year storm.
4. It operates passively and does not subject the stormwater runoff to any active treatment process such as coagulation, flocculation, and disinfection.

There are reporting requirements for any owner or operator of any detention facility constructed after August 5, 2015 that seeks protection under the new statute. A data sheet and online map-based compliance portal website has been developed that will allow owners and operators in Boulder County to upload the required notification information. The notification requirement applies only to facilities constructed after August 5, 2015. Facilities in existence before August 5, 2015, are defined in the statute as materially noninjurious to water rights and do not require notification. A guidance document from the State Engineer that further clarifies the requirements of Senate Bill 15-212 can be found online (*http://water.state.co.us/DWRIPub/Documents/DWR%20Storm%20Water%20Statement.pdf*) or via an internet search for "Senate Bill 15-212 state engineer guidance."

The compliance portal can be found online (*https://maperture.digitaldataservices.com/gvh/?viewer=cswdif*). A document containing frequently asked questions, links to a video tutorial, and the link to the compliance portal can be found online (*http://www.crgov.com/DocumentCenter/View/12225*) or via an internet search for "Colorado water rights compliance portal." The owner or operator must report new detention via the portal, and the county must approve the portal entry once it is complete. The owner or operator shall inform the county once the portal documentation is ready for approval.

1204 PERMANENT WATER QUALITY

This section presents circumstances under which permanent water quality facilities are required with development; the options available to provide permanent water quality treatment; and maintenance requirements associated with permanent water quality facilities. Permanent water quality can be provided with a volume-based approach by capturing and slowly releasing the Water Quality Capture Volume (WQCV). Other mechanisms used to provide water quality treatment do not utilize the WQCV and instead use filtration, infiltration, sorption, or biological processes to reduce pollutants.

1204.1 Permanent Water Quality and Development

Permanent water quality treatment is required for all new development and redevelopment. Where detention is required, permanent water quality treatment shall be included within the detention facility. Exceptions to the permanent water quality requirement may be granted if the project has any of the following characteristics:

1. Residential development density that does not exceed one single-family dwelling per 3 acres
2. Residential projects with a total imperviousness less than 10 percent for any given acre
3. Residential development on sites smaller than 0.5 acre

4. Exclusions from post-construction stormwater management provided by the most recent MS4 permit
5. Other situations as may be determined by the County Engineer to be in the best interest of the county.

Exceptions may also be granted provided low-impact development principles are included in the design. These may include the using pervious pavers or pavement for driveways and walkways and routing roof drainage across a vegetated pervious area prior to discharging it to a roadside ditch or stream. All permanent water quality facilities in Boulder County are subject to oversight by the county.

1204.2 Permanent Water Quality Treatment for Impairments and TMDLs

Where new development or redevelopment is located within an area that drains to an impaired waterbody on the 303(d) list, or to a waterbody with an approved TMDL, the county requires that permanent water quality facilities be selected based on their effectiveness at treating the pollutants of concern, to the extent practicable. The selection process should reference data available from the International Stormwater BMP database, available online (*http://www.bmpdatabase.org/*).

1204.3 Permanent Water Quality Treatment within Detention Basins

When detention facilities are designed to provide full-spectrum detention, the WQCV can be accommodated within the volume of the pond, without the need for additional volume to treat water quality. The WQCV can be treated in Boulder County in extended detention basins, constructed wetland ponds, sand filters, and rain gardens. The sizing and design of water quality facilities within detention basins shall be in accordance with the most recent version of the USDCM.

1204.4 Additional Permanent Water Quality Treatment Options

Multiple methods to treat water quality do not rely on using a part of a large detention basin. These include volume-based treatment in basins that are only large enough to treat the WQCV and flow-based treatment facilities that utilize mechanisms other than sedimentation. Design of permanent water quality facilities outside of a full-spectrum detention facility in Boulder County shall be in accordance with the latest version of the USDCM unless otherwise noted.

1204.4.1 Volume-Based Facilities

Facilities that rely on capturing the WQCV and releasing it slowly are volume-based facilities. These include rain gardens, sand filter basins, and green roofs. They typically provide very good sediment removal and moderate to good nutrient removal. They do require space to be set aside so that storage of the WQCV can be achieved. Fact sheets in the USDCM provide additional information on each type of volume-based treatment.

1204.4.2 Flow-Based Facilities

Facilities that are designed based on an anticipated flow rate to be treated include grass swales, grass buffers, constructed wetland channels, infiltration trenches, and proprietary facilities. The USDCM provides design guidance on grass swales, grass buffers, and constructed wetland channels. Infiltration trenches and proprietary facilities are discussed below. Grass swales, grass buffers, and constructed wetland channels do not provide the degree of treatment that most of the flow-based methods provide, but they can provide a significant benefit to sites that will not accommodate a basin.

1204.4.3 Proprietary Treatment

Proprietary treatment facilities may be used to provide permanent water quality if they have been preapproved for use by Boulder County. Proprietary facilities are typically used only for very small peak flow rates, as they become cost ineffective at higher flow rates that are more suited to a water quality basin.

A proprietary treatment facility may be used in Boulder County if it has been certified by the Washington State Department of Ecology (WSDOE) Water Quality Program. WSDOE has a very thorough process by which to test and certify water treatment technologies. This process is known as the Technology Assessment Protocol–Ecology (TAPE) program. The TAPE program maintains an extensive list of stormwater treatment technologies approved through their processes. The list of products is categorized by the type of treatment provided and the level of testing that has been completed. Treatment categories include pretreatment, oil, enhanced, basic, phosphorus, and construction. The "basic" category of treatment will be used most often, as these products will meet the conditions of Boulder County's MS4 permit for total suspended solids (TSS) removal. Products must meet the conditional or general use designation, indicating they have passed field performance tests. Products only meeting the pilot use level will not be accepted.

In the absence of any national program to test proprietary products, the WSDOE TAPE program provides a consistent and independent metric by which to evaluate proprietary systems. The list of approved designs is available online (*http://www.ecy.wa.gov/programs/wq/stormwater/newtech/technologies.html*) or can be found via an internet search for "WSDOE TAPE products." Some commercial products that currently have the TAPE certification for conditional or general use for various categories of treatment include StormFilter, Vortechs, and Filterra.

The TAPE program has also approved the Media Filter Drain, which is an infiltration trench developed by the Washington State Department of Transportation (WSDOT) for use along highways. It has been very successful in removing metals such as zinc and copper from highway runoff, and is currently being used along some highways in Colorado.

The product ultimately chosen for water quality treatment should be evaluated based on the category it is certified for to ensure that it will meet specific site needs. Things to consider when choosing a proprietary product include the design flow rate to be treated, the anticipated peak flow rate through the system, and the target pollutants to be removed by the system.

1204.5 Maintenance Requirements

The performance of permanent water quality facilities is extremely sensitive to a lack of maintenance. If permanent water quality facilities are to be constructed, Boulder County requires an enforceable maintenance agreement to be in place prior to issuing any applicable local permits. The agreement must include the party responsible for maintaining the facility, inspection frequency, and proposed maintenance activities.

1205 REFERENCES

Urban Drainage and Flood Control District, 2016. *Urban Storm Drainage Criteria Manual: Volume 2 Structures, Storage, and Recreation*, prepared by the Urban Drainage and Flood Control District, Denver, CO.

Urban Drainage and Flood Control District, 2016. *Urban Storm Drainage Criteria Manual: Volume 3 Stormwater Quality*, prepared by the Urban Drainage and Flood Control District, Denver, CO.