

**POST-CONSTRUCTION STORMWATER RUNOFF  
ORDINANCE**

**COMMONWEALTH OF KENTUCKY  
COUNTY OF BULLITT  
ORDINANCE NO. 13-11**

**An Ordinance Relating to the Post-Development  
Maintenance and Reduction of Erosion,  
Pollution, Siltation and Sedimentation, and  
Local Flooding in Bullitt County**

**BE IT ORDAINED** by the Fiscal Court of County of Bullitt, Commonwealth of Kentucky as follows:

**SECTION 1- AUTHORITY**

This Ordinance is adopted pursuant to the powers granted and limitations imposed by Kentucky laws, including the statutory authority granted to Kentucky counties in Kentucky Revised Statutes Chapter 67.

This Ordinance is adopted pursuant to requirements of the National Pollutant Discharge Elimination System and the Kentucky Pollutant Discharge Elimination System Stormwater Phase II General Permit.

**SECTION 2- PURPOSE AND SCOPE**

The requirements and procedures set forth in this Ordinance are intended to protect the general health, safety, and welfare of the citizens of Bullitt County, and more specifically:

- A. To protect and enhance the Municipal Separate Storm Sewer System of Bullitt County;
- B. To maintain after development, as nearly as possible, the pre-development runoff characteristics, and to reduce stream channel erosion, pollution, siltation and sedimentation, and local flooding;
- C. To comply with all applicable provisions of the National Pollutant Discharge Elimination System and the Kentucky Pollutant Discharge Elimination System Stormwater General Permit for Phase II communities; and
- D. To establish legal authority and procedures for the implementation and enforcement of the Post-Development Maintenance and Erosion Reduction measures necessary to ensure compliance with this Ordinance.

### SECTION 3- DEFINITIONS

For the purposes of this Ordinance, the following terms, phrases, words, and their derivatives shall have the meaning stated below:

- A. *Approving Agency* is the Bullitt County Department of Code Enforcement.
- B. *Best Management Practices ("BMPs")* are techniques or series of techniques which are proven to be effective in controlling runoff, erosion and sedimentation, and in mitigating flooding.
- C. *Blue Line Stream* is a natural surface drainage structure shown on United States Geological Survey topographic maps as a solid blue line. Also, it is classified by the Kentucky Division of Water as a natural drainage structure having a continuous flow during normal weather conditions.
- D. *Channel* is a natural stream that conveys water or a Ditch excavated for the natural flow of water.
- E. *Common Plan of Development or Sale* means a contiguous area where multiple separate and distinct construction activities are planned to occur at different times on different schedules under one plan.
- F. *Detention Basin* is a temporary or permanent, natural or manmade structure that provides for the temporary storage of stormwater runoff, designed to prevent the permanent pooling of water.
- G. *Developer* is any person, firm, corporation, sole proprietorship, partnership, state agency, or political subdivision thereof engaged in a Land Disturbance Activity.
- H. *Ditch* is an excavation, either dug man-made or natural, for the purpose of drainage or irrigation and having intermittent flow.
- I. *Drainage Area* means an area enclosed by a topographic feature that contributes runoff to a single point that is measurable in a horizontal plane.
- J. *Erosion* means the wearing away of ground surface as a result of the movement of wind, water, ice, and/or Land Disturbance Activity.
- K. *Extended Detention* means a stormwater design feature that provides gradual release of a volume of water in order to increase settling of pollutants and to protect downstream channels from frequent storm events.
- L. *Federal Clean Water Act* means the Federal Water Pollution Control Act (33 U.S.C. § 1251 et seq.).
- M. *Fifty-year Storm* means a storm that is capable of producing rainfall expected to be equaled or exceeded on the average of once in fifty (50) years. It may also be expressed as a storm having the probability of a two percent (2%) chance of being equaled or exceeded in any given year.
- N. *Flow Attenuation* means prolonging the flow time of runoff to reduce the peak discharge.

O. *Green Infrastructure BMPs* are types of structural BMPs that enhance the potential for infiltration and evapotranspiration. Green infrastructure BMPs are intended to treat, filter, flocculate, infiltrate, screen, evapotranspire, harvest and reuse stormwater runoff, or otherwise manage the stormwater runoff quality. Green infrastructure BMPs can be implemented to meet the water quality treatment standard, and typically include, but are not limited to, the following:

- Grass swales;
- Filter strips;
- Infiltration basins;
- Dry, wet, and extended-wet detention ponds;
- Stormwater wetlands;
- Bioretention areas;
- Natural infiltration areas;
- Sand filters;
- Pervious pavements; and
- Rain gardens.

P. *High Quality Waters* are surface waters categorized as high quality pursuant to 401 KAR 10:030, Section 1.

Q. *Impervious Cover* means any surface that cannot effectively absorb or allow water to infiltrate. This may include roads, streets, parking lots, rooftops and sidewalks.

R. *Infiltration* means the passage or movement of water into the soil surface.

S. *Land Disturbance Activity* is any construction-related land change that may result in soil erosion from wind, water and/or ice, and the movement of sediments into or upon waters, lands, or rights of way within Bullitt County, including, but not limited to, construction, demolition, clearing and grubbing, grading, excavating, transporting, and filling of land. Land Disturbance Activity does not include the following:

- Minor land disturbance activities, including, but not limited to, underground utility repairs, replacement of existing utilities, home gardens and landscaping, minor repairs, and maintenance work;
- Installation of fence, sign, telephone, and electric poles and other kinds of posts or poles;
- Cemetery graves;
- "Agricultural Use" as defined under KRS 100.111;
- Resource Extraction activity pursuant to the Kentucky Pollutant Discharge Elimination System General Permit or a facility specific individual KPDES Permit;

- Site investigations, such as geotechnical explorations, clearing for surveying work, monitoring wells, and archaeological explorations, that are undertaken prior to submittal of an application for preliminary subdivision platting; and
  - Emergency work to protect life, limb, or property and emergency repairs. If the Land Disturbance Activity would have required an approved EPSC Permit except for the emergency, then the land area disturbed shall be shaped and stabilized in accordance with the requirements of applicable Ordinances and regulations.
- T. *Municipal Separate Storm Sewer System ("MS4")* means a conveyance, or system of conveyances including roads with drainage systems, municipal and county maintained roadways, catch basins, curbs, gutters, ditches, man-made channels, and storm drains designed or used for collecting and/or conveying stormwater. Sanitary and combined sewers are *not* included in the definition of a Municipal Separate Storm Sewer System.
- U. *One Hundred-year (100) Storm* means a storm that is capable of producing rainfall expected to be equaled or exceeded on the average of once in one hundred (100) years. It may also be expressed as a storm having the probability of a one percent (1%) chance of being equaled or exceeded in any given year.
- V. *Outfall* is the point of discharge to any Watercourse from a public or private storm water drainage facility.
- W. *Post-Development* means the conditions which exist following the completion of the Land Disturbance Activity in terms of topography, vegetation, land use, and runoff rate, volume or direction.
- X. *Pre-Development* means the conditions which existed prior to the initiation of the Land Disturbance Activity in terms of topography, vegetation, land use, and runoff rate, volume or direction.
- Y. *Redevelopment* means any construction, alteration, or improvement involving Land Disturbance Activity performed on sites where existing land use is commercial, industrial, institutional, or multifamily residential.
- Z. *Retention Basin* is a temporary or permanent, natural or manmade structure that provides for the storage of stormwater runoff by means of a permanent pool of water.
- AA. *Retrofitting* means construction of a structural Best Management Practice in a previously developed area, modification of an existing structural Best Management Practice, or implementation of a nonstructural Best Management Practice to improve water quality over current conditions.
- BB. *Runoff* is any water flowing over ground surface, including, but not limited to, rainfall, snowmelt or irrigation water.
- CC. *Sediment* is soils or other superficial materials transported or deposited

by surface water as a product of erosion.

- DD. *Sheet Flow* is water runoff in a thin uniform layer or rills and which is of a small enough quantity to be treated by sediment barriers.
- EE. *Site Plan* is a plan or set of plans showing the details of any Land Disturbance Activity of a site, including, but not limited to, the construction of structures, open and enclosed drainage facilities, stormwater management facilities, parking lots, driveways, curbs, pavements, sidewalks, bike paths, recreational facilities, ground covers, plantings, and landscaping.
- FF. *Six-Month Storm* means a storm that is capable of producing rainfall expected to be equaled or exceeded on the average of twice every year.
- GG. *Soil Conservation Service ("SCS")* is the federal agency now titled the "Natural Resources Conservation Service" ("NCRS") and is an agency of the United States Department of Agriculture.
- HH. *Soil Conservation Service Technical Release 55 ("TR-55")* is a document titled Urban Hydrology for Small Watersheds, which contains simplified procedures to calculate storm runoff volume, peak rates of discharge, hydrographs, and storage volumes required for stormwater control facilities.
- Stormwater Conveyance System* means all storm sewers, channels, streams, ponds, lakes, or other conveyances used for conveying concentrated stormwater runoff or for storing stormwater runoff.
- JJ. *Stormwater Design Standards* means the standards set forth in the *Kentucky Erosion Prevention and Sediment Control Field Guide* as published by the Kentucky Division of Water.
- KK. *Stormwater Management* means for:
1. Quantitative Control: A system of vegetative and structural measures that control the increased volume and rate of surface runoff caused by man-made changes to the land; and
  2. Qualitative Control: A system of vegetative, structural, and other measures that reduce or eliminate pollutants that might otherwise be carried by surface runoff.
- LL. *Stream* is a body of water running or flowing on the Earth's surface, or a channel in which such flow, which may be intermittent, occurs.
- MM. *Ten-year (10) Storm* means a storm that is capable of producing rainfall expected to be equaled or exceeded on the average of once in ten (10) years. It may also be expressed as a storm having the probability of a ten percent (10%) chance of being equaled or exceeded in any given year.
- NN. *Twenty Five-year (25) Storm* means a storm that is capable of producing rainfall expected to be equaled or exceeded on the average of

once in twenty five (25) years. It may also be expressed as a storm having the probability of a four percent (4%) chance of being equaled or exceeded in any given year.

- 00. *Two-year (2) Storm* means a storm that is capable of producing rainfall expected to be equaled or exceeded on the average of once in two (2) years. It may also be expressed as a storm having the probability of a fifty percent (50%) chance of being equaled or exceeded in any given year.
- PP. *Water Quality Treatment Standard* is the requirement intended to provide water quality treatment to the stormwater runoff volume from the 80th percentile precipitation event, equivalent to a rainfall event of 0.85 inches. The water quality treatment standard requires the stormwater runoff volume from this rainfall event to completely pass through a stormwater management measure, or green infrastructure BMP, prior to discharging from a development or re-development site.
- QQ. *Watercourse* is any natural or improved stream, river, creek, ditch, channel, canal, conduit, gutter, culvert, drain, gully, swale or wash in which waters flow either continuously or intermittently.
- RR. *Watershed* is a region draining to a specific river, river system, or body of water.
- SS. *Waterway Buffer* is a defined area adjacent to a watercourse where Land Disturbance Activities may be permitted, but construction of any new building or structure shall not be permitted.
- TT. *Wetlands* are lowland areas such as marshes that are saturated with moisture as defined in Sec. 404 of the Federal Water Pollution Control Act Amendments of 1987.

#### **SECTION 4- STORMWATER MANAGEMENT GENERAL MEASURES**

- A. **Applicability** - This Ordinance shall apply to any new construction or redevelopment Land Disturbance Activity of One (1) acre or more or any Land Disturbance Activity on any individual lot(s) or parcel(s) of less than One (1) acre when said Land Disturbance Activity is associated with a Common Plan of Development of One (1) acre or more. This Ordinance shall apply to private and public development, including roads. This Ordinance shall apply to the design of drainage facilities in both the local and through drainage systems, except where facilities have significant and immediate impact upon State or Federal property along highways. In those cases, the most restrictive of State or Federal standards shall govern. Unless otherwise excepted under this Ordinance, detention and/or retention basins shall be required for all applicable land uses within Bullitt County.

- B. Site Plan Submittal** - Any person or Developer to whom this Ordinance applies shall submit Site Plans as set forth below prepared and approved by a certified engineer to the Approving Agency. The submittal shall be accompanied by the appropriate fees for plan review, inspections, and administrative costs as established by a Fee Schedule approved by Bullitt Fiscal Court.
1. *Preliminary Site Plan Submittal* - A Preliminary Site Plan setting forth the proposed stormwater measures and facilities as required by this Ordinance shall be submitted to the Approving Agency for review and approval prior to the initiation of any Land Disturbance Activity.
  2. *Final/As-Built Site Plan Submittal* - A Final Site Plan setting forth the As-Built, field surveyed stormwater measures and facilities shall be submitted to the Approving Agency upon completion of the Land Disturbance Activity.
- C. Waterway Buffer** - A Waterway Buffer shall be applied to any area where the floodplain is not defined. Said buffer shall be measured perpendicular to the stream as shown on a United States Geological Survey topographical map according to the distances as follows:
- A minimum of Thirty (30) feet from the top of the bank on unnamed, intermittent streams;
  - A minimum of Fifty (50) feet from the top of the bank on Blue Line Streams; and
  - A minimum of One Hundred (100) feet from the top of the bank on named branches, streams or rivers.
- D. Stormwater Management Measures** - Stormwater management measures, also known as structural Best Management Practices (BMPs) or green infrastructure BMPs, shall be used to treat, filter, flocculate, infiltrate, screen, evapo-transpire, harvest and reuse stormwater runoff, or otherwise manage the stormwater runoff quality. These measures are applicable to any new development or redevelopment land disturbance activity as defined herein, but only in locations within the Municipal Separate Storm Sewer System (MS4). Said measures shall be sized for the on-site water quality treatment standard.

## SECTION 5- DESIGN CRITERIA AND METHODS

- A. Design Storms** - The selection of a Design Storm is the basis for all runoff calculations and facility design for a project site. The Stormwater Conveyance System shall be designed to adequately handle the runoff from storms having various frequencies of occurrence from different types of development in accordance with the general categories set forth below



in this Section. To ensure the adequacy of the Stormwater Conveyance System, the following minimum Design Storms shall be used, where applicable:

1. The 10-year Storm shall be used for all public storm sewer inlets and closed pipe systems. The 10-year Storm shall also be used for all channels and ditches, which should be capable of conveying the 10-year Storm flow within their banks.
2. The 100-year Storm shall be used as a check storm for sewer systems designed for a 10-year Storm to confirm containment at levels below the rim opening to prevent surcharging.
3. The 2-year Storm, 10-year Storm, 25-year Storm, and 100-year Storm shall be used to calculate Pre-Development runoff from a site for Detention, Retention, and Sediment Control Basins.
4. The 2-year Storm, 10-year Storm, 25-year Storm, and 100-year Storm shall be used to calculate Post-Development runoff from a site for Detention, Retention, and Sediment Control Basins.
5. The 100-year Storm shall be used for all Detention, Retention, or Sediment Control Basins as a check storm to ensure against flooding or surcharging.
6. The 100-year Storm shall be used in the design of flood control facilities. The post-development peak flow rates shall be less than or equal to the pre-development peak flow rates for the 2-year Storm, 10-year Storm, 25-year Storm, and 100-year Storm events.
7. The 100-year Storm shall be used in comparison with established flood elevations from property owners, observations, Kentucky Department of Transportation drainage folder data, Federal Emergency Management Agency maps, and other applicable records to minimize the impacts of flooding.
8. Additional controls or localized restrictions may be placed on specific sites, such as deemed necessary by the Approving Agency.

**B. Runoff Calculation Methods** - The peak runoff calculation procedures to be utilized depend upon the size of the proposed development or project as follows:

1. If the total tributary area to an existing or proposed stormwater facility on the project site is Fifty (50) acres or less, then the method of peak runoff calculation shall be the Rational Method as set forth in Section 5(C) below or the Soil Conservation Service hydrologic methods set forth in Section 5(D) below.
2. If the total project drainage area is greater than Fifty (50) acres,

then the Soil Conservation Service hydrologic methods set forth in Section 5(D) below must be used for calculations unless another method is approved by the Approving Agency.

- C. **Rational Method** - The Rational Method may only be used to calculate peak discharge rates for drainage areas of Fifty (50) acres or less. The Rational Method shall not be used to calculate the volume of stormwater runoff or develop runoff hydrographs. The Rational Method shall be performed as follows:

$$Q = CiA$$

where:

Q = peak runoff quantity in cubic feet per second;

C = runoff coefficient, varying with the amount of imperviousness and other characteristics of the drainage area;

I = average intensity of precipitation in inches per hour, varying with frequency of storm occurrence, duration or concentration time, and area of the tributary watershed; and

A = area in acres of the tributary watershed.

1. The runoff coefficient (C) must represent a composite of the surface condition tributary to the point under consideration. To determine the composite C-factor for the entire project site, a weighted average must be calculated based upon the percentages of the areas with different C-factors. The runoff coefficient is dependent upon the soil type and land use. The type and condition of the soil determines its ability to absorb precipitation. Reference may be made to the Louisville Metropolitan Sewer District Design Manual for a list of Rational Method runoff coefficients.
2. Rainfall intensity (i) is the average rainfall rate in inches per hour, and is selected on the basis of design rainfall duration and design frequency of occurrence. The rainfall intensity should be obtained from Rainfall Intensity-Duration-Frequency (IDF) Curves for the appropriate design storm. Since IDF Curves have not been specifically developed for Bullitt County, then the IDF Curves developed for Metro Louisville shall be used and may be referenced in the Louisville Metropolitan Sewer District Design Manual. The design duration is equal to the time of concentration (Tc) for the drainage area under consideration.
3. The time of concentration (Tc) shall be determined by calculating

the time for a particle of water to travel from the most hydrological remote point of the project area to the point of interest. The time of concentration to any point in a storm drainage system is a combination of the sheet flow (overland), the shallow concentrated flow, and the channel flow, which includes storm sewers. The Soil Conservation Service TR-55 method for calculating the time of concentration shall be used. The minimum time of concentration shall not be less than ten (10) minutes. Manning's Equation should be used to estimate any in-pipe or channel travel.

- D. Soil Conservation Service Method** - The Soil Conservation Service (SCS) Method may be used for the following: To calculate storm runoff volume; To calculate peak rate of discharge; To develop runoff hydrographs for basins and subbasins; and To calculate the required storage volume for stormwater control facilities.

The SCS Method is the preferred method for performing hydrologic analysis. The SCS Method shall utilize the formulas, constants and data as currently provided by the Soil Conservation Service. The SCS Method utilizes a 24-hour storm duration, which is considered to be acceptable for Bullitt County. When the SCS Method is used, the Type II rainfall distribution shall be used. The rainfall depths for the 24-hour storm are found in the Weather Bureau Technical Paper 40 or the Rainfall Frequency Values for Kentucky, Engineering Memorandum No. 2, June 1, 1979, and are included in Table 1 below:

**Table 1 - 24-hour Storm Rainfall Depths**

Storm Frequency	24-hour Rainfall Depth (In inches)
2-year	3.20
10-year	4.50
25-year	5.20
50-year	5.70
100-year	6.30

The Curve Number (CN) needed for SCS computations is similar to the runoff coefficient used in the Rational Method in that it is based on the surface conditions of the project site. The CN can be determined from tables in SCS TR-55 or in the Louisville Metropolitan Sewer District Design Manual. Soil Conservation Service publications may be used for detailed information.

- E. Water Quality Treatment Standard** - The on-site water quality treatment standard is intended to improve the water quality of stormwater runoff before

being discharged into the MS4. The standard is established so that stormwater management measures shall be sized to capture the stormwater runoff volume from the 80th percentile precipitation event, equivalent to a rainfall event of 0.85 inches, at a minimum.

The on-site water quality treatment standard is a volume-based standard and is appropriate for sizing green infrastructure BMPs that provide their primary treatment function by storing and treating the water quality volume (WQv). Stormwater management measures, also known as structural Best Management Practices (BMPs) or green infrastructure BMPs, are designed to treat a volume of runoff, which is detained for a certain period of time to allow for settling of solids and associated pollutants, as well as any biochemical treatment processes that may be provided for dissolved pollutants such as adsorption, precipitation, biodegradation, and plant uptake.

The WQv used for sizing green infrastructure BMPs shall be computed as follows:

$$Rv = 0.009 (I) + 0.05$$

where:

Rv = volumetric runoff coefficient; and

I = the percent imperviousness of the drainage area.

$$WQv = 3,630 \times Rv \times P \times A$$

where:

WQv = water quality volume (ft<sup>3</sup>);

Rv = volumetric runoff coefficient;

P = rainfall depth associated with the 80th percentile precipitation event (in), equivalent to a rainfall event of 0.85 inches; and

A = drainage area to BMP (acres).

Green infrastructure BMPs should be selected, sized, and designed to completely capture the WQv prior to discharging from the site. The green infrastructure BMPs shall be designed such that the drain time is long enough to treat the stormwater and release it at a rate that minimizes degradation of the water resources, but short enough to provide storage available for successive rainfall events and avoid the creation of nuisance conditions. The drain time for all green infrastructure BMPs shall be 24

hours at a minimum and 48 hours at a maximum, such that there is no standing or residual water in the BMP following the WQv rainfall event.

Green infrastructure BMPs typically include, but are not limited to, the following:

- Grass swales;
- Filter strips;
- Infiltration basins;
- Dry, wet, and extended-wet detention ponds;
- Stormwater wetlands;
- Bioretention areas;
- Natural infiltration areas;
- Sand filters;
- Pervious pavements; and
- Rain gardens.

For those areas of development and re-development that result in a new or expanded discharge from the MS4 to high-quality waters, additional provisions may be required to protect existing in-stream water uses and the level of water quality necessary to protect the existing uses.

## **SECTION 6- DESIGN OF STORM SEWERS**

- A. Purpose of Storm Sewers** - Storm Sewer systems are designed to collect and convey stormwater runoff from street inlets, runoff control structures, and other locations where the accumulation of stormwater is undesirable. The objective is to remove runoff from an area fast enough to avoid unacceptable amounts of ponding damage and inconvenience while preventing adverse off-site impacts.
- B. Peak Discharge Calculations** - The method of runoff calculation for determining peak discharge (Q) for a drainage area shall be the methods described in Section 5 herein.
- C. Design Methodology/Design Storm** - Public storm sewer pipes shall be designed to carry peak flows as determined by the methods previously described herein. All storm sewers shall be designed for the 10-year Storm event. The 100-year Storm shall be used as a check storm to confirm stormwater containment at levels below the rim opening to prevent surcharging. Manning's Equation shall be used to calculate pipe

flow and velocity. A listing of the Manning's Equation roughness coefficients for various pipe materials may be found in the Kentucky Department of Highways Design Manual or the Louisville Metropolitan Sewer District Design Manual.

- D. Minimum Pipe Sizing** - The minimum diameter for public storm sewer pipes shall be fifteen (15) inches for inlet headwalls and twelve (12) inches for systems with a catch basin at the initial point. Driveway entrance pipes shall be a minimum of twelve (12) inches. Smaller pipe sizes may be approved by the Approving Agency for detention basin outlets on a case-by-case basis. Such pipes shall not be smaller than six (6) inches in order to prevent clogging.
- E. Pipe Velocities** - Public storm sewer pipes shall be designed with a minimum velocity of three (3) feet per second at full flow, or a minimum velocity of two (2) feet per second at design flow, whichever requires the greater slope. The maximum velocity for public storm sewer pipes shall not be greater than twenty five (25) feet per second. Excessive velocities may result in hydraulic grade line problems and may increase the potential for erosion where the system outfalls. Velocities shall be designed to be non-erosive at the re-entry into the natural stream or downstream channel. An outlet velocity of six (6) feet per second or less is generally considered to be non-erosive. The downstream receiving channel or stream may still need stabilization if site soil conditions require in order to prevent scour or erosion. In cases where the outlet velocity is greater than six (6) feet per second, the downstream receiving channel or stream must receive adequate protection against erosion through the use of erosion prevention practices or energy dissipation devices. Velocities for all pipes and structures shall be included in the drainage calculations for both public storm sewer systems and private storm sewer systems.
- F. Pipe Grades** - Storm sewers shall have a minimum slope of one half percent (0.5%). A slope of less than one half percent (0.5%) may only be permitted upon prior review and approval by the Approving Agency. Sewers on twenty percent (20%) slopes or greater shall be anchored securely with concrete anchors or equal-spaced as follows:
1. Not over thirty two (32) feet center to center on grades twenty percent (20%) and up to thirty five percent (35%);
  2. Not over twenty four (24) feet center to center on grades thirty five percent (35%) and up to fifty percent (50%); and
  3. Not over sixteen (16) feet center to center on grades fifty percent (50%) and over.

- G. Manhole Spacing and Sizing** - Storm sewer manholes should have a maximum spacing and sizing as follows:
1. The minimum diameter of manholes shall be forty eight inches (48"), while larger diameters are preferable for larger diameter sewers;
  2. For storm sewers less than or equal to forty eight inches (48") in diameter, maximum spacing of manholes shall be four hundred (400) feet; and
  3. For storm sewers greater than forty eight inches (48") in diameter, maximum spacing of manholes shall be six hundred (600) feet.

**H. Hydraulic Grade Lines** - To ensure against surface ponding or street flooding, the Hydraulic Grade Line ("HGL") in any public inlet, catch basin or manhole must be below the rim elevation of the structure for the 100-year check storm. The headwater and tailwater elevations for the 10-year Storm and 100-year check storm and outlet velocities shall be shown on all profiles of the public stormwater system on the plans or on storm sewer profiles included with drainage calculations.

To ensure proper conveyance of stormwater runoff to a control facility on private property, the submittal must include information verifying that the headwater elevation for the 100-year Storm in any inlet or manhole is not higher than the inlet grate. The headwater and tailwater elevations for the 10-year Storm and 100-year check storm shall be shown on all profiles of the private stormwater system on the plans or on storm sewer profiles included with the drainage calculations, and outlet velocities shall be included in the drainage calculations.

The maximum allowable headwater shall not exceed 1.2 times the structure rise unless specifically approved by the Approving Agency on a case-by-case basis.

**I. Inlet Capacity** - The capacity of on-street inlets on storm sewer systems shall not be less than the quantity of flow tributary to the inlet for the design storm. Inlets at low points or sags shall have extra capacity as a safeguard for street flooding from flows overtopping the street curb. Curb openings or combination inlets shall be used for overflows in the event that the grate is clogged. Special inlets may be required for streets with steep gradients to provide the extra capacity such situations require. The 10-year Storm shall be used to design stormwater inlets. Inlet capacity shall be checked for the 100-year design storm at site boundary points to ensure that the intent of the overall Stormwater Management Plan is being met. Design methodology utilized shall be similar to those presented in

manuals produced by the Kentucky Transportation Cabinet.

- J. Storm Sewer Outfalls** - When a storm sewer system outfalls into a flood plain of any major watercourse, the outfall should not be subject to frequent floods or backwaters to the maximum extent practicable. Standard headwalls and/or headwalls with wingwalls shall be constructed for all outfalls and include rock channel protection and aprons as erosion control as required. Suitable baffles or other energy dissipaters shall be provided if necessary to prevent erosion. The invert of the first storm sewer appurtenance upstream of the outfall structure should be above the elevation of the calculated 100-year flood plain at the receiving body if practicable.
- K. Culvert and Bridge Design Criteria** - Culverts and Bridges, including proper backfill, shall be designed in accordance with the methods given in the Drainage Guidance Manual published by the Kentucky Transportation Cabinet, Department of Highways, or other applicable Kentucky Transportation Cabinet manual as approved by the Approving Agency. The maximum allowable headwater should no exceed 1.2 times the structure rise unless specifically approved by the Approving Agency on a case-by-case basis.

## **SECTION 7- DESIGN OF STORMWATER DRAINAGE CHANNELS AND DITCHES**

- A. Purpose of Drainage Channels and Ditches** - This Section sets forth the technical criteria necessary to design stormwater Channels and Ditches using conventional design procedures. These procedures shall be applied to roadside and rear yard Ditches and highly urbanized Channels. Open channels provide many advantages in the management and control of stormwater runoff. Such channels provide for natural infiltration of stormwater into the ground water supply and extend the Time of Concentration ( $T_c$ ), helping to maintain the runoff rate nearer to that which existed prior to development. The objective of open channel flow design is: To determine a channel slope and size that will have sufficient capacity to prevent undue flooding damage during the anticipated peak runoff period; and To determine the degree of protection based on stream velocity to prevent erosion in the drainage channel.
- B. Peak Flow Capacity** - Each portion of the stormwater system of drainage channels and ditches shall be capable of handling the peak flows as determined by the proper method previously described in Section 5 above. Manning's Equation is recommended to calculate the flow rates. Typical roughness coefficients may be found in the Louisville Metropolitan Sewer District Design Manual.



- C. **Design Methodology/Design Storm** - For all developments, Channels and Ditches shall be capable of conveying the 10-year Storm flow within their banks. Through drainage structures or main flood control channels, such as detention basins, shall be designed to collect and transport the Post-development rate of runoff for the 100-year Storm. In all cases, the 100-year discharge elevation must be checked to ensure that adjacent structures do not suffer flood damage.
- D. **Channel Linings** - When open drainage channels require various lining types to attain ultimate design capacity, the earth sections of the drainage channel and its structures shall be designed and constructed to the ultimate design required. Preference shall be given to vegetated and natural channel design. Hardened channel linings such as riprap and concrete shall be specified only in cases where vegetated linings or reinforced vegetative linings are not practicable.
- E. **Channel Design Slopes and Velocities** -
1. Erosion shall be controlled by limiting velocities, changing the channel lining, or reshaping the channel to spread the flow of runoff. Methods of controlling erosion in open channels include the following: Grass covers or sod; Aggregate channel lining; Geotextile turf reinforcement mats ("TRMs") and rolled erosion control products ("RECPs"); Reinforced concrete or pre-cast paving; and Bioengineering practices. Design velocities should generally be greater than 1.5 feet per second to avoid excessive deposition of sediments. When flat slopes are unavoidable, concrete paving shall be used to accelerate runoff.
  2. Channel linings shall be designed to control erosive flows resulting from the 10-year Storm. The design of channel linings shall meet both the velocity and shear stress requirements.
  3. Consideration shall be given for the construction of other methods of lining for erosion control, including check dams, drop structures, gabions, or other methods subject to approval of the Approving Agency.
  4. For vegetated or natural channels, two percent (2%) slopes are preferred, but the minimum slope shall be one percent (1%). For hardened concrete channels, the minimum slope shall be one half percent (0.5%) unless otherwise specifically approved by the Approving Agency on a case-by-case basis.

**SECTION 8- DESIGN OF STORMWATER RUNOFF CONTROL FACILITIES**

- A. Purpose of Runoff Control Facilities** - Stormwater runoff control facilities are required for all land uses, including, but not limited to, single and multi-family residential, mobile home parks, urban and rural commercial, shopping centers, professional office, planned unit development, mixed land use, research parks, institutional, industrial, and public uses. Such facilities are also required for other activities that include impervious surfaces that generate increased runoff requiring storage in accord with this Ordinance. These facilities may be designed for each individual site, but the use of regional facilities is encouraged.

Runoff control facilities shall be designed so that no standing water will remain in Detention Basins during dry weather or that standing water in Retention Basins shall not be allowed to stagnate and present health hazards. The use of other methods of controlling peak discharge rates, such as bio-retention swales and structures and/or created wetlands, may be used if approved by the Approving Agency. The amount of water to be detained shall be determined by the methods described herein using the design criteria as set forth in Section 5 above.

Based upon location in the contributing watershed, alternative stormwater management practices may be required by the Approving Agency if it is determined or can be demonstrated that detention of runoff will be detrimental to the overall hydrologic response of the watershed.

- B. Design Methodology/Design Storm** - As set forth in Section 5(B) above, runoff calculations shall be required for both the Pre-development and Post-development conditions of the site. The following Design Storms shall be used when calculating runoff:
1. The Pre-development site runoff rate shall be calculated for the 2-year, 10-year, 25-year, and 100-year storm frequency. The entire acreage contributing to the runoff shall be included in the calculations; and
  2. The Post-development site runoff rate shall be calculated for the 2-year, 10-year, 25-year, and 100-year storm frequency. The entire acreage contributing to the runoff shall be included in the calculations.
- C. Basin Storage Volume** - The Basin Storage Volume shall be sized to maintain the Post-development discharge rates at the same level as the Pre-development discharge rates for the full range of prescribed design storm events. If warranted by the conditions present, such as inadequate capacity of existing culverts and drainage systems immediately downstream of the site proposed for development, additional stormwater

management measures and/or off-site drainage improvements may be required at the discretion of the Approving Agency. If the basin is to be located directly on a portion of the through drainage system, volume calculations must also consider the total system flow reaching the basin from the contributing watershed, both on-site and off-site.

**D. Basin Design Standards** - The following conditions are required for stormwater runoff control facilities:

1. The peak discharge from the Detention/Retention Basin shall be controlled by a release outlet structure and shall not be greater than a Pre-development peak runoff rate based on a 2-year, 10-year, 25-year, and 100-year storm frequency at the discharge point;
2. The outlet structure shall be sized to accommodate flow equal to the 100-year storm Post-development discharge. The routing of the outlet structure shall be shown based on a 100-year storm frequency;
3. The emergency spillway shall be designed to prevent flowing during a 100-year storm event, unless the principle spillway has become blocked. Erosion protection and any necessary energy dissipation shall be provided for spillways and any receiving watercourse. Spillways shall not be placed over a dam. Vegetated emergency spillways shall be embedded in in-situ soils.
4. The dam elevation shall not be less than one (1) foot above the 100-year storm storage and overflow elevation;
5. Detention Basins shall be fully discharged within thirty-six (36) hours after the storm event;
6. The Detention Basin shall be the first item of construction and shall be designed to function as a sediment basin throughout construction. The basin design must be checked for capacity due to additional runoff generated by disturbed site conditions; and
7. The Detention Basin shall be easily accessible for maintenance. All basins shall be designed and constructed with side slopes no greater than 3:1 (three feet horizontal per on foot vertical). Fencing may be required by the Approving Agency when warranted by the location of the detention basin.

**E. Storm Hydrographs** - Hydrographs for the 2-year, 10-year, 25-year, and 100-year storm events shall be routed through the proposed stormwater management facilities using the Modified Puls Method or another method approved by the Approving Agency.

**F. Maintenance Responsibilities** - The owner of a stormwater runoff control

facility and/or the developer of each subdivision shall be responsible for properly maintaining each stormwater runoff control facility in order for such facility to function according to its design and purpose. Maintenance provisions for each facility shall be noted on the submittal plans, including suitable access as approved by the Approving Agency. Operation and Maintenance of stormwater control facilities is set forth in more detail in Section 10 of this Ordinance.

## **SECTION 9- DESIGN OF STORMWATER MANAGEMENT MEASURES OR GREEN INFRASTRUCTURE BMPs**

- A. Purpose of Stormwater Management Measures** - Stormwater management measures, also known as structural BMPs or green infrastructure BMPs, shall be used to treat, filter, flocculate, infiltrate, screen, evapo-transpire, harvest and reuse stormwater runoff, or otherwise manage the stormwater runoff quality. These measures are applicable to any new development or redevelopment land disturbance activity as defined herein, but only in locations within the Municipal Separate Storm Sewer System (MS4). Said measures shall be sized for the on-site water quality treatment standard.
- B. Design Methodology/Design Storm** - As set forth in Section 5(E) above, calculations shall be required to indicate that green infrastructure BMPs have been sized to completely capture the WQv, equivalent to the runoff volume generated from a rainfall event of 0.85 inches.

For additional information on the various types of green infrastructure BMPs available to meet the water quality treatment standard requirement, reference can be made to the Green Infrastructure Design Manual developed by the Louisville Metropolitan Sewer District.

## **SECTION 10- PERFORMANCE SECURITY**

Any property owner or developer engaging in Land Disturbance Activity subject to this Ordinance shall be required to submit a Performance Security prior to the issuance of any permit prescribed herein to insure the proper installation of any stormwater control facilities pursuant to an approved stormwater management plan. The Performance Security shall be in an amount equal to the total estimated construction cost of the stormwater control facilities approved under the plan plus 10% of such cost. The Performance Security shall contain forfeiture provisions for failure to satisfactorily complete the facilities as required by the plan.

The Performance Security shall be released in full only upon submission of "As-Built Plans" and a written certification by a registered professional engineer that all facilities have been installed and are operating in accordance with the approved

plan and any other applicable provisions of this Ordinance. The Approving Agency shall make a final inspection of the stormwater facilities to ensure that they are in compliance with the approved plan prior to release of the Performance Security. Provision for a partial, pro-rata release of the Performance Security based upon completion of various development stages may be approved at the discretion of the Approving Agency.

#### **SECTION 11- OWNERSHIP AND MAINTENANCE RESPONSIBILITIES OF STORMWATER FACILITIES**

- A. Operation and Maintenance** - The owner or developer responsible for maintenance shall perform or cause to be performed preventative maintenance of all completed stormwater management facilities to ensure proper functioning.
- B. Maintenance Agreements** - All stormwater facilities shall be covered by an enforceable Operation and Maintenance Agreement to ensure the system functions as designed. This Agreement shall include any and all maintenance easements required to access and inspect the stormwater facilities and to allow for routine maintenance as necessary to ensure proper functioning of the facilities. In addition, a legally binding and enforceable covenant specifying the party(ies) responsible for the proper maintenance of all stormwater facilities subject to the Agreement shall be secured prior to issuance of any permits for Land Disturbance Activities.
- C. Maintenance Easement** - Prior to the issuance of any permit pursuant to a plan that includes any stormwater facilities, the applicant/owner shall execute a Maintenance Easement Agreement that shall be binding on all subsequent owners of land served by the stormwater facilities. The Agreement shall provide for access to the facilities at any time for inspection by the Approving Agency, and for regular or special assessments of property owners to ensure the facilities are maintained in proper working conditions to meet design standards and any other provisions of this Ordinance. The Easement Agreement shall be filed with the Approving Agency and recorded in the office of the Bullitt County Clerk.
- D. Maintenance and Repair Plan** - Plan submittals for all stormwater management facilities shall include detailed maintenance and repair procedures to ensure their continual proper functioning. These plans and procedures shall identify all parts and components of the facilities that require maintenance, as well as any equipment, training and skills necessary for said maintenance. Provisions for the periodic review and evaluation of the effectiveness of the maintenance procedures and the need for any revisions or additional procedures shall be included in the plan.

**E. Maintenance Covenants** - Maintenance of all stormwater management facilities shall be ensured through the creation of a formal Maintenance Covenant that must be approved by the Approving Agency and recorded in the office of the Bullitt County Clerk prior to final plan approval. The Covenant shall include a schedule for proper and periodic maintenance to ensure proper functioning of all stormwater facilities subject thereto. The Maintenance Covenant shall also provide for the following:

1. An annual self-inspection to review and document maintenance and repair needs and to ensure compliance with the requirements of this Ordinance;
2. Periodic self-inspections to ensure proper performance between scheduled maintenance;
3. Any maintenance schedule shall include provisions for the removal of silt, litter and other debris from all catch basins, inlets and drainage pipes, for grass cutting and vegetation removal, and for necessary replacement of any landscape vegetation;
4. All maintenance needs shall be documented and addressed in a timely manner to ensure proper functioning of the facilities;
5. Self-inspection reports shall be maintained and made available to the Approving Agency upon request; and
6. The Approving Agency may require additional inspections and maintenance as deemed necessary to ensure proper functioning of the stormwater facilities and compliance with this Ordinance and the approved plan.

**F. Inspection of Stormwater Facilities** - The Approving Agency is hereby granted the authority to conduct inspections of stormwater facilities approved pursuant to this Ordinance on a routine basis, random basis, or based upon a complaint of other notice of violation. The Approving Agency may inspect drainage basins or areas identified as higher than typical sources of sediment or other contaminants or pollutants, businesses or industries of a type associated with higher than usual discharges of contaminants or pollutants or with discharges of a type which are more likely to cause violations of state or federal water or sediment quality standards or the NPDES Stormwater Permit, and it may conduct joint inspections with other agencies inspecting under environmental or safety laws. Said inspections may include, but are not limited to, the following: review of maintenance and repair records; sampling discharges, surface water, groundwater, and material or water in drainage control facilities; and evaluation of the condition of drainage control facilities and other stormwater treatment practices.

- G. Right of Entry for Inspections** - Upon installation of a new stormwater control facility on private property, or a new connection between private property and a public drainage control system, sanitary sewer, or combined sewer, the property owner shall grant the Approving Agency the right to enter the property at all reasonable times and in a reasonable manner for purpose of conducting required and authorized inspections. This right includes the right to enter when a reasonable basis has been established to believe that a violation of this Ordinance is occurring or has occurred.
- H. Failure to Maintain** - If a responsible party fails or refuses to meet the requirements of the approved plan and maintenance covenant, then the Approving Agency, or its designated agent, after reasonable notice as set forth herein, may enter upon the property and correct any violation by performing all necessary work to place the stormwater facility in proper working condition. In the event the stormwater facility is in a state that poses an immediate danger to public safety or health in the determination of the Approving Agency, then the Approving Agency, or its designated agent, may enter upon the property immediately without notice to correct and perform all work necessary to remediate the immediate danger.

Absent an immediate danger, the Approving Agency shall provide the responsible party with written notice of any failure to maintain. The responsible party shall have a minimum of fifteen (15) days to respond with a plan to affect maintenance and repair to address the failure in a manner and time that is acceptable to the Approving Agency. If the responsible party fails to respond to the written notice or fails to respond with an approved plan, then the Approving Agency, or its designate agent, may enter upon the property and correct any violation by performing any work necessary as set forth above. The Approving Agency shall have the authority to assess the owner(s) of the property for the full cost, including administrative costs, for any and all work performed and may place a lien on the property to be recorded in the office of the Bullitt County Clerk. Said lien may be enforced by the Approving Agency through appropriate legal action, including foreclosure and judicial sale of the property.

**As-Built Plans** - All applicants shall submit a set of "As-Built" Plans for any stormwater facilities to the Approving Agency in a form acceptable to the Approving Agency after final construction is complete. The Plans shall demonstrate the final design specifications for all stormwater management facilities and must be certified by a professional engineer. A final inspection by the Approving Agency shall be required before the full release of any posted performance security.

## **SECTION 12- PENALTIES**

**A. Criminal Penalties:**

Any person violating any of the provisions of this Ordinance shall upon conviction thereof be guilty of a Class B Misdemeanor and shall be fined in an amount not to exceed Two Hundred Fifty dollars (\$250.00), or shall be imprisoned for a term not to exceed Ninety (90) days, or both such fine and imprisonment. Each day a particular violation occurs shall constitute a separate offense.

**B. Civil Penalties:**

In addition to the criminal penalties set forth above, any person convicted of violating any of the provisions of this Ordinance shall be liable to Bullitt County Fiscal Court for a civil penalty in an amount not to exceed Four Thousand dollars (\$4,000.00) for each offense. Each day a particular violation occurs shall constitute a separate offense. Said civil penalty may be assessed and imposed by Bullitt District Court, pursuant to KRS § 24A.120.

**SECTION 13- INTERPRETATION AND APPLICATION**

This Ordinance shall be interpreted, construed and applied to insure consistency with the requirements of Kentucky law, the Federal Clean Water Act and all amendments thereto, and any Kentucky Pollutant Discharge Elimination System and/or National Pollutant Discharge Elimination System permits. Compliance with this Ordinance does not relieve a person of responsibility from compliance with the Kentucky Division of Water Notice of Intent process.

**SECTION 14- INCONSISTENT ORDINANCES REPEALED**

All Ordinances which are hereafter found or determined to be in conflict herewith are, to the extent of such conflict, hereby repealed.

**SECTION 15- SEVERABILITY**

Should any part or section of this Ordinance be declared unconstitutional or otherwise invalid by a court of competent jurisdiction, all other parts or sections of this Ordinance which are not found to be unconstitutional or otherwise invalid shall survive and remain in full force and effect.



**SECTION 16- EFFECTIVE DATE**


This Ordinance shall take effect and be in full force upon passage and publication pursuant to law.

Given First Reading at a Regular Meeting of the Fiscal Court of Bullitt County, Kentucky on the 7<sup>th</sup> day of May, 2013.


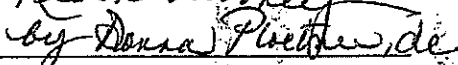
Given Second Reading, Voted upon and Passeded at a Regular Meeting of the Fiscal Court of Bullitt County, Kentucky on the 21<sup>st</sup> day of May, 2013.

BULLITT COUNTY FISCAL COURT

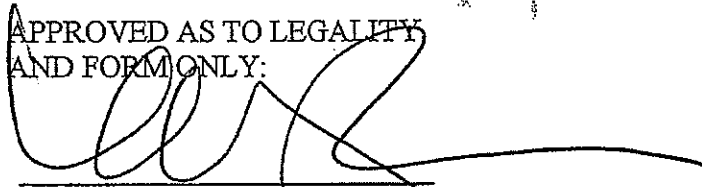
05-21-13  
DATE

  
MELANIE J. ROBERTS  
COUNTY JUDGE/EXECUTIVE

ATTESTED TO:

  
  
KEVIN MOONEY  
BULLITT COUNTY CLERK

APPROVED AS TO LEGALITY  
AND FORM ONLY:

  
MONICA MEREDITH ROBINSON  
BULLITT COUNTY ATTORNEY

Ordinance # 13-11

Post-Construction  
Stormwater Runoff

Adopted 05-21-13

Recorded in Fiscal Court Order

Book 039 Page 697-702

Recorded in County Ordinance

Book 4 Page 284-295