

**CITY OF CONNERSVILLE
DEPARTMENT OF
STORM WATER MANAGEMENT**

**DRAINAGE STANDARDS
MANUAL**

Prepared for:

**City of Connersville
Department of Storm Water Management
Connersville, IN 47331**

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Revised September, 2006

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INTRODUCTION

INTRODUCTION

This manual contains minimum drainage standards and procedures to be followed for submittal to the Board of Directors (Board) of the Connersville Department of Storm Water Management (CDSWM) for the purpose of obtaining storm water drainage approval for land disturbing projects within the Connersville Storm Water Management District (District). Drainage approval for all land disturbing projects, including activities in the public right-of-way, must be received from the Board prior to construction and/or land disturbing activity. The standards and procedures in this manual shall rule over any previous drainage standards pertaining to the District.

It shall be the policy of the Board that developers of new development and redevelopment within the District submit for approval a drainage plan that prevents increased storm water run-off resulting from land alteration. The drainage plan shall provide for the proper drainage of storm water run-off from the developed site and the drainage basin in which it is contained. The drainage system shall be constructed and installed in accordance with the plans and specifications as approved by the Board/City Engineer. A Storm Water Pollution Prevention and Erosion and Sediment Control Plan shall be submitted and shall be in accordance with the Indiana Administrative Code 327 IAC 15-5 and the standards in this manual. Permits as required by Indiana Department of Environmental Management (IDEM, including Rule 5), Indiana Department of Natural Resources (IDNR), Army Corps of Engineers (COE), Indiana Department of Transportation (InDOT) and any other local, state, and federal regulatory agencies are the responsibility of the property owner/developer.

An *Application for Drainage Approval*, two complete sets of professionally certified plans, specifications, supporting calculations and *Certification of Sufficiency of Plan* shall be submitted to the CDSWM along with the initial drainage review fee of \$100.00. The initial review fee includes one hour of plan review. Projects requiring more than one hour of plan review due to their complexity or deficiency in design or submittal shall be assessed plan review fees at the rate of \$125.00 per hour. Plan review fees shall be made payable to the Connersville Department of Storm Water Management. A submittal will not be considered complete until all items on the *Drainage Plan Submittal Checklist* included with this manual (see Figure 1) have been submitted. It is recommended that new development projects include with their drainage plan submittal the *Storm Water User Fee Credit Application Package* found in the CDSWM's *Policies and Procedures Manual*, if applicable. A response letter with any comments generated as a result of the drainage review will be issued to the professional engineer/land surveyor responsible for completing the design. Upon notification of final drainage approval, three (3) sets of professionally certified plans and specifications shall be submitted to the CDSWM.

A single- or double- family dwelling constructed or placed on an individual lot and not requiring professionally prepared and certified storm water plans shall require drainage approval from the Board. Submittal requirements shall be as defined in the *Drainage Plan Submittal Checklist (Single- and Double-Family Dwellings)* in Figure 2. A complete application package shall be submitted to the CDSWM along with the drainage review fee of \$50.00.

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Special circumstances that are not covered by these Drainage Standards shall be regulated and reviewed on a case-by-case basis.

For construction projects required to submit Storm Water Pollution Prevention and Erosion and Sediment Control Plans shall submit three complete copies to the Fayette County Area Planning commission (one copy will be forwarded to the CDSWM and one copy will be forwarded to the Fayette County Soil and Water Conservation District for review) along with the initial drainage review fee of \$100.00. The initial review fee includes one hour of plan review. Projects requiring more than one hour of plan review due to their complexity or deficiency in design or submittal shall be assessed plan review fees at the rate of \$125.00 per hour. Plan review fees shall be made payable to the Connersville Department of Storm Water Management. Land disturbing activities shall not begin until the project site owner has received a *Technical Review and Comment Form* stating “The Plan is Adequate” and has submitted all appropriate documentation to the IDEM, the County Soil and Water Conservation District (SWCD) and the CDSWM. All submittal requirements and standards are included in this manual.

For construction projects required to submit Storm Water Pollution Prevention Plans (SWPPPs) for Post-Construction Storm Water Quality shall submit plans to the CDSWM along with an initial review fee of \$100.00. The initial review fee includes one hour of plan review. Projects requiring more than one hour of plan review due to their complexity or deficiency in design or submittal shall be assessed plan review fees at the rate of \$125.00 per hour. Plan review fees shall be made payable to the Connersville Department of Storm Water Management. A review letter with any comments generated as a result of the review will be issued to the professional engineer/land surveyor responsible for completing the design of Post-Construction controls.

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A. Storm Sewer Design

1. In designing storm sewer systems, the following minimum standards shall apply:
 - a. The Rational Method is acceptable for calculating peak flows to storm sewers (for watersheds less than 200 acres in size). Manning's equation is acceptable for sizing storm pipes for gravity flow, non-submerged outfall conditions. Figure 3 contains run-off coefficients for use in the Rational Formula. Due to Connersville's close proximity, rainfall intensities specified by the City of Indianapolis shall be employed for drainage analysis. The Intensity-Duration-Frequency (IDF) table in Figure 4 from the City of Indianapolis Stormwater Design and Construction Specifications Manual shall be used for rainfall intensity values.
 - b. The storm sewer system shall pass the 10-year storm event under gravity flow conditions (no surcharging). A 25-year storm event shall stay within the system and not cause aboveground flooding. More stringent storm event criteria may be required at the discretion of the Board/City Engineer. Design calculations for sizing of the storm pipe shall be submitted on the Storm Pipe Flow Calculation Form provided in Figure 5 or a computer program output with similar information may be submitted. Headloss computations may be required for storm sewer systems with free outfalls at the discretion of the Board/City Engineer if pipes are at less than 0.5% slope.
 - c. Storm sewer systems with the potential of operating under submerged outfall conditions shall include hydraulic grade calculations using a reasonable tail water elevation. Headloss computations shall be included with the hydraulic grade calculations.
 - d. For streets, inlet grates shall be sized to pass a 10-year storm with no more than one and a half (1.5) inches of ponding above the street inlet grate, or such that no more than one half (1/2) of the driving lane is flooded. (Ditch inlet grates shall have no more than six (6) inches of ponding above the grate). Flow capacities of storm inlet grates shall be calculated using weir and orifice flow equations with consideration given to square footage of grate open areas and flow perimeter dimensions provided by casting manufacturers. All grates shall be safe for bicycle and pedestrian (especially children) traffic. For curb inlets, a barred-style curb box is required. Open curb boxes will not be allowed for new development or redevelopment.
 - e. Storm street inlets shall be placed at all low areas and spaced a maximum of 300 feet apart or 300 feet from the high point in the street unless the Board or the City Engineer requires more restrictive spacing. Gutter spread calculations shall be submitted upon request by the Board/City Engineer. Gutter spread shall be limited to one half (1/2) of the driving lane.

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- f. Exposed ends of storm pipes shall have 6-inch thick reinforced concrete slope walls (See Figure 8) or riprap placed as directed by the Board/City Engineer. All outfall pipes may be required to have flap gates, flap valves or other end treatment to prevent backflow or other types of intrusion into the storm drain system.
- g. For land disturbing activities, whenever evidence available to the Board/City Engineer indicates natural surface drainage to be inadequate, the subdivider or developer shall provide an adequate storm sewer system.
- h. Height of cover for pipes shall meet the most restrictive requirements of either manufacturers' recommendations or AASHTO Standard Specifications for Highway Bridges. However, when installed under pavement, the minimum pipe cover shall be two (2) feet for flexible pipe and one (1) foot for RCP.

B. Materials

1. Storm sewers:

Storm sewers shall be gasket type, reinforced concrete pipe (RCP), polyvinyl chloride (PVC) pipe, or high-density polyethylene (HDPE) pipe. The minimum pipe size shall be 12" diameter. The minimum design velocity for full pipe flow shall be 2.5 feet per second (fps).

a. RCP:

RCP shall be Class III, IV, or V in accordance with ASTM C76. A minimum Wall "B" thickness is required. Gasketed joints shall be in conformance with ASTM C443.

b. PVC pipe:

(1) PVC solid wall gravity flow storm sewer pipe shall be the bell and spigot type with elastomeric seal joints and smooth inner walls in accordance with ASTM D3034 (4"-15") or ASTM F679 (18"-36").

PVC dual wall gravity flow storm sewer pipe shall be the bell and spigot type with elastomeric seal joints with smooth inner walls and corrugated outer walls in accordance with ASTM F949 (4"-36").

PVC closed profile gravity flow storm sewer pipe shall be the bell and spigot type with elastomeric seal joints with smooth inner and outer walls braced inside circumferentially with projections or ribs in accordance with ASTM F1803 (18"-60").

All PVC pipe shall have a minimum Cell Class as set forth by ASTM D1784 and shall have a minimum pipe stiffness of 46 psi.

(2) Flexible, gasketed joints shall be compression type so that when assembled, the gasket inside the bell is compressed radially on the pipe spigot to form a soiltight seal. The assembly of joints shall be in accordance with the pipe manufacturer's recommendations, and ASTM D3212. The gasket shall conform to the requirements of ASTM F477. All field cutting of pipe shall be completed in a neat, trim manner using a hand or power saw.

(3) PVC Pipe shall be Type PSM or Pro 21 as manufactured by Diamond Plastics Corporation, Ring-Tite as manufactured by JM Pipe, A-2000 as manufactured by Contech Construction Products, or approved equal.

c. HDPE pipe:

(1) HDPE pipe shall be in accordance with AASHTO M294 Type S, consisting of an annular outer corrugated pipe wall and a smooth inner wall, or Type D, consisting of a smooth inner wall braced circumferentially with circular ribs joined to a smooth outer wall. Pipe

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manufactured under this specification shall conform to the cell classification as defined in ASTM D3350. The flexibility factor of HDPE pipe shall not exceed 0.095.

- (2) HDPE pipe shall possess male and female pipe ends which allow the construction of overlapping, gasketed pipe joints, in conformance with the requirements of ASTM D3212. The gasket material shall conform to all requirements of ASTM F477.
- (3) HDPE pipe shall be Sure-Lok as manufactured by Hancor, Inc., N-12 Soil-Tight as manufactured by ADS, or approved equal.

2. Drainage Structures:

All storm sewer manholes, catch basins, and inlets shall be precast concrete, unless approved otherwise by the Board/City Engineer. Precast concrete storm sewer manholes shall meet or exceed the requirements of ASTM C478 and shall be in accordance with InDOT standard specifications. Precast concrete catch basins and inlets shall be in accordance with InDOT standard specifications.

Inlet grates or curb inlets must be pre-stamped with a pollution prevention message such as “No Dumping, Drains to Stream”.

3. Bedding and backfill materials shall be as follows:

a. Class I :

Angular, six (6) to forty (40) millimeters ($\frac{1}{4}$ to $1\frac{1}{2}$ inch) graded stone such as crushed stone. InDOT Classification No. 5, No. 8 and No. 9. A No. 8 washed gravel possessing a minimum 50% mechanical crush count, and meeting the following nominal sizes and percents passing will be considered an equivalent Class I material: 100% passing 1" sieve, 75-95% passing $\frac{3}{4}$ " sieve, 40-70% passing $\frac{1}{2}$ " sieve, 20-50% passing $\frac{3}{8}$ " sieve, 0-15% passing No. 4 sieve, and 0-10% passing No. 8 sieve.

b. Class II:

Coarse sands and gravel-sand mixtures with a maximum particle size of forty (40) millimeters ($1\frac{1}{2}$ inches), including variously graded sands and gravels containing small percentages of fine, generally granular and non-cohesive, either wet or dry. Soil types GW, GP, SW and SP are included in this class. InDOT Classification for “B” borrow material.

c. Pavement zone shall be defined as the area under and within five (5) feet of the edge of pavement, curb and/or sidewalk.

d. RCP shall be provided with Class I or Class II bedding material from a minimum of four (4) inches below the pipe barrel to $\frac{1}{6}$ the outside pipe

diameter. Within the pavement zone, the backfill shall be Class II material compacted to 95% standard proctor density. Outside the pavement zone, the backfill shall be clean fill material. Figure 6 provides a bedding and backfill detail for RCP.

- e. PVC and HDPE pipe shall be provided with Class I bedding material from a minimum of four (4) inches below the pipe barrel to twelve (12) inches above the crown of the pipe. Within the pavement zone, the backfill shall be Class II material compacted to 95% standard proctor density. Outside the pavement zone, the backfill shall be clean fill material. Figure 7 provides a bedding and backfill detail for PVC and HDPE pipe.
- f. Bedding and backfill for drainage structures shall conform to InDOT specifications and standard drawings.

C. Design of Detention/Retention Facilities

In general, storm water detention analysis shall be required for land-altering projects if the impervious surface area will be increased by 0.5 acre or more. Storm water detention shall be required if the peak discharge of storm water from the developed site will exceed the peak discharge from the site in its present land use. (See No. 5 below). These general requirements will be reviewed on a case-by-case basis by the Board when making a determination to allow direct discharge or for requiring detention facilities. Preliminary discussion of the project with the Board or a representative of the Board is encouraged.

Detention/retention facility – a storm water control facility that stores storm water run-off indefinitely (retention) or detains it (detention) in order to reduce the storm water run-off from a property, or a combination thereof.

In designing storm water detention/retention facilities, the following minimum standards shall apply:

1. The USDA Soil Conservation Service (SCS) method of calculating run-off and generating hydrographs shall be utilized for detention/retention design. Figure 9 shall be used for rainfall depths. The 2nd Quartile Huff Rainfall Distribution – 50% probability curve and/or table shown in Figures 10 and 11 respectively shall be used for hydrograph computations.
2. Tables provided in Figures 12 through 14 shall be referenced for determination of run-off curve numbers according to land uses and hydrologic soil groups.
3. Storm durations shall be used that maximize the peak flow for the pre-developed condition and maximize detention storage volume for the post-developed condition. The storm duration shall be equal to or greater than the site time of concentration, but shall not be less than thirty (30) minutes.
4. Time of concentration shall be the time it takes for run-off to travel from the hydraulically most distant point in the subarea to its outfall point. Time of concentration calculations shall consist of overland (sheet) flow time, shallow concentrated flow time, and travel time in channels, pipes, gutters, etc. The maximum sheet flow calculation shall be 300 feet for pervious area and 100 feet for impervious area. After these distances, flow over land is calculated as shallow concentrated flow or channel flow as appropriate. The minimum time of concentration shall be five (5) minutes. A worksheet for time of concentration calculations is provided in Figure 15. A list of Manning's roughness coefficients for sheet flow is provided in Figure 16. These "Manning's n" values are used only in the sheet flow equation on the worksheet and not for open channel design.
5. The peak discharge resulting from the 100-year post-developed storm event shall not exceed the peak discharge resulting from the 10-year pre-developed storm event. In addition, the peak discharge resulting from the 2-year post-developed

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storm event shall not exceed the peak discharge resulting from the 2-year pre-developed storm event. Outlet control structures of ponds shall be designed to meet the required release rates.

6. Wet detention/retention ponds shall have a minimum ten (10) foot wide safety ledge placed below the normal pool water level at a maximum slope of 10:1. The slope of the vegetated bank above the safety ledge shall not exceed 3:1. Below the safety ledge, ponds with slopes steeper than 3:1 shall be secured with riprap and no bank shall exceed a slope of 1½:1.
7. Dry detention/retention ponds shall have a minimum bottom slope of 1% or be designed with subsurface drainage. Maximum vegetated bank side slopes on the pond shall be 3:1.
8. Detention/retention ponds shall have a minimum freeboard of one (1) foot. Freeboard is additional depth above the maximum flow depth through the spillway.
9. All impervious area of the site shall drain through the detention/retention facility.
10. The depth of storm water run-off in parking lots providing detention shall not exceed ten (10) inches during the 100-year storm event.
11. Detention/retention facilities shall be designed with emergency spillways capable of handling 1¼ times the peak discharge resulting from the 100-year storm event. The developer is responsible for analyzing the ponding results of a 100-year storm event and establishing flood protection grade for all structures and verifying an adequate outlet for the 100-year storm.
12. Fencing or a barrier shall be required around wet detention ponds to prevent children from accessing the pond.

D. Open Channel Design

In general, Manning's equation may be used for open channel flow calculations for unobstructed channels. Open channels with culverts may require additional analysis. See Figure 17 for Manning's "n" values.

In the design of open channels, the following minimum standards shall apply:

1. Open channels shall be designed to pass the run-off from the 10-year storm event.
2. Grass-lined channel side slopes shall be no steeper than 3:1.
3. For yard ditches, longitudinal slopes of grass channels shall not be less than 1%. Slopes between 0.3% and 1% shall require subsurface drainage tile, shall be paved using 6-inch reinforced concrete, or shall be provided with a fabric-wrapped, washed gravel trench. No channel shall have less than a 0.3% longitudinal slope. Alternative channel treatments shall be subject to approval of the Board/City Engineer.
4. For relatively large open channels, channel slopes and invert treatments shall be approved on a case-by-case basis.

E. Streets

1. All streets shall be provided with an adequate storm drainage system consisting of curbs, gutters, storm sewers and inlets, or side ditches and culverts, as determined by the Board/City Engineer.
 - a. A 6-inch minimum perforated pipe underdrain shall be required on each side of all streets as required by the Board/City Engineer.
 - b. Where curbs and gutters are not provided in the street, ditches with inverts at least 12 inches below the subgrade of the pavement may be required.
2. Down spouts and sump pump outlets discharging onto a grass surface shall be no closer to the road than the building setback line.
3. Open channels along dedicated roadways and within right-of-ways, or on easements dedicated to the City, are not to be altered in any way without written permission from the Board. Driveways may be constructed over these swales or ditches only when the Board has approved appropriate sized culverts or other structures.
4. Culverts under public roadways shall be RCP (minimum Class III, Wall B) and shall be sized to pass the peak run-off from the 25-year storm event. Run-off from the 100-year storm event shall be analyzed to assure overtopping of the roadway does not exceed 6 inches. More restrictive overtopping conditions may be required at the discretion of the Board/City Engineer.
5. Culvert materials used under private drives and driveways will be evaluated and approved on a case-by-case basis.

F. Project Construction

All construction shall be completed per the Occupational Safety and Health Act (OSHA) and other applicable safety regulations. The CDSWM assumes no responsibility for construction safety.

1. Inspection Services:

The CDSWM shall inspect all projects for drainage and erosion control compliance to approved plans during construction. As noted above, the CDSWM assumes no responsibility for construction safety, and its inspection is not for and does not include construction safety. Inspection shall be part-time or full-time, based upon the nature of construction and facilities. Inspection services shall be performed per the *Agreement between Owner/Contractor and Connersville Department of Storm Water Management for Storm Water System Inspection Services*. The property Owner/Developer shall be responsible for making payment to the CDSWM for the estimated inspection fees prior to project construction. The inspection fees shall be estimated by the Utility based upon the Contractor's estimated time to complete the drainage portion of the project. The actual inspection fees shall be assessed based upon the actual number of hours of inspection required. Inspection fees shall be charged at the rate of \$50.00 per hour.

The Contractor/Developer shall notify the CDSWM and the Inspector at least forty-eight (48) hours in advance of the installation, backfilling and testing of storm sewers and manholes.

2. Testing:

All storm sewers and manholes shall be soil tight. The Contractor shall repair all visible points of possible bedding and/or backfill infiltration into the system to the satisfaction of the Inspector. When necessary, the Contractor shall remove and reconstruct as much of the work as is necessary to obtain a system that passes the following minimum tests:

a. Mandrel Tests for Flexible Pipes:

All gravity flow storm sewers constructed of flexible pipe (PVC and HDPE) shall be mandrel tested. The Inspector shall be notified of the proposed testing times and locations forty-eight (48) hours in advance. Arrangements for the cost and supply of all equipment necessary to perform mandrel tests shall be the responsibility of the Contractor/Developer.

A seven and one-half (7½) percent "GO-NO-GO" Mandrel Deflection Test shall be performed on all flexible gravity storm sewer pipe. These pipes shall be mandrelled with a rigid device sized to pass seven and one-half (7½) percent or less deflection (or deformation) of the base inside diameter of the pipe. The mandrel test shall be conducted no earlier than thirty (30) days after reaching final trench backfill grade. The mandrel device shall be cylindrical in

shape and constructed with nine (9) or ten (10) evenly spaced arms or prongs. Variations of mandrel diameter dimensions due to pipe wall thickness tolerances or ovality shall not be deducted from the diameter dimension of the mandrel but shall be counted as part of the seven and one-half (7½) percent or lesser deflection allowance. The mandrel diameter dimension shall carry a minimum tolerance of 0.01 inches.

The mandrel shall be hand pulled through all sewer lines and any section of sewer not passing the mandrel shall be uncovered, replaced or repaired, and retested. The contact length shall be measured between points of contact on the mandrel arm. The Contractor shall provide proving rings to check the mandrel. The Contractor shall furnish drawings of mandrels with complete dimensions to the Inspector upon request for each diameter and specification of pipe.

b. RCP Inspection:

All reinforced concrete storm sewer pipes that are thirty-six (36) inches in diameter and smaller shall be visually inspected by lamping in the presence of the Inspector. Inspection of RCP shall be required to identify problems such as excessive sedimentation, joint failures, structural defects, misalignments, sags or other defects that have the potential of affecting the hydraulic performance, durability, or structural integrity of the pipe segment.

All reinforced concrete storm sewer pipes larger than thirty-six (36) inches in diameter shall be visually surveyed along their entire length in the presence of the Inspector. The Board/City Engineer has the option of requiring televising of the lines.

c. Manhole and Box Inlet Inspection:

The Inspector shall visually check each manhole and box inlet structure for excessive leakage, backfill infiltration, or improper workmanship and materials. Structures that fail to meet minimum construction standards shall be repaired or, if necessary, replaced, and reinspected.

d. Enforcement of Standards:

Failure to comply with the Connersville Drainage Standards may result in a Stop Work Order or necessary legal action by the CDSWM.

e. Easements:

The following applicable easements shall be granted to the City of Connersville by way of a *Grant of Perpetual Drainage Easement*.

- a. Twenty (20) feet for pipes 15 inches in diameter and smaller.
- b. Twenty-five (25) feet for pipes between 15 and 36 inches in diameter.
- c. Forty (40) feet for pipes greater than 36 inches in diameter.

- d. Thirty (30) feet measured horizontally outside the 100-year flood elevation for detention/retention ponds and access to the pond as determined by the CDSWM.
 - e. Twenty (20) feet for yard swales.
 - f. Easements for open channel are to be determined by the CDSWM on a case-by-case basis.
 - g. Easements for drainage conveyances shall be centered on the centerline of the conveyance.
5. Transfer of Ownership of Storm Water System:
Owners/Developers that will dedicate the storm water system to the City of Connersville shall enter into an agreement - *Storm Water System Agreement – Developer-Installed and Contributed Storm Water System*. The Owner/Developer, at no cost to the City of Connersville, shall furnish the design, labor and materials to install the storm water system. The CDSWM must approve the design, materials and the Owner/Developer’s selected contractor, based upon reliability and responsiveness. *Waivers of Lien* for suppliers, subcontractors and contractors will be required at the time of completion of the *Transfer of Ownership* form.
6. Performance and Maintenance Bond Requirements:
The Owner/Developer shall provide a performance bond to the CDSWM prior to project construction. The performance bond shall be in the amount of 120% of the contract amount to construct drainage improvements and shall be provided on the standard form - *Connersville Department of Storm Water Management Performance and Repair Bond*. After completion of the project, the Owner/Developer shall provide a three-year maintenance bond in the amount of 25% of the contract amount to construct said drainage improvements to protect against defective materials and workmanship. The maintenance bond shall be provided on the standard form - *Connersville Department of Storm Water Management Maintenance Bond*.
7. Record Drawings:
Record drawings shall be completed within 30 days after the completion of the project and submitted to the CDSWM for final approval of the project. Record drawings shall be certified by a Professional Engineer or Land Surveyor. Record drawings shall include both a hard copy and an electronic copy (AutoCAD compatible drawings on CD) of as-built information including easements, horizontal alignments, elevations, inverts, top-of-castings, pond cross sections, and flow lines of swales.

**CHAPTER 2: STORM WATER POLLUTION
PREVENTION AND EROSION AND SEDIMENT
CONTROL STANDARDS**

CHAPTER 2: STORM WATER POLLUTION PREVENTION AND EROSION AND SEDIMENT CONTROL STANDARDS

A. Purpose

This chapter is intended to establish the minimum standards for design and construction of erosion and sedimentation controls and storm water pollution prevention measures for construction sites where land disturbing activities shall take place. These standards were developed in accordance with the requirements of 327 IAC 15-13, Storm Water Run-Off Associated with Municipal Separate Storm Sewer System Conveyances (Rule 13) and Indiana Administrative Code 327 IAC 15-5 for Storm Water Run-off Associated with Construction Activities (Rule 5).

Projects meeting the requirements of the Post-Construction Storm Water Quality section shall also be required to install water quality treatment best management practices prior to project completion.

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B. Authority and Compliance

Per Ordinance 4533, the CDSWM has the authority to permit, provide construction plan review for, inspect, and take appropriate enforcement actions against construction sites that meet the requirements of Ordinance 4533.

Construction sites where land disturbing activities meet the requirements of Ordinance 4533, at a minimum, shall be in compliance with all terms and conditions of Ordinance 4533, the Connersville Drainage Standards Manual, and Rule 5. In those circumstances where the requirements of Ordinance 4533 and the Drainage Standards Manual are more stringent than those contained in Rule 5, the requirements of Ordinance 4533 and the Drainage Standards Manual shall be followed.

The CDSWM has the right to impose additional requirements and restrictions beyond those outlined in these Standards, Ordinance 4533, and Rule 5 for projects where unique or special conditions exist.

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C. Definitions

1. “Construction Activity” means land disturbing activities and land disturbing activities associated with the construction of infrastructure and structures. This term does not include routine ditch or road maintenance or minor landscaping projects.
2. “Construction plan” means a representation of a project site and all activities associated with the project. The plan includes the location of the project site, buildings and other infrastructure, grading activities, schedules for implementation, and other pertinent information related to the project site. A storm water pollution prevention plan is a part of the construction plan.
3. “Construction site access” means a stabilized stone surface at all points of ingress or egress to a project site for the purpose of capturing and detaining sediment carried by tires of vehicles or other equipment entering or existing the project site.
4. “Contractor” means an individual or company hired by the project site or individual lot owner, their agent, or the individual lot operator to perform services on the project site.
5. “Drainage Standards Manual” means the storm water standards for the City of Connersville that contain policies and procedures, drainage, erosion and sediment control, and post-construction standards that new development and redevelopment must meet.
6. “Developer” means any person financially responsible for construction activity; or an owner of property who sells or leases, or offers for sale or lease, any lots in a subdivision.
7. “Erosion” means the detachment and movement of soil, sediment, or rock fragments by water, wind, ice, or gravity.
8. “Erosion and sediment control measure” means a practice, or a combination of practices, to control erosion and resulting sedimentation.
9. “Erosion and sediment control system” means the use of appropriate erosion and sediment control measures to minimize sedimentation by first reducing or eliminating erosion at the source and then, as necessary, trapping sediment to prevent it from being discharged from or within a project site.
10. “Final stabilization” means the establishment of permanent vegetative cover or the application of a permanent nonerosive material to areas where all land disturbing activities have been completed and no additional land disturbing activities are planned under the current permit.

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11. “Grading” means the cutting and filling of the land surface to a desired slope or elevation.
12. “Impervious surface” means surfaces, such as pavement and rooftops, which imbed or prevent the infiltration of storm water into the soil.
13. “Individual building lot” means a single parcel of land within a multiparcel development.
14. “Individual lot operator” means a person who has financial control of construction activities for an individual lot.
15. “Land disturbing activity” means any manmade change of the land surface, including removing vegetative cover that exposes the underlying soil, excavating, filling, transporting, and grading.
16. “Larger common plan of development or sale” means a plan, undertaken by a single project site owner or a group of project site owners acting in concert, to offer lots for sale or lease; where such land is contiguous, or is known, designated, purchased or advertised as a common unit or by a common name, such land shall be presumed as being offered for sale or lease as part of a larger common plan. The term also includes phased or other construction activity by a single entity for its own use.
17. “MS4” means Municipal Separate Storm Sewer System.
18. “Permanent stabilization” means the establishment, at a uniform design of seventy percent (70%) across the disturbed area, of vegetative cover or permanent nonerosive material that will ensure the resistance of the soil to erosion, sliding, or other movement.
19. “Phasing of construction” means sequential development of smaller portions of a large project site, stabilizing each portion before beginning land disturbance on subsequent portions, to minimize exposure of disturbed land to erosion.
20. “Project site” means the entire area on which construction activity is to be performed.
21. “Project site owner” means the person required to submit the NOI letter per Rule 5 and required to comply with the terms of these standards, Ordinance 4533, and Rule 5, including either of the following:
 - a. a developer
 - b. a person who has financial and operational control of construction activities and project plans and specifications, including the ability to make modifications to those plans and specifications.

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22. “Sediment” means solid material (both mineral and organic) that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice and has come to rest on the earth’s surface.
23. “Soil” means the unconsolidated mineral and organic material on the surface of the earth that serves as then natural medium for the growth of plants.
24. “Storm Water Pollution Prevention Plan (SWPPP)” means a plan developed to minimize the impact of storm water pollutants resulting from construction activities. The plan indicates the specific measures and sequencing to be used to control sediment, soil erosion and other construction site wastes during and after construction.
25. “Storm water quality measure” means a practice, or a combination of practices, to control or minimize pollutants associated with storm water run-off.
26. “Strip development” means a multilot project where building lots front on an existing road.
27. “Subdivision” means any land that is divided or proposed to be divided into lots, whether contiguous or subject to zoning requirements, for the purpose of sale or lease as part of a larger common plan of development or sale.
28. “SWCD” means Soil and Water Conservation District.
29. “Technical Review and Comment Form”: A form issued by the building department stating that the Erosion and Sediment Control Plan is adequate or stating revisions needed in the Erosion and Sediment Control Plan and Storm Water Pollution Prevention Plan.
30. “Temporary stabilization” means the covering of soil to ensure its resistance to erosion, sliding, or other movement. The term includes vegetative cover, anchored mulch, or other nonerosive material applied at a uniform density of seventy percent (70%) across the disturbed area.
31. “Tracking” means the deposition of soil that is transported from one (1) location to another by tires, tracks of vehicles, or other equipment.
32. “Trained individual” means an individual who is trained and experienced in the principles of storm water quality, including erosion and sediment control as may be demonstrated by state registration, professional certification, experience, or completion of coursework that enable the individual to make judgments regarding storm water control or treatment and monitoring.

Note: Rule 5 also contains additional definitions for language used in that rule.

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D. Policies and Procedures

1. Coverage:

All residential and non-residential construction projects which result in land disturbing activities equal to or greater than one (1) acre shall be in compliance with Ordinance 4533, these Standards, and Rule 5. The area of land disturbance resulting from the construction activity shall be calculated per 327 IAC 15-5-2(h)(1).

2. Exceptions:

Individual, single-family construction projects not part of a larger, common development are exempt from the submittals outlined in the following section (Submittals), but must comply with the provisions of 327 IAC 15-5 section 7(b)(1) through 7(b)(5), 7(b)(10) through 7(b)(17), 7(b)(19), and 7(b)(20) throughout construction activities and until the areas are permanently stabilized.

3. Submittals:

A Technical Review and Comment Form stating that the “Plan is Adequate” and an Improvement Location Permit shall be obtained prior to the initiation of any land disturbing activities. Construction site owner shall submit a review fee of \$100 and 3 copies (forward one copy to the CDSWM and one copy to the Fayette County Soil and Water Conservation District for review) of the following information to the Fayette County Area Plan Commission:

- Construction Plans
- Construction Storm Water Pollution Prevention Plan (SWPPP)
- Post-Construction SWPPP

The detailed submittal requirements are contained in 327 IAC 15-5 Section 6 through Section 6.5 and summarized in Figure 18 of this manual. The construction project Post- Construction SWPPP must also be in compliance with Post-Construction Storm Water Quality section of this manual.

After receiving the Technical Review and Comment Form (Figure 19) stating that the “Plan is Adequate” and an Improvement Location Permit, the following shall be submitted to IDEM, and the Fayette County Soil and Water Conservation District at least 48 hours prior to the initiation of land disturbing activities.

- Notice of Intent Form (Figure 20)
- A copy of the Technical Review and Comment Form verifying plan approval by the CDSWM
- Proof of Publication required by 327 IAC 15-5-5 (9)

A copy of the Notice of Intent shall also be submitted to the Fayette County Area Planning Commission (the APC will forward a copy to the CDSWM).

CHAPTER 2: STORM WATER POLLUTION PREVENTION AND EROSION AND SEDIMENT CONTROL STANDARDS

Single-family residential development consisting of four (4) or fewer lots or a single-family residential strip development where the developer offers for sale or lease without land improvements, and the project is not part of a larger common plan of development or sale, shall meet the detailed submittal requirements contained in 327 IAC 15-5-6.5(b).

For those construction activities operated by the MS4 operator or MS4 municipalities within the MS4 area, construction plans must be submitted to the local SWCD, the Indiana Department of Natural Resources, division of soil conservation, or other entity designated by IDEM for review and approval. If the MS4 operator does not receive either a notice of deficiency or an approval within thirty-five (35) days of the submittal, the plan will be considered adequate. After a one (1) year period of permit compliance, the MS4 operator or the designated MS4 entity need not submit the plans and may review MS4-operated project construction plans internally with the written authorization of the Indiana Department of Natural Resources, division of soil conservation.

4. MS4 Projects:

In addition to the requirements of 327 IAC 15-5-6.5, for those construction activities operated by the MS4 operator or MS4 municipalities within the MS4 area, project construction plans must include a traffic phasing plan for those projects that have the potential to alter vehicular traffic routes. Also, the project SWPPP must address all requirements of 327 IAC 15-5-6.5(a)(7) and the following areas located outside of right-of-ways:

- a. Utility relocation areas.
- b. Material hauling and transportation routes/roads.
- c. Borrow pits.
- d. Temporary staging and material stockpile areas.
- e. Temporary disposal areas for waste materials.

5. Inspection Responsibilities:

A self-monitoring program meeting the requirements of 327 IAC 15-5-7 shall be implemented. A trained individual shall perform an inspection of the project site to verify the erosion and sediment controls are being maintained and functioning properly and to determine whether additional controls are necessary. Inspections shall be performed after every storm event with a total measured rainfall accumulation equal to or greater than 0.5 inch and at a minimum, inspections shall be performed weekly.

Written evaluation reports must be prepared by the end of the business day following the day of the inspection. The written evaluation reports must also be available to the CDSWM or other local, county or state entity within 48 hours of a request.

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Written evaluation reports must contain the following information:

- Name of individual performing the inspection
- Date of the inspection
- Problems identified at the project
- Corrective actions recommended and completed

Construction site owners shall allow right-of-entry for the City of Connersville, or local, county, or state regulatory agency or a representative thereof to inspect any project site involved in construction activities, at reasonable times.

6. Priority Sites:

When construction plans are submitted for review, the reviewer will identify priority sites for inspection and enforcement. The criteria for priority sites will be based on the nature and extent of construction, proximity to sensitive areas, steep topography on or adjacent to proposed construction site, proximity to wetlands, and potential for direct run-off to receiving waters. Construction sites inspections will be based on priority determinations.

The CDSWM, or local, county, or state regulatory agency or a representative thereof may make recommendations to the project site owner or their representative to install appropriate measures beyond those specified in the storm water pollution prevention plan to achieve compliance.

7. Enforcement:

All persons engaging in construction activities on a project site shall be responsible for complying with these Standards, Ordinance 4533, and Rule 5. Any person causing or contributing to a violation of any provisions of these Standards, Ordinance 4533, and Rule 5 shall be subject to enforcement and penalty.

In the event the CDSWM or other regulatory agency determines the project is not in compliance with these Standards, Ordinance 4533, or Rule 5, the project site owner has five (5) business days following the written notification (warning letter of noncompliance or violation notice) from the CDSWM to correct the deficiency. In the event the deficiency is not corrected within this period, a fine of not less than 25 dollars per day per infraction shall be assessed to the project site owner. This fine shall not exceed \$1000 per day.

A stop-work order (revocation of Improvement Location Permit) may be issued in the event that any person violates the terms of these Standards, Ordinance 4533, Rule 5 or implements a construction activity in such a manner as to materially adversely affect the health, welfare, or safety of persons residing or working in or adjacent to the project site.

If remaining storm water quality measures are not properly maintained by the person occupying or owning the property, the CDSWM may also issue fines to that individual.

CHAPTER 2: STORM WATER POLLUTION PREVENTION AND EROSION AND SEDIMENT CONTROL STANDARDS

E. General Requirements for Storm Water Pollution Prevention Plans

All land disturbing projects shall implement controls to minimize the transport of sediment from the project sites. Per 327 IAC 15-5-7, the project site owner shall, at least, meet the following requirements:

1. Sediment-laden water which otherwise would flow from the project site shall be treated by erosion and sediment control measures to minimize sedimentation.
2. Appropriate measures shall be implemented to minimize or eliminate wastes or unused building materials, including garbage, debris, cleaning wastes, wastewater, concrete truck washout, and other substances from being carried from a project site by run-off or wind. Identification of areas where concrete truck washout is permissible must be clearly posted at appropriate areas of the site. Wastes and unused building materials shall be managed and disposed of in accordance with all applicable statutes and regulations.
3. A stable construction site access shall be provided at all points of construction traffic ingress and egress to the project site.
4. Public or private roadways shall be kept cleared of accumulated sediment that is a result of run-off or tracking. Bulk clearing of sediment shall not include flushing the area with water. Cleared sediment shall be redistributed or disposed of in a manner that is in accordance with all applicable statutes and regulations.
5. Storm water run-off leaving a project site must be discharged in a manner that is consistent with applicable state or federal law.
6. The project site owner shall post a notice near the main entrance of the project site. For linear project sites, such as a pipeline or highway, the notice must be placed in a publicly accessible location near the project field office. The notice must be maintained in a legible condition and contain the following information:
 - Copy of the completed NOI letter and the NPDES permit number, where applicable.
 - Name, company name, telephone number, e-mail address (if available), and address of the project site owner or a local contact person.
 - Location of the construction plan if the project site does not have an on-site location to store the plan.
7. This permit and posting of the notice of intent does not provide the public with any right to trespass on a project site for any reason, nor does it require that the project site owner allow members of the public access to the project site.
8. The SWPPP shall serve as a guideline for storm water quality, but should not be interpreted to be the only basis for implementation of storm water quality

CHAPTER 2: STORM WATER POLLUTION PREVENTION AND EROSION AND SEDIMENT CONTROL STANDARDS

- measures for a project site. The project site owner is responsible for implementing, in accordance with Rule 5, all measures necessary to adequately prevent polluted storm water run-off.
9. The project site owner shall inform all general contractors, construction management firms, grading or excavating contractors, utility contractors, and the contractors that have primary oversight on individual building lots of the terms and conditions of this rule and the conditions and standards of the SWPPP and the schedule for proposed implementation.
 10. Phasing of construction activities shall be used, where possible, to minimize disturbance of large areas.
 11. Appropriate measures shall be planned and installed as part of an erosion and sediment control system.
 12. All storm water quality measures must be designed and installed under the guidance of a trained individual.
 13. Collected run-off leaving a project site must be either discharged directly into a well-defined, stable receiving channel or diffused and released to adjacent property without causing an erosion or pollutant problem to the adjacent property owner.
 14. Drainage channels and swales must be designed and adequately protected so that their final gradients and resultant velocities will not cause erosion in the receiving channel or at the outlet.
 15. Natural features, including wetlands and sinkholes, shall be protected from pollutants associated with storm water run-off.
 16. Unvegetated areas that are scheduled or likely to be left inactive for fifteen (15) days or more must be temporarily or permanently stabilized with measures appropriate for the season to minimize erosion potential. Alternative measures to site stabilization are acceptable if the project site owner or their representative can demonstrate they have implemented erosion and sediment control measures adequate to prevent sediment discharge. Vegetated areas with a density of less than seventy percent (70%) shall be restabilized using appropriate methods to minimize the erosion potential.
 17. During the period of construction activities, all storm water quality measures necessary to meet the requirements of this rule shall be maintained in working order.
 18. A self-monitoring program shall be implemented (see Inspection page 22).

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19. Proper storage and handling of materials, such as fuels or hazardous wastes, and spill prevention and clean-up measures shall be implemented to minimize the potential for pollutants to contaminate surface or ground water or degrade soil quality.
20. Final stabilization of a project site shall be achieved when:
 - All land disturbing activities have been completed and a uniform (for example, evenly distributed, without large bare areas) perennial vegetative cover with a density of seventy percent (70%) has been established on all unpaved areas and areas not covered by permanent structures, or equivalent permanent stabilization measures have been employed; and
 - Construction projects on land used for agricultural purposes are returned to its preconstruction agricultural use or disturbed areas, not previously used for agricultural production, such as filter strips and areas that are not being returned to their preconstruction agricultural use, meet the final stabilization requirements listed above.

CHAPTER 2: STORM WATER POLLUTION PREVENTION AND EROSION AND SEDIMENT CONTROL STANDARDS

F. Individual Building Lots within a Permitted Project

Per 327 IAC 15-5-7.5, all storm water quality measures, including erosion and sediment control, necessary to comply with Rule 5 and these Standards shall be implemented in accordance with the plan. Provisions for erosion and sediment control on individual building lots regulated under the original permit of a project site owner must include the following requirements:

1. The individual lot operator, whether owning the property or acting as the agent of the property owner, shall be responsible for erosion and sediment control requirements associated with activities on individual lots.
2. Installation and maintenance of a stable construction site access.
3. Installation and maintenance of appropriate perimeter erosion and sediment control measures prior to land disturbance.
4. Sediment discharge and tracking from each lot must be minimized throughout the land disturbing activities on the lot until permanent stabilization has been achieved.
5. Clean-up of sediment that is either tracked or washed onto roads. Bulk clearing of sediment shall not include flushing the area with water. Cleared sediment must be redistributed or disposed of in a manner that is in compliance with all applicable statutes and rules.
6. Adjacent lots disturbed by an individual lot operator must be repaired and stabilized with temporary or permanent surface stabilization.
7. For individual residential lots, final stabilization meeting the criteria in item (20) of the previous section will be achieved when the individual lot operator:
 - Completes final stabilization; or
 - Has installed appropriate erosion and sediment control measures for an individual lot prior to occupation of the home by the homeowner and has informed the homeowner of the requirement for, and benefits of, final stabilization.

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G. Technical Design Criteria

Erosion and sediment controls shall be designed and installed in accordance with Rule 5, these Standards, and the Indiana Storm Water Quality Manual. Technical review of the erosion and sediment control program, SWPPP, and other required submittals shall be completed by the CDSWM. The technical review shall assess the adequacy of proposed erosion and sediment control against the technical design criteria contained in the Indiana Storm Water Quality Manual.

The following guidelines shall be used during development of the Storm Water Pollution Prevention Plan:

1. Construction sequencing shall minimize the amount of exposed land and the duration of exposure without temporary or permanent protection.
2. Grading activities shall minimize the amount of cut and fill.
3. Perimeter controls shall be installed prior to land disturbing activities.
4. Storm sewer inlets and conveyance outfalls shall be equipped with appropriate erosion and sediment controls and shall remain in place until the entire contributing drainage area is permanently stabilized.
5. Project access points shall have 2-inch to 3-inch or larger aggregate for a depth of at least 6 inches placed at all ingress and egress points to minimize tracking of sediment beyond the project site by vehicles and construction equipment. The aggregate must cover a minimum area of 20' x 50', and be periodically maintained (cleaned, top dressed).
6. Sediment tracked to road surfaces shall be removed using acceptable practices, such as shoveling or street sweeping, daily. Washing of road surfaces is not acceptable, unless the run-off flows to a sediment control measure.
7. Storm water run-off velocities from the project site shall be kept as low as possible.
8. Erosion from soil stockpiles shall be minimized via stabilization or erosion control measures.
9. Permanent seeding shall take place as soon as practicable. Temporary seeding shall be utilized in areas left undisturbed for more than thirty (30) days.
10. Dust control measures shall be implemented as necessary.

CHAPTER 2: STORM WATER POLLUTION PREVENTION AND EROSION AND SEDIMENT CONTROL STANDARDS

11. Erosion control blankets shall be required on all fill slopes exceeding 4 (horizontal) to 1 (vertical).
12. Mulching material is required for all temporary and permanent seeding.
13. The minimum thickness of rock riprap shall be 6 inches.

CHAPTER 2: STORM WATER POLLUTION PREVENTION AND EROSION AND SEDIMENT CONTROL STANDARDS

H. Project Termination

The project site owner shall plan an orderly and timely termination of the construction activities, including the implementation of storm water quality measures that are to remain on the project site.

The project site owner, or a representative thereof, shall submit a written notice of termination (NOT) form (See Figure 21) to the CDSWM, the County SWCD, and IDEM upon project termination once the following requirements are met:

1. All land disturbing activities, including construction on all building lots, have been completed.
2. Final stabilization of the entire site has been completed.
3. All permanent storm water quality measures (if required per Post-Construction Storm Water Quality section) have been implemented and are operational.
4. Temporary erosion and sediment control measures have been removed.

The NOT must be submitted within two (2) weeks of project termination, and contain a statement(s) verifying that each of these conditions have been met.

The CDSWM or a representative thereof may inspect the project site to confirm the information provided in the NOT. Upon verification of the NOT letter, the CDSWM shall issue written approval to the project site owner that the project site owner shall no longer be responsible for compliance with the requirements of this Chapter.

Early Project Termination Requirements:

The project site owner may submit an NOT letter to obtain early release from compliance with these Standards, Ordinance 4533, and Rule 5.

The project site owner must meet the requirements per 327 IAC 15-5-8(b)(2) as outlined below:

1. The remaining, undeveloped acreage does not exceed five (5) acres, with contiguous areas not to exceed one (1) acre.
2. A map of the project site, clearly identifying all remaining undeveloped lots, is attached to the NOT letter. The map must be accompanied by a list of names and addresses of individual lot owners or individual lot operators of all undeveloped lots.

CHAPTER 2: STORM WATER POLLUTION PREVENTION AND EROSION AND SEDIMENT CONTROL STANDARDS

3. All public and common improvements, including infrastructure, have been completed and permanently stabilized and have been transferred to the appropriate local entity.
4. The remaining acreage does not pose a significant threat to the integrity of the infrastructure, adjacent properties, or water quality.
5. All permanent storm water quality measures have been implemented and are operational.

Upon verification of the NOT letter, the CDSWM shall issue written approval to the project site owner. Upon receipt of this approval, the project site owner shall notify all current individual lot owners and all subsequent individual lot owners of the remaining undeveloped acreage and acreage with construction activity that they be responsible for complying with the General Requirements for Individual Building Lots within a Permitted Project. The remaining individual lot owners do not need to submit an NOI letter or NOT letter. The notice must contain a verified statement that each of the conditions in Items 1 through 5, listed above, have been met. The notice must also inform the individual lot owners of the requirements to:

1. Install and maintain appropriate measures to prevent sediment from leaving the individual building lot; and
2. Maintain all erosion and sediment control measures that are to remain on-site as part of the construction plan.

CHAPTER 3: POST-CONSTRUCTION STORM WATER QUALITY

A. Introduction

The purpose of this chapter is to establish minimum performance standards for management of post-construction storm water run-off quality, which is necessary to reduce the impacts of sediment and pollutants on local habitat and water resources. In addition to the standards in this manual, projects meeting the applicability of this chapter must also comply with Ordinance 4700, an ordinance to establish requirements for post-construction storm water run-off controls.

Sediments can have adverse effects on aquatic life in streams and lakes and can transport other attached pollutants affecting the welfare of the public residing in local watersheds. Major sources of sediment include washoff of particles that are deposited on impervious surfaces and the erosion of stream banks and construction sites. Improvements in the quality of post-construction storm water run-off can be met by best management practices (BMPs) including maximizing the use of site design to reduce run-off, managing and treating storm water run-off through the use of structural controls, and implementing pollution prevention practices to prevent erosion and reduce potential contaminants.

Hydrologic studies show that small-sized, frequently occurring storms account for the majority of rainfall events. The run-off from these storms accounts for a major portion of the annual pollutant loadings. By treating the frequently occurring smaller rainfall events, and a portion of the storm water run-off from larger events, it is possible to effectively mitigate the water quality impacts from developed areas.

The City of Connersville and the Connersville Department of Storm Water Management (CDSWM) has adopted a policy that the control of storm water run-off quality will be based on the management of total suspended solids (TSS). This requirement will serve as the basis of the storm water quality management program for all areas within the jurisdiction of the City of Connersville. The target TSS removal rate is 80%.

One approach to reduce the post-development TSS loadings by 80% is to require treatment of a water quality volume from a site. A second approach is to require treatment of a water quality flow rate from the site. Approved methods for calculating the water quality volume and flow rate are described in this chapter.

The appropriate storm water quality volume (WQ_v) and/or storm water quality flow rate (Q_{wq}) generated from a qualifying site shall be adequately treated before discharge. Pre-approved structural BMPs are provided in Table 1 located at the end of this chapter and are presumed to comply with the 80% TSS removal rate where indicated if:

1. Sized to capture the prescribed water quality volume or flow rate, as applicable,
2. Designed according to the specific performance criteria outlined in this manual,
3. Constructed properly, and
4. Maintained regularly.

Post-construction storm water quality measures must be properly maintained to ensure storm water run-off is continuously treated from the developed and stabilized site.

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Special circumstances that are not covered by these standards shall be regulated and reviewed on a case-by-case basis.

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B. Applicability

Any land disturbing project, including new development and redevelopment, within the City of Connersville that results in the disturbance of one (1) acre or more of total land area is subject to the requirements of this chapter. Furthermore, land disturbing activities that are less than one (1) acre but part of a larger common plan of development are required to comply with this chapter.

Per ordinance, the following activities are exempt from these requirements:

1. Construction of, or modifications to, single family structures that are not a part of a larger common plan of development,
2. Single family residential development consisting of four (4) or fewer lots,
3. Individual lots within a larger common development plan that has been previously permitted for storm water management, and
4. Any logging, agricultural, or other activity which is consistent with an approved soil conservation plan or a timber management plan prepared or approved by county, state, or federal regulating agencies.

CHAPTER 3: POST CONSTRUCTION STORM WATER QUALITY

C. Submittal Requirements

A submittal for storm water quality treatment review will not be considered complete until all of the items below have been submitted.

1. A Storm Water Pollution Prevention Plan (SWPPP) shall be required that details how run-off and associated water quality impacts resulting from the development will be controlled or managed. In addition to submittal requirements listed in this manual, the following items shall be included in the SWPPP:
 - a. A description of potential pollutant sources from the proposed land use, which may reasonably be expected to add a significant amount of pollutants to storm water discharges.
 - b. A description of measures that will be installed to control pollutants in storm water discharges that will occur after construction activities have been completed. Such practices include infiltration of run-off, flow reduction by use of open vegetated swales and natural depressions, buffer strip and riparian zone preservation, filter strip creation, minimization of land disturbance and surface imperviousness, maximization of open space, and storm water retention and detention ponds.
 - c. A sequence describing when each post-construction storm water quality measure will be installed.
 - d. Storm water quality measures that will remove or minimize pollutants from storm water run-off.
 - e. Storm water quality measures that will be implemented to prevent or minimize adverse impacts to stream and riparian habitat.
 - f. A narrative description and checklist of operation and maintenance guidelines for all post-construction storm water quality measures to facilitate their proper long-term function. This narrative description and checklist shall be made available to future parties who will assume responsibility for the operation and maintenance of the post-construction storm water quality measures.
2. An *Application for Drainage Approval* form with the applicable initial review fee of \$100.00. The initial review fee includes one (1) hour of storm water quality treatment review. Projects requiring more than one (1) hour of review due to their complexity or deficiency in design or submittal shall be assessed plan review fees at the rate of \$125.00 per hour. Review fees shall be payable to the Connersville Department of Storm Water Management. A review letter with any comments generated as a result of the review will be issued to the professional engineer responsible for completing the design.
3. A complete set of professionally certified construction plans showing the location, dimensions, and construction details of all post-construction storm water quality measures, detailed specifications and supporting water quality BMP sizing calculations.

CHAPTER 3: POST CONSTRUCTION STORM WATER QUALITY

4. Unless otherwise stated in this manual (refer to the Project Construction section of this manual for additional details on easements), a thirty-foot easement around the water quality treatment BMP along with an access easement to the BMP is required. Upon approval of the easement location shown on the construction plans, the easement shall be granted to the City of Connersville by way of a *Grant of Perpetual Drainage Easement*.

D. Methods for Sizing BMPs

There are two (2) methods for calculating the required size of a BMP. The first method calculates the water quality volume to be treated, which applies to detention-based BMPs. The second method calculates the water quality peak flow rate to be treated, which applies to filtration processes and mechanical-type BMPs such as hydrodynamic devices.

The water quality volume or flow rate shall be treated by an acceptable (pre-approved) BMP(s) from Table 1 or an equivalent practice. Such practices or techniques and devices not pre-approved that may be more functional and desirable for storm water management may be utilized upon approval by the CDSWM. Mechanical-type BMPs must meet ASTM standard methods for verifying performance and must be certified by a professional engineer. The BMP must meet the 80% TSS removal rate at a US silica OK110 sand micron range (very fine/fine sand) without resuspension of particles at the design water quality flow rate resulting from a 1-inch rainfall depth. Testing of the TSS removal rate must be conducted by an independent testing facility rather than by the manufacturer.

A quick reference, minimum design criteria and maintenance and inspection checklists for each pre-approved BMP are provided in the Appendices of this manual.

1. WATER QUALITY VOLUME (WQ_v)

The WQ_v is the storage needed to capture and treat the run-off from the first one-inch of rainfall. The WQ_v is equivalent to one inch of rainfall multiplied by the volumetric run-off coefficient (R_v) and the site area. The volume of run-off is directly related to the amount of impervious cover at the site and is calculated using the following equation:

$$WQ_v = \frac{(P)(R_v)(A)}{12}$$

where:

- WQ_v = water quality volume (acre-feet)
- P = 1 inch of rainfall
- R_v = volumetric run-off coefficient
= 0.05 + 0.009(I), where I is the percent (%) impervious cover
- A = area in acres

2. WATER QUALITY FLOW RATE (Q_{wq})

The Q_{wq} is needed to size BMP devices designed to treat run-off at a peak design flow rate through the system.

CHAPTER 3: POST CONSTRUCTION STORM WATER QUALITY

Conventional SCS methods have been found to underestimate the volume and rate of run-off for rainfall events less than 2 inches. The following procedure can be used to calculate the Q_{wq} . The method relies on the water quality volume in conjunction with an adjusted curve number (CN_{wq}) and the NRCS TR-55 methodology.

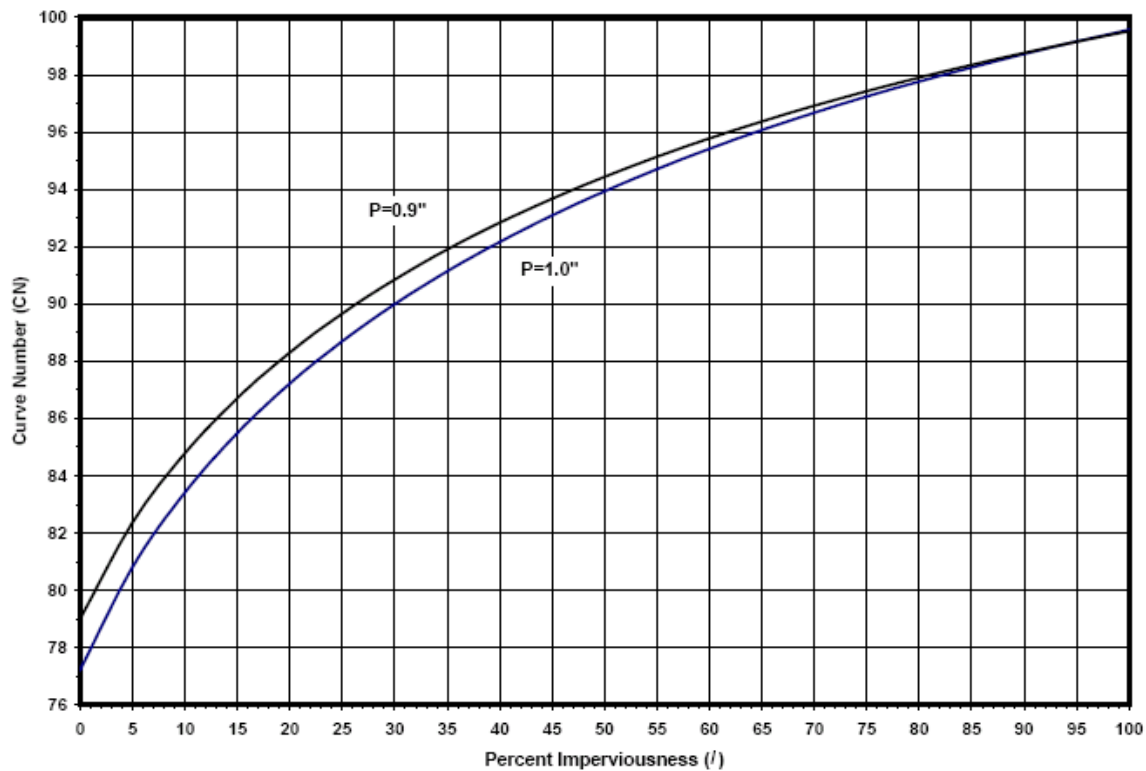
Step 1 - Using the water quality volume, calculate the adjusted CN_{wq} :

$$CN_{wq} = 1000 / [10 + 5P + 10WQ_{vi} - 10(WQ_{vi}^2 + 1.25WQ_{vi}P)^{1/2}]$$

where:

- CN_{wq} = adjusted curve number for water quality flow rate calculation
- P = rainfall in inches (use 1 inch for water quality storm)
- WQ_{vi} = water quality volume in inches = 1.0 inch (R_v)
- R_v = volumetric run-off coefficient
= $0.05 + 0.009(I)$, where I is the percent (%) impervious cover

Graphically:



Step 2 – Calculate the site time of concentration (t_c) and area in acres (A).

Step 3 – Use the adjusted CN_{wq} , t_c and A as input for TR-55 calculations in conjunction with the Huff II rainfall distribution, for 1 inch of rainfall depth using the storm duration that produces the highest peak flow rate to calculate the Q_{wq} .

E. Inspection and Maintenance

The staff of the CDSWM or their designated representative may conduct inspections of the water quality treatment system construction. If required by the City of Connersville the applicant shall execute an *Inspection Services Agreement* with the City of Connersville and pay all applicable inspection fees per the terms stated in the agreement. The applicant must notify the City of Connersville 48 hours in advance of construction of the storm water management system.

Each BMP must have an operation and maintenance plan signed by the BMP Owner and submitted with the SWPPP. The CDSWM must approve the plan. Routine inspection and maintenance is the responsibility of the BMP Owner. The approved maintenance plan and inspection forms provided in this manual may be used in performing maintenance activities. Records of routine inspection are the responsibility of the owner and must be made available upon request of the City of Connersville.

Minimum design criteria, maintenance and inspection checklists and example calculations for each pre-approved BMP are provided as Appendix A of this manual.

CHAPTER 3: POST CONSTRUCTION STORM WATER QUALITY

F. Pre-Approved BMPs

TABLE 1- PRE-APPROVED BMPs

<u>TABLE 1- PRE-APPROVED BMPs</u>			
BMP	Description	80% TSS Removal	Selection Guidelines
Storm Water Pond	Constructed basin with a permanent pool of water in which run-off is captured and treated.	Yes	Minimum 10 acres
Storm Water Wetland	Constructed wetland areas consisting of shallow marsh areas, open water and semi-wet areas above a permanent pool.	Yes	Regional sites Minimum 10 acres
Bioretention Area	Shallow basins or landscaped areas with engineered soils and vegetation and filter strip treatment prior to ponding area.	Yes	0.5 – 2 acres preferred Maximum 5 acres
Water Quality Dry Swale with Pretreatment	Vegetated open channel that captures and treats storm water run-off within dry cells.	Yes	Maximum 5 acres
Sand Filters with Pretreatment	Structure that treats run-off through filtration using a sand bed as the primary filter media. Requires pretreatment due to high clog factor.	Yes	Maximum 2 - 10 acres
Infiltration Trench with Forebay	Trench that captures and treats storm water run-off by allowing it to infiltrate into the ground through aggregate into highly porous underlying soils.	Yes	Maximum 5 acres
Biofilters	Densely vegetated land engineered as pretreatment or as part of a treatment train	No	Used in conjunction with other water quality treatment measures

References:

Georgia Storm Water Management Manual, Volume 2
 Maryland Storm Water Design Manual, Volume II
 Indianapolis Storm Water Specifications Manual

FIGURES

APPENDICES