LEBANON COUNTY

STORMWATER MANAGEMENT ORDINANCE

Ordinance # 50 – 2013

Adopted December 5, 2013

Lebanon County Stormwater Ordinance

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LEBANON COUNTY STORMWATER MANAGEMENT ORDINANCE

Article I

Section 101 - Title

This Ordinance shall be known as the "Lebanon County Stormwater Management Ordinance."

Section 102 - Statement of Findings

A. Inadequate management of accelerated stormwater runoff resulting from development throughout a watershed increases flood flows and velocities, contributes to erosion and sedimentation, overtaxes the carrying capacity of existing streams and storm sewers, greatly increases the cost of public facilities to convey and manage stormwater, undermines floodplain management and flood reduction efforts in upstream and downstream communities, reduces groundwater recharge, threatens public health and safety, and increases non-point source pollution of water resources.

B. A comprehensive program of stormwater management, including reasonable regulation of development and activities causing accelerated runoff, is fundamental to the public health, safety, welfare, and the protection of people of Lebanon County and all of the people of the Commonwealth, their resources, and the environment.

C. Inadequate planning and management of stormwater runoff resulting from land development and redevelopment throughout a watershed can also harm surface water resources by changing the natural hydrologic patterns; accelerating stream flows (which increase scour and erosion of streambeds and stream banks thereby elevating sedimentation); destroying aquatic habitat; and elevating aquatic pollutant concentrations and loadings such as sediments, nutrients, heavy metals and pathogens. Groundwater resources are also impacted through loss of recharge.

D. Stormwater is an important water resource that provides groundwater recharge for water supplies and base flow of streams, which also protects and maintains surface water quality.

E. Reasonable regulation of connections and discharges to municipal separate storm sewer systems is fundamental to the public health, safety and welfare and the protection of people of the Commonwealth, their resources and the environment.

F. Public education on the control of pollution from stormwater is an essential component in successfully addressing stormwater issues.

G. Federal and state regulations require certain municipalities to implement a program of stormwater controls. These municipalities are required to obtain a permit for stormwater

discharges from their separate storm sewer systems under the National Pollutant Discharge Elimination System (NPDES). Permittees are required to enact, implement and enforce a prohibition of non-stormwater discharges to the permittee's regulated small municipal separate storm sewer system (MS4).

H. Non-stormwater discharges to municipal separate storm sewer systems can contribute to pollution of the Waters of the Commonwealth.

Section 103 - Purpose

The purpose of this Ordinance is to promote health, safety and welfare within Lebanon County, by minimizing the harms and maximizing the benefits described in the Statement of Findings (above) through provisions intended to:

A. Meet legal water quality requirements under state law, including regulations at 25 PA Code Chapter 93 to protect, maintain, reclaim, and restore the existing and designated uses of the Waters of the Commonwealth.

B. Manage accelerated runoff and erosion and sedimentation problems close to their source, by regulating activities that cause these problems.

C. Preserve the natural drainage systems to the maximum extent possible.

D. Maintain groundwater recharge, to prevent degradation of surface and groundwater quality, and to otherwise protect water resources.

E. Maintain existing flows and quality of streams and watercourses.

F. Preserve and restore the flood-carrying capacity of streams and prevent scour and erosion of stream banks and streambeds.

G. Manage stormwater impacts close to the runoff source, with a minimum of structures and a maximum use of natural processes.

H. Provide procedures, performance standards, and design criteria for stormwater planning and management.

I. Provide proper operations and maintenance of all temporary and permanent stormwater management facilities and Best Management Facilities (BMPs) that are constructed and implemented.

J. Provide standards to meet the NPDES permit requirements.

K. Implement an "illegal discharge detection and elimination program" within MS-4 permitted urbanized areas to address non-stormwater discharges into municipal separate storm sewer system.

L. Coordinate land development in accordance with the Zoning Ordinance, Subdivision ad Land Development Ordinance, Long Range Transportation Plan, County and Municipal Comprehensive Plans, Watershed Plans, and other plans of the Municipalities and County.

Section 104 – Statutory Authority

A. Primary Authority:
The County of Lebanon is empowered to regulate these activities by the authority of the Act of October 4, 1978, 32 P.S., P.L. 864 (Act 167), 32 P.S. Section 680.1 et seq., as amended, the "Storm Water Management Act."

B. Secondary Authority:
The County of Lebanon is also empowered to assist municipalities in regulating land use activities that affect runoff by the authority of the Act of July 31, 1968, P.L. 805, No. 247, The Pennsylvania Municipalities Planning Code, as amended.

C. All activities related to proper operation and maintenance of approved stormwater management BMPs and all activities that may contribute non-stormwater discharges to a regulated small MS4 are subject to regulation by this Ordinance.

Section 105 – Applicability

This Ordinance shall apply to any regulated activity within all municipalities in Lebanon County who have not adopted municipal stormwater management regulations.

Earth disturbance activities and associated stormwater management controls are also regulated under existing state law and implementing regulations. This Ordinance shall operate in coordination with those parallel requirements. The requirements of this Ordinance shall be no less restrictive in meeting the purposes of this Ordinance than state law.

Section 106 - Repealer

Except as otherwise required by law, this Ordinance is intended as a continuation of, and not a repeal of, existing regulations governing the subject matter. To the extent that this Ordinance restates regulations contained in ordinances previously enacted by the County of Lebanon, this Ordinance shall be considered a restatement and not a repeal of such regulations. It is the specific intent of the County of Lebanon that all provisions of this Ordinance shall be considered in full force and effect as of the date such regulations were initially enacted. All ordinances or parts of ordinances inconsistent with the provisions of this Ordinance are hereby repealed. It is expressly provided that the provisions of this Ordinance shall not affect any act done, contract executed or liability incurred prior to its effective date, or affect any suit or prosecution pending or to be instituted to enforce any rights, rule, regulation or ordinance, or part thereof, or to punish any violation which occurred under any prior stormwater regulation or ordinance. In the event

that any violation has occurred under any stormwater regulation or ordinance of the County of Lebanon, prosecution may be initiated against the alleged offender pursuant to the provisions of said prior stormwater regulation or ordinance, and the provisions and penalties provided in said stormwater regulation or ordinance shall remain effective as to said violation.

Any plan pending at the time of the effective date of this Ordinance shall be allowed to proceed with revisions, finalization and implementation in accordance with any Ordinance in effect prior hereto.

Section 107 – Severability

In the event that a court of competent jurisdiction declares any section(s) or provision(s) of this Ordinance invalid, such decision shall not affect the validity of any of the remaining section(s) or provision(s) of this Ordinance.

Section 108 – Compatibility with Other Ordinance Requirements

Approvals issued and actions taken pursuant to this Ordinance do not relieve the applicant of the responsibility to comply with or to secure required permits or approvals for activities regulated by any other applicable codes, laws, rules, statutes or ordinances. To the extent that this Ordinance imposes more rigorous or stringent requirements for stormwater management, the specific requirements contained in this Ordinance shall be followed. Conflicting provisions in other ordinances or regulations shall be construed to retain the requirements of this Ordinance addressing state water quality requirements.

The degree of stormwater management sought by the provisions of this Ordinance is considered reasonable for regulatory purposes. **When applicable, this ordinance shall be used in conjunction with the Lebanon County Subdivision and Land Development Ordinance.** This Ordinance shall not create liability on the part of the County of Lebanon, any appointed or elected official of the County of Lebanon, the Lebanon County Conservation District or any employee thereof for any erosion, sedimentation or flood damages that result from reliance on this Ordinance or any administrative decision lawfully made there under.

Section 109 – Duty of Persons Engaged in the Development of Land

Notwithstanding any provision(s) of this Ordinance, including exemptions, any landowner or any person engaged in the alteration or development of land which may affect stormwater runoff characteristics shall implement such measures as are reasonably necessary to prevent injury to health, safety, or other property. Such measures also shall include actions as are required to manage the rate, volume, direction, and quality of resulting stormwater runoff in a manner which otherwise adequately protects health, property and water quality.

Section 110 – Other Approvals

Compliance with this Ordinance does not preclude the need to obtain other permits and approvals as may be required by the municipality, the County of Lebanon, the Lebanon County

Conservation District, the Commonwealth of Pennsylvania, the federal government or other agencies. Other permits and approvals may include subdivision and land development plan, zoning permits, building code permits, an erosion and sedimentation pollution control plan, National Pollution Discharge Elimination System permit (NPDES), water obstruction and encroachment permit, dam safety permit, submerged lands license agreement, Section 401 and 404 of the Clean Water Act and others. The most stringent of all pertinent requirements shall apply.

Any permit or authorization issued or approved based on false, misleading or erroneous information provided by an applicant is void without the necessity of any proceedings for revocation. Any work undertaken or use established pursuant to such permit or other authorization is unlawful. No action may be taken by a board, agency or employee of the County purporting to validate such a violation.

Article II - Definitions

For the purpose of this Ordinance, certain terms and words used herein shall be interpreted as follows:

A. Words used in the present tense include the future tense; the singular number includes the plural; and the plural includes the singular; words of masculine gender include feminine gender; and words of feminine gender include masculine gender.

B. The word "includes" or "including" shall not limit the term to the specific example but is intended to extend its meaning to all other instances of like kind and character.

C. The word "person" includes an individual, firm, association, organization, partnership, trust company, corporation, or any other similar entity.

D. The words "shall" and "must" are mandatory; the words "may" and "should" are permissive.

E. The words "used or occupied" include the words "intended, designed, maintained or arranged to be used, occupied or maintained."

F. The words "watershed", "sub-watershed" and "drainage area" are synonymous and refer to the contributing area of interest.

G. Word list. As used in this Ordinance, the following terms shall have the meanings indicated:

Accelerated Erosion – The removal of the surface of the land through the combined action of man's activities and the natural process at a rate greater than would occur because of the natural process alone.

Agricultural Activities – The work of producing crops and raising livestock including tillage, plowing, disking, harrowing, pasturing and installation of conservation measures. Construction of new buildings or impervious area is not considered an agricultural activity.

Alteration – As applied to land, a change in topography as a result of the moving of soil and rock from one location or position to another; the changing of surface conditions by causing the surface to be more or less impervious; land disturbance.

Applicant- A landowner, developer, their heirs, successors or assigns or other person who has filed an application for approval to engage in any Regulated Activities at a project site within the County.

Best Management Practices (BMPs) - Activities, facilities, measures, planning or procedures used to manage stormwater impacts from Regulated Activities, to meet State Water Quality Requirements, to promote groundwater recharge and to otherwise meet the purposes of this Ordinance. Stormwater BMPs are commonly grouped into one of two broad categories or measures: "non-structural" or "structural". "Non-structural" BMPs are measures referred to as operational and/or behavior-related practices that attempt to minimize the contact of pollutants with stormwater runoff whereas "structural" BMPs are measures that consist of a physical device or practice that is installed to capture and treat stormwater runoff. "Structural" BMPs include, but are not limited to, a wide variety of practices and devices, from large-scale wet ponds and constructed wetlands, to small-scale underground treatment systems, infiltration facilities, filter strips, low impact design, bioretention, wet ponds, permeable paving, grassed swales, riparian or forested buffers, sand filters, detention basins, and manufactured devices. "Structural" stormwater BMPs are permanent appurtenances to the project site.

BMP Manual - Shall mean the Pennsylvania Stormwater Best Management Practices Manual as published by the Department of Environmental Protection, Bureau of Watershed Management, document number: 363-0300-002, effective date: December 30, 2006, and as revised.

Baffles – Guides, grids, grating or similar devices placed in a pond to deflect or regulate flow and create a longer flow path.

Base Flood – The flood, also known as the 100-year flood, which has a 1% chance of being equaled or exceeded in any given year; the flood which has been selected to serve as the basis upon which the flood plain management provisions of this and other ordinances have been prepared.

Bioretention – A water quality practice that utilizes landscaping and soils to treat storm water runoff by collecting it in shallow depressions before filtering through a fabricated planting soil media.

Bridge – For the purpose of this ordinance a bridge is defined as a stormwater conveyance structure requiring an effective span or diameter exceeding 6 feet.

Carbonate Geology – Limestone or dolomite bedrock also marble (within graphitic felsic gneiss fm).

Check Dam – An earthen, stone or log structure, used in grass swales to reduce water velocities, promote sediment deposition, and enhance infiltration.

Conservation District – The Lebanon County Conservation District (LCCD). The Lebanon County Conservation District has the authority under a delegation agreement executed with the Pennsylvania Department of Environmental Protection to administer all or a portion of the erosion and sediment control program and construction activities within the political boundaries of Lebanon County, PA.

Commissioners – The governing body of the County of Lebanon.

Commonwealth – The Commonwealth of Pennsylvania.

Construction – The term "construction" shall include the building, reconstruction, extension, expansion, alteration, substantial improvement, or erection or relocation of a building or structure, including manufactured homes, and gas or liquid storage tanks. For floodplain purposes, "new construction" includes structures for which the "start of construction" commenced on or after the effective date of a floodplain management regulation adoption by the municipality.

Conveyance – The ability of a pipe, culvert, swale or other similar facility to carry the peak flow from the design storm.

County – Lebanon County, Pennsylvania.

Culvert – A structure with appurtenant works that carries a stream and/or stormwater runoff under or through an embankment or fill.

Dam – An artificial barrier, together with its appurtenant works, constructed for the purpose of impounding or storing water or another fluid or semi-fluid, or a refuse bank, fill or structure for highway, railroad or other purposes which does or may impound water or another fluid or semi-fluid.

DEP – The Pennsylvania Department of Environmental Protection.

Design Storm – The magnitude and temporal distribution of precipitation from a storm event measured in probability of occurrence (e.g., a 25-year storm) and duration (e.g., 24 hours), used in the design and evaluation of stormwater management systems.

Detention Basin – An impoundment structure designed to manage stormwater runoff by temporarily storing the runoff and releasing it at a pre-determined rate.

Detention Pond – A vegetated pond designed to collect water runoff for a given storm event and release it at a pre-determined rate; also known as a "dry pond."

Detention Volume – The volume of runoff that is captured and released during or after a storm event and released into the Waters of the Commonwealth at a controlled rate.

Developer – A person, partnership, association, corporation, or other entity, or any responsible person therein or agent thereof, that undertakes any Regulated Activity of this Ordinance.

Development – Any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, filling, grading, paving, excavating, earth disturbance activity, mining, dredging or drilling operations, the placement of manufactured homes, streets and other paving, utilities and the subdivision of land.

Disturbed Area – An un-stabilized land area where an earth disturbance activity is occurring or has occurred.

Downslope Property Line – That portion of the property line of the lot, tract, or parcels of land being developed located such that overland or piped flow from the site would be directed toward it.

Drainage Conveyance Facility – A stormwater management facility designed to convey stormwater runoff and shall include streams, channels, swales, pipes, conduits, culverts, storm sewers, etc.

Drainage Easement – A right granted by a landowner to a grantee, allowing the use of private land for stormwater management, drainage, or conveyance purposes.

Earth Disturbance Activity – A construction or other human activity which disturbs the surface of the land, including, but not limited to, clearing and grubbing, grading, excavations, embankments, land development, mineral extraction, and the moving, depositing, stockpiling, or storing of soil, rock or earth materials.

Energy Dissipater – A device used to slow the velocity of stormwater particularly at points of concentrated discharge such as pipe outlets.

Engineer, County – A Registered Engineer designated by the Commissioners to perform duties as required by this Ordinance on behalf of the County.

Erosion – The natural process by which the surface of the land is worn away by water, wind or chemical action.

Erosion and Sedimentation Pollution Control Plan – A site specific plan consisting of both drawings and narrative that identifies BMPs that minimize accelerated erosion and sedimentation before, during and after earth disturbance activities.

Extended Detention – A stormwater design feature that provides for the gradual release of a volume of water in order to increase settling of pollutants and protect downstream channels from frequent storm events.

Excavation – Any act by which earth, sand, gravel, rock or any other similar material is dug into, cut, quarried, uncovered, removed, displaced, relocated or bulldozed. It shall include the conditions resulting there from.

Exceptional Value Waters – Surface waters of high quality, which satisfies PA Code title 25 Environmental Protection, Chapter 93 Water Quality Standards 93.4b(b) (relating to anti-degradation).

Existing Conditions – All existing pervious land cover shall be considered as "meadow" unless the natural land cover is documented to generate lower Curve Numbers or Rational "C" Coefficients, such as forested lands.

FEMA – the Federal Emergency Management Agency.

Fill – Any act by which earth, sand, gravel, rock or any other material is placed, pushed, dumped, pulled, transported or moved to a new location above the natural surface of the ground or on top of the stripped surface and shall include the conditions resulting there from; the difference in elevation between a point on the original ground and a designated point of higher elevation on the final grade; the material used to make fill.

Filter Strip – A strip of permanent vegetation above ponds, diversions and other structures to retard the flow of runoff, causing deposition of transported material, thereby reducing sedimentation.

Flood Fringe – The remaining portions of the one hundred (100) year floodplain outside of the floodway boundary.

Floodplain – Any land susceptible to inundation by water from any natural source or delineated by applicable Department of Housing and Urban Development, Federal Insurance Administration Flood Hazard Boundary – mapped as being a special flood hazard area. Included are lands adjoining a river or stream that have been or may be inundated by a 100-year flood. Also included are areas that comprise Group 13 soils, as listed in Appendix A of the Pennsylvania Department of Environmental Protection (PADEP) Technical Manual for Sewage Enforcement Officers (as amended or replaced from time to time by PADEP).

Floodway – The channel of watercourse and those portions of the adjoining floodplains that are reasonably required to carry and discharge the 100-year frequency flood. Unless otherwise specified, the boundary of the floodway is as indicated on maps and flood insurance studies provided by FEMA. In an area where no FEMA maps or studies have defined the boundary of the 100-year frequency floodway, it is assumed - absent evidence to the contrary – that the floodway extends from the stream to 50 feet from the top of the bank of the stream.

Freeboard – A vertical distance between the elevation of the design high water and the top of a dam, levee, tank, basin, or diversion ridge. The space is required as a safety margin in a pond or basin.

Forest Management / Timber Operations – Planning and activities necessary for the management of forest land. These include timber inventory and preparation of forest management plans, silvicultural treatment, cutting budgets, logging road design and construction, timber harvesting, site preparation and reforestation.

Governing Body – Lebanon County Commissioners; the council in the cities and boroughs; the board of commissioners in townships of the first class; and the board of supervisors in the townships of the second class.

Grade – A reference plane, usually of the road, channel or natural ground specified in percent and shown on plans as specified herein.

Grading – The act of moving earth. Changing of the earth surface by excavation or fill.

(To) Grade – To finish surface of a roadbed, top of embankment or bottom of excavation.

Grassed Waterway – A natural or constructed waterway, usually broad and shallow, covered with erosion-resistant grasses, often used to conduct surface water from cropland.

Groundwater Recharge – Replenishment of existing natural underground water supplies.

High Quality Waters – Surface waters having quality, which exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water by satisfying PA Code Title 25 Environmental Protection, Chapter 93 Water Quality Standards 93.4b(a).

Hydrograph – a graph showing the rate of flow (discharge) versus time past a specific point in a river or other channel or conduit carrying flow, or to a point of interest. The rate of flow is typically expressed in cubic meters or cubic feet per second (cms or cfs).

Hydrologic Soil Group (HSG) – A classification of soils by the Natural Resources Conservation Service into one of four HSG classifications (A, B, C, and D) according to their minimum infiltration rate, which is obtained for bare soil after prolonged wetting. The Natural Resources Conservation Service (NRCS) of the US Department of Agriculture defines the four groups and provides a list of most of the soils in the United States and their group classification. The soils in the area of interest may be identified from a soil survey report generated by the use of the NRCS Web Soil Survey at http://websoilsurvey.nrcs.usda.gov. Soils become less pervious as the HSG varies from A to D.

Impervious Surface (Impervious Area) – A surface that prevents the infiltration of water into the ground. Impervious surfaces (or areas) shall include, but are not limited to: roofs, additional indoor living spaces, patios, garages, storage sheds and similar structures, streets, sidewalks and vehicle and pedestrian areas that are gravel and crushed stone. Any surface area proposed to initially be gravel, crushed stone or paving shall be assumed to be impervious. Pervious paving shall be considered as an impervious surface for runoff management and storage calculations. In addition, other areas determined by the Lebanon County Engineer to be impervious within the meaning of this definition shall also be considered as contributing to total impervious cover.

Impoundment – A retention or detention basin designed to retain stormwater runoff and release it at a controlled rate.

Improvements – Physical additions and changes to the land, necessary to produce usable and desirable lots.

Infiltration Structures – A structure designed to direct runoff into the ground (e.g., French drains, seepage pits, seepage trench, bio-infiltration facilities, etc…)

Inlet – A surface connection to a closed drain. A structure at the diversion of a conduit. The upstream end of any structure through which water may flow.

Karst – A type of topography or landscape characterized by surface depressions, sinkholes, rock pinnacles/uneven bedrock surface, steep-sided hills, underground drainage and caves. Karst is formed on carbonate rocks, such as limestone, dolomites, marble and sometimes gypsum.

Land Development – Any of the following activities:

A. The improvement of one lot or two or more contiguous lots, tracts or parcels of land for any purpose involving:

1. A group of two or more residential or nonresidential buildings, whether proposed initially or cumulatively, or a single nonresidential building on a lot or lots regardless of the number of occupants or tenure; or

2. The division or allocation of land or space, whether initially or cumulatively, between or among two or more existing or prospective occupants by means of, or for the purpose of streets, common areas, leaseholds, condominiums, building groups or other features.

B. A subdivision of land.

C. Development in accordance with Section 503(1.1) of the PA Municipalities Planning Code.

Landowner – the legal or beneficial owner or owners of land including the holder of an option or contract to purchase (whether or not such option or contract is subject to any condition), a lessee if he is authorized under the lease to exercise the rights of the landowner, or other person having a proprietary interest in land.

Level Spreader – A level structural device providing a smooth stable surface such as concrete or similar non-degradable material which effectively distributes stormwater uniformly over the ground surface as sheet flow to prevent concentrated, erosive flows and promote infiltration.

Licensed Professional – Professional engineers, landscape architects, geologists and land surveyors licensed to practice within the Commonwealth of Pennsylvania.

Limit of Disturbance – A line provided on the Erosion and Sediment Control and Storm Water Management Site Plan that indicates the total area to be disturbed during a proposed earth disturbance activity.

Manning's Equation (Manning's Formula) – A method for calculation of velocity of flow (e.g., feet per second) and flow rate (e.g., cubic feet per second) in open channels based upon channel shape, roughness, depth of flow and slope. "Open channels" may include closed conduits so long as the flow is not under pressure.

Minimum Separation – The minimum distance between the discharge or runoff from impervious surfaces and the receiving stream, storm sewer or property line, whichever is smaller, whether the discharge is point or nonpoint discharge. It is intended to provide ample, natural undisturbed vegetated pervious areas to allow for the infiltration of increased volumes of runoff.

Municipality – City, Borough or Township.

National Pollutant Discharge Elimination System (NPDES) – The national system for the issuance of permits under section 402 of the Federal Clean Water Act (33 u.s.c.a. 1342) including a state or interstate program which has been approved in whole or in part by the Environmental Protection Agency, including the regulations codified in chapter 92 (relating to NPDES permitting, monitoring and compliance), and as specified in Title 25, chapter 102.

NPDES permit for stormwater discharges associated with construction activities – A permit required for the discharge or potential discharge of stormwater into waters of the commonwealth from construction activities, including clearing and grubbing, grading and excavation activities involving 1 acre or more of earth disturbance activity or an earth disturbance activity on any portion, part, or during any stage of, a larger common plan of development or sale that involves 1 acre or more of earth disturbance activity over the life of the project.

Natural Drainage Flow – The pattern of surface and stormwater drainage from a particular site before construction or installation of improvements or prior to any re-grading.

NOAA Atlas 14: -Precipitation-Frequency Atlas of the United States, Atlas 14, Volume 2, US Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, Hydrometeorological Design Study Center, Silver Spring, Maryland (2004). NOAA's Atlas 14 can be accessed at Internet address: http://hdsc.nws.noaa.gov/hdsc/pfds/.

Non-point Source Pollution - Pollution that enters a water body from diffuse origins in the watershed and does not result from discernible, confined, or discrete conveyances.

NRCS -Natural Resources Conservation Service (previously Soil Conservation Service (SCS)).

On-Site Stormwater Management – The control of runoff to allow water falling on a given site to be absorbed or retained on site to the extent that after development the peak rate of discharge leaving the site does not exceed the allowable rate as directed by this ordinance.

Open Channel – A drainage element in which stormwater flows with an open surface. Open channels include, but shall not be limited to, natural and man-made drainageways, swales, streams, ditches, canals and pipes flowing partly full.

Outfall - (i) Point where water flows from a conduit, stream, or drain: (ii) "Point Source" as described in 40 CFR § 122.2 at the point where the municipality's sewer system discharges to surface Waters of the Commonwealth.

Outlet – Points of water disposal from a stormwater conveyance system, stream, river, lake, tidewater or artificial drain.

PADEP – The Pennsylvania Department of Environmental Protection.

Parent Tract – All contiguous land held in single and separate ownership, regardless whether (i) such land is divided into one or more lots, parcels, purports or tracts; (ii) such land was acquired by the landowner at different times or by different deeds, devise, partition or otherwise; or (iii) such land is bisected by public or private streets or right-of-way, which was held by the landowner or his predecessor in title on the effective date of this Ordinance.

Parking Lot Storage – Involves the use of impervious or semi-impervious parking areas as temporary impounds with controlled release rates during rainstorms.

Peak Discharge – The maximum rate of stormwater runoff from a specific storm event.

PennDOT – The Pennsylvania Department of Transportation

Pennsylvania Municipalities Planning Code – Adopted as Act 247 of 1968, this act enables municipalities to plan for, and regulate community development with subdivision and land development ordinances. The code also contains guidelines for subdivision and land development ordinance content. For the purpose of this ordinance, the Code is referred to as "Act 247," and is intended to include the current code and any further amendments thereto.

Person – An individual, partnership, public or private association or corporation, or a governmental unit, public utility or any other legal entity whatsoever which is recognized by law as the subject of rights and duties.

Pervious Area – Any area not defined as impervious.

Pipe – A culvert, closed conduit, or similar structure (including appurtenances) that conveys stormwater.

Point Source - Any discernible, confined, or discrete conveyance, including, but not limited to: any pipe, ditch, channel, tunnel, or conduit from which stormwater is or may be discharged, as defined in State regulations at PA Code Title 25, § 92.1.

Project Site – The specific area of land where any regulated activities are planned, conducted, or maintained.

Pollutant – Any contaminant or other alteration of the physical, chemical, biological or radiological integrity of surface water which causes or has the potential to cause pollution as defined in section 1 of the Clean Streams Law (35 P.S., 691.1- 691.1001).

Pollution – Contamination of any surface waters such as will create or is likely to create a nuisance or render such waters harmful, detrimental or injurious to public health, safety or welfare, or to domestic, municipal, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wild animals, birds, fish or other aquatic life, including but not limited to such contamination by alteration of the physical, chemical or biological properties of such waters or change in temperature, taste, color or odor thereof, or the discharge of any liquid, gaseous, radioactive, solid or other substances into such waters.

Qualified Professional – Any person licensed by the Pennsylvania Department of State or otherwise qualified by law to perform the work required by the Ordinance.

Rational Formula - A rainfall-runoff relation used to estimate peak flow.

Recharge Volume – The portion of the water quality volume used to maintain groundwater recharge rates at development sites.

Redevelopment – Earth disturbance activities on land, which has previously been developed.

Regulated Activities – Any earth disturbance activities or any activities that involve the alteration or development of land in a manner that may affect stormwater runoff and activities that may contribute non-stormwater runoff discharges to a regulated small MS4. "Regulated Activities" include, but are not limited to, the following listed items:

A. Earth Disturbance Activities
B. Land Development
C. Subdivision
D. Construction of new or additional impervious or semi-impervious surfaces
E. Construction of new buildings or additions to existing buildings
F. Diversion or piping of any natural or man-made stream channel
G. Installation of new or modification of existing stormwater management facilities or appurtenances thereto
H. Installation of new or modification of existing stormwater BMPs
I. Changes in soil absorption caused by compaction during development or timber harvesting
J. Redirection or concentration of runoff to adjoining properties, as it relates to properties regulated under this ordinance.
K. Modification in contours, including filling and/or draining of low areas, as it relates to properties regulated under this ordinance.

Regulated Earth Disturbance Activity – Activity involving earth disturbance subject to regulation under PA Code Title 25, 92, 25 PA Code 102, or the Clean Streams Law.

Release Rate – The percentage, or event criteria of the pre-development peak rate of runoff from a site or subwatershed area to which the post-development peak rate of runoff must be reduced to protect downstream areas.

Retention Basin – A pond containing a permanent pool of water designed and/or constructed to store water runoff for a given storm event and release it at a predetermined rate.

Retention Volume/Removed Runoff – The volume of runoff that is captured and not released directly into the surface Waters of the Commonwealth during or after a storm event.

Return Period – The average interval, in years, within which a storm event of a given magnitude can be expected to recur. For example, the probability of a 25-year storm occurring in any one given year is 0.04 (i.e. a 4% chance).

Riparian Buffer – A permanent vegetated area bordering surface waters, that serves as a protective filter to help protect streams and wetlands from impacts of adjacent land uses.

Riser – A vertical structure extending from the bottom of a pond that is used to control the discharge rate from the pond for a specified design storm.

Rooftop Detention – Temporary ponding and gradual release of stormwater falling directly onto flat roof surfaces by incorporating controlled-flow roof drains into building designs.

Runoff – Any part of precipitation that flows over the land surface.

Runoff Capture Volume – The volume of runoff that is captured (retained) and not released into surface Waters of the Commonwealth during or after a storm event.

Sediment – Soils or other erodible materials transported by stormwater as a product of erosion.

Sediment Basin – An impoundment being used to remove sediment from stormwater runoff.

Sediment Pollution – The placement, discharge or any other introduction of sediment into the Waters of the Commonwealth occurring from the failure to design, construct, implement, or maintain control measures and control facilities in accordance with the requirements of this Ordinance.

Sedimentation – The process by which mineral or organic matter is accumulated or deposited by the movement of air or water.

Seepage Pit/Seepage Trench – An area of excavated earth filled with loose stone or similar course material, into which water is directed for infiltration into the ground.

Separate Storm Sewer System – A conveyance or system of conveyances (including roads with drainage systems, Municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) primarily used for collecting and conveying stormwater runoff.

Shallow Concentrated Flow – Runoff pattern following sheet flow, prior to open channel flow.

Sheet Flow – Runoff flow that occurs overland in places where there are no defined channels, the flood water spreads out over a large area at a uniform depth. This also referred to as overland flow.

Site Improvements – Physical additions or changes to the land that may be necessary to provide usable and desirable lots, including but not limited to, utilities, streets, curbing, sidewalks, street lights and stormwater facilities.

Slope – Deviation of any surface from horizontal. For engineering purposes, slopes are usually expressed in a percentage based upon vertical difference in feet per 100 feet of horizontal distance.

Soil Cover Complex Method – A method of runoff computation developed by the NRCS that is based on relating soil type and land use/cover to a runoff parameter called Curve Number (CN).

Soil Stabilization – The chemical or structural treatment of a mass of soil to increase or maintain its stability or otherwise to improve its engineering properties.

Spillway (Emergency) – A depression in the embankment of a pond or basin, or other overflow structure, that is used to pass peak discharges greater than the maximum design storm controlled by the pond or basin.

Stabilization – The proper placing, grading, constructing, reinforcing, lining and covering of soil, rock or earth to ensure its resistance to erosion, sliding or other movement.

State Water Quality Requirements – The regulatory requirements to protect, maintain, reclaim, and restore water quality under Title 25 of the Pennsylvania Code and the Clean Streams Law – including, but not limited to:

A. Each stream segment in Pennsylvania has a "designated use," such as "cold water fishery" or "potable water supply," which is listed in Chapter 93. These uses must be protected and maintained, under state regulations.

B. "Existing uses" are those attained as of November 1975, regardless whether they have been designated in Chapter 93. Earth disturbance activities must be designed to protect and maintain existing uses and maintain the level of water quality necessary to protect those uses in all streams, and to protect and maintain water quality in special protection streams.

C. Water quality involves the chemical, biological, and physical characteristics of surface water bodies. After earth disturbance activities are complete, these characteristics can be impacted by addition of pollutants such as sediment, and changes in habitat through increased flow volumes and/or rates as a result of changes in land surface area from those

activities. Therefore, permanent discharges to surface waters must be managed to protect the stream bank, stream bed, and structural integrity of the waterway, to prevent these impacts.

D. Protection and maintenance of water quality in special protection streams pursuant to PA Code Title 25 Chapter 93.

Storage Indication Method - A reservoir routing procedure based on solution of the continuity equation (inflow minus outflow equals the change in storage) with outflow defined as a function of storage volume and depth.

Storm Frequency – The number of times that a given storm "event" occurs or is exceeded on the average in a stated period of years.

Storm Sewer – A system of pipes and/or open channels that convey intercepted runoff and stormwater from other sources, but excludes domestic sewage and industrial wastes.

Stormwater – Runoff from precipitation, snowmelt, surface runoff and drainage.

Stormwater Detention – Any storm drainage technique that retards or detains runoff, such as detention or retention basins, parking lot storage, rooftop storage, porous pavement, dry wells or any combination thereof.

Stormwater Detention Basin – A vegetated pond designed to drain completely after storing runoff only for a given storm event and release it at a predetermined rate; also known as a "dry pond."

Stormwater Management – The control of runoff to allow water falling on a given site to be absorbed or retained on site to the extent that after development the peak rate discharge leaving the site does not exceed the allowable rate based on conditions prior to development.

Stormwater Management District – A watershed or subwatershed area for which separate storm water management regulations or criteria have been established.

Stormwater Management Facilities (SWM BMPs) – A system designed to handle stormwater runoff, and where required, delay the peak discharge long enough to minimize the potential for downstream flooding. Any structure, natural or man-made, that, due to its condition, design, or construction; conveys, stores, or otherwise affects stormwater runoff. Typical stormwater management facilities include, but are not limited to: detention basins, wet ponds, open channels, storm sewers, pipes and infiltration facilities.

Stormwater Management Plan – A plan for managing storm water runoff on a watershed-wide basis, in accordance with the guidelines of Act 167, the Pennsylvania Stormwater Management Act.

Stormwater Management (SWM) Site Plan – The plan prepared by a qualified professional indicating how storm water runoff will be managed at the particular site of interest according to this Ordinance.

Stream – A watercourse. A channel or conveyance of surface water having defined bed and banks, whether natural or artificial, with perennial or intermittent flow.

Stream Bank Stabilization – A collection of vegetative and/or mechanical means for stabilizing stream banks to minimize, prevent or abate degradation.

Stream Enclosure – A bridge, culvert, or other structure in excess of 100 feet in length upstream to downstream, which encloses regulated Waters of the Commonwealth.

Subwatershed Area – The smallest drainage unit of a watershed for which stormwater management criteria has been established.

Subdivision – The division or redivision of a lot, tract or parcel of land by any means into two or more lots, tracts, parcels or other divisions of land including changes in existing lot lines for the purpose, whether immediate or future, of lease, partition of the court for distribution to heirs or devisees, transfer of ownership or building or lot development; provided, however, that the subdivision by lease of land for agricultural purposes into parcels of more than 10 acres, not involving any new street or easement of access, or any residential dwelling, shall be exempted.

Surface Waters – Perennial and intermittent streams, rivers, lakes, reservoirs, ponds, wetlands, springs, natural seeps and estuaries, excluding water in facilities approved for wastewater treatment such as wastewater treatment impoundments, cooling water ponds and constructed wetlands used as part of a wastewater treatment process.

Swale – A low-lying stretch of land that gathers or carries surface water runoff. A watercourse without defined bed and bank.

Time of Concentration (Tc) – The time for surface water runoff to travel from the hydraulically most distant point of the watershed to a point of interest within the watershed. This time is the combined total of overland flow time and flow time in pipes or channels, if any.

Topography – A general term that includes the characteristics of the ground surface such as hills, plains, mountains, degree of relief, steepness of slope and physiographic features. The configuration of a surface area showing relative elevations.

Topsoil – Acceptable friable loam that is free of subsoil, clay lumps, brush, roots, weeds, other objectionable vegetation, stones, other foreign material larger than 2" in any dimension, litter, and/or other material unsuitable or harmful to plant growth.

Undeveloped Land – Any lot which has not been graded or in any other manner prepared for the construction of a building.

USDA – The United States Department of Agriculture.

Vegetative Cover – Such cover shall consist of trees, shrubs, flowers, grass or similar natural cover.

Watercourse – A channel or conveyance of surface water, having defined bed and banks, whether natural or artificial, with perennial or intermittent flow.

Waters of the Commonwealth – Rivers, streams, creeks, rivulets, impoundments, ditches, watercourses, storm sewers, lakes, dammed water, wetlands, ponds, springs and other bodies or channels of conveyance of surface and underground water, or parts thereof, whether natural or artificial, within or on the boundaries of the Commonwealth of Pennsylvania.

Water Pollution – The addition of pollutants to water in concentrations or in sufficient quantities to result in measurable degradation of water quality.

Water Quality Volume – The total volume of water runoff that is required to be collected and treated for water quality control by direction to BMP facilities.

Water Table – The upper surface of groundwater, or that level below which the soil is seasonally saturated with water.

Watershed – Region or area drained by a river, watercourse, or other surface water, whether natural or artificial. Also synonymous with "sub-watershed" and "drainage area" referring to local drainage area of interest for site specific calculations.

Wetland – Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs and similar areas. (The term includes but is not limited to wetland areas listed in the State Water Plan, the United States Forest Service Wetlands Inventory of Pennsylvania, the Pennsylvania Coastal Zone Management Plan and a wetland area designated by a river basin commission. Wetlands include all lands regulated as wetlands by PA Department of Environmental Protection or the U.S. Army Corps of Engineers. In the event there is a conflict between the definitions of these agencies, the more restrictive definition applies).

Article III - STORM WATER MANAGEMENT AND DESIGN CRITERIA

Section 301 - Scope

A storm water management site plan shall be required for each subdivision, land development and Regulated Activity, unless exempted by Section 402. The storm water management site plan shall demonstrate effective control of storm water runoff and compliance with the storm water management requirements, standards and design criteria of this Ordinance. The storm water management site plan shall be an integral part of each subdivision and land development plan at the preliminary and final plan stage. For the purposes of this Section of the Ordinance, the following activities are defined as Regulated Activities and shall be considered as land development (in addition to subdivision and land development) for regulation by this Ordinance:

A. Construction of new or additional impervious or semi-pervious surfaces (driveways, parking lots, etc.); and

B. Construction of new buildings or additions to existing buildings; and

C. Diversion or piping of any natural or man-made stream channel; and

D. Installation of storm water management facilities or appurtenances thereto.

E. Alteration of conditions that may increase or alter natural drainage from the existing site.

Additionally, subdivisions, land developments and regulated activities shall be in compliance with all Storm Water Management Plans within Lebanon County watersheds, including the Tulpehocken Creek, Cocalico Creek and other adopted watershed plans.

Section 302 - General Requirements

A. For all regulated earth disturbance activities, erosion and sediment control BMPs shall be designed, implemented, operated, and maintained during the regulated earth disturbance activities (e.g., during construction) to meet the purposes and requirements of this Ordinance and to meet all requirements under Title 25 of the Pennsylvania Code and the Clean Streams Law. Various BMPs and their design standards are listed in the *Erosion and Sediment Pollution Control Program Manual* (E&S Manual)2, No. 363-2134-008 (April 15, 2000), as amended and updated.

B. On parcels regulated under this ordinance, stormwater flows onto adjacent property shall not be created, increased, decreased, relocated, or otherwise altered without written notification of the adjacent property owner(s) by the developer, and concurrence by the adjacent property owner. Such stormwater flows shall be subject to the requirements of this Ordinance.

C. Stormwater drainage systems shall be provided in order to permit unimpeded flow along natural watercourses, except as modified by SWM BMPs or open channels consistent with this Ordinance.

D. If diffused flow is proposed to be concentrated and discharged onto adjacent property with permission from the receiving property owner, the Developer must document that adequate downstream conveyance facilities exist to safely transport the concentrated discharge, or otherwise prove that no erosion, sedimentation, flooding or other harm will result from the concentrated discharge and downstream easements shall be established to provide drainage paths for concentrated discharge. Maximum use shall be made of the existing on-site natural and man-made stormwater management facilities.

E. For all regulated activities, SWM BMPs shall be implemented, operated, and maintained to meet the purposes and requirements of this Ordinance and to meet all requirements under Title 25 of the Pennsylvania Code, the Clean Streams Law, and the Stormwater Management Act.

F. Various BMPs and their design standards are listed in the Pennsylvania Stormwater Best Management Practices Manual (BMP Manual).

G. For all regulated activities, unless preparation of an SWM Site Plan is specifically exempted in Section 402:

1. Preparation and implementation of an approved SWM Site Plan is required.

2. No regulated activities shall commence until Lebanon County issues written approval of an SWM Site Plan, which demonstrates compliance with the requirements of this Ordinance.

3. The County Engineer shall determine if a SWM Site Plan is required or if a SWM Site Plan exemption is warranted.

H. SWM Site Plans approved by Lebanon County shall be on site throughout the duration of the regulated activity.

I. The County may, after consultation with DEP, approve measures for meeting the state water quality requirements other than those in this Ordinance, provided that they meet the minimum requirements of, and do not conflict with, state law including, but not limited to, the Clean Streams Law.

J. Impervious areas:

1. The measurement of impervious areas shall include all of the impervious areas in the total proposed development even if development is to take place in phases.

2. For development taking place in phases, the entire development plan must be used in determining conformance with this Ordinance.

3. For projects that add impervious area to a parcel, the total impervious area on the parcel is subject to the requirements of this Ordinance; except that the volume controls in Section 311 and the peak rate controls of Section 313 do not need to be applied to existing impervious areas that are not being altered by the proposed regulated activity.

4. In all drainage areas where disturbance is taking place and new impervious surface is added, up to 50% of the existing impervious area may be utilized in the pre-development coverage calculation.

5. The anticipated flooded surface area occurring within the site shall be considered as impervious.

K. All regulated activities shall include such measures as necessary to:

1. Protect health, safety, and property;

2. Meet the water quality goals of this Ordinance by implementing measures to:

a. Minimize disturbance to floodplains, wetlands, and wooded areas.

b. Maintain or extend riparian buffers.

c. Avoid erosive flow conditions in natural flow pathways.

d. Minimize thermal impacts to waters of the Commonwealth.

e. Disconnect impervious surfaces by directing runoff to pervious areas, wherever possible.

f. To the maximum extent practicable, incorporate the techniques for Low Impact Development Practices described in the BMP Manual.

L. The design of all facilities over karst geology shall include an evaluation of measures to minimize adverse effects, such as sinkholes and groundwater contamination.

M. Infiltration BMPs should be spread out, made as shallow as practicable, and located to maximize use of natural on-site infiltration features while still meeting the other requirements of this Ordinance.

N. Normally dry, open top, storage facilities should completely drain both the volume control and rate control capacities over a period of time not less than 24 and not more than 72 hours from the end of the design storm.

O. Those proposing Regulated Activities which do not fall under the exemption criteria provided in Section 402, shall submit a SWM Site Plan, consistent with this Ordinance,

to the Lebanon County Planning Department for review. In applying the exemption criteria set forth in Section 402, the total proposed development is to be calculated, even if the development is to take place in phases. For the purposes of the exemption, impervious surface shall include, but not be limited to, any roof, parking or driveway areas and any new streets and sidewalks. Any areas designed to be gravel or crushed stone shall be assumed to be impervious for the purposes of the exemption criteria in Section 402.

P. Any stormwater management facilities regulated by this Ordinance that would be located in or adjacent to waters of the Commonwealth or wetlands shall be subject to approval by DEP through the Joint Permit Application process, or, where deemed appropriate by DEP, the General Permit process. When there is a question whether wetlands may be involved, it is the responsibility of the Developer or his agent to show that the land in question cannot be classified as wetlands, otherwise approval to work in the area must be obtained from DEP. A wetlands report, prepared by a qualified professional, shall be submitted whenever wetlands are disturbed.

Q. Roof drains shall not be connected to streets, sanitary or storm sewers or roadside ditches to promote overland flow and infiltration/percolation of stormwater. When it is more advantageous to connect directly to streets or storm sewers, then it shall be permitted on a case by case basis by Lebanon County.

R. Stormwater management facilities, which involve a State Highway, shall be subject to the approval of PennDOT.

S. Minimization of impervious surfaces and infiltration of runoff through seepage beds, infiltration trenches, etc. are encouraged, where soil conditions permit, to reduce the size or eliminate the need for detention facilities.

T. Where a development site is traversed by watercourses other than permanent streams, drainage easements shall be provided conforming to the line of such watercourses. The terms of the easement shall prohibit excavation, the placing of fill or structures, and any alterations that may adversely affect the flow of stormwater within any portion of the easement. Also, maintenance, including mowing of vegetation within the easement shall be required, except as approved by the appropriate governing authority.

U. The PA Code, Title 25, Chapter 105, Rules and Regulations, apply to the construction, modification, operation or maintenance of both existing and proposed water obstructions and encroachments throughout the watershed, including work in wetlands. Inquiries on permit requirements or other concerns shall be addressed to the DEP, Bureau of Waterways Engineering in Harrisburg. Mailing Address: PA Department of Environmental Protection, Bureau of Waterways Engineering, PO Box 8460, Harrisburg, PA 17105-8460. Site Address: 400 Market Street, 3rd Floor Rachel Carson State Office Building, Harrisburg, PA 17101.

V. When it can be shown that, due to topographic conditions, natural drainageways on the site cannot adequately provide for drainage, open channels may be constructed

conforming substantially to the line and grade of such natural drainageways. Work within natural drainageways shall be subject to approval by DEP through the Joint Permit Application process, or, where deemed appropriate by DEP, through the General Permit process.

W. Stormwater resulting from Regulated Activities shall not be discharged into sinkholes.

X. To the maximum extent practicable, incorporate the techniques for Low Impact Development Practices described in the BMP Manual[1]

Section 303 - Storm Water Management Districts

Lebanon County is divided into storm water management districts to facilitate control of storm water runoff appropriately for the watershed, instead of individual site-specific design. Therefore, Lebanon County has developed separate standards and design criteria for each studied watershed or subwatershed, as recommended by Act 167, the Pennsylvania Storm Water Management Act and developed within the individual watershed plans. Storm Water management districts are illustrated within the Appendix and are listed as follows:

- Tulpehocken A
- Tulpehocken B-1
- Tulpehocken B-2
- Cocalico
- Lebanon County Residual

Implementation of the district provisions shall be subject to the following:

A. Post development rates of runoff from any subdivision, land development or regulated activity shall meet the peak release rates of runoff prior to development that are specified within the Design Criteria and Calculation Methodology.

B. The boundaries of the storm water management districts are shown on the maps within the Appendix. A large scale master map of the districts is on file in the Planning Department. Where the district boundary is in question, a landowner or developer may request a determination from the Planning Department by submitting a request, accompanied by the property owner's name, property size, municipality and Lebanon County Geographic Information System Parcel Identification Number (G-PIN).

C. When a proposed development site is within two (2) or more storm water management districts, the design shall be prepared by district so that peak discharge rates for each district shall be satisfied in accordance with item #1 above. Storm water runoff should not be transferred from one watershed or sub-watershed to another. If a transfer cannot be avoided, the peak discharge limits of the receiving watershed district shall be satisfied in accordance with item #1 above.

D. Additional storm water management districts may be established as watershed studies are completed. Upon adoption of those watershed plans by the Lebanon County Commissioners and/or Municipalities and State Agencies, the applicable design criteria within the watershed plans shall be satisfied by developers of the affected land.

E. Off-Site Areas - Off-site Areas that drain through a proposed development site are not subject to release rate criteria when determining allowable peak runoff rates. However, on-site drainage facilities shall be designed to safely convey off-site flows through the development site for the 100 year event.

F. Site Areas - Where the site area to be impacted by a proposed development activity differs significantly from the total site area, only the proposed impact area utilizing stormwater management measures shall be subject to the Management District Criteria. In other words, un-impacted areas bypassing the stormwater management facilities would not be subject to the Management District Criteria.

G. Adequate erosion protection shall be provided along all open channels, and at all points of discharge.

Section 304 - Storm Water Management Performance Standards and Design Criteria

Storm water management planning and storm water management facilities shall be designed and constructed in accordance with the following:

A. General Standards

1. The design of all storm water management facilities shall incorporate sound engineering principles and practices.

2. All storm water runoff flowing over the development site shall be considered in the design of the storm water management facilities.

3. Runoff from impervious areas shall be drained to pervious areas of the development site and the storm water management control facilities.

4. Storm water runoff from a development site shall flow directly into a natural watercourse, into an existing storm sewer system or onto adjacent properties in a manner similar to the runoff characteristics of the pre-development flow.

5. A concentrated discharge of storm water to an adjacent property shall be within an existing watercourse or storm sewer system and enclosed within an easement. All discharges must be to stable areas or conveyances. If the existing waterway or drainage system is not stable, a design must be proposed that when implemented, will ensure a stable conveyance. Downstream easements are required to be established to provide drainage paths for concentrated discharge. Design and construction shall preclude erosion, sedimentation, flooding or similar damage.

6. Where a development site is traversed by watercourses, drainage easements shall be provided conforming to the line of such watercourses. The terms of the easement shall prohibit excavation, the placing of fill or structures, and any alterations that may adversely affect the flow of storm water within any portion of the easement. Also, maintenance, including mowing of vegetation within the easement shall be required, except within BMP areas where mowing is not desired. The drainage easement shall adequately contain the anticipated inundation associated with the identified 100 year floodplain, or be depicted fifty (50) feet from the top of the channel bank for undefined floodplain areas.

7. When it can be shown that, due to topographic conditions, natural drainageways on the site cannot adequately provide for drainage, open channels may be constructed conforming substantially to the line and grade of such natural drainageways. Work within natural drainageways shall be subject to approval by PADEP through the Chapter 105 Permit process, or, where deemed appropriate by PADEP, through the General Permit process.

8. Any storm water management facilities regulated by this Ordinance that would be located in or adjacent to waters of the Commonwealth or wetlands shall be subject to approval by PADEP, through the Joint Permit Application process, or, where deemed appropriate by PADEP, the General Permit process. When there is a question whether wetlands may be involved, it is the responsibility of the Developer or his agent to show that the land in question cannot be classified as wetlands; otherwise approval to work in the area must be obtained from PADEP.

9. Any storm water management facilities regulated by this Ordinance that would discharge to State highway rights-of-way shall be subject to approval by the Pennsylvania Department of Transportation (PennDOT). Storm water detention basins, retention basins, infiltration basins and similar structures shall maintain a ten (10) foot isolation from PennDOT right-of-way.

10. Minimization of impervious surfaces and infiltration of runoff through infiltration beds, infiltration trenches, etc. is encouraged, where soil conditions permit, to reduce the size or eliminate the need for detention facilities.

11. Roof drains shall not be connected to streets, sanitary or storm sewers or roadside ditches so as to promote overland flow and infiltration/percolation of storm water where advantageous to do so. When it is more advantageous to connect directly to streets or storm sewers, then it shall be permitted on a case by case basis, based upon adequate justification to be provided by the applicant.

12. Storm water management facilities and discharges shall not be located within sinkhole prone areas of carbonate geology, including areas containing sinkholes, closed depressions, fractured limestone traces and limestone rock outcrops.

13. Storm water facilities that are not located within a street right-of-way shall be centered within an adequate easement of no less than twenty (20) feet in width. Easements shall follow property lines where possible and are to be provided with metes and bounds descriptions that tie to known points and shall close on individual lots.

14. A variety of methods for storm water detention and retention are available for use. These include surface detention, subsurface detention, use of existing facilities (ponds, etc.) or a combination thereof. Subsurface detention shall be utilized only where the subsurface is stable, the area is not prone to sinkhole formation, and all underground pipes are sealed to prevent leaks.

15. Storage of equivalent storm water runoff for a portion of a property may be considered in lieu of storage of generated runoff provided:

    a. The site is located so that it is physically impossible to detain runoff from the proposed facilities or drainage problems exist upgrade that would impact upon the site or downgrade properties.

    b. The impact of generated runoff discharging off site from the subdivision or land development is determined by the County Engineer to be negligible and not detrimental to adjacent properties.

    c. Implementation of equivalent storage shall be determined applicable and feasible by the County Engineer.

16. Storm sewer pipes, culverts, manholes, inlets, endwalls, endsections, and other storm water management facilities shall be designed and constructed in accordance with the requirements of the Pennsylvania Department of Transporation, Design Manual Part 2 Highway Design, Publication 13, including amendments thereto, unless specifications are otherwise provided herein. Structures and their installation within or directly connected to existing or intended public right-of-ways shall conform to the current PennDOT Pub 72M, Roadway Construction Standards.

17. Headwalls and endwalls shall be used where storm water runoff enters or leaves the storm sewer horizontally from a natural or manmade channel. PENNDOT Type "DW" headwalls and endwalls shall be utilized. Galvanized metal end sections are also acceptable, but polyethylene flared end sections are prohibited. All headwalls and endwalls and flared end sections with pipes of 12 inch or greater diameter shall be protected from child entry by placing removable stainless steel bars (and compatible mounting hardware), spaced four inches (4") apart across the opening.

Section 305 - Retention and Detention Basins

Any stormwater management facility designed to store stormwater runoff and requiring a berm or earthen embankment (i.e., detention or retention basin) shall be designed to provide an emergency spillway to handle the 100-year post-development peak flow rate tributary to the basin. The use of inlets and pipes are prohibited for the emergency spillway. Storm water runoff from existing natural swales and/or other existing drainage conveyors shall not be directed towards or intercepted by the storm water management facilities. The height of embankment must be set as to provide a minimum 1.0-foot of freeboard above the maximum pool elevation computed when the entire 100-year peak flow rate to the structure passes through the spillway. Rain gardens, with a maximum water depth of 12 inches, shall be exempt from this requirement; however, conveyance of the 100-year peak discharge must be shown to be conveyed in a stable condition. The criteria for design and construction of stormwater management facilities are not the same criteria that are used in the permitting of dams under the DEP Dam Safety Program. Depending upon the physical characteristics of a dam, a dam permit may be required and the design will have to meet the provisions of PA Code, Title 25, Chapter 105. Depending on the physical characteristics of a dam, the design could require that anywhere from a 100-year to a Probable Maximum Flood (PMF) storm event be considered. Retention and detention basins shall be designed and constructed according to the following minimum standards:

A. The maximum water depth to the base of the emergency spillway shall not exceed six (6) feet in residential areas. Depths up to eight (8) feet are permitted in non-residential projects, provided minimum six (6) foot high fencing is provided when depths exceed six (6) feet.

B. The minimum top width of dams shall be five (5) feet for impoundments draining five (5) acres or less and eight (8) feet minimum width for impoundments with drainage areas of or exceeding five (5) acres.

C. The side slopes of earth fill dams shall not be less than three (3) horizontal to one (1) vertical on both sides of the embankment. However, any portion of the inside berm of an unfenced basin above a proposed water depth of three (3) feet shall have a side slope of five (5) horizontal to one (1) vertical or flatter. All pond areas, including bottoms of non-water quality ponds, side slopes and top of berms, shall be provided with a minimum 4 inches of topsoil and shall be mulched and seeded with formula B in accordance with PennDOT publication 408, section 804. All areas to receive topsoil should be scarified 12 inches deep before topsoil placement.

D. All basins shall be structurally sound and shall be constructed of sound and durable materials. The completed structure and the foundation of all basins shall be stable under all probable conditions of operation. An emergency spillway shall be provided for the basin and shall be capable of discharging the 100-year peak rate of runoff which enters the basin after development, in a manner which will not damage the integrity of the facility and will not create a downstream hazard. Where practical, the emergency spillway shall be constructed in undisturbed ground. An easement for inspection and

repair shall be provided when the conveyance structure crosses property boundaries. Downstream drainage easements from the emergency spillway may be required.

E. A cutoff or key trench of impervious material shall be provided under all basin berms.

F. All discharge control devices with appurtenances (except discharge pipes) shall be made of reinforced concrete and stainless or hot dip galvanized steel. Bolts/fasteners are to be stainless or galvanized steel. Discharge pipes shall conform to the requirements of Section 306.

G. Concrete, polyethelyne or welded galvanized steel anti-seep collars compatible with the discharge pipe shall be placed around all basin discharge pipes to increase the seepage length along the pipe by 15% within the saturated zone of the pipe based on a 4:1 phreatic line. The connection of the anti-seep collar to the discharge pipe shall be completely watertight.

H. Basin principal spillway outlet structures shall consist of stainless steel orifice plates (and mounting hardware), galvanized or reinforced concrete riser and discharge pipe, and welded structural steel inlet grates (with a bituminous coating). Smooth lined corrugated polyethylene pipe may be used for discharge piping. The use of PVC pipe is prohibited for basin discharge piping except for small applications. Principle spillways with riser pipes where the designed water depth is deeper than 0.4 times the diameter of the riser, shall have an anti-vortex device to prevent reduced capacity of the riser.

   (Example, if the top of an 18" riser is 100.00, the riser shall have an anti-vortex device if the water is higher than 100.00 + [(18 * 0.4)/12] = 100.60). Materials used for design shall be specified on the plans.

I. All pipes and culverts through dams shall have properly spaced cutoff collars or anti-seep collars.

J. Minimum floor elevations for all structures that would be affected by a basin or storm conveyance system shall be two (2) feet above the 100-year water surface elevation.

K. An emergency spillway shall be provided to safely pass the peak flow rate of the incoming one hundred year storm, with one (1) foot of freeboard between the maximum pool elevation and the top of the embankment. The maximum pool elevation shall be established using the weir equation through the spillway while ignoring discharge flows from the principal spillway and storage volume within the basin. Routing calculations for rate control structures discharging to the ground surface shall ignore exfiltration or infiltration discharges from the structure.

L. Except for retention basins, permanent ponds and wetlands, all basins shall have dewatering features such as low flow channels or tile fields. Low flow channels shall be provided with reinforced matting extending two feet beyond the channel. All detention basins shall include an outlet structure designed to completely drain the basin within

twenty-four (24) hours following the end of the design rainfall. However, basins containing ground water recharge and/or water quality storage shall include an outlet structure designed to fully drain the recharge and/or water quality volume in no less than twenty-four (24) hours or more than seventy-two (72) hours.

M. Basin discharges to proposed or existing conveyance systems shall require evidence of adequate capacity in the receiving facility.

N. The minimum slope of any detention basin bottom surface shall be two percent (2%) positive grade toward the outlet, along all flow paths except those basins specifically designed to provide infiltration of storm water in conformance with the Water Quality standards of this Ordinance.

O. Detention basin length or basin flow path length shall be at least two (2) times the basin width to facilitate water treatment and infiltration.

P. In areas of carbonate geology, retention and detention basins shall:

1. Be placed at least one hundred (100) feet from the rim of any sinkhole or closed depression; and

2. Be placed a minimum of twenty-five (25) feet from rock outcroppings or pinnacles; and

3. Not discharge into a sinkhole; and

4. Be designed and located to prevent ground water contamination and sinkhole formation, including the use of impermeable liners where deemed necessary to avoid or abate such problems. The construction of clay liners shall conform to the minimum requirements included in the Appendix.

5. Be constructed under the supervision of a professional engineer or professional geologist licensed by the Commonwealth. A professionally sealed as-built construction report, and plan including relative dates, name(s) of contractor(s), methods of construction, and verification of conformance to plan specifications and good engineering practices shall be provided to the Lebanon County Planning Department prior to bond reduction requests related to the basin(s).

Q. Basins shall not be divided by a property line.

R. Vertical pipes, inlets, and other surface water receiving structures shall be installed with trash racks.

Section 306 - Pipes and Conveyance Facilities

Pipes, curbs, gutters, manholes, inlets, headwalls, endwalls, streets, and other storm water conveyance facilities shall be designed and constructed in accordance with the following:

A. Pipes

1. Pipe trenching and backfilling shall be in accordance with the requirements of the Pennsylvania Department of Transportation, Publication 408 and Roadway Construction Drawings, current edition, unless manufacturer's specifications and the County Engineer authorize alternative procedures.

2. Pipe sizes and type shall be in accordance with the approved drawings. Minimum pipe size for drainage facilities to be dedicated for municipal ownership shall be fifteen (15) inches in diameter and the type shall be corrugated galvanized metal pipe (CMP), smooth lined high density polyethylene pipe (HDPEP), reinforced concrete pipe (RCP) or approved equivalent.

3. Pipes shall be constructed and set to line and grade as shown on approved drawings. All pipes shall be laid on straight runs between drainage structures.

4. Pipes shall be provided with a minimum of twelve (12) inches of cover from the top of pipe barrel to bottom of base course. In unpaved areas, one (1) foot of cover is required to the finished grade.

5. Backfilling shall be to four (4) feet above the top of the proposed pipe elevation or to subgrade, whichever is less, before excavating for the pipe. Additionally, hauling shall not be permitted over pipe with less than four (4) feet of cover.

6. All pipe outlets shall be discharged to natural or manmade waterways and shall be provided with reinforced concrete headwalls or pipe end sections. Pipe outlets shall also be provided with an erosion resistant material or energy dissipators to calm the anticipated velocity and discharge of storm water.

7. Underdrains, pavement base drains, or combination storm sewer and underdrains shall be provided at low points, cut sections, poorly drained areas and other areas which, in the opinion of the County Engineer, are required to provide adequate subsurface drainage to protect the integrity of the street.

8. All storm sewers which cross a street shall be perpendicular to the street centerline or within thirty degrees (30°) of perpendicular. Vertical and horizontal isolation conflicts with other utilities shall be avoided. Storm sewers within a street shall not cross underneath a curb, especially at curb radii locations.

9. A concentrated discharge of stormwater to an adjacent property shall be within an existing watercourse or otherwise an easement shall be required. Pipe outlets shall

also be provided with erosion resistant material or energy dissipaters to calm the anticipated velocity and discharge of stormwater.

Section 307 - Inlets and Manholes

A. Inlet tops shall be precast concrete top units conforming to the Pennsylvania Department of Transportation, Publication 408, current edition, and as detailed on the Roadway Construction Standards RC-45M drawings providing an eight (8) inch curb reveal from the gutter grade point. Type "C" inlets with 10" hoods that provide a 2" sump condition may be used with approval from the County Engineer. The maximum allowable spread of water shall be one-half (1/2) of a through travel lane. Design calculations are required to document the capacity and spacing. Inlets shall be analyzed for collection efficiency and bypass flows from upstream structures shall be accounted for in inlet spacing design. The efficiency of storm inlets shall be supported with calculations based on the FHWA HEC-22. Yard inlets and other non-dedicated inlets may be designed with alternative components, subject to County Engineer approval.

B. All inlets over four (4) feet in depth shall be provided with steps for accessibility. Inlets shall be placed along the curb line, gutter line, or edge of paving.

C. All inlets in paved areas shall have bicycle safe grates.

D. All inlets shall be constructed with concrete flow channels cast in-place in the bottom of each inlet, except in municipalities where inlet sump areas are preferred.

E. Inlets and manholes shall not be spaced more than four hundred (400) feet apart. Manholes or inlets are required at all points of horizontal or vertical deflection.

Section 308 - Catch Basin Markings

All new catch basins located in street right-of-way must be marked with high performance preformed thermoplastic markings. Two layer combination with blue/white contrast. Bottom thermoplastic is blue with top layer white. Markings to say "NO DUMPING!" on the first line and "INTO STORM DRAIN" on the second line. Specify Pre-mark® PLUS storm drain marking, or equal. Size shall be twenty-nine (29) inches by five (5) inches.

Section 309 - Channels

All channels shall be lined with adequate channel lining material, regardless of the designed velocity or shear stress. Maximum permitted channel velocities are:

A. Three feet (3') per second where only sparse vegetation can be established.

B. Four feet (4') per second under normal conditions where vegetation is to be established by seeding or sodding.

C. Velocities may not exceed four feet (4) per second for newly constructed grass channels, unless appropriately designed and approved by the Lebanon County Conservation District.

D. For lined water carrying channels, the following velocities are permitted:

1. Minimum Six-inch (6") rock riprap up to 6 f.p.s.
2. Minimum Nine-inch (9") rock riprap up to 8 f.p.s.
3. Asphalt – up to 7 f.p.s.
4. Durable bedrock – up to 8 f.p.s.
5. Twelve-inch (12") riprap – up to 9 f.p.s.
6. Concrete or steel – up to 12 f.p.s.
7. The normal maximum velocity of open channel flows shall not exceed 10 f.p.s.

E. The following conditions shall be met for all swales:

1. Swales shall be designed using Manning's equation. Vegetated swales shall be designed based upon accepted "n" factors for the anticipated degree of vegetative retardance. The maximum allowable velocity for an established grass swale is four (4) feet per second.

2. The "n" factors to be used for paved or rip-rap swales or gutters shall be based upon accepted engineering design practices as approved by the County Engineer.

3. Swale side slopes shall be 2:1 minimum. Side slopes for grass covered swales which will be mowed shall be 3:1 minimum.

4. All swales shall be designed to concentrate low flows to minimize siltation and meandering.

5. All vegetated swales shall have a minimum slope of one (1) percent unless approved by the County Engineer.

6. Swales shall be centered within a minimum twenty-foot (20') wide easement.

Section 310 - Streets

A. All streets shall be so designed to provide for the discharge of surface water from their rights-of-way.

B. The slope of the crown on proposed streets shall be ¼ of an inch per foot. Slope of the centerline grade shall be at least 1.00%. On curbed streets, the right-of-way beyond the street shall be sloped toward the street at ¼ of an inch per foot.

C. Adequate facilities shall be provided at low points along streets and where necessary to intercept runoff.

D. Pipes and basin outlets shall not discharge directly onto or be conveyed onto a public street.

E. The maximum allowable spread of water on proposed streets shall be one-half (1/2) of a through travel lane or one (1) inch less than the curb depth, whichever is less.

F. Driveway intersections with streets shall be designed so that street flows are not diverted onto driveways.

G. Water flows across street intersections shall not exceed one (1) inch in depth.

H. Stormwater roof drains, sump pumps, and pipes, shall not directly discharge water into a street right-of-way or discharge into a sanitary sewer or storm sewer.

Section 311 - Volume Reduction Requirements (Groundwater Recharge)

A. Provisions for stormwater volume reductions are required for areas being developed. Design of the Stormwater BMPs shall give consideration to providing ground water recharge to compensate for the reduction in the percolation that occurs when the ground surface is paved and roofed over. These ground water recharge measures are required wherever feasible. Soils used for the construction of basins shall have low-erodibility factors ("K"factors).

B. The low impact development practices provided in the Pennsylvania Stormwater BMP Manual shall be utilized for all regulated activities to the maximum extent practicable. Water volume controls shall be implemented using the *Design Storm Method* in Subsection 1 or the *Alternate Method* in Subsection 2 below.

   1. The *Design Storm Method* (CG-1 in the Pennsylvania Stormwater BMP Manual[1]) is applicable to any size of regulated activity. See Appendix for CG-1 Worksheets 1-5, which shall be used to perform the required calculations. This method requires detailed modeling based on site conditions.

a. Do not increase the post-development total runoff volume to surface waters of the Commonwealth for all storms equal to or less than the 2-year 24-hour duration precipitation.

b. For modeling purposes:

i. Existing (pre-development) non-forested pervious areas must be considered meadow in good condition.

ii. 50% of existing impervious area, when present, shall be considered meadow in good condition in the model for existing conditions.

c. If site conditions prevent total removal of the 2-year volume increase to surface waters of the Commonwealth after all feasible BMP options are considered, the *Alternate Method* shall be applied (see subsection 2 below).

2. The *Alternate Method* provided below should only be used where the volume control requirements of the *Design Storm Method* are not attainable. See the Appendix for Worksheets 7 & 8, which shall be used to perform the required calculations.

a. Stormwater facilities shall capture at least the first 2 inches of runoff from all new impervious surfaces.

b. At least the 1-first inch of runoff from new impervious surfaces shall be permanently removed from the runoff flow (i.e. it shall not be released into the surface waters of this Commonwealth). Removal options include reuse, evaporation, transpiration, and infiltration.

c. Wherever possible, infiltration facilities should be designed to accommodate infiltration of the entire permanently removed runoff; however, in all cases at least the first one-half (1/2) inch of the permanently removed runoff should be infiltrated.

3. Stormwater Calculation Process (as outlined in the PADEP Pennsylvania Stormwater Management Best management Practices Manual, current version).

a. Stormwater Calculation Process - Non-structural BMPs.

- Step 1: Provide General Site information (Worksheet 1).

- Step 2: Identify sensitive natural resources, and if applicable, identify which areas will be protected (Worksheet 2).

- Step 3: Incorporate Non-structural BMPs into the stormwater design. Quantify the volume benefits of Non-structural BMPs (Worksheet 3).

Proceed to *Design Storm Method.*

b. ***For Design Storm Method:***

- Step 4: Estimate the increased volume of runoff for the 2-year storm event, using the Soil Cover Complex Curve Number method. **Combining Curve Numbers for land areas proposed for development with Curve Numbers for areas unaffected by the proposed development into a single weighted curve number is NOT acceptable.** Runoff volume should be calculated based on land use and soil types (Worksheet 4).

- Step 5: Design and incorporate Structural and Non-Structural BMPs that provide volume control for the 2-year volume increase indicated on Worksheet 4. Provide calculations and documentation to support the volume estimate provided by BMPs. For Non-structural BMPs, provide Nonstructural BMP checklists to demonstrate that BMPs are appropriate. Indicate the volume reduction provided by BMPs (Worksheet 5). *Note: if the designer is unable to incorporate the 2-year volume increase after all feasible BMP options have been considered, the designer proceeds to the Alternate Method described below.*

- Step 6: Provide detailed routing analysis to demonstrate peak rate control for the 1-year through 100-year storm events. This routing should consider the benefits of BMPs. Provide additional detention capacity if needed. *Note: there are no exemptions from the peak rate analysis except as permitted under Section 402.*

Proceed to Water Quality Calculations (Step 7), See Section 312

c. **For *Alternate Method*:**

- Step 4: Capture the first 2 inches of runoff from all contributing impervious surfaces. The first 1-inch of runoff should be permanently removed and not be released to the Surface Waters of the Commonwealth. The other 1inch of runoff should be detained. Compute Runoff Volumes using Worksheet 7.

- Step 5: Design and incorporate Structural and Non-Structural BMPs that provide permanent removal for the PRV and extended detention. The removal options for PRV include reuse, evaporation, transpiration, and infiltration. Infiltration for the first 0.5 inch is encouraged. Documentation to support the computations for volumes can be provided using Worksheet 8. For Non-structural BMPs, checklists can be used to demonstrate that selected BMPs are appropriate. Indicate the volume reduction provided by BMPs on Worksheet 8.

- Step 6: Provide detailed routing analysis to demonstrate peak rate control for the 1-year through 100-year storm events. This routing should consider the benefits of BMPs. *Note: there are no exemptions from the peak rate analysis except as permitted under §402.*

Proceed to Water Quality Calculations (Step 7), See Section 312.

4. To comply with subsections 1 or 2 above, the land developer MAY submit original and innovative designs to the County Engineer for review and approval. Such designs may achieve the objectives through a combination of BMPs.

C. Infiltration BMPs shall meet the following minimum requirements:

1. Infiltration BMPs intended to receive runoff from developed areas shall be selected based on suitability of soils and site conditions and shall be constructed on soils that have the following characteristics:

   a. A minimum depth of 24 inches between the bottom of the facility and the seasonal high water table and/or bedrock (limiting zones).

   b. An infiltration and/or percolation rate sufficient to accept the additional stormwater load and drain completely as determined by field tests conducted by the developer's/landowner's professional designer.

      i. The recharge volume provided at the site shall be directed to the most permeable hydrologic soil group (HSG) available.

      ii. The recharge facility shall be capable of completely infiltrating the impounded water within 72 hours subsequent to any storm event.

D. A detailed soils evaluation of the project site shall be performed to determine the suitability of recharge facilities. The evaluation shall be performed by a qualified professional, and at a minimum, address soil permeability, depth to bedrock, susceptibility to sinkhole formation, and subgrade stability. The general process for designing the infiltration BMP shall be:

1. Analyze hydrologic soil groups as well as natural and man-made features within watershed to determine general areas of suitability for infiltration practices.

2. Provide field test(s) to determine appropriate percolation rate and/or hydraulic conductivity.

3. Design infiltration structure for required storm volume based on field determined capacity at the level of the proposed infiltration surface.

E. Extreme caution shall be exercised where infiltration is proposed in geologically susceptible areas such as limestone areas. Extreme caution shall also be exercised where salt or chloride would be a pollutant since soils do little to filter this pollutant and it may contaminate the groundwater. It is also extremely important that the design professional evaluate the possibility of groundwater contamination from the proposed infiltration/recharge facility and recommend a hydrogeologic justification study be performed if necessary. Whenever a SWM BMP will be located in an area underlain by

limestone, a geological evaluation of the proposed location shall be conducted to determine susceptibility to sinkhole formations. The design of all SWM BMPs over limestone formations shall include measures to prevent ground water contamination and, where necessary, instability resulting from sinkhole formation. The County may require the installation of an impermeable liner in SWM basins. A detailed hydrogeologic investigation may be required by the County.

The County may require the developer to provide safeguards against groundwater contamination for uses which may cause groundwater contamination, should there be a mishap or spill.

It shall be the developer's responsibility to verify if the site is underlain by limestone. The following note shall be attached to all SWM Site Plans and signed and sealed by the developer's engineer/surveyor/landscape architect/geologist:

_____, certify that the proposed detention basin (circle one) is/is not underlain by limestone.

F. If the developer's professional consultant can prove through analysis that the development site is located in an area underlain by carbonate geology, and such geologic conditions would likely result in sinkhole formations, then the site may be exempted from groundwater recharge requirements. However, the development site shall be required to meet all other hydrologic and water quality management standards as mandated by this Ordinance.

G. Where pervious pavement is proposed for parking lots, recreational facilities, non-dedicated streets, or other areas, pavement construction specifications shall be noted on the plan.

H. Recharge/infiltration facilities may be used in conjunction with other innovative or traditional BMPs, stormwater control facilities, and nonstructural stormwater management alternatives.

Section 312 - Water Quality Requirements

A. Water Quality Calculations:

- Step 7: Determine if the stormwater management design complies with either the Design Storm Method or the Alternate Method. If volume compliance is achieved under either of these methods, proceed to Step 8. If compliance is not achieved, proceed to Step 10.

- Step 8: Determine if at least 90% of the disturbed site area is controlled by a BMP (maximum disturbed, uncontrolled area of 10%). To be considered "controlled" by a BMP, the disturbed area must either drain to a structural BMP (or series of BMPs) or be off-set by a preventive BMP, such as reduced imperviousness or landscape

restoration. If at least 90% of the disturbed area is controlled, proceed to Step 9; else proceed to Step 11.

- Step 9: Total Suspended Solids (TSS) and Total Phosphorus (TP) requirements are considered met. Demonstrate use of specific nitrate prevention/reduction BMPs (Worksheet 10 in Appendix G). If the required BMPs (2 primary or 4 secondary or 1 primary and 2 secondary) are proposed within the stormwater management plan, then the water quality requirement for nitrate is achieved. If the required BMPs are not proposed, proceed to Step 10.

- Step 10: If volume control is not met using either the Design Storm Method or Alternate Method, demonstrate use of specific BMPs for pollutant prevention. Worksheet 11 in Appendix G.

- Step 11: Estimate pollutant load from disturbed areas of the site, excluding preventive measures (if proposed). Worksheet 12 in Appendix G.

- Step 12: Calculate pollutant load reductions with the proposed structural BMPs. Worksheet 13 in Appendix G. If target load reductions are achieved for TSS, TP, and nitrate, then the water quality requirements are met.

Section 313 - Calculation Methodology

Storm Water runoff calculations for all development sites and regulated activities shall be calculated in accordance with the following computation methodologies:

Accepted Calculation Methods

Method	Applicability
Soil Cover Complex Method (formerly SCS)	Acceptable for all watersheds Preferred for watersheds > 10 acres and for use with detention basin routings
Rational Method	Acceptable for small watersheds and residential underground absorption systems (See Storm Event Criteria below). Recommended for watersheds < 10 acres
TR-20, USDA Soil Conservation Service	Acceptable for all watersheds, especially where full hydrologic computer model is desired
HEC-1 U.S. Army Corps of Engineers	Acceptable for all watersheds, especially where full hydrologic computer model is desired

Selection of the method of calculation by the design professional shall be based upon the limitations and suitability of each method for the development site. The County Engineer should be consulted for method alternatives and applicability.

A. Storm Event Criteria

All runoff calculations shall be completed in accordance with the standard guidelines for the selected method of calculation.

Rational Method - The PennDOT Storm Intensity-Duration-Frequency Chart provided in the Appendix shall be used. Where stormwater runoff hydrographs are produced using the Rational Method, the provided storage volume shall be verified with a critical duration analysis that investigates similar storm occurrences with extended durations and applicable intensities to determine the anticipated maximum elevation to occur in the storage facility for each required storm event.

Soil Cover Complex Method - The Soil Conservation Service Type II, 24-hour rainfall distribution shall be used in conjunction with the rainfall depths from NOAA Atlas 14 or consistent with the following table.

Established twenty-four (24) hour rainfall depths
for the various storm events throughout Lebanon County are:

	Inches of Rainfall within District		
Design Storm Frequency in Years	Tulpehocken Creek	Cocalico Creek	Remainder of Lebanon County
1 Year	2.40	2.5	2.5
2 Years	3.00	3.1	3.0
5 Years	3.60	4.1	4.0
10 Years	4.56	5.0	4.8
25 Years	5.52	5.5	5.3
50 Years	6.48	6.2	6.0
100 Years	7.44	7.0	6.7

1. Storm Water Runoff Control Criteria

Storm Water Management shall be accomplished by controlling post development runoff rates to pre development runoff rates for the storm events listed as follows:

	Pre Development Design Storm			
Post Development Design Storm	Tulpehocken Creek Dist. A	Tulpehocken Creek Dist. B1&2	Cocalico Creek	Remainder of Lebanon County
2 Year	1 Year	1 Year	Post Development	1 Year
5 Year	5 Year	2 Year	shall be 50% or	2 Year
10 Year	10 Year	5 Year	less of the Pre	5 Year
25 Year	25 Year	10 Year	Development Rate	25 Year
100 Year	100 Year	100 Year	for all storm events	100 Year

2. Assumptions and Criteria

a. Runoff calculations shall include a hydrologic and hydraulic analysis indicating volume and velocities of flow and the grades, sizes, and capacities of water carrying structures, sediment basins, retention and detention structures and sufficient design information to construct such facilities. Runoff calculations shall also indicate both pre-development and post-development rates for peak discharge of storm water runoff from the development site.

b. All pre-development calculations, unless in woodland, shall be based upon the assumption of meadow in good hydrologic condition. Wooded areas shall utilize forest/woodland cover coefficients. Where the site contains existing impervious surface, up to 50% of the impervious area may be considered as an existing pre-development condition. Runoff coefficients and curve numbers shall be selected from the tables in the appendix.

i. Drainage areas tributary to sinkholes or closed depressions shall be excluded from the modeled analysis defining predevelopment flows. If left undisturbed during construction, activities areas draining to closed depressions may also be removed from peak runoff rates and post development analysis. New additional contributing runoff shall not be directed to existing sinkholes or closed depressions.

c. Runoff calculations for the pre- and post- development comparison shall evaluate all storm water events listed within the storm water runoff control criteria Section 313(3).

d. Post development analysis shall consider open areas of possible water impoundments receiving rainfall (such as detention basins, rain garden, etc.) to

have an impervious cover area of the maximum surface storage area of the water surface correlating to the storm event of interest.

e. Design of storm water facilities shall be verified by routing the storm event hydrographs through the facilities using the Storage Indication Method. Routings of Rational Method hydrographs shall determine the critical duration corresponding to the highest peak water surface elevation in the detention facility based on extended runoff inflows for each control storm event, or consist of a methodology approved by the County Engineer. The combination of Rational Method hydrographs based on timing shall be prohibited.

f. Pre and Post Development time-of-concentration paths shall be delineated on topographic mapping with the end and beginning of segments clearly identified as well as the lengths and corresponding end elevations used for each segment. The post-development time-of-concentration shall never be greater than the pre-development time-of-concentration for any watershed or subwatershed. Times of concentration shall be based upon the following:

   i. The maximum length of overland sheet flow shall be one hundred (100) feet before shallow concentrated or open channel flow develops and shall be justified using the methodology presented in Chapter 3 of the NRCS Technical Release 55 (TR-55) to include the following. For pre-development conditions, the sheet flow Manning's n value of 0.24 (dense grasses), 0.40 (woods light underbrush) and 0.80 (woods dense underbrush) shall be used. For post development sheet flow over proposed mowed areas the Manning's n value shall be 0.15. All other Manning's n assignments shall follow generally accepted standards.

   ii. Travel time for shallow concentrated flows shall utilize the NRCS Methodology using the Velocity Factor Kv (NEH-4 Figure 15.2) in feet/sec.; 20.3 (paved), 16.1 (unpaved), 15.0 (grassed waterway), 7.0 (short grass), 5.0 (woodland) and 2.5 (woodland with heavy litter)
   The travel time is calculated as $Tt = L/V$ and $V = Kv*S^{1/2}$
   Where Tt = travel time (sec), L = length (ft), V = Velocity (ft/sec), Kv = applicable factor, and S = path slope (ft/ft).

   iii. Overland flows which are concentrated within field depressions, swales, gutters, curbs or pipe collection systems shall be designed using Manning's Equation for time of concentration criteria for open channel conditions between these design points using acceptable Manning's n values.

g. Storm sewer pipes, culverts, gutters, inlets, outlets and swales shall be designed and constructed in accordance with the standards of the PADot Design Manual, Part 2, Highway Design (latest edition), including the following requirements:

Facility	Minimum Post Development Peak Discharge Requirement
Pipes, Gutters and Swales	Ten (10) Year Storm
Culverts and Cross Drains	Twenty-five (25) Year Storm
Bridges and Stream Crossings	One hundred (100) Year Storm

All stormwater collection facilities shall investigate and account for bypass scenarios.

Conveyance of the 100-year storm event in a safe manner with acceptable hydraulic elevations shall be verified for all systems that:

- may affect improvements such as buildings (etc).
- all drainage areas directed to storm water facilities used for post rate management

Swales shall be designed utilizing Manning's Equation to insure adequate capacity, control of velocity and swale stability. Calculations shall support swale stability for initial conditions (prior to established vegetation) and long term conditions for the required peak flow rate. Vegetated swales shall have a minimum longitudinal slope of one percent (1%) and maximum side slopes of 3 to 1, unless specifically designed as a BMP structure. Culvert design shall investigate, at a minimum, inlet, barrel and outlet control conditions.

3. Calculation Process

A general procedure recommended for site evaluation and storm water design is as follows:

a. Evaluate factors influencing storm water runoff, with a goal of limiting earth disturbance, minimizing grading, and reducing or dispersing impervious surfaces.

b. Satisfy the Volume Control requirements (See Sect. 311).

c. Meet water quality (BMP) standards, preferably with BMPs near the source of the runoff (See Sect. 312).

d. Calculate and satisfy peak runoff objective, considering all measures other than detention basins.

e. Size detention basins accordingly.

f. Demonstrate compliance with predevelopment hydrograph requirements.

Section 314 - Best Management Practices

A. Goals and Objectives

1. Preserve existing natural features, especially those which store, infiltrate or filter water runoff.

2. Infiltrate rainfall to recharge the ground water table.

3. Use physical (structural) and biological or vegetative (non-structural) filtration of water runoff to reduce pollutants and remove sediment.

4. Moderate water runoff velocities to minimize erosion and damage to downstream aquatic habitat.

5. Integrate BMPs into the site layout to perform a water quality function and compliment the developed use of the site.

6. Enhance site aesthetics through the use of a variety of BMP techniques and components.

7. Maximize collection and treatment of small storm event (first flush) storm water runoff which contains the highest concentration of pollutants.

8. Utilize a system of BMP facilities and ground water recharge devices throughout the site.

B. General Standards

1. Water quality shall be maintained through the requirement for BMP design components for all subdivisions, land developments and regulated activities within Lebanon County, except where other provisions of this Ordinance provide for plan or storm water design exemptions. Also exempted are minor subdivisions such as lot additions, lot revisions, division of existing buildings and other plans where no new construction or development is proposed. Revision or expansion projects requiring land development approval with storm water design shall include measures to retrofit the site with BMPs to maintain or improve the water quality of the storm water discharges.

2. The required Volume Control, specified elsewhere herein, shall be detained and treated within BMPs for all areas of the site to be developed.

3. Site designs shall minimize earth disturbance and the generation of storm water runoff while maximizing pervious areas for treatment of storm water.

4. All BMPs shall be sized to capture the required control volume, designed according to the BMP criteria within this Ordinance, constructed properly and maintained regularly.

5. Storm water runoff which is directly discharged to wetlands, streams, ponds, High Quality or Exceptional Value Watersheds or which originates from land uses or activities with higher potential for pollutant loadings (such as auto salvage yards, vehicle service areas, loading/unloading areas, truck centers, etc.) may require the use of additional or specific structural BMPs for pollution prevention and maintenance of water temperatures and quality.

6. Place BMPs near the source of storm water runoff and treat runoff from impervious surfaces before mixing with runoff from less contaminated sources.

7. Use native vegetation and water tolerant plants. Trees and shrubs shall not be planted on storm water facility embankments or in other areas where roots may endanger pipes, headwalls, endwalls, spillway structures or other structural facilities.

8. All impervious area runoff shall be directed to BMPs. The Volume Control shall be provided within each watershed or sub watershed to provide the intended treatment for upstream runoff. Volume Control credit will not be allowed toward non-contributing runoff areas.

9. BMP categories used within these regulations are 1) Ponds 2) Wetlands 3) Infiltration Systems 4) Filtering Systems, and 5) Open Channels. The Design Criteria subsection listed hereafter provides specific descriptions of the BMPs within these classifications. Where effectiveness can be demonstrated, alternative BMP designs and concepts may be utilized.

10. Site designs shall include measures to reduce storm water velocities and collect sediment near the source of the water runoff so that BMPs can be effective in treating water quality and maintenance can be reduced. Recommended facilities are forebays, energy dissipators, outlet stabilization structures, inlet protection devices, level spreaders, and flow splitters.

11. "A" type soils (very permeable) may require installation of a clay, bentonite or poly liner where water retention is designed, such as with ponds and wetlands.

12. Carbonate geology (limestone) areas require careful evaluation for appropriate BMP design. Facility depths should be minimized and liners may be required.

13. Forebays and micropools are recommended for ponds and required for wetlands. Forebays and micropools should each contain approximately ten (10) percent of the required water volume. Forebays should be at least ten (10) feet long and be baffled from the main basin with a berm of rip rap or similar material, to a depth of one (1) foot below the water quality volume level, to insure an indirect flow path.

Additionally, when forebays are used, a minimum of ninety (90) percent of the discharge into the facility shall be directed into the forebays.

14. All ponds and wetlands shall be surrounded by a riparian buffer strip of a minimum twenty-five (25) feet in width. Streams shall be bordered by a riparian buffer strip, a minimum of twenty-five (25) feet or the width of the flood plain, whichever is greater.

15. Planting of wetland plants is required within created wetlands and encouraged in ponds and other applicable BMPs. Fringe wetland plants may be used on aquatic benches or within shallow pools, while emergent wetlands vegetation should be planted along side slopes and facility edges.

16. Infiltration, filtering or other BMP systems which are designed to treat the required control volume from small storms shall be preceded by a flow splitter or equivalent bypass device to route larger water volumes around the system.

17. All underground stone and sand BMP systems shall be lined with geotextile fabric on the sides, bottom and top, (double layer on top) have a level (flat) bottom, be underlain by a minimum of two (2) feet of soil or sand above the seasonal high water table and be placed a minimum of ten (10) feet horizontally from building foundation walls.

18. Infiltration systems with stone shall utilize AASHTO # 1 (No. 4) stone and assume a maximum of forty (40) percent voids area.

19. Grass swales should be designed with a flat channel bottom at least two (2) feet in width, with a longitudinal slope of one (1) to two (2) percent. If grass swale slopes exceed four (4) percent, check dams or similar water velocity modifiers should be used.

C. <u>Design Criteria</u>

1. The following site factors should be considered in selecting and designing the appropriate BMPs:

   a. Total contributing area.

   b. Permeability and infiltration rate of the site soils.

   c. Slope and depth to bedrock.

   d. Seasonal high water table.

   e. Proximity to building foundations and well heads.

f. Erodibility of soils.

g. Land availability and configuration of the topography.

2. The following factors should be evaluated when determining the suitability of BMPs for a development site:

a. Peak discharge and required volume control.

b. Stream bank erosion.

c. Efficiency of the BMPs to mitigate potential water quality problems.

d. The volume of runoff that will be effectively treated.

e. The nature of the pollutant being removed.

f. Maintenance requirements.

g. Creation/protection of aquatic and wildlife habitat.

h. Recreational value.

i. Enhancement of aesthetic and property value.

D. Examples

1. Ponds (Basins) are enhancements to conventional detention basins, usually containing a pool of water to perform the BMP function of capturing pollutants to improve the water quality of the discharge. Specific pond types and guidelines are:

a. Wet Retention Pond.

A permanent pool of standing water, normally containing a perimeter aquatic bench of 6" to 18" in depth, where pollutants are removed through sedimentation and plant absorption.

b. Extended Detention Pond

A basin designed to temporarily hold storm water for an extended period of time to facilitate physical settling of pollutants. These facilities may be normally dry, contain a shallow marsh, have a small wetpool, and often contain a combination of these features. Extended detention ponds usually include a vegetated forebay that is baffled from the main basin with a rip rap mound, a small sized outlet for the water quality storm discharge, a primary outlet for large storm events and a benched basin for varying water depths.

c. Multiple Pond

A pond system containing a series of two (2) or more pools or cells to create a longer pollutant removal pathway.

d. Rain Garden

An excavated shallow (maximum ponding depth of 12") surface depression planted with specially selected native vegetation to treat and capture runoff.

2. Wetlands may be constructed to contain an environment of shallow marsh where pollutants can be removed through a combination of settling, absorption, retention, plant uptake and biological decomposition. Wetland designs are best suited for larger watersheds and must be accompanied by a landscaping plan which specifies plant species, planting arrangement, bed preparation and operation/maintenance requirements. Additionally, wetlands shall be planted with three (3) or more plant species for diversity and survival, plus at least fifty (50) percent of the wetland area must be planted and maintained in plant cover. Specific wetland types and guidelines are:

a. Shallow Wetlands

These systems are configured with several varying levels of marsh areas, containing a meandering water pathway from the forebay to a micropool at the outlet. Water depths usually range from 6" to 18".

b. Pocket Wetlands

Wetlands for small locations where a seasonal high water table is needed to help sustain the water elevations.

3. Infiltration systems are designed to capture storm water runoff and infiltrate it into the ground. These systems are best adapted for small drainage areas and effectively reduce runoff volume, remove many pollutants, recharge the groundwater and contribute to maintaining stream baseflows. Specific infiltration system types and guidelines are:

a. Infiltration Trench

Shallow excavations that are lined with geotextile fabric and filled with stone to create an underground water reservoir, which gradually percolates into the surrounding subsoil. Infiltration trenches are especially useful for connection to roof drains. Larger trenches will require an under drain to a storm water conveyance system.

b. Infiltration Basin

A large, open depression (basin), which collects storm water for percolation. The basin surface should be vegetated with deep rooted plants to enhance infiltration. Soils, slope, geology and hydrogeology may restrict use of these basins.

c. Porous Pavement

Low traffic or overflow parking areas may be designed with porous pavement, a porous asphalt layer which permits runoff to drain into an underground stone area where it can infiltrate into the subsoil.

d. Depressed Pervious Area

These facilities are useful for capturing runoff within a parking lot island. They are designed lower than the surrounding areas, contain permeable soils with a filtration system or a beehive drain and often contain an underdrain for excess runoff. Plants, shrubs and trees enhance performance and aesthetics. Contributing parking areas require curb cuts, curbs with weep holes or similar design to facilitate runoff discharge to the pervious area.

4. Filtering systems are effective for filtering sediment and other pollutants from runoff by passing it through sand, soil, sand/soil mix, vegetation, a structural filter or any combination thereof. Filtered runoff is then infiltrated or drained to other on-site facilities. These systems may be integrated into landscaped areas and parking islands where plantings will add aesthetic enhancements. Specific filtering system types and guidelines are:

a. Sand Filter

An underground chamber or bed with sand designed to filter pollutants as water drains through it, with an underdrain system for discharge of the filtered water to a storm water conveyance system.

b. Bioretention System

These designs utilize a mixture of sand and permeable soil underneath a planted, landscaped depression to collect and treat surface water runoff. Bioretention areas are especially advantageous for parking lot islands and snow storage locations.

c. Riparian Buffer Strip

Along streams, wetlands and ponds, an area of land which is vegetated with a combination of trees, shrubs and herbaceous plants. This land strip is designed to protect the water resource by filtering pollutants, improving the habitat and

cooling the waterways by shading. The riparian buffer strip shall include the 100 year flood plain, or be a minimum of twenty-five (25) feet wide from the edge of the normal water level, whichever is greater.

d. Vegetated Filter Strip

These BMPs are characterized by grass or low growing vegetation on a uniformly sloped area which is designed to intercept sheet flow water runoff between an impervious surface and the storm water conveyance facilities. Vegetated filter strips reduce water velocities and trap sediment and pollutants. They require good vegetation and soil permeability and should be avoided on steep slopes. They are best used along small parking lots, should be a minimum of twenty (20) feet wide in the direction of water flow, and normally are designed equal in size to the impervious area draining to the filter strip.

e. Vegetated Swale

A broad, shallow, low gradient swale with a dense stand of medium height vegetation, which is designed to trap pollutants and promote infiltration.

f. Water Quality Inlet

Underground boxlike structure, such as an oil/grit separator, which is used to remove sediment and hydrocarbons from water runoff originating from parking lots and heavy traffic areas with the potential for petroleum discharges. These facilities are used close to the source of the runoff and currently include other products such as Stormceptor and Vortechnics.

5. Open channels convey, filter and percolate storm water runoff. They are often used as an alternative to, or component of, a storm sewer system. Specific open channel types and guidelines are:

a. Grass Swale

Grass swales filter pollutants as storm water runoff is drained to other areas. These facilities are best combined with other BMPs and may include check dams or minor depression storage to reduce water velocity and encourage infiltration. An underbedding of mixed sand and soil with a pipe or stone underdrain will improve the use for infiltration and ground water recharge.

b. Lined Channel

Rip rap, concrete or other erosion resistant material may be used to line a channel to prevent scouring and degradation of a water carrying channel.

6. Additional Information and Requirements

The information, guidelines and requirements of this Section of this Ordinance are intended to provide guidance in the design, construction, operation, and maintenance of BMPs to protect water quality throughout Lebanon County. It is recognized that BMP technology is relatively new and, therefore subject to continuing modifications and improvements. As such these regulations provide for considerable design flexibility, provided the design is consistent with the standards listed in this Ordinance.

Additionally, it is further intended that comprehensive handbooks and design manuals for BMPs shall be utilized and relied upon for guidance. Recommended sources of information are as follows:

a. Pennsylvania Stormwater Best Management Practices Manual, effective date December 30, 2006

b. 2000 Maryland Stormwater Design Manual, Volumes I and II, prepared by the Maryland Department of the Environment.

c. Minnesota Urban Small Sites BMP Manual, printed July 2001 by the St. Paul Metropolitan Council Environmental Services.

d. D.E.P. Erosion and Sedimentation Pollution Control Program Manual, dated March 2000 from Penna. D.E.P.

Section 315 - Erosion and Sediment Pollution Control Requirements During Earth Disturbance Activities

A. All subdivision and land development plans which propose earthmoving activity shall include erosion and sediment pollution control design to satisfy the requirements of Chapter 102 Pennsylvania Department of Environmental Protection 25 PA Code Chapter 92 and/or 102 and the PA Clean Streams Law (35 P.S., Sect. 691.1 et seq.) and to prevent soil erosion, sediment and other pollutants from entering streams, lakes and neighboring properties. In order to demonstrate and maintain compliance with erosion and sediment pollution control requirements, subdividers and land developers shall:

1. Prior to earthmoving or subdivision/land development plan approval, obtain Erosion and Sediment Pollution Control design approval from the Lebanon County Conservation District.

2. Obtain applicable NPDES approvals or permits through the Lebanon County Conservation District and the Pennsylvania D.E.P, and maintain plans and permits on-site.

3. Install required erosion and sediment pollution control facilities prior to the start of construction and maintain said facilities during the construction period.

4. Preserve and protect natural vegetation where possible.

5. Adhere to approved erosion and sediment pollution control design requirements and NPDES standards.

6. Inspect weekly and after each runoff event and maintain all erosion and sediment pollution control facilities to insure their effectiveness. Accumulated sediment shall be promptly removed and disturbed areas shall be reseeded or stabilized.

7. Design, install and maintain facilities in accordance with the PA D.E.P. Erosion and Sediment Pollution Control Program Manual, March 2000, as amended.

8. Include standard erosion and sediment control notes on all plans, as per the list within the Appendix.

9. Be subject to penalties for noncompliance, in accordance with Section VII provisions.

10. Construction of temporary roadways (for utility construction, timber harvesting, etc.) shall comply with all applicable standards for erosion and sedimentation control and stream crossing regulations under 25 PA Code, Chapters 102 and 105. The erosion and sedimentation control plan shall be submitted to the Lebanon County Conservation District for approval and shall address the following, as applicable:

    a. Design of roadway systems, including all roads, skid roads, landing areas, trails, and storage and staging areas.

    b. Runoff control structures (e.g., diversions, culverts, detention ponds, etc.).

    c. Stream crossings for both perennial and intermittent streams.

    d. Access to public roadways, including design of rock construction entrance for mud and debris control.

    e. A remediation plan for restoring the disturbed area through re-grading, topsoil placement, reseeding, and other stabilization techniques as required.

11. Additional erosion and sedimentation control design standards and criteria that must be applied where infiltration BMPs are proposed include the following:

    a. Areas proposed for infiltration BMPs shall be protected from sedimentation and compaction during the construction phase, as to maintain their maximum infiltration capacity.

    b. Infiltration BMPs shall be protected from receiving sediment laden runoff

c. The type of protection for infiltration BMPs shall be identified (i.e. orange construction fence surrounding the perimeter of the BMP).

12. Maintenance during development of a project shall be the responsibility of the developer and/or landowner and shall include, but not be limited to:

a. Removal of silt and debris from basins, traps, inlet protection, silt fencing, or other structures or measures when capacity of those structures is reached.

b. Periodic maintenance of temporary control facilities such as replacement of straw bale dikes, straw filters or similar measures.

c. Establishment or reestablishment of vegetation by seeding and mulching or sodding of scoured areas or areas where vegetation is not successfully been established.

d. Installation of necessary controls to correct unforeseen problems caused by storm events within design frequencies.

e. The contractor or developer shall be responsible for removal of all temporary measures and installation of permanent measures upon completion and stabilization of the project.

13. Total Maximum Daily Load (TMDL) Requirements

a. Agricultural activities contributory to a watershed within Lebanon County containing an established nonpoint source (agriculture) TMDL, shall be conducted in compliance with Chapter 102 (Erosion and Sediment Pollution Control), Chapter 91-Section 91.36 (General Provisions related to Manure Management) and Act 38 (Nutrient Management).

b. This section shall apply to agricultural activities conducted in watersheds where TMDL's are established in the future.

Article IV - Storm Water Management Site Plan Requirements

Section 401 - General Requirements

A. For any of the activities regulated by this Ordinance, the preliminary or final approval of subdivision and/or land development plans, the issuance of any zoning, building or occupancy permit, or the commencement of any land disturbance activity may not proceed until the Property Owner or Developer or his/her agent has received written approval of a SWM Site Plan from Lebanon County.

B. All Stormwater Management Site Plans shall be designed and certified by individuals registered in the Commonwealth of Pennsylvania and qualified to perform such duties based on education and training in hydrology and hydraulics.

Section 402 - Plan Exemptions

A. General Requirements

Any regulated activity that meets the exemption criteria listed herein is exempt from the plan preparation and processing requirements of this Ordinance. The criteria shall apply to the total parent tract property and development, even if development takes place in phases. Parent tracts shall be properties as existing on the effective date of this Ordinance, unless specified otherwise, and shall provide the basis for individual or cumulative impervious area computations. Exemptions relieve the property owner from plan submission, but not from providing adequate storm water management and erosion and sedimentation pollution control to meet the purpose of this Ordinance and protect adjoining properties.

B. Plan exemptions include the following:

1. Lot additions, land exchanges, subdivision of existing buildings and other minor subdivision activity which does not involve any new building lots.

2. Agricultural activities such as growing crops, plowing fields, gardening, etc.

3. Regulated activities that result in cumulative earth disturbances less than 5,000 square feet and impervious area enlargements less than 2,500 square feet are exempt from the requirements in Sections 311 & 312, and Article IV of this ordinance.

4. Forest management and timber operations are exempt from the SWM Site Plan preparation requirements of this Ordinance provided the activities are performed according to the requirements of 25 Pa. Code 102.

5. Building expansion, impervious area enlargement, and development of existing lots, provided that no subdivision of new lots or land development for new principal uses is involved and the following criteria are satisfied:

Total Parcel Size*	Minimum Distance **	Impervious Exemption ***
< ½ Acre	10 Feet	2,500 Sq. Ft.
½ - 1 Acre	20 Feet	5,000 Sq. Ft.
1.01 – 2 Acres	40 Feet	10,000 Sq. Ft.
2.01 – 5 Acres	50 Feet	15,000 Sq. Ft.
>5 Acres	100 Feet	20,000 Sq. Ft.

(Chart applies to properties where formal land development design has not previously been performed. In the case where a land development design has previously been performed, exemptions shall be at the discretion of the Lebanon County Planning Department and the County Engineer).

* Parent tract or original parcel size, prior to any subdivision, as of this Ordinance date.

**Minimum distance between proposed impervious areas and the downslope property line(s).

***Individual or cumulative total impervious area, after the effective date of this Ordinance.

Any lot which has been exempted from submission of a storm water management site plan, in accordance with the guidelines listed herein, and is subsequently found to be developed contrary to the plan exemption criteria shall be subject to mandatory submission of the required plan. Failure to satisfy these requirements is a violation of this Ordinance, punishable as provided by Article VII of this Ordinance.

C. Design Exemptions

Single family residential lots may be exempted from the mandatory design and installation of certain storm water management facilities when the lot improvements (house, driveway, regrading, etc.) on the proposed subdivision plan document to the satisfaction of the Planning Department and the County Engineer that the lot improvements will not result in detrimental storm water discharges within the lot(s) or upon adjoining lands, roads, waterways or other areas. Exemption may be granted by the Planning Department provided all of the following criteria are satisfied:

1. The subdivision plan shall meet all of the criteria for a minor subdivision; and

2. The minimum lot area shall be two (2) acres; and

3. The slope of the lot shall not exceed 4% in the lot improvement area and slopes in excess of 8% shall not exist within fifty feet (50') of the lot improvement area; and

4. Streams, waterways and ecologically sensitive areas shall not exist within one hundred feet (100') of the lot improvement area; and

5. The proposed lot improvements shall be a minimum of fifty feet (50') from side and rear lot lines, unless site conditions or other requirements necessitate greater setbacks; and

6. The maximum impervious area shall be 15,000 square feet; and

7. Plan notes shall document that the soils within the lot improvement area are in the hydrologic soil group A, B or C, as published in the current edition of TR-55, Urban Hydrology for Small Watersheds and listed within the Appendix; and

8. Storm water discharges shall not endanger or potentially damage the lot improvements, adjoining lands, roads or otherwise pose a threat to the health, safety or welfare of the public; and

9. No unique or adverse lot conditions shall exist which warrant refusal of the exemption request; and

10. Subdivision application shall be accompanied by standard application and inspection fees to assure evaluation of lot(s) for compliance with the exemption criteria at the design, construction and inspection stages; and

11. Subdivision plans containing any lots which have received storm water management design and installation exemptions in accordance with these provisions shall contain a prominent plan note explaining the exemption and the lot development restrictions applicable thereto; and

12. Any lot receiving a storm water management installation exemption and subsequently found to be developed, or under development, contrary to these exemption provisions or otherwise evidencing a storm water runoff problem shall forthwith be subject to the following:

    a. Corrective action shall be taken in the lot development to eliminate the noncompliance.

    b. Submission of a revised subdivision or land development plan shall be required, depicting necessary storm water management facilities, in accordance with standard plan processing procedures.

    c. Lot owner(s), developers(s) or other responsible person(s) who fail to take corrective lot development action or fail to submit a required revised plan shall be guilty of a violation of this Ordinance, punishable as provided by Section VII of this Ordinance.

D. Design Exemptions – 10 acres+

1. A storm water management exemption can also be attained for subdivisions containing no more than two proposed lots in excess of 10 acres in size. Residue lands exceeding 10 acres in area may also be considered for exemption. Lots submitted for exemption shall comply with the following criteria.

   a. The plan preparer certifies that any of the subsections 402(a) thru 402(l) cannot be met.

   b. Required sewage planning (on-site or public) is completed.

   c. An acceptable driveway location can be provided with specific site distance information.

   d. Subject plan shall contain bold ¼" letter restrictive note on the lot(s) detailing the requirement for Regulated Activities approval upon proposed improvement or further subdivision of lot(s).

   e. Site topography shall be deemed acceptable by the County Engineer.

   f. Only proposed parcels in excess of 10 acres are to be considered under this section.

   g. Subdivision application shall be accompanied by standard application and inspection fees to assure evaluation of lot(s) for compliance with the exemption criteria at the design, construction and inspection stages; and

   h. Subdivision plans containing any lots which have received storm water management design and installation exemptions in accordance with these provisions shall contain a prominent plan note explaining the exemption and the lot development restrictions applicable thereto; and

E. <u>Contents</u>

The storm water management site plan shall contain all required plans, maps, calculations, documentation and supportive information necessary to satisfy the requirements of this Ordinance. Storm water management plans and hydrologic reports shall be prepared and certified by licensed professionals registered in Pennsylvania and qualified to perform such duties, based on education, training and experience. Plans shall contain the name of the development and name, address, telephone number, e-mail address, and engineering seal of the individual preparing the report in addition to the following:

1. A general description of the proposed project.

2. All plan information required by Sections 4.02 through 4.04 of the Lebanon County Subdivision and Land Development Ordinance (LCSALDO), as applicable, for preliminary or final plans.

3. Existing and proposed contours at required intervals, as per Section 4.02.C (LCSALDO).

4. Plans shall be legible in every detail.

5. Existing and proposed land uses, buildings, structures, roads, paved areas and any changes to the land surface or vegetative cover.

6. Project location on a 7.5 minutes U.S.G.S. map or equivalent.

7. Provisions for permanent access or maintenance easements for all physical SWM BMPs, such as ponds and infiltration structures, as necessary to implement the Operation and Maintenance (O&M) Plan.

8. A storm water management report containing:

    a. An introduction which summarizes the development proposal, methodology of calculations, and the main components of the proposed storm water management design.

    b. Storm water runoff calculations as specified in this Ordinance, including complete hydraulic and structural computations for all storm water management facilities and Volume Control designs.

    c. Where multiple storm water management facilities (including water recharge and water quality) are used, an explanation of how these facilities will interrelate is required.

    d. Pre and post development watershed subareas with time of concentration path delineations clearly marked to indicate all sheet flow, shallow concentrated flow and open channel segments by length and assumed beginning and end elevations for each segment.

    e. In carbonate geology areas, a geologic assessment of the impact of the proposed project and associated site improvements and any precautionary or remedial actions recommended.

    f. Design and specifications for all storm water management facilities, ground water recharge areas, water quality features and erosion and sedimentation facilities.

g. Horizontal and vertical profiles of all pipes, swales, open channels and storm water management facilities, showing existing and proposed grades.

h. Evaluation of the project's effect on upstream and downstream adjoining properties.

i. Adequate drainage easements around all storm water management facilities, with a twenty (20) foot minimum width required. All easements require a metes and bounds description which closes within each lot and tie to known points for final plan approval.

j. Ownership and maintenance provisions.

k. All designs, calculations and illustrations necessary to demonstrate compliance with the design standards specified within this Ordinance, as determined by the County Engineer.

l. All applicable worksheets from Chapter 8 of the BMP manual when establishing volume controls.

m. Date of visit by a design professional.

F. Stormwater Management Facilities

1. All stormwater management facilities must be located on a plan and described in detail. The volumes of stormwater detention required shall be noted on the plan, as well as approximate dimensions of the proposed facility.

2. Plans for Groundwater recharge facilities must show the locations of existing septic tank infiltration areas and wells. A minimum fifty (50) foot separation from On-Lot Disposal System (OLDS) infiltration areas is required. Infiltration rates shall be based upon percolation and probe tests conducted at the site of the proposed facility.

3. All calculations, assumptions, and criteria used in the design of the stormwater management facilities must be shown. If multiple facilities are used in conjunction with each other, such as infiltration BMPs with vegetation based management practices, a summary narrative shall be included describing any sequencing and how the facilities are meant to function with each other to manage stormwater runoff.

4. A plan note shall be added to grant County and Municipal officials and employees thereof the right of access to the property for inspection of a stormwater BMP and, in the event of default by the developer, installation of the stormwater management facilities.

5. Maintenance & ownership provisions shall be clearly spelled out on the plan.

Section 403 - SWM Site Plan Review

A. Review of storm water management site plans shall be the responsibility of the County Engineer. Submissions shall supplement standard subdivision and land development plan copies and include at a minimum:

1. Two (2) copies of all plans, reports and calculations for all submissions, re-submissions, revisions or modifications.

2. Two (2) copies of all state, federal or municipal permits required as an approval prerequisite.

3. The County Engineer shall review the SWM Site Plan for consistency with this Ordinance. The County Engineer shall require receipt of a complete plan, as specified in this Ordinance.

4. The County Engineer shall review the SWM Site Plan, subdivision or land development for any submission against the Lebanon County Subdivision and Land Development Ordinance for all provisions not superseded by this Ordinance.

5. Should the SWM Site Plan be determined to be consistent with this Ordinance, the County Engineer will forward a letter recommending approval to Lebanon County.

6. Should the SWM Site Plan be determined to be inconsistent with this Ordinance, the County Engineer will forward a review letter recommending revisions to or disapproval of the plan to Lebanon County. Any inconsistent SWM Site Plans may be revised by the Developer and resubmitted.

7. For Regulated Activities requiring a DEP Joint Permit Application, the County Engineer (upon request of the applicant or applicant's agent) shall notify DEP whether the SWM Site Plan is consistent with this Ordinance and forward a copy of the review letter to Lebanon County. DEP may consider the County Engineer's review comments in determining whether to issue a permit.

8. For Regulated Activities requiring a DEP National Pollutant Discharge Elimination System Permit Application, the County Engineer (upon request of the applicant or applicant's agent) shall notify DEP whether the SWM Site Plan is consistent with this Ordinance and forward a copy of the review letter to Lebanon County.

9. Lebanon County shall not approve any subdivision, land development, or SWM Site Plan for Regulated Activities specified in Section 104 of this Ordinance if the SWM Site Plan has been found to be inconsistent with this Ordinance, as determined by the County Engineer. All required permits from DEP must be obtained prior to approval of any SWM Site Plan, subdivision or land development.

10. The municipality shall not issue a zoning or building permit for any Regulated Activity specified in Section 104 of this Ordinance if the SWM Site Plan has been found to be inconsistent with this Ordinance, as determined by the County Engineer.

All required permits from DEP must be obtained prior to issuance of a zoning or building permit.

11. The Developer shall maintain a copy of the approved SWM Site Plan at the project site during construction, as record drawings. Any discrepancies with the original design that warrants changes to the SWM Site Plan shall be submitted to the County Engineer for review and approval.

12. If Lebanon County disapproves the SWM Site Plan, the County will state the reasons for the disapproval in writing.

13. Changes to the approved SWM Site Plan shall be authorized only with the written approval of the County Engineer.

14. Prior to formal plan approval, plans containing storm water management design shall require the review signature of the County Engineer.

Section 404 - As-Builts, Completion Certificate, and Final Inspection

A. The developer shall be responsible for providing as-built plans of all SWM BMPs included in the approved subdivision, land development, or SWM Site Plan. The as-built plans and an explanation of any discrepancies with the construction plans shall be submitted to Lebanon County.

B. The as-built submission shall include a certification of completion signed by a qualified professional verifying that all permanent SWM BMPs have been constructed according to the approved plans and specifications. If any licensed qualified professionals contributed to the construction plans, then a licensed qualified professional must sign the completion certificate.

C. After receipt of the completion certification from the applicant's qualified professional, the County Engineer may conduct a final inspection.

D. Minor residential subdivisions shall be exempt from requirement for submission of an as-built plan unless, in the opinion of the County Engineer, as-built conditions vary from the approved plan such that an as-built plan is warranted.

E. An as-built plan shall contain the following stormwater related information:

1. Actual location of floodplain by elevation and dimension from property line.

2. Actual location and cross section of swales and accompanying easements.

3. Actual horizontal and vertical location of SWM BMPs, including type and size of storm drainage pipes.

4. For all storage SWM BMPs (e.g. stormwater basins, rain gardens and infiltration facilities), the following information shall be provided:

    a. As-built elevation contours of the SWM BMP as applicable, or the horizontal and vertical dimensions of underground facilities to include depth from ground surface to top of facility.

    b. Verification of materials used in construction (e.g. geotextile materials).

    c. As-built outlet structure details, including type, size, and inverts of discharge pipes.

    d. As-built elevations for embankments and emergency spillways.

    e. A table showing the stage/storage/discharge information for the constructed conditions.

    f. A table providing a comparison of the approved design versus the as-built discharge rates.

F. The County Engineer, the County Conservation District office representatives, and duly authorized representatives of the County of Lebanon may enter at reasonable times upon any property within Lebanon County to inspect storm water facilities, structures and related site improvements for compliance with the approved plans and this Ordinance.

G. Construction of storm water management, erosion control and related facilities shall be in accordance with the approved subdivision and land development plans and the requirements of this Ordinance. Construction or development contrary to, or not in compliance with, the storm water management design on the approved subdivision or land development plan shall be a violation of this Ordinance, punishable as provided by Article VII of this Ordinance.

H. After subdivision and land development has been completed and the site developed, the County Engineer may inspect the site periodically to confirm operation and maintenance of the storm water facilities in accordance with the approved plan and this Ordinance.

I. The cost of inspections shall be paid by the person/entity responsible for operation and maintenance of the stormwater facilities, in accordance with a fee schedule adopted as part of this Ordinance or by fee resolution thereafter.

Section 405 - Modification of Ordinance Facilities

A modification which involves a change in stormwater management methods, facilities or techniques, or that involves the relocation or re-design of stormwater management facilities, or which is necessary because soil or other conditions are not as stated on the approved plan, shall require a resubmission in accordance with the plan requirements set forth in this Ordinance and the Lebanon County Subdivision and Land Development Ordinance.

Section 406 - Modification of Ordinance Provisions

A. The provisions of this Ordinance are intended as minimum standards for the protection of the public health, safety, and welfare. Lebanon County reserves the right to modify or to extend them conditionally in individual cases as may be necessary in the public interest; provided, however, that such variation shall not have the effect of nullifying the intent and purpose of this Ordinance, and that the applicant shows that to the satisfaction of Lebanon County that the applicable regulation is unreasonable, or will cause undue hardship, or that an alternative proposal will allow for equal or better results. The list of such modifications shall be listed on the plan.

B. In granting waivers/modifications, Lebanon County may impose such conditions as will, in its judgment, secure substantially the objectives of the standards and requirements of this Ordinance.

Section 407 - Ownership and Maintenance (O&M) Responsibilities

For the purpose of this section, drainage courses, swales, stormwater inlets, pipes, conduits, detention and retention basins, subsurface storage structures, and other stormwater management facilities shall be included under the term "SWM BMPs."

A. The Final Plan shall reflect and/or be accompanied by supporting documentation identifying the ownership and method of administering and maintaining all permanent SWM BMPs.

B. The SWM Site Plan for the development site shall contain an operation and maintenance plan for review by the County Engineer. The operation and maintenance plan shall outline required routine maintenance actions and schedules necessary to insure proper operation of the facility(ies).

C. The SWM Site Plan for the development site shall establish responsibilities for the continuing operating and maintenance of all proposed SWM BMPs, consistent with the following principals:

   1. If a development consists of structures such as streets, sewers and other public improvements which are to be dedicated to the Municipality, SWM BMPs may also be dedicated to and maintained by the Municipality. However, if the Municipality accepts dedication of streets, the Municipality is under no obligation to accept dedication of SWM BMPs located outside of the public right-of-way.

2. If a development site is to be maintained in a single ownership or if sewers and other public improvements are to be privately owned and maintained, then the ownership and maintenance of SWM BMPs shall be the responsibility of the owner, lessee, or private management entity (e.g. homeowners association or other parties of interest). Facilities owned and maintained by a private entity shall be maintained in accordance with the terms of an agreement, declaration of easement or other legally binding documentation approved in form by the Municipality and Lebanon County. The agreement, declaration of easement or other legally binding documentation shall provide that the Municipality, Lebanon County and the Lebanon County Engineer have the right to:

   a. Inspect the facilities at any time.

   b. Require the private entity to take corrective measures and assign the private entity reasonable time periods for any necessary action.

   c. Authorize maintenance to be done and lien all cost of the work against the properties of the private entity responsible for maintenance.

D. The Municipality, upon recommendation of the County Engineer, shall make the final determination on the continuing maintenance responsibilities. The municipal governing body reserves the right to accept the ownership and operating responsibility for any or all of the stormwater management controls.

E. Maintenance of SWM BMPs shall include, but not be limited to, the following:

1. Liming and fertilizing vegetated channels and other areas in accordance with soil test recommendations.

2. Reestablishment of vegetation by seeding and mulching or sodding of scoured areas or areas where vegetation has not been successfully established.

3. Mowing as necessary to maintain adequate strands of grass and to control weeds. Chemical weed control may be used if federal, state, and local laws and regulations are met.

4. Removal of silt from all permanent structures which trap silt and sediment in order to keep the material from building up in grassed waterways, pipes, detention basins, infiltration structures, or other SWM BMP's, and thus reducing their capacity to convey or store water.

5. Regular inspection of the areas in question to assure proper implementation of SWM BMP's, maintenance and care.

6. All pipes, swales and detention facilities shall be kept free of any debris or other obstructions and maintained in original design condition.

7. Replacement or repair of damaged structural SWM BMPs or components of such SWM BMPs.

Section 408 - Operation & Maintenance Agreement

A. Prior to final approval of the site's SWM Site Plan, subdivision plan, or land development plan, the property owner shall sign and record the operation and maintenance (O&M) agreement contained in Appendix D which is attached and made part hereof, covering all stormwater control facilities that are to be privately owned.

1. The owner, successor and assigns shall operate and maintain all facilities in accordance with the approved schedule(s) in the O&M Plan.

2. The owner shall convey to the Municipality and Lebanon County easements to assure access for periodic inspections by the Municipality and Lebanon County and maintenance, as necessary.

3. The owner shall keep on file with the Municipality and Lebanon County the name, address, and telephone number of the person or company responsible for operation and maintenance activities. In the event of a change, new information shall be submitted by the owner to the Municipality and Lebanon County within ten (10) working days of the change.

   Other items may be included in the agreement where determined necessary to guarantee the satisfactory maintenance of all facilities. The O&M agreement shall be subject to the review and approval of the Municipality and Lebanon County.

   The owner is responsible for operation and maintenance (O&M) of the SWM BMPs. If the owner fails to adhere to the O&M Agreement, the Municipality may perform the services required and charge the owner appropriate fees. Nonpayment of fees may result in a lien against the property.

Section 410 - Maintenance of Existing Facilities / BMPs

A. SWM BMPs existing on the effective date of this ordinance on individual lots which have not been accepted by the municipality or for which maintenance responsibility has not been assumed by a private entity such as a homeowners' association shall be maintained by the individual property owners. Such maintenance shall include at a minimum those items set forth in Section 407E above. If the Municipality or Lebanon County determines at any time that any permanent stormwater management facility has been eliminated, altered, blocked through the erection of structures or the deposit of material, or improperly maintained, the condition constitutes a nuisance and shall notify the property owner of corrective measures which are required, and provide for a reasonable period of time, not to exceed 30 days, within which the property owner shall take such corrective action. If the property owner does not take the required corrective action, the Municipality and/or the County may either perform the work, or contract for the performance of the work and bill the property owner for the cost of the work plus a penalty of 10% of the cost of the work. If the property owner does not pay such bill within 30 days, the Municipality may file a municipal claim against the property upon which the work was performed in accordance with the applicable laws.

B. No person shall modify, remove, fill, landscape or alter stormwater management facilities which have been installed on a property unless a SWM Site Plan has been approved to

permit such modification, removal, filling, landscaping or alteration. No person shall place any structure, fill, landscaping or vegetation into a stormwater management facility or within a drainage easement, which will limit or alter the functioning of the facility or easement in any manner.

Section 411 - Responsibilities of Developers and Landowners

A. The Municipality shall make the final determination on the continuing maintenance responsibilities. The Municipality may require a dedication of such facilities as part of their requirements. Such a requirement is not an indication that the Municipality will accept the facilities. The Municipality reserves the right to accept or reject the ownership and operating responsibility for any portion of the stormwater management controls.

B. Facilities, areas, or structures used as SWM BMPs shall be enumerated as permanent real estate appurtenances and recorded as deed restrictions or conservation easements that run with the land.

C. The O&M Plan shall be recorded as a restrictive deed covenant that runs with the land.

D. The Municipality and/or Lebanon County may take enforcement actions against an owner for any failure to satisfy the provisions of this Ordinance.

Article V – Inspections

Section 501 - Schedule of Inspections

A. The County Engineer or a designated inspector under the County Engineer's direct supervision, in conformance with Section 702, shall inspect all phases of the installation of the SWM BMPs as deemed appropriate by the County Engineer.

B. During any stage of the work, if the County Engineer determines that the SWM BMPs are not being installed in accordance with the approved SWM Site Plan, Lebanon County shall provide written notification to the owner(s)/developer(s) and the contractor(s) indicating the deficiencies and require that the deficiencies be corrected within 30 days (or longer as may be required). If the deficiencies are not corrected within the specified period of time, Lebanon County or the Municipality may:

1. Revoke any existing permits until a revised SWM Site Plan is submitted and approved, as specified in this Ordinance.

2. Utilize financial security posted by the owner(s)/developer(s) as part of the developer's agreement to install any unfinished facilities or remedy any improperly constructed facilities.

3. Pursue other legal remedies pursuant to Article VII of this Ordinance.

4. If applicable, at the completion of the project, and as a prerequisite for the final release of the improvements guarantee, the owner/developer or his representatives shall:

   a. Provide a certificate of final completion letter from an engineer, landscape architect, surveyor or other qualified professional verifying that all permanent facilities have been constructed according to the plans and specifications and approved revisions thereto.

   b. Provide a set of as-built (record) drawings.

5. After receipt of the certification by Lebanon County, a final inspection shall be conducted by the County Engineer or designated representative to certify compliance with this Ordinance.

Section 502 - Post-Construction SWM BMPs Schedule of Inspections

SWM BMPs should be inspected by the landowner, or the owner's designee (including the Municipality for dedicated and owned facilities), according to the following list of minimum frequencies:

A. Annually for the first 5 years following construction.

B. Once every 3 years thereafter.

C. During or immediately after the cessation of a 10-year or greater storm.

Article VI – Performance Guarantees

Section 601 - Completion of Improvements or Guarantee Thereof Prerequisite to Final Plan Approval

A. Performance Guarantee in Lieu of Installation – No plat shall be finally approved unless the streets shown on such plan have been improved to a mud-free or otherwise permanently passable condition, or improved as may be required by the subdivision and land development ordinance and any walkways, curbs, gutters, streets, street lights, fire hydrants, shade trees, water mains, sanitary sewers, storm sewers, storm water management facilities, required plantings, and other improvements as may be required by the subdivision and land development ordinance have been installed in accordance with this Ordinance. In lieu of the completion of any improvement required as a condition for the final approval of a plat, the subdivider or developer shall deposit with the municipality or county (depending upon type of improvement) a fiscal security in an amount sufficient to cover the costs of any improvements or common amenities including, but not limited to roads, storm water detention and/or retention basins and other related drainage facilities, open space improvements, or buffer or screen plantings which may be required.

B. Type Guarantee – Without limitation as to other types of financial security which the County may approve, which approval shall not be unreasonably withheld, Federal or Commonwealth chartered lending institution irrevocable letters of credit and restrictive escrow accounts in such lending institutions shall be deemed acceptable financial security for the purposes of this Section. Such financial security shall be posted with a bonding company or Federal or Commonwealth chartered lending institution chosen by the party posting the financial security, provided said bonding company or lending institution is authorized to conduct such business within the Commonwealth. Such bond, or other security shall provide for, and secure to the public, the completion of any improvements which may be required on or before the date fixed in the formal action of approval or accompanying agreement for completion of the improvements.

C. Amount of Guarantee – The amount of financial security to be posted for the completion of the required improvements shall be equal to one hundred and ten percent (110%) of the cost of completion estimated as of ninety (90) days following the date scheduled for completion by the developer. Annually, the County may adjust the amount of the financial security by comparing the actual cost of the improvements which have been completed and the estimated cost for the completion of the remaining improvements as of the expiration of the ninetieth (90th) day after either the original date scheduled for completion or a rescheduled date of completion.

   Subsequent to said adjustment, the County may require the developer to post additional security in order to assure that the financial security equals said one hundred and ten percent (110%). Any additional security shall be posted by the developer in accordance with this subsection.

The amount of financial security required shall be based upon an estimate of the cost of completion of the required improvements, submitted by an applicant or developer and prepared by a licensed professional as such in this Commonwealth and certified by such licensed professional to be a fair and reasonable estimate of such cost. The County Engineer shall review and approve the cost estimate or, for good cause, refuse to accept the estimate.

If the party posting the financial security requires more than one (1) year from the date of posting of the financial security to complete the required improvements, the amount of financial security may be increased by an additional ten (10) percent of each year period beyond the first anniversary date from posting of financial security or to an amount not exceeding one hundred and ten percent (110%) of the cost of completing the required improvements as reestablished on or about the expiration of the preceding one (1) year period by using the above cost estimate preparation procedure. A developer who fails to complete the improvements within the allotted time specified in the financial guarantee shall, at least sixty (60) days in advance of the guarantee expiration date, renew or resubmit a financial guarantee. Failure to keep a financial guarantee in effect until the completion and approval of all improvements shall be a violation of this Ordinance.

D. Progressive Installation – In the case where development is projected over a period of years, the Planning Department may authorize submission of final plats by sections or phases of development subject to such requirements or guarantees as to improvements in future sections or stages of development as it finds essential for the protection of any finally approved section of the development.

E. Release from Guarantee – As the work of installing the required improvements proceeds, the party posting the financial security may request the release, from time to time, of such portions of the financial security necessary for payment to the contractor or contractors performing the work. Any such requests shall be made in writing to the municipal governing body, or Planning Department where applicable, and within forty-five (45) days of receipt of such request the applicable municipal or county engineer, shall certify, in writing, to his employers whether or not such portion of the work upon the improvements has been completed in accordance with the approved plat. When the improvements are certified to be in accordance with the approved plat, the County shall authorize release by the bonding company or lending institution of an amount as estimated by the municipal or county engineer fairly representing the value of the improvements completed. If the County fails to act within said forty-five (45) day period, the release of funds shall be deemed to have been approved as requested. The County may, prior to final release at the time of completion and certification by its engineer, require retention of ten percent (10%) of the estimated cost of the aforesaid improvement.

The applicant shall assume the necessary expense incurred for the inspection of improvements. Such inspection costs shall be based upon a schedule, established by the Ordinance, and amended from time to time as deemed necessary.

F. Maintenance Guarantee – Where the Municipality accepts dedication of all or some of the required improvements following completion, the Municipality may require the posting of financial security to secure structural integrity of said improvements as well as the functioning of said improvements in accordance with the design and specifications depicted on the final plat for a term not to exceed eighteen (18) months from the date of acceptance of dedication. Said financial security shall be of the same type as otherwise required in this Section with regard to installation of such improvements. The amount of financial security shall not exceed fifteen (15) percent of the actual cost of installation of said improvements. The bonding amounts of all improvements included in the Maintenance Guarantee may be reduced to said 15% and retained within the Performance Guarantee until notification from the municipality of Maintenance Guarantee establishment is received by the County.

G. Remedies to Effect Completion of Improvements – In the event that any required improvements have not been installed as provided in this Ordinance or in accordance with the approved final plat, the County is hereby granted the power to enforce any corporate bond, or other security by appropriate legal and equitable remedies. If proceeds of such bond, or other security are insufficient to pay the cost of installing or making repairs or corrections to all the improvements covered by said security, County may, at its option, install part of such improvements in all or part of the subdivision or land development and may institute appropriate legal or equitable action to recover the moneys necessary to complete the remainder of the improvements. All of the proceeds, whether resulting from the security or from any legal or equitable action brought against the developer, or both, shall be used solely for the installation of the improvements covered by such security, and not for any other municipal or county purpose. Failure to properly install the required improvements shall also constitute a violation of this Ordinance, punishable as provided by Article VII of this Ordinance.

H. At the completion of the project, and as a prerequisite for the final release of the improvements guarantee, the owner/developer or his representatives shall:

1. Provide a certificate of final completion letter from an engineer, landscape architect, surveyor or other qualified professional verifying that all permanent facilities have been constructed according to the plans and specifications and approved revisions thereto.

2. Provide a set of as-built (record) drawings.

I. After receipt of the certification by Lebanon County, a final inspection shall be conducted by the County Engineer or designated representative to certify compliance with this Ordinance.

Section 602 Insurance

The developer agrees to indemnify and save harmless the municipality and Lebanon County against and from any and all loss, cost, damage, liability, and expense on account of damage to property of, or injury to or death of, the parties thereto or third person, caused by, growing out of, or in any way whatsoever attributable to the construction of said improvements and the use of

the street(s) delineated on the subdivision plat during construction. The developer further agrees, but without limiting its liability to indemnify the municipality or county, to carry liability insurance contracts with a reliable insurance company covering the period of said construction in the sum of $500,000 to $1,000,000 for injury to or death of person(s), and in the sum of $500,000 for damage to or destruction of property, which insurance contracts shall include the municipality and county as named insured.

Article 7 – Administration, Fees and Penalties

Section 701 - Intent

This stormwater ordinance shall be considered to set forth the minimum requirements for the protection of the public health, safety, comfort, property or general welfare, pursuant to the authority of the Pennsylvania Municipalities Planning Code, Act Number 247, 1968 sessions, as amended, or such statutes hereinafter in effect, and shall be construed most favorably to the county as encouraging standards of planning and development exceeding these basic and minimum regulations.

Section 702 - Administration and Enforcement

The Lebanon County Planning Department and the Lebanon County Engineer are authorized to administer the provisions of this ordinance as herein provided, and to enforce the provisions of this Ordinance on behalf of the Lebanon County Commissioners.

Upon presentation of proper credentials, duly authorized representatives of Lebanon County may enter at reasonable times upon any property within their jurisdiction to investigate or ascertain the condition of the subject property in regard to any aspect regulated by this Ordinance.

In addition to other remedies provided herein, the Planning Department and/or the County Engineer may, on behalf of the Lebanon County Commissioners, institute and maintain appropriate actions by law or in equity to restrain, correct or abate violations, to prevent unlawful construction, to recover damages and to prevent illegal occupancy of a building, structure or premises. The description by metes and bounds in the instrument of transfer or other documents used in the process of selling or transferring shall not exempt the seller or transferor from such penalties or from the remedies herein provided.

The Planning Department may refuse to issue (or order municipal refusal to issue) any permit or grant any approval necessary to further improve or develop any real property which has been developed or which has resulted from a subdivision of real property in violation of this ordinance. This authority to deny such a permit or approval shall apply to any of the following applicants:

A. The owner of record at the time of such violation; and

B. The vendee or lessee of the owner of record at the time of such violation without regard as to whether such vendee or lessee had actual or constructive knowledge of the violation; and

C. The current owner of record who acquired the property subsequent to the time of violation without regard as to whether such current owner had actual or constructive knowledge of the violation; and

D. The vendee or lessee of the current owner of record who acquired the property subsequent to the time of violation without regard as to whether such vendee or lessee had actual or constructive knowledge of the violation. As an additional condition for issuance of a permit or the granting of an approval to any such owner, current owner, vendee or lessee for the development of any such real property, the Planning Department may require compliance with the conditions that would have been applicable to the property at the time the applicant acquired an interest in such real property.

Section - 703 Modifications

The provisions of this Ordinance are intended as minimum standards for the protection of the public health, safety and welfare of the residents and inhabitants of Lebanon County. The Planning Department and/or Lebanon County Engineer may grant a modification of the requirements of one or more provisions of this Ordinance if the Planning Department concludes that the literal enforcement will exact undue hardship because of peculiar conditions pertaining to the land in question, provided that such modifications will not be contrary to the public interest and that the purpose and intent of this Ordinance is observed.

All requests for a modification shall be in writing to the Planning Department and the Lebanon County Engineer and shall accompany and be part of the application for development. The request shall state in full the grounds and facts of unreasonableness or hardship on which the request is based, the provision or provisions of the Ordinance involved and the minimum modification necessary.

All such modification requests shall be approved or disapproved by the Planning Department. A written record of the action shall be kept for all modification requests.

Section 704 - Appeals

A subdivider of developer aggrieved by any action of the Planning Department, County Engineer or the County Commissioners regarding refusal to approve a subdivision or land development plan may, within thirty (30) days of such refusal, appeal to the Common Pleas Court of Lebanon County. Any other appeals by aggrieved parties or other landowners shall be subject to the appeal procedures outlined in Article X of Act 247.

Section 705 - Penalties

Any person, partnership or corporation who or which has violated the provisions of this stormwater ordinance shall, upon being found liable therefore in a civil enforcement proceeding commenced by the Planning Department on behalf of the County Commissioners, pay a judgment of not more than $500 plus all court costs, including reasonable attorney fees incurred by the County of Lebanon as a result thereof.

District justices shall have initial jurisdiction in proceedings brought by the Planning Department in accordance with this Section. No judgment shall commence or be imposed, levied or be payable until the date of the determination of a violation by the district justice. If the defendant

neither pays nor timely appeals the judgment, the Planning Department may enforce the judgment on behalf of the County Commissioners pursuant to the applicable rules of civil procedure. Each day that a violation continues shall constitute a separate violation, unless the district justice determining that there has been a violation, further determines that there was a good faith basis for the person, partnership or corporation violating the Ordinance to have believed that there was no violation, in which event there shall be deemed to have been only one such violation until the fifth day following the date of the determination of a violation by the district justice and thereafter each day that a violation continues shall constitute a separate violation.

Section 706 - Schedule of Fees

A. Fee Procedures – Each subdivision or land development plan application shall be accompanied by the required review fees, as established herein. Fees shall be payable at the time of plan submission (unless otherwise noted herein) and plan processing, approval and recording shall not be completed until all required fees are paid.

B. There shall be no refund or credit of fees or a portion of any fee should the subdivider or developer withdraw the plan during the review process or fail to receive plan approval.

C. The fee schedule set forth in this section may be amended from time to time by adoption of a resolution by the Lebanon County Commissioners setting forth the new fees.

D. **The below fee schedule is for storm water management review only**. Separate fees for subdivision and/or land development may apply. Refer to the Lebanon County Subdivision and Land Development Ordinance for clarification.

E. Engineer Review Fees – All applications involving storm water management or engineering review shall be accompanied by fees, payable to the County Engineer, in accordance with the following:

1. For review of subdivision and land development plans and requests for inspections:

	1 Lot/Unit	2-5 Lots/Units	6-19 Lots/Units
Preliminary Plans	$200/lot or unit	$150/lot or unit	$125/lot or unit
Final Plans	$200/lot or unit	$150/lot or unit	$100/lot or unit
Inspections	$200/lot or unit	$150/lot or unit	$125/lot or unit

Lots/Units	20-49 Lots/Units	50-99 Lots/Units	100 or more
Preliminary Plans	$100/lot or unit	$75/lot or unit	$50/lot or unit
Final Plans	$75/lot or unit	$50/lot or unit	$40/lot or unit
Inspections	$100/lot or unit	$75/lot or unit	$50/lot or unit

2. For review of commercial, industrial, or institutional land developments, re-submitted plans, inspections, and other plans which do not qualify for the per lot or unit rate:

   a. A base fee is required for review or inspection. The base fee will be established on site acreage as provided below. Plan reviews or inspections requiring more than covered by the base fee shall be subject to an additional fee based upon the hourly rate established in #2 (b). The base fee is:

0-10 acres	10.01-20 acres	20.01 or more acres
$ 700 (up to 7 hours)	$ 1,500 (up to 15 hours)	$ 2,500 (up to 25 hours)

   b. An hourly rate of $100.00 per hour of County Engineer review or inspection time.

3. All fees shall be payable at the time of application, except that:

   a. Inspection fees based upon the per lot, per unit or base fee rates shall be paid by separate checks with the final plan, prior to recording the final plan; and

   b. The hourly rate specified in #2 (b) for review or supplemental review fee shall be payable after review, but before plan approval; and

   c. The hourly rate specified in #2 (b) for inspection or supplemental inspection fee shall be payable after inspection but before final inspection approval and release of any applicable financial guarantees.

Section 707 - Amendments

Amendments to this Ordinance may be initiated by the Planning Department or the County Commissioners. If the amendments are initiated by the County Commissioners, the proposed amendment or amendments shall be submitted to the Planning Department for review and comment at least thirty (30) days prior to a public hearing. Before enactment of a proposed amendment or amendments the County Commissioners shall hold a public hearing thereon pursuant to public notice.

Article VIII - Prohibitions

Section 801 - Prohibited Discharges and Connections

A. Any drain or conveyance, whether on the surface or subsurface, that allows any non-stormwater discharge including sewage, process wastewater, and wash water to enter the regulated municipal separate storm sewer system (MS4) or to enter the waters of this Commonwealth is prohibited.

B. No person shall allow, or cause to allow, discharges into the regulated MS4, or discharges into waters of this Commonwealth, which are not composed entirely of stormwater, except (1) as provided in Subsection C below and (2) discharges allowed under a state or federal permit.

C. The following discharges are authorized unless they are determined to be significant contributors to pollution to the regulated MS4 or to the waters of the Commonwealth:

➢ Discharges from firefighting activities	➢ Flows from riparian habitats and wetlands
➢ Potable water sources including water line flushing	➢ Uncontaminated water from foundations or from footing drains
➢ Irrigation drainage	➢ Lawn watering
➢ Air conditioning condensate	➢ De-chlorinated swimming pool discharges
➢ Springs	➢ Uncontaminated groundwater
➢ Water from crawl space pumps ➢ Basement sump pumps, pumping groundwater only	➢ Water from individual residential car washing
➢ Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spill material has been removed) and where detergents are not used	➢ Routine external building wash down (which does not use detergents or other compounds)
➢ Diverted stream flows	

D. In the event that the County, Municipality or DEP determines that any of the discharges identified in Subsection C above significantly contribute pollutants to the regulated MS4 or to the waters of the Commonwealth, the County, Municipality or DEP will notify the responsible person(s) to cease the discharge.

Section 802 - Roof Drains and Sump Pumps

Roof drains and sump pumps shall discharge to infiltration or vegetative BMPs.

Section 803 - Alteration of SWM BMPs

No person shall modify, remove, fill, landscape, or alter any SWM BMPs, facilities, areas, or structures without the written approval of Lebanon County, the Lebanon County Conservation District, and DEP (if DEP permit(s) applies).

Article IX - References

1. Pennsylvania Department of Environmental Protection. No. 363-0300-002 (December 2006), as amended and updated. Pennsylvania Stormwater Best Management Practices Manual. Harrisburg, PA.

2. Pennsylvania Department of Environmental Protection. No. 363-2134-008 (April 15, 2000), as amended and updated. Erosion and Sediment Pollution Control Program Manual. Harrisburg, PA.

3. U.S. Department of Agriculture, National Resources Conservation Service (NRCS). National Engineering Handbook. Part 630: Hydrology, 1969-2001. Originally published as the National Engineering Handbook, Section 4: Hydrology. Available from the NRCS online at: http://www.nrcs.usda.gov/.

4. U.S. Department of Agriculture, Natural Resources Conservation Service. 1986. Technical Release 55: Urban Hydrology for Small Watersheds, 2nd Edition. Washington, D.C.

5. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, Hydrometeorological Design Studies Center. 2004-2006. Precipitation-Frequency Atlas of the United States, Atlas 14, Volume 2, Version 3.0, Silver Spring, Maryland. Internet address: http://hdsc.nws.noaa.gov/hdsc/pfds/.

LEBANON COUNTY ORDINANCE NO. 50

AN ORDINANCE CREATING THE LEBANON COUNTY STORMWATER ORDINANCE

BE IT ORDAINED AND ENACTED by the Lebanon County Commissioners and it is hereby ordained and enacted by the Authority of the same as follows:

A new ordinance known as the "Lebanon County Stormwater Ordinance"

Lebanon County Subdivision Stormwater Ordinance
(Ordinance Number 50)

ENACTED and **ORDAINED** at a regular meeting of the on this 5th day of December, 2013. This Ordinance shall take effect immediately.

William E. Ames - County Commissioner

Robert J. Phillips - County Commissioner

Jo Ellen Litz - County Commissioner

ATTEST:

Jamie Wolgemuth – County Administrator

Appendix A-1
PENNDOT REGION 4 – STORM INTENSITY-DURATION-FREQUENCY CHART

PennDOT Region 4 Intensity vs. Duration

Duration (min)	1-Yr. (in/hr)	2-Yr. (in/hr)	5-Yr. (in/hr)	10-Yr. (in/hr)	25-Yr. (in/hr)	50-Yr. (in/hr)	100-Yr. (in/hr)
5	3.65	4.19	4.89	5.41	5.99	6.61	7.32
10	2.79	3.24	3.84	4.36	4.84	5.31	5.90
15	2.28	2.68	3.18	3.66	4.06	4.47	4.96
20	1.98	2.34	2.78	3.24	3.59	3.95	4.39
25	1.74	2.07	2.47	2.88	3.19	3.52	3.92
30	1.57	1.87	2.24	2.61	2.90	3.21	3.58
35	1.42	1.70	2.04	2.37	2.64	2.94	3.28
40	1.31	1.57	1.89	2.18	2.44	2.72	3.04
45	1.21	1.46	1.76	2.03	2.27	2.55	2.84
50	1.13	1.37	1.65	1.90	2.13	2.40	2.67
55	1.07	1.29	1.56	1.79	2.01	2.27	2.53
60	1.01	1.22	1.48	1.70	1.91	2.16	2.41
65	0.95	1.15	1.40	1.61	1.82	2.05	2.30
70	0.91	1.09	1.33	1.53	1.73	1.96	2.20
75	0.86	1.04	1.27	1.46	1.66	1.88	2.11
80	0.82	1.00	1.21	1.40	1.59	1.80	2.03
85	0.79	0.96	1.17	1.35	1.53	1.74	1.96
90	0.76	0.92	1.12	1.30	1.48	1.68	1.89
95	0.73	0.88	1.08	1.25	1.43	1.62	1.83
100	0.70	0.85	1.04	1.21	1.38	1.57	1.77
105	0.68	0.82	1.01	1.17	1.34	1.52	1.72
110	0.66	0.80	0.98	1.13	1.30	1.48	1.68
115	0.64	0.77	0.95	1.10	1.26	1.44	1.63
120	0.62	0.75	0.92	1.07	1.23	1.40	1.59
125	0.60	0.73	0.90	1.04	1.20	1.36	1.55
130	0.58	0.71	0.87	1.01	1.17	1.33	1.51
135	0.57	0.69	0.85	0.99	1.14	1.30	1.48
140	0.55	0.68	0.83	0.96	1.11	1.27	1.44
145	0.54	0.66	0.81	0.94	1.08	1.24	1.41
150	0.53	0.64	0.79	0.92	1.06	1.21	1.38
175	0.47	0.58	0.71	0.83	0.96	1.10	1.25
200	0.43	0.53	0.65	0.75	0.88	1.01	1.15
225	0.39	0.48	0.59	0.70	0.81	0.93	1.07
275	0.34	0.42	0.51	0.61	0.71	0.82	0.94
300	0.32	0.39	0.48	0.58	0.68	0.78	0.89
325	0.30	0.37	0.45	0.55	0.64	0.74	0.84
350	0.29	0.35	0.43	0.52	0.61	0.70	0.80
400	0.26	0.32	0.39	0.48	0.56	0.64	0.74
450	0.24	0.29	0.36	0.44	0.52	0.59	0.68
500	0.22	0.27	0.33	0.41	0.48	0.55	0.64
600	0.19	0.24	0.29	0.36	0.43	0.49	0.56
700	0.17	0.21	0.26	0.33	0.39	0.44	0.51
800	0.16	0.19	0.23	0.30	0.35	0.40	0.46
900	0.14	0.18	0.21	0.27	0.33	0.37	0.43
1,000	0.13	0.16	0.20	0.25	0.31	0.34	0.40
1,100	0.12	0.15	0.18	0.23	0.29	0.32	0.37
1,200	0.11	0.14	0.17	0.22	0.27	0.31	0.35
1,300	0.11	0.13	0.16	0.21	0.26	0.29	0.33
1,400	0.10	0.12	0.15	0.19	0.24	0.28	0.32
1,440	0.10	0.12	0.15	0.19	0.24	0.27	0.31

Appendix A-2

RUNOFF COEFFICIENTS "C" FOR RATIONAL FORMULA

Soil Group	A			B			C			D		
Slope	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+
Land Use												
Cultivated												
Winter Conditions	0.14	0.23	0.34	0.21	0.32	0.41	0.27	0.37	0.48	0.34	0.45	0.56
Summer Conditions	0.10	0.16	0.22	0.14	0.20	0.28	0.19	0.26	0.33	0.23	0.29	0.38
Fallowed Fields												
Poor Conditions	0.12	0.19	0.28	0.17	0.25	0.34	0.23	0.33	0.40	0.27	0.35	0.45
Good Conditions	0.08	0.13	0.16	0.11	0.15	0.21	0.14	0.19	0.26	0.18	0.23	0.31
Forest/Woodland	0.08	0.11	0.14	0.10	0.14	0.18	0.12	0.16	0.20	0.15	0.20	0.25
Grass Areas												
Good Conditions	0.10	0.16	0.20	0.14	0.19	0.26	0.18	0.22	0.30	0.21	0.25	0.35
Average Conditions	0.12	0.18	0.22	0.16	0.21	0.28	0.20	0.25	0.34	0.24	0.29	0.41
Poor Conditions	0.14	0.21	0.30	0.18	0.28	0.37	0.25	0.35	0.44	0.30	0.40	0.50
Impervious Areas	0.90	0.91	0.92	0.91	0.92	0.93	0.92	0.93	0.94	0.93	0.94	0.95
Weighted Residential												
Lot Size 1/8 acre	0.29	0.33	0.36	0.31	0.35	0.40	0.34	0.38	0.44	0.36	0.41	0.48
Lot Size 1/4 acre	0.26	0.30	0.34	0.29	0.33	0.38	0.32	0.36	0.42	0.34	0.38	0.46
Lot Size 1/3 acre	0.24	0.28	0.31	0.26	0.32	0.35	0.29	0.35	0.40	0.32	0.36	0.45
Lot Size 1/2 acre	0.21	0.25	0.28	0.24	0.27	0.32	0.27	0.31	0.37	0.30	0.34	0.43
Lot Size 1 acre	0.18	0.23	0.26	0.21	0.24	0.30	0.24	0.29	0.36	0.28	0.32	0.41

Appendix A-3

RUNOFF CURVE NUMBERS "CN" FOR SCS METHOD

Soil Group	A			B			C			D		
Slope	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+
Land Use												
Cultivated												
Winter Conditions	48	60	65	62	73	73	68	78	79	77	81	88
Summer Conditions	35	51	61	48	55	70	57	65	77	64	69	80
Fallowed Fields												
Poor Conditions	45	54	76	56	63	85	64	74	90	69	77	93
Good Conditions	30	44	74	43	48	83	48	54	88	56	60	90
Forest/Woodland	30	30	40	42	46	55	45	50	70	50	56	77
Grass Areas												
Good Conditions	35	39	51	48	54	61	56	59	74	62	63	80
Average Conditions	45	49	53	52	55	69	60	63	79	65	69	84
Poor Conditions	48	55	68	56	67	79	66	74	86	73	81	89
Impervious Areas	96	97	98	96	97	98	96	97	98	96	97	98
Weighted Residential												
Lot Size 1/8 acre	71	75	77	74	76	85	78	80	90	81	83	92
Lot Size 1/4 acre	61	62	67	66	69	75	67	69	83	75	78	87
Lot Size 1/3 acre	57	59	65	64	66	72	65	66	81	74	77	86
Lot Size 1/2 acre	54	57	63	62	64	70	63	65	80	72	76	85
Lot Size 1 acre	51	55	62	61	63	68	61	64	79	71	75	84

Appendix A-4

MANNING'S "n" VALUES FOR PIPES	
PIPE MATERIAL	MANNING'S "n"
Helical corrugated steel / aluminum $2\,^{2}/_{3} \times ^{1}/_{2}$ corrugations Diameter (inches)	
15	0.014
18	0.015
21	0.018
24	0.017
27	0.018
30	0.019
36	0.020
42	0.021
48	0.021
Reinforced Concrete	0.013
Smooth Lined Corrugated Polyethylene All Diameters	0.012

Appendix A-5

MANNING ROUGHNESS COEFFICIENTS

Roughness Coefficients (Manning's "n") For Channel Flow

Reach Description	*n*
Natural stream, clean, straight, no rifts or pools	0.03
Natural stream, clean, winding, some pools or shoals	0.04
Natural stream, winding, pools, shoals, stony with some weeds	0.05
Natural stream, sluggish deep pools and weeds	0.07
Natural stream or swale, very weedy or with timber underbrush	0.10
Concrete pipe, culvert or channel	0.012
Corrugated metal pipe	0.012-0.027*

*depending upon type, coating and diameter

Appendix A-6

CLAY LINER

1. SCOPE

The work shall consist of the construction of the clay liner as shown on the construction plans.

2. MATERIALS

Soils used in clay liner construction shall have a minimum plasticity index of 12 as tested by Atterberg Limit tests (ASTM D4318), a minimum percentage passing the number 200 sieve as specified on the construction plans, and a re-compacted in-place permeability of 1 x 10^{-7} centimeters per second or less.

Clay materials shall contain no sod, brush, roots, frozen soil, or other perishable materials. Rock particles larger than 3 inches shall be removed prior to compaction of the clay.

3. FOUNDATION PREPARATION

Foundation surfaces shall be graded to remove surface irregularities and shall be scarified or otherwise acceptably scored or loosened to a minimum depth of 2 inches. The moisture content of the loosened material shall be controlled as specified for the clay liner, and the surface materials of the foundation shall be compacted and bonded with the first layer of the clay liner as specified for subsequent layers of clay liner.

4. PLACEMENT

The clay liner shall not be placed until the required foundation preparation has been completed and the foundation has been inspected and approved by the Technician or Engineer. The clay liner shall not be placed upon a frozen surface, nor shall snow, ice, or frozen material be incorporated in the clay liner.

The clay liner shall be placed in lifts. The thickness of each lift before compaction shall not exceed the smaller of 6 inches or the length of the teeth of the footed compactor used.

The distribution of materials throughout the clay liner shall be essentially uniform, and the clay liner shall be free from lenses, pockets, streaks, or layers of material differing substantially in texture, moisture content, or gradation from the surrounding material.

If the surface of any layer becomes too hard and smooth for proper bond with the succeeding layer, it shall be scarified to a depth of not less than 2 inches before the next layer is placed.

5. CONTROL OF MOISTURE CONTENT

During placement and compaction of the clay liner, the moisture content of the clay being placed shall be maintained above optimum moisture as determined by the Standard Proctor Test (ASTM D698) or Modified Proctor Test (ASTM D1557).

The application of water to the clay shall be accomplished at the borrow areas insofar as practicable. Water may be applied by sprinkling the clay after placement and before compaction of the liner, if necessary. Uniform moisture distribution shall be obtained by disking.

6. COMPACTION

The clay liner shall be compacted to a minimum of 95% of standard proctor dry density (ASTM D698) or to a minimum of 90% of modified proctor dry density (ASTM D1557), at a moisture content above optimum moisture.

The clay liner shall be compacted with a footed compactor weighing at least 25,000 pounds, operated continuously, in un-compacted lift thicknesses not to exceed the smaller of 6 inches or the length of the teeth on the footed compactor used.

7. REWORKING OR REMOVAL AND REPLACEMENT OF DEFECTIVE LINER

Clay placed at densities lower than the specified minimum density or at moisture contents lower than optimum moisture content or otherwise not conforming to the requirements of the specifications shall be reworked to meet the specifications or removed and replaced. The replacement clay and the foundation and fill surfaces upon which it is placed shall conform to all requirements of this specification for foundation preparation, approval, placement, moisture control, and compaction.

8. TESTING AND DOCUMENTATION REQUIREMENTS

Liner construction shall be tested and documented as specified below. Copies of the documentation report, including test locations and test results, shall be provided to the owner.

Field and laboratory soil tests shall be completed on the clay liner, by a third party engineering or testing firm retained by the contractor, to document compliance with this specification. Testing shall be completed as the liner is being placed. The following tests shall be completed at the specified frequency.

Standard proctor test (ASTM D698)	1 per 5,000 cubic yards of clay liner
or	
Modified Proctor Test (ASTM D1557)	1 per 5,000 cubic yards of clay liner
Field density tests ASTM D2922, or D2937, or D2167, or D1556)	1 test per 100-foot grid per 1 foot thickness of clay liner
Atterberg Limit tests (ASTM D4318)	1 per 1,500 cubic yards of clay liner

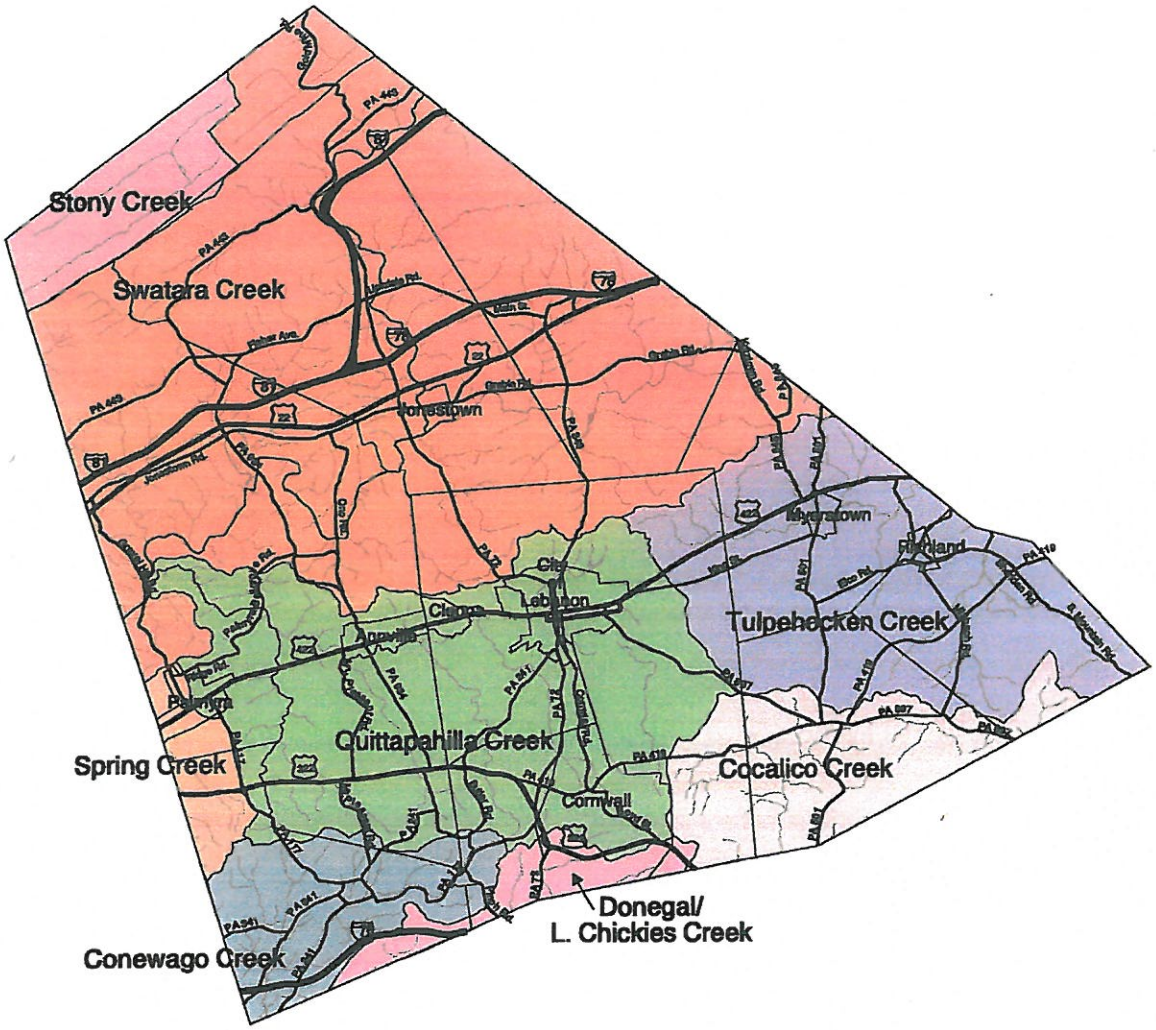
Grain size distribution (ASTM D422)	1 per 1,500 cubic yards of clay liner
Permeability (ASTM D5084)	1 per 5,000 cubic yards of clay liner (2 minimum per facility)

Atterberg limits, grain size distribution, and permeability tests shall be completed on undisturbed samples obtained from the constructed clay liner. A minimum of one of each of the laboratory tests specified above shall be completed per clay liner.

All test holes shall be backfilled using powdered bentonite mixed with clay soil used in liner construction and compacted by hand tamping. The clay shall be broken down into clods less than ½ inch in diameter. A minimum of 25% of the backfilled test hole volume shall be occupied by powdered bentonite after backfilling.

Appendix B

LEBANON COUNTY WATERSHEDS

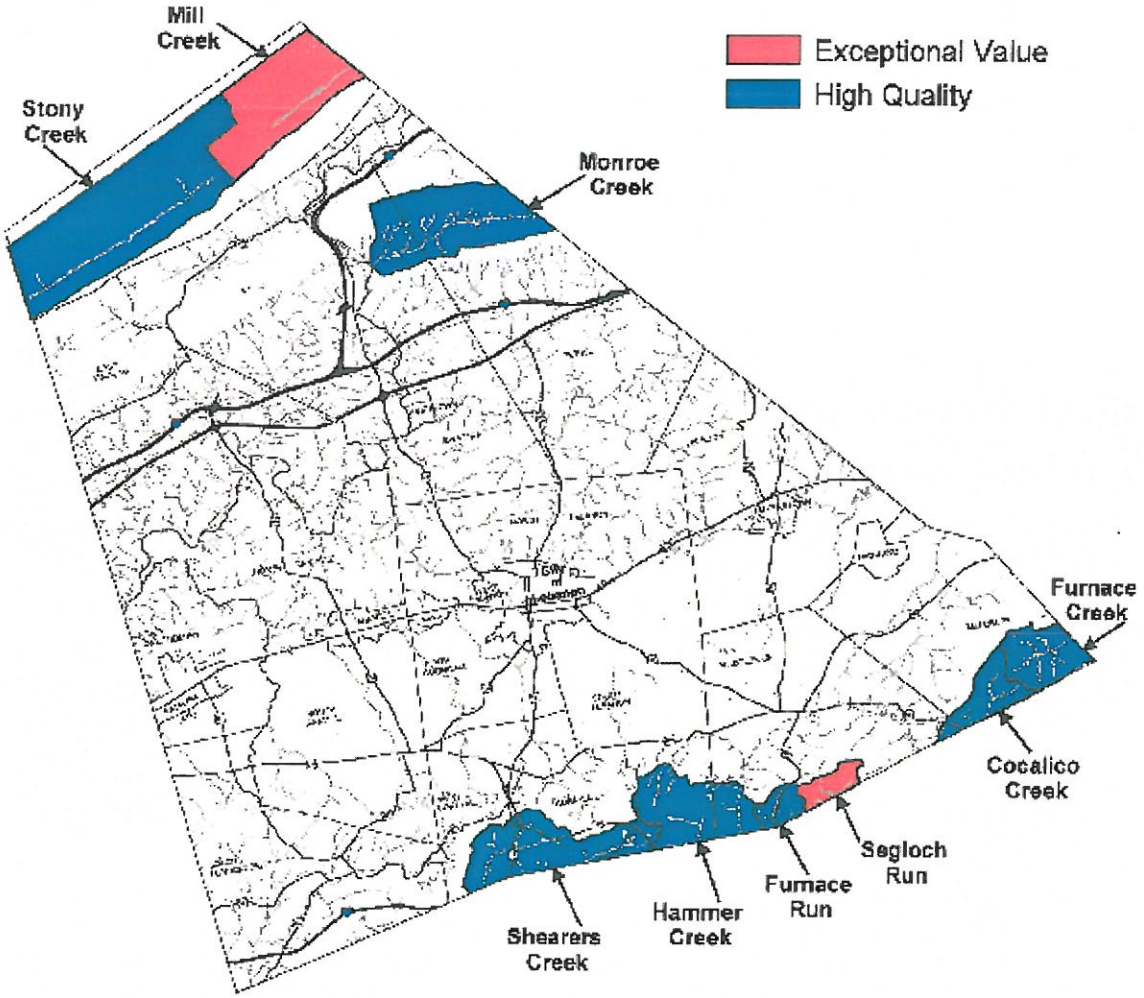


Map Prepared by the Lebanon City/County GIS Department (May 2002).
Metadata provided on request from the Lebanon City/County GIS Department.
North American Datum of 1927 (NAD27). Projection Stateplane, Zone 5151.

N

LEBANON COUNTY

Exceptional Value & High Quality Watersheds



Map Prepared by the Lebanon County GIS Department (January 2013)

Appendix C

Lebanon County - Stormwater Management
Best Management Practices (BMP)
Operation and Maintenance (O&M) Agreement

THIS AGREEMENT, made and entered into this _____ day of _____, 20__, by and between __[name of owner/equitable owner]_____, (hereinafter the "Landowner"), and the subject municipality, Lebanon County; Pennsylvania, (hereinafter "Municipality");

WITNESSETH

WHEREAS, the Landowner is the owner of certain real property as recorded by deed in the land records of Lebanon County, Pennsylvania, Deed Book _____ at Page _____, (hereinafter "Property").

WHEREAS, the Landowner is proceeding to build and develop the Property; and

WHEREAS, the Subdivision/Land Development/Stormwater Management (SWM) Site Plan (hereinafter "Plan") for ___[name of owner/equitable owner]_____ which is expressly made a part hereof, as approved or to be approved by Lebanon County, provides for management of stormwater within the confines of the Property; and

WHEREAS, the SWM BMP Operation and Maintenance Plan (hereinafter referred to as the "O&M Plan") approved by the Municipality for the property identified herein, which is attached hereto as Exhibit A and made part hereof, as approved by the Municipality, provides for management of stormwater within the confines of the Property through the use of BMPs; and

WHEREAS, the Municipality and the Landowner, his successors and assigns agree that the health, safety, and welfare of the residents of the Municipality and the protection and maintenance of water quality require that on-site SWM Best Management Practices (BMPs) be constructed and maintained on the Property: and

WHEREAS, the Municipality requires, that stormwater management facilities as shown on the Plan be constructed and adequately maintained by the Landowner, his successors and assigns; and

WHEREAS, the Municipality requires, through the implementation of the SWM Site Plan, that SWM BMPs as required by said SWM Site Plan and the Lebanon County Stormwater Management Ordinance be constructed and adequately operated and maintained by the Landowner, successors, and assigns.

NOW, THEREFORE, in consideration of the foregoing premises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

1. The stormwater management BMPs shall be constructed by the Landowner, his successors and assigns, in accordance with the terms, conditions and specifications identified in the subdivision/land development/SWM Site Plan.

2. The Landowner, his successors and assigns, shall operate and maintain the stormwater management BMPs as shown on the subdivision/land development/SWM Site Plan in good working condition in accordance with the specific operation and maintenance requirements noted in the approved O&M Plan.

3. The Landowner, his successors and assigns, hereby grants permission to the Municipality, Lebanon County and the Lebanon County Engineer, his authorized agents and employees, upon presentation of proper identification, to enter upon the Property at reasonable times, and to inspect the SWM BMPs whenever deemed necessary. Whenever possible, the Municipality, Lebanon County or the Lebanon County Engineer shall notify the Landowner prior to entering the Property. The purpose of the inspection is to assure safe and proper functioning of the SWM BMPs. The inspection shall cover the entire facilities, pipes, berms, outlet structures, pond areas, access roads, etc. When inspections are conducted, the Municipality, Lebanon County and/or the Lebanon County Engineer shall give the Landowner, his successors and assigns, copies of the inspection report with findings and evaluations. At a minimum, this agreement grants the Municipality, Lebanon County and/or the Lebanon County Engineer the right to perform inspections in accordance with the following schedule:

   - Annually for the first 5 years after the construction of the stormwater facilities,
   - Once every 3 years thereafter, or
   - During or immediately upon the cessation of a 10 year or greater precipitation event.

4. All reasonable costs for said inspections shall be borne by the Landowner and payable to the inspecting agency.

5. The owner shall convey to the Municipality easements and/or rights-of-way to assure access for periodic inspections by the Municipality and Lebanon County and maintenance, if required.

6. In the event the Landowner, his successors and assigns, fails to maintain the SWM BMPs in good working condition acceptable to the Municipality, the Municipality, or its representatives, may enter upon the Property and take such necessary and prudent action to maintain said SWM BMPs and to charge the costs of the maintenance and/or repairs to the Landowner, his successors and assigns. This provision shall not be construed as to allow the Municipality to erect any structure of a permanent nature on the land of the Landowner, outside of any easement belonging to the Municipality. It is expressly understood and agreed that the Municipality is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the Municipality.

7. The Landowner, his successors and assigns, will perform maintenance in accordance with the maintenance schedule for the SWM BMPs including sediment removal as outlined on the approved schedule and/or Subdivision/Land Development/SWM Site Plan.

8. In the event the Municipality, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like on account of the Landowner's or his successors' and assigns' failure to perform such work, the Landowner, his successors and assigns, shall reimburse the Municipality upon demand, within 10 days of receipt of invoice thereof, for all costs incurred by the Municipality hereunder. If not paid within said 10-day period, the Municipality may enter a lien against the property in the amount of such costs, or may proceed to recover his costs through proceedings in

equity or at law as authorized under the applicable provisions of the Pennsylvania Municipal Code.

9. The Landowner, his successors and assigns, shall indemnify the Municipality and Lebanon County and their agents and employees against any and all damages, accidents, casualties, occurrences or claims, which might arise or be asserted against the Municipality or Lebanon County for the construction, presence, existence or maintenance of the stormwater management facilities by the Landowner, his successors and assigns.

10. In the event a claim is asserted against the Municipality, its agents or employees, the Municipality shall promptly notify the Landowner, his successors and assigns, and they shall defend, at their own expense, any suit based on such claim. If any judgment or claims against the Municipality, its agents or employees shall be allowed, the Landowner, his successors and assigns shall pay all costs and expenses in connection therewith.

11. In the advent of an emergency or the occurrence of special or unusual circumstances or situations, the Municipality or Lebanon County may enter the Property, if the Landowner is not immediately available, without notification or identification, to inspect and perform necessary maintenance and repairs, if needed, when the health, safety or welfare of the citizens is at jeopardy. However, the Municipality or Lebanon County shall notify the landowner of any inspection, maintenance, or repair undertaken within 5 days of the activity. The Landowner shall reimburse the agency undertaking the inspections, maintenance or repairs for any associated costs.

12. The intent and purpose of this Agreement is to ensure the proper maintenance of the onsite BMPs by the Landowner; provided, however, that this Agreement shall not be deemed to create or affect any additional liability of any party for damage alleged to result from or be caused by stormwater runoff.

13. The Landowner, its executors, administrators, assigns, and other successors in interests, shall release the Municipality, Lebanon County Engineer and Lebanon County from all damages, accidents, casualties, occurrences, or claims which might arise or be asserted against said employees and representatives from the construction, presence, existence, or maintenance of the BMP(s) by the Landowner, Municipality or Lebanon County.

This Agreement shall be recorded among the land records of Lebanon County, Pennsylvania and shall constitute a covenant running with the Property and/or equitable servitude, and shall be binding on the Landowner, his administrators, executors, assigns, heirs and any other successors in interests, in perpetuity.

ATTEST:

WITNESS the following signatures and seals:

(SEAL) For the Municipality:

_____

(SEAL) For the Landowner:

_____

I, _____, a Notary Public in and for the County and State aforesaid, whose commission expires on the _____ day of _____, 20__, do hereby certify that _____ whose name(s) is/are signed to the foregoing Agreement bearing date of the _____ day of _____, 20__, has acknowledged the same before me in my said County and State.

GIVEN UNDER MY HAND THIS _____ day of _____, 20___.

_____

NOTARY PUBLIC

(SEAL)

Appendix D

Soil Hydrologic Group Classification

Soil Name	Hydrologic Group
Abbottstown	C
Bedington	B
Berks	C
Bowmansville	C
Brecknock	B
Brinkerton	D
Buchanan	C
Bucks	B
Calvin	C
Chester	B
Clarksburg	C
Comly	C
Duffield	B
Hagerstown	C
Hazelton	B
Holly	D
Klinesville	C/D
Laidig	C
Leck Kill	B
Lehigh	C
Lindside	C
Markes	D
Melvin Variant	D
Mount Lucas	C
Murrill	B
Neshaminy	B
Nolin Variant	B
Penn	C
Philo	B
Pope	B
Readington	C
Rowland	C
Thorndale	D
Ungers	B
Watchung	D
Weikert	C/D

Appendix E

SAMPLE STANDARD STORM WATER NOTES

Use all applicable notes and supplement or revise where necessary for clarification:

1. All storm water management facilities shown on this plan shall be constructed by the developer in accordance with the design, conditions and specifications identified on this plan. Ownership and maintenance shall be the responsibility of the landowner, his successors and assigns, unless specifically identified otherwise herein.

2. Storm water management facilities shall be maintained in good working condition so that they are performing their design function, in a manner acceptable to the county, as required by the Lebanon County Stormwater Ordinance. Maintenance shall include performing routine maintenance and repair or replacement of damaged facilities, vegetation or storm water areas to conditions as shown on the approved plan and in accordance with the Lebanon County Stormwater Ordinance.

3. Any drainage and utility easements shown on the plan shall be constructed, owned and maintained in accordance with the approved plan and shall be referenced within the property deed.

4. Runoff from the lot improvements shall be directed to the storm water management facilities. Storm water runoff from existing natural swales and/or other existing drainage conveyors shall not be directed towards or intercepted by the storm water management facilities.

5. Municipal and County Officials and their agents or employees have the right of access for inspection and, in cases of construction default, construction of the storm water management facilities.

6. After storm water management facilities installation is completed, contact the Lebanon County Planning Department (717-228-4444) for inspection by the County Engineer. No occupancy permitted until storm water management facilities have been installed and approved through inspection by the County Engineer.

   Where facilities such as new streets with storm sewers and related structures are intended for ownership and maintenance by the Municipality, Homeowner's Association, or similar organization, detailed additional notes are required to document ownership and maintenance responsibilities.

STORM WATER EXEMPTIONS

Use the following note instead of the 6 standard storm water notes:

Lot(s) #_____ has (have) been exempted from the mandatory design and installation of storm water management facilities, based upon satisfaction of the exemption criteria with Section 402 of the Lebanon County Stormwater Ordinance. No occupancy permitted until lot(s) #_____ has (have) been inspected and approved by the County Engineer (717-228-4444) to verify that construction and development has been completed in accordance with this plan and Section 402 criteria.

Appendix F

EROSION AND SEDIMENTATION POLLUTION CONTROL GUIDELINES

INTRODUCTION

Pennsylvania law requires an Erosion and Sedimentation Pollution Control (E & SPC) plan be developed and implemented for all earthmoving activities. The following guidelines are to be incorporated into an E & SPC plan for projects that do not have an existing plan. **The guidelines alone do not constitute a complete plan.** The E & SPC plan must be fully developed and site specific in accordance with Pennsylvania Department of Environmental Protection Chapter 102 rules and regulations. Additional information regarding E & SPC development and Chapter 102 regulations may be obtained from the County Conservation District.

PROCEDURE

The following list of E & SPC guidelines shall be used as standard subdivision and land development plan notes on all plans. Major subdivision and land development plans also require site specific E & SPC design sheets and details.

GUIDELINES

1. A logical construction sequence shall be developed that includes the installation of E & SPC facilities, and Best Management Practices (BMP's), before earthmoving may commence.

2. E & SPC facilities and BMP's shall be correctly installed and maintained. Maintenance information and construction details may be obtained from the County Conservation District.

3. Earth disturbance shall take place within a defined limit of disturbance and immediately prior to construction.

4. Development plans shall preserve salient natural features, minimize land cuts and fills and conform to the general topography. Plans shall be designed and implemented so as to create the least potential for erosion and to adequately contain the volume and reduce the velocity of surface water runoff.

5. Natural vegetation shall be retained, protected and supplemented prior to and during construction.

6. Topsoil shall be removed from construction areas and stockpiled for final grading and seedbed preparation. Downslope areas of any stockpiles, construction or borrow areas shall be protected with correctly installed and maintained silt fence, straw bales or sediment traps prior to any earth disturbance in order to minimize sediment laden runoff.

7. All cuts and fills shall be brought to final grade early in the construction sequence, and stabilized immediately with seed and mulch.

8. Only driveway excavations that can be stabilized with a crushed stone base the same day shall be completed.

9. Current regulations state: *(a) Upon completion of an earth disturbance activity or any stage or phase of an activity, the site shall be immediately seeded, mulched or otherwise protected from accelerated erosion and sedimentation. (b) Erosion and sediment control BMP's shall be implemented and maintained until the permanent stabilization is completed. (c) For an earth disturbance activity or any stage or phase of an activity to be considered permanently stabilized, the disturbed areas shall be covered with one of the following: (1) A minimum uniform 70% perennial vegetative cover, with a density capable of resisting accelerated erosion and sedimentation. (2) An acceptable BMP which permanently minimizes accelerated erosion and sedimentation.*

10. The Penn State *Erosion Control & Conservation Plantings on Noncropland guide or Agronomy guide* shall be consulted for permanent and temporary seeding and mulching types and rates. (Straw mulch shall be applied at a rate of at least 3 tons per acre or 5 bales per 1000 square feet. Slopes steeper than 3:1 shall be correctly lined with appropriate turf reinforcement matting.) Other helpful publications include *Turfgrass Establishment* (special Circular 163), *Turfgrass Seed and Seed Mixtures* (extension circular 391), and *Principles of Turfgrass Irrigation* (special circular 158). The publications referenced are available from the Penn State Extension Office.

11. All recycling and disposal of construction waste shall be in accordance with local and state rules and regulations for waste management. Construction waste includes but is not limited to: Excess soil and rock, building materials, concrete and concrete wash water, sanitary waste and any other materials that could adversely impact surface or ground water quality.

Post Construction Stormwater Management (PCSM) Standard Notes

PCSM Requirements
A licensed professional or a designee shall be present onsite and be responsible during critical stages of implementation of the approved PCSM Plan. The critical stages may include the installation of underground treatment or storage BMPs, structurally engineered BMPs, or other BMPs as deemed appropriate by the Department or the conservation district. The PCSM Plan, inspection reports, and monitoring records shall be available for review and inspection by the Department or the conservation district.

PCSM Long Term Operations and Maintenance Requirements
The permittee or co-permittee shall be responsible for long-term operation and maintenance of PCSM BMPs unless a different person is identified in the notice of termination and has agreed to long-term operation and maintenance of PCSM BMPs.
A permittee or co-permittee that fails to transfer long-term operation and maintenance of the PCSM BMP or otherwise fails to comply with this requirement shall remain jointly and severally responsible with the landowner for long-term operation and maintenance of the PCSM BMPs located on the property.

Permit Termination
Upon permanent stabilization of the earth disturbance activity and installation of BMPs in accordance with an approved plan, the permittee or co-permittee shall submit a notice of termination to the Department or conservation district. The notice of termination must include:

(1) The facility name, address and location

(2) The operator name and address

(3) The NPDES permit number

(4) The reason for permit termination

(5) Identification of the persons who have agreed to and will be responsible for long-term operation and maintenance of the PCSM

(6) Copy of Legal Instrument: For any property containing a PCSM BMP, the permittee or co-permittee shall record an instrument with the recorder of deeds which will assure disclosure of the PCSM BMP and the related obligations in the ordinary course of a title search of the subject property. The recorded instrument must identify the PCSM BMP, provide for necessary access related to long-term operation and maintenance for PCSM BMPs and provide notice that the responsibility for long-term operation and maintenance of the PCSM BMP is a covenant that runs with the land that is binding upon and enforceable by subsequent grantees, and provide proof of filing with the notice of termination.

(7) Final certification: The permittee shall include with the notice of termination "Record Drawings" with a final certification statement from a licensed professional, which reads as follows:

"I (name) do hereby certify pursuant to the penalties of 18 Pa. C.S.A. §4904 to the best of my knowledge, information and belief, that the accompanying record drawings accurately reflect the as-built conditions, are true and correct, and are in conformance with Chapter 102 of the rules and regulations of the Department of Environmental Protection and that the project site was constructed in accordance with the approved PCSM Plan, all approved plan changes and accepted construction practices."

(1) The permittee shall retain a copy of the record drawings as a part of the approved PCSM Plan.

(2) The permittee shall provide a copy of the record drawings as part of the approved PCSM Plan to the person identified in this section as being responsible for the long-term operation and maintenance of the PCSM BMPs.

APPENDIX G

WORKSHEETS FOR COMPUTING EXPECTED POLLUTANT LOADS FROM SPECIFIC LAND USES

Worksheet 1. General Site Information

INSTRUCTIONS: Fill out Worksheet 1 for each watershed

Date:

Project Name:

Municipality:

County:

Total Area (acres):

Major River Basin:

http://www.pawaterplan.dep.state.pa.us/StateWaterPlan/docroot/default.aspx

Watershed:

Sub-Basin:

Nearest Surface Water(s) to Receive Runoff:

Chapter 93 – Designated Water Use:

http://www.pacode.com/secure/data/025/chapter93/chap93toc.html

Impaired according to Category 4 or 5 of the Integrated Water Quality Monitoring and Assessment Report? Yes ☐ No ☐

http://www.portal.state.pa.us/portal/server.pt/community/water_quality_standards/10556/integrated_water_quality_report_-_2010/682562

List Causes of Impairment:

Is there an established TMDL that applies: Yes ☐ No ☐

Total Maximum Daily Loads (TMDLS)

http://www.dep.state.pa.us/watermanagement_apps/tmdl/.

http://www.epa.gov/reg3wapd/tmdl/pa_tmdl/index.htm

Is project subject to, or part of:

Municipal Separate Storm Sewer System (MS4) Requirements? Yes ☐ No ☐

http://www.portal.state.pa.us/portal/server.pt/community/stormwater_management/10628/npdes_ms4%C2%A0information/669119

Existing or planned drinking water supply? Yes ☐ No ☐

If yes, distance from proposed discharge (miles):

Approved Act 167 Plan? Yes ☐ No ☐

http://www.portal.state.pa.us/portal/server.pt?open=514&objID=554325&mode=2

Existing River Conservation Plan? Yes ☐ No ☐

http://www.dcnr.state.pa.us/brc/rivers/riversconservation/registry/

Worksheet 2. Sensitive Natural Resources

INSTRUCTIONS

1. Provide Sensitive Resources Map according to non-structural BMP 5.4.1 in Chapter 5. This map should identify wetlands, woodlands, natural drainage ways, steep slopes, and other sensitive natural areas.

2. Summarize the existing extent of each sensitive resource in the Existing Sensitive Resources Table (below, using Acres). If none present, insert 0.

3. Summarize Total Protected Area as defined under BMPs in Chapter 5.

4. Do not count any area twice. For example, an area that is both a floodplain and a wetland may only be considered once.

EXISTING NATURAL SENSITIVE RESOURCE	MAPPED? Yes/no/n/a	TOTAL AREA (Ac.)	PROTECTED AREA (Ac.)
Waterbodies			
Floodplains			
Riparian Areas			
Wetlands			
Woodlands			
Natural Drainage Ways			
Steep Slopes, 15% - 25%			
Steep Slopes, over 25%			
Other:			
Other:			
TOTAL EXISTING:			

Worksheet 3. Nonstructural BMP Credits

PROTECTED AREA

1.1 Area of Protected Sensitive/Special Value Features (see WS 2) _____ **Ac.**

1.2 Area of Riparian Forest Buffer Protection _____ **Ac.**

3.1 Area of Minimum Disturbance/Reduced Grading _____ **Ac**

TOTAL _____ **Ac**

Site Area	Minus	Protected Area	=	Stormwater Management Area
[ ]	-	[ ]	=	[ ]

This is the area that requires stormwater management

VOLUME CREDITS

3.1 Minimum Soil Compaction (See Chapter 8, page 22 – SW BMP Manual)

Lawn	_____ ft^2	x 1/4" x 1/12	=	_____ ft^3
Meadow	_____ ft^2	x 1/3" x 1/12	=	_____ ft^3

3.3 Protect Existing Trees (See Chapter 8, page 23 – SW BMP Manual)

For Trees within 100 feet of impervious area:

Tree Canopy	_____ ft^2	x 1/2" x 1/12	=	_____ ft^3

5.1 Disconnect Roof Leaders to Vegetated Areas (See Chapter 8 page 25 – SW BMP Manual)

For runoff directed to areas protected under 5.8.1 and 5.8.2

Roof Area	_____ ft^2	x 1/3" x 1/12	=	_____ ft^3

For all other disconnected roof areas

Roof Area	_____ ft^2	x 1/4" x 1/12	=	_____ ft^3

5.2 Disconnect Non-Roof impervious to Vegetated Areas (See Chapter 8, page 26 – SW BMP Manual)

For Runoff directed to areas protected under 5.8.1 and 5.8.2

Impervious Area	_____ ft^2	x 1/3" x 1/12	=	_____ ft^3

For all other disconnected roof areas

Impervious Area	_____ ft^2	x 1/4" x 1/12	=	_____ ft^3

TOTAL NON-STRUCTURAL VOLUME CREDIT* [_____ ft]

**For use on Worksheet 5*

Worksheet 4. Change in Runoff Volume for 2-YR Storm Event

PROJECT: _____
Drainage Area: _____
2-Year Rainfall: _____ in

Total Site Area: _____ acres
Protected Site Area: _____ acres
Managed Area: _____ acres

Existing Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
Woodland								
Meadow								
Impervious								
TOTAL:								

Developed Conditions

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[2] (ft^3)
TOTAL:								

2-Year Volume Increase (ft3):

2-Year Volume Increase = Developed Conditions Runoff Volume – Existing Conditions Runoff Volume

1. Runoff (in) = $Q = (P-0.2S)^2 / (P+0.8S)$ where
   P = 2-Year Rainfall (in)
   S = (1000/ CN)-10
2. Runoff Volume (CF) = Q x Area x 1/12
   Q = Runoff (in)
   Area = Land use area (sq. ft)

Note: Runoff Volume must be calculated for EACH land use type/condition and HSGI.
The use of a weighted CN value for volume calculations is not acceptable.

Worksheet 5. Structural BMP Volume Credits

PROJECT: _____

SUB-BASIN: _____

Required Control Volume (ft^3) – *from Worksheet 4*: _____

Non-structural Volume Credit (ft^3) – *from Worksheet 3*: - _____
(maximum is 25% of required volume)

Structural Volume Reqmt (ft^3) _____

(Required Control Volume minus Non-structural Credit)

	Proposed BMP	Area (ft^2)	Volume Reduction Permanently Removed (ft^3)
6.4.1	Porous Pavement		
6.4.2	Infiltration Basin		
6.4.3	Infiltration Bed		
6.4.4	Infiltration Trench		
6.4.5	Rain Garden/Bioretention		
6.4.6	Dry Well / Seepage Pit		
6.4.7	Constructed Filter		
6.4.8	Vegetated Swale		
6.4.9	Vegetated Filter Strip		
6.4.10	Berm		
6.5.1	Vegetated Roof		
6.5.2	Capture and Re-use		
6.6.1	Constructed Wetlands		
6.6.2	Wet Pond / Retention Basin		
6.7.1	Riparian Buffer/Riparian Forest Buffer Restoration		
6.7.2	Landscape Restoration / Reforestation		
6.7.3	Soil Amendment		
6.8.1	Level Spreader		
6.8.2	Special Storage Areas		
Other			

Total Structural Volume (ft^3): _____

Structural Volume Requirement (ft^3): _____

DIFFERENCE _____

WORKSHEET 7. CALCULATION OF RUNOFF VOLUMES (PRV and EDV) FOR CG-2 ONLY

PROJECT: _____

DRAINAGE AREA:

Total Site Area: _____ **acres**

Protected Site Area: _____ **acres**

Managed Area: _____ **acres**

Total Impervious Area **acres**

2 Inch Runoff - Multiply Total Impervious Area by 2 inch

Cover Type	Area (ac)	Runoff Capture Volume (ft^3)
Roof		
Pavement		
Other Impervious		
TOTAL:		

1 Inch Rainfall -

Cover Type	Area (sf)	Area (ac)	Runoff (in)	Runoff Volumes (ft^3)
TOTAL:				

1. Total Runoff Capture Volume (ft^3) =Total Impervious Area (ft^2) x 2 inch x 1/12

2. PRV (ft^3) = Total Impervious Area (ft^2) x 1 inch x 1/12

3. EDV (ft^3) = Total Impervious Area (ft^2) x 1 inch x 1/12

Water quality volume requirements for land areas with existing cover consisting of meadow, brush, wood-grass combination, or woods proposed for conversion to any other non-equivalent type of pervious cover shall be sized for one-half (1/2) the volume required for impervious surfaces as mentioned in this worksheet and calculated in items 1 through 3 above

WORKSHEET 8 . STRUCTURAL BMP VOLUME CREDITS

PROJECT: _____

SUB-BASIN: _____

Required Control Volume (ft^3) - *from Worksheet 7*: _____

Non-structural Volume Credit (ft^3) - *from Worksheet 3*: - _____

Structural Volume Reqmt (ft^3) _____

(Required Control Volume minus Non-structural Credit)

Proposed BMP*		Area (ft^2)	Storage Volume (ft^3)
6.4.1	Porous Pavement		
6.4.2	Infiltration Basin		
6.4.3	Infiltration Bed		
6.4.4	Infiltration Trench		
6.4.5	Rain Garden/Bioretention		
6.4.6	Dry Well / Seepage Pit		
6.4.7	Constructed Filter		
6.4.8	Vegetated Swale		
6.4.9	Vegetated Filter Strip		
6.4.10	Berm		
6.5.1	Vegetated Roof		
6.5.2	Capture and Re-use		
6.6.1	Constructed Wetlands		
6.6.2	Wet Pond / Retention Basin		
6.6.3	Dry Extended Detention Basin		
6.6.4	Water Quality Filters		
6.7.1	Riparian Buffer Restoration		
6.7.2	Landscape Restoration / Reforestation		
6.7.3	Soil Amendment		
6.8.1	Level Spreader		
6.8.2	Special Storage Areas		
Other			

Total Structural Volume (ft^3): _____

Structural Volume Requirement (ft^3): _____

DIFFERENCE _____

WORKSHEET 10. WATER QUALITY COMPLIANCE FOR NITRATE

Does the site design incorporate the following BMPs to address nitrate pollution? A summary "yes" rating is achieved if at least 2 Primary BMPs for nitrate are provided across the site or 4 secondary BMPs for nitrate are provided across the site (or the

PRIMARY BMPs FOR NITRATE:

	YES	NO
NS BMP 5.4.2 - Protect / Conserve / Enhance Riparian Buffers		
NS BMP 5.5.4 - Cluster Uses at Each Site		
NS BMP 5.6.1 - Minimize Total Disturbed Area		
NS BMP 5.6.3 - Re-Vegetate / Re-Forest Disturbed Areas (Native Species)		
NS BMP 5.9.1 - Street Sweeping / Vacuuming		
Structural BMP 6.7.1 - Riparian Buffer Restoration		
Structural BMP 6.7.2 - Landscape Restoration		

SECONDARY BMPs FOR NITRATE:

NS BMP 5.4.1 - Protect Sensitive / Special Value Features		
NS BMP 5.4.3 - Protect / Utilize Natural Drainage Features		
NS BMP 5.6.2 - Minimize Soil Compaction		
Structural BMP 6.4.5 - Rain Garden / Bioretention		
Structural BMP 6.4.8 - Vegetated Swale		
Structural BMP 6.4.9 - Vegetated Filter Strip		
Structural BMP 6.6.1 - Constructed Wetland		
Structural BMP 6.7.1 - Riparian Buffer Restoration		
Structural BMP 6.7.2 - Landscape Restoration		
Structural BMP 6.7.3 - Soils Amendment/Restoration		

Worksheet 11 – BMPs for Pollution Prevention		
Does the site design incorporate the following BMPs to address nitrate pollution? A summary "yes" rating is achieved if at least 2 Primary BMPs are provided across the site. "Provided across the site" is taken to mean that the specifications for that BMP set forward in Chapters 5 and 6 are satisfied.		
	Yes	**No**
BMPs for Pollution Prevention:	☐	☐
NS BMP 5.4.1 – Protect Sensitive/Special Value Features	☐	☐
NS BMP 5.4.2 – Protect/Conserve/Enhance Riparian Buffers	☐	☐
NS BMP 5.4.3 – Protect/Utilize Natural Flow Pathways in Overall Stormwater Planning and Design	☐	☐
NS BMP 5.5.1 – Cluster Uses at Each Site; Build on the Smallest Area Possible	☐	☐
NS BMP 5.6.1 – Minimize Total Disturbed Area - Grading	☐	☐
NS BMP 5.6.2 – Minimize Soil Compaction in Disturbed Areas	☐	☐
NS BMP 5.6.3 – Re-Vegetate/Re-Forest Disturbed Areas (Native Species)	☐	☐
NS BMP 5.7.1 – Reduce Street Imperviousness	☐	☐
NS BMP 5.7.2 – Reduce Parking Imperviousness	☐	☐
NS BMP 5.8.1 – Rooftop Disconnection	☐	☐
NS BMP 5.8.2 – Disconnection from Storm Sewers	☐	☐
NS BMP 5.9.15 – Street Sweeping	☐	☐
Structural BMP 6.7.1 – Riparian Buffer Restoration	☐	☐
Structural BMP 6.7.2 – Landscape Restoration	☐	☐
Structural BMP 6.7.3 – Soils Amendment and Restoration	☐	☐

Worksheet 12 – Water Quality Analysis of Pollutant Loading from All Disturbed Areas

Total Site Area (AC)	
Total Disturbed Area (AC)	
Disturbed Area Controlled by BMPs (AC)	

Total Disturbed Areas:

		Pollutant					Pollutant Load		
	Land Cover Classification	TSS EMC (mg/l)	TP EMC (mg/l)	Nitrate-Nitrite EMC (mg/l as N)	Cover (Acres)	Runoff Volume (AF)	TSS** (LBS)	TP** (LBS)	NO_3 (LBS)
Pervious Surfaces	Forest	39	0.15	0.17					
	Meadow	47	0.19	0.3					
	Fertilized Planting Area	55	1.34	0.73					
	Native Planting Area	55	0.40	0.33					
	Lawn, Low-Input	180	0.40	0.44					
	Lawn, High-Input	180	2.22	1.46					
	Golf Course Fairway/Green	305	1.07	1.84					
	Grassed Athletic Field	200	1.07	1.01					
Impervious Surfaces	Rooftop	21	0.13	0.32					
	High Traffic Street/Highway	261	0.40	0.83					
	Medium Traffic Street	113	0.33	0.58					
	Low Traffic/Residential Street	86	0.36	0.47					
	Res. Driveway, Play Courts, etc.	60	0.46	0.47					
	High Traffic Parking Lot	120	0.39	0.60					
	Low Traffic Parking Lot	58	0.15	0.39					
						TOTAL LOAD			
						REQUIRED REUCTION (%)	85%	85%	50%
						REQUIRED REDUCTION (LBS)			

*Pollutant Load = [EMC, mg/l] X [Volume, AF] X [2.7, Unit Conversion]

**TSS and TP calculations only required for projects not meeting CG1/CG2 or not controlling less than 90% of the disturbed area

Worksheet 13 – Pollutant Reduction Through BMP Applications*

*Fill this worksheet out for each BMP type with different pollutant removal efficiencies. Sum pollutant reduction achieved for all BMP types on final sheet.

BMP Type: _____

Disturbed Area Controlled by this BMPs (AC)

Disturbed Area Controlled by this BMPs:

		Pollutant					Pollutant Load**		
	Land Cover Classification	TSS EMC (mg/l)	TP EMC (mg/l)	Nitrate-Nitrite EMC (mg/l as N)	Cover (Acres)	Runoff Volume (AF)	TSS** (LBS)	TP** (LBS)	NO_3 (LBS)
Pervious Surfaces	Forest	39	0.15	0.17					
	Meadow	47	0.19	0.3					
	Fertilized Planting Area	55	1.34	0.73					
	Native Planting Area	55	0.40	0.33					
	Lawn, Low-Input	180	0.40	0.44					
	Lawn, High-Input	180	2.22	1.46					
	Golf Course Fairway/Green	305	1.07	1.84					
	Grassed Athletic Field	200	1.07	1.01					
Impervious Surfaces	Rooftop	21	0.13	0.32					
	High Traffic Street/Highway	261	0.40	0.83					
	Medium Traffic Street	113	0.33	0.58					
	Low Traffic/Residential Street	86	0.36	0.47					
	Res. Driveway, Play Courts, etc.	60	0.46	0.47					
	High Traffic Parking Lot	120	0.39	0.60					
	Low Traffic Parking Lot	58	0.15	0.39					
	TOTAL LOAD TO THIS BMP TYPE								
	POLLUTANT REMOVAL EFFICIENCIES FROM APPENDIX A. STORMWATER MANUAL (%)						85%	85%	50%
	POLLUTANT REDUCITON ACHIEVED BY THIS BMP TYPE (LBS)								

POLLUTANT REDUCTION ACHIEVED BY ALL BMP TYPES (LBS)			
REQUIRED REDUCTION from WS12 (LBS)			

*Pollutant Load = [EMC, mg/l] X [Volume, AF] X [2.7, Unit Conversion]

**TSS and TP calculations only required for projects not meeting CG1/CG2 or not controlling less than 90% of the disturbed area