Legislative Version of Amendments to the Engineering Design Standards and Procedures Manual Chapter 3 Stormwater Quality to Incorporate MS4 Permit Requirements

AMENDMENTS
Various Sections of the Engineering Manual (EDSPM) are amended to remove barriers to Low-Impact Development and define stormwater terms. The amendments are show in legislative format (deleted text with strike-thru red font and new text with double underline red font). Commentary is shown in *purple italics font*, preceding the text to which it is referring.

EDSPM – CHAPTER 3
STORMWATER QUALITY

COMMENTARY: Chapter 3 of the Engineering Manual is no longer in the EDSPM. The following sections are part of the Springfield Development Code (SDC) or moved to other portions of the EDSPM.

- ***3.01 Stormwater Quality Design Standards:*** *Moved to SDC 4.3.110.*
- ***3.02 Stormwater Quality Design Criteria:*** *Moved to SDC 4.3.110.*
- ***3.02.1 Stormwater Quality Design Storm:*** *Moved to SDC 4.3.110, updated to use more modern data from the Eugene Airport weather station, matches the current design storms from the City of Eugene (same data from the same station).*
- ***3.02.2 Retention/Protection/Preference for Open Watercourses and Water Bodies:*** *Moved to 4.3.115.*
- ***3.02.3 Stormwater Quality Pollutants of Concern:*** *Included in SDC 4.3.110.*
- ***3.02.3.A Temperature Standard:*** *Moved to SDC 4.3.110, to be achieved primarily by infiltration and then shading if infiltration is not possible.*
- ***3.02.3.B Bacteria and Mercury Standards:*** *Is addressed in SDC 4.3.110 using "maximum extent practicable" for development that is using the treatment standard (e.g. not infiltrating all runoff). The municipal code also provides a pathway to require additional BMPs at any time if there is actual illicit discharge occurring that results in a bacteria or mercury issue for a property that uses the site performance standard instead.*
- ***3.02.3.C Total Suspended Solids (TSS) Standard:*** *This section has been integrated into SDC 4.3.110(C). Other information cited in this section is state law and does not need to be adopted or codified by Springfield.*
- ***3.02.3.D DEQ Stormwater Discharge Benchmarks:*** *This section is added to SDC 4.3.110(C).*
- ***3.02.4 Special Considerations for Higher-Risk Activities:*** *This section was replaced with Appendix H of the SDC for on site source controls.*
- ***3.02.4.A Eugene Stormwater Management Manual, Chapter 3:*** *The Stormwater Source*

Controls were moved to Appendix H of the SDC.

- ***3.02.4.B Underground Injection Control (UIC):*** *Covered in SDC Appendix D Typical Stormwater Facility Details or EDSPM Chapter 4 Stormwater.*

- ***3.02.4.C Roof-mounted Equipment:*** *No longer necessary. This section is covered by DEQ rules for UIC's by requiring treatment before discharge to a UIC for any nonresidential roof.*

- ***3.02.4.D Drinking Water Protection (DWP) Overlay District:*** *This is a development standard and therefore belongs in the development code. Any Time of Travel related standards need to be in the DWP Overlay section. This section is otherwise duplicative of SDC 3.3.200 DWP Overlay District and is removed from the EDSPM.*

- ***3.02.5 Parking Lots/Paved Areas:*** *No longer necessary as the site treatment standard in SDC 4.3.110 requires treatment for all impervious parking lots.*

- ***3.02.6 Vegetative Treatment Requirements:*** *Vegetative treatment requirements are incorporated into SDC 4.3.110(C) and (D) and will be adopted in Appendix F of the SDC. This section is removed from the EDSPM.*

- ***3.02.7 Parking Lot Maintenance:*** *Moved to EDSPM Chapter 4 as an advisory section.*

- ***3.03 Private Stormwater Maintenance Requirements:*** *Moved to SDC 4.3.110.*

- ***3.03.1 Operations and Maintenance Plan Submittal for Privately Maintained Facilities:*** *O&M mandatory requirements are in SDC 4.3.110 or included in Appendix E to the Development Code.*

- ***3.03.2 Specific Requirements of the O & M Plan:*** *Moved to SDC 4.3.110.*

Legislative Version of Proposed Amendments to the Engineering Design Standards and Procedures Manual Chapter 4 Stormwater to Incorporate MS4 Permit Requirements

PROPOSED AMENDMENTS
Various Sections of the Engineering Manual (EDSPM) are amended to remove barriers to Low-Impact Development and define stormwater terms. Commentary is shown in *purple italics font*, preceding the text to which it is referring.

STORMWATER ~~CAPACITY~~

4.00 DESIGN STANDARDS

4.01 PURPOSE

The purpose of the Stormwater Capacity Design Standards is to provide a consistent policy under which certain physical aspects of stormwater conveyance design will be implemented. These standards have the objective of developing a stormwater conveyance system that ~~shall~~ must:

A. Be consistent with the most current stormwater studies, master plans, and discharge permits for Springfield, the Springfield Development Code (SDC), APWA standard construction specifications, City of Springfield standard construction details and other Chapters of this Manual;

B. Be of adequate design to safely manage all volumes of water generated upstream and on the site to an approved point of discharge;

C. Provide conveyance for stormwater generated by future development upstream;

D. Prevent the uncontrolled or irresponsible discharge of stormwater onto adjoining public or private property;

E. Prevent the capacity of downstream channels and stormwater management facilities from being exceeded;

F. Have sufficient structural strength to resist erosion and all external loads that may be imposed;

G. Avoid impacts to stream water quality and quantity, and seek to maintain the historic hydrograph, including peak and base flows;

H. Maximize efficient use of Springfield's natural drainage systems and wetlands;

I. Require groundwater recharge wherever possible by utilizing stormwater management techniques that decrease im~~pervious~~ permeable surfaces and increase infiltration to manage stormwater runoff;

J. Promote the protection of the Springfield's existing high level of overall water quality and facilitate implementation of further water quality improvements;

K. Be designed in a manner and use materials that allow economical maintenance;

L. Be designed using methods and materials to insure a minimum practical design life of 75 years for all systems and 100+ years in traveled right-of-way; and

M. Be designed based on future land use.

4.02 GENERAL DESIGN CONSIDERATIONS

Stormwater system design within a development site ~~shall~~ must include provisions to address water quality ~~concerns (see Chapter 3),~~ and the collection and conveyance of runoff from all public and private ~~streets, sidewalks, and driveways, and from the roof, footing, and area drains of all structures~~ impermeable ~~areas~~ surfaces. Furthermore, the design ~~shall~~ must provide for the future extension of the stormwater system to the entire drainage basin in conformance with current adopted stormwater master plans or approved modifications to those plans.

All stormwater system designs ~~shall~~ must be based upon the requirements in Springfield Development Code 4.3.110, which requires ~~on~~ an engineering analysis that takes into consideration water quality issues, infiltration capacity on-site, existing runoff rates and discharge points onto neighboring properties, pipe flow capacity, ~~hydraulic grade line, soil characteristics, pipe strength,~~ conflict with existing or proposed utilities, and potential construction problems.

In all locations ~~where stormwater infrastructure is not available, or where suitable subsurface conditions exist, for~~ of new or redevelopment the primary method for stormwater management will ~~be utilizing~~ utilize ~~a~~ Low Impact Development Approaches (LIDA), discussed in more detail in Section 4.17. ~~In locations where LIDA is not possible the stormwater system will provide quality treatment prior to discharge per the requirements in Chapter 3 and 4 of the EDSPM.~~

4.03 ACCOUNTABILITY FOR STORMWATER SYSTEM DESIGN

This Chapter presents Springfield's standards for engineering and design of stormwater system facilities. While Springfield believes these standards are appropriate for a wide range of development proposals, compliance solely with these requirements does not relieve the professional engineer of their responsibility to ensure stormwater facilities are engineered to provide adequate protection for public and private property and natural resources.

To assist applicants in preparing a Stormwater Study, Springfield has developed a Stormwater Scoping Sheet to ensure that site stormwater system design is prepared in compliance with this Manual and the Springfield Development Code. The ~~Stormwater Scoping Sheet~~ Stormwater Management System Scope of Work must ~~shall~~ be completed for each development and can be found ~~at http://www.springfield-or.gov/dept_dpw.htm~~ on the City's website.

Other agencies may require some form of stormwater system review and impose requirements that are separate from, and in addition to, Springfield's requirements. The applicant must coordinate with these agencies and resolve any conflicts or concerns in stormwater conveyance and water quality requirements.

COMMENTARY: *All the stormwater study types, design storms and related stormwater treatment requirements are moved to the Springfield Development Code. There are now two different study types reduced from three: a small site and full site study. The small site can use the rational method and safe harbor calculators provided with this chapter of the EDSPM as appendices, that*

are sourced from the City of Eugene. The design storms were revised using more modern data from the weather station at the Eugene airport and that now matches those used by the City of Eugene.

~~4.03.1 Stormwater Study~~

~~All developments that will increase or modify impervious surface shall submit, if further study is not required by the criteria outlined below, a Stormwater Study and a plan for the development site that provides for a system capacity design for a 2-year storm event. The time of concentration for the study shall be determined by using a ten minute start time and calculated travel times in gutters, pipes and swales for each drainage basin on the development site. The stormwater system design shall be checked for overflow impacts that may occur in the 25-year storm event and include contingency measures to protect both on-site buildings and abutting properties.~~

~~A complete Stormwater Study, as outlined below, shall be submitted for all developments that generate public and/or private stormwater runoff from more than one (1) acre of land or create or modify more than 5000 sf of impervious area. Developments or redevelopments that drain into or modify an existing stormwater system with capacity of 0.5 cfs or greater shall also submit a complete Stormwater Study. Note: an Oregon licensed Civil Engineer shall prepare the complete Stormwater Study. All developments containing or adjacent to a floodplain, stream, wetland, natural resource area, or wellhead protection zone shall review and report their impact to those systems as part of the required Stormwater Study.~~

~~If required by the criteria stated above, a complete Stormwater Study shall be provided for a development that is proposed within Springfield's planning jurisdiction. This study shall include the following:~~

~~A. A written narrative describing the proposed stormwater system in detail, including connections to the public system, a description addressing water quality measures (Best Management Practices) proposed, as well asany necessary capacity measures that may be required for development (i.e. a detention pond). .~~

~~B. A hydrological study map, that shall contain:~~

~~1. The development site and adjacent areas that contribute significant offsite flows, well defined, and an appropriate amount of area beyond the development site of not less than 100 feet;~~

~~2. Streets important to the study, and street names;~~

~~3. Flow arrows in streets and ditches;~~

~~4. Contours or spot elevations for verification of direction of overland flow and pipe cover; Contour intervals on the study map shall be as follows:~~

~~Slope (%)~~	~~Contour Interval (Feet)~~
~~0 - 10~~	~~1~~
~~11 - 25~~	~~2~~
~~> 25~~	~~10~~

5. Drainage areas of all sub-basins (in acres);

6. Collection points (nodes) at downstream limits of all sub-basins;

7. A profile of the stormwater system showing invert elevations, manhole top and bottom elevations, existing utilities, and existing and finished ground line elevations;

8. Existing and proposed stormwater pipes and channels with sizes and/or cross-sections included;

9. Future pipes in the system, complete with proposed sizes, slopes, pipe cover, flow line elevations at manholes, etc.;

10. North arrow, scale, company name and logo, designer, date, etc.;

11. Environmentally sensitive areas (e.g. gullies, ravines, swales, wetlands, steep slopes, springs, creeks, etc.) For natural drainage features show direction of flow; and

12. 100-year flood plain with flood elevations and 100-year flood way, as applicable.

C. Hydrologic calculations to establish runoff volumes (see analysis method requirements and design event in the Sections 4.03.2).

D. Hydraulic calculations to establish pipe size, flow velocity, hydraulic grade line, etc.

Unless specifically required by Springfield for a particular development, land use applications will not be required to provide engineering level details for on-site pipe profiles (showing invert elevations, manhole top and bottom elevations, pipe cover, etc) as part of application. However, these details shall be required prior to final development approval.

4.03.2 Stormwater Study Types

A. A Small Site Stormwater Study shall be required when ALL of the following criteria are met:

1. The study area is less than five (5) acres in size.

2. The study area drains into an established public system with available capacity for the peak flow based on the storm event frequency required under Section 4.03.4 Hydrologic Calculations.

3. For sites using a Low Impact Design Approach, a soils study may be required to ensure the site soils are suitable for the proposed stormwater management facilities.

4. The development proposed is a residential development. Commercial and industrial developments may also qualify for a Small Site Stormwater Study, provided the proposed development site is less than 1 acre.

5. The study area does not contain and is not adjacent to a floodplain, stream, wetland, natural resource area, or well head protection zone.

B. A Full Site Stormwater Study shall be required when the criteria for a Small Site Stormwater Study cannot be met and where ANY of the following conditions are

~~met:~~

~~1. The study area is greater than 25 acres in size.~~

~~2. Developments that require creation of a new outfall and/or exceed existing system capacity and require an offsite capacity analysis for approval.~~

~~3. The study area that contains or is adjacent to a floodplain, stream, wetland, or natural resource area.~~

~~4. Any development that does not qualify for a Small Site of Mid-Level Site Stormwater Study and that either generates a peak flow in excess of 0.5 cfs, or modifies a stormwater system with a capacity of 0.5 cfs or greater, or is a redevelopment or development that creates 5,000 square feet or more of new impervious area.~~

~~**4.03.3 Hydrologic Calculations**~~

~~Hydrologic calculations for the various study types shall conform to the following:~~

~~A. Small Site Stormwater Study:~~

~~1. Rational peak flow method1 .~~

~~1 When the 'C' factor in rational method peak flow analysis is 0.5 or greater, the time of concentration / flow time and the peak flow from the impervious areas shall be computed separately and compared to the combined area. The higher of the two peak flow rates shall then be used to size the conveyance.~~

~~2. 2-year storm event frequency for volumes up to 5 cfs.~~

~~3. 5-year storm event frequency for volumes from 5 cfs to 20 cfs.~~

~~B. Mid-Level Site Stormwater Study:~~

~~1. Unit Hydrograph Method. Use SCS Type 1A distribution for rainfall (values given below).~~

~~2. Storm events and volumes same as Small Site and using the 10-year event for volumes of 20 cfs to 40 cfs.~~

~~3. 25-year storm event for detention facilities where necessary to meet downstream capacity issues.~~

~~4. 50-year storm event for volumes above 40 cfs.~~

~~C. C. Full Site Stormwater Study:~~

~~1. Unit Hydrograph Method. Use SCS Type 1A distribution for rainfall (values given below).~~

~~2. Floodplain analysis if development affects a floodplain.~~

~~3. Storm events and volumes same as outlined in Small and Mid-Level above and 100- year flood for areas in the floodplain.~~

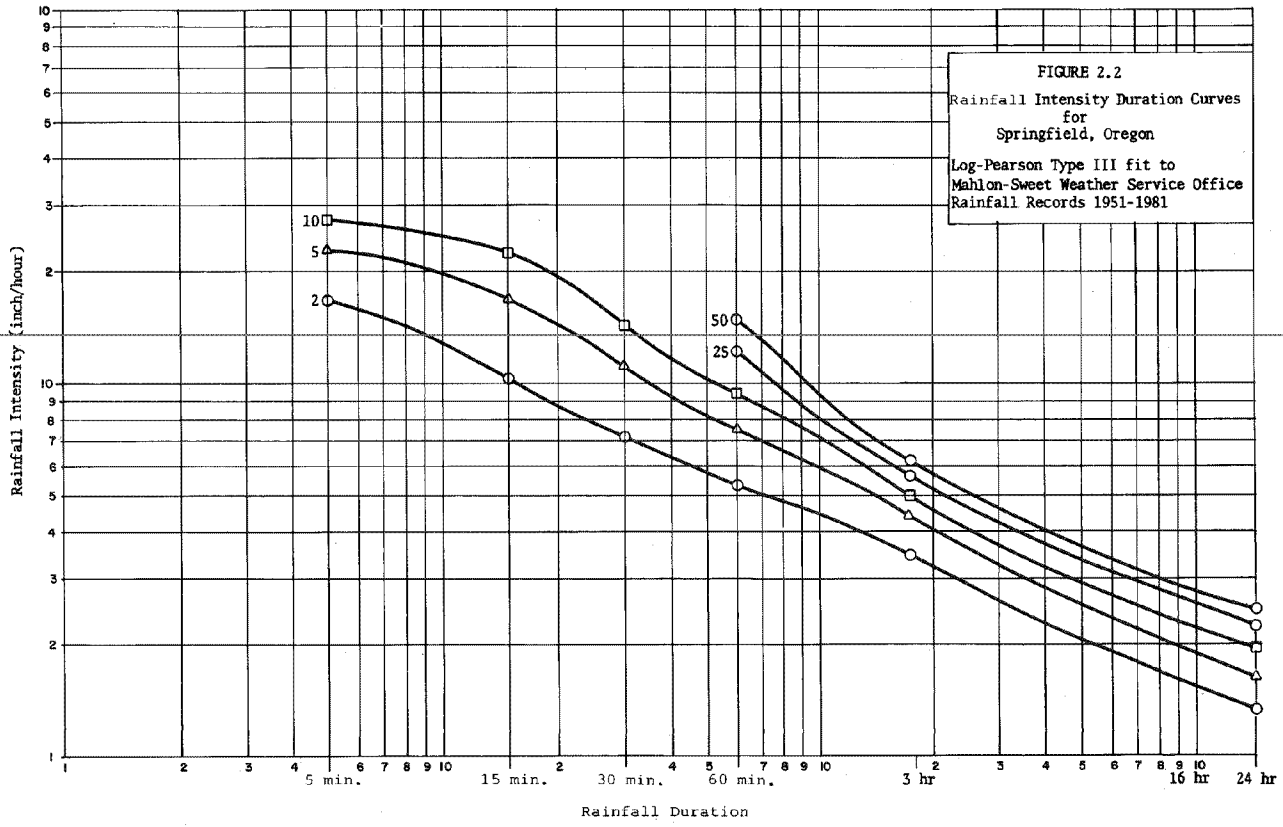
~~Based on the Springfield Stormwater Facilities Master Plan (2008) and the Portland Stormwater Management Manual (2008), the following represents the SCS Type 1A design rainfall depths that shall be used for Unit Hydrograph calculations for the following 24-hour duration storm events:~~

~~**Storm Event**~~	~~**Rainfall**~~
~~Water Quality Event~~	~~0.83 Inches~~
~~2 Year~~	~~3.3 Inches~~

~~5 Year~~	~~3.8 Inches~~
~~10 Year~~	~~4.3 Inches~~
~~25 Year~~	~~4.8 Inches~~
~~100 Year~~	~~5.2 Inches~~

~~When utilizing the rational method, the Intensity Duration Frequency curves from the West Springfield Drainage Master Plan (1983) located below shall be used for design. An intensity of 1/4 inch per hour shall be used for the water quality storm event as specified in Chapter 3.~~

~~When utilizing the rational method, the Intensity Duration Frequency curves from the *West Springfield Drainage Master Plan* (1983) located below shall be used for design. An intensity of 1/4 inch per hour shall be used for the water quality storm event as specified in Chapter 3.~~



~~**4.03.4 Hydraulic Calculations**~~

~~A. The method of hydraulic calculations shall be subject to City Engineer approval.~~

~~B. Site development improvement projects shall address on-site and off-site stormwater management concerns, both upstream and downstream of a project, including but not limited to:~~

~~1. Modifications to the existing on-site stormwater management facilities shall not restrict flows creating backwater onto off-site property to levels greater than the existing situation unless approved by the affected off-site property owners and Springfield. The affected property owner(s) shall agree to and sign an easement identifying the location of the backwater storage. The easement shall be in a form approved by the City Engineer.~~

~~2. Stormwater management facilities shall be designed and constructed to~~

~~accommodate all flows generated from upstream property from the most recent approved land use plan at full development.~~

~~3. The design of stormwater management facilities shall analyze the impact of restrictions downstream of the project site. The developer shall remove downstream restrictions that create on-site backwater or the on-site backwater shall be addressed in the design of the development's storm system. The removal of downstream obstructions shall not be allowed if this removal creates downstream capacity problems.~~

~~C. Review of Downstream System:~~

1. ~~The design engineer for each development constructing new impervious surface of more than 5,000 square feet shall submit documentation, for review by the City Engineer, of the downstream capacity of any existing storm facilities impacted by the proposed development. The design engineer shall perform an analysis of the stormwater system downstream of the development to a point in the stormwater system where the proposed development site constitutes 10 percent or less of the total tributary drainage volume, but in no event less that 1/4 mile.~~

2. ~~If the capacity of any downstream public storm conveyance system or culvert is surpassed during the Event/CFS level requirements, due directly to the development, the developer shall correct (mitigate) the capacity problem or construct an on-site detention facility unless approved otherwise by the City Engineer.~~

~~3. If the projected increase in surface water runoff that will leave a proposed development will cause or contribute to damage from flooding to existing buildings or dwellings, the downstream stormwater system shall be enlarged to relieve the identified flooding condition prior to development, or the developer shall construct an on-site detention facility.~~

4. ~~Any increase in downstream flow shall be reviewed for erosion potential, defined as downstream channels, ravines, or slopes with evidence of erosion/incision sufficient to pose a sedimentation hazard to downstream conveyance systems or pose a landslide hazard by undercutting adjacent steep slopes.~~

~~4.03.5 Design of Conveyance~~

~~The conveyance system shall be designed to convey and contain at least the peak runoff for the Event/CFS design requirements. Structures for proposed pipe systems shall provide a minimum of 1 foot of freeboard between the hydraulic grade line and the top of the structure or finish grade above pipe for a 25-year peak rate of runoff. Surcharge in pipe systems shall not be allowed if it will cause flooding in portions of a habitable structure, including below-floor crawl spaces. All public pipes shall be laid at a positive slope, and no system shall be designed to be permanently surcharged.~~

~~The following conditions may cause the City Engineer to require hydraulic designs to include an overland conveyance component demonstrating how a 100-year event will be accommodated. This overland component shall not be allowed to flow through or inundate an existing building.~~

~~1. Discharges to an already overloaded portion of the stormwater network, as determined by the Springfield *Stormwater Facilities Master Plan*;~~

~~2. Additional discharges to overloaded or surcharged conveyances where overflows may cause significant property damage; or~~

~~3. Where failure of on-site treatment and infiltration stormwater systems could lead to flooding of adjacent or on-site structures.~~

4.04 DESIGN OF STORMWATER SYSTEMS

A. Manhole Design:

1. Manholes ~~shall~~ must be provided at least every 500 feet, at every grade change, and at every change in alignment and junction of 2 or more lines. Manhole lids ~~shall~~ must have a minimum of 6 inches of clearance from the edge of a curb or gutter and ~~shall~~ must not be in a wheel path of the traveled way.

2. All manholes ~~shall~~ must be a minimum of 4~~2~~8 inches in diameter.

3. Pipe crowns of branch or trunk lines entering and exiting junctions ~~shall~~ must be at the same elevation. If a lateral is placed so its flow is directed against the main flow through the manhole or catch basin, the lateral invert ~~shall~~ must be raised to match the crown of the mainline pipe.

4. Manholes on a sealed joint system (tight line) and all stormwater systems on slopes greater than 10 percent ~~shall~~ must be constructed with a 20-foot, parallel perforated line to collect ground and trench water into the system.

5. Inside drop structures ~~shall provide a minimum of 42 inches of clear space~~ are not allowed. A manhole may have a free inside drop of up to 2 feet.

6. All manholes ~~shall~~ must have a minimum 12-inch ledge on 1 side of the channel in the base at an elevation of 0.8 of pipe height, except for water quality manholes.

7. Details of pipe configuration and flow channelization ~~shall~~ must be submitted with the plans where pipes into or out of a manhole are larger than 24 inches, or where more than 3 ~~4~~ mainline connections are made.

8. Connections to an existing manhole, elevation of the existing ledge, and elevations of existing inlets and outlets ~~shall~~ must be submitted with the plans.

9. Connections are allowed directly into a manhole if the manhole is properly channelized. No more than 3 side laterals (maximum number of penetrations must not exceed 4) ~~shall~~ must be connected to a manhole unless otherwise approved by the City Engineer. There ~~shall~~ must be a minimum of 8 inches separating connections as measured from the outside diameter of the pipe.

~~10. A manhole may have a free inside drop of up to 2 feet.~~

~~11. Line manholes may be 'T' top design for pipe diameters 42 inches and larger where no side line connections are present or planned.~~

B. Water Quality Manholes/Structures:

1. Water quality manholes or structures ~~shall~~ must be an approved, manufactured unit.

All capacity, efficiency, and operations and maintenance ~~data~~ plans ~~shall~~ must be submitted at the time of plan review.

2. Each water quality manhole~~s~~ or structure~~s~~ ~~shall~~ must be designed for the runoff from the upstream watershed at build out, based on the applicable comprehensive land use plan. No flow ~~shall~~ may be introduced into the manhole or structure in addition to the design amount.

3. Water quality manholes ~~shall~~ must be a minimum of 60 inches in diameter, unless otherwise approved by the City Engineer.

4. Water quality manholes ~~shall~~ must not be used in a submerged or surcharged system. The manufacturer's required head losses ~~shall~~ must be accommodated for in the system design.

5. Water quality structures and water quality catch basins ~~shall~~ must meet the requirements of current Stormwater Quality Standards as specified in Springfield Development Code 4.3.110 (C) & (D).

C. Pipe Type:

1. Concrete pipe – standard pipe material for stormwater system design within Springfield. Refer to the ~~Springfield~~ APWA Standard Construction Specifications for pipe bedding details.

2. PVC – ~~may be used in areas that meet criteria for Hillside Development as specified in Chapter 7, where tight-line or sealed systems are required, or areas located outside of the right-of-way. Pipe loading analysis calculations may be required on a case-by-case basis~~ standard pipe material for stormwater design within Springfield. Must use factory (manufactured) fittings suitable for the PVC type required. All PVC pipe with less than 3' of cover from top of finished pavement must be C900 type.

3. HDPE with manufactured fittings – may be used in all areas that meet manufacturer's installation requirements when approved by the City Engineer. Pipe loading analysis may be required on a case-by-case basis.

4. Ductile iron – may be used when sufficient depth of cover over the pipe is not available for the above pipe types due to existing topographic demands and conflicting site and building code requirements.

D. Pipe Size:

1. Pipe from an inlet to the main line in the public system ~~shall~~ must be a minimum of 10 inches in diameter.

2. Main line pipe ~~shall~~ must be a minimum of 12 inches in diameter.

3. Service laterals for single-family residences ~~shall~~ must be 6 inches in diameter. All other service laterals ~~shall~~ must be a minimum of 10 inches in diameter.

E. Minimum and Maximum Velocities:

1. All storm pipes ~~shall~~ must achieve a minimum velocity of 3 feet per second at 0.5 part full based upon Table 4-1 and the associated 'n' value.

2. All pipe exceeding critical flow velocities ~~shall~~ must have analysis data submitted showing the effects of hydraulic jump at manholes and downstream water levels for peak flow situations.

Table 4-1: Manning's 'n' Values for Pipes

~~Type of Pipe Material~~	~~Uniform Flow (Preliminary Design)~~	~~Backwater Flow (Capacity Verification)~~
~~Concrete Pipe and Lined Corrugated PE Pipe~~	~~0.014~~	~~0.012~~
~~Annular Corrugated Metal Pipe~~		
~~• 2-2/3 inch X ½ inch Plain or Fully Coated~~	~~0.028~~	~~0.024~~
~~• Paved Invert~~	~~0.021~~	~~0.018~~
~~• 3 inch X 1 inch Corrugation~~	~~0.031~~	~~0.027~~
~~• 6 inch X 2 inch Corrugation (Field Bolted)~~	~~0.035~~	~~0.030~~
~~Helical 2-2/3 inch X 1/2 inch Corrugation and Corrugated PE Pipe~~	~~0.028~~	~~0.024~~
~~Spiral Rib Metal Pipe and PVC Pipe~~	~~0.013~~	~~0.011~~
~~Ductile Iron Pipe Cement Lined~~	~~0.014~~	~~0.012~~
~~Solid Wall PE Pipe (Butt Fused Only)~~	~~0.009~~	~~0.009~~

Type of Pipe Material	For design and capacity analysis
• Concrete Pipe / Box Culverts	0.013
• PVC Pipe	0.009
• Ductile Iron Pipe Cement Lined	0.014
• Helical Corrugated HDPE Pipe	0.024
• Solid Wall HDPE Pipe	0.009

F. Pipe Location:

1. All public stormwater pipes ~~shall~~ must be located within the public right-of-way or City owned stormwater treatment facilities. The stormwater line must not be closer than
5 feet to the edge of public right of way. The City Engineer may grant exceptions for systems with physical constraints precluding the location within the public right-of-way such as shared access easements.

~~2. Stormwater pipes shall not be located closer than 10 feet from the edge of a public street right-of-way.~~

~~3.~~ 2. Stormwater pipes in easements ~~shall~~ must be located in the center of the easement unless otherwise approved by the City Engineer. The centerline of a stormwater pipe ~~shall~~ must not be located closer than 7 feet to ~~an easement side line~~ the edge of the easement. Minimum easement size must be ½ of the pipe's diameter plus 14

feet.

~~4.~~ 3. Stormwater pipes must be located so that manholes are not in the wheel path.

~~5.~~ 4. Stormwater laterals ~~shall~~ must be provided on the down slope side of all lots in developments where gravity drainage to the street or other approved discharge location cannot be provided.

~~6.~~ 5. The crowns (inside tops) of pipes ~~shall~~ must match wherever practical when changing pipe sizes at manholes.

G. Distance between Structures:

1. The maximum length of pipe between stormwater structures ~~shall~~ must be 500 feet for all systems with pipe 24 inches and smaller. Larger diameter pipe systems ~~shall~~ must not exceed 600 feet between structures.

H. Alignment:

1. Pipe ~~shall~~ must be laid on a straight alignment and at a uniform grade rate from structure to structure except as provided for in the Hillside Overlay District as specified in Chapter 7 and SDC 3.3-500.

I. Pipe Cover:

1. Pipe cover ~~shall~~ must be measured from the finished ground elevation to the top of the outside surface of the pipe in areas outside paved areas. In paved areas, the pipe cover ~~shall~~ must be measured from the lowest point of the gutter section to the top outside surface of the pipe.

2. The minimum pipe cover ~~shall~~ must be 18 inches for concrete reinforced pipe and 36 inches for plain concrete and plastic pipe materials or per the manufacturer's requirement for the proposed materials. ~~An engineered solution may be accepted for pipe not able to meet these conditions.~~

3. ~~In flat drainage basins, the design engineer shall demonstrate that the stormwater pipe has been laid at a depth sufficient to properly drain the remainder of the upstream tributary area.~~

J. ~~Tight-line (~~A~~a~~ sealed pipe system~~) shall be used for conveyance systems traversing a slope that is steeper than 10 percent and greater than 20 feet in height. It shall also~~ must be required within sensitive areas or where contamination of either the ground water or the stormwater from contaminated ground areas is a particular concern.

G. Perforated pipe drain systems, ~~or 'French drains' shall be engineered and be approved by the City Engineer. Where perforated pipe systems are used to dispose of stormwater, they shall meet all requirements for an Underground Injection Control (UIC) system.~~ 'soakage trenches' or other UIC for public stormwater disposal are not allowed in the City of Springfield.

4.05 CATCH BASIN/INLET DESIGN

A. All inlet and catch basin openings ~~shall~~ must be designed to accept flow from a 10 year storm event with gutter spread not to extend more than 3 feet into the adjacent roadway. Combination inlets with grates, where used, ~~shall~~ must be of multi-chambered design, and ~~shall~~ must be designed, as far as practical, to avoid failure due to accumulation of debris.

B. The standard ~~catch basin for use within Springfield shall be the curb inlet basin in the forms listed in the current issue of the Springfield Standard Specifications. Gutter catch basins may be used where conflicts dictate their use only if no on-street bike facilities are present or planned. Combination gutter/curb inlet basins shall be used where slopes and velocities allow by-pass of more the 15 percent of the design flow (HEC 12 method of determination), or for use in Hillside development (see Chapter 7)~~. curb inlet used is Springfield Standard Drawing 4-21 (double chambered curb inlet) or ODOT standard RD 371 and RD 372. The standard catch basin to be used is Springfield Standard Drawing 4-11 or ODOT standard Drawing RD 364. In areas where a combination inlet is necessary ODOT standard RD 366 is to be used. All grates used must be bike and pedestrian friendly (ODOT standard type 2).

C. All catch basins ~~shall~~ must be constructed with an 18 inch sump.

D. A main stormwater line larger than 12 inches must ~~shall~~ not pass through a catch basin or inlet, unless approved ~~as a manhole inlet combination~~ by the City Engineer.

E. Flows in streets during the 2-year event ~~shall~~ must not run deeper than 4 inches against a curb or extend more than 3 feet into the adjacent travel lane (bicycle or vehicle). Streets classed as collector and above and streets in commercial areas ~~shall~~ must meet the above requirements for the 10 year event. Inlets in sag locations ~~shall~~ must be designed with no more than 6 inch depth of water (top of curb) above the gutter flow line during the 25-year event.

F. A catch basin ~~shall~~ must be provided just upslope to curb returns or ADA ramps if present on streets with a centerline gradient of 3 percent or more ~~and~~ or a street gutter flow run of 100 feet or more.

G. Catch basins may connect to main stormwater lines with a manufactured tee connection when the main stormwater line is at least 1 size larger that the catch basin line. An Insert-A-Tee may be used when the catch basin line is ½ or smaller of the diameter of the main line. When the catch basin line is the same size as the main stormwater line, the connections ~~shall~~ must be made at a manhole or other approved structure. The maximum length of pipeline between the catch basin and the mainline ~~shall~~ must be 40 feet for 10 inch pipe and 60 feet for 12 inch pipe. ~~Oversize catch basins (30 inch inside dimention) shall be installed when a tee connection is used.~~

4.06 AREA DRAINS AND DITCH INLETS

A. The standard area drain ~~shall~~ must be as shown in Springfield Standard Drawing No. 4-11 and 4-12 ~~Ditch inlets shall be shown in Standard Drawings No. 4-13 and 4-14 with 12-inch sumps and 10 inch minimum outlet size.~~ or ODOT standard drawings RD 364 and RD 368 for area drains, and RD 370 may be used for ditch inlets.

B. A main stormwater line ~~shall~~ must not pass through a field inlet or ditch inlet.

~~C.~~ Ditch inlets ~~shall~~ can be located at the upper terminus of a main stormwater line ~~or~~

~~shall connect to a main stormwater line only at a manhole~~.

4.07 CONSTRUCTED CHANNELS

A. When constructed channels are used or modified, they ~~shall~~ must be lined with vegetation whenever possible. The proposed vegetation will require a planting plan as part of site plan/building plan approval.

B. Rock-lined channels ~~shall~~ must only be used where a vegetative lining will not provide adequate protection from ~~erosive velocities~~ erosion per Table 4-2.

C. Channel Design:

1. Constructed open channels ~~shall~~ must be sized to pass the required flows and have side slopes no steeper than 2:1. Any proposed constructed channel improvement that does not meet these requirements may be required to be piped by the City Engineer.

2. Channels designed to handle the runoff from a development ~~shall~~ must be constructed from the development to an existing public stormwater system with an established outfall to a receiving waterway.

3. Channels ~~shall~~ must not contain protruding pipes, culverts or other structures that reduce or hinder the flow characteristics of the channel, except for structures that are required and designed to dissipate velocities. Channels ~~shall~~ must be designed to prevent scouring and erosion. All pipes will be provided with protection per ODOT standard detail RD317.

4. Channel protection ~~shall~~ must be as shown in Table 4-2.

D. Access – Maintenance:

1. Access roads or other suitable access ways for maintenance purposes ~~shall~~ must be provided when ~~channels~~ surface water systems do not ~~abut~~ border public right-of-way with a suitable road. Access ~~shall~~ must be provided along ~~1~~ one side of the ~~channel~~ system as necessary for vehicular maintenance access.

2. Access roads ~~shall~~ must have a maximum grade of 15 percent, and a maximum cross slope of 3 percent.

3. A turnaround with 40-foot minimum outside turning radius ~~shall~~ must be provided on the access road or access provided at both ends to the public right of way.

4. Access roads ~~shall~~ must be a minimum of 15 feet wide on curved sections and 12 feet on straight sections.

5. Access roads in excess of 50 feet in length ~~shall~~ must have a turnaround unless approved by the City Engineer.

6. Access roads ~~shall~~ must have the capability of supporting a 20-ton vehicle under all weather conditions.

7. The first 18 feet of access roads must be paved with a durable, dust free top course past the edge of the road or sidewalk. Past the first 18 feet access roads will be surfaced with an all-weather top course, with preference given to

permeable materials such as grass pave or permeable concrete.

Table 4-2: Channel Protection for Channel Construction

Greater Than (FPS)	Less Than or Equal to (FPS)	Required Protection	Thickness	Min. Height Above Design Water Surface
0	5	Vegetation Lining	N/A	0.5 ft.
5	8	Riprap Class 50	1 ft.	1 ft.
8	12	Riprap Class 100 with check dams	2 ft.	2 ft.
12	20	Gabion or Velocity Dissipaters	Varies	2 ft.

4.07.1 Roadside Ditches

A. Existing or new roadside ditches ~~shall~~ must be constructed with a maximum depth of 2 feet as measured from the shoulder of the road and a minimum depth of the adjacent road section (typically 16 inches for the City of Springfield standard road section).

B. Side slopes ~~shall~~ must be 2H:1V or less.

C. The ditches must be vegetated with plants or seeds from Appendix F Approved Vegetation List in the Springfield Development Code.

~~C.~~ D. Velocity when flowing full ~~shall~~ must not exceed the erosive velocity limits of the soil or lining in the ditch.

4.08 OUTFALLS

Outfalls ~~shall~~ must conform to the requirements of all federal, state, and local regulations. Outfall design ~~shall~~ must be based on considerations to protect the outfall area and channel from scour, sloughing and channel degradation rather than hydraulic efficiency. The design velocity from the outfall for its largest recurrence interval design storm ~~shall~~ must be consistent with the velocity in the receiving channel for the same recurrence interval design storm as the outfall design storm. If the velocity from the outfall is greater than the velocity in the receiving channel, erosion protection and energy dissipation may be required. Installation of backflow prevention gates may be necessary when the outfall is in a tail-water condition.

A. Outfalls ~~shall~~ must be placed above the mean low water level except as permitted by the City Engineer.

B. All outfalls ~~shall~~ must be provided with a rock splash pad or other approved erosion control protection measures. Rock protection at outfalls ~~shall~~ must be designed in accordance with the ~~Springfield Standards Specifications and Table 4-2 above~~ ODOT standard detail RD317 and Table 4-2 above. Mechanisms that reduce velocity prior to discharge from an outfall are encouraged and may be required. Examples are drop manholes and rapid expansion into pipes of much larger size.

C. An engineered energy dissipater, that may include stilling basins, drop pools, hydraulic jump basins, baffled aprons, or bucket aprons, ~~shall~~ must be provided for outfalls with velocity at design flow greater than 10 FPS. These ~~shall~~ must be designed using published references such as *Hydraulic Design of Energy Dissipaters for Culverts and*

Channels published by the Federal Highway Administration of the United States Department of Transportation, and others. Design reference ~~shall~~ must be included on the construction plan submittal.

~~**4.09 DOWNSTREAM PROTECTION REQUIREMENT**~~

~~Each new development or redevelopment shall mitigate the impacts, on both the quantity and quality of stormwater, upon the public stormwater system. The development may be able to mitigate capacity impacts on the public stormwater system using the following techniques, subject to the limitations and requirements of this Manual and, approval by the City Engineer.~~

~~A. Constructing permanent on-site stormwater capacity detention facilities designed in accordance with current stormwater management practices.~~

~~B. Using Low Impact Design Approaches (LIDA) to minimize impervious surfaces and stormwater runoff increases.~~

~~C. Enlarging or improving the downstream conveyance system.~~

~~**4.10 CRITERIA FOR ALLOWING DETENTION IN LIEU OF ON-SITE DETENTION**~~

~~On-site detention facilities shall be constructed when any of the following conditions exist:~~

~~A. There is an identified downstream deficiency, and detention, rather than conveyance system enlargement, is determined to be the more effective solution.~~

~~B. There is an identified regional detention-site within the boundary of the development.~~

~~C. The need for pre-treatment of stormwater discharge dictates that flows be detained for water quality processes.~~

~~D. There is a need to mitigate flow impacts on receiving streams.~~

~~E. The development site is located in an area where on-site treatment and disposal using LIDA is required or considered desirable and feasible.~~

~~**4.10.1 On-Site Detention Design Criteria**~~

~~A. When required, on-site stormwater detention facilities shall be designed to capture runoff so the runoff rates from the site after development do not exceed the pre-development conditions, based upon a 2- through 25-year, 24-hour return storm. Volume and duration of pre-development conditions will be considered.~~

~~B. When required because of an identified downstream deficiency, on-site stormwater detention facilities shall be designed so that the peak runoff rates will not exceed pre-development rates for the specific range of storms that cause the downstream deficiency.~~

~~C. Construction of on-site detention shall not be allowed as an option if such a detention facility would have an adverse effect upon receiving waters in the basin or sub-basin in the event of flooding or would increase the likelihood or severity of flooding problems downstream of the site.~~

~~4.11 IMPERVIOUS AREA USED IN DESIGN~~

~~For single family and duplex residential subdivisions, stormwater capacity detention facilities shall be sized for all impervious areas created by the subdivision, including all streets, residences on individual lots at a rate of 2,640 square feet of impervious surface area per dwelling unit, and other impervious area. These facilities shall be constructed in conjunction with the subdivision's public improvements.~~

~~For all developments other than single family and duplex, the sizing of stormwater capacity detention facilities shall be based on the impervious area to be created by the development, including structures and all streets and impervious areas. Impervious surfaces shall be determined based upon building permits, construction plans, or other appropriate methods deemed reliable by the City Engineer.~~

~~4.12~~ 4.09 ~~DETENTION~~ STORMWATER TREATMENT ~~POND~~ FACILITY DESIGN

~~Detention ponds~~ Treatment ponds and other open impoundment facilities ~~such as landscape areas, open playing fields and parklands,~~ must be constructed to comply with the requirements of ORS 537, in general and more specifically~~.~~, ORS 537.400 Ponds and Reservoirs. All stormwater ~~detention~~ treatment ponds ~~shall~~ must be designed by an Oregon licensed Civil Engineer and comply with the following ~~criteria~~ specifications:

A. Facility Geometrics:

1. Interior side slopes up to the maximum water surface ~~shall~~ must be no steeper than ~~3~~2H:1V if an access ramp is available with slope less than 3H:1V and a fence is provided around the perimeter. If these are not provided the slopes ~~shall~~ must be no steeper than 3H:1V. If the interior slope needs to be mowed, the slope ~~shall~~ must be 4H:1V.

2. Exterior side slopes ~~shall~~ must not be steeper than 2H:1V unless analyzed for stability by an Oregon licensed Geotechnical Engineer.

3. ~~Pond walls and/or dikes may be retaining walls, provided that the design is prepared and stamped by an Oregon licensed Civil Engineer; and a fence is provided along the top of the wall; and that at least 25 percent of the pond perimeter will be a vegetated soil slope of not greater than 3H:1V~~. A retaining wall can be used with City Engineer approval. An access ramp no steeper than 3H:1V must be provided and a fence provided around the perimeter of the retaining wall.

B. Water Quality Considerations:

1. ~~Pond bottoms shall be level, and located a minimum of 0.5 feet below the inlet and outlet to provide sediment storage.~~ Facility bottoms must be graded to drain to the outlet. Inlets to the facility must have a forebay to capture sediments. A perforated pipe underdrain will be provided to fully drain the pond if the soil the pond is constructed in does not have an infiltration rate in excess of 0.25 inches per hour as determined by an on-site infiltration test per Appendix D in the City of Springfield Development Code.

2. The inlet and outlet structures ~~should be on opposite ends of the pond to promote maximum residence time and to prevent short-circuiting~~ must be separated as much as possible and still maintain positive slope from the inlets to the outlets of the pond

to promote maximum residence time and to prevent short-circuiting. Baffles ~~may be installed~~ or a sinuous channel may be required to increase the residence time and flow path if locating outlet structures far enough apart is not practical ~~on opposite sides of the pond is not practical~~.

3. ~~Detention~~ Stormwater treatment facilities ~~shall~~ must be designed so that the "drawdown" time does not exceed 48 hours. In the event drawdown time exceeds 48 hours, additional calculations ~~shall~~ must be submitted showing the proposed facility can contain an additional 25-year, 24-hour return period storm.

4. The use of a sedimentation fore bay ~~shall~~ must be required during the construction process if the pond is to be used for sedimentation control as determined by the Land Drainage and Alteration Permit. After construction is complete, the pond ~~shall~~ must be completely cleaned and all sediment removed prior to ~~hook up to Springfield infrastructure~~ acceptance of the project or final site approval as a stormwater treatment structure.

C. Overflow: ~~- Emergency Spillway~~:

1. ~~A pond~~ An overflow system ~~shall~~ must provide controlled discharge of the design storm event for developed contributing area without overtopping any part of the ~~pond~~ facility embankment or exceeding the capacity of the ~~emergency spillway~~ overflow. The design ~~shall~~ must provide controlled discharge directly into the downstream conveyance system. An ~~emergency~~ overflow ~~spillway (secondary overflow)~~ ~~shall~~ must be provided to safely pass the 100-year, 24-hour design storm event ~~over the pond embankment~~ before the pond embankment is overtopped in the event of control structure failure and for storm/runoff events exceeding design. The ~~emergency~~ overflow ~~spillway~~ ~~shall~~ must be located to direct overflows safely towards the downstream conveyance system. The ~~emergency~~ overflow ~~spillway shall~~ must be stabilized with riprap or other approved means and ~~shall~~ must extend to the toe of each face of the berm embankment.

~~D. Access Maintenance:~~

~~1. Pond access easements and roads shall be provided when ponds do not abut public right-of-way. Access roads shall provide access to the control structure and along 1 or both sides of the pond as necessary for vehicular maintenance access.~~

~~E. Access roads shall meet the criteria specified in Section 4.07 D.~~

~~F.~~ D. Berm Embankment - Slope Stabilization:

1. ~~Pond~~ Facility berm embankments higher than 6 feet ~~shall~~ must be designed by an Oregon licensed Civil Engineer or Geotechnical Engineer. The berm embankment ~~shall~~ must have a minimum 1~~5~~0 foot top width where necessary for maintenance access; otherwise, top width may vary as recommended by the design engineer, but in no case ~~shall~~ may top width be less than 4 feet.

2. The toe of the exterior slope of ~~pond~~ facility berm embankment ~~shall~~ must be no closer than 5 feet from the tract or easement property line.

3. The ~~pond~~ facility berm embankment ~~shall~~ must be constructed on native consolidated soil (or adequately compacted and stable fill soils analyzed by an

Oregon licensed Geotechnical Engineer) free of loose surface soil materials, roots and other organic debris.

4. The ~~pond~~ facility berm embankments ~~shall~~ must be constructed by excavating a 'key' equal to 50 percent of the berm embankment cross-sectional height and width or as designed by an Oregon licensed Geotechnical Engineer.

5. The berm embankment ~~shall~~ must be constructed on compacted soil (95 percent minimum dry density, per AASHTO T99, placed in 6 inch lifts, with the following soil characteristics: a minimum of 30 percent clay, a maximum of 60 percent sand, a maximum of 60 percent silt, with nominal gravel content) or as designed by an Oregon licensed Geotechnical Engineer.

6. Anti-seepage collars ~~shall~~ must be placed on pipes in berm embankments that impound water greater than 4 feet in depth at the design water surface.

7. Exposed earth on the ~~pond~~ facility bottom and side slopes ~~shall~~ must be seeded with seed mixture or planted per an approved planting plan for the facility and approved by the City Engineer.

~~**4.13 USE OF PARKING LOTS FOR DETENTION**~~

~~Parking lots may be used to provide additional detention volume for runoff events greater than the 2-year runoff event provided that:~~

~~A. The depth of water detained shall not exceed 1 foot at any location in the parking lot for runoff events up to and including the 100-year event; AND~~

~~B. The gradient of the parking lot area subject to ponding shall be 1 percent or greater; AND~~

~~C. The emergency overflow path shall be identified and noted on the engineering plan, and comply with all other development and stormwater management requirements; AND~~

~~D. Fire lanes used for emergency equipment shall be free of ponding water for all runoff events up to and including the 100-year event.~~

~~**4.14 USE OF ROOFS FOR DETENTION**~~

~~Detention ponding on roofs of structures may be used to meet flow control requirements provided that:~~

~~A. All applicable provisions of the International Building Code are met or exceeded by the design; AND~~

~~B. The roof support structure shall be analyzed by an Oregon licensed Structural Engineer to address the weight of ponded water; AND~~

~~C. The roof area subject to ponding shall be sufficiently water-proofed to achieve a minimum service life of 30 years; AND~~

~~D. The minimum pitch of the roof area subject to ponding shall be 1/4 inch per foot, AND~~

~~E. An overflow system shall be included in the design to safely convey the 100-year peak flow~~

~~from the roof; AND~~

~~F. A mechanism shall be included in the design to allow the ponding area to be drained for maintenance purposes or in the event the restrictor device is plugged.~~

~~4.15 UNDERGROUND DETENTION FACILITIES~~

~~Springfield's preference is to have stormwater runoff detention occur above ground. In select locations, the City Engineer may approve the use of underground detention facilities. Underground detention facilities may only be proposed once all other means of surface detention have been explored and exhausted and are subject to the approval of the City Engineer. All underground detention facilities shall be designed by an Oregon licensed Civil Engineer and shall be used for controlling stormwater capacity only. Stormwater quality control shall occur in accordance with Chapter 3, while hydrologic and hydraulic calculations shall be in accordance with this Chapter.~~

~~Note: To minimize the occurrence of routine maintenance, all underground detention facilities shall be designed with a water quality manhole (or equivalent) upstream, to facilitate sediment fallout prior to stormwater entering the detention facility.~~

4.10 ~~4.15.1~~ DETENTION TANKS

Detention tanks serve as runoff capacity control through the means of underground storage. Detention tanks ~~shall~~ must be limited to large diameter pipes. In addition to runoff capacity control, detention tanks should be designed for factors such as environmental conditions (soil corrosiveness, inundation, etc.), maintenance access, and ground and/or surface loadings. Detention tanks ~~shall~~ must comply with the following ~~criteria~~ specifications:

A. General Design:

1. The minimum pipe size allowed for a detention tank in the public stormwater system ~~shall~~ is ~~be~~ 36 inches in diameter.

2. All tanks ~~shall~~ must be designed as flow-through systems, incorporating the use of in line manholes for maintenance and sediment removal.

3. Detention tank bottoms ~~shall~~ must be level, and ~~shall~~ must be located a minimum of 0.5 feet below the inlet and outlet to provide sediment storage.

4. City owned tanks ~~shall~~ must be located in the public right-of-way; tanks proposed to be located outside the public right-of-way ~~shall~~ must be located in a public stormwater tract or easement, dedicated to the City of Springfield for that purpose.

B. Materials - Acceptable materials for detention are:

1. Reinforced concrete pipe, vaults, or chambers of at least 3000 psi concrete.
2. Dual wall HDPE PIPE.
3. PVC pipe.

All pipes must be installed with sufficient cover per the manufacturer's requirements for the pipe type used.

~~2. The following materials may be used if they are located outside of the public right-of-way:~~

~~a. Corrugated or spiral rib aluminum pipe;~~
~~b. Lined corrugated polyethylene pipe; or~~
~~c. PVC pipe.~~

C. Buoyancy:

1. The effects of buoyancy ~~shall~~ must be considered in areas with a known high groundwater table or areas where seasonal high groundwater may cause flotation of the detention tank. Measures such as concrete anchors, concrete backfill, subsurface drains, etc. ~~shall~~ must be required in these areas, as well as supporting engineered calculations.

D. Structural Stability:

1. Special consideration ~~shall~~ must be given to ensure tanks meet requirements for potential traffic loading and overburden support. Tanks ~~shall~~ must be placed on stable, well- consolidated native material with appropriate bedding. A structural analysis, geotechnical analysis, and engineered calculations may be required with the design, demonstrating stability and constructability. For tanks proposed under the travel way, H20 live loadings ~~shall~~ must be accommodated.

E. Access Maintenance:

1. Access easements and roads ~~shall~~ must be provided when tanks are not located within the public right-of-way.

2. Access openings ~~shall~~ must be provided at a distance of no less than 50 feet from any location within the tank; be a minimum of 36 inches in diameter; and meet requirements per standard manhole details 4-1 and 4-1A for lid and surrounds. ~~have watertight round lids.~~

3. All access openings ~~shall~~ must have surface access for maintenance vehicles.

4. The distance from tank invert to finished grade ~~shall~~ must be not more than 20 feet.

5. OSHA confined space requirements ~~shall~~ must be met for tanks, and entrances to confined spaces ~~shall~~ must be clearly marked.

~~F. Access Roads:~~

~~1. Access roads shall meet the requirements set forth in Section 4.07D.~~

~~**4.15.2 Detention Vaults**~~

~~Detention vaults serve as runoff capacity control through the means of underground storage. Detention vaults typically are of box-shaped design, and constructed with reinforced concrete. Besides runoff capacity control, vaults shall be designed for considerations such as environmental conditions (soil corrosiveness, inundation, etc.), maintenance access, and ground and/or surface loadings. Detention vaults shall comply with the following criteria:~~

~~A. General Design:~~

~~1. Vaults shall be designed as flow-through systems with level bottoms.~~

~~2. Construction material shall consist of a minimum 3,000-psi structural reinforced~~

~~concrete, and all joints shall be equipped with water stops.~~

~~3. The locations of the inlet and outlet shall be elevated 0.5 feet above the vault bottom to provide for sediment storage.~~

~~B. Structural Stability:~~

~~1. Special consideration shall be given to ensure vaults meet requirements for potential traffic loading and overburden support. Vaults shall be located on well-consolidated native material, with appropriate bedding. A structural analysis, geotechnical analysis, and engineered calculations may be required with the design, demonstrating stability and constructability. Buoyancy calculations may also be required.~~

~~C. Access Maintenance:~~

~~1. Access easements and roads shall be provided in the event vaults are not located within the public right-of-way.~~

~~2. The distance from vault invert to finished grade shall be not more than 20 feet.~~

~~3. Access openings shall be provided at a distance of no less than 50 feet from any location within the vault, shall be a minimum of 36 inches in diameter, and shall have watertight round lids. Additionally, access openings shall be located at both the inlet and outlet locations of the vault.~~

~~4. All access openings shall have surface access for maintenance vehicles.~~

~~5. OSHA confined space requirements shall be met for vaults, and entrances to confined spaces shall be clearly marked.~~

~~D. Access Roads:~~

~~1. Access roads shall meet the requirements specified in Section 4.07D.~~

~~4.16~~ 4.11 INFILTRATION FACILITIES

~~4.16.1 Overview~~

~~In general, infiltration facilities are used in areas of highly permeable soils, to reduce the quantity of stormwater runoff in receiving systems and to recharge the groundwater aquifer. Examples of infiltration facilities include but are not limited to retention ponds; infiltration trenches; infiltration tanks; and drywells. A geotechnical evaluation of the site, prepared by an Oregon licensed Engineer or Geotechnical Engineer, or an Oregon Registered Engineering Geologist shall be required for infiltration facilities other than single lot residential drywells and rain gardens, proposed within Springfield and its Urban Growth Boundary. Sites utilizing infiltration for stormwater management may be eligible for Systems Development Charges and Stormwater User Rate fee reductions. The Oregon Department of Environmental Quality (DEQ) regulates drywells under its Underground Injection Control (UIC) program.~~

~~4.16.2 Underground Injection Control~~

~~The DEQ regulates and registers certain infiltration facilities as underground injection wells. Registration covers all injection wells, including stormwater disposal wells, industrial/commercial~~

~~injection facilities, aquifer recharge wells, subsidence control wells, aquifer remediation wells, and other miscellaneous injection wells. In Oregon, all fresh water aquifers are protected as underground sources of drinking water (USDW). In addition to the minimum federal UIC requirements, all injection facilities shall further comply with Oregon Administrative Rule 340-44.~~

~~Drywell usage for clean roof runoff shall be considered and may be required in the overall stormwater management system design. Impervious surface area used for runoff calculations may be reduced by 25 percent of the area draining to on-site drywells.~~

~~Drywells shall be designed in accordance with Springfield Standard Drawings 4-19 and 4-20.~~

~~4.16.3 Surface Infiltration Facility Requirements~~

~~Infiltration facilities shall conform to the following standards:~~

~~A. Water Quality:~~

~~1. All infiltration facilities receiving runoff from areas other than building rooftops shall have stormwater quality treatment devices installed upstream of the facility as specified in Chapter 3. Infiltration facilities shall not be put "on-line" in the stormwater system until all upstream erosion control measures are in place, and all proposed project improvements finalized, thereby minimizing the amount of sediment laden runoff input into the facility.~~

~~2. All infiltration and water quality facilities are required to go through an Operations and Maintenance submittal process as specified in Chapter 3.~~

~~B. Soils:~~

~~1. For all proposed infiltration facilities, an Oregon licensed Civil Engineer or Geotechnical Engineer, or Oregon Registered Engineering Geologist, shall demonstrate through percolation rate testing, soil logs, and a written statement that the soil type existing on-site will function properly to allow an infiltration facility. A Geotechnical Report as referenced in SDC 5.12-120F.7 or 5.17-120I.10 shall be submitted concurrently with the proposed design. Infiltration facilities will not be allowed on soils with a high groundwater table.~~

~~C. Infiltration Rate Testing Procedures:~~

~~1. All infiltration rate testing shall comply with either: the *EPA falling head percolation test procedure* (Design Manual – Onsite Wastewater Treatment and Disposal Systems, EPA, 1980; or the *double ring infiltrometer test* (ASTM D3385).~~

~~2. Sufficient soil testing shall be performed to establish the representative permeability of the soil; however, a minimum of 3 soil tests shall be performed for each infiltration facility located on a site.~~

~~3. Each test hole shall be filled with water and maintained at depth above the test elevation for a saturation period specified for the respective test.~~

~~4. After the saturation period, the infiltration rate shall be determined based on the respective test procedures, with a head of 6 inches of water.~~

~~D. Design Infiltration Rate:~~

~~1. Research has shown that actual infiltration rates in many facilities are much lower than design infiltration rates predicted by the tests referenced above, particularly after a period of use, in that sedimentation and ground compaction can occur. Eventually, this leads to flooding and~~

~~expenditures to mitigate the problem. Therefore, the design engineer shall incorporate a safety factor of at least 2 into the design infiltration rate. The maximum design infiltration rate used for sizing facilities shall be 10 inches per hour.~~

~~E. Overflow – Emergency Spillway:~~

~~1. Infiltration facility overflow systems shall provide controlled discharge of the design storm event for developed contributing area without overtopping any part of the infiltration facility or exceeding the capacity of the emergency spillway. The design shall provide controlled discharge directly into the downstream conveyance system. An emergency overflow spillway shall be provided to safely pass the 100-year, 24-hour design storm event in the event of failure. The spillway shall be located to direct overflows safely towards the downstream conveyance system.~~

~~4.17 LOW IMPACT DEVELOPMENT APPROACHES~~

~~Low Impact Development Approaches (LIDA) is the required method to manage stormwater runoff in urban areas. LIDA work with the natural and urban surroundings to manage stormwater as close to its source as possible. The LIDA method strives to treat runoff as a resource that is utilized to enhance a development rather than a waste product. This approach includes several technologies such as:~~

- ~~Rain Gardens~~
- ~~Infiltration Swales~~
- ~~Retention Ponds~~
- ~~Infiltration Planters~~
- ~~Green Roofs~~
- ~~Rainwater Harvesting & Reuse~~
- ~~Permeable Pavements~~

~~If effectively implemented, LIDA may have lower construction costs than conventional stormwater treatment infrastructure and can reduce the needed space for these facilities. In some cases, LIDA can supplement and even replace irrigation systems for landscaped areas and reduce the need for a traditional, extensive underground piping network to drain a dense, urban area.~~

~~Many of the undeveloped areas within the Springfield Urban Growth Boundary do not have access to a public stormwater management system. Installing public infrastructure may be costly to developers and utilization of LIDA can substantially reduce these costs. Upgrading existing stormwater systems within the developed area of Springfield will also be costly and reducing runoff from increasing densities from redevelopment will allow Springfield to manage and treat runoff with fewer costly upgrades to existing stormwater systems. LIDA systems are also easily integrated with required landscape areas and as such can be incorporated during development or redevelopment at little additional cost to the property owner and developer.~~

~~4.17.1 Requirements For Low Impact Development Approach Areas~~

~~Springfield currently requires development and redevelopment within the Glenwood Refinement Plan boundary to use LIDA for stormwater management. LIDA is encouraged elsewhere in Springfield and the developer may utilize this approach in any area if site conditions are suitable. In addition, LIDA systems may be applicable in other areas without access to a stormwater system that has sufficient capacity for the increased runoff due to development.~~

~~The following criteria shall be used when designing stormwater systems utilizing LIDA:~~

~~1. Within the Glenwood Refinement Plan Boundary, all development sites must capture and retain on-site the first 1 inch of rainfall in a 24-hour period using on-site LIDA systems.~~

~~2. The site soils shall be evaluated for infiltration capability as stated in 4.16.3 when designing LIDA systems.~~

~~3. The amount of runoff infiltrated shall be maximized to the greatest extent practicable taking into account site limitations such as soil type and site location.~~

~~4. Offsite runoff shall be minimized to the greatest extent practicable. The City Engineer may waive or reduce this requirement in cases where a suitable offsite disposable area is available.~~

~~5. The riparian setback and other landscaped areas of any development site shall be utilized for stormwater treatment and infiltration where practicable.~~

~~6. For development sites adjacent to public open space areas with sufficient capacity to infiltrate additional runoff, an overflow connection from the site to the public open space will be allowed. For maximum effectiveness of the overall stormwater facilities, design of onsite and adjacent open space treatment areas shall be coordinated where practicable.~~

~~7. LIDA systems shall be designed in conformance with Eugene's *Stormwater Management Manual*. For a system that a developer may want to use that is not included in Eugene's manual, the developer must provide the City Engineer with the applicable design standards and criteria from a public agency that has approved its use. The City Engineer will review the developer's proposal and determine if that system is acceptable for use in Springfield at the desired location.~~

COMMENTARY: This section was added for a clear standard to be used to ensure the long term function of permeable pavements.

~~4.17.2~~ 4.11.1 Requirements for Permeable Pavements for Impermeable Area Reduction

Permeable Pavements may be used for impermeable area reduction only and not utilized for stormwater quality treatment or stormwater destination from other impermeable surface.

All permeable pavements used for driveways, residential, or commercial parking areas must be constructed of material that is firmly bonded so that it cannot be displaced or moved during its intended use and is durable and dust free. Loose fill permeable pavements are allowed on maintenance and emergency access areas or other areas that are not to be used for daily vehicular traffic.

Permeable pavements are not allowed in areas with a high likelihood of pollutant spills such as (but not limited to) vehicle service areas, loading docks, and trash enclosures or handling areas. Permeable pavements should not be used in high traffic areas such as drive through lanes, loading/unloading areas, or main access aisles of parking lot.

If permeable pavement is to be used in a proposed development, the use must be approved during site plan review (if applicable), Drinking Water Protection permit (if applicable), and building permit review. To be approved the following items are required to be submitted for review:

A. Site Requirements:

1. The location of the permeable pavement on the site showing the permeable pavement location is no steeper than 5 percent slope in any direction and setback from any foundation by at least 10 feet and any private property line by at least 5 feet. Permeable pavement may be placed directly adjacent to public right-of-way but may not be placed in utility easements.

2. An on-site infiltration test by a qualified professional using the method in the City of Springfield Development Code Appendix C showing the soil is suitable for permeable pavement installation so that the base aggregate can contain the 10 year storm OR an underdrain system is provided to a public system with sufficient capacity for the discharge from the underdrain system.

B. Permeable pavement section requirements

1. A full cross-section of the pavement structure from the subgrade to the top of pavement must be provided by either the manufacturer of the pavement product or a licensed professional engineer.

2. Existing ground/subgrade. The subgrade should be uncompacted and native material if possible. If placed in compacted soil or compacted fill, an underdrain system is required.

3. Geotextile fabric is required between the base rock and the subgrade. If the section is designed to infiltrated into the subgrade the fabric must be permeable. Additional permeable fabric may be required between layers within the pavement section as shown by the manufacturer or engineer.

4. Aggregate base rock: A permeable layer of open graded base rock must be provided for storage of runoff and the structural platform for the wearing surface. The aggregate base layer must be designed to accommodate the specific volume of rainfall storage required and the anticipated surface design loads. In no case may the layer be less than 6 inches. This must be clearly labeled with for thickness and material, Diameter of aggregate base must be no greater than 2-1/2 inch and no less than 3/4-inch and consist of crushed rock.

5. Bedding course: Some permeable pavement products and designs require a shallow layer between the aggregate base rock and the paving course, typically sand or small diameter crushed rock. If used, this layer must be clearly labeled for thickness and material and no less than 1 inch thick

6. Paving/top course: Paving courses must be designed for the anticipated surface loads and the aggregate base layer design. All paving courses must be permeable as to infiltrate stormwater directly into the aggregate base layer. Asphalt mixes must be of the open graded design. Permeable concrete mixes must be of the open graded design with little or no sand. Permeable pavers and other premanufactured products should be installed per manufacturer's recommendations.

7. Underdrains: If the permeable paving is to be installed in area without adequate infiltration an underdrain must be provided. This must consist of perforated PVC or HDPE pipe no less

than 3 inches in diameter, provided with a wrapped, permeable geotextile material and drain to a stormwater management system, public or private, that meets the requirements in Chapter 4 of the City of Springfield EDSPM.

8. If propriety permeable pavement material is being proposed, a complete set of manufacturer's specifications for the permeable pavement section, installation, suitability for the intended use, and all materials is required.

C. Permeable Pavement Inspection Requirements
Inspection and proper documentation are required for permeable pavement at the following points in construction:

1. When excavation of the section is complete and the underdrain has been installed (if an underdrain is required) to verify the full depth of the section is excavated and the native material is uncompacted.

2. When the aggregate base rock is installed but before the bedding course or pavement/top course is installed. As part of this inspection a load ticket or other approved proof is required that the aggregate base rock meets the material as specified in the approved pavement section submitted with the development approval or the building permit.

3. When the top course is finished and the pavement is fully installed. As part of this inspection a load ticket or other approved proof is required that the pavement/top course meets the material as specified in the approved pavement section submitted with the development approval or the building permit.

COMMENTARY This section was moved from the now vacant Chapter 3 as an advisory section for proper maintenance procedures.

~~3.02.7~~ 4.12 PARKING LOT MAINTENANCE

~~In addition to the above requirements,~~ Springfield highly recommends routine surface cleaning of parking lots. The use of "dry" cleaning techniques (sweeping, vacuuming, etc.) is highly preferred because they eliminate water discharges to the storm system. Absorbent material ~~shall~~ must be used on particularly oily or dirty surfaces prior to cleaning. Generally, parking lots should be cleaned prior to the wet season ~~(i.e. October)~~ to dampen the effects of the first flush. Additional cleanings can be determined through on-site observations and accumulations of sediments. Parking lot debris from cleanup ~~shall~~ must be disposed of at a landfill.

Wet cleaning techniques (pressure washing, garden hoses, etc.) involving water for parking lot cleanup are regulated by the Springfield Municipal Code (SMC), Sections 4.370 and 4.372. If parking lots must be washed with water, contact the Environmental Services Division for information regarding requirements and disposal of cleaning water. Wash water ~~shall~~ must not be directed into the stormwater system under any circumstances without required BMPs being implemented.

Routine area drains and catch basin cleaning ~~shall~~ must also be done as part of parking lot cleaning activities. Storm catch basins collect debris such as oils, ~~paper,~~ sediments, and ~~other~~

trash. If not routinely cleaned this debris will plug the discharge pipe and cause flooding as well as discharging polluted water into the public stormwater system. Discharge of polluted stormwater is a violation of the SMC Section 4.372~~(6)~~ and is subject to a fine.

Legislative Version of Amendments to the Engineering Design Standards and Procedures Manual Appendix 4A Stormwater Subsurface Filtration/Infiltration Facility Sizing Selection to Incorporate MS4 Permit Requirements

AMENDMENTS
Various Sections of the Engineering Manual (EDSPM) are amended to remove barriers to Low-Impact Development and define stormwater terms. Commentary is shown in *purple italics font*, preceding the text to which it is referring.

STORMWATER SUBSURFACE FILTRATION/INFILTRATION SIZING SPREADSHEET

COMMENTARY: This spreadsheet (commonly referred to as a calculator) is provided as an approved way for small developments to choose and correctly size the stormwater facilities in Springfield development Code Appendix D Typical Stormwater Facility Details without needing a design professional. The use of this is not required. It is sourced from the City of Eugene Stormwater Management Manual and has all the proposed standards (1.4" of runoff retained on site or and equivalent runoff flow rate if infiltration is not available) built into the calculations.

Stormwater SubSurface Filtration/Infiltration Facility Sizing Spreadsheet
24 Hour Storm, NRCS Type 1A Rainfall Distribution
City of Springfield

Version 2.1

Project Information

Project Name:	[Sample Project]	**Date:**	[Date]
Project Address:	[#### Street or Intersection]	**Permit Number:**	[Permit #]
	Springfield, OR [Zip Code]	**Catchment ID:**	[Catchment ID]
Designer:	[Designer Name]		
Company:	[Company Name]		

Instructions:

1. Complete this form for each drainage catchment in the project site that is to be sized per the Presumptive Approach.
2. Provide a distinctive Catchment ID for each facility coordinated with the site basin map to correlate the appropriate calculations with the facility.
3. The maximum drainage catchment to be modeled per the Presumptive Approach is 1 acre (43,560 SF)
4.For infiltration facilities in Class A or B soils where no infiltration testing has been perfromed use an infiltration rate of 0.5 in/hr. Maximum design

Design Requirements:

Choose "Yes" from the dropdown boxes below next to the design standards requirements for this facility.

Pollution Reduction (PR)	Yes	*Soakage trenches draining commerical parking lots require pre-treatment to meet pollution reduction requirements
Flow Control (FC)	Yes	
Destination (DT)	Yes	*An infiltration facility must be chosen as the facility type to meet destination requirements

Site Data-Post Development

Total Square Footage Impervious Area=		sqft	**Total Square Footage Pervious Area=**		sqft
Impervious Area CN=			**Pervious Area CN=**		
Total Square Footage of Drainage Area=		sft	**Time of Concentration Post Development=**		min
Weighted Average CN=					

Site Data-Pre Development **(Data in this section is only used if Flow Control is required)**

Pre-Development CN=			**Time of Concentration Pre-Development=**		min

Soil Data

Tested Soil Infiltration Rate=		in/hr (See Note 4)	**Destination Design=**	N/A	in/hr
Design Soil Infiltration Rate=	0	in/hr	**Soil Infiltration Rate**		

Design Storms Used For Calculations

Requirement	Rainfall Depth		Design Storm
Pollution Reduction	1.4	inches	Water Quality
Flow Control	3.6	inches	Flood Control
Destination	3.6	inches	Flood Control

Facility Data

Facility Type=			**Facility Surface Area=**	0	sqft
Surface Width=		ft	**Facility Surface Perimeter=**	0	ft
Surface Length=		ft	**Basin Volume=**		cf

Layer Properties

	Material	Facility Depth (in)	Percent Voids	Effective Storage Depth (in)
Layer 1				0.0
Layer 2				0.0
Layer 3				0.0
Layer 4				0.0
	Totals=	0.0 in		**0.0** in

Pollution Reduction-Calculation Results

Peak Flow Rate to Stormwater Facility =		cfs	Peak Facility Overflow Rate=	0.000	cfs
Total Runoff Volume to Stormwater Facility =		cf	Total Overflow Volume=	0	cf
Max. Eff. Depth of Stormwater in Facility=		in			
Drawdown Time=		hours			

Yes **Facility Sizing Meets Pollution Reduction Standards?**

YES **Meets Requirement of No Facility Flooding?**
YES **Meets Requirement for Maximum of 18 Hour Drawdown Time?**

Flow Control-Calculation Results

Peak Flow Rate to Stormwater Facility =		cfs	Peak Facility Overflow Rate=		cfs
Total Runoff Volume to Stormwater Facility =		cf	Total Overflow Volume=		cf
Max. Eff. Depth of Stormwater in Facility=		in	Peak Off-Site Flow Rate Filtration Facility Underdrain=		cfs
Drawdown Time=		hours			

Pre-Development Runoff Data

Peak Flow Rate =		cfs
Total Runoff Volume =		cf

Yes **Facility Sizing Meets Flow Control Standards?**

YES **Meets Requirement for Post Development offsite flow less or equal to Pre-Development Flow?**
YES **Meets Requirement for Maximum of 18 Hour Drawdown Time?**

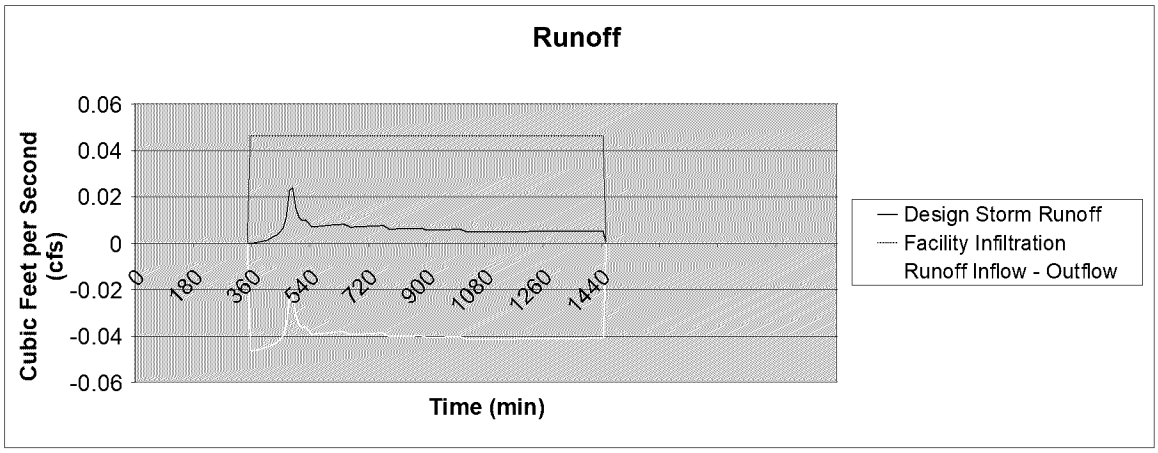
Destination-Calculation Results

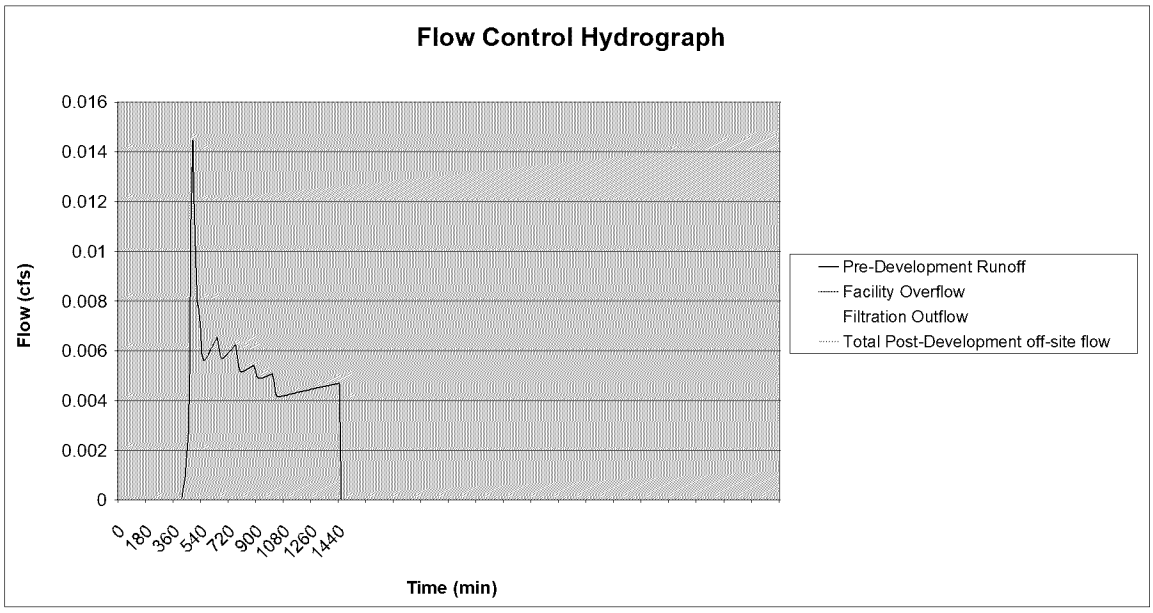
Peak Flow Rate to Stormwater Facility =		cfs	Peak Facility Overflow Rate=		cfs
Total Runoff Volume to Stormwater Facility =		cf	Total Overflow Volume=		cf
Max. Eff. Depth of Stormwater in Facility=		in			
Drawdown Time=		hours			

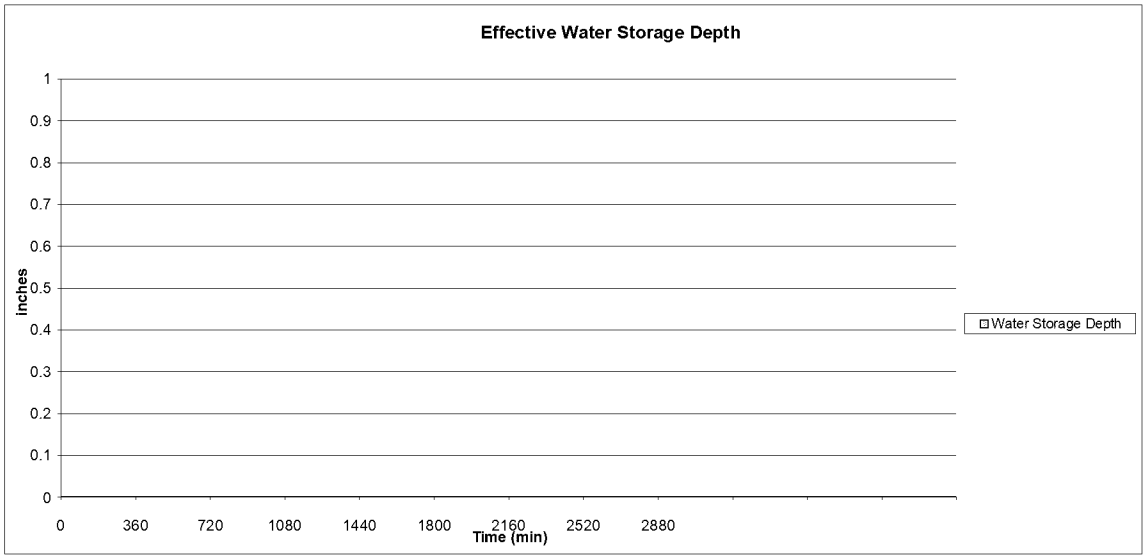
N/A **Facility Sizing Meets Destination Standards?**

N/A **Meets Requirement of No Facility Flooding?**
N/A **Meets Requirement for Maximum of 30 hour Drawdown Time?**

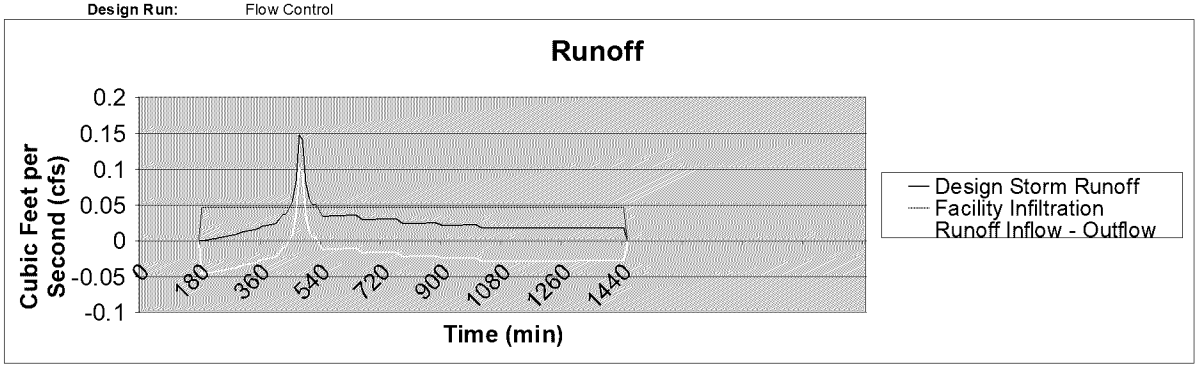
Project Name: [Sample Project]
Permit Number: [Permit #]
Catchment ID: [Catchment ID]
Design Run: Pollution Reduction

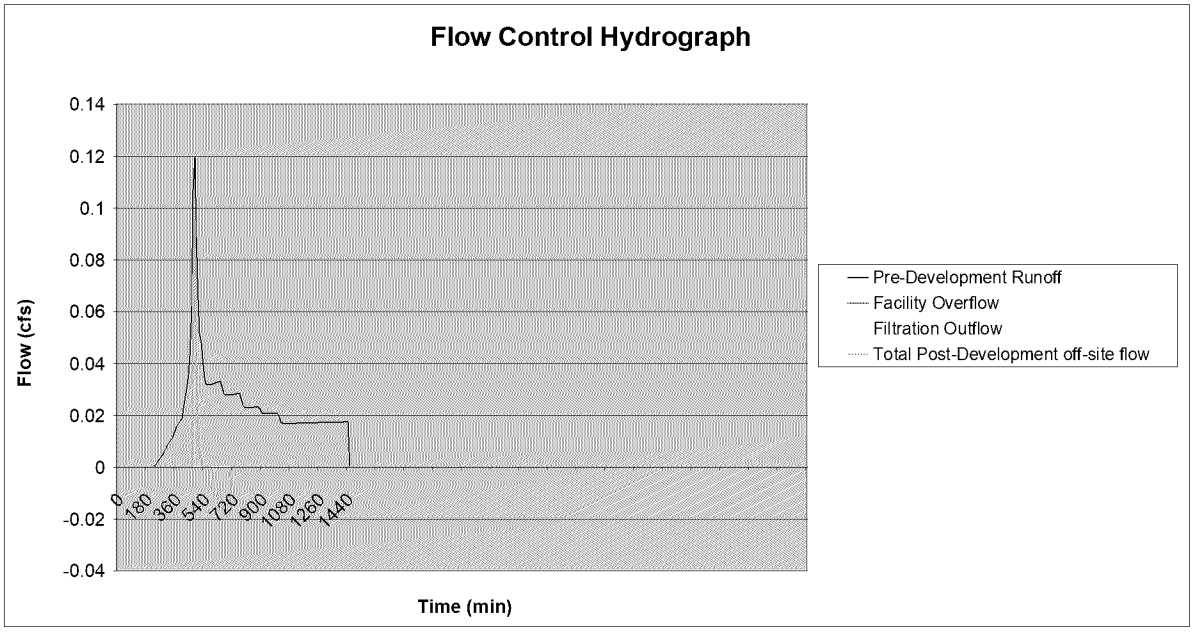


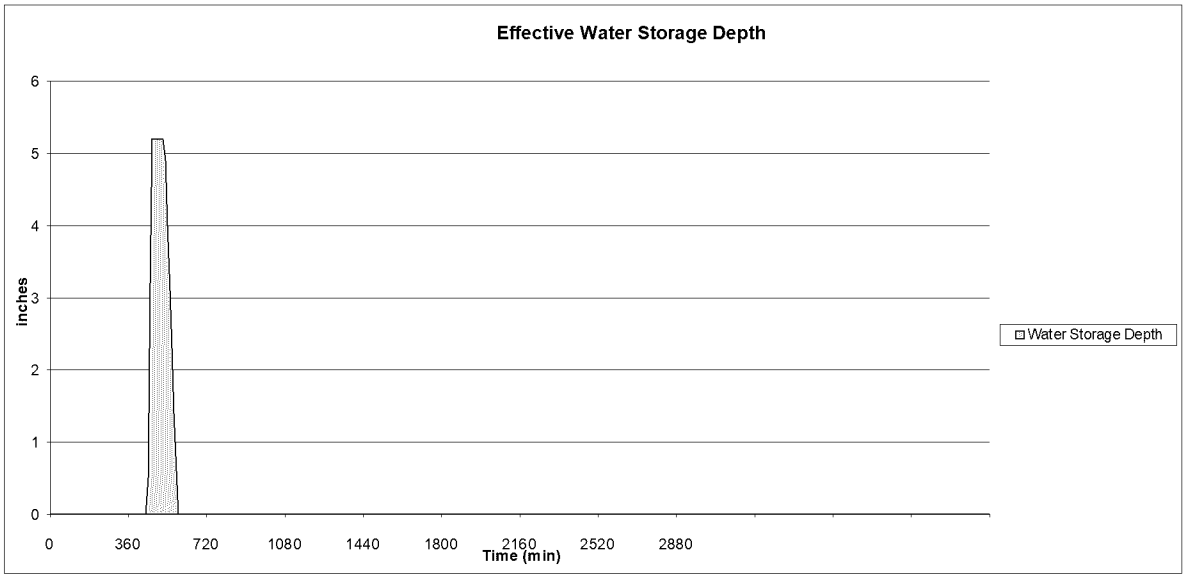




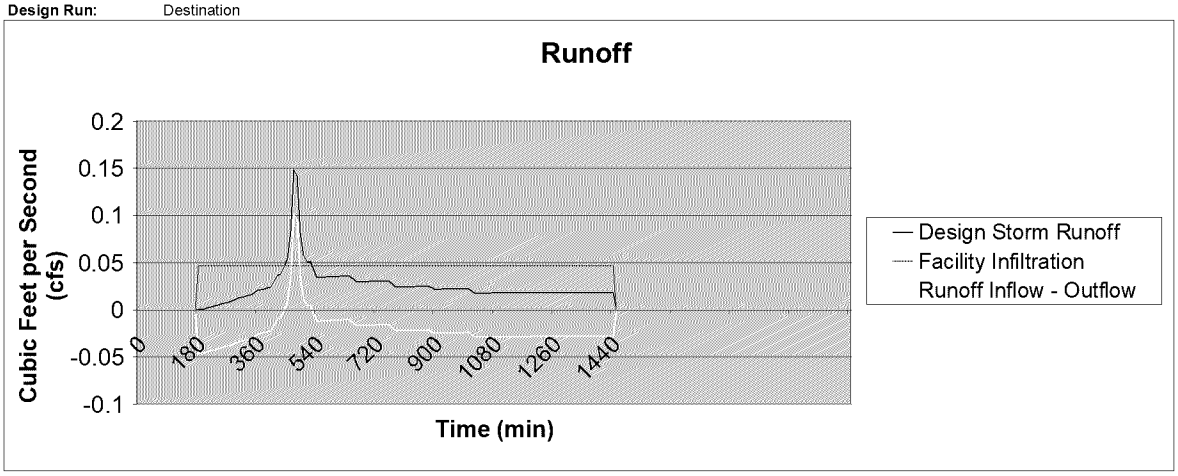
Project Name: [Sample Project]
Permit Number: [Permit #]
Catchment ID: [Catchment ID]
Design Run: Flow Control

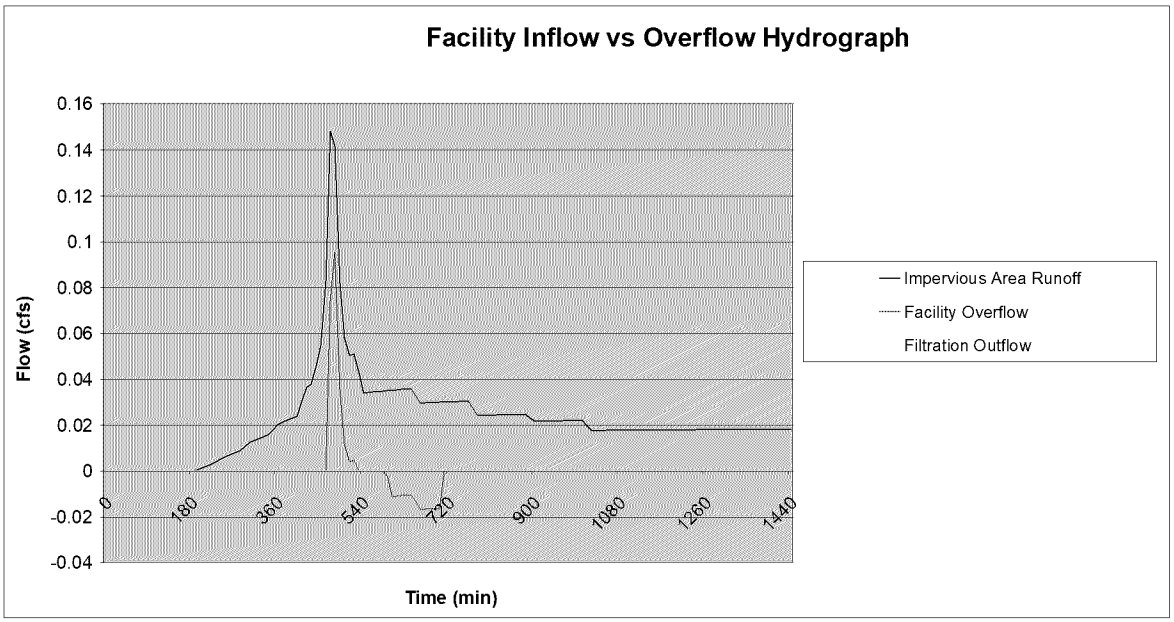


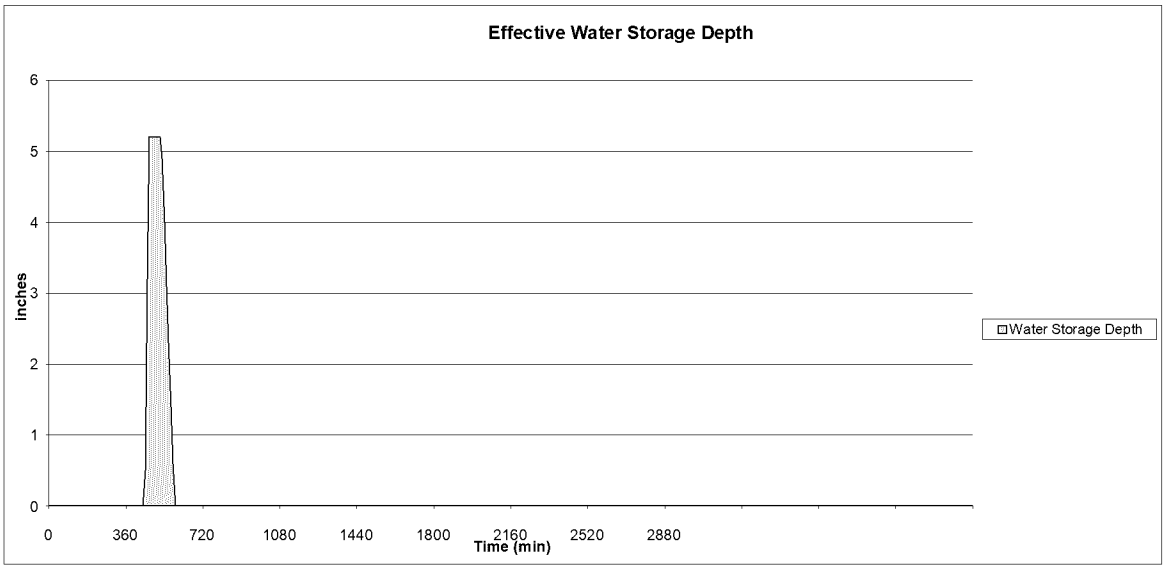




Project Name: [Sample Project]
Permit Number: [Permit #]
Catchment ID: [Catchment ID]
Design Run: Destination







Legislative Version of Amendments to the Engineering Design Standards and Procedures Manual Appendix 4B Stormwater Surface Filtration/Infiltration Facility Sizing Selection to Incorporate MS4 Permit Requirements

AMENDMENTS
Various Sections of the Engineering Manual (EDSPM) are amended to remove barriers to Low-Impact Development and define stormwater terms. Commentary is shown in *purple italics font*, preceding the text to which it is referring.

STORMWATER SUBSURFACE FILTRATION/INFILTRATION SIZING SPREADSHEET

COMMENTARY: This spreadsheet (commonly referred to as a calculator) is provided as an approved way for small developments to choose and correctly size the stormwater facilities in Springfield Development Code Appendix D Typical stormwater facility Details without needing a design professional. The use of this is not required. It is sourced from the City of Eugene Stormwater Management Manual and has all the proposed standards (1.4" of runoff retained on site). Subsurface facilities are not suitable for flow through calculations.

Stormwater Surface Filtration/Infiltration Facility Sizing Spreadsheet
24 Hour Storm, NRCS Type 1A Rainfall Distribution
City of Springfield

Version 2.1

Project Information

Project Name:	[Sample Project]	**Date:**	[Date]
Project Address:	[#### Street or Intersection]	**Permit Number:**	[Permit #]
	Springfield, OR [Zip Code]	**Catchment ID:**	[Catchment ID]
Designer:	[Designer Name]		
Company:	[Company Name]		

Instructions:

1. Complete this form for each drainage catchment in the project site that is to be sized per the Presumptive Approach.
2. Provide a distinctive Catchment ID for each facility coordinated with the site basin map to correlate the appropriate calculations with the facility.
3. The maximum drainage catchment to be modeled per the Presumptive Approach is 1 acre (43,560 SF)
4. For infiltration facilities in Class A or B soils where no infiltration testing has been perfromed use an infiltration rate of 0.5 in/hr. For all facilities use a maximum soil infiltration rate of 2.5 in/hr for topsoil/growing medium.

Design Requirements:

Choose "Yes" from the dropdown boxes below next to the design standards requirements for this facility.

Pollution Reduction (PR)	Yes
Flow Control (FC)	No
Destination (DT)	No

*An infiltration facility must be chosen as the facility type to meet destination requirements

Site Data-Post Development

Total Square Footage Impervious Area=	6000	sqft	**Total Square Footage Pervious Area=**	6000	sqft
Impervious Area CN=	98		**Pervious Area CN=**	85	
Total Square Footage of Drainage Area=	12000	sft	**Time of Concentration Post Development=**	5	min
Weighted Average CN=	92				

Site Data-Pre Development **(Data in this section is only used if Flow Control is required)**

Pre-Development CN=	85		**Time of Concentration Pre-Development=**	10	min

Soil Data

Tested Soil Infiltration Rate=	2.5	in/hr (See Note 4)	**Destination Design=**	N/A	in/hr
Design Soil Infiltration Rate=	2.5	in/hr	**Soil Infiltration Rate**		

Design Storms Used For Calculations

Requirement	Rainfall Depth		Design Storm
Pollution Reduction	1.4	inches	Water Quality
Flow Control	3.6	inches	Flood Control
Destination	3.6	inches	Flood Control

Facility Data

Facility Type=	Infiltration Stormwater Planter		**Facility Surface Area=**	175	sqft
Surface Width=	5	ft	**Facility Surface Perimeter=**	80	ft
Surface Length=	35	ft	**Facility Bottom Area=**	175	sqft
Facility Side Slopes=	0	to 1	**Facility Bottom Perimeter=**	80	ft
Max. Ponding Depth in Stormwater Facility=	6	in	**Basin Volume=**	87.5	cf
Depth of Growing Medium (Soil)=	18	in	**Ratio of Facility Area to Impervious Area=**	0.015	

Pollution Reduction-Calculation Results

Peak Flow Rate to Stormwater Facility =	0.047	cfs	Peak Facility Overflow Rate=	0.003	cfs
Total Runoff Volume to Stormwater Facility =	686	cf	Total Overflow Volume=	29	cf
Max. Depth of Stormwater in Facility=	6.0	in			
Drawdown Time=	0.2	hours			

NO **Facility Sizing Meets Pollution Reduction Standards?**

NO **Meets Requirement of No Facility Flooding?**
YES **Meets Requirement for Maximum of 18 Hour Drawdown Time?**

Flow Control-Calculation Results

Peak Flow Rate to Stormwater Facility =	0.212	cfs	Peak Facility Overflow Rate=	0.201	cfs
Total Runoff Volume to Stormwater Facility =	2677	cf	Total Overflow Volume=	1818	cf
Max. Depth of Stormwater in Facility=	6.0	in	Peak Off-Site Flow Rate Filtration Facility Underdrain=	N\A	cfs
Drawdown Time=	2.5	hours			

Pre-Development Runoff Data

Peak Flow Rate =	0.143	cfs
Total Runoff Volume =	2104	cf

N\A **Facility Sizing Meets Flow Control Standards?**

N\A **Meets Requirement for Post Development offsite flow less or equal to Pre-Development Flow?**
N\A **Meets Requirement for Maximum of 18 Hour Drawdown Time?**

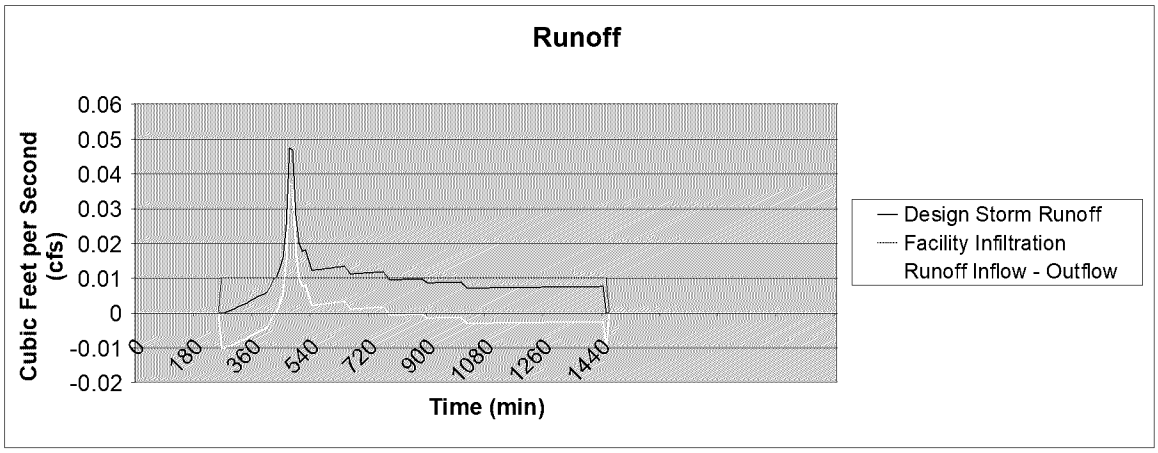
Destination-Calculation Results

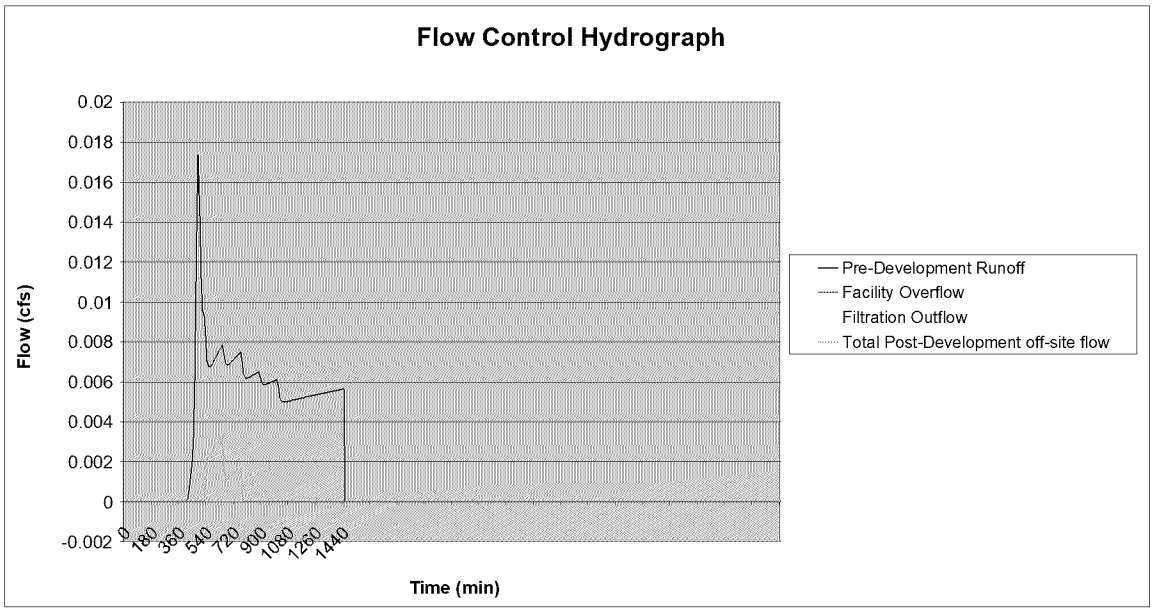
Peak Flow Rate to Stormwater Facility =	N/A	cfs	Peak Facility Overflow Rate=	N/A	cfs
Total Runoff Volume to Stormwater Facility =	N/A	cf	Total Overflow Volume=	N/A	cf
Max. Depth of Stormwater in Facility=	N/A	in			
Drawdown Time=	N/A	hours			

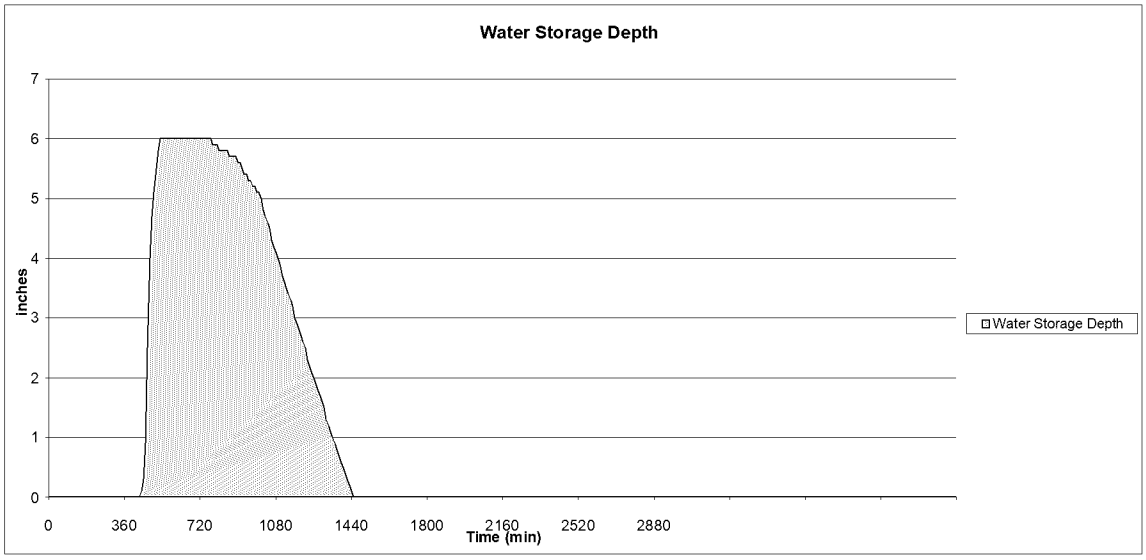
N/A **Facility Sizing Meets Destination Standards?**

N/A **Meets Requirement of No Facility Flooding?**
N/A **Meets Requirement for Maximum of 30 hour Drawdown Time?**

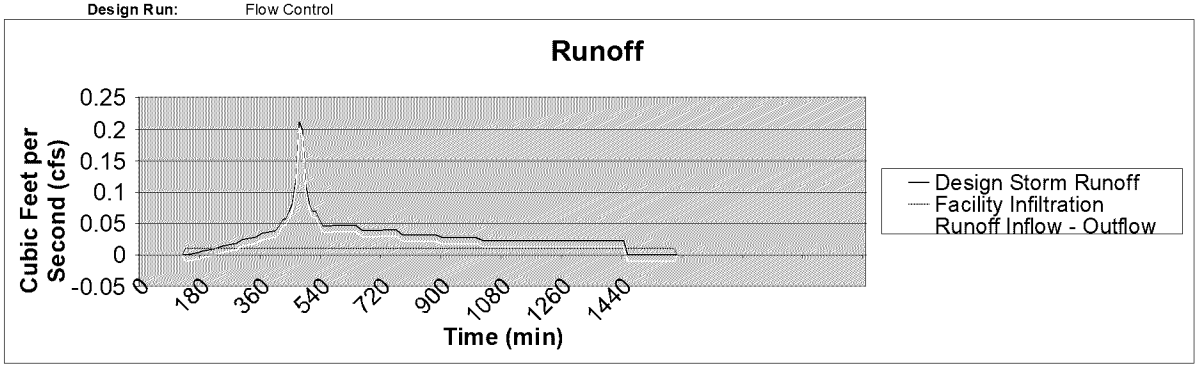
Project Name: [Sample Project]
Permit Number: [Permit #]
Catchment ID: [Catchment ID]
Design Run: Pollution Reduction

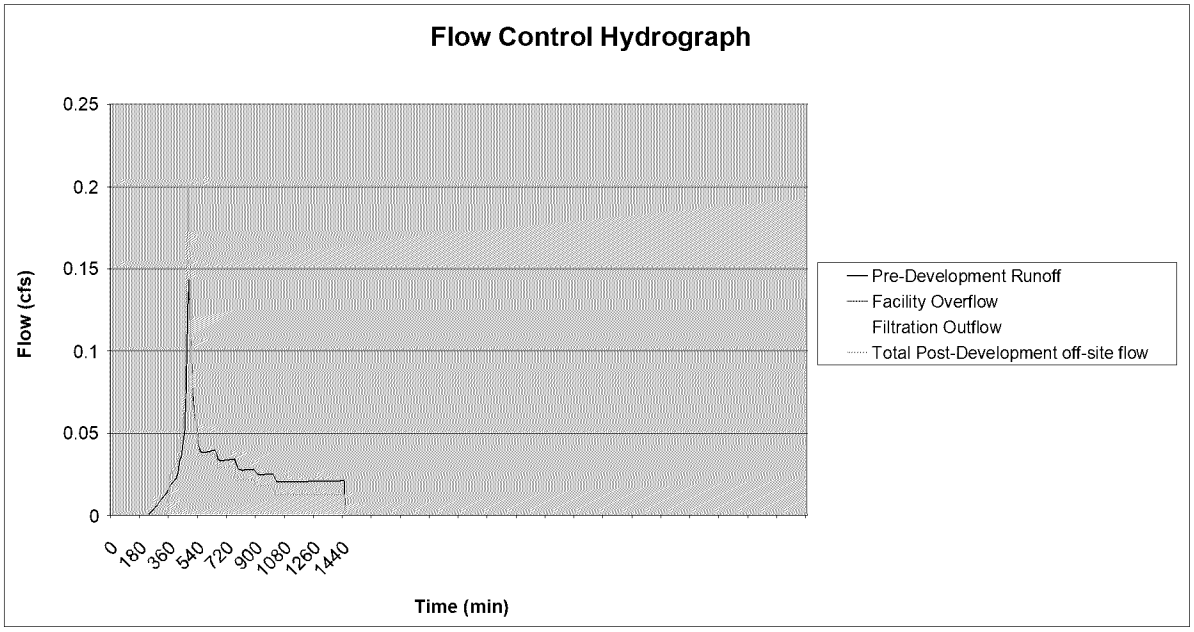


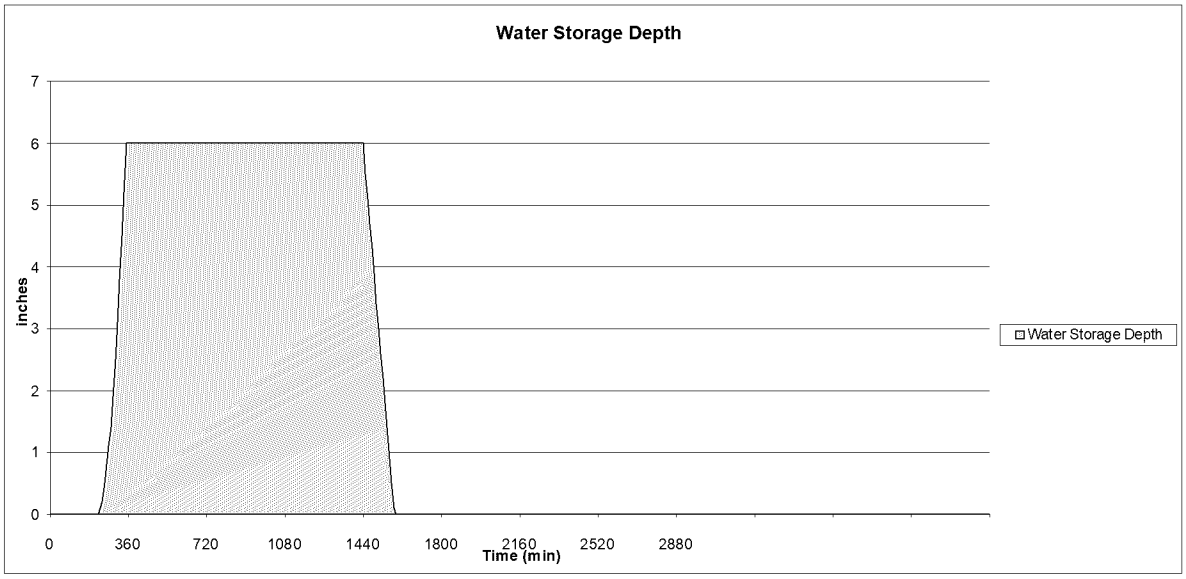




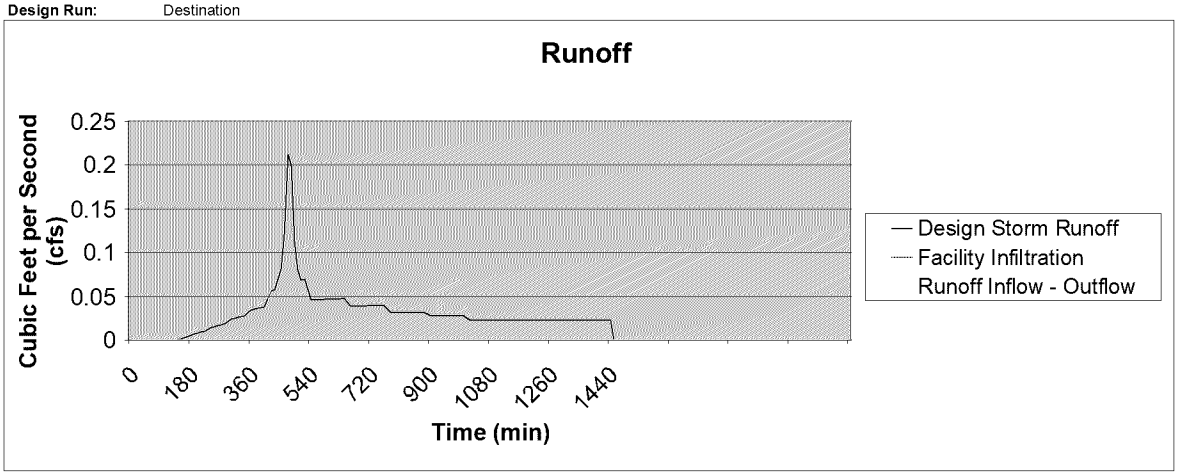
Project Name: [Sample Project]
Permit Number: [Permit #]
Catchment ID: [Catchment ID]
Design Run: Flow Control

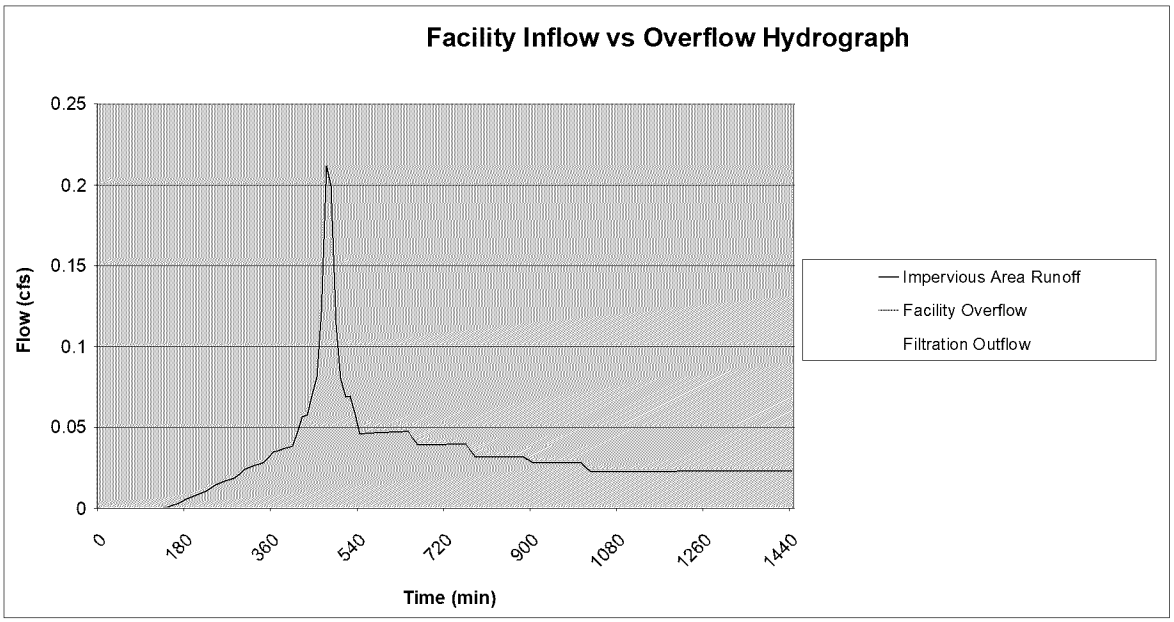


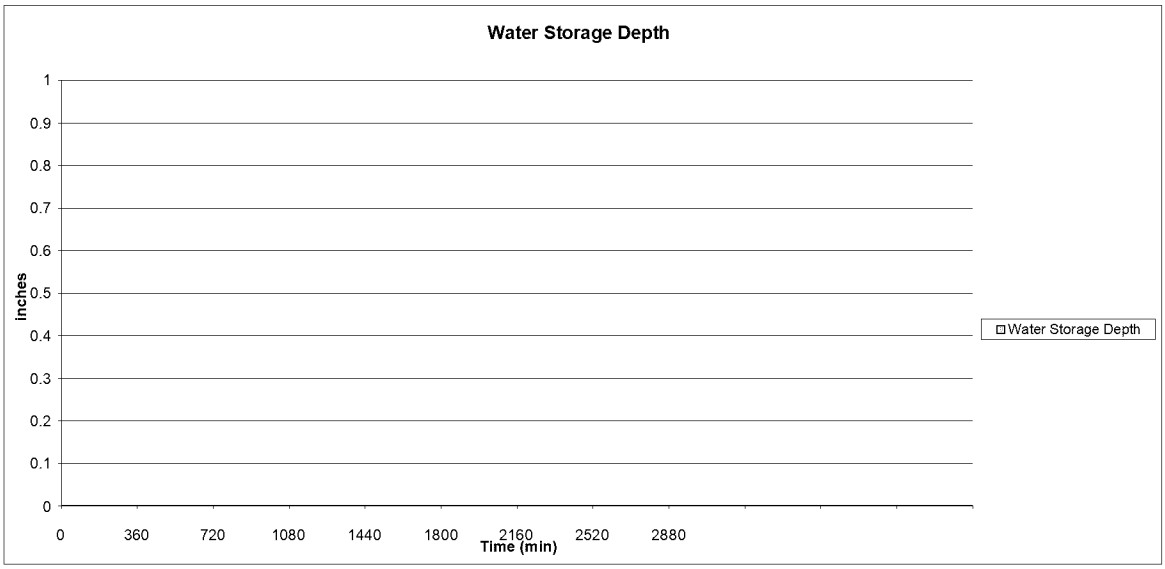




Project Name: [Sample Project]
Permit Number: [Permit #]
Catchment ID: [Catchment ID]
Design Run: Destination







Legislative Version of Amendments to the Engineering Design Standards and Procedures Manual Appendix 4C Stormwater Simplified Approach for Stormwater Management (SIM Form) to Incorporate MS4 Permit Requirements

AMENDMENTS
Various Sections of the Engineering Manual (EDSPM) are amended to remove barriers to Low-Impact Development. Commentary is shown in *purple italics font*, preceding the text to which it is referring.

STORMWATER SIMPLIFIED APPROACH FOR STORMWATER MANAGEMENT (SIM FORM)

COMMENTARY: *This worksheet provides a simple method for the sizing of facilities to meet the proposed standards for a limited number of surface facilities in Springfield Development Code Appendix D typical stormwater facility details for small-scale developers and builders to use on suitable sites. It is sourced from the City of Eugene Stormwater Management Manual.*

2014 SIM FORM: Tree Credit and Rainwater Harvesting Worksheet

See "Tree Credits" section for more information regarding the use of trees to meet Stormwater Impervious Area Reduction.

New Evergreen Trees

To receive Impervious Area Reduction Credit, new evergreen trees must be planted within 25 feet of the new or replaced impervious surfaces. New trees cannot be credited against rooftop areas. Minimum tree height **(at the time of planting)** to receive credit is 6 feet

Enter number of new evergreen trees that meet qualification requirements in Box A		Box A
Multiply Box A by 200 and enter result in Box B		Box B

New Deciduous Trees

To receive Impervious Area Reduction Credit, new large deciduous trees must be planted within 25 feet of the new or replaced impervious surfaces and new small deciduous trees must be planted within 10 feet of new or replaced impervious surfaces. New trees cannot be credited against rooftop areas. Minimum tree caliper **(at the time of planting)** to receive credit is 2 inches.

Enter number of new deciduous trees that meet qualification requirements in Box C		Box C
Multiply Box C by 100 and enter result in Box D		Box D

Existing Tree Canopy

To receive Impervious Area Reduction Credit, existing large tree canopies must be within 25 feet and existing small tree canopies must be within 10 feet of ground-level impervious surfaces (cannot be credit against roof top surfaces). Existing tree canopy credited towards Impervious Area Reduction must be preserved during and after construction throughout the life of the development. Minimum tree caliper to receive credit is 4 inches. No credit will be given to existing tree canopy located within environmental conservation areas.

Enter square footage of existing tree canopy that meet qualification requirements in Box E.		Box E
Multiply Box E by 0.5 and enter result in Box F.		Box F

Total Tree Credit

Add Boxes B, D and F and enter the result in Box G		Box G
Multiply Box 1 of Form SIM by 0.1 and enter the result in Box H.		Box H
Enter the lesser of Box G and H in Box I. (This is the amount to be entered as "Tree Credit" on Form SIM.)		Box I

SIM FORM 2014 Instructions

1. Enter square footage (sf) of total impervious area being developed into BOX 1.
2. Enter square footage (sf) for impervious area reduction techniques.
3. Enter sum of the impervious area reduction techniques into BOX 2.
4. Subtract BOX 2 from BOX 1 to find BOX 3, the amount of impervious area that requires stormwater management.
5. Select appropriate stormwater management facilities.
6. Enter the square footage of impervious area managed that will flow into each facility type.
7. Multiply each impervious area managed by the corresponding sizing factor. Enter this area as the facility surface area, This is the size of facility required to manage runoff
9. Where selecting facilities that will overflow, select the point of discharge location.
10. Enter the sum of the total of all the impervious area managed into BOX 4. BOX 4 must be greater than or equal to BOX 3.

2014 SIM FORM: Tree Credit and Rainwater Harvesting Worksheet

See "Tree Credits" section for more information regarding the use of trees to meet Stormwater Impervious Area Reduction.

New Evergreen Trees

To receive Impervious Area Reduction Credit, new evergreen trees must be planted within 25 feet of the new or replaced impervious surfaces. New trees cannot be credited against rooftop areas. Minimum tree height **(at the time of planting)** to receive credit is 6 feet

Enter number of new evergreen trees that meet qualification requirements in Box A		Box A
Multiply Box A by 200 and enter result in Box B		Box B

New Deciduous Trees

To receive Impervious Area Reduction Credit, new large deciduous trees must be planted within 25 feet of the new or replaced impervious surfaces and new small deciduous trees must be planted within 10 feet of new or replaced impervious surfaces. New trees cannot be credited against rooftop areas. Minimum tree caliper **(at the time of planting)** to receive credit is 2 inches.

Enter number of new deciduous trees that meet qualification requirements in Box C		Box C
Multiply Box C by 100 and enter result in Box D		Box D

Existing Tree Canopy

To receive Impervious Area Reduction Credit, existing large tree canopies must be within 25 feet and existing small tree canopies must be within 10 feet of ground-level impervious surfaces (cannot be credit against roof top surfaces). Existing tree canopy credited towards Impervious Area Reduction must be preserved during and after construction throughout the life of the development. Minimum tree caliper to receive credit is 4 inches. No credit will be given to existing tree canopy located within environmental conservation areas.

Enter square footage of existing tree canopy that meet qualification requirements in Box E.		Box E
Multiply Box E by 0.5 and enter result in Box F.		Box F

Total Tree Credit

Add Boxes B, D and F and enter the result in Box G		Box G
Multiply Box 1 of Form SIM by 0.1 and enter the result in Box H.		Box H
Enter the lesser of Box G and H in Box I. (This is the amount to be entered as "Tree Credit" on Form SIM.)		Box I

SIM FORM 2014 Instructions

1. Enter square footage (sf) of total impervious area being developed into BOX 1.
2. Enter square footage (sf) for impervious area reduction techniques.
3. Enter sum of the impervious area reduction techniques into BOX 2.
4. Subtract BOX 2 from BOX 1 to find BOX 3, the amount of impervious area that requires stormwater management.
5. Select appropriate stormwater management facilities.
6. Enter the square footage of impervious area managed that will flow into each facility type.
7. Multiply each impervious area managed by the corresponding sizing factor. Enter this area as the facility surface area, This is the size of facility required to manage runoff
9. Where selecting facilities that will overflow, select the point of discharge location.
10. Enter the sum of the total of all the impervious area managed into BOX 4. BOX 4 must be greater than or equal to BOX 3.