

Amendments to the Springfield Development Code to Incorporate Stormwater Permit Requirements

AMENDMENTS

Various Sections of the Springfield Development Code (SDC) are amended to remove barriers to Low-Impact Development and define stormwater terms. SDC 4.3.110 has been re-organized to more closely match the structure and requirements of the MS4 Permit. The proposed amendments are shown in legislative format (deleted text with strike-thru **red** font and new text with double underline red font). For ease of review, this legislative format does not show where code language was moved from one place to another. Commentary is shown *in purple italics font*, preceding the text to which it is referring.

3.2.450 CI District—Design Standards

Commentary: The recommendation to amend this section comes from the City of Springfield Stormwater Facilities Master Plan (2008) which proposed that the code be amended to allow vegetated stormwater quality features in the landscaping. Consistent with the MS4 Permit, vegetation may be permitted within structural stormwater controls.

In the CI District, new buildings; expansions of, or additions to existing buildings; or improvements to existing façades that require a building permit shall provide architectural designs that encourage flexibility and innovation in site planning by complying with the following on-site design standards:

- (B) Landscaping.** The following landscaping standards are in addition to standards specified in SDC 4.4.105:
- (1)** A minimum of 35 percent of each development area shall be landscaped open space.
 - (2)** Plants shall be sized to attain 90 percent coverage of required landscape areas (excluding tree canopies), within 3 years of installation. Plantings of native species and plant communities shall achieve 90 percent coverage within 5 years of installation.
 - (3)** At least 10 percent of the interior of a parking lot having 20 or more parking spaces shall be landscaped. This standard is in addition to any landscaping setbacks required in SDC 3.2.420.
 - (4)** Natural assets identified in the Gateway Refinement Plan, any other applicable refinement plan or elsewhere in this Code shall be included in the site design and protected. Where protection of these natural assets prevents the development of the site consistent with this Code, the functional equivalent of the natural assets may be substituted as may be allowed by the City.

- (5) Vegetation within a structural stormwater control that complies with SDC 4.3.110 may be counted toward the minimum landscaping requirements of this section.

3.2.625 Mixed-Use District Development Standards—General.

Commentary: The recommendation to amend this section comes from the City of Springfield Stormwater Facilities Master Plan (2008) which proposed that the code be amended to allow vegetated stormwater quality features in the landscaping. Consistent with the MS4 Permit, the City must encourage the use of Low Impact Development stormwater facilities. The word “shall” was replaced with “must” to clarify that the requirements are mandatory.

Mixed-use zoning districts require special attention to building design because of the intermixing of land uses and higher intensity of development that can occur in these areas. The standards below implement commonly accepted design principles with the goal to achieve more attractive, functional and pedestrian oriented design. Not every case and circumstance is anticipated by these standards, nor is it the goal of this section to prescribe every design detail of development. It is expected that the Springfield development community will apply their own design creativity to build on these principles and create attractive, livable, and viable projects. The standards below provide an objective framework for achieving the desired goal of attractive, pedestrian oriented development. Developers may choose to meet these standards as prescribed, or they may propose other design ideas which are equal or superior to a particular standard in meeting the design objectives in subsections (A) through (G), below. Where developers request an exemption from a stated standard, it is their responsibility to propose an alternative design and to demonstrate to the Director that it is equal or superior to the stated standard. The Director has the authority to authorize an exception to these standards and determine the acceptability of an alternative design the developer proposes. When developers propose alternative designs that are not acceptable to the Director, they may appeal the decision as specified in SDC 5.3.115.

(D) Landscaping and Screening.

- (1) **Intent.** Landscaping is intended to compliment built forms within a development area, softening and providing visual relief and contrast to buildings, sidewalks, parking lots, and provide opportunities for stormwater controls including Low Impact Development. Trees, as part of a landscaping plan, ~~shall~~must provide shade for pedestrian comfort as well. The installation of landscaping ~~shall~~must be accomplished in a manner that assures that planted stock receives adequate irrigation. Screening is intended to compliment a development area by shielding trash receptacles, storage areas and other unsightly facilities from public view within the development area.
 - (a) Mixed-use developments ~~shall~~must provide landscaping and screening in accordance with SDC ~~4.4.100~~ 4.4.105 and 4.4.110 and the following standards:
 - (b) Street trees ~~shall~~must be required consistent with SDC 4.2.140. Species ~~shall~~must be compatible with the design features specified in subsection (G), below and ~~shall~~must provide continuity with nearby landscaping. The Director may grant a 1-for-1 reduction in the number of street trees required when a development preserves healthy, mature trees located

within 10 feet of the sidewalk. Required street trees ~~shall~~must be placed in planter strips between sidewalks and curbs as specified in SDC 4.2.135 and 4.2.140, or in individual tree pits. If individual tree pits are utilized, each pit ~~shall~~must be a minimum of 64 square feet per tree, with a minimum width of 4.5 feet.

- (2) Screening of parking areas, drives, mechanical equipment and trash receptacles ~~shall~~must meet be as specified in SDC 4.4.110. In addition:
- (a) No trash receptacles ~~shall be~~are allowed within the front setback areas abutting residential districts.
 - (b) All ground-mounted utility equipment not installed underground ~~shall~~must be placed to reduce visual impact or screened with walls or landscaping.
 - (c) Notwithstanding the timelines specified in SDC 4.4.105, plants ~~shall~~must be sized to attain 50 percent coverage in 2 years and 100 percent coverage in 4 years.

Drinking Water Protection Overlay District

Commentary: The Drinking Water Protection Overlay District was amended with the input of Springfield Utility Board's Drinking Water Source Protection Coordinator and the City of Springfield Stormwater Facilities Master Plan (2008). Amendments allow an exception to the prohibition of dry wells for roof drainage, to prohibit permeable pavements in the 0-1 year time of travel zone, to clarify an exemption for the use of materials including liquid fuel for generators, clarified terms throughout 3.3.200, and to prohibit stormwater infiltration in a 100' buffer around wellheads per guidance from Oregon Health Authority. The applicability of the DWP Overlay standards in SDC 3.3.235 was revised to clarify that – even when no DWP Overlay permit application is required – development must comply with any applicable requirements of the overlay district. For instance, infiltration facilities within 100 feet of a wellhead would be prohibited even if a development did not otherwise trigger the need for a DWP Overlay permit.

Note: The exception to 3.3.230(B)(3) was revised so that it would not nullify (B)(9)'s regulatory exemption for emergency generators. The EXCEPTION language was moved to apply under (B)(3) only. Language was also added to the start of 3.3.235 to clarify that development must comply with the Drinking Water Protection requirements even if an application isn't required (e.g., the prohibited uses are still prohibited even if the City is not requiring an application submittal). Furthermore, the City may seek enforcement if a permitted use starts to use hazardous materials in a new way that would conflict with the Drinking Water Protection Overlay.

3.3.220 Time of Travel Zones.

- (B) The areas within specified wellhead TOTZ are those drinking water protection areas certified by the Oregon Health ~~Division~~ Authority, under the Oregon Administrative Rules that apply to Oregon's EPA-approved Drinking Water Protection Program, in Oregon Health Authority Delineation Certification #0002R, Version 2~~March 18, 1999~~.
- (C) In determining the location of a property within a TOTZ, the following criteria apply:
- (1) The Lane County Department of Assessment and Taxation maps shall be used as a base map with the addition of TOTZ boundaries.
 - (2) That portion of a tax lot that lies within a TOTZ is governed by the restrictions applicable to that TOTZ.
 - (3) Tax lots having parts lying within more than one TOTZ are governed by the standards of the more restrictive TOTZ.

EXCEPTION: The Director may waive the requirement that the more restrictive standards apply when all of the following apply:

- (a) Storage, use, handling, treatment, and/or production of hazardous or other materials that pose a risk to groundwater will not take place within the portion of the tax lot having the more restrictive TOTZ standards; and
 - (b) Storage, use, handling, treatment, and/or production of hazardous or other materials that pose a risk to groundwater will not take place within 50 feet of the portion of the tax lot having more restrictive TOTZ standards; and
 - (c) The tax lot is 20,000 square feet or larger.
- (4) A property owner may request the TOTZ be modified by submitting a Zone Change application to the City. Any request for modification of the TOTZ shall be accompanied by certification of the TOTZ as proposed to be modified by the Oregon Health Authority ~~Division~~, under the Administrative Rules that apply to Oregon's EPA-approved Drinking Water Protection Program. (6238)

3.3.225 Review.

- (D) Prior to undertaking an activity covered by SDC 3.3.225(A), the owner or tenant shall submit a DWP Overlay District Application to the City for review and approval. Applications shall include the following information:
- (1) A Hazardous Material Inventory Statement and a ~~Material~~ Safety Data Sheet for any or all materials entered in the Statement unless exempted under SDC 3.3.230. Hazardous material weights shall be converted to volume measurement for purposes of determining amounts; 10 pounds shall be considered equal to 1 gallon as specified in Springfield Fire Code 5003.1.2;
 - (2) A list of the chemicals to be monitored through the analysis of groundwater

samples and a monitoring schedule if ground-water monitoring is anticipated to be required;

- (3) A detailed description of the activities conducted at the facility that involve the storage, handling, treatment, use or production of hazardous or other materials that pose a risk to groundwater materials in quantities greater than the maximum allowable amounts as stated in SDC 3.3.235(A);
- (4) A description of the primary and any secondary containment devices proposed, and, if applicable, clearly identified as to whether the devices will drain to the storm or sanitary sewer;
- (5) A proposed Hazardous Material Management Plan for the facility that indicates procedures to be followed to prevent, control, collect and dispose of any unauthorized release of a hazardous material;
- (6) A description of the procedures for inspection and maintenance of containment devices and emergency equipment;
- (7) A description of the plan for disposition of unused hazardous materials or hazardous material waste products ~~over the maximum allowable amounts~~ including the type of transportation, and proposed routes.

3.3.230 Exemptions.

This section does not exempt any material or use from Fire Code regulations adopted by the City.

- (A) Exemptions are as specified in this section unless the Director, in consultation with SUB and Fire/Life Safety, determines that a hazardous material, activity, and/or facility that is exempt pursuant to this section has a significant or substantial potential to degrade groundwater quality. Then the Director may require compliance with the requirements of this section related to that hazardous material, activity, or facility. This determination will be based upon site and/or chemical-specific data and is ~~are~~ eligible for appeal to the Hearings Officer as specified in SDC 3.3.245.
- (B) Unless otherwise provided herein, the following materials are exempt from regulation hereunder:
 - (1) Use, storage and handling of specific hazardous materials that do not present a risk to the aquifer, as determined and listed by the Director in consultation with SUB, are exempt from all regulation under this section with the exception of the potential requirement to list these hazardous materials on the Hazardous Material Inventory Statement as found in the most recent Fire Code regulations adopted by the City. A Drinking Water Protection Hazardous Materials Exemption Request may be submitted to the Director for Hazardous Materials that can be demonstrated to pose no threat to the aquifer. These materials may be exempted from regulation ~~and added to the list~~. The demonstration of no

threat is the responsibility of the applicant seeking the exemption and will be subject to review by technical experts.

- (2) Hazardous materials offered for sale in their original sealed containers of 5 gallons or less are exempt from the 500-gallon storage limit specified in SDC 3.3.235(A)(1).
- (3) Hazardous materials in fuel tanks and fluid reservoirs including, but not limited to fuel, engine oil, and coolant, which are attached to a private or commercial motor vehicle and used directly in the motoring operation of that vehicle, or machinery, ~~including, but not limited to: fuel, engine oil and coolant~~

EXCEPTION: Portable generators are not exempt.
- (4) Fuel oil used in existing heating systems.
- (5) Emergency use, storage, and handling of hazardous materials by governmental organizations in the public interest.
- (6) Hazardous materials used and stored specifically for water treatment processes of public water systems and private systems for the same purposes when approved by the Director.
- (7) Hazardous materials contained in properly operating sealed units (including, but not limited to: transformers, refrigeration units) that are not opened as part of routine use.
- (8) Local natural gas distribution lines.
- (9) Fuel for emergency generators located at facilities that provide essential community services (including, but not limited to: hospitals, fire/life safety, police, public shelters, wireless telecommunications system (WTS) facilities, and telephone systems).
- (10) Any commonly used office supply—including, but not limited to: correcting fluid for typewriters, toner for computer printers or cleaners for windows and bathrooms—where the supplies are purchased off-site for use on-site.
- (11) Aggregate quantities equal to or less than 20 gallons of hazardous materials that do not contain DNAPLs.

~~**EXCEPTION: Liquid fuel for generators are not exempt from the regulations in SDC 3.3.230(B).**~~

3.3.235 Standards for Hazardous Materials within Time of Travel Zones.

Applications required under SDC 3.3.225(A) must ~~shall~~ comply with the following standards. Notwithstanding SDC 3.3.225(A), development that conflicts with the standards of this section is prohibited. Where the following standards are more restrictive than the standards of the Springfield Fire Code, the following standards ~~apply:~~ will prevail.

(A) Zero to One Year TOTZ Standards.

- (1) Within the zero to one year TOTZ, hazardous or other materials that pose a risk to groundwater may be stored in aggregate quantities of no more than 500 gallons if in original containers not exceeding 5 gallons* in size. Within that aggregated 500-gallon inventory, no more than 150 gallons of hazardous or other materials that pose a risk to groundwater may be on the premises in opened containers for handling, treatment, use production, or dispensing on site. Hazardous or other materials that pose a risk to groundwater are allowed only upon compliance with containment and safety standards specified by the most recent Fire Code adopted by the City.

* A waiver of the 5-gallon maximum size may be given by the Director if the applicant can demonstrate that a larger size container would pose less risk to the aquifer.

- (2) Unless exempted, all hazardous or other materials that pose a risk to groundwater shall be stored in areas with approved secondary containment in place (Springfield Fire Code 5002.1 and 5004.2.2).
- (3) All new uses of Dense Non-Aqueous Phase Liquids (DNAPLs) are prohibited.
- (4) Any change in type of use or an increase in maximum daily inventory quantity of any DNAPL shall be considered a new use and prohibited.
- (5) The following certain types of new facilities or changes in use and/or storage of hazardous or other materials that pose a risk to groundwater are prohibited:
- (a) Underground hazardous material storage facilities;
 - (b) Hazardous material product pipelines used to transport the hazardous material off of the tax lot where it is produced or used;
 - (c) Injection wells;

EXCEPTION: Dry wells for residential roof drainage;

- (d) Solid waste landfills and transfer stations;
 - (e) Fill materials containing hazardous materials;
 - (f) Land uses and new facilities that will use, store, treat, handle, and/or produce DNAPLs; and
 - (g) Permeable pavements.
- (6) Requirements found in Springfield Fire Code 5004.2.2.5 for a monitoring program and monitoring methods to detect hazardous materials in the secondary containment system shall be met for all amounts of hazardous or other materials that pose a risk to groundwater unless exempted.

- (7) The following requirements for inspection and record-keeping procedures for monthly in-house inspection and maintenance of containment and emergency equipment for all amounts of hazardous or other materials that pose a risk to groundwater shall be met unless exempted: Schedules and procedures for inspecting safety and monitoring and emergency equipment. The applicant shall develop and follow a written inspection procedure acceptable to the Director for inspecting the facility for events or practices which could lead to unauthorized discharges ~~or of~~ hazardous materials. An inspection check sheet shall be developed to be used in conjunction with routine inspections. The check sheet shall provide for the date, time, and location of inspection; note problems and dates and times of corrective actions taken; and include the name of the inspector and the countersignature of the designated safety manager for the facility.
- (8) Application of fertilizers containing nitrates are restricted to no more than the amount recommended by the Lane County, Oregon State University Extension Service for turf grass and are prohibited within 100 feet of a wellhead. In no event shall a single application exceed one half pound per 1,000 square feet of area per single application or a total yearly application of 5 pounds nitrogen fertilizer per 1,000 square feet.

(9) Stormwater infiltration facilities are prohibited within 100 feet of a wellhead.

(B) One to Five Year TOTZ Standards.

- (1) The storage, handling, treatment, use, application, or production or otherwise keeping on premises of more than 20 gallons of hazardous or other materials that pose a risk to groundwater in aggregate quantities not containing DNAPLs ~~are is~~ allowed only upon compliance with containment and safety standards specified by the most recent Fire Code adopted by the City.
- (2) Unless exempted, all hazardous or other materials that pose a risk to groundwater shall be stored in areas with approved secondary containment in place (Springfield Fire Code 5002.1 and 5004.2.2).
- (3) All new ~~use~~ uses of DNAPLs are prohibited.
- (4) Any change in the type of use or an increase in maximum daily inventory quantity of any DNAPL is considered a new use and is prohibited.
- (5) The following certain types of facilities or changes in chemical use and/or storage of hazardous or other materials that pose a risk to groundwater are prohibited:
 - (a) Hazardous material product pipelines used to transport the hazardous material off of the tax lot where it is produced or used;
 - (b) Injection wells;

EXCEPTION: Dry wells for residential roof drainage;

- (6) Requirements found in Springfield Fire Code 5004.2.2.5 for a monitoring program and monitoring methods to detect hazardous ~~or other~~ materials in the secondary containment system shall be met for all amounts of hazardous or other materials that pose a risk to groundwater unless exempted.
- (7) The following requirements for inspection and record keeping procedures for monthly in-house inspection and maintenance of containment and emergency equipment for all amounts of hazardous or other materials that pose a risk to groundwater shall be met unless exempted: Schedules and procedures for inspecting safety and monitoring and emergency equipment. The applicant shall develop and follow a written inspection procedure acceptable to the Director for inspecting the facility for events or practices which could lead to unauthorized discharges ~~of~~ hazardous materials. An inspection check sheet shall be developed to be used in conjunction with routine inspections. The check sheet shall provide for the date, time, and location of inspection; note problems and dates and times of corrective actions taken; and include the name of the inspector and the countersignature of the designated safety manager for the facility.

(C) Five to Ten Year TOTZ Standards.

- (1) The storage, handling, treatment, use, production or otherwise keeping on premises of more than 20 gallons of hazardous or other materials that pose a risk to groundwater in aggregate quantities not containing DNAPLs is allowed only upon compliance with containment and safety standards specified by the most recent Fire Code adopted by the City.
- (2) All hazardous or other materials that pose a risk to groundwater shall be stored in areas with approved secondary containment in place (Springfield Fire Code 5002.1 and 5004.2.2).
- (3) All new uses of DNAPLs are prohibited.
- (4) Any change in type of use or an increase in the maximum daily inventory quantity of any DNAPL is considered a new use and is prohibited.
- (5) The following requirements for inspection and record-keeping procedures for monthly in-house inspection and maintenance of containment and emergency equipment for all amounts of hazardous or other materials that pose a risk to groundwater shall be met unless exempted: Schedules and procedures for inspecting safety and monitoring and emergency equipment. The applicant shall develop and follow a written inspection procedure acceptable to the Director for inspecting the facility for events or practices which could lead to unauthorized discharges ~~of~~ hazardous materials. An inspection check sheet shall be developed to be used in conjunction with routine inspections. The check sheet shall provide for the date, time, and location of inspection; note problems and dates and times of corrective actions taken; and include the name of the inspector and the countersignature of the designated safety manager for the facility.

- (D) **Ten to Twenty Year TOTZ Standards.** The storage, handling, treatment, use, production or keeping on premises of more than 20 gallons of hazardous or other materials that pose a risk to groundwater in aggregate quantities is allowed only upon compliance with containment and safety standards specified by the most recent Fire Code adopted by the City. (6443; 6238)

3.3.240 Conditions.

The Director may attach conditions of approval that will minimize negative impacts of regulated substances on groundwater and ensure that the facility or the proposed development can fully meet the standards specified in SDC 3.3.235. These conditions may include, but are not limited to: on-site monitoring wells, Wellhead Protection Area signs, special storm-water facilities, or other conditions to address specific risks associated with the proposed development.

Commentary: The recommendation to amend this section comes from the City of Springfield Stormwater Facilities Master Plan (2008) which proposed that the code be amended to encourage green street design (with the use of swales, planters, rain gardens and other features to reduce runoff and pollutants) and to comply with the MS4 Permit to encourage the use of Low Impact Development.

4.2.100 Infrastructure Standards – Transportation

4.2.105 Public Streets.

- (C) Minimum street curb-to-curb widths and minimum street right-of-way widths are as specified in Table 4.2.1, unless otherwise indicated in the Springfield Transportation System Plan, an applicable Refinement Plan, Plan District, Master Plan, Conceptual Development Plan, or the adopted bicycle and pedestrian plan; where necessary to achieve right-of-way and street alignment; or as needed to meet site-specific engineering standards, including, but not limited to, requirements for multi-way boulevard and/or modern roundabout designs. Streets may include Low Impact Development approaches, such as stormwater planters, swales, rain gardens and tree planting to reduce stormwater runoff from impervious surfaces. Example street layouts meeting minimum street standards are provided in Figures 4.2.B through 4.2.V for illustrative purposes only. These Figures are intended to demonstrate potential street configurations that meet the requirements.

Commentary: The recommendation to amend this section comes from the City of Springfield Stormwater Facilities Master Plan (2008) which proposed that the code be amended to allow stormwater quality facilities in sidewalks. Low Impact Development approaches may be placed in sidewalk planter strips provided they meet the provisions in the Engineering Manual (EDSPM) and SDC 4.3.110.

4.2.135 Sidewalks.

- (D) Planter strips are required as part of sidewalk construction. Planter strips must be at least 4½ feet wide (as measured from the back of curb to the edge of the sidewalk) and at least 4½ feet long. Planter strips must have approved landscaping consisting of street trees and ground cover and also may include Low Impact Development approaches allowed per in accordance with the

applicable provision in the Engineering Design Standards and Procedures Manual and SDC 4.3.110. Tree wells set in concrete or sidewalk areas must be a minimum of 4 feet by 4 feet. Concrete, asphalt, or other impermeable pavement are not allowed to substitute for landscaping within planter strips. Planter strips less than 4½ feet wide may be permitted when necessary for connectivity, safety, or to comply with street design requirements, subject to approval by the Director.

- (E) Maintenance of sidewalks is the continuing obligation of the abutting property owner.

4.3.110 Stormwater Management.

Commentary: Amendments to 4.3.110(A) adds a definitions section, defines terms as required or recommended by the permit, and clarifies that definitions in this Section apply to the Stormwater Management section.

(A) Definitions. For the purposes of this section only, the following definitions apply. Additional definitions are provided in SDC 6.1.105 or SDC 6.1.110. Unless specifically defined below or in SDC 6.1.110, words or phrases used in this section shall be interpreted so as to give them the meaning they have in common usage.

(1) Maximum Extent Practicable (MEP) is the technology-based discharge standard for municipal separate storm sewer systems to reduce pollutants in stormwater discharges that was established by Section 402(p)(3)(B)(iii) of the Clean Water Act [33 U.S.C §1342(p)(3)(B)(iii)].

(2) Minimize means to reduce and/or eliminate to the extent achievable using control measures (including BMPs) that are technologically available, economically practicable, and achievable in light of best industry or municipal practices.

Commentary: Amendments to 4.3.110(B) adds an Applicability section, complies with the language from the permit and existing code by requiring structural stormwater controls for 5,000 square feet or more of impervious surface, and requires a Stormwater Study for development that generates runoff from more than 1 acre of land or peak flows in excess of 0.5 cubic feet per second. Since the August 1, 2023 hearing, Lane County provided feedback to remove the underlined clause in SDC 4.3.110(B)(1): “Development that creates or replaces 5,000 square feet or more of impervious surface area and discharges to the storm system...”. The phrase “discharges to the storm system” is intended to include sites that drain to the City’s MS4 permit area. However, the City’s MS4 permit area includes the entire Springfield UGB and so this phrase is unnecessary. It also creates confusion related to sites that choose to meet the site performance standard by infiltrating the first 1.4” of rainfall in 24 hours; these sites will still discharge to the storm system during very large storm events and are still subject to SDC 4.3.110. Therefore, to avoid confusion and remove unnecessary language, City and County staff recommend removing this clause.

(B) **Applicability.** The following development activities require the use of a site-specific stormwater management approach that incorporates one or more structural stormwater controls:

- (1)** Development that creates or replaces 5,000 square feet or more of impervious surface area and discharges to the storm system;
- (2)** Development that disturbs one or more acres of land within the development area; and
- (3)** Development that generates peak flows in excess of 0.5 cubic feet per second within the development area.

Commentary: Amendments to 4.3.110(C):

- Define the two types of performance standards for structural stormwater control facilities and comply with the MS4 Permit requirements.
- Stipulate that the stormwater system is separate from the sanitary sewer and that discharge of stormwater to the sanitary sewer system is prohibited.
- Require that all structural stormwater controls must be designed, operated, and maintained to comply with the Appendices in the Springfield Development Code or Engineering Manual.
- Move SDC 4.3.110(6) Identification of Water Quality Limited Watercourses and SDC 4.3.110(7) Protection of Riparian Area Functions to SDC 4.3.115 Water Quality Protection.
- Address permeable pavements, injection wells, on site source controls for high risk land uses (which previously resided in Chapter 3 of the EDSPM and is now in Appendix H of the SDC), and roof mounted equipment.
- SDC 4.3.110(C)(1) was amended to reference the correction SDC section for the Stormwater Study reference (SDC 4.3.110(E) instead of SDC 4.3.110(D)).

(A C) **Stormwater ~~Management Improvements~~ Structural Controls – General Standards.**

- (1)** **Engineered Design Requirement.** The Stormwater Study required under section 4.3.110(D)(E) and All stormwater management system design including supporting documentation for the design of the proposed stormwater structural controls must be prepared and stamped by an Oregon licensed engineer.
- ~~**(2)** A stormwater management system must be installed to serve each new development within the city limits.~~
- (2)** **Technical Standards.** The Stormwater Study required under section 4.3.110(D) must demonstrate compliance with one of the following performance standards:
 - (a)** Site Performance Standard: The first one and four tenths inches (1.4") of rainfall from each storm event must be routed to one or more structural stormwater controls with sufficient capacity to fully infiltrate, evapotranspire, and/or be reused on site without stormwater runoff discharging from the site; or

- (b) Treatment Standard: All rainfall not retained onsite, up to the first one and four tenths inches (1.4") of rainfall from each storm event, must be treated in compliance with the standards and design criteria in SDC 4.3.110(D).
- ~~(3)~~ The stormwater management system must be designed and constructed in conformance with 4.3.110(C) — Stormwater Study Standards below.
- ~~(3.4)~~ **Discharge to Sanitary Sewer Prohibited.** The stormwater management system must be separated from and not discharge to any public or private sanitary sewer system.
- ~~(4)~~ **Facility Design Standards.** The structural stormwater controls must be designed, operated, and maintained consistent with the requirements in the facility-specific design requirements provided in Appendix D Typical Stormwater Facility Details. Unless an alternative is approved under the Treatment Standard, stormwater controls that include vegetative treatment must incorporate only those plant species listed in Appendix F.
- ~~(5)~~ **Construction Standards.** Any development that creates or replaces 5,000 square feet or more of impervious surface area and discharges to the storm system must install storm water controls that minimize the amount and rate of surface water runoff into the city stormwater system. The storm system All stormwater structural controls must be constructed consistent with the *Engineering Design Standards and Procedures Manual* sections 4.03.1, 4.03.2, and 4.03.4 Chapter 4.
- ~~(6)~~ **Identification of Water Quality Limited Watercourses.** The Director must maintain a Water Quality Limited Watercourses (WQLW) Map on file in the Development Services Department, which designates certain watercourses and their direct tributaries within the City and its urbanizing area. Any revision to the WQLW Map must be approved by the City Council as an amendment to this code. Those watercourses and their direct tributaries included on the WQLW Map have been found to warrant protective measures in support of the City's response to State and Federal regulations regarding surface and subsurface discharging stormwater management systems by satisfying the following standard:
- ~~(a)~~ Water Quality Limited Watercourses (WQLW): Waters of the State that meet 1 or more of the following standards:
- ~~(i)~~ Watercourse reaches, lying within the City and its urbanizing area, that are included by the State of Oregon Department of Environmental Quality (ODEQ) on its most recently adopted "303(d)" List of Impaired and Threatened Waterbodies.
 - ~~(ii)~~ Watercourse reaches, lying within the City and its urbanizing area, with significant water quality impairment identified by water quality monitoring and sampling done in accordance with approved quality assurance/quality control (QA/QC) protocols.

~~(b) A direct tributary to a WQLW that satisfies the following standards:~~

- ~~(i) Any watercourse that flows directly into a WQLW. However, watercourses that flow into the WQLW as a piped connection, where the pipe system extends more than 200 feet upstream of the connection point are not considered as flowing into a WQLW under this standard.~~
- ~~(ii) Any watercourse that is a diversion from a WQLW and that discharges into either a WQLW or other direct tributary to a WQLW and where the water quality of the diverted flow at the discharge point has been degraded when compared with the water quality at the diversion point.~~

~~(6) **Permeable Pavements.** Permeable pavements may be used to reduce the area of impervious surfaces and shall be constructed consistent with the *Engineering Design Standards and Procedures Manual*. Permeable pavements cannot be used for treatment of stormwater from other impervious areas.~~

~~(7) **Protection of Riparian Area Functions.** A developer is required to employ site design, landscaping, and drainage management practices to protect, preserve, and restore the riparian area functions of the reaches of those watercourses shown on the WQLW Map that are contained within or abut the lot/parcel upon which the proposed development is located. For the purposes of this code, riparian area functions include, but are not limited to:~~

- ~~(a) — Maintaining temperature;~~
- ~~(b) — Maintaining channel stability;~~
- ~~(c) — Providing flood storage;~~
- ~~(d) — Providing groundwater recharge;~~
- ~~(e) — Removing sediments;~~
- ~~(f) — Reducing contaminants, for example: excess nutrients; oils and grease; metals; and fecal coliform;~~
- ~~(g) — Moderating stormwater flows; and~~
- ~~(h) — Providing fish and wildlife habitat.~~

~~(7) **Injection Wells.** Except where prohibited by this code, underground injection wells are allowed only with approval from the Department of Environmental Quality.~~

(8) On Site Source Controls for High Risk Land Uses. Where an application proposes one of the following high-risk uses, the application must comply with additional standards as provided in Appendix H On Site Source Controls:

- (B) Site Uses and Characteristics That Trigger Source Controls
- (C) Fuel Dispensing Facilities.
- (D) Aboveground Storage of Liquid Materials.
- (E) Solid Waste Storage Areas, Containers, and Trash Compactors.
- (F) Outdoor Storage of Bulk Materials.
- (G) Material Transfer Areas.
- (H) Equipment and/or Vehicle Washing Facilities.
- (I) Covered Vehicle Parking Structures.

(9) Roof-mounted Equipment. All rooftop mounted equipment shall be provided with secondary containment or a weather resistant enclosure to ensure that, in the event of a leak or spill, any fluids cannot migrate into a public or private stormwater system or to any underground injection control facilities.

Commentary: Amendments to 4.3.110(D):

- *Stipulate that a Type 2 application process is required when the Alternative Treatment Standard is proposed.*
- *Define the terms of technical infeasibility or site constraints for the Alternative Treatment Standard.*
- *Stipulate that all development must retain rainfall onsite to the maximum extent practicable and any rainfall not retained onsite, must treat up to the first one and four tenths inches (1.4") to achieve no less than 80% removal of total suspended solids. All stormwater not retained onsite must be discharged to the public stormwater system.*
- *Structural stormwater controls used to meet the Treatment Standard must incorporate Low Impact Development.*

(D) Treatment Standard – Criteria. The following provisions apply to review of an application that proposes to meet the Treatment Standard under SDC 4.3.110(C)(2)(a) above.

(1) Type 2 Review. An application that proposes to comply with the Alternative Treatment Standard must be reviewed through a Type 2 application process in accordance with SDC 5.1.400, except when proposed for a development that is subject to Type 3 review, in which case it may be approved through a Type 3 review.

(2) Applicability. An application that proposes to comply with the Alternative Treatment Standard must demonstrate that the Site Performance Standard cannot be retained and infiltrated on-site due to technical infeasibility or site constraints.

(a) Site constraints that may be used to demonstrate technical infeasibility under this subsection include but are not limited to shallow bedrock, high groundwater, protection of groundwater from contamination, soil instability as documented by geotechnical analysis required elsewhere by this Code, land use that is inconsistent with capture and infiltration of

stormwater, the known presence of soil contamination, or constraints arising under the provisions of the Drinking Water Protection Overlay District in SDC 3.3.200.

- (b) An applicant is not required to demonstrate that it is technically infeasible to evapotranspire and/or reuse rainfall onsite to meet the Site Performance Standard.

(3) Design Standards.

- (a) The development must retain rainfall onsite to the maximum extent practicable.

- (b) All rainfall not retained onsite, up to the first one and four tenths inches (1.4") of rainfall from each storm event, must be treated to achieve:

- (i) Reduction in the discharge of mercury, bacteria, and heavy metals to the maximum extent practicable; and

- (ii) No less than 80% removal of total suspended solids (TSS) for typical influent concentrations ranging from 100-200 mg TSS per liter; or

- (iii) For atypical influent concentrations less than 100 mg TSS/L or greater than 200 mg TSS/L, an alternative treatment standard may be required to target an equivalent water quality benefit as onsite retention.

- (c) Detention ponds cannot be approved as a stand-alone treatment method and must be combined with Low Impact Development.

- (d) All stormwater not retained on site must be discharged to the public stormwater system. Conveyances to the public stormwater systems must be designed to accommodate, at minimum, the peak runoff for the 25-year rainfall event for the entire tributary area. Exception: If the discharge of the runoff for the 25-year rainfall event is determined likely to exceed capacity of the public stormwater system or if said discharge would result in flooding, the conveyance must be designed to accommodate the peak runoff for the 100-year rainfall event.

- (4) Low Impact Development (LID) Required.** Structural stormwater controls used to meet the Treatment Standard must incorporate Low Impact Development (LID) as provided in Appendix D to the maximum extent practicable.

(5) Vegetation Standards.

- (a) Trees that are required to be planted on-site under the provisions of this code must be planted to provide shade to the stormwater facility to the maximum extent practicable.

- (b) Construction and planting must occur under conditions (such as temperature, moisture level, and handling) that prevent soil compaction and erosion. Any imported soil must be a sandy loam mixed with compost

or a sand/soil/compost blend. Soil must be at least one-third compost by volume, be free-draining, and support plant growth. The compost must be derived from plant material; animal waste is not permitted.

Commentary: SDC 4.3.110(E) clarifies that a Stormwater Study is required for any development that installs a structural stormwater control as defined in SDC 4.3.110(B) above. The Study must detail how the proposed stormwater control targets natural surface or predevelopment hydrologic function and provide a hydrological study map that meets the standards in 4.3.110(E)(2)(b).

(B E) Stormwater Study Standards.

- (1) ~~An applicant must complete a Stormwater Study, as outlined below, must be submitted for all developments that generate public and/or private stormwater runoff from more than one acre of land or generate peak flows in excess of 0.5 cfs. Applications for development that creates 5,000 square feet of new impervious surface or modifies an existing stormwater management system with a capacity of 0.5 cfs or greater must also include a complete Stormwater Study for any development requiring the installation of structural stormwater controls as specified in SDC 4.3.110(B).~~

~~All developments containing or adjacent to a floodplain, stream, wetland, natural resource area, or wellhead protection zone must include in the submitted Stormwater Study a review and report on the impact to those.~~

- (2) A Stormwater Study must include the following:

- (a) A written narrative describing the proposed stormwater management system approach in detail, describing how the approach targets natural surface or predevelopment hydrologic function through the installation and long-term operation and maintenance of the proposed structural stormwater controls. ~~including connections to the public stormwater management system, a description addressing water quality measures (Best Management Practices) proposed, as well as any necessary capacity measures that may be required for development (i.e.—a detention pond) as determined by the Stormwater Study.~~
- (b) A hydrological study map, that contains all of the following for (i) the development site and adjacent areas that contribute in excess of 0.1 cfs from offsite flows, ~~well defined~~, and an area beyond the development site of not less than 100 feet;
- ~~(ii i)~~ Streets adjacent to or hydrologically connected to the development area, and street names;
 - ~~(iii ii)~~ Flow arrows in streets and ditches;
 - ~~(iv iii)~~ Contours or spot elevations for verification of direction of overland flow and pipe cover; Contour intervals on the study map must be as follows:

Slope

Contour Interval

(%)	(Feet)
-----	-----
0 - 10	2
11 - 25	5
> 25	10

- (v iv) Drainage areas of all sub-basins (in acres);
- (vi v) Collection points (nodes) at downstream limits of all sub-basins;
- (vii vi) A profile of the stormwater management system showing invert elevations, maintenance access hole top and bottom elevations, existing utilities, and existing and finished ground line elevations;
- (viii vii) Existing and proposed stormwater pipes and channels-surface waters with sizes and/or cross-sections included;
- (ix viii) Future pipes in the system, complete with proposed sizes, slopes, pipe cover, and flow line elevations at maintenance access holes;
- (x ix) North arrow, scale, Engineer's name and contact information, and date;
- (xi x) Environmentally sensitive areas (e.g. gullies, ravines, swales, wetlands, steep slopes, springs, creeks, etc.) and direction of the flow of natural drainage features; ~~and~~
- (xii xi) 100-year flood plain with flood elevations, and 100-year flood way, and, as applicable.
- (xii xii) The location of all locally significant natural resource areas, Water Quality Limited Watercourses, or wellhead protection zones.
- (c) A report describing development impacts to any floodplain or floodway.
- (~~e~~ d) Hydrologic calculations to establish runoff volumes and peak flows ~~as provided in subsection (D) below.~~
- (~~d~~ e) Hydraulic calculations to establish pipe size, flow velocity, and hydraulic grade line.

Commentary: SDC 4.3.110(F) amends the stormwater study types to be either a Small Site Study or a Full Site Study (a Mid-Level Site Study was removed from the code). A Small Site Stormwater Study is permitted when a site is less than 1 acre, meets the site performance standard in 4.3.110(B)(2)(A), and does not contain or is abutting a floodplain/floodway, locally significant natural resource area, wetland, or riparian area; Water Quality Limited Watercourse, or well-head protection zone. For sites that cannot meet these standards, a Full Site Study is required.

(G E) Stormwater Study Types

- (1) A Small Site Stormwater Study is required when all the following criteria are met:
- (a) The proposed development is on a site that is less than ~~five-one~~ acres in size ~~for a residential development, or is a commercial, industrial, or mixed-use development that is on a site that is one acre or less in size and the onsite stormwater basin structural controls do not treat any single drainage basin larger than 15,000 square feet impervious area.~~
 - (b) The ~~development meets the Site Performance Standard as provided in 4.3.110(C)(2)(A), study area drains into an existing public stormwater management system with available capacity, as determined by testing performed by an Oregon licensed Engineer in conformance with the Eugene Stormwater Manual, for the peak flow based on the storm event frequency required under SDC 4.3.110(D).~~
 - (c) The study area does not contain or is not abutting to any of the following: a floodplain or floodway, stream, wetland, locally significant natural resource area, wetland, or riparian area; or Water Quality Limited Watercourse, or well head protection zone. Only locally significant resources that are on an adopted inventory or map, or resources that are adopted as part of the WQWL map are applicable under this standard.
- ~~(2) A Mid-Level Site Stormwater Study is required when the criteria for a Small Site Stormwater Study cannot be met and when ALL of the following criteria are met:~~
- ~~(a) The development area, including any hydraulically connected area on the same property, is less than 25 acres in size.~~
 - ~~(b) The development area, including any hydraulically connected area on the same property, drains to an established public system within the city limits.~~
 - ~~(c) The development area, including any hydraulically connected area on the same property, does not contain or is not adjacent to a floodplain, stream, wetland, natural resource area, or well head protection zone.~~
- ~~(3) A Full Site Stormwater Study is required when the criteria for a Small Site and Mid-Level Site Stormwater Study cannot be met, and where any of the following conditions are met:~~
- ~~(a) The development area, including any hydraulically connected area on the same property, is greater than 25 acres in size.~~
 - ~~(b) Developments that require creation of a new outfall and/or the stormwater from the new development will exceed the existing stormwater management system capacity.~~
 - ~~(c) The development area, including any hydraulically connected area on the same property, contains or is adjacent to a floodplain, stream, wetland, or natural resource area.~~

- ~~(d) — Any development that generates a peak flow in excess of 0.5 cfs, modifies an existing stormwater management system with a capacity of 0.5 cfs or greater, or is a redevelopment or new development that creates 5,000 square feet or more of new impervious area.~~

Commentary: SDC 4.3.110(G) amends the stormwater study hydrologic calculation standards for a small site stormwater study or a full site study. For a small site study, the calculations must demonstrate compliance with the Site Performance Standard (calculations must use a value of 1.4" over 24 hours) or the Treatment Standard (calculations must use an intensity of at least 0.13 in/hr for off line facilities and 0.22 in/hr for online facilities) and be supported by the methods and calculators in Chapter 4 of the Engineering Manual. For a full site study, the calculations must be supported by calculations using the unit hydrograph method and the storm event frequencies in Table 4.3.1.

(D-G) Stormwater Study Hydrologic Calculation Standards. The stormwater study required under SDC 4.3.110(~~C E~~) must be supported by hydrologic calculations that conform to the following standards:

- (1) A small site stormwater study must be supported by hydrologic calculations using the rational method or a unit hydrograph method (as required for a full site stormwater study in (2) below. The rational peak flow method, $Q=CiA$, where 'Q' is the peak flow, 'C' is a runoff coefficient, 'i' is the rainfall intensity, and 'A' is the catchment area. Rainfall intensity and design storm requirements must be used as provided in 4.3-110(C)2, as follows:
 - ~~(a) — When the runoff coefficient 'C' is 0.5 or greater, the peak flow for impervious surfaces must be calculated separately from the pervious surfaces and compared to the peak flow of the combined area. The higher of the two peak flow rates must be used as the peak flow rate for the purpose of the stormwater study.~~
 - (a) To demonstrate compliance with the Site Performance Standard, calculations must use a value of 1.4" over 24 hours using the type 1a SCS storm intensity curve
 - ~~(b) — For the purposes of determining whether stormwater quality standards are met using the rational method, a rainfall intensity 'i' of 0.25 inch per hour must be used to calculate peak flow.~~
 - (b) To demonstrate compliance with the Treatment Standard, calculations must use an intensity of at least 0.13inch/hour for off line facilities and 0.22inch/hour for online facilities, up to the maximum extent practicable.
 - ~~(c) — For the purposes of determining stormwater capacity using the rational peak flow method, the rainfall intensity 'i' must be calculated using the Intensity Duration Frequency curves from the West Springfield Drainage Master Plan (1983) (available in Chapter 4 of the Engineering Design Standards and Procedures Manual). The storm event frequencies in SDC Table 4.3.1 must be used:~~

- (c) A small site stormwater study that is supported by the methods and calculators provided in section 4.03.1 of the *Engineering Design Standards and Procedures Manual* will be approved without requiring additional documentation or support for calculations.

Table 4.3.1 Storm Event Frequencies	
Peak Flow Range	Storm Event Frequency
<5 cfs	2-year storm event
5 cfs to <20 cfs	5-year storm event
20 cfs to <40 cfs	10-year storm event (1)
40 cfs and above	50-year storm event

(1) The 25-year storm event may be required when downstream capacity issues are identified during a Type 2 or Type 3 review process.

- (2) A ~~Mid-Level Site Stormwater Study~~ and full site stormwater study must be supported by calculations using the unit hydrograph method.
- (a) The Natural Resources Conservation Service (NRCS) SCS Type 1A distribution must be used (provided in the *Engineering Design Standards and Procedures Manual* for reference). The Storm Event Frequencies in Table 4.3.1 must be used.

Table 4.3.1 Storm Event Frequencies					
Recurrence Interval, Years	2	5	10	25	100
Flood Control, Destination: 24-Hour Depths, Inches	3.12	3.6	4.46	5.18	6.48
<u>Water Quality Storm – Pollution reduction: 24-Hour Depths, 1.4 Inches</u>					

- (b) For the purposes of determining whether stormwater quality standards ~~for mid-level and full sites~~, a rainfall intensity of ~~0.83~~1.4 inches per 24-hour period must be used.
- (c) A full site stormwater study must include floodplain analysis if the development will affect the floodplain. The 100-year ~~flood storm~~ event frequency must be used for development within the floodplain.

Commentary: The Operations and Maintenance Requirements in the Engineering Manual were added to the code to ensure that all structural controls installed in compliance with the MS4 permit are operated and maintained to meet site performance or alternative treatment standards.

(H) Operations and Maintenance Requirements.

- (1) All structural stormwater controls must be operated and maintained to continue to meet the Site Performance Standard or alternative Treatment Standard as applicable.
- (2) The owner of property subject to any application that proposes structural stormwater controls that will be privately-owned and operated must enter into an Operations and Maintenance Agreement with the City. The Agreement must specify at least the following:
 - (a) A plan to maintain and operate the structural stormwater controls to continue to meet the Site Performance Standard or alternative Treatment Standard, which may include but is not limited to operations and maintenance requirements in Appendix E.
 - (b) For structural stormwater controls that include vegetation, requirements to maintain and/or replace vegetation to ensure at least 90% vegetative coverage; and;
 - (c) For structural stormwater controls that include soils in the treatment process, requirements to maintain soil permeability and plant health; and
 - (d) Reporting requirements to document compliance with ongoing operations and maintenance requirements.
- (3) For any property that is subject to an Operations and Maintenance Agreement, a Notice of Operations and Maintenance Agreement (NOMA) must be recorded with Lane County Deeds and Records. The NOMA must be in a form approved by the City, be sign by the property owner and properly notarized, and include a legal description of the subject property.

Commentary: SDC 4.3.115 was amended to move SDC 4.3.110(6) Identification of Water Quality Limited Watercourses and SDC 4.3.110(7) Protection of Riparian Area Functions to this section for clarity and consistency. Clarification was provided to require site design, landscaping, and drainage management practices to protect, preserve, and restore riparian area functions.

4.3.115 Water Quality Protection

- (A) **Applicability.** These regulations apply water quality protection to only those sites that require Minimum Development Standards Review as specified in SDC 5.15.100, Site Plan Review approval as specified in SDC 5.17.100, and Land Divisions (Partition Tentative Plan and Subdivision Tentative Plan) approval as specified in SDC 5.12.100, or that disturb more than one acre of land through a Type 1 review. The following standards do not apply to single unit dwellings duplexes, or middle housing in the R-1 District that disturb less than one acre of land, unless as specified in SDC 4.3.115 (AB)(1). Existing buildings that are within the riparian areas specified in SDC 4.3.115(AB)(1) and (2) are not considered non-conforming. SDC 4.3-115(AB)(2)(a) and (b) provide additional protection from a non-conforming status.
- (B) **Identification of Water Quality Limited Watercourses.** The Director must maintain a Water Quality Limited Watercourses (WQLW) Map on file in the Development Services

Department, which designates certain watercourses and their direct tributaries within the City and its urbanizing area. Any revision to the WQLW Map must be approved by the City Council as an amendment to this Code. Those watercourses and their direct tributaries included on the WQLW Map are Waters of the State that have been found to warrant protective measures in support of the City's response to State and federal regulations regarding surface and subsurface discharging stormwater management systems, by satisfying one or more of the following standards:

- (1) Watercourse reaches, lying within the City and its urbanizing area, that are included by the State of Oregon Department of Environmental Quality (ODEQ) on its most recently adopted "303(d)" List of Impaired and Threatened Waterbodies.
 - (2) Watercourse reaches, lying within the City and its urbanizing area, with significant water quality impairment identified by water quality monitoring and sampling done in accordance with approved quality assurance/quality control (QA/QC) protocols.
 - (3) A direct tributary to a WQLW that satisfies the following standards:
 - (a) Any watercourse that flows directly into a WQLW. However, watercourses that flow into the WQLW as a piped connection, where the pipe system extends more than 200 feet upstream of the connection point are not considered as flowing into a WQLW under this standard.
 - (b) Any watercourse that is a diversion from a WQLW and that discharges into either a WQLW or other direct tributary to a WQLW and where the water quality of the diverted flow at the discharge point has been degraded when compared with the water quality at the diversion point.
- (C) Protection of Riparian Area Functions.** A developer is required to employ site design, landscaping, and drainage management practices to protect, preserve, and restore the riparian area functions of the reaches of those watercourses shown on the WQLW Map that are contained within or abut the lot/parcel upon which the proposed development is located.
- (1) For the purposes of this Code, riparian area functions include, but are not limited to:
 - (a) Maintaining temperature;
 - (b) Maintaining channel stability;
 - (c) Providing flood storage;
 - (d) Providing groundwater recharge;
 - (e) Removing sediments;
 - (f) Reducing contaminants, for example: excess nutrients; oils and grease; metals; and fecal coliform;

- (g) Moderating stormwater flows; and
- (h) Providing fish and wildlife habitat.
- (2) The following standards apply to the protection of water quality and protection of riparian area functions specified above:
 - (a) Avoid development or redevelopment in the following circumstances:
 - (i) Unsuitable areas, including, but not limited to, unstable slopes, wetlands and riparian areas;
 - (ii) Stream Crossings. Where crossings have to be provided, the impacts on water quality must be minimized to the maximum extent practical; and
 - (iii) Hardening or armoring of stream banks and shorelines.
 - (b) Prevent:
 - (i) Stormwater discharge impacts to water quality and quantity; and
 - (ii) Erosion and sediment run-off during and after construction.
 - (c) Protect:
 - (i) Riparian areas, buffers, and functions around all watercourses; and
 - (ii) Wetlands, wetland buffers and wetland functions.
 - (d) Preserve the hydrologic capacity of any watercourses.
 - (e) Utilize Native Vegetation in Riparian Areas. The required riparian area landscaping must be installed as part of the building permit process and may be bonded as specified in SDC 5.17.150.
 - (f) Restore and enhance riparian areas that are degraded in riparian function.
- (3) In applying SDC 4.3.115(C)(2) above, riparian area protection, preservation, restoration, and enhancement measures must be applied as follows:
 - (a) For new development and redevelopment, existing riparian area functions must be protected and preserved. Degraded functions must be restored or enhanced through the full riparian area width, as specified in SDC 4.3.115(A)(1) and (2), and extending through the full frontage of the lot/parcel along the watercourse on the Water Quality Limited Watercourse (WQLW) Map.

- (b) For additions and expansions on any portion of a lot/parcel, existing riparian area functions must be protected and preserved through the full riparian area width specified in SDC 4.3.115(A)(1) and (2), and extending through the full frontage of the lot/parcel along the watercourse on the WQLW Map.
- (c) For additions and expansions within 100 feet of a watercourse on the WQLW Map on a lot/parcel that has degraded riparian functions, the area for restoration or enhancement must be based upon the ratio of the impervious area of the addition or expansion to the existing building or impervious area on the lot/parcel. The restoration or enhancement must start at the top of bank of the watercourse and work landward.

(A D) Riparian Area Boundaries. When addressing criterion (E) as specified in SDC 5.12.125, for Land Divisions, and SDC 5.17.125 for Site Plan Review to protect riparian areas along watercourses shown on the Water Quality Limited Watercourses (WQLW) Map, the following riparian area boundaries must be utilized:

- (1) Along all watercourses shown on the WQLW Map with average annual stream flow of 1,000 cubic feet per second (CFS) or greater, the riparian area boundary is 75 feet landward from the top of the bank. Existing native vegetative ground cover and trees must be preserved, conserved, and maintained between the ordinary low water line and the top of bank and 75 feet landward from the top of bank.

Within the Willamette Greenway, any change or intensification of use to a single unit dwelling or Middle Housing requires Site Plan Review as specified in SDC 3.3.315. through the Site Plan Review process the Director may reduce the size of the required riparian area if there is a finding that the proposed development is in compliance with SDC 3.3.300, the Willamette Greenway Overlay District, SDC 3.2.280 and other applicable provisions of this Code.

- (2) Along all watercourses shown on the WQLW Map with average annual stream flow less than 1,000 CFS the riparian area boundary is 50 feet landward from the top of the bank. Existing native vegetative ground cover and trees must be preserved, conserved, and maintained both between the ordinary low water line and the top of bank and 50 feet landward from the top of bank.
 - (a) For all watercourses subject to Subsection 4.3.115(A)(2), other than the Mill Race or Cedar Creek, the 50-foot riparian area standard may be reduced to 35 feet, provided an equivalent amount and function of pervious land is established elsewhere on the property that utilizes water quality measures including, but not limited to: wetlands; bioswales; and additional trees, especially in parking areas, exclusive of otherwise required water quality measures and landscape areas. The applicant has the burden of proof to demonstrate, to the satisfaction of the Director, equivalency in relation to both the amount of pervious land (as specified above) and riparian area function (as specified in SDC 4.3.110(G)).

- (b) An existing building within a riparian area is not considered a non-conforming use if destroyed by earthquake, flood or other natural disaster, or fire. In this case, the replacement building may be constructed within the same footprint as the existing building. If the building is within the Willamette Greenway, the standards in SDC 3.3.300, Willamette Greenway Overlay District apply.
- (3) Where a watercourse divides a lot/parcel and the existing riparian area along that watercourse is degraded in riparian function, the applicant may relocate the watercourse to another portion of the property as approved by the Director and applicable State or Federal agency.

(B E) Permitted Uses in Riparian Areas. The following uses are permitted in riparian areas as long as they do not diminish riparian functions:

- (1) The planting of native trees and native vegetation to promote bank stability, enhance riparian areas, minimize erosion, preserve water quality and protect federally listed species. Trees may be clustered to allow the preservation of views; or to allow maintenance vehicles to approach City maintained stormwater facilities including detention basins, outfalls, culverts and similar stormwater facilities as may be permitted by the *Engineering Design Standards and Procedures Manual*.
- (2) The felling of hazardous trees for safety reasons as specified in SDC 5.19.100, Tree Felling.
- (3) Riparian area restoration and enhancement including the removal of invasive plant species, where necessary.
- (4) Flood control structures, where necessary.
- (5) Stormwater management systems and outfalls, as specified in the *Engineering Design Standards and Procedures Manual* or as required by other regulating authorities.
- (6) Multi-use paths for pedestrian and/or bicycle use must be permitted, provided that the multi-use path drains away from the watercourse. Multi-use paths must be located along the outer edge of the required riparian area and away from the watercourse. The multi-use path must be located at the outermost edge of the 75-foot-wide Riparian Setback to the maximum extent practicable. Utilities may be extended within a multi-use path.
- (7) Water-dependent or water-related uses between the Willamette River and the Greenway Setback Line as may be permitted in the Willamette Greenway Overlay District.
- (8) Private driveways, public street crossings, bridges, and necessary culverts when there is no other vehicle access to the property. Crossings must be preferably at right angles to the watercourse. Public and private utilities must be permitted within the driveway, public street, or bridge right-of-way.

- (9) Repair, replacement, or improvement of utility facilities as long as the riparian area is restored to its original condition.
- (10) Routine repair and maintenance of existing structures, streets, driveways, utilities, accessory uses and other similar facilities.
- (11) Other activities similar to those listed above that do not diminish riparian function. The Director must make the interpretations as specified in SDC 5.11.100.

~~(C) For protection of water quality and protection of riparian area functions as specified in SDC 4.3.110, the following standards apply:~~

~~(1) Avoid development or redevelopment in the following circumstances:~~

- ~~(a) Unsuitable areas, including, but not limited to, unstable slopes, wetlands and riparian areas;~~
- ~~(b) Stream Crossings. Where crossings have to be provided, the impacts on water quality must be minimized to the maximum extent practical; and~~
- ~~(c) Hardening or armoring of stream banks and shorelines.~~

~~(2) Prevent:~~

- ~~(a) Stormwater discharge impacts to water quality and quantity; and~~
- ~~(b) Erosion and sediment run-off during and after construction.~~

~~(3) Protect:~~

- ~~(a) Riparian areas, buffers, and functions around all watercourses; and~~
- ~~(b) Wetlands, wetland buffers and wetland functions.~~

~~(4) Preserve the hydrologic capacity of any watercourses.~~

~~(5) Utilize Native Vegetation in Riparian Areas. The required riparian area landscaping must be installed as part of the building permit process and may be bonded as specified in SDC 5.17.150.~~

~~(6) Restore and enhance riparian areas that are degraded in riparian function.~~

~~(7) In applying SDC 4.3.115(C)(1) through (6), riparian area protection, preservation, restoration, and enhancement measures must be applied as follows:~~

- ~~(a) For new development and redevelopment, existing riparian area functions must be protected and preserved. Degraded functions must be restored or enhanced through the full riparian area width, as specified in SDC 4.3.115(A)(1) and (2), and extending through the full frontage of the lot/parcel along the watercourse on the Water Quality Limited Watercourse (WQLW) Map.~~

- ~~(b) — For additions and expansions on any portion of a lot/parcel, existing riparian area functions must be protected and preserved through the full riparian area width specified in SDC 4.3.115(A)(1) and (2), and extending through the full frontage of the lot/parcel along the watercourse on the WQLW Map.~~
- ~~(c) — For additions and expansions within 100 feet of a watercourse on the WQLW Map on a lot/parcel that has degraded riparian functions, the area for restoration or enhancement must be based upon the ratio of the impervious area of the addition or expansion to the existing building or impervious area on the lot/parcel. The restoration or enhancement must start at the top of bank of the watercourse and work landward.~~

Commentary: The recommendation to amend this section comes from the City of Springfield Stormwater Facilities Master Plan (2008) which proposed that the code be amended to add vegetated stormwater facilities in landscaping requirements. SDC 4.4.105 clarifies that Low Impact Development is a landscaping requirement and must be landscaped to comply with SDC 4.3.110(C) for review under the Treatment Standard. Where parking lot planting areas are required, Low Impact Development and vegetated structural stormwater controls may be used to meet that requirement.

Note: Section 4.4.105(E) for Parking Lot landscaping are outside the scope of these Stormwater Post-Construction Requirements Update amendments but are provided for context and clarity.

4.4.100 - Landscaping, Screening, and Fence Standards

4.4.105 Landscaping.

- (A)** These regulations ensure that new development complies with the landscaping provisions of this code and any applicable Refinement Plans, Plan Districts, Master Plans, and Conceptual Development Plans; is adequately screened from less intensive development; considers the effects of vegetation on public facilities; retains significant clusters of natural trees and shrubs wherever possible; minimizes run-off, protects water quality and moderates temperature; facilitates energy conservation and crime prevention; and improves the appearance of the City to create a desirable place to live and work.
- (B)** ~~Three~~ Four types of landscaping may be required:
 - (1)** Landscaping standards for private property as specified in this section and other sections of this code.
 - (2)** Street trees in the public right-of-way as specified in SDC 4.2.140.
 - (3)** Curbside planter strips in the public right-of-way as specified in SDC 4.2.135.
 - (4)** Low Impact Development as specified in SDC 4.3.110(C) for review under the Treatment Standard.

~~(C) Materials and installation costs of required planting and irrigation, other than what is required by the Minimum Development Standards, SDC 5.15.100, must not exceed 10 percent of the value of the new development, including the cost of parking facilities.~~

(C) The following areas of a lot/parcel must be landscaped, unless otherwise specified in this code:

(1) All required setback areas and any additional planting areas as specified in the appropriate zoning district.

(2) Parking lot planting areas required in this section.

(3) Low Impact Development as specified in SDC 4.3.110(C) for review under the Treatment Standard.

~~(E D)~~ At least 65 percent of each required planting area listed in Subsection (D) above must be covered with living plant materials within 5 years of the date of installation, unless a higher standard applies elsewhere in this code. The living plant materials must be distributed throughout the required planting area. The planting acceptable per 1,000 square feet of required planting area is as follows:

(1) A minimum of 2 trees, not less than 6 feet in height, that are at least a 2 inch (dbh) caliper (at the time of planting, not including root ball); and

(2) Ten shrubs, 5 gallons or larger.

(3) Lawn and/or groundcover may be substituted for up to 25 percent of the living plant material requirement, unless trees or shrubbery are required for screening. This substitution is only allowed when the applicant has demonstrated that there is are provisions for ongoing maintenance of the landscape areas.

These standards do not apply to single unit detached dwellings and middle housing in the R-1 District.

~~(F E) **Parking Lots.** Parking lot planting areas must include 1 canopy tree at least 2 inches (dbh) in caliper that meets City street tree standards as may be permitted by the Engineering Design Standards and Procedures Manual and at least 4 shrubs, 5 gallon or larger, for each 100 square feet of planting area. Shrubs that abut public right-of-way or that is placed in the interior of any parking lot must not exceed 2.5 feet in height at maturity.~~

(1) The following Pparking lot planting areas must be landscaped in accordance with the standards in (2) below include:

~~(1a)~~ (4a) Parking and driveway setback areas specified in the applicable land use district; and

~~(2b)~~ (2b) Five percent of the interior of a parking lot, exclusive of any required parking setbacks, if 24 or more parking spaces are located between the street side of a building and an arterial or collector street and are visible from any street.

(3c) See also SDC 4.7.380 or 4.7.385 for multiple unit housing design standards.

(2) Parking lot planting areas must include at least 4 shrubs, 5 gallon or larger, for each 100 square feet of planting area. Any shrubs that abut public right-of-way or that is placed in the interior of any parking lot must not exceed 2.5 feet in height at maturity. Where parking lot planting areas are required, Low Impact Development and vegetated structural stormwater controls may be used to meet this requirement. Shrubs provided within a structural stormwater control may not be counted toward meeting this criterion.

(32) **Small Parking Lots and Modifications to Existing Parking Lots.** Planting areas for developments with one-half acre or less of new surface parking lot area must include 1 canopy tree at least 2 inches (dbh) in caliper, for each 100 square feet of parking lot planting area. Trees must meet City street tree standards in the City of Springfield Street Tree list in Appendix G for the appropriately sized planter area.

(4) **Large Parking Lots.** Developments that include more than one-half acre of surface parking lot area must comply with the following:

(a) Developments not required to comply with OAR 330-135-0010 must provide a climate mitigation action including at least one of the following:

(i) Payment of at least \$1500 per new parking space into a fund at the Oregon Department of Energy dedicated to equitable solar or wind energy development; or

(ii) Tree canopy covering at least 40% of the new parking lot area at maturity but no more than 15 years after planting; or

(iii) If parking is provided for a non-residential use, the development may include a mixture of (i) and (ii) – providing between 30% and 40% tree canopy and paying for a proportionate percentage of parking spaces.

(b) Developments must provide either trees along driveways or a minimum of 30% tree canopy coverage over parking areas. Developments are not required to provide trees along drive aisles.

(c) The tree spacing and species planted must be designed to maintain a continuous canopy, except when interrupted by driveways, drive aisles, and other site design considerations. Trees that are provided in compliance with (4)(a)(ii) above meet this standard.

(d) Trees must meet City street tree standards as specified in City of Springfield Street Tree list in Appendix G for the appropriately sized planter area.

~~(ee)~~ Development of a tree canopy under subsections (a) and (b) must be done in coordination with the local electric utility, including pre-design, building, and maintenance phases.

~~(fe)~~ Applicant must provide a certification provided by a certified arborist with an Oregon Landscape Contractor license that trees planted to meet subsections (1) and (2) will be planted to meet or exceed the 2021 American National Standards Institute A300 standards.

(G F) All new required planting areas must be provided with a permanent irrigation system which can include a drip irrigation system. Areas planted with noninvasive drought tolerant species or plant communities are exempt from this standard.

(H G) Landscaped setbacks abutting required screening on the same property are exempted from planting requirements if the area is not visible from any public right-of-way or adjacent property.

(I H) Planting Installation Standards.

(1) Existing landscaping to be retained must be provided with protection which will remain through the construction process. The plants to be saved and the method of protection must be noted on the Landscape Plan.

(2) Existing trees to be retained on private property must not have construction occur within the drip line, unless a landscape architect certifies that affected trees will not have at least a 90 percent chance of survival over a 5-year period. Trees to be retained must be provided with protection with at least a 3-foot-tall temporary fence barrier around the drip line and include protection around the tree to prevent abrasion to the tree. The trees to be retained and the method of protection must be included on the Landscape Plan.

(3) The Landscape Plan must include specifications for topsoil, including depth and organic matter requirements, to ensure the health and vitality of required planting. Where planting areas have been excavated the replacement of topsoil must be provided for and indicated on the Landscape Plan. All waste material must be removed from required planting areas prior to the application of topsoil.

(a) Inspection may be made by the Director prior to planting to verify proper rough grade and installation of irrigation systems.

(b) Plant materials and soil preparation may be inspected prior to or in conjunction with the occupancy inspection to ensure that placement, quantity, size, and variety conform to the approved Planting Plan and the requirements of this section. Nursery tags identifying variety and species must remain on plant specimens until the Final Building Inspection by the Building Official or the issuance of a Certificate of Occupancy. (6443)

(4) Landscaping and vegetation within structural stormwater controls, including Low Impact Development, must meet the maintenance requirements in SDC 4.3.110(F).

***Commentary:** The recommendation to amend this section comes from the City of Springfield Stormwater Facilities Master Plan (2008) which proposed that the code be amended to allow curb cuts to allow runoff from stormwater quality facilities in parking lot landscaping.*

4.6.120 Motor Vehicle Parking—Parking Lot Improvements.

All parking areas must conform to the setback, vision clearance, planting, and screening provisions of this code and must be completed prior to occupancy. Required parking spaces must be improved as follows:

- (C)** All parking spaces fronting a sidewalk, alley, street, landscaped area, or structure must be provided with a secured wheel bumper or linear curb not less than 6 inches in height to be set back from the front of the stall a minimum of 2 feet to allow for vehicle encroachment. Wheel bumpers must be a minimum of 6 feet in length. Curbs must be constructed in conformance with the Standard Construction Specifications. the curb into the landscape area. Curbs separating landscaped areas from parking areas must allow stormwater runoff to pass through, as provided in APWA detail drawing RD RD700 &701.

***Commentary:** The recommendation to amend this section comes from the City of Springfield Stormwater Facilities Master Plan (2008) which proposed that the code be amended to require review for stormwater management requirements or additions and expansions of impervious areas.*

5.17.100 - Site Plan Review

5.17.110 Applicability.

- (A)** The Site Plan Review process is used for:
- (1)** The following categories of multiple unit housing, commercial, public and semi-public, and industrial development or uses, including construction of impervious surfaces for parking lots, ~~and~~ storage areas, and stormwater improvements:
 - (a)** New development on vacant sites and redevelopment, except:
 - (i)** Where a proposed development qualifies for a Minimum Development Standards review in accordance with SDC 5.15;
 - (ii)** Where multiple unit housing qualifies for a Type 1 process as specified in SDC 4.7.380.
 - (b)** Additions or expansions that exceed either 50 percent of the existing building gross floor area or 5,000 square feet or more of new building gross floor area and/or impervious surface area, except where a

proposed development qualifies for a Minimum Development Standards review according to SDC 5.15;

- (c) Additions, expansions, and changes of use, regardless of size or intervening use, that:
 - (i) Contain or are within 150 feet of the top of bank (as measured from the property line of the subject property) of any Water Quality Limited Watercourses (WQLW) identified on the WQLW Map on file in the Development Services and Public Works Department;
 - (ii) Contain or are within 100 feet of the top of bank (as measured from the property line of the subject property) of any direct tributaries of WQLW identified on the WQLW Map on file in the Development Services and Public Works Department;
 - (iii) Are located within the City's urbanizable area, outside of the city limits; or
 - (iv) Are located within 50 feet of property in a residential land use district or residentially designated land (as measured from the property line of the subject property); or
 - (v) Proposes review under the Treatment Standard in SDC 4.3.110(B)-(C) to demonstrate compliance with applicable stormwater treatment standards.
- (d) Discretionary Uses, except where a proposed development qualifies for a Minimum Development Standards review in accordance with SDC 5.15; and
- (e) Any uses listed in the applicable land use district, overlay, or plan district, which specifically require Site Plan Review.

Commentary: Definitions are provided to SDC 6.1.110 to clarify stormwater terms.

6.1.100 – Definitions

6.1.110 Meaning of Specific Words and Terms.

Evapotranspiration. The sum of evaporation and transpiration of water from the earth's surface to the atmosphere. Includes the evaporation of liquid or solid water plus transpiration from plants (the release of water vapor into the atmosphere through plant stomata or pores).

~~**Impervious Surface.** Any surface that either prevents or delays the infiltration of water into the soil as it entered under natural conditions preexistent to development, and/or a surface area that causes water to run off the surface in greater quantities or at an increased rate of flow than prior to development. Common impervious surfaces include: building roofs; traditional concrete or~~

~~asphalt paving on walkways, driveways, parking lots, gravel lots and roads; and heavily compacted earthen materials.~~

Impervious Surface. Any surface resulting from development activities that prevents the infiltration of water. Common impervious surfaces include: building roofs; traditional concrete or asphalt paving on walkways, driveways, parking lots, gravel lots and roads; and heavily compacted earthen materials.

Low Impact Development (LID). A stormwater management approach that seeks to mitigate the impacts of increased runoff and stormwater pollution using a set of planning, design, and construction approaches and stormwater management practices that promote the use of natural systems for infiltration, evapotranspiration, and reuse of rainwater, and can occur at a wide range of landscape scales (i.e., regional, community, and site). Low impact development is a comprehensive land planning and engineering design approach to stormwater management with a goal of mimicking the pre-development hydrologic regime of urban and developing watersheds.

Off-line Stormwater Facilities. Facilities that are sized for only the water quality storm and in which higher stormwater flows are bypassed around the treatment area. These facilities typically require an inlet control structure and typically include mechanical treatment facilities.

On-line Stormwater Facilities. Facilities in which stormwater flows are routed through the treatment area, so high flows are not bypassed around the facility, such as vegetated swales and most vegetated treatment facilities.

Predevelopment Hydrologic Function. The hydrology of a site reflecting the local rainfall patterns, soil characteristics, land cover, evapotranspiration, and topography. The term predevelopment as used in predevelopment hydrologic function is consistent with the term predevelopment as discussed in Federal Register Volume 64, Number 235 and refers to the runoff conditions that exist onsite immediately before the planned development activities occur. Predevelopment is not intended to be interpreted as the period before any human-induced land disturbance has occurred.

Storm Event. A precipitation event that results in surface runoff. For modeling purposes in the City of Springfield this is a Type 1a storm of 24-hour duration.

Stormwater. Water derived from a storm event or conveyed through a storm sewer water management system.

Stormwater or Stormwater Runoff. That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, channels, or pipes into a defined surface water channel or a constructed infiltration facility. It includes snow melt runoff and surface runoff and drainage.

Structural Stormwater Controls. Stormwater controls that are physically designed, installed, and maintained to prevent or reduce the discharge of pollutants in stormwater to minimize the impacts of stormwater on waterbodies. Examples of structural stormwater controls or Best Management Practices (BMPs) include: (1) storage practices such as wet ponds and extended-

detention outlet structures; (2) filtration practices such as grassed swales, sand filters and filter strips; and, (3) infiltration practices such as infiltration basins and infiltration trenches.

Total Maximum Daily Loadings (TMDL). The calculated pollutant amount that a water body can receive and still meet Oregon water quality standards. The TMDL program evaluates and sets pollutant loads to impaired waterbodies and designates management agencies to implement water quality improvement plans.

Total Suspended Solids (TSS). The ratio of the weight of solid residue in a filtered sample to the volume of the sample, where the residue is obtained by filtering the sample through a 0.45 μ m filter.

APPENDIX B

SANTA BARBARA URBAN HYDROGRAPHY METHOD

(A) Overview

- (1) The Santa Barbara Urban Hydrograph (SBUH) method was developed by the Santa Barbara County Flood Control and Water Conservation District to determine a runoff hydrograph for an urbanized area.

(B) Elements Of the Santa Barbara Urban Hydrograph (SBUH) Method

- (1) The SBUH method depends on several variables:
 - (a) Pervious (A_p) and impervious (A_{imp}) land areas
 - (b) Time of concentration (T_c) calculations
 - (c) Runoff curve numbers (CN) applicable to the site
 - (d) Design storm

(C) Land Area

- (1) The total area, including the pervious and impervious areas within a drainage basin, shall be quantified in order to evaluate critical contributing areas and the resulting site runoff.
- (2) Each area within a basin shall be analyzed separately and their hydrographs combined to determine the total basin hydrograph.
- (3) Areas shall be selected to represent homogenous land use/development units.

(D) Time of Concentration

- (1) Time of concentration, T_c , is the time for a theoretical drop of water to travel from the furthest point in the drainage basin to the facility being designed. (In this case, T_c is derived by calculating the overland flow time of concentration and the channelized flow time of concentration.) T_c depends on several factors, including

ground slope, ground roughness, and distance of flow. The following formula for determining T_c is:

(a) Formulas

(i) $T_c = T_{t1} + T_{c2} + T_{c3} + \dots + T_{cn}$

(ii) $T_t = L/60V$ (Conversion of velocity to travel time)

(iii) $T_t = (0.42 (nL)^{0.8}) / (158(s)^{0.4})$ (Manning's kinematic solution for sheet flow less than 300 feet)

(b) Shallow concentrated flow for slopes less than 0.005 ft/ft.:

(i) $V = 16.1345(s)^{0.5}$ (Unpaved surfaces)

(ii) $V = 20.3282(s)^{0.5}$ (Paved surfaces)

(c) Where,

(i) T_t = travel time, minutes

(ii) T_c = total time of concentration, minutes (minimum T_c = 5 minutes)

(iii) L = flow length, feet

(iv) V = average velocity of flow, feet per second

(v) n = Manning's roughness coefficient for various surfaces

(vi) s = slope of the hydraulic grade line (land or watercourse slope), feet per foot

(d) When calculating T_c , the following limitations apply:

(i) Overland sheet flow (flow across flat areas that does not form into channels or rivulets) shall not extend for more than 300 feet.

(ii) For flow paths through closed conveyance facilities such as pipes and culverts, standard hydraulic formulas shall be used for establishing velocity and travel time.

(iii) Flow paths through lakes or wetlands may be assumed to be zero (i.e., $T_c = 0$).

(E) Runoff Curve Numbers

- (1) The runoff curve numbers approved for water quantity/quality calculations are included as Table C-2 of this appendix.
- (2) The curve numbers presented in Table C-2 are for wet antecedent moisture conditions. Wet conditions assume previous rainstorms have reduced the capacity of soil to absorb water. Given the frequency of rainstorms in this area, wet conditions are most likely and give conservative hydrographic values.

(F) Design Storm

- (1) The SBUH method also requires a design storm to perform the runoff calculations. For flow control calculations, use NRCS Type 1A 24-hour storm distribution. This storm is shown in Figure C-1 and Table C-4. The depth of rainfall for the 2 through 100-year storm events is shown below in Table C-1.

Table C-1 24-HOUR RAINFALL DEPTHS					
Recurrence Interval, Years	2	5	10	25	100
Flood Control, Destination: 24-Hour Depths, Inches	3.12	3.6	4.46	5.18	6.48
Water Quality Storm – Pollution reduction: 24-Hour Depths, 1.4 Inches					

Table C-2 Runoff Curve Numbers					
Cover description		Curve numbers for hydrologic soil group			
Cover type	Hydrologic condition	A	B	C	D
Runoff curve numbers for urban areas*					
Open space (lawns, parks, golf courses, cemeteries, etc.):					
Grass cover <50%		68	79	86	89
Grass cover 50% to 75%)		49	69	79	84
Grass cover > 75%		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way) Urban districts:		72	82	87	89
Urban districts:					
Commercial and business		89	92	94	95
Industrial		81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)		77	85	90	92
1/4 acre		61	75	83	87
1/3 acre		57	72	81	86
1/2 acre		54	70	80	85
1 acre		51	68	79	84
2 acres		46	65	77	82
Runoff curve numbers for other agricultural lands*					
Pasture, grassland, or range-continuous forage for grazing					
<50% ground cover or heavily grazed	Poor	68	79	86	89

with no mulch					
50 to 75% ground cover and not heavily grazed	Fair	49	69	79	84
>75% ground cover and lightly or only occasionally grazed	Good	39	61	74	80
Meadow-continuous grass, protected from grazing and generally mowed for hay	-	30	58	71	78
<50% ground cover	Poor	48	67	77	83
50 to 75% ground cover	Fair	35	56	70	77
>75% ground cover	Good	30	48	65	73
Woods-grass combination (orchard or tree farm)	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods					
Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.	Poor	45	66	77	83
Woods are grazed but not burned, and some forest litter covers the soil.	Fair	36	60	73	79
Woods are protected from grazing, and litter and brush adequately cover the soil.	Good	30	55	70	77
Runoff curve numbers for Simplified Approaches**					
Eco-roof	Good	n/a	61	n/a	n/a
Roof Garden	Good	n/a	48	n/a	n/a
Contained Planter Box	Good	n/a	48	n/a	n/a
Infiltration & Flow-Through Planter Box	Good	n/a	48	n/a	n/a
Pervious Pavement	-	76	85	89	n/a
Trees					
New and/or Existing Evergreen	-	36	60	73	79
New and/or Existing	-	36	60	73	79
Deciduous					

n/a - Does not apply, as design criteria for the relevant mitigation measures do not include

the use of this soil type.

*Soil Conservation Service, *Urban Hydrology for Small Watersheds*, Technical Release 55, pp. 2.5-2.8, June 1986.

**CNs of various cover types were assigned to the Proposed Simplified Approaches with similar cover types as follows:

Eco-roof – assumed grass in good condition with soil type B.

Roof Garden – assumed brush-weed-grass mixture with >75% ground cover and soil type B. Contained Planter Box – assumed brush-weed-grass mixture with >75% ground cover and soil type B.

Infiltration & Flow-Through Planter Box – assumed brush-weed-grass mixture with >75% ground cover and soil type B.

Pervious Pavement – assumed gravel.

Trees – assumed woods with fair hydrologic conditions.

Note: To determine hydrologic soil type, consult local USDA Soil Conservation Service Soil Survey.

Table C-3 NRCS Hydrologic Soil Group Descriptions	
NRCS Hydrologic	
Soil Group	Description
Group A	Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of deep, well drained to excessively drained sands or gravels. These soils have a high rate of water transmission.
Group B	Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.
Group C	Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils that have a layer that impedes the downward movement of water or soils that have a moderately fine texture. These soils have a slow rate of water transmission.
Group D	Soils having a very slow infiltrate rate (high runoff potential) when thoroughly wet. These consist chiefly of clay soils that have a high shrink-swell position, soils that have a permanent high water table, soils that have a fragipan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

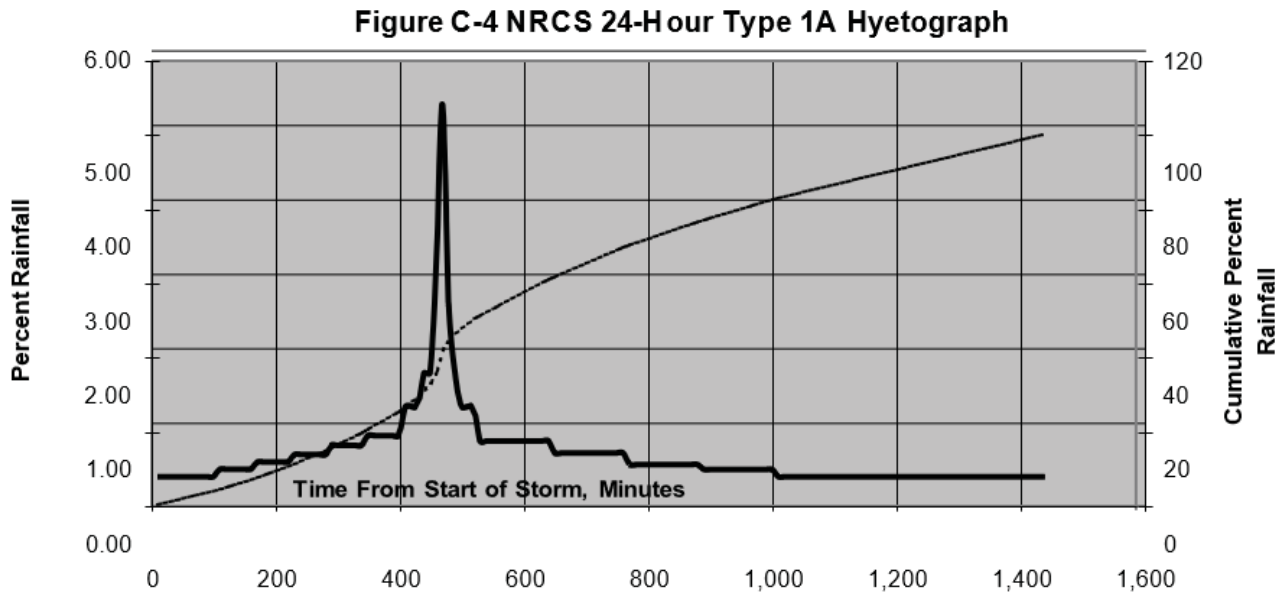


Table C-5 NRCS Type 1A Hyetographic Distribution - For Use In Water Quality/Quantity Design

Time From Start of Storm, Minutes	% Rainfall	Cumu- lative %	Time From Start of Storm, Minutes	% Rainfall	Cumu- lative %	Time From Start of Storm, Minutes	% Rainfall	Cumu- lative %	Time From Start of Storm, Minutes	% Rainfall	Cumu- lative %
0 - 10	0.40	0.40	360 - 370	0.95	22.57	720 - 730	0.72	67.40	1080 - 1090	0.40	86.00
10 - 20	0.40	0.80	370 - 380	0.95	23.52	730 - 740	0.72	68.12	1090 - 1100	0.40	86.40
20 - 30	0.40	1.20	380 - 390	0.95	24.47	740 - 750	0.72	68.84	1100 - 1110	0.40	86.80
30 - 40	0.40	1.60	390 - 400	0.95	25.42	750 - 760	0.72	69.56	1110 - 1120	0.40	87.20
40 - 50	0.40	2.00	400 - 410	1.34	26.76	760 - 770	0.57	70.13	1120 - 1130	0.40	87.60
50 - 60	0.40	2.40	410 - 420	1.34	28.10	770 - 780	0.57	70.70	1130 - 1140	0.40	88.00
60 - 70	0.40	2.80	420 - 430	1.34	29.44	780 - 790	0.57	71.27	1140 - 1150	0.40	88.40
70 - 80	0.40	3.20	430 - 440	1.80	31.24	790 - 800	0.57	71.84	1150 - 1160	0.40	88.80
80 - 90	0.40	3.60	440 - 450	1.80	33.04	800 - 810	0.57	72.41	1160 - 1170	0.40	89.20
90 - 100	0.40	4.00	450 - 460	3.40	36.44	810 - 820	0.57	72.98	1170 - 1180	0.40	89.60
100 - 110	0.50	4.50	460 - 470	5.40	41.84	820 - 830	0.57	73.55	1180 - 1190	0.40	90.00
110 - 120	0.50	5.00	470 - 480	2.70	44.54	830 - 840	0.57	74.12	1190 - 1200	0.40	90.40
120 - 130	0.50	5.50	480 - 490	1.80	46.34	840 - 850	0.57	74.69	1200 - 1210	0.40	90.80
130 - 140	0.50	6.00	490 - 500	1.34	47.68	850 - 860	0.57	75.26	1210 - 1220	0.40	91.20
140 - 150	0.50	6.50	500 - 510	1.34	49.02	860 - 870	0.57	75.83	1220 - 1230	0.40	91.60
150 - 160	0.50	7.00	510 - 520	1.34	50.36	870 - 880	0.57	76.40	1230 - 1240	0.40	92.00
160 - 170	0.60	7.60	520 - 530	0.88	51.24	880 - 890	0.50	76.90	1240 - 1250	0.40	92.40
170 - 180	0.60	8.20	530 - 540	0.88	52.12	890 - 900	0.50	77.40	1250 - 1260	0.40	92.80
180 - 190	0.60	8.80	540 - 550	0.88	53.00	900 - 910	0.50	77.90	1260 - 1270	0.40	93.20
190 - 200	0.60	9.40	550 - 560	0.88	53.88	910 - 920	0.50	78.40	1270 - 1280	0.40	93.60
200 - 210	0.60	10.00	560 - 570	0.88	54.76	920 - 930	0.50	78.90	1280 - 1290	0.40	94.00
210 - 220	0.60	10.60	570 - 580	0.88	55.64	930 - 940	0.50	79.40	1290 - 1300	0.40	94.40
220 - 230	0.70	11.30	580 - 590	0.88	56.52	940 - 950	0.50	79.90	1300 - 1310	0.40	94.80
230 - 240	0.70	12.00	590 - 600	0.88	57.40	950 - 960	0.50	80.40	1310 - 1320	0.40	95.20
240 - 250	0.70	12.70	600 - 610	0.88	58.28	960 - 970	0.50	80.90	1320 - 1330	0.40	95.60
250 - 260	0.70	13.40	610 - 620	0.88	59.16	970 - 980	0.50	81.40	1330 - 1340	0.40	96.00
260 - 270	0.70	14.10	620 - 630	0.88	60.04	980 - 990	0.50	81.90	1340 - 1350	0.40	96.40
270 - 280	0.70	14.80	630 - 640	0.88	60.92	990 - 1000	0.50	82.40	1350 - 1360	0.40	96.80
280 - 290	0.82	15.62	640 - 650	0.72	61.64	1000 - 1010	0.40	82.80	1360 - 1370	0.40	97.20
290 - 300	0.82	16.44	650 - 660	0.72	62.36	1010 - 1020	0.40	83.20	1370 - 1380	0.40	97.60
300 - 310	0.82	17.26	660 - 670	0.72	63.08	1020 - 1030	0.40	83.60	1380 - 1390	0.40	98.00
310 - 320	0.82	18.08	670 - 680	0.72	63.80	1030 - 1040	0.40	84.00	1390 - 1400	0.40	98.40
320 - 330	0.82	18.90	680 - 690	0.72	64.52	1040 - 1050	0.40	84.40	1400 - 1410	0.40	98.80
330 - 340	0.82	19.72	690 - 700	0.72	65.24	1050 - 1060	0.40	84.80	1410 - 1420	0.40	99.20
340 - 350	0.95	20.67	700 - 710	0.72	65.96	1060 - 1070	0.40	85.20	1420 - 1430	0.40	99.60
350 - 360	0.95	21.62	710 - 720	0.72	66.68	1070 - 1080	0.40	85.60	1430 - 1440	0.40	100.00

APPENDIX C

INFILTRATION TESTING

(A) Applicability

- (1)** To properly size and locate stormwater management facilities, it is necessary to characterize the soil infiltration conditions at the location of the proposed facility. All projects that propose onsite infiltration must evaluate existing site conditions and determine:
 - (a)** If the infiltration rate is adequate to support the proposed stormwater management facility (satisfied through presence of mapped NRCS Type A & B Soils or the Simplified Approach infiltration test) or;
 - (b)** The design infiltration rate prior to facility design (satisfied through the Presumptive Approach infiltration testing conducted by a qualified professional).

The following sections provide the approved standard infiltration testing specifications.

(B) Simplified Approach Open Pit Infiltration Test

- (1)** The purpose of the Simplified Approach is to provide a method which can be conducted by a nonprofessional for design of simple stormwater systems on small projects.
- (2)** The Simplified Approach open pit test is applicable only to projects on private property with less than 15,000 square feet of new or redeveloped impervious area.
 - (a)** The results of infiltration testing must be documented on the Simplified Approach Form.
 - (b)** The Simplified Approach cannot be used to find a design infiltration rate.
 - (c)** The intent of the open pit test is to determine whether or not the local infiltration rate is adequate (2 inches/hour or greater) for the predesigned stormwater facilities described in Appendix F of the EDSPM(Infiltration swales, basins, planters, drywells, and trenches).

- (d) The Simplified Approach Infiltration Test does not need to be conducted by a licensed professional.

(C) Simplified Approach Procedure

- (1) A simple open pit infiltration test is required for each facility designed through the Simplified Approach. The test should be where the facility is proposed or within the immediate vicinity.
 - (a) Excavate a test hole to the depth of the bottom of the infiltration system, or otherwise to 4 feet.
 - (i) The test hole can be excavated with small excavation equipment or by hand using a shovel, auger, or post hole digger.
 - (ii) If a layer hard enough to prevent further excavation is encountered, or if noticeable moisture/water is encountered in the soil, stop and measure this depth from the surface and record it on the Simplified Approach Form. Proceed with the test at this depth.
 - (iii) Fill the hole with water to a height of about 6 inches from the bottom of the hole, and record the exact time. Check the water level at regular intervals (every 1 minute for fast draining soils to every 10 minutes for slower-draining soils) for a minimum of 1 hour or until all of the water has infiltrated. Record the distance the water has dropped from the top edge of the hole.
 - (iv) Repeat this process two more times, for a total of three rounds of testing.
 - (v) These tests should be performed as close together as possible to accurately portray the soil's ability to infiltrate at different levels of saturation. The third test provides the best measure of the saturated infiltration rate.
 - (b) For each test pit required, submit all three testing results with the date, duration, drop in water height, and conversion into inches per hour.
 - (c) If the results of the Simplified Approach open pit test show an infiltration rate greater than 2.0 inches per hour, the applicant can proceed with Simplified Approach facility design (where applicable).
 - (d) If the applicant would like to use an infiltration rate for design purposes, a Presumptive Infiltration Test must be conducted.

(D) Presumptive Infiltration Testing

- (1)** The Presumptive Approach must be used for all public and private developments where the Simplified Approach is not applicable.
- (2)** The qualified professional must exercise judgment in the selection of the infiltration test method.
- (3)** The three infiltration available testing methods used to determine a design infiltration rate are:
 - (a)** Open pit falling head;
 - (b)** Encased falling head; or
 - (c)** Double-ring infiltrometer.
- (4)** Where satisfactory data from adjacent areas is available that demonstrates infiltration testing is not necessary, the infiltration testing requirement may be waived.
- (5)** Waiver of the site specific testing is subject to approval by the City.
- (6)** Recommendation for foregoing infiltration testing must be submitted in a report which includes supporting data and is stamped and signed by the project engineer or geologist.

(E) Testing Criteria

- (1)** Except for the Simplified Approach, all testing must be conducted or overseen by a qualified professional who is either a Professional Engineer, Registered Geologist, Soil Scientist or other professional testing service with equivalent training and experience in determining the permeability of soils.
- (2)** The depth of the test must correspond to the facility depth.
 - (a)** If a confining layer is observed during the subsurface investigation to be within 4 feet of the bottom of the planned infiltration system, the testing should be conducted within that confining layer.
 - (b)** Tests must be performed in the immediate vicinity of the proposed facility.

(c) Exceptions can be made to the test location provided the qualified professional can support that the strata are consistent from the proposed facility to the test location.

(d) Infiltration testing should not be conducted in engineered or undocumented fill.

(F) Minimum Number of Required Tests

- (1) The simplified Approach requires one infiltration test for every proposed facility.
- (2) The Presumptive Approach requires one infiltration test for every proposed facility or one test for every 100 feet of proposed linear facility.
- (3) Generalized soil infiltration rates may be used if facilities are proposed in areas of consistent topography and soil strata as outlined in a Geotechnical report.

(G) Factor of Safety

- (1) A minimum factor of safety of 2 shall be applied to field obtained infiltration rates where infiltration of the site performance standard storm per 4.3.110 (B) is proposed.

(H) Presumptive Infiltration Testing Instructions

Open Pit Falling Head Procedure

The open pit falling head procedure is performed in an open excavation and therefore is a test of the combination of vertical and lateral infiltration.

- (1) Excavate a hole with bottom dimensions of approximately 2 feet by 2 feet into the native soil to the elevation of the proposed facility bottom. Smooth excavations should be scratched and loose material removed.
- (2) Fill the hole with clean water a minimum of 1 foot above the soil to be tested, and maintain this depth of water for at least 4 hours (or overnight if clay soils are present) to presoak the native material.
 - (a) In sandy soils with little or no clay or silt, soaking is not necessary.

- (b) If after filling the hole twice with 12 inches of water, the water seeps completely away in less than 10 minutes, the test can proceed immediately.
- (3) Determine how the water level will be accurately measured. The measurements should be made with reference to a fixed point.
- (4) After the presaturation period, refill the hole with water to 12 inches above the soil and record the time.
 - (a) Alternative water head heights may be used for testing provided the presaturation height is adjusted accordingly.
 - (b) Measure the water level at 10-minute intervals for a total period of 1 hour (or 20-minute intervals for 2 hours in slower soils) or until all of the water has drained.
 - (c) In faster draining soils (sands and gravels), it may be necessary to shorten the measurement interval in order to obtain a well-defined infiltration rate curve.
 - (d) Constant head tests may be substituted for falling head tests at the discretion of the professional overseeing the infiltration testing.
- (5) Repeat the test.
 - (a) Successive trials should be run until the percent change in measured infiltration rate between two successive trials is minimal.
 - (b) The trial should be discounted if the infiltration rate between successive trials increases.
 - (c) At least three trials must be conducted. After each trial, the water level is readjusted to the 12 inch level.
- (6) The average infiltration rate over the last trial should be used to calculate the unfactored infiltration rate. The final rate must be reported in inches per hour.
- (7) For very rapidly draining soils, it may not be possible to maintain a water head above the bottom of the test pit. A rate based test may be used if the infiltration rate meets or exceeds the flow of water into the test pit.

Note that a maximum infiltration rate of 20 inches per hour can be used in stormwater system design.

(I) Encased Falling Head Test

The encased falling head procedure is performed with a 6-inch casing that is embedded approximately 6 inches into the native soil. The goal of this field test is to evaluate the vertical infiltration rate through a 6-inch plug of soil, without allowing any lateral infiltration. The test is not appropriate in gravelly soils or in other soils where a good seal with the casing cannot be established.

- (1)** Embed a solid 6-inch diameter casing into the native soil at the elevation of the proposed facility bottom. Ensure that the embedment provides a good seal around the pipe casing so that percolation will be limited to the 6-inch plug of the material within the casing.
 - (a)** This method can also be used when testing within hollow stem augers, provided the driller and tester are reasonably certain that a good seal has been achieved between the soil and auger.
- (3)** Fill the pipe with clean water a minimum of 1 foot above the soil to be tested, and maintain this depth for at least 4 hours (or overnight if clay soils are present) to presoak the native material.
 - (a)** Any soil that sloughed into the hole during the soaking period should be removed.
 - (b)** In sandy soils with little or no clay or silt, soaking is not necessary.
 - (c)** If after filling the hole twice with 12 inches of water, the water seeps completely away in less than 10 minutes, the test can proceed immediately.
- (4)** To conduct the first trial of the test, fill the pipe to approximately 12 inches above the soil and measure the water level.
 - (a)** Alternative water head heights may be used for testing provided the presaturation height is adjusted accordingly.
 - (b)** The level should be measured with reference to a fixed point. Record the exact time.
 - (c)** Measure the water level at 10-minute intervals for a total period of 1 hour (or 20-minute intervals for 2 hours in slower soils) or until all of the water has drained.
 - (d)** In faster draining soils (sands and gravels), it may be necessary to shorten the measurement interval in order to obtain a well-defined infiltration rate curve.

- (i) Constant head tests may be substituted for falling head tests at the discretion of the professional overseeing the infiltration testing.
- (ii) Successive trials should be run until the percent change in measured infiltration rate between two successive trials is minimal.
- (iii) The trial should be discounted if the infiltration rate between successive trials increases.
- (iv) At least three trials must be conducted.
- (v) After each trial, the water level is readjusted to the 12 inch level.
- (vi) The average infiltration rate over the last trial should be used to calculate the unfactored infiltration rate.
- (vii) Alternatively, the infiltration rate measured over the range of water head applicable to the project stormwater system design may be used at the discretion of the professional overseeing the testing.
- (viii) The final rate must be reported in inches per hour.

(J) Double Ring Infiltrometer Test

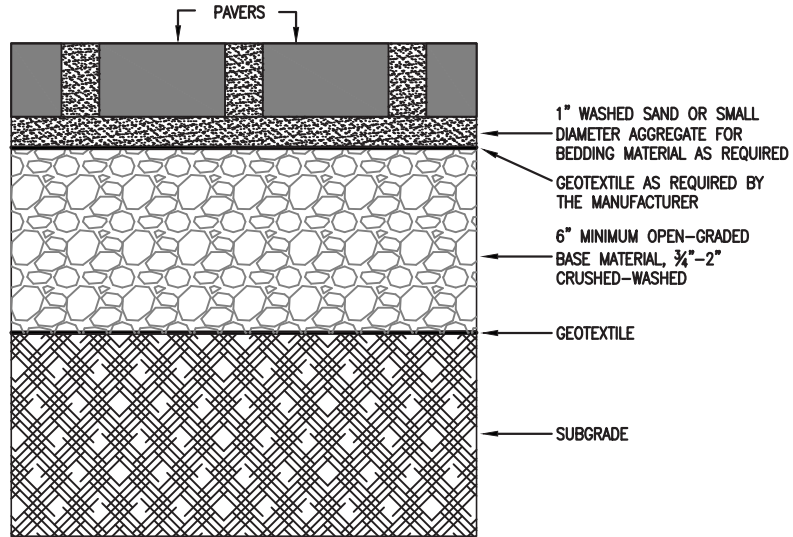
- (1) The double-ring infiltrometer test procedure should be performed in accordance with ASTM 3385-94.
- (2) The test is performed within two concentric casings embedded and sealed to the native soils. The outer ring maintains a volume of water to diminish the potential of lateral infiltration through the center casing. The volume of water added to the center ring to maintain a static water level is used to calculate the infiltration rate.
- (3) The double-ring infiltrometer is appropriate only in soils where an adequate seal can be established.

(K) Reporting Requirements

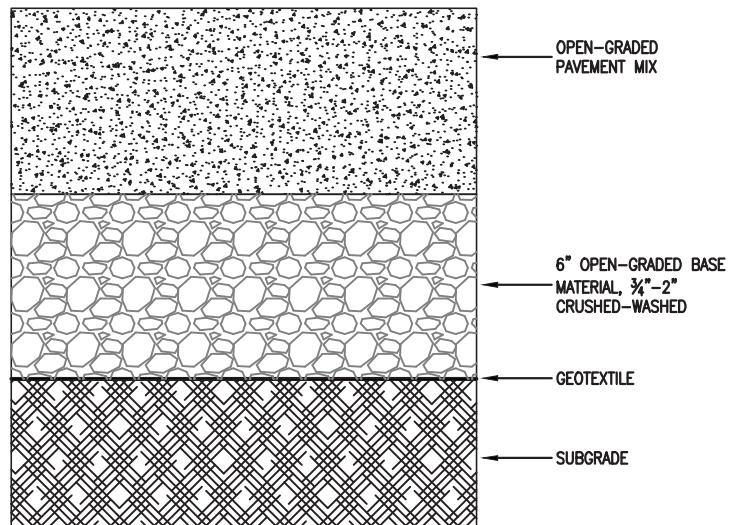
The following information should be included in the Infiltration Testing Report. The Infiltration Testing Report should be attached to the project's Stormwater Management Report:

- (1)** Statement of project understanding (proposed stormwater system).
- (2)** Summary of subsurface conditions encountered.
- (3)** Summary of infiltration testing including location and number of tests and testing method used.
- (4)** Discussion of how the tests were performed (i.e. pipe type or diameter or test pit dimensions).
- (5)** Infiltration testing results in inches per hour.
- (6)** Recommended design infiltration rate including factors of safety.
- (7)** Groundwater observations within exploration and an estimate of the depth to seasonal high groundwater.
- (8)** Site plan showing location of infiltration tests.
- (9)** Boring or test pit logs.
 - (a)** The logs should include an associated soil classification consistent with ASTM D2488-00, Standard Practice for Classification for Description and Identification of Soils (Visual-Manual Procedure).
 - (b)** The logs should also include any additional pertinent subsurface information, such as soil moisture conditions, depth and description of undocumented or engineered fill, soil color and mottling conditions, soil stiffness or density, and approximate depth of contact between soil types.
- (10)** Infiltration Test Data

**APPENDIX D
TYPICAL FACILITY DETAILS**



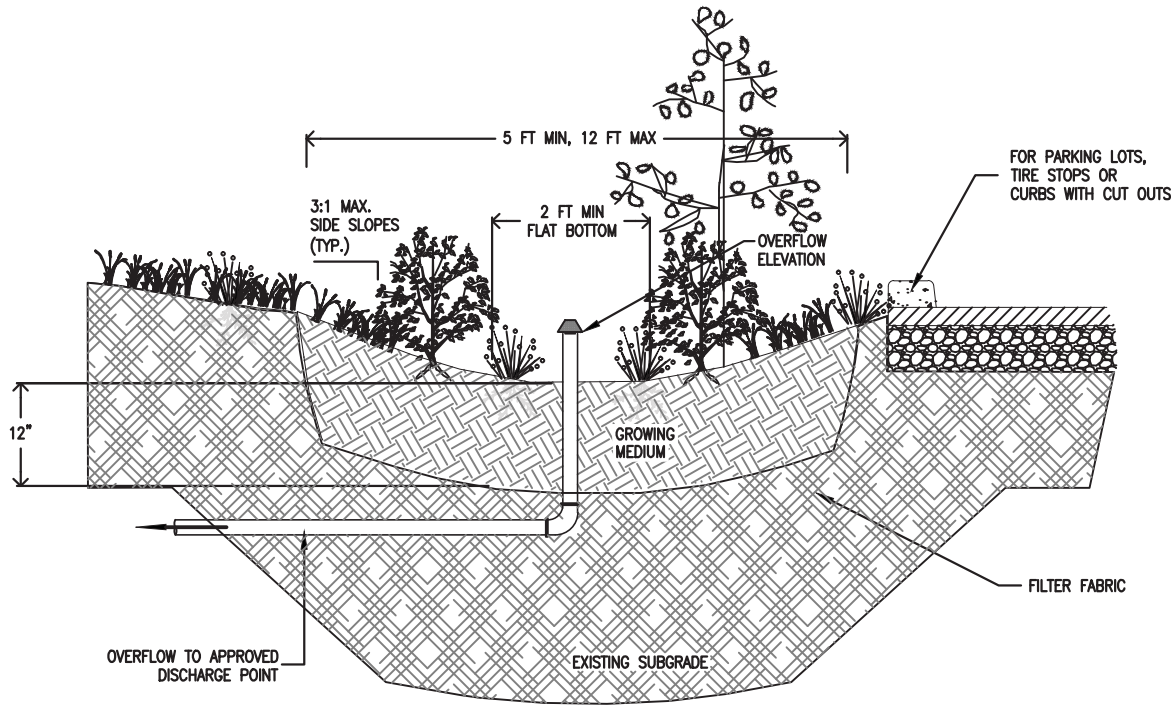
PERMEABLE CONCRETE BLOCK
OR "PAVER" SYSTEMS



PERVIOUS (OPEN GRADED) CONCRETE
AND ASPHALT

PERMEABLE PAVEMENT

TYPICAL DETAILS



1. Provide protection from all vehicle traffic, equipment staging, and foot traffic in proposed infiltration areas prior to, during, and after construction.

2. Dimensions:

- a. Width of swale: 5' - 12'.
- Depth of swale: 12"
- b. Longitudinal slope of swale: 0.5% min and 6% max.
- c. Flat bottom width: 2' minimum.
- d. Side slopes of swale: 3:1 maximum.

3. Setbacks (from centerline of facility):

- a. Infiltration swales must be 10' from foundations and 5' from property lines.
- b. Filtration swales must have a waterproof liner when within 10' from foundation of 5' from property lines.

4. Overflow:

- a. Overflows are required to an approved point discharge point unless sized to fully infiltrate the flood control design storm.
- b. Inlet elevation must allow for 2" of freeboard, minimum.

5. Piping: Minimum 3" pipe required for up to 1,500 sq ft of impervious area, otherwise 4" min. Piping material, slopes and installation shall follow the Uniform Plumbing Code.

6. Drain rock:

- a. Size: 3/4" - 2-1/2" washed
- b. Depth: 12" minimum

7. A geotextile is required to isolate the drain rock from the subgrade and growing medium.

8. Growing medium:

- a. In 0-2 year TOTZ, a 24" minimum with at least 50% organic material
- b. In all other areas, 12" minimum
- c. Import topsoil or amended native soil

9. Vegetation: Follow landscape plans otherwise refer to plant list in SWMM Appendix F. Vegetative swales must have following plantings per 100sf of facility area:

- a. 100 Ground Covers, OR
- b. 80 Ground Covers, 2 Small Shrubs, 4 Large Shrubs, and 1 Tree (deciduous or evergreen)

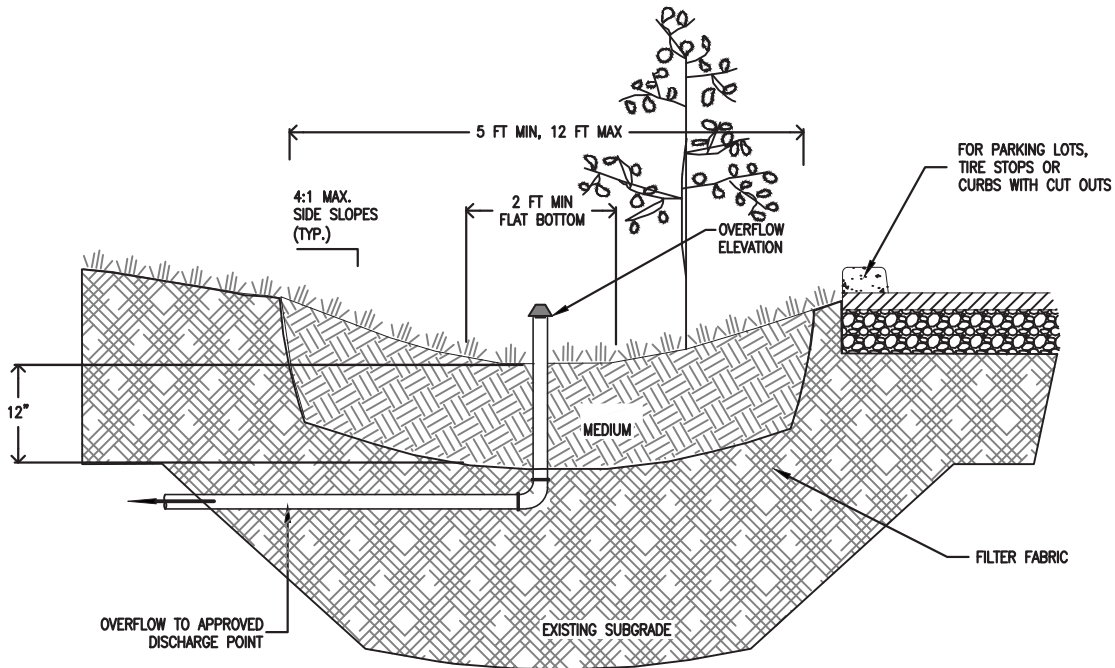
10. Waterproof liner: Shall be 30 mil PVC or equivalent for flow-through facilities.

11. Install washed pea gravel or river rock to transition from inlets and splash pad to growing medium.

12. Check dams: Shall be placed at 12" intervals along the length of the swale.

VEGETATED SWALE

TYPICAL DETAILS



1. Provide protection from all vehicle traffic, equipment staging, and foot traffic in proposed infiltration areas prior to, during, and after construction.

2. Dimensions:

- Width of swale: 5' - 12'.
- Depth of swale: 12"
- Longitudinal slope of swale: 0.5% min and 6% max.
- Bottom width: 2' minimum.
- Side slopes: 3:1 maximum for vegetative and 4:1 for grassy.

3. Setbacks (from centerline of facility):

- Infiltration swales must be 10' from foundations and 5' from property lines.
- Filtration swales must have a waterproof liner when within 10' from foundation of 5' from property lines.

4. Overflow:

- Overflows are required to an approved point discharge point unless sized to fully infiltrate the flood control design storm.
- Inlet elevation must allow for 2" of freeboard, minimum.

5. Piping: Minimum 3" pipe required for up to 1,500 sq ft of impervious area, otherwise 4" min. Piping material, slopes and installation shall follow the Uniform Plumbing Code.

6. Growing medium:

- In 0-2 year TOTZ, a 24" minimum with at least 50% organic material
- In all other areas, 12" minimum
- Import topsoil or amended native soil

7. Vegetation: Follow landscape plans otherwise refer to plant list in SWMM Appendix F. Grassy swales must have 100 coverage. Vegetative swales must have following plantings per 100sf of facility area:

- 100 Ground Covers, OR
- 80 Ground Covers, 2 Small Shrubs, 4 Large Shrubs, and 1 Tree (deciduous or evergreen)

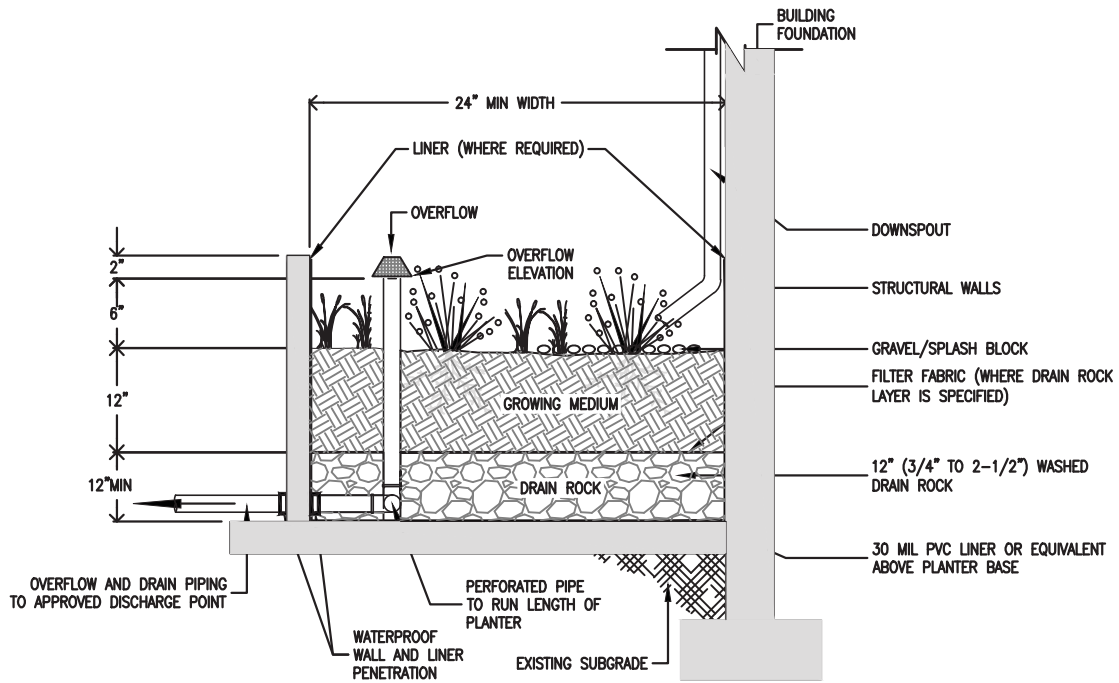
8. Waterproof liner: Shall be 30 mil PVC or equivalent where required.

9. Install washed pea gravel or river rock to transition from inlets and splash pad to growing medium.

10. Check dams: Shall be placed at 12" intervals along the length of the swale.

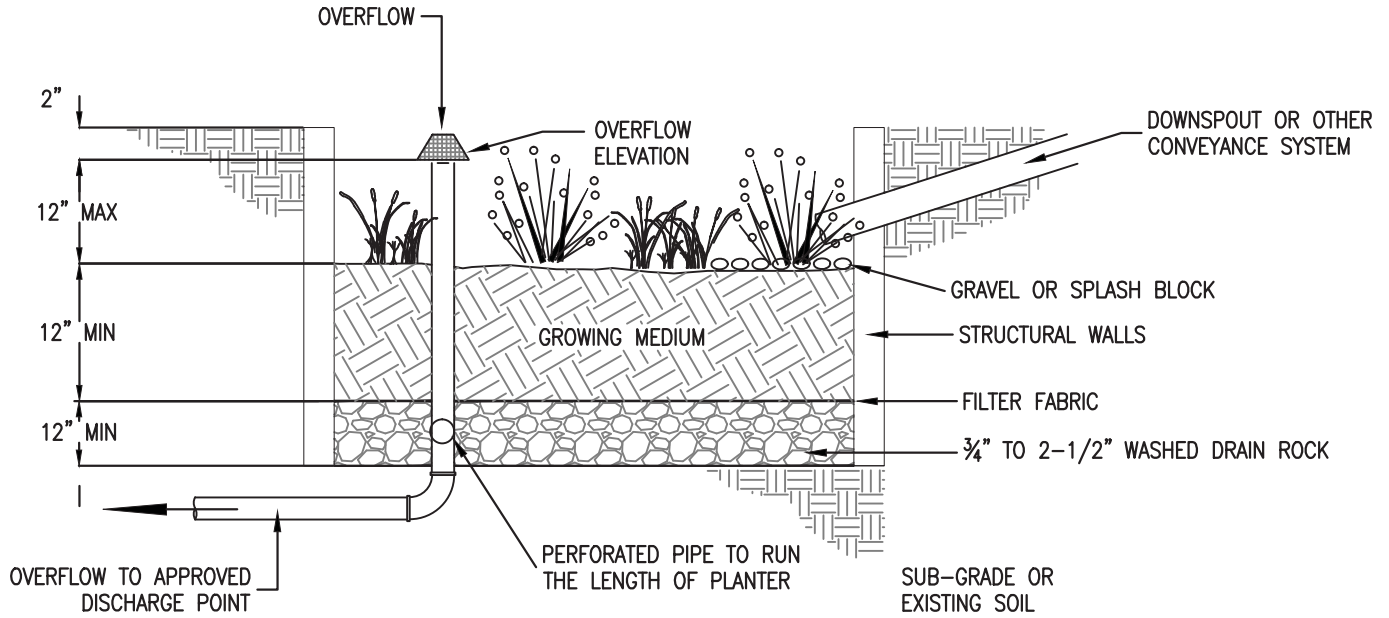
GRASSY SWALE

TYPICAL DETAILS



1. Provide protection from all vehicle traffic, equipment staging, and foot traffic in proposed infiltration areas prior to, during, and after construction.
2. Dimensions:
 - a. Width of planter: 24" minimum.
 - b. Depth of planter: 6" minimum from top of growing medium to overflow elevation.
 - c. Slope of planter: 0.5% or less.
3. Setbacks:
 - a. Infiltration planters must be 10' from foundations and 5' from property lines.
 - b. Filtration planters do not require a setback with an approved waterproof liner.
4. Overflow:
 - a. Overflows are required to an approved discharge point when using the Simplified Method
 - b. Overflows are not required when sized to fully infiltrate the flood control event using the Presumptive Method.
 - c. Minimum 2" freeboard from overflow elevation to the top of the planter walls.
5. Piping: Minimum 3" pipe required for up to 1,500 sq ft of impervious area, otherwise 4" min. Piping material, slopes and installation shall follow the Uniform Plumbing Code.
6. Drain rock:
 - a. Size: 3/4" to 2-1/2" diameter open graded
 - b. Depth: 12" Minimum
 - c. Length and Width: Full length and width of facility
7. Drain rock layer shall be separated from the growing medium by a geotextile
8. Growing medium:
 - a. In 0-2 year TOTZ, a 24" minimum with at least 50% organic material
 - b. In all other areas, 12" minimum
 - c. Import topsoil or amended native soil
9. Vegetation: Follow landscape plans otherwise refer to plant list in SWMM Appendix F. Number of plantings per 100sf of facility area:
 - a. 100 Ground Covers, OR
 - b. 80 Ground Covers and 4 Small Shrubs, OR
 - c. 60 Ground Covers and 12 Small Shrubs
10. Planter walls:
 - a. Material shall be stone, brick, concrete, wood, or other durable material (no chemically treated wood).
 - b. Walls shall be included on building plans here incorporated into foundations or other permitted structures..
11. Waterproof liner (where required): Shall be 30 mil PVC or equivalent.
12. Install washed pea gravel or river rock to transition from inlet or splash pad to growing medium.

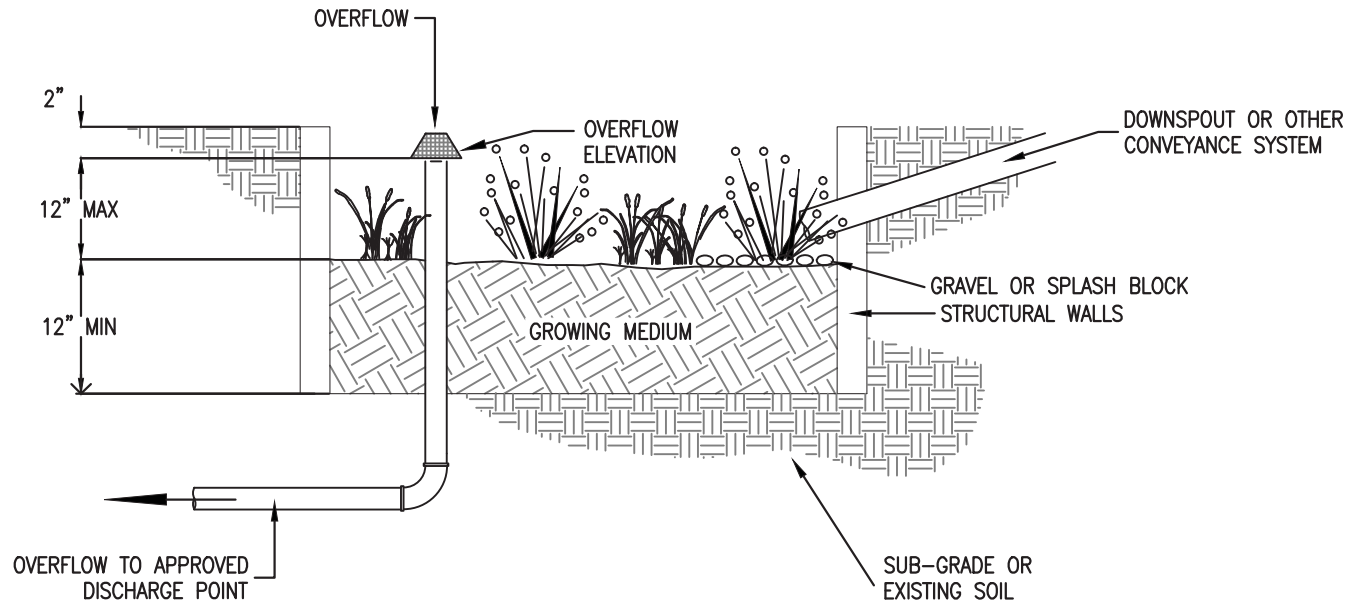
FOUNDATION
FILTRATION PLANTER
TYPICAL DETAILS



1. Provide protection from all vehicle traffic, equipment staging, and foot traffic in proposed infiltration areas prior to, during, and after construction.
2. Dimensions:
 - a. Width of planter: 24" minimum.
 - b. Depth of planter: 6" minimum from top of growing medium to overflow elevation.
 - c. Slope of planter: 0.5% or less.
3. Setbacks:
 - a. Infiltration planters must be 10' from foundations and 5' from property lines.
 - b. Filtration planters do not require a setback with an approved waterproof liner.
4. Overflow:
 - a. Overflows are required to an approved discharge point when using the Simplified Method
 - b. Overflows are not required when sized to fully infiltrate the flood control event using the Presumptive Method.
 - c. Minimum 2" freeboard from overflow elevation to the top of the planter walls.
5. Piping: Minimum 3" pipe required for up to 1,500 sq ft of impervious area, otherwise 4" min. Piping material, slopes and installation shall follow the Uniform Plumbing Code.
6. Drain rock:
 - a. Size: 3/4" to 2-1/2" diameter open graded
 - b. Depth: 12" Minimum
 - c. Length and Width: Full length and width of facility
7. Drain rock layer shall be separated from the growing medium by a geotextile filter fabric
8. Growing medium:
 - a. In 0-2 year TOTZ, a 24" minimum with at least 50% organic material
 - b. In all other areas, 12" minimum
 - c. Import topsoil or amended native soil.
9. Vegetation: Follow landscape plans otherwise refer to plant list in SWMM Appendix F. Minimum container size is 1 gallon.
of plantings per 100sf of facility area:
 - a. 100 Ground Covers, OR
 - b. 80 Ground Covers and 4 Small Shrubs, OR
 - c. 60 Ground Covers and 12 Small Shrubs
10. Planter walls:
 - a. Material shall be stone, brick, concrete, wood, or other durable material (no chemically treated wood).
 - b. Walls shall be included on building plans here incorporated into foundations or other permitted structures..
11. Waterproof liner (where required): Shall be 30 mil PVC or equivalent.
12. Install washed pea gravel or river rock to transition from inlet or splash pad to growing medium.

FILTRATION PLANTER

TYPICAL DETAILS



1. Provide protection from all vehicle traffic, equipment staging, and foot traffic in proposed infiltration areas prior to, during, and after construction.

2. Dimensions:

- a. Width of planter: 24" minimum.
- b. Depth of planter: 6" minimum from top of growing medium to overflow elevation.
- c. Slope of planter: 0.5% or less.

3. Setbacks:

- a. Infiltration planters must be 10' from foundations and 5' from property lines.
- b. Filtration planters do not require a setback with an approved waterproof liner.

4. Overflow:

- a. Overflows are required to an approved discharge point when using the Simplified Method
- b. Overflows are not required when sized to fully infiltrate the flood control event using the Presumptive Method.
- c. Minimum 2" freeboard from overflow elevation to the top of the planter walls.

5. Piping: Minimum 3" pipe required for up to 1,500 sq ft of impervious area, otherwise 4" min. Piping material, slopes and installation shall follow the Uniform Plumbing Code.

6. Growing medium:

- a. In 0-2 year TOTZ, a 24" minimum with at least 50% organic material
- b. In all other areas, 12" minimum
- c. Import topsoil or amended native soil

7. Vegetation: Follow landscape plans otherwise refer to plant list in SWMM Appendix F. Minimum container size is 1 gallon.

of plantings per 100sf of facility area:

- a. 100 Ground Covers, OR
- b. 80 Ground Covers and 4 Small Shrubs, OR
- c. 60 Ground Covers and 12 Small Shrubs

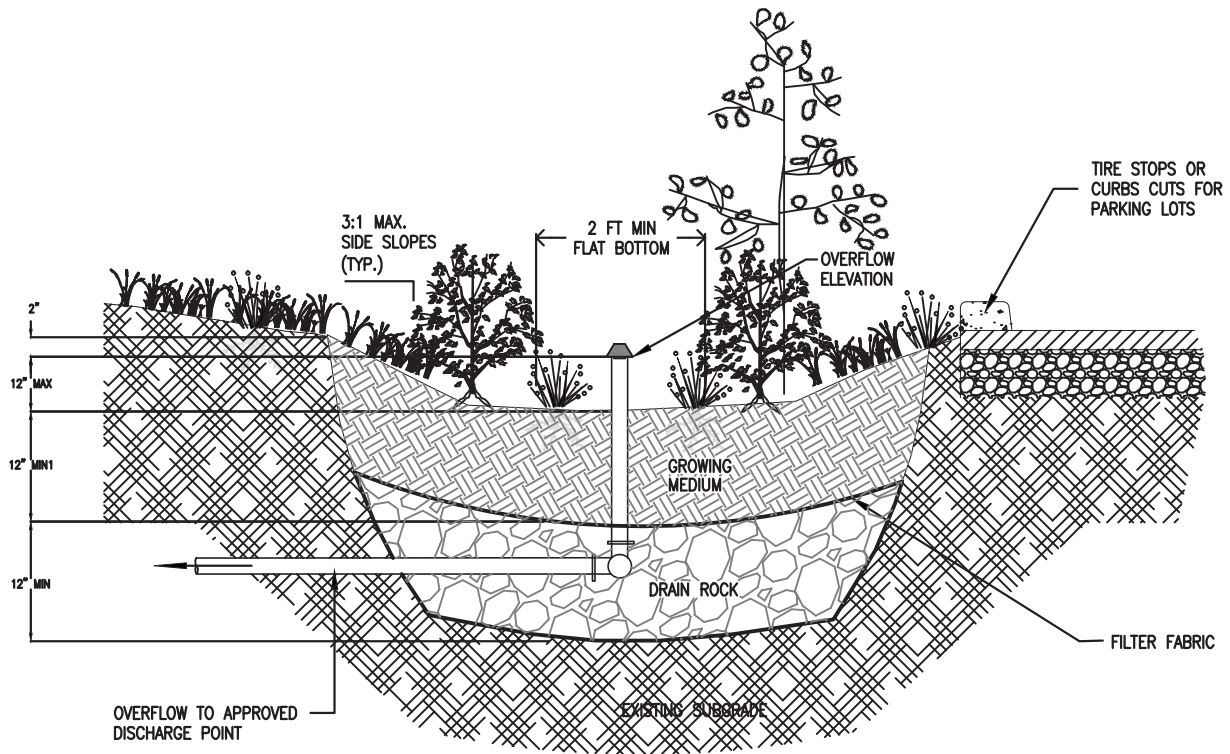
8. Planter walls:

- a. Material shall be stone, brick, concrete, wood, or other durable material (no chemically treated wood).
- b. Walls shall be included on building plans here incorporated into foundations or other permitted structures..

9. Install washed pea gravel or river rock to transition from inlet or splash pad to growing medium.

INFILTRATION PLANTER

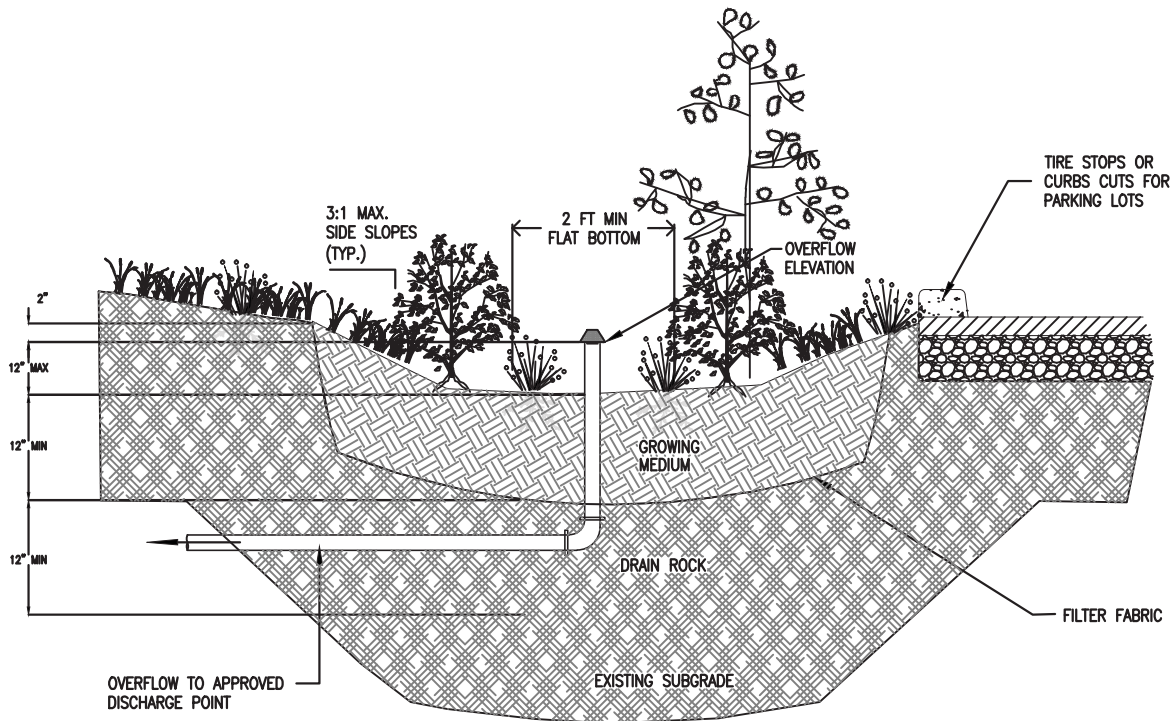
TYPICAL DETAILS



1. Provide protection from all vehicle traffic, equipment staging, and foot traffic in proposed infiltration areas prior to, during, and after construction.
2. Dimensions:
 - a. Depth of rain garden: 6" minimum and 12" maximum
 - b. Flat bottom width: 2' min.
 - c. Side slopes of Rain Garden: 3:1 maximum.
3. Setbacks:
 - a. Infiltration rain gardens must be 10' from foundations and 5' from property lines.
 Filtration Rain Garden do not require a setback with an approved waterproof liner.
4. Overflow:
 - a. Overflows are required unless sized to fully infiltrate the flood control design storm.
 - b. Inlet elevation must allow for 2" of freeboard, minimum.
5. Piping: Minimum 3" pipe required for up to 1,500 sq ft of impervious area, otherwise 4" min. Piping material, slopes and installation shall follow the Uniform Plumbing Code.
6. Drain rock:
 - a. Size: 3/4"-2-1/2" washed
 - b. Depth: 12" Minimum
7. Drain rock later shall be separated from the growing medium and the surround soils by a geotextile filter fabric.
8. Growing medium:
 - a. In 0-2 year TOTZ, a 24" minimum with at least 50% organic material
 - b. In all other areas, 12" minimum
 - c. Import topsoil or amended native soil
9. Vegetation: Follow landscape plans otherwise refer to plant list in SWMM Appendix F. Number of plantings per 100sf of facility area:
 - a. 100 Ground Covers, OR
 - b. 80 Ground Covers, 2 Large Shrubs 4 Small Shrubs and 1 tree (deciduous or evergreen)
10. Install washed pea gravel or river rock to transition from inlets and splash pad to growing medium.

FILTRATION RAIN GARDEN

TYPICAL DETAILS

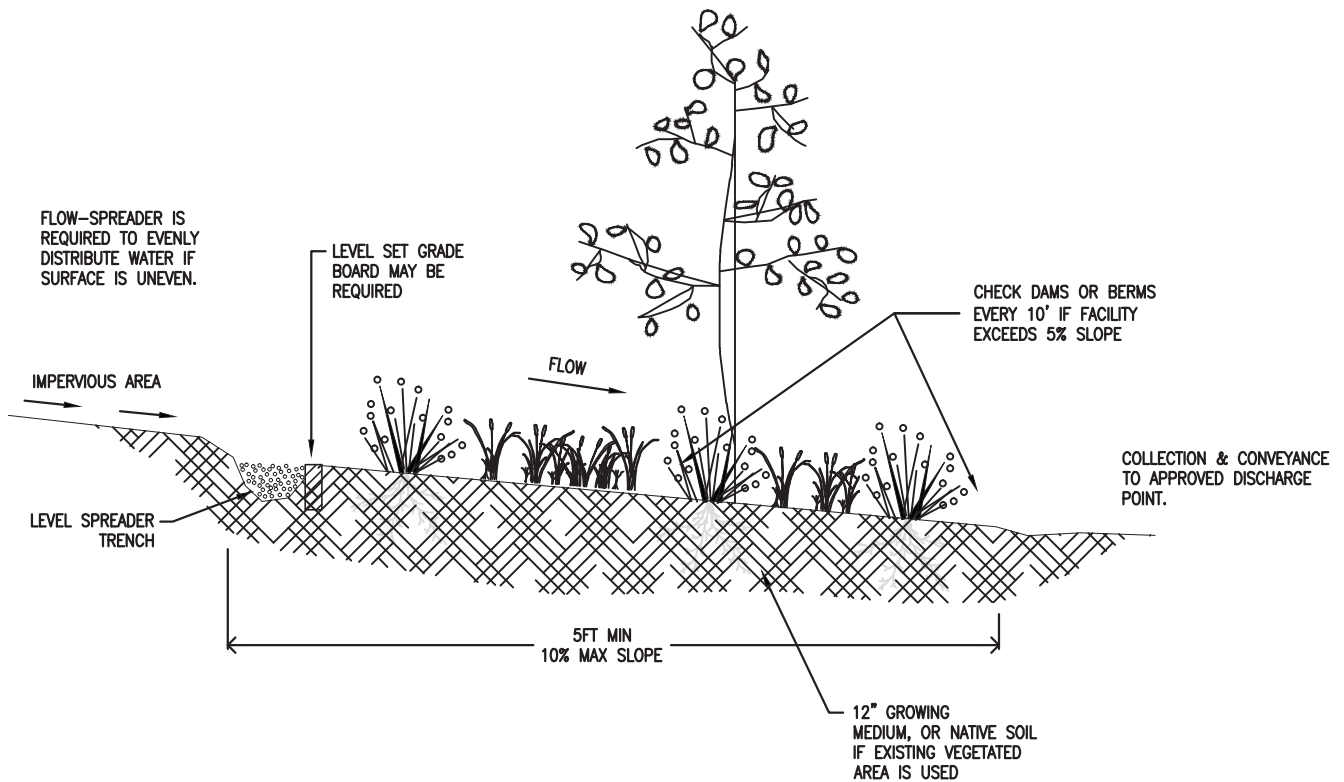


1. Provide protection from all vehicle traffic, equipment staging, and foot traffic in proposed infiltration areas prior to, during, and after construction.
2. Dimensions:
 - a. Depth of rain garden: 6" minimum and 12" maximum
 - b. Flat bottom width: 2' min.
 - c. Side slopes of Rain Garden: 3:1 maximum.
3. Setbacks:
 - a. Infiltration rain gardens must be 10' from foundations and 5' from property lines. Filtration Rain Garden do not require a setback with an approved waterproof liner.
4. Overflow:
 - a. Overflows are required unless sized to fully infiltrate the flood control design storm.
 - b. Inlet elevation must allow for 2" of freeboard, minimum.

5. Piping: Minimum 3" pipe required for up to 1,500 sq ft of impervious area, otherwise 4" min. Piping material, slopes and installation shall follow the Uniform Plumbing Code.
6. Growing medium:
 - a. In 0-2 year TOTZ, a 24" minimum with at least 50% organic material
 - b. In all other areas, 12" minimum
 - c. Import topsoil or amended native soil
7. Vegetation: Follow landscape plans otherwise refer to plant list in SWMM Appendix F. Number of plantings per 100sf of facility area:
 - a. 100 Ground Covers, OR
 - b. 80 Ground Covers, 2 Large Shrubs 4 Small Shrubs and 1 tree (deciduous or evergreen)
8. Install washed pea gravel or river rock to transition from inlets and splash pad to growing medium.

INFILTRATION RAIN GARDEN

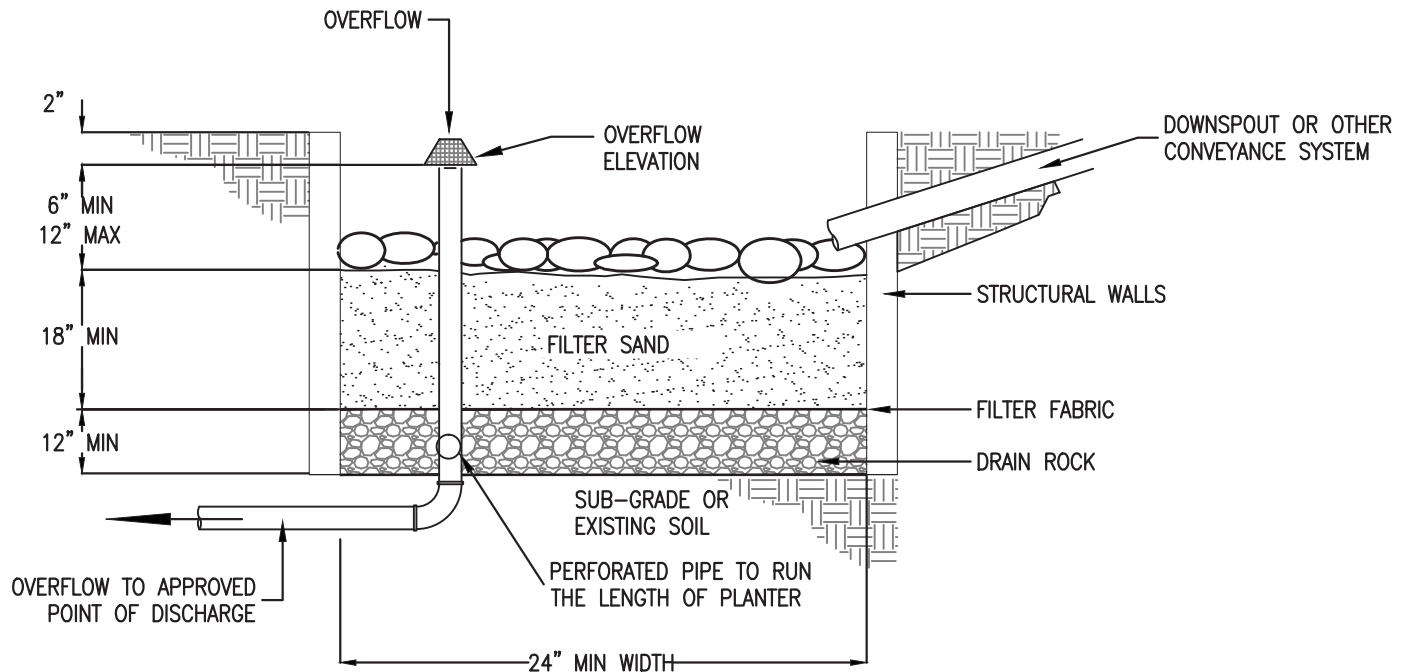
TYPICAL DETAILS



1. Provide protection from all vehicle traffic, equipment staging, as well as foot traffic for proposed infiltration areas prior to and during construction.
2. Dimensions:
 - a. Flow line length: 5' minimum.
 - b. Slopes: 0.5 - 10%
3. Setbacks (from beginning of facility):
 - a. 5' from property line
 - b. 10ft from buildings
 - c. 50ft from wetlands, rivers, streams, and creeks where required.
4. Overflow: Collection from filter strip shall be specified on plans to approved discharge point.
5. Growing medium: Unless existing vegetated areas are used for the filter strip, growing medium shall be used within the top 12".
6. Vegetation: The entire filter strip must have 100% coverage by native grasses, native wildflower blends, native ground covers, or any combination thereof. Follow landscape plans otherwise refer to plant list in SWMM Appendix F. Number of plantings per 100sf of facility area:
 - a. 100 Ground Covers, OR
 - b. 80 Ground Covers, 4 Small Shrubs, OR
 - c. 60 Ground Covers, 12 Small Shrubs
7. Level Spreaders: A grade board, perforated pipe, berm or trench may be required to disperse the runoff evenly across the filter strip to prevent a point of discharge. The top of the level spreader must be horizontal and at an appropriate height to provide sheet flow directly to the soil without scour. Grade boards can be made of any material that will withstand weather and solar degradation. Trenches used as level spreaders can be open or filled with washed crushed rock, pea gravel, or sand
8. Check dams: shall be placed according to facility design otherwise:
 - a. Equal to the width of the filter
 - b. Every 10' where slope exceeds 5%.

FILTER STRIP

TYPICAL DETAILS



1. Provide protection from all vehicle traffic, equipment staging, and foot traffic in proposed infiltration areas prior to, during, and after construction.

2. Dimensions:

- a. Width: 24" minimum.
- b. Depth: 6" minimum
- c. Slope: 0.5% or less

3. Setbacks (from centerline of f):

- a. Infiltration sand filters must be 10' from foundations and 5' from property lines. Filtration sand filters do not have setbacks with an approved waterproof liner.

4. Overflow:

- a. Overflows are required to an approved point of discharge.
- b. Inlet elevation must allow for 2" of freeboard, minimum.

5. Piping: Minimum 3" pipe required for up to 1,500 sq ft of impervious area, otherwise 4" min. Piping material, slopes and installation shall follow the Uniform Plumbing Code.

6. Drain rock (minimum): 12" minimum of 3/4" - 2-1/2" washed.

7. Separation between drain rock: Drain rock shall be separated from sand layer and surrounding sold by a geotextile filter fabric

8. Filter sand:

- a. 18" minimum.
- b. See sand specification in SWMM.

9. Sand filter walls:

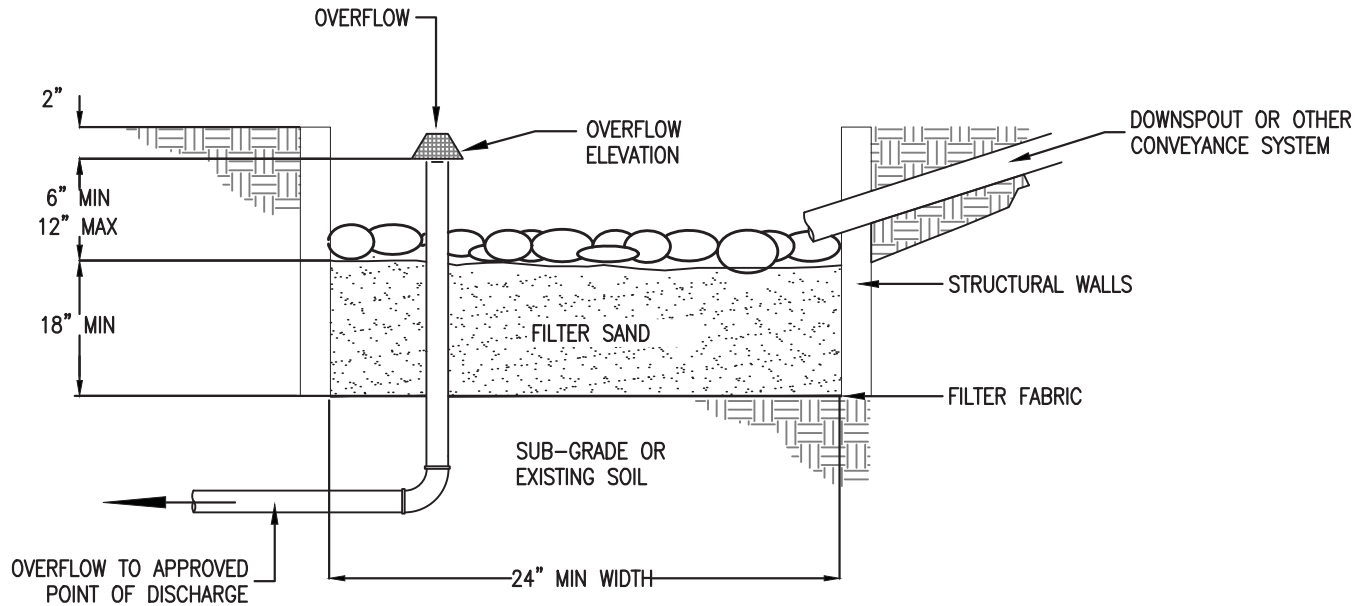
- a. Material shall be stone, brick, concrete, wood, or other durable material (no chemically treated wood).
- b. Filter walls built into foundation walls shall be shown on building plans.

10. Waterproof liner (where required): Shall be 30 mil PVC or equivalent.

11. Install washed pea gravel or river rock to transition from inlet or splash pad to growing medium.

FILTRATION SAND FILTER

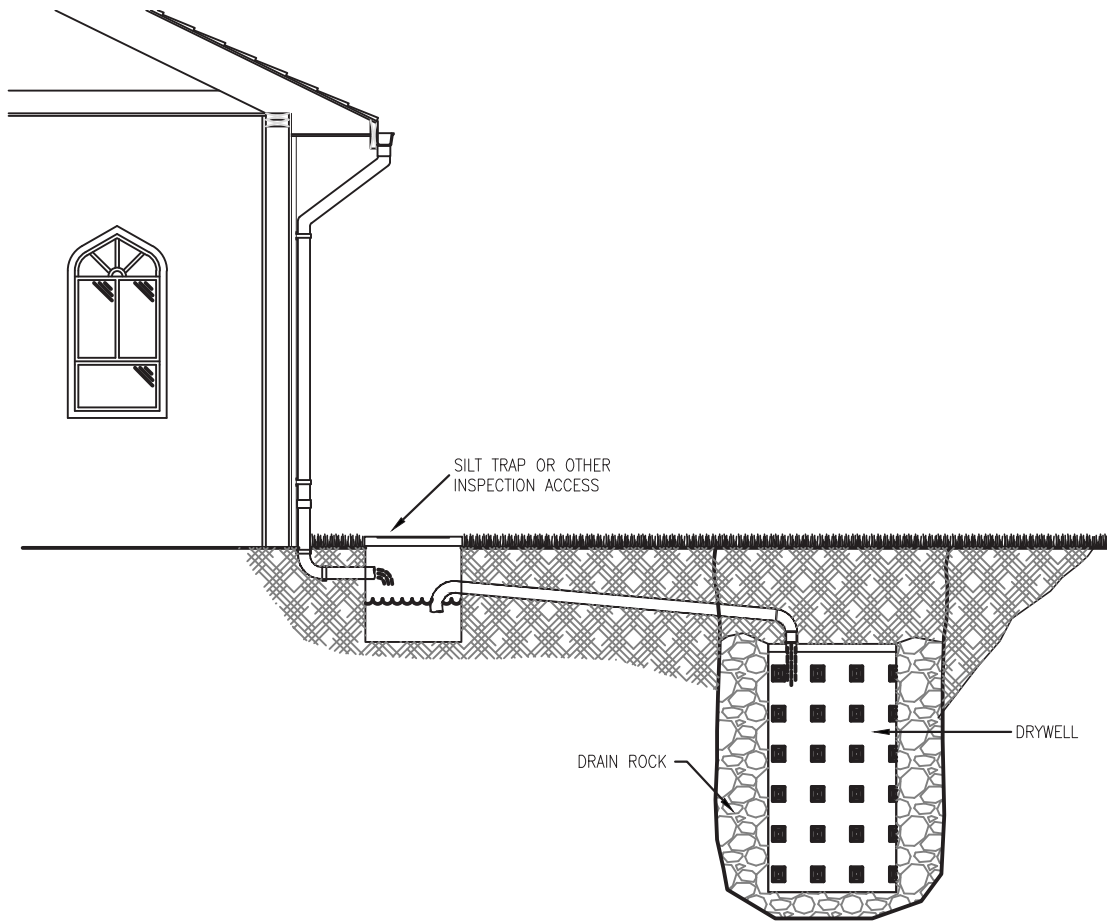
TYPICAL DETAILS



1. Provide protection from all vehicle traffic, equipment staging, and foot traffic in proposed infiltration areas prior to, during, and after construction.
2. Dimensions:
 - a. Width: 24" minimum
 - b. Depth: 6" minimum
 - c. Slope: 0.5% or less.
3. Setbacks:
 - a. Infiltration sand filters must be 10' from foundations and 5' from property lines.
 - b. Flow-through sand filters must be less than 30" in height above surrounding area if within 5 feet of property line.
4. Overflow (where required):
 - a. Overflow required for Simplified Approach.
 - b. Inlet elevation must allow for 2" of freeboard, minimum.
 - c. Protect from debris, sand, and sediment with strainer or grate.
5. Piping: Minimum 3" pipe required for up to 1,500 sq ft of impervious area, otherwise 4" min. Piping material, slopes and installation shall follow the Uniform Plumbing Code.
6. Filter sand:
 - a. 18" minimum.
 - b. See sand spec in SWMM Exhibit 2-4.
7. Sand filter walls:
 - a. Material shall be stone, brick, concrete, wood, or other durable material (no chemically treated wood).
 - b. Concrete, brick, or stone walls shall be included on foundation plans.
8. Install washed pea gravel or river rock to transition from inlet or splash pad to growing medium.

INFILTRATION SAND FILTER

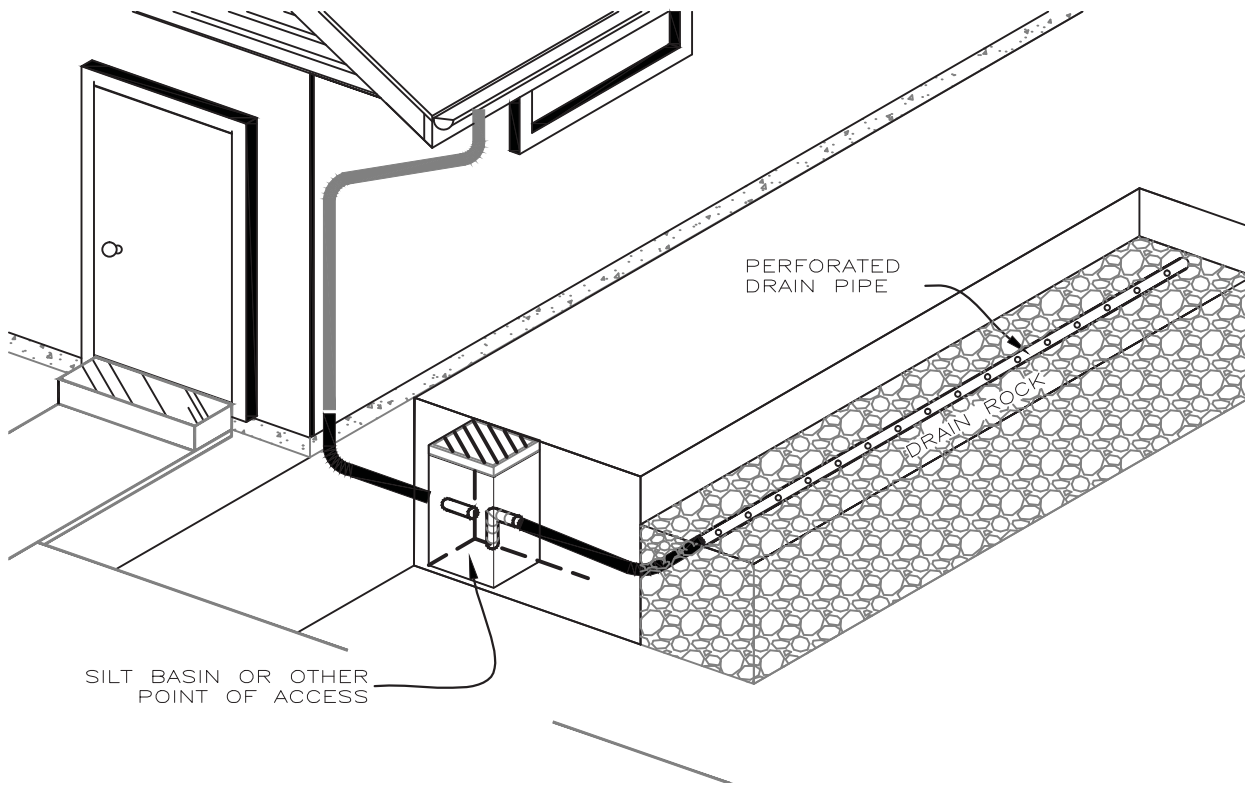
TYPICAL DETAILS



1. All drywells are considered Class 5 injection wells and must be registered with the Oregon Department of Environmental Quality as Underground Injection Control (UIC) systems.
2. Provide protection from all vehicle traffic, equipment staging, and foot traffic in proposed infiltration areas prior to, during, and after construction.
3. Drywells shall be designed using the presumptive approach due to the limited soil conditions in Eugene and the need to fully infiltrate the flood control design storm. This detail is intended to illustrate a typical drywell installation. Installation shall conform to the drywell design provided by the Presumptive Method.
4. Setbacks (from center of facility):
 - a. 10' from foundations
 - b. 5' from property lines
5. Piping: Minimum 3" pipe required for up to 1,500 sq ft of impervious area, otherwise 4" min. Piping material, slopes and installation shall follow the Uniform Plumbing Code.
6. Silt Traps: A silt trap or other access point is required at finished grade for inspection and maintenance access

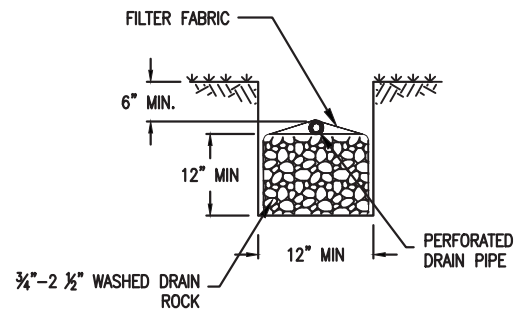
DRYWELL

TYPICAL DETAILS



1. All soakage trenches are considered injection wells and must be registered with the Oregon Department of Environmental Quality as Underground Injection Control (UIC) systems.
2. Provide protection from all vehicle traffic, equipment staging, and foot traffic in proposed infiltration areas prior to, during, and after construction.
3. Soakage trenches shall be designed using the presumptive approach due to the limited soil conditions in Eugene and the need to fully infiltrate the flood control design storm. This detail is intended to illustrate a typical soakage trench installation. Installation shall conform to the soakage trench design provided by the Presumptive Method.
4. Setbacks (from center of facility):
 - a. 10' from foundations
 - b. 5' from property lines
5. Piping: Minimum 3" pipe required for up to 1,500 sq ft of impervious area, otherwise 4" min. Piping material, slopes and installation shall follow the Uniform Plumbing Code.
6. Silt Traps: A silt trap or other access point is required at finished grade for inspection and maintenance access

SOAKAGE TRENCH TYPICAL CROSS SECTION



SOAKAGE TRENCH

TYPICAL DETAILS

APPENDIX E

OPERATIONS AND MAINTENANCE

This appendix presents the operation and maintenance (O&M) requirements for stormwater management facilities designed and installed in the City of Springfield pursuant to SDC 4.3.110.

INTRODUCTION

Notice of Operations and Maintenance Agreement – (NOMA)

The NOMA must be in a form approved by the City Attorney and must identify the property as having a stormwater management facility and the responsible party for future operations and maintenance. *The NOMA must be completed and recorded at Lane County Deeds and Records. Signatures on the NOMA shall be notarized.*

The intent of the NOMA is to ensure that the facility will be identified to future property owners and that the facility will be maintained according to the Springfield Development Code, Springfield Municipal Code, the O&M Agreement, and the O&M Plan for the site.

Operations and Maintenance Agreement – (O&M Agreement)

The O&M Agreement must be on a form approved by the City Attorney and must identify the property as having a stormwater management facility; the owner's name, address, email, and phone number; the site address; financially responsible party for ongoing operation and maintenance; and parties responsible for inspecting and maintaining the facility.

The O&M Agreement does not need to be recorded. The intent of the Agreement is to ensure that the facility will be maintained for functionality, aesthetics, and will identify accountability. The stormwater site plan attached to the Agreement will help identify to the owners and inspectors the location and the functions of the stormwater facilities, and the Facility Specific O&M Plan will identify the routine maintenance procedures and scheduling.

Facility Specific Operations and Maintenance Plan – (&M Plan)

This appendix provides pre-approved Facility Specific Operations and Maintenance Plans (O&M Plans) for various types of stormwater quality facilities. Stormwater facilities that are not included in this appendix (i.e. a manufactured stormwater treatment technology), are required to submit an O&M Plan that meets the manufacturer's requirements and facility specific operations and maintenance activities consistent with ongoing function of the stormwater facility(ies).

The O&M Plan strategies in this appendix apply to all stormwater management facilities and related facility components identified in SDC 4.3.110. Stormwater destination facilities are required to be operated and maintained in working condition for the life of the facility.

Private Facilities:

Record a copy of the NOMA with Lane County Deeds and Records. Submit with the final site plan, a *recorded copy* of the NOMA, the O&M Agreement, and the Facility Specific Operations and Maintenance Plan (O&M Plan) for each type of stormwater management facility permitted on the site. The operations and maintenance activities listed on the O&M Plan documents, which will be on file with the City Engineer, may later be revised with City Engineer approval.

Public Facilities:

Submit a copy of a Facility Specific O&M Plan with the Public Improvement Permit Project. County recording of this plan is not necessary.

OPERATIONS AND MAINTENANCE PLAN SUBMITTALS

Privately Maintained Facilities

The *O&M Plan* for a privately maintained facility shall include the following components for each development site. A complete Plan must be submitted and approved as provided in SDC 4.3.110.

1. A recorded copy of the Notice of Operation and Maintenance Agreement (NOMA)
2. Operations and Maintenance Agreement (O&M Agreement)
3. Stormwater Management Site Plan (as approved under the Development Agreement)
4. Landscape Plan
5. Stormwater Management Facility Inspection and Maintenance Log
6. Facility-Specific Operations and Maintenance Plan(s) (O&M Plan(s))

Detailed submission requirements for the above items are found below.

1.) *Notice of Operations and Maintenance Agreement – (NOMA):* The NOMA identifies the property as having a stormwater management facility and identifies the responsible party for future operations and maintenance. *The Notice must be completed and recorded at Lane County Deeds and Records. Signatures on the Notice shall be notarized.* The NOMA may be submitted in person or mailed, along with payment of the applicable fees, to the County Recorder's Office. Lane County Deeds and Records, 125 E 8th Avenue, Eugene, OR 97401.

https://www.lanecounty.org/government/county_departments/county_administration/operations/county_clerk/real_property_recording/document_recording_requirements

The property description on the NOMA must be a full legal description of the property and may not be a tax lot number. Legal descriptions may be obtained from the county assessor's office. *The NOMA shall be printed on legal-sized (8 ½ x 14) paper to facilitate the recording process. If printed on smaller paper, additional recording fees may apply.*

2.) *Operations and Maintenance Agreement – (O&M Agreement):* The completed Agreement must identify the owner's name, address, and phone number, the site address, financial method used to cover future operation and maintenance, and parties responsible for inspecting and maintaining the facility. The O&M Agreement does not need to be recorded.

3.) *Stormwater Management Site Plan:* A copy of the Stormwater Management Site Plan shall be attached to the O&M Agreement. The Plan must show the location of the facility(ies) on the site, the sources of runoff entering the facility, and the ultimate stormwater destination.

4.) *Landscape Plan:* A Landscape Plan (if separate from the Stormwater Management Site Plan) shall be attached to the O&M Agreement. The Plan must show the location, density, plant size, quantity, and species by scientific and common name.

5.) *Stormwater Management Facility Inspection and Maintenance Log:* Stormwater Management Facility Inspection and Maintenance Logs must be kept on file by the facility owner(s). Logs should note all inspection dates, the facility components that were inspected, and any maintenance or repairs made. The Facility-Specific O&M Plans can serve as a checklist for what should be included in the Log (e.g. the facility elements that need to be inspected, frequency of inspection, conditions that indicate maintenance is needed, etc.). Logs must include the information listed in the form included in this appendix. Logs must be retained on site for a minimum of two years.

6.) *Facility Specific Operations and Maintenance Plans – (O&M Plan):* O&M Plans provided in this packet identify the specific operations and maintenance activities that are required for each of the approved stormwater management facilities listed in Appendix D Stormwater Facility Details. The appropriate Plan must be attached to the O&M Agreement and submitted as part of the application process. Applicants may either select and use the pre-approved Facility Specific O&M Plans provided in this packet or prepare a Facility Specific O&M Plan that incorporates the specific activities that corresponds with their chosen type of stormwater facilities through a Type II review process. The Facility Specific O&M Plans do not have to be recorded. This allows the future stormwater management facility owner to submit operations and maintenance activity revisions to the City without the need to re-record the O&M Plans with the County.

The facility specific operations and maintenance activities for private facilities may be modified any time after permit issuance subject to mutual agreement by the City and owner, in writing. Modifying the operations and maintenance activities is optional, and is intended to give the owner an opportunity to adjust maintenance needs according to site-specific history and conditions. Modifications may require the owner to apply for concurrent modification of a prior land use approval. Proposed modifications to the O&M Plan must be submitted, along with an updated O&M Agreement, to the City for review and approval.

7.) *Operations and Maintenance Plans for Proprietary Facilities:* Proprietary O&M Plans for approved proprietary facilities must describe the inspection, cleaning, and operation and maintenance criteria for the facility and provide manufacturer's recommended maintenance if applicable.

Stormwater Management Facility

Inspection & Maintenance Log

STORMWATER MANAGEMENT FACILITY INSPECTION AND MAINTENANCE LOG
Property Address:
Inspection Date:
Inspection Time:
Inspected By:
Approximate Date/Time of Last Rainfall:
Type of Stormwater Management Facility:
Location of Facility on Site (in relation to buildings or other permanent structures):
Water levels and observations (ponded water (indicating poor soil permeability), oil sheen, smell, turbidity, etc.):
Sediment accumulation and/or areas of erosion? Record sediment removal/erosion repair:
Condition of vegetation? Record survival rates, invasive species present, number of dead plants, etc. Record any replacement of plants and type of management (mowing, weeding, etc.):
Condition of physical properties such as inlets, outlets, piping, fences, irrigation facilities, and side slopes? Record damaged items and replacement activities:
Presence of litter? Presence of insects or damage from animals? Record removal activities:
Identify safety hazards present. Record resolution activities:

Facility Specific

Operations & Maintenance Plans

FACILITY SPECIFIC OPERATIONS AND MAINTENANCE PLANS	
Eco-Roofs	
Contained Planters	
Permeable Pavement	
Swales (Vegetated, Grassy and Street)	
Level Spreaders	
Vegetated Filter Strips	
Stormwater Planters	
Rain Gardens	
Sand Filters	
Soakage Trenches	
Wet, Extended Wet, and Dry Ponds	
Constructed Treatment Wetlands	
Underground Detention Tanks, Vaults and Pipes	
Drywells	
Spill Control Manholes	

<p style="text-align: center;">Eco-Roofs Operations and Maintenance Plan</p>
<p>Eco-Roofs are lightweight vegetated roof systems used in place of conventional roofs that retain and filter stormwater and provide aesthetic and energy conservation benefits. All facility components, including soil substrate or growth medium, vegetation, drains, irrigation systems (if applicable), membranes, and roof structure shall be inspected for proper operations, integrity of the waterproofing, and structural stability throughout the life of the eco-roof. All elements shall be inspected once a month from April through September. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:</p>
<p>Soil Substrate/ Growing Medium shall be inspected for evidence of erosion from wind or water. If erosion channels are evident, they shall be stabilized with additional soil substrate/growth medium and covered with additional plants.</p>
<p>Structural Components shall be operated and maintained in accordance with manufacturer's requirements. Drain inlets shall be kept unrestricted.</p> <ul style="list-style-type: none"> • Inlet/outlet pipe shall be cleared when soil substrate, vegetation, debris or other materials clog the drains. Sources of sediment and debris shall be identified and corrected. • Determine if drain pipe is in good condition and correct as needed.
<p>Debris and Litter shall be removed to prevent clogging of drains and interference with plant growth.</p>
<p>Vegetation shall be maintained to provide 90% plant cover.</p> <ul style="list-style-type: none"> • During the Establishment Period, plants shall be replaced once per month as needed. During the long-term period, dead plants shall generally be replaced once per year in the fall months. • Fallen leaves and debris from deciduous plant foliage shall be removed if build up occurs. • Nuisance and prohibited vegetation shall be removed when discovered. • Dead vegetation shall be removed and replaced with new plants. • Weeding shall be manual with no herbicides or pesticides used. Weeds shall be removed regularly and not allowed to accumulate. • Fertilization is not necessary and fertilizers shall not be applied. • During drought conditions, mulch or shade cloth may be applied to prevent excess solar damage and water loss. • Mowing of grasses shall occur as needed. Clippings shall be removed if build up occurs.
<p>Irrigation can be accomplished either through hand watering or automatic sprinkler systems. If automatic sprinklers are used, manufacturers' instructions for operations and maintenance shall be followed.</p> <ul style="list-style-type: none"> • During the Establishment Period (1-3 years), water sufficient to assure plant establishment and not to exceed ¼ inch of water once every 3 days shall be applied. • During the long-term period (3+ years), water sufficient to maintain plant cover and not to exceed ¼ inch of water once every 14 days shall be applied.
<p>Spill Prevention measures from mechanical systems located on roofs shall be exercised when handling substances that can contaminate stormwater.</p> <ul style="list-style-type: none"> • Releases of pollutants shall be corrected as soon as identified. • The presence of a green/eco roof does not waive requirements for containment of mechanical systems.
<p>Training and/or written guidance information for operating and maintaining rooftop gardens shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.</p>
<p>Access and Safety to the eco-roof shall be safe and efficient.</p> <ul style="list-style-type: none"> • Egress and ingress routes shall be maintained to design standards. Walkways shall be clear of obstructions and maintained to design standards.
<p>Aesthetics of the rooftop garden shall be maintained as an asset to the property owner and community.</p> <ul style="list-style-type: none"> • Evidence of damage or vandalism shall be repaired and accumulation of trash or debris shall be removed upon discovery.

Insects shall not be harbored on the eco-roof.

- Standing water creating an environment for development of insect larvae shall be eliminated by manual means. Chemical sprays shall not be used.

<p style="text-align: center;">Contained Planters Operations and Maintenance Plan</p>
<p>Contained planters are designed to intercept rainfall that would normally fall on impervious surfaces. In this respect, contained planters convert impervious surfaces to pervious surfaces, decreasing the amount of stormwater runoff from a site. Water should drain through the planter within 3-4 hours after a storm event. All facility components and vegetation shall be inspected for proper operations and structural stability. These inspections shall occur, at a minimum, quarterly for the first 2 years from the date of installation and 2 times per year thereafter. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:</p>
<p>Filter Media consisting of sand or topsoil shall allow stormwater to percolate uniformly through the planter.</p> <ul style="list-style-type: none"> • Planter shall be excavated and cleaned, and gravel or soil shall be replaced to correct low infiltration rates. • Holes that are not consistent with the design and allow water to flow directly through the planter to the ground shall be plugged. • Litter and debris shall be removed routinely (e.g., no less than quarterly) and upon discovery
<p>Planter shall contain filter media and vegetation.</p> <ul style="list-style-type: none"> • Structural deficiencies in the planter including rot, cracks, and failure shall be repaired.
<p>Planter Reservoir receives and detains storm water prior to infiltration. If water does not drain from reservoir within 3-4 hours of storm event, sources of clogging shall be identified and corrected. Topsoil may need to be amended with sand or replaced all together.</p>
<p>Vegetation shall be healthy and dense enough to provide filtering while protecting underlying soils from erosion.</p> <ul style="list-style-type: none"> • Mulch shall be replenished at least annually. • Planter vegetation shall be irrigated to ensure survival. • Vegetation or trees that limit access or interfere with planter operation shall be pruned or removed. • Fallen leaves and debris from deciduous plant foliage shall be raked and removed. • Nuisance and prohibited vegetation shall be removed when discovered. Invasive vegetation contributing up to 25% of vegetation of all species (measured in a 10 x 10 foot plot) shall be removed and replaced. • Dead vegetation shall be removed to maintain less than 10% of area coverage or when planter function is impaired. Vegetation shall be replaced within a specific timeframe, e.g., 3 months, or immediately if required to maintain cover density and control erosion where soils are exposed.
<p>Training and/or written guidance information for operating and maintaining planters shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.</p>
<p>Access to the stormwater planter shall be safe and efficient. Egress and ingress routes shall be maintained to design standards. Roadways shall be maintained to accommodate size and weight of vehicles, if applicable.</p> <ul style="list-style-type: none"> • Obstacles preventing maintenance personnel and/or equipment access to the planter shall be removed. • Gravel or ground cover shall be added if erosion occurs, e.g., due to vehicular or pedestrian traffic.
<p>Insects and Rodents shall not be harbored at the stormwater planter. Pest control measures shall be taken when insects/rodents are found to be present.</p> <ul style="list-style-type: none"> • Standing water creating an environment for development of insect larvae shall be eliminated. • If a complaint is received or an inspection reveals that a stormwater facility is significantly infested with mosquitoes or other vectors, the property owner/owners or their designee may be required to eliminate the infestation at the City inspector's discretion. Control of the infestation shall be attempted by using first nonchemical methods and secondly, only those chemical methods specifically approved by the City's inspector. Acceptable methods include but are not limited to the following:

- i. Installation of predacious bird or bat nesting boxes.
 - ii. Alterations of water levels approximately every 4 days in order to disrupt mosquito larval cycles.
 - iii. Stocking ponds and other permanent water facilities with fish or other predatory species.
 - iv. If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides *Bacillus thurengensis* var. *israeliensis* or other approved larvicides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor.
- Holes in the ground located in and around the stormwater planter shall be filled and compacted.

Debris and Litter shall be removed to maintain soil health and to prevent interference with plant growth.

<p style="text-align: center;">Permeable Pavement Operations and Maintenance Plan</p>
<p>Permeable Pavement is a porous pavement surface with an underlying stone reservoir that temporarily stores surface runoff before infiltrating into the subsoil or being collected in underlying drain pipes and being discharged off-site. There are many types of permeable pavement including plastic rings planted with grass, stone or concrete blocks with pore spaces backfilled with gravel or sand, porous asphalt, and porous concrete. Permeable pavement accepts only precipitation, not stormwater runoff. All facility components, vegetation, and source controls shall be inspected for proper operations and structural stability, at a minimum, quarterly for the first 2 years from the date of installation, 2 times per year thereafter, and within 48 hours after each major storm event. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:</p>
<p>Surface: In most permeable pavement design, the pavement itself acts as pretreatment to the stone reservoir below. The surface shall be kept clean and free of leaves, debris, and sediment. The surface shall not be overlaid with an impermeable paving surface.</p> <ul style="list-style-type: none"> • Regular sweeping shall be implemented for porous asphalt or concrete systems. Vacuum sweeping is preferred and can greatly prolong the effective life of the pavement.
<p>Overflows or Emergency Spillways are used in the event that the facility's infiltration capacity is exceeded. Overflow devices shall be inspected for obstructions or debris, which shall be removed upon discovery. Overflow or emergency spillways shall be capable of transporting high flows of stormwater to an approved stormwater receiving system.</p> <ul style="list-style-type: none"> • Sources of erosion damage shall be identified and controlled when native soil is exposed near the overflow structure.
<p>Vegetation (where applicable) shall be healthy and dense enough to provide filtering while protecting underlying soils from erosion. Vegetation, such as trees and shrubs, should not be located in or around the permeable pavement because roots from trees can penetrate the pavement, and leaves from deciduous trees and shrubs can increase the risk of clogging the surface.</p> <ul style="list-style-type: none"> • Vegetation and large shrubs/trees that limit access or interfere with porous pavement operation shall be pruned. • Fallen leaves and debris from deciduous plant foliage shall be raked and removed. • Poisonous, nuisance, dead or odor producing vegetation shall be removed immediately. • Grass shall be mowed to less than four inches and grass clippings shall be bagged and removed. • Irrigation shall be provided as needed.
<p>Source Control measures prevent pollutants from mixing with stormwater. Typical non-structural control measures include raking and removing leaves, street sweeping, vacuum sweeping, limited and controlled application of pesticides and fertilizers, and other good housekeeping practices.</p>
<p>Spill Prevention measures shall be exercised when handling substances that can contaminate stormwater. A spill prevention plan shall be implemented at all non-residential sites and in areas where there is likelihood of spills from hazardous materials. However, virtually all sites, including residential and commercial, present potential danger from spills. All homes contain a wide variety of toxic materials including gasoline for lawn mowers, antifreeze for cars, solvents, pesticides, and cleaning aids that can adversely affect stormwater if spilled. It is important to exercise caution when handling substances that can contaminate stormwater. Releases of pollutants shall be corrected as soon as identified. In addition, long term exposure to low levels of petroleum products, such as that from a leaky vehicle, can severely degrade the pavement.</p>
<p>Training and/or written guidance information for operating and maintaining permeable pavement shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.</p>
<p>Access to the permeable pavement shall be safe and efficient. Egress and ingress routes shall be maintained to design standards. Roadways shall be maintained to accommodate size and weight of vehicles, if applicable. Obstacles preventing maintenance personnel and/or equipment access to the porous pavement shall be removed. Gravel or ground cover shall be added if erosion occurs, e.g., due to</p>

vehicular or pedestrian traffic.

Debris and Litter shall be removed to prevent clogging.

Insects and Rodents shall not be harbored at the permeable pavement. Pest control measures shall be taken when insects/rodents are found to be present.

- Standing water creating an environment for development of insect larvae shall be eliminated.
- If a complaint is received or an inspection reveals that a stormwater facility is significantly infested with mosquitoes or other vectors, the property owner/owners or their designee may be required to eliminate the infestation at the City inspector's discretion. Control of the infestation shall be attempted by using first non-chemical methods and secondly, only those chemical methods specifically approved by the City's inspector. Acceptable methods include but are not limited to the following:
 - i. Installation of predacious bird or bat nesting boxes.
 - ii. Alterations of pond water levels approximately every four days in order to disrupt mosquito larval development cycles.
 - iii. Stocking ponds and other permanent water facilities with fish or other predatory species.
 - iv. If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides *Bacillus thurengensis* var. *israeliensis* or other approved larvicides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor.
- Holes in the ground located in and around the permeable pavement shall be filled and compacted.

If used at this site, the following will be applicable:

Signage may serve to educate people about the importance or function of the site's stormwater protection measures. It may also discourage behaviors that adversely affect stormwater protection measures. For example, if debris is a problem, a sign reminding people not to litter may partially solve the problem. Broken or defaced signs shall be replaced/repared.

Placing of permeable pavement on site:

Permeable pavement should not be placed in any area where there is high likelihood of spills or contamination such as vehicle fueling areas, washing areas, loading docks, trash enclosures or material handling areas. Permeable pavement is not well suited to high traffic areas or areas where heavy vehicles will frequently travel. Such areas include parking lot lanes, entrance lanes and any areas subject to vehicle braking and turning movements. Parking lot stalls, emergency access areas and infrequently used areas are typically suitable for permeable pavement treatment.

<p align="center">Swales (Vegetated, Grassy and Street) Operations and Maintenance Plan</p>
<p>Swales are vegetated or grassed open channels that trap pollutants by filtering and slowing flows, allowing particles to settle out. The swale should drain within 48 hours of a storm event. All facility components, vegetation, and source controls shall be inspected for proper operations and structural stability, at a minimum, quarterly for the first 2 years from the date of installation, 2 times per year thereafter, and within 48 hours after each major storm event. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:</p>
<p>Swale Inlet (such as curb cuts or pipes) shall maintain a calm flow of water entering the swale.</p> <ul style="list-style-type: none"> • Source of erosion shall be identified and controlled when native soil is exposed or erosion channels are forming. • Sediment accumulation shall be hand-removed with minimum damage to vegetation using proper erosion control measures. Sediment shall be removed if it is more than 3" thick or so thick as to damage or kill vegetation. • Inlet shall be cleared when conveyance capacity is plugged. Sources of sediment and debris shall be identified and corrected. • Rock splash pads, spreaders and dissipaters shall be replenished to prevent erosion.
<p>Side Slopes shall be maintained to prevent erosion that introduces sediment into the swale.</p> <ul style="list-style-type: none"> • Slopes shall be stabilized and planted using appropriate erosion control measures when native soil is exposed or erosion channels are forming.
<p>Swale Media shall allow stormwater to percolate uniformly through the landscape swale. If the swale does not drain within 48 hours, it shall be tilled and replanted according to design specifications.</p> <ul style="list-style-type: none"> • Swale area shall be protected during construction from compaction. • Annual or semi-annual tilling shall be implemented if compaction or clogging continues. • Debris in quantities that inhibit operation shall be removed routinely (e.g., no less than quarterly), or upon discovery.
<p>Swale Outlet shall maintain sheet flow of water exiting swale unless a collection drain is used. Source of erosion damage shall be identified and controlled when native soil is exposed or erosion channels are forming.</p> <ul style="list-style-type: none"> • Outlets such as drains and overland flow paths shall be cleared when 50% of the conveyance capacity is plugged. • Outlet structures shall be cleaned of sediment and debris at least 1 time per year or when the level is at 50% of the conveyance capacity. • Sources of sediment and debris shall be identified and corrected.
<p>Vegetation shall be healthy and dense enough (at least 90% cover) to provide filtering while protecting underlying soils from erosion. Mulch shall be replenished as needed to ensure survival of vegetation.</p> <ul style="list-style-type: none"> • Vegetation, large shrubs or trees that interfere with landscape swale operation shall be pruned. • Fallen leaves and debris from deciduous plant foliage shall be removed if build up is damaging vegetation. • Grassy swales shall be mowed to keep grass 4" to 9" in height. Clippings shall be removed when possible, to remove pollutants absorbed in grasses, or when build up is damaging vegetation. • Nuisance and prohibited vegetation (such as blackberries and English Ivy) shall be removed when discovered. Invasive vegetation contributing up to 25% of vegetation of all species shall be removed and replaced. • Dead vegetation and woody material shall be removed to maintain less than 10% of area coverage or when swale function is impaired. Vegetation shall be replaced within 3 months, or immediately if required to maintain cover density and control erosion where soils are exposed.
<p>Debris and Litter shall be removed to ensure stormwater conveyance and to prevent clogging of inlet and outlet drains and interference with plant growth.</p>
<p>Spill Prevention measures shall be exercised when handling substances that contaminate stormwater.</p>

Releases of pollutants shall be corrected as soon as identified.
Training and/or written guidance information for operating and maintaining swales shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.
<p>Access to the swale shall be safe and efficient. Egress and ingress routes shall be maintained to design standards. Roadways shall be maintained to accommodate size and weight of vehicles, if applicable.</p> <ul style="list-style-type: none"> • Obstacles preventing maintenance personnel and/or equipment access to the swale shall be removed. • Gravel or ground cover shall be added if erosion occurs, e.g., due to vehicular or pedestrian traffic.
<p>Insects and Rodents shall not be harbored in the swale. Pest control measures shall be taken when insects/rodents are found to be present.</p> <ul style="list-style-type: none"> • If a complaint is received or an inspection reveals that a stormwater facility is significantly infested with mosquitoes or other vectors, the property owner/owners or their designee may be required to eliminate the infestation at the City inspector's discretion. Control of the infestation shall be attempted by using first non-chemical methods and secondly, only those chemical methods specifically approved by the City's inspector. Acceptable methods include but are not limited to the following: <ul style="list-style-type: none"> i. Installation of predacious bird or bat nesting boxes. ii. Alterations of pond water levels approximately every four days in order to disrupt mosquito larval development cycles. iii. Stocking ponds and other permanent water facilities with fish or other predatory species. iv. If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides <i>Bacillus thurengensis</i> var. <i>israeliensis</i> or other approved larvicides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor. • Holes in the ground located in and around the swale shall be filled.
<p>If used at this site, the following will be applicable:</p> <p>Check Dams, flow spreaders and dissipaters shall control and distribute flow.</p> <ul style="list-style-type: none"> • Causes for altered water flow or short circuits shall be identified, and obstructions cleared upon discovery. • Causes for channelization shall be identified and repaired. • Systems shall remain free of sediment build up and debris.

<p style="text-align: center;">Level Spreaders Operations and Maintenance Plan</p>
<p>Level Spreaders are used to spread and disperse a concentrated flow thinly over a vegetated or forested riparian buffer or filter strip. Stormwater enters the spreader as a concentrated flow and discharges as sheet flow across a buffer area. All facility components and the vegetated buffer shall be inspected for proper operations and structural stability. These inspections shall occur, at a minimum, quarterly for the first 2 years from the date of installation, 2 times per year thereafter, and within 48 hours after each major storm event. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:</p>
<p>Level Spreader shall allow runoff to enter the vegetative filter as predominantly sheet flow.</p> <ul style="list-style-type: none"> • Source of erosion damage shall be identified and controlled when native soil is exposed or erosion channels are forming. • Sediment build-up near or exceeding 2” in depth shall be removed.
<p>Inlet shall assure unrestricted stormwater flow to the level spreader.</p> <ul style="list-style-type: none"> • Sources of erosion shall be identified and controlled when native soil is exposed or erosion channels are present. • Sediment accumulation shall be hand-removed with minimum damage to vegetation using proper erosion control measures. Sediment shall be removed if it is more than 3 inches thick or so thick as to damage or kill vegetation. • Inlet shall be cleared when conveyance capacity is plugged. • Rock splash pads and dissipaters shall be replenished to prevent erosion.
<p>Spreader lip shall allow water to exit the level spreader as sheet flow.</p> <ul style="list-style-type: none"> • Sources of erosion damage shall be identified and controlled when native soil is exposed or erosion channels are deeper than 2 inches. • Outlet shall be cleared when 50% of the conveyance capacity is plugged. Sources of sediment and debris shall be identified and corrected.
<p>Vegetated buffer shall be healthy and dense enough (at least 90% cover) to provide filtering while protecting underlying soils from erosion.</p> <ul style="list-style-type: none"> • Nuisance and prohibited vegetation (such as blackberries and English Ivy) shall be removed when discovered. Invasive vegetation contributing up to 25% of vegetation of all species shall be removed and replaced. • Dead vegetation shall be removed to maintain less than 10% of area coverage or when vegetation function is impaired. Vegetation shall be replaced immediately to control erosion where soils are exposed and within 3 months to maintain cover density.
<p>Spill Prevention measures shall be exercised when handling substances that contaminate stormwater. Releases of pollutants shall be corrected as soon as identified.</p>
<p>Training and/or written guidance information for operating and maintaining level spreaders shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.</p>
<p>Access to the level spreaders shall be safe and efficient. Egress and ingress routes shall be maintained to design standards. Obstacles preventing maintenance personnel and/or equipment access to the facility shall be removed.</p>
<p>Insects and Rodents shall not be harbored in the level spreader. Pest control measures shall be taken when insects/rodents are found to be present.</p> <ul style="list-style-type: none"> • If a complaint is received or an inspection reveals that a stormwater facility is significantly infested with mosquitoes or other vectors, the property owner/owners or their designee may be required to eliminate the infestation at the City inspector’s discretion. Control of the infestation shall be attempted by using first non-chemical methods and secondly, only those chemical methods specifically approved by the City’s inspector. Acceptable methods include but are not limited to the following: <ul style="list-style-type: none"> i. Installation of predacious bird or bat nesting boxes.

- ii. Alterations of pond water levels approximately every four days in order to disrupt mosquito larval development cycles.
 - iii. If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides *Bacillus thurengensis* var. *israeliensis* or other approved larvicides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor.
- Holes in the ground located in and around the level spreader shall be filled.

<p style="text-align: center;">Vegetated Filter Strips Operations and Maintenance Plan</p>
<p>Vegetated Filter Strips are gently sloped vegetated areas that stormwater runoff is directed to flow and filter through. Stormwater enters the filter as sheet flow from an impervious surface or is converted to sheet flow using a flow spreader. Flow control is achieved using the relatively large surface area and check dams. Pollutants are removed through infiltration and sedimentation. The vegetative filter should drain within 48 hours of storm event. All facility components and vegetation shall be inspected for proper operations and structural stability. These inspections shall occur, at a minimum, quarterly for the first 2 years from the date of installation, 2 times per year thereafter, and within 48 hours after each major storm event. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:</p>
<p>Flow Spreader shall allow runoff to enter the vegetative filter as predominantly sheet flow.</p> <ul style="list-style-type: none"> • Source of erosion damage shall be identified and controlled when native soil is exposed or erosion channels are forming. • Sediment build-up near or exceeding 2 inch in depth shall be removed.
<p>Filter Inlet shall assure unrestricted stormwater flow to the vegetative filter.</p> <ul style="list-style-type: none"> • Sources of erosion shall be identified and controlled when native soil is exposed or erosion channels are present. • Sediment accumulation shall be hand-removed with minimum damage to vegetation using proper erosion control measures. Sediment shall be removed if it is more than 2 inches thick or so thick as to damage or kill vegetation. • Inlet shall be cleared when conveyance capacity is plugged. • Rock splash pads shall be replenished to prevent erosion.
<p>Filter Media shall allow stormwater to percolate uniformly through the vegetative filter.</p> <ul style="list-style-type: none"> • If the vegetative filter does not drain within 48 hours, it shall be re-graded and replanted according to design specifications. Established trees shall not be removed or harmed in this process. • Debris in quantities more than 2 inch deep or sufficient to inhibit operation shall be removed routinely (e.g., no less than quarterly), or upon discovery.
<p>Check Dams and Dissipaters shall direct and control flow.</p> <ul style="list-style-type: none"> • Causes for altered water flow and channelization shall be identified, and obstructions cleared upon discovery. • Cracks, rot, and structural damage shall be repaired.
<p>Filter Outlet shall allow water to exit the vegetative filter as sheet flow, unless a collection drainpipe is used.</p> <ul style="list-style-type: none"> • Sources of erosion damage shall be identified and controlled when native soil is exposed or erosion channels are deeper than 2 inches. • Outlet shall be cleared when 50% of the conveyance capacity is plugged. Sources of sediment and debris shall be identified and corrected.
<p>Vegetation shall be healthy and dense enough (at least 90% cover) to provide filtering while protecting underlying soils from erosion.</p> <ul style="list-style-type: none"> • Fallen leaves and debris from deciduous plant foliage shall be raked and removed if build up is damaging vegetation. • Nuisance and prohibited vegetation (such as blackberries and English Ivy) shall be removed when discovered. Invasive vegetation contributing up to 25% of vegetation of all species shall be removed and replaced. • Dead vegetation shall be removed to maintain less than 10% of area coverage or when vegetative filter function is impaired. Vegetation shall be replaced immediately to control erosion where soils are exposed and within 3 months to maintain cover density.
<p>Debris and Litter shall be removed to ensure stormwater conveyance and to prevent clogging of inlet and outlet drains and interference with plant growth.</p>
<p>Spill Prevention measures shall be exercised when handling substances that contaminate stormwater.</p>

Releases of pollutants shall be corrected as soon as identified.

Training and/or written guidance information for operating and maintaining vegetated filters shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.

Access to the vegetative filter shall be safe and efficient. Egress and ingress routes shall be maintained to design standards. Obstacles preventing maintenance personnel and/or equipment access to the facility shall be removed. Gravel or ground cover shall be added if erosion occurs, e.g., due to vehicular or pedestrian traffic.

Insects and Rodents shall not be harbored in the vegetated filter. Pest control measures shall be taken when insects/rodents are found to be present.

- If a complaint is received or an inspection reveals that a stormwater facility is significantly infested with mosquitoes or other vectors, the property owner/owners or their designee may be required to eliminate the infestation at the City inspector's discretion. Control of the infestation shall be attempted by using first non-chemical methods and secondly, only those chemical methods specifically approved by the City's inspector. Acceptable methods include but are not limited to the following:
 - i. Installation of predacious bird or bat nesting boxes.
 - ii. Alterations of pond water levels approximately every four days in order to disrupt mosquito larval development cycles.
 - iii. Stocking ponds and other permanent water facilities with fish or other predatory species.
 - iv. If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides *Bacillus thurengensis* var. *israeliensis* or other approved larvicides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor.
- Holes in the ground located in and around the vegetated filter shall be filled.

<p style="text-align: center;">Stormwater Planters Operations and Maintenance Plan</p>
<p>Stormwater Planters are designed to allow runoff to filter through layers of topsoil (thus capturing pollutants) and then either infiltrate into the native soils (infiltration planter) or be collected in a pipe to be discharged off-site (flow-through planter). The planter is sized to accept runoff and temporarily store the water in a reservoir on top of the soil. The flow-through planter is designed with an impervious bottom or is placed on an impervious surface. Water should drain through the planter within 3-4 hours after a storm event. All facility components and vegetation shall be inspected for proper operations and structural stability. These inspections shall occur, at a minimum, quarterly for the first 2 years from the date of installation, 2 times per year thereafter, and within 48 hours after each major storm event. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:</p>
<p>Downspout from rooftop or sheet flow from paving allows unimpeded stormwater flow to the planter.</p> <ul style="list-style-type: none"> • Debris shall be removed routinely (e.g., no less than every 6 months) and upon discovery. • Damaged pipe shall be repaired upon discovery.
<p>Splash Blocks prevent splashing against adjacent structures and convey water without disrupting media.</p> <ul style="list-style-type: none"> • Any deficiencies in structure such as cracking, rotting, and failure shall be repaired.
<p>Planter Reservoir receives and detains storm water prior to infiltration. Water should drain from reservoir within 3-4 hours of storm event.</p> <ul style="list-style-type: none"> • Sources of clogging shall be identified and corrected to prevent short circuiting. • Topsoil may need to be amended with sand or replaced all together to achieve a satisfactory infiltration rate.
<p>Filter Media consisting of sand, gravel and topsoil shall allow stormwater to percolate uniformly through the planter. The planter shall be excavated and cleaned, and gravel or soil shall be replaced to correct low infiltration rates.</p> <ul style="list-style-type: none"> • Holes that are not consistent with the design and allow water to flow directly through the planter to the ground shall be plugged. • Sediment accumulation shall be hand removed with minimum damage to vegetation using proper erosion control measures. Sediment shall be removed if it is more than 4 inches thick or so thick as to damage or kill vegetation. • Litter and debris shall be removed routinely (e.g., no less than quarterly) and upon discovery.
<p>Planter shall contain filter media and vegetation.</p> <ul style="list-style-type: none"> • Structural deficiencies in the planter including rot, cracks, and failure shall be repaired.
<p>Overflow Pipe safely conveys flow exceeding reservoir capacity to an approved stormwater receiving system.</p> <ul style="list-style-type: none"> • Overflow pipe shall be cleared of sediment and debris when 50% of the conveyance capacity is plugged. • Damaged pipe shall be repaired or replaced upon discovery.
<p>Vegetation shall be healthy and dense enough (at least 90% cover) to provide filtering while protecting underlying soils from erosion.</p> <ul style="list-style-type: none"> • Mulch shall be replenished at least annually. • Vegetation, large shrubs or trees that limit access or interfere with planter operation shall be pruned or removed. • Fallen leaves and debris from deciduous plant foliage shall be raked and removed if build up is damaging vegetation. • Nuisance or prohibited vegetation shall be removed when discovered. Invasive vegetation contributing up to 25% of vegetation of all species shall be removed and replaced. • Dead vegetation shall be removed to maintain less than 10% of area coverage or when planter function is impaired. Vegetation shall be replaced within a specific timeframe, e.g., 3 months, or immediately if required to maintain cover density and control erosion where soils are exposed.
<p>Debris and Litter shall be removed to ensure stormwater infiltration and to prevent clogging of overflow</p>

drains and interference with plant growth.

Spill Prevention measures shall be exercised when handling substances that contaminate stormwater. Releases of pollutants shall be corrected as soon as identified.

Training and/or written guidance information for operating and maintaining stormwater planters shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.

Access to the stormwater planter shall be safe and efficient. Egress and ingress routes shall be maintained to design standards. Roadways shall be maintained to accommodate size and weight of vehicles, if applicable.

- Obstacles preventing maintenance personnel and/or equipment access to the stormwater planter shall be removed.
- Gravel or ground cover shall be added if erosion occurs, e.g., due to vehicular or pedestrian traffic.

Insects and Rodents shall not be harbored in the stormwater planter. Pest control measures shall be taken when insects/rodents are found to be present.

- If a complaint is received or an inspection reveals that a stormwater facility is significantly infested with mosquitoes or other vectors, the property owner/owners or their designee may be required to eliminate the infestation at the City inspector's discretion. Control of the infestation shall be attempted by using first non-chemical methods and secondly, only those chemical methods specifically approved by the City's inspector. Acceptable methods include but are not limited to the following:
 - i. Installation of predacious bird or bat nesting boxes.
 - ii. Alterations of pond water levels approximately every four days in order to disrupt mosquito larval development cycles.
 - iii. Stocking ponds and other permanent water facilities with fish or other predatory species.
 - iv. If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides *Bacillus thurengensis* var. *israeliensis* or other approved larvicides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor.
- Holes in the ground located in and around the stormwater planter shall be filled and compacted.

<p style="text-align: center;">Rain Gardens Operations and Maintenance Plan</p>
<p>A vegetated Infiltration Basin or rain garden is a vegetated depression created by excavation, berms, or small dams to provide for short-term ponding of surface water until it percolates into the soil. The basin shall infiltrate stormwater within 24 hours. All facility components and vegetation shall be inspected for proper operations and structural stability, at a minimum, quarterly for the first 2 years from the date of installation, 2 times per year thereafter, and within 48 hours after each major storm event. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:</p>
<p>Basin Inlet shall assure unrestricted stormwater flow to the vegetated basin.</p> <ul style="list-style-type: none"> • Sources of erosion shall be identified and controlled when native soil is exposed or erosion channels are present. • Inlet shall be cleared when conveyance capacity is plugged. • Rock splash pads shall be replenished to prevent erosion.
<p>Embankment, Dikes, Berms and Side Slopes retain water in the infiltration basin.</p> <ul style="list-style-type: none"> • Structural deficiencies shall be corrected upon discovery: <ul style="list-style-type: none"> ○ Slopes shall be stabilized using appropriate erosion control measures when soil is exposed/ flow channels are forming. ○ Sources of erosion damage shall be identified and controlled.
<p>Overflow or Emergency Spillway conveys flow exceeding reservoir capacity to an approved stormwater receiving system.</p> <ul style="list-style-type: none"> • Overflow shall be cleared when 25% of the conveyance capacity is plugged. • Sources of erosion damage shall be identified and controlled when soil is exposed. • Rocks or other armament shall be replaced when only one layer of rock exists.
<p>Filter Media shall allow stormwater to percolate uniformly through the infiltration basin. If water remains 36-48 hours after storm, sources of possible clogging shall be identified and corrected.</p> <ul style="list-style-type: none"> • Basin shall be raked and, if necessary, soil shall be excavated, and cleaned or replaced. • Infiltration area shall be protected from compaction during construction.
<p>Sediment/ Basin Debris Management shall prevent loss of infiltration basin volume caused by sedimentation. Gauges located at the opposite ends of the basin shall be maintained to monitor sedimentation.</p> <ul style="list-style-type: none"> • Sediment and debris exceeding 3 inch in depth shall be removed every 2-5 years or sooner if performance is affected.
<p>Debris and Litter shall be removed to ensure stormwater infiltration and to prevent clogging of overflow drains and interference with plant growth.</p> <ul style="list-style-type: none"> • Restricted sources of sediment and debris, such as discarded lawn clippings, shall be identified and prevented.
<p>Vegetation shall be healthy and dense enough (at least 90% cover) to provide filtering while protecting underlying soils from erosion.</p> <ul style="list-style-type: none"> • Mulch shall be replenished as needed to ensure healthy plant growth • Vegetation, large shrubs or trees that limit access or interfere with basin operation shall be pruned or removed. • Grass shall be mowed to 4"-9" high and grass clippings shall be removed no less than 2 times per year. • Fallen leaves and debris from deciduous plant foliage shall be raked and removed if build up is damaging vegetation. • Nuisance or prohibited vegetation (such as blackberries or English Ivy) shall be removed when discovered. Invasive vegetation contributing up to 25% of vegetation of all species shall be removed. • Dead vegetation shall be removed to maintain less than 10% of area coverage or when infiltration basin function is impaired. Vegetation shall be replaced within 3 months, or immediately if required to control erosion.

Spill Prevention measures shall be exercised when handling substances that contaminate stormwater. Releases of pollutants shall be corrected as soon as identified.

Training and/or written guidance information for operating and maintaining vegetated infiltration basins shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.

Access to the infiltration basin shall be safe and efficient. Egress and ingress routes shall be maintained to design standards. Roadways shall be maintained to accommodate size and weight of vehicles, if applicable.

- Obstacles preventing maintenance personnel and/or equipment access to the infiltration basin shall be removed.
- Gravel or ground cover shall be added if erosion occurs, e.g., due to vehicular or pedestrian traffic.

Insects and Rodents shall not be harbored in the infiltration basin. Pest control measures shall be taken when insects/rodents are found to be present.

- If a complaint is received or an inspection reveals that a stormwater facility is significantly infested with mosquitoes or other vectors, the property owner/owners or their designee may be required to eliminate the infestation at the City inspector's discretion. Control of the infestation shall be attempted by using first non-chemical methods and secondly, only those chemical methods specifically approved by the City's inspector. Acceptable methods include but are not limited to the following:
 - i. Installation of predacious bird or bat nesting boxes.
 - ii. Alterations of pond water levels approximately every four days in order to disrupt mosquito larval development cycles.
 - iii. Stocking ponds and other permanent water facilities with fish or other predatory species.
 - iv. If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides *Bacillus thurengensis* var. *israeliensis* or other approved larvicides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor.
- Holes in the ground located in and around the infiltration basin shall be filled.

If used at this site, the following will be applicable:

Fences shall be maintained to preserve their functionality and appearance.

- Collapsed fences shall be restored to an upright position.
- Jagged edges and damaged fences shall be repaired or replaced.

<p style="text-align: center;">Sand Filters Operations and Maintenance Plan</p>
<p>Sand filters consist of a layer of sand in a structural box used to trap pollutants. The water filters through the sand and then flows into the surrounding soils or an underdrain system that conveys the filtered stormwater to a discharge point. All facility components, vegetation, and source controls shall be inspected for proper operations and structural stability. These inspections shall occur, at a minimum, quarterly for the first 2 years from the date of installation, and 2 times per year thereafter, and within 48 hours after each major storm event. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:</p>
<p>Filter Inlet shall allow water to uniformly enter the sand filter as calm flow, in a manner that prevents erosion.</p> <ul style="list-style-type: none"> • Inlet shall be cleared of sediment and debris when 40% of the conveyance capacity is plugged. • Source of erosion damage shall be identified and controlled when native soil is exposed or erosion channels are forming. • Sediment accumulation shall be hand-removed with minimum damage to vegetation using proper erosion control measures. Sediment shall be removed if it is more than 4 inches thick or so thick as to damage or kill vegetation. • Rock splash pads shall be replenished to prevent erosion.
<p>Reservoir receives and detains stormwater prior to infiltration. If water does not drain within 2-3 hours of storm event, sources of clogging shall be identified and correction action taken.</p> <ul style="list-style-type: none"> • Debris in quantities more than 1 cu ft or sufficient to inhibit operation shall be removed routinely (e.g., no less than quarterly), or upon discovery. • Structural deficiencies in the sand filter box including rot, cracks, and failure shall be repaired upon discovery.
<p>Filter Media shall allow stormwater to infiltrate uniformly through the sand filter. If water remains 36-48 hours after storm, sources of possible clogging shall be identified and corrected.</p> <ul style="list-style-type: none"> • Sand filter shall be raked and if necessary, the sand/gravel shall be excavated, and cleaned or replaced. • Sources of restricted sediment or debris (such as discarded lawn clippings) shall be identified and prevented. • Debris in quantities sufficient to inhibit operation shall be removed no less than quarterly, or upon discovery. • Holes that are not consistent with the design structure and allow water to flow directly through the sand filter to the ground shall be filled. • The infiltration area shall be protected from compaction during construction.
<p>Underdrain Piping (where applicable) shall provide drainage from the sand filter, and Cleanouts (where applicable) located on laterals and manifolds shall be free of obstruction, and accessible from the surface.</p> <ul style="list-style-type: none"> • Under-drain piping shall be cleared of sediment and debris when conveyance capacity is plugged. Cleanouts may have been constructed for this purpose. • Obstructions shall be removed from cleanouts without disturbing the filter media.
<p>Overflow or Emergency Spillway conveys flow exceeding reservoir capacity to an approved stormwater receiving system.</p> <ul style="list-style-type: none"> • Overflow spillway shall be cleared of sediment and debris when 50% of the conveyance capacity is plugged. • Source of erosion damage shall be identified and controlled when erosion channels are forming. • Rocks or other armament shall be replaced when sand is exposed and eroding from wind or rain.

Vegetation

- Vegetation, large shrubs or trees that limit access or interfere with sand filter operation shall be pruned.
- Fallen leaves and debris from deciduous plant foliage shall be raked and removed.
- Nuisance or prohibited vegetation (such as blackberries or English Ivy) shall be removed when discovered. Invasive vegetation contributing up to 25% of vegetation of all species shall be removed.

Debris and Litter shall be removed to ensure stormwater infiltration and to prevent clogging.

Spill Prevention measures shall be exercised when handling substances that contaminate stormwater. Releases of pollutants shall be corrected as soon as identified.

Training and/or written guidance information for operating and maintaining sand filters shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.

Access to the sand filter shall be safe and efficient. Egress and ingress routes shall be maintained to design standards. Roadways shall be maintained to accommodate size and weight of vehicles, if applicable.

- Obstacles preventing maintenance personnel and/or equipment access to the facility shall be removed.
- Gravel or ground cover shall be added if erosion occurs, e.g., due to vehicular or pedestrian traffic.

Insects and Rodents shall not be harbored in the sand filter. Pest control measures shall be taken when insects/rodents are found to be present.

- If a complaint is received or an inspection reveals that a stormwater facility is significantly infested with mosquitoes or other vectors, the property owner/owners or their designee may be required to eliminate the infestation at the City inspector's discretion. Control of the infestation shall be attempted by using first non-chemical methods and secondly, only those chemical methods specifically approved by the City's inspector. Acceptable methods include but are not limited to the following:
 - i. Installation of predacious bird or bat nesting boxes.
 - ii. Alterations of pond water levels approximately every four days in order to disrupt mosquito larval development cycles.
 - iii. Stocking ponds and other permanent water facilities with fish or other predatory species.
 - iv. If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides *Bacillus thurengensis* var. *israeliensis* or other approved larvicides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor.
- Holes in the ground located in and around the infiltration basin shall be filled.

<p style="text-align: center;">Soakage Trenches Operations and Maintenance Plan</p>
<p>Soakage Trenches consist of drain rock and sand, and receive stormwater from roof downspouts and/or area drains. There are various components within the system – piping, silt basin and the trench itself. The Conveyance Piping consists of an inlet pipe (downspout or area drain), an outlet pipe located between the silt basin and the soakage trench, and a perforated pipe, located on top of the aggregate bed of the soakage trench. The Silt Basin is a structure receiving runoff from an inlet pipe and conveying it to the soakage trench. The silt basin serves as the pre-treatment system for the soakage trench, removing sediments and other debris that can impact its proper functioning. All facility components, vegetation, and source controls shall be inspected for proper operations and structural stability. These inspections shall occur, at a minimum, quarterly for the first two years from the date of installation, then two times per year afterwards, or within 48 hours after each major storm. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:</p>
<p>Soakage trench infiltration: If water is noticed on top of the trench within 48 hours of a major storm, the soakage trench may be clogged.</p> <ul style="list-style-type: none"> • Check for debris/sediment accumulation, rake and remove and evaluate upland causes (erosion, surface or roof debris, etc. • Assess the condition of the aggregate and the filter fabric in the trench. If there is sediment in the aggregate, excavate and replace. • If there is a tear in the filter fabric, repair or replace. • The soakage trench area shall be protected from compaction during construction.
<p>Conveyance Piping: If water ponds over the trench for more than 48 hours after a major storm and no other cause is identified, it may be necessary to remove the filter fabric to determine if the perforated pipe is clogged with sediment or debris.</p> <ul style="list-style-type: none"> • Any debris or algae growth located on top of the soakage trench should be removed and disposed of properly. • If the piping has settled more than 1-inch, add fill material. If there are cracks or releases, replace or repair the pipe. If there are signs of erosion around the pipe, this may be an indication of water seeping due to a crack or break.
<p>Silt Basin: If water remains in the soakage trench for 36-48 hours after storm, check for sediment accumulation in the silt basin</p> <ul style="list-style-type: none"> • If less than 50% capacity remains in the basin or 6” of sediment has accumulated, remove and dispose the sediment.
<p>Spill Prevention: Virtually all sites, including residential and commercial, present dangers from spills. All homes contain a wide variety of toxic materials including gasoline for lawn mowers, antifreeze for cars, nail polish remover, pesticides, and cleaning aids that can adversely affect groundwater if spilled. It is important to exercise caution when handling substances that can contaminate stormwater.</p> <ul style="list-style-type: none"> • Activities that pose the chance of hazardous material spills shall not take place near soakage trenches.
<p>A Shut-Off Valve or Flow-Blocking Mechanism may have been required with the construction of the soakage trench to temporarily prevent stormwater from flowing into it, in the event of an accidental material spill. This may also involve mats kept on-site that can be used to cover inlet drains in parking lots. The shut-off valve shall remain in good working order, or if mats or other flow-blocking mechanisms are used, they shall be kept in stock on-site.</p>
<p>Training and/or written guidance information for operating and maintaining soakage trenches shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.</p>
<p>Access to the soakage trench is required for efficient maintenance. Egress and ingress routes will be maintained to design standards at inspections.</p>
<p>Insects and Rodents shall not be harbored in the soakage trench. Pest control measures shall be taken when insects/rodents are found to be present.</p> <ul style="list-style-type: none"> • If a complaint is received or an inspection reveals that a stormwater facility is significantly infested

with mosquitoes or other vectors, the property owner/owners or their designee may be required to eliminate the infestation at the City inspector's discretion. Control of the infestation shall be attempted by using first non-chemical methods and secondly, only those chemical methods specifically approved by the City's inspector. Acceptable methods include but are not limited to the following:

- i. Installation of predacious bird or bat nesting boxes.
 - ii. Alterations of pond water levels approximately every four days in order to disrupt mosquito larval development cycles.
 - iii. Stocking ponds and other permanent water facilities with fish or other predatory species.
 - iv. If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides *Bacillus thurengensis* var. *israeliensis* or other approved larva ides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor.
- Holes in the ground located in and around the soakage trench shall be filled.

<p style="text-align: center;">Wet, Extended Wet, and Dry Ponds Operations and Maintenance Plan</p>
<p>Wet Ponds are constructed ponds with a permanent pool of water. Pollutants are removed from stormwater through gravitational settling and biologic processes. Extended Wet Ponds are constructed ponds with a permanent pool of water and open storage space above for retention or short-term detention of large storm events. Pollutants are removed from stormwater through gravitational settling and biologic processes. Dry Ponds are constructed ponds with temporary storage for the retention or detention of large storm events. The stormwater is stored and released slowly over a matter of hours. All facility components, vegetation, and source controls shall be inspected for proper operations and structural stability. These inspections shall occur, at a minimum, quarterly for the first 2 years from the date of installation, and 2 times per year thereafter, and within 48 hours after each major storm event. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:</p>
<p>Pond Inlet shall assure unrestricted stormwater flow to the wet pond.</p> <ul style="list-style-type: none"> • Inlet pipe shall be cleared when conveyance capacity is plugged. Sources of sediment and debris shall be identified and corrected. • Determine if pipe is in good condition: <ul style="list-style-type: none"> ○ If more than 1 inch of settlement, add fill material and compact soils. ○ If alignment is faulty, correct alignment. ○ If cracks or openings exist indicated by evidence of erosion at leaks, repair or replace pipe as needed.
<p>Forebay traps coarse sediments, reduces incoming velocity, and distributes runoff evenly over the wet pond. A minimum 1-foot freeboard shall be maintained.</p> <ul style="list-style-type: none"> • Sediment buildup exceeding 50% of the facility capacity shall be removed every 2-5 years or sooner if performance is being affected.
<p>Embankment, Dikes, Berms and Side Slopes retain water in the wet pond.</p> <ul style="list-style-type: none"> • Slopes shall be stabilized using appropriate erosion control measures when native soil is exposed or erosion channels are forming. • Structural deficiencies shall be corrected upon discovery: <ul style="list-style-type: none"> ○ If cracks exist, repair or replace structure. ○ If erosion channels deeper than 2 inches exist, stabilize surface. Sources of erosion damage shall be identified and controlled.
<p>Control Devices (e.g., weirs, baffles, etc.) shall direct and reduce flow velocity. Structural deficiencies shall be corrected upon discovery:</p> <ul style="list-style-type: none"> • If cracks exist, repair or replace structure.
<p>Overflow Structure conveys flow exceeding reservoir capacity to an approved stormwater receiving system.</p> <ul style="list-style-type: none"> • Overflow structure shall be cleared when 50% of the conveyance capacity is plugged. Sources of sediment and debris shall be identified and corrected. • Sources of erosion damage shall be identified and controlled when native soil is exposed at the top of overflow structure or erosion channels are forming. • Rocks or other armoring shall be replaced when only one layer of rock exists above native soil.
<p>Sediment and Debris Management shall prevent loss of wet pond volume caused by sedimentation.</p> <ul style="list-style-type: none"> • Wet ponds shall be dredged when 1 foot of sediment accumulates in the pond. • Gauges located at the opposite ends of the wet pond shall be maintained to monitor sedimentation. Gauges shall be checked 2 times per year. • Sources of restricted sediment or debris, such as discarded lawn clippings, shall be identified and prevented. • Debris in quantities sufficient to inhibit operation shall be removed routinely, e.g. no less than quarterly, or upon discovery. • Litter shall be removed upon discovery.

Vegetation shall be healthy and dense enough to provide filtering while protecting underlying soils from erosion and minimizing solar exposure of open water areas.

- Mulch shall be replenished at least annually.
- Vegetation, large shrubs or trees that limit access or interfere with wet pond operation shall be pruned or removed.
- Grass (where applicable) shall be mowed to 4 inch-9 inch high and grass clippings shall be removed if build up is damaging vegetation.
- Fallen leaves and debris from deciduous plant foliage shall be raked and removed if build up is damaging vegetation.
- Nuisance or prohibited vegetation (such as blackberries or English Ivy) shall be removed when discovered. Invasive vegetation contributing up to 25% of vegetation of all species shall be removed and replaced.
- Dead vegetation shall be removed to maintain less than 10% of area coverage or when wet pond function is impaired. Vegetation shall be replaced within 3 months, or immediately if required to maintain cover density and control erosion where soils are exposed. If removing a dead or hazard tree a permit maybe required, contact the City's Public Works Department for details on tree removal.
- Vegetation producing foul odors shall be eliminated.

Spill Prevention measures shall be exercised when handling substances that can contaminate stormwater. Releases of pollutants shall be corrected as soon as identified.

Training and/or written guidance information for operating and maintaining ponds shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.

Access to the wet pond shall be safe and efficient. Egress and ingress routes shall be maintained to design standards. Roadways shall be maintained to accommodate size and weight of vehicles, if applicable.

- Obstacles preventing maintenance personnel and/or equipment access to the wet pond shall be removed.
- Gravel or ground cover shall be added if erosion occurs, e.g., due to vehicular or pedestrian traffic.

Insects and Rodents shall not be harbored in the pond. Pest control measures shall be taken when insects/rodents are found to be present.

- If a complaint is received or an inspection reveals that a stormwater facility is significantly infested with mosquitoes or other vectors, the property owner/owners or their designee may be required to eliminate the infestation at the City inspector's discretion. Control of the infestation shall be attempted by using first non-chemical methods and secondly, only those chemical methods specifically approved by the City's inspector. Acceptable methods include but are not limited to the following:
 - i. Installation of predacious bird or bat nesting boxes.
 - ii. Alterations of pond water levels approximately every four days in order to disrupt mosquito larval development cycles.
 - iii. Stocking ponds and other permanent water facilities with fish or other predatory species.
 - iv. If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides *Bacillus thurengensis* var. *israeliensis* or other approved larvicides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor.
- Holes in the ground located in and around the pond shall be filled.

If used at this site, the following will be applicable:

Signage shall clearly convey information.

- Broken or defaced signs shall be replaced or repaired.

Fences shall be maintained to preserve their functionality and appearance.

- Collapsed fences shall be restored to an upright position.
- Jagged edges and damaged fences shall be repaired or replaced.

<p align="center">Constructed Treatment Wetlands Operations and Maintenance Plan</p>
<p>Constructed Treatment Wetlands remove pollutants through several processes: sedimentation, filtration, and biological processes. All facility components, vegetation, and source controls shall be inspected for proper operations and structural stability. These inspections shall occur, at a minimum, quarterly for the first 2 years from the date of installation, and 2 times per year thereafter, and within 48 hours after each major storm event. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:</p>
<p>Wetland Inlet shall assure unrestricted stormwater flow to the wetland.</p> <ul style="list-style-type: none"> • Inlet pipe shall be cleared when conveyance capacity is plugged. Sources of sediment and debris shall be identified and corrected. • Determine if pipe is in good condition: <ul style="list-style-type: none"> ○ If more than 1 inch of settlement, add fill material and compact soils. ○ If alignment is faulty, correct alignment. ○ If cracks or openings exist indicated by evidence of erosion at leaks, repair or replace pipe as needed.
<p>Forebay traps coarse sediments, reduces incoming velocity, and distributes runoff evenly over the wetland. A minimum 1-foot freeboard shall be maintained.</p> <ul style="list-style-type: none"> • Sediment buildup exceeding 50% of the facility capacity shall be removed every 2-5 years or sooner if performance is being affected.
<p>Embankment, Dikes, Berms and Side Slopes retain water in the wetland.</p> <ul style="list-style-type: none"> • Slopes shall be stabilized using appropriate erosion control measures when native soil is exposed or erosion channels are forming. • Structural deficiencies shall be corrected upon discovery: <ul style="list-style-type: none"> ○ If cracks exist, repair or replace structure. ○ If erosion channels deeper than 2 inches exist, stabilize surface. Sources of erosion damage shall be identified and controlled.
<p>Control Devices (e.g., weirs, baffles, etc.) shall direct and reduce flow velocity.</p> <ul style="list-style-type: none"> • Structural deficiencies shall be corrected upon discovery: <ul style="list-style-type: none"> ○ If cracks exist, repair or replace structure.
<p>Overflow Structure conveys flow exceeding reservoir capacity to an approved stormwater receiving system.</p> <ul style="list-style-type: none"> • Overflow structure shall be cleared when 50% of the conveyance capacity is plugged. Sources of sediment and debris shall be identified and corrected. • Sources of erosion damage shall be identified and controlled when native soil is exposed at the top of overflow structure or erosion channels are forming. • Rocks or other armament shall be replaced when only one layer of rock exists above native soil.
<p>Sediment and Debris Management shall prevent loss of wetland volume caused by sedimentation.</p> <ul style="list-style-type: none"> • Wetlands shall be dredged when 1 foot of sediment accumulates. • Gauges located at the opposite ends of the wetland shall be maintained to monitor sedimentation. Gauges shall be checked 2 times per year. • Sources of restricted sediment or debris, such as discarded lawn clippings, shall be identified and prevented. • Debris in quantities sufficient to inhibit operation shall be removed routinely, e.g. no less than quarterly, or upon discovery. • Litter shall be removed upon discovery.
<p>Vegetation shall be healthy and dense enough to provide filtering while protecting underlying soils from erosion and minimizing solar exposure of open water areas.</p> <ul style="list-style-type: none"> • Mulch shall be replenished when needed. • Vegetation, large shrubs or trees that limit access or interfere with wetland operation shall be pruned. • Fallen leaves and debris from deciduous plant foliage shall be raked and removed.

- Nuisance or prohibited vegetation (such as blackberries or English Ivy) shall be removed when discovered. Invasive vegetation contributing up to 25% of vegetation of all species shall be removed and replaced.
- Dead vegetation shall be removed to maintain less than 10% of area coverage or when wetland function is impaired. Vegetation shall be replaced within 3 months, or immediately if required to maintain cover density and control erosion where soils are exposed.
- Vegetation producing foul odors shall be eliminated.

Spill Prevention measures shall be exercised when handling substances that can contaminate stormwater. Releases of pollutants shall be corrected as soon as identified.

Training and/or written guidance information for operating and maintaining treatment wetlands shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.

Access to the wetland shall be safe and efficient. Egress and ingress routes shall be maintained to design standards. Roadways shall be maintained to accommodate size and weight of vehicles, if applicable.

- Obstacles preventing maintenance personnel and/or equipment access to the wetland shall be removed.
- Gravel or ground cover shall be added if erosion occurs, e.g., due to vehicular or pedestrian traffic.

Insects and Rodents shall not be harbored in the constructed treatment wetland. Pest control measures shall be taken when insects/rodents are found to be present.

- If a complaint is received or an inspection reveals that a stormwater facility is significantly infested with mosquitoes or other vectors, the property owner/owners or their designee may be required to eliminate the infestation at the City inspector's discretion. Control of the infestation shall be attempted by using first non-chemical methods and secondly, only those chemical methods specifically approved by the City's inspector. Acceptable methods include but are not limited to the following:
 - i. Installation of predacious bird or bat nesting boxes.
 - ii. Alterations of pond water levels approximately every four days in order to disrupt mosquito larval development cycles.
 - iii. Stocking ponds and other permanent water facilities with fish or other predatory species.
 - iv. If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides *Bacillus thurengensis* var. *israeliensis* or other approved larvicides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor.
- Holes in the ground located in and around the constructed treatment wetland shall be filled.

If used at this site, the following will be applicable:

Signage shall clearly convey information.

- Broken or defaced signs shall be replaced or repaired.

Fences shall be maintained to preserve their functionality and appearance.

- Collapsed fences shall be restored to an upright position.
- Jagged edges and damaged fences shall be repaired or replaced.

<p style="text-align: center;">Underground Detention Tanks, Vaults and Pipes Operations and Maintenance Plan</p>
<p>Underground Detention Tanks, Vaults, and Pipes are designed to fill with stormwater during large storm events, slowly releasing it over a number of hours. There are numerous components to each system. Drain Inlet Pipes convey stormwater into the detention facility. The Detention Chamber is the structure in which stormwater accumulates during a storm event. Orifice Structure/ Outlet Drain Pipe restricts the flow out of the detention chamber, allowing it to fill up and slowly drain out. The orifice structure is located at the downstream end of the detention chamber. Underground facilities shall be inspected quarterly and within 48 hours after each major storm event. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:</p>
<p>Proprietary Structures such as oil-water separators, sedimentation manholes, grit chambers, etc. are required to have an O&M plan submitted with material from the manufacturer for that specific product for the O&M Agreement.</p> <ul style="list-style-type: none"> • If such material is not available or satisfactory for maintenance needs, city staff will assist developer/property owner in preparing the O&M plan.
<p>Drain Inlet Pipes shall be inspected for clogging or leaks where it enters the vault or basin during every inspection and cleanout.</p> <ul style="list-style-type: none"> • Debris/sediment that is found to clog the inlet shall be removed, and disposed of in accordance with applicable federal and state requirements.
<p>Detention Chamber shall be inspected for cracks or damage during each inspection.</p> <ul style="list-style-type: none"> • The detention chamber shall be cleaned out yearly or after an inch of sediment has accumulated. If there is a valve on the outlet pipe it shall be closed otherwise the outlet shall be plugged prior to cleanout. Grit and sediment that has settled to the bottom of the chamber shall be removed during each cleaning. • Water and sediment in the detention chamber shall be removed, and disposed of in accordance with regulations. • Cleaning shall be done without use of detergents or surfactants. A pressure washer may be used if necessary.
<p>Orifice Structure/ Outlet Drain Pipe shall be inspected for clogging during unit inspections/cleanouts.</p> <ul style="list-style-type: none"> • Debris/sediment that is found to clog the inlet shall be removed, and disposed of in accordance with applicable federal and state requirements.
<p>Vegetation such as trees should not be located in or around the detention facility because roots from trees can penetrate the unit body, and leaves from deciduous trees and shrubs can increase the risk of clogging the intake pipe.</p> <ul style="list-style-type: none"> • Large shrubs or trees that are likely to interfere with detention facility operation shall be identified at each inspection then removed.
<p>Source Control measures typically include structural and non-structural controls. Non-structural controls can include street sweeping and other good housekeeping practices. It is often easier to prevent pollutants from entering stormwater than to remove them.</p> <ul style="list-style-type: none"> • Source control measures shall be inspected and maintained (where applicable).
<p>Spill Prevention procedures require high-risk site users to reduce the risk of spills. However, virtually all sites, including residential and commercial, present dangers from spills. Homes contain a wide variety of toxic materials including gasoline for lawn mowers, antifreeze for cars, pesticides, and cleaning aids that can adversely affect storm water if spilled. It is important for everyone to exercise caution when handling substances that can contaminate stormwater. Spill prevention procedures shall be implemented in areas where there is likelihood of spills from hazardous materials.</p>
<p>Training and/or written guidance information for operating and maintaining detention facilities shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.</p>
<p>Access to the detention facility is required for efficient maintenance. Egress and ingress routes shall be open and maintained to design standards.</p>

Signage may serve to educate people about the importance or function of the site's stormwater protection measures. Signs may also discourage behavior that adversely impacts the stormwater protection measures and encourages behavior that enhances or preserves stormwater quality. If debris is a problem, a sign reminding people not to litter may partially solve the problem. Signage (where applicable) will be maintained and repaired as needed during or shortly after inspections.

Insects and Rodents shall not be harbored in the detention facility. Pest control measures shall be taken when insects/rodents are found to be present

- If a complaint is received or an inspection reveals that a stormwater facility is significantly infested with mosquitoes or other vectors, the property owner/owners or their designee may be required to eliminate the infestation at the City inspector's discretion. Control of the infestation shall be attempted by using first non-chemical methods and secondly, only those chemical methods specifically approved by the City's inspector. Acceptable methods include but are not limited to the following:
 - i. Installation of predacious bird or bat nesting boxes.
 - ii. Alterations of pond water levels approximately every four days in order to disrupt mosquito larval development cycles.
 - iii. Stocking ponds and other permanent water facilities with fish or other predatory species.
 - iv. If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides *Bacillus thurengensis* var. *israeliensis* or other approved larvicides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor.
- Holes in the ground located in and around the detention facility shall be filled.

<p style="text-align: center;">Drywells Operations and Maintenance Plan</p>
<p>Drywells are designed to infiltrate stormwater into the ground. Stormwater is piped to drywells from roof downspouts or pollution control facilities such as swales or planters. The pollution control facility is designed to settle out sediments and separate oils and greases from the water before releasing it through a pipe to the drywell. This prolongs the life of the drywell and helps to prevent the contamination of soils and groundwater. The drywell is a concrete or plastic manhole section with many small holes in the sides to allow stormwater to infiltrate into the surrounding soil. The drywell system shall be inspected and cleaned quarterly and within 48 hours after each major storm event. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. Drywells are considered Underground Injection Wells in Oregon and are subject to State regulations for permitting and testing by the Oregon DEQ. The following items shall be inspected and maintained as stated:</p>
<p>Stormwater Drain Pipe shall be inspected for clogging or leaks where it enters the drywell.</p> <ul style="list-style-type: none"> • Debris/sediment that is found to clog the pipe shall be removed and disposed of in accordance with applicable federal and state requirements.
<p>Drywell shall be inspected during each cleanout. Ponding around the catch basins or sedimentation manhole or drywell lids may indicate that the drywell is failing due to siltation, or the clogging of the sediment pores surrounding the drywell. Clogged drywells must be replaced.</p>
<p>Vegetation such as trees should not be located in or around the drywell because roots from trees can penetrate the unit body, and leaves from deciduous trees and shrubs can increase the risk of clogging the intake pipe.</p> <ul style="list-style-type: none"> • Large shrubs or trees that are likely to interfere with operation will be identified at each inspection and removed.
<p>Source Control measures typically include structural and non-structural controls. Non-structural controls can include parking lot or street sweeping and other good housekeeping practices. It is often easier to prevent pollutants from entering stormwater than to remove them.</p> <ul style="list-style-type: none"> • Source control measures shall be inspected and maintained (where applicable).
<p>Spill Prevention procedures require high-risk site users to reduce the risk of spills. However, virtually all sites, including residential and commercial, present dangers from spills. Homes contain a wide variety of toxic materials including gasoline for lawn mowers, antifreeze for cars, solvents, pesticides, and cleaning aids that can adversely affect storm water if spilled. It is important to exercise caution when handling substances that can contaminate stormwater. Spill prevention procedures shall be implemented in areas where there is likelihood of spills from hazardous materials.</p>
<p>A Shut-Off Valve or Flow-Blocking Mechanism may have been required with the construction of the drywell to temporarily prevent stormwater from flowing into it, in the event of an accidental material spill. This may also involve mats kept on-site that can be used to cover inlet drains in parking lots. The shutoff valve shall remain in good working order, or if mats or other flow-blocking mechanisms are used, they shall be kept in stock on-site.</p>
<p>Training and/or written guidance information for operating and maintaining drywell systems shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.</p>
<p>Access to the drywell is required for efficient maintenance. Egress and ingress routes shall be open and maintained to design standards.</p> <ul style="list-style-type: none"> • City inspection staff may require owners to provide proof of registration, permitting and maintenance logs for the facility as required by the Oregon DEQ.
<p>Insects and Rodents shall not be harbored in the drywell. Pest control measures shall be taken when insects/rodents are found to be present.</p> <ul style="list-style-type: none"> • If a complaint is received or an inspection reveals that a stormwater facility is significantly infested with mosquitoes or other vectors, the property owner/owners or their designee may be required to eliminate the infestation at the City inspector's discretion. Control of the infestation shall be attempted by using first non-chemical methods and secondly, only those chemical methods specifically approved by the City's inspector. Acceptable methods include but are not limited to the

following:

- i. Installation of predacious bird or bat nesting boxes.
 - ii. Alterations of pond water levels approximately every four days in order to disrupt mosquito larval development cycles.
 - iii. Stocking ponds and other permanent water facilities with fish or other predatory species.
 - iv. If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides *Bacillus thurengensis* var. *israeliensis* or other approved larvicides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor.
- Holes in the ground located in and around the drywell shall be filled.

Signage may serve to educate people about the importance or function of the site's stormwater protection measures. Signs may also discourage behavior that adversely impacts the stormwater protection measures and encourages behavior that enhances or preserves stormwater quality. If debris is a problem, a sign reminding people not to litter may partially solve the problem. Signage (where applicable) shall be maintained and repaired as needed during or shortly after inspections.

<p style="text-align: center;">Spill Control Manholes Operations and Maintenance Plan</p>
<p>Spill Control Manholes operate using the principal that oil and water are immiscible (do not mix) and have different densities. Oil, being less dense than water, floats to the surface. The spill control manhole shall be inspected and cleaned quarterly. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:</p>
<p>Stormwater Drain Inlet Pipe shall be inspected for clogging or leaks where it enters the manhole during every inspection and cleanout. Debris/sediment that is found to clog the inlet shall be removed, tested, and disposed of in accordance with applicable federal and state requirements.</p>
<p>Manhole Chamber shall be inspected for cracks or damage during each inspection.</p> <ul style="list-style-type: none"> • The manhole shall be cleaned out quarterly. Cleanout shall be done in a manner to minimize the amount of trapped oil entering the outlet pipe. If there is a valve on the outlet pipe it shall be closed otherwise the outlet will be plugged prior to clean-out. • Water and oil shall be removed, tested, and disposed of in accordance with regulations. Grit and sediment that has settled to the bottom of the chamber shall be removed during each cleaning • Cleaning shall be done without use of detergents or surfactants. A pressure washer along with a vacuum may be used if necessary.
<p>Absorbent Pillows and Pads (where applicable) absorb oil from the separation chamber.</p> <ul style="list-style-type: none"> • Replacement shall occur at least twice a year, in the spring and fall, or as necessary to retain oil-absorbing function.
<p>Stormwater Drain Outlet Pipe shall be inspected for clogging or leaks where it exits the manhole. Particular attention shall be paid to ensure that the joint where the tee joins the outlet pipe is watertight.</p> <ul style="list-style-type: none"> • Debris/sediment that is found to clog the outlet shall be removed, tested, and disposed of in accordance with applicable federal and state requirements.
<p>Vegetation such as trees should not be located in or around the spill control manhole because roots can penetrate the unit body, and leaves from deciduous trees and shrubs can increase the risk of clogging.</p> <ul style="list-style-type: none"> • Large shrubs or trees that are likely to interfere with manhole operation shall be identified at each inspection and removed.
<p>Source Control measures typically include structural and non-structural controls. Non-structural controls can include street sweeping and other good housekeeping practices.</p> <ul style="list-style-type: none"> • Source control measures shall be inspected and maintained.
<p>Spill Prevention procedures require high-risk site users to reduce the risk of spills. However, virtually all sites, including residential and commercial, present dangers from spills. Homes contain a wide variety of toxic materials including gasoline for lawn mowers, antifreeze for cars, pesticides, and cleaning aids that can adversely affect storm water if spilled. It is important to exercise caution when handling substances that can contaminate stormwater. Spill prevention procedures shall be implemented in areas where there is likelihood of spills from hazardous materials.</p>
<p>Training and/or written guidance information for operating and maintaining spill control manholes shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.</p>
<p>Access to the spill control manhole is required for efficient maintenance. Egress and ingress routes shall be open and maintained to design standards.</p>
<p>Insects and Rodents shall not be harbored in the spill control manhole. Pest control measures shall be taken when insects/rodents are found to be present.</p> <ul style="list-style-type: none"> • If a complaint is received or an inspection reveals that a stormwater facility is significantly infested with mosquitoes or other vectors, the property owner/owners or their designee may be required to eliminate the infestation at the City inspector's discretion. Control of the infestation shall be attempted by using first non-chemical methods and secondly, only those chemical methods specifically approved by the City's inspector. Acceptable methods include but are not limited to the following:

- i. Installation of predacious bird or bat nesting boxes.
 - ii. Alterations of pond water levels approximately every four days in order to disrupt mosquito larval development cycles.
 - iii. Stocking ponds and other permanent water facilities with fish or other predatory species.
 - iv. If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides *Bacillus thurengensis* var. *israeliensis* or other approved larvicides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor.
- Holes in the ground located in and around the manhole shall be filled.

Signage may serve to educate people about the importance or function of the site's stormwater protection measures. Signage (where applicable) shall be maintained and repaired as needed during or shortly after inspections.

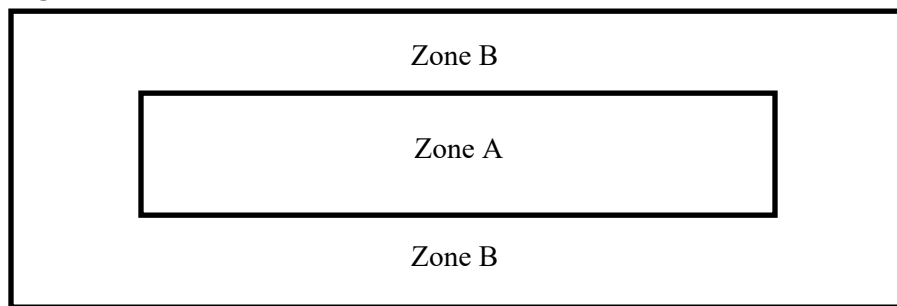
APPENDIX F – APPROVED VEGETATION LIST

Facility Planting Zones

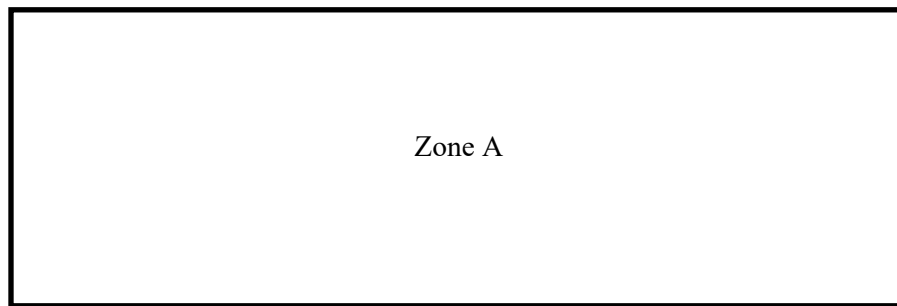
Zone A: Area of the facility defined as the bottom of the facility to the designated high-water mark. This area has wet to moist soils and plants located here shall be tolerant of mild inundation.

Zone B: Area of the facility defined as the side slopes from the designated high-water mark up to the edge of the facility. This area typically has drier to moist soils with the moist soils being located farther down the side slopes. Plants here should be drought tolerant and help stabilize the slopes.

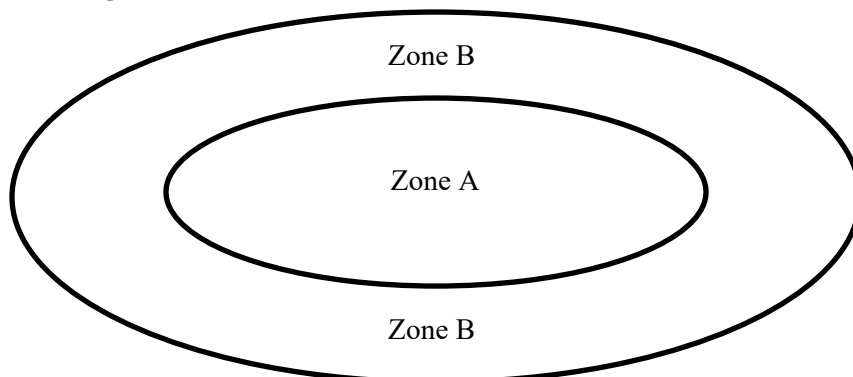
Swale Planting Zones



Planter Planting Zones



Rain Garden Planting Zones



Facility Plant List

Note: Alternative plants not found on this list may be approved based on ease of maintenance and beneficial impacts to water and soil quality. Non-native invasive plants are not allowed. Only native plants are allowed in stormwater facilities within Natural Resource Protection Area setbacks (SDC 4.3-117.F.4). Each stormwater facility must have a minimum of three unique species.

X = yes, blank = no

	Scientific Name	Common Name														
	*approved for public facilities		Grassy Swales	Vegetated Swales/Filter Strips	Stormwater Planters	Rain Gardens/Dry Ponds	Wet/Extended Wet Ponds	Zone A (wet to moist soil)	Zone B (moist to dry soil)	NW Native	Groundcover	Evergreen	Potential Height	O.C. Spacing	Sun Exposure	
Herbaceous Plants	<i>Agrostis exarata</i>	Spike Bentgrass	X					X		X			36"	Seed	Full to Part	
	<i>Alisma plantago-aquatica</i> var. <i>americanum</i>	Water Plantain					X	X		X	X		24"	12"	Full	
	<i>Allium acuminatum</i>	Hooker’s Onion	X				X	X		X			12"	12"	Full	
	<i>Allium amplexans</i>	Slim Leaf Onion	X	X	X	X		X		X			12"	12"	Full	
	<i>Arctostaphylos uva-ursi</i> *	Kinnickinnick		X		X	X		X	X	X	X	6"	12"	Full to Part	
	<i>Asclepias speciosa</i>	Showy Milkweed	X	X	X	X	X	X	X	X			48"	36"	Full	
	<i>Aster hallii</i>	Hall’s Aster	X	X		X			X	X			36"	18"	Full	
	<i>Aster suspicatus</i>	Douglas Aster	X	X		X			X	X			36"	18"	Full	
	<i>Athyrium filix-femin</i>	Lady Fern	X	X		X			X	X			36"	24"	Shade	
	<i>Beckmania syzigachne</i>	American Slough Grass	X					X		X	X		36"	Seed 12"	Full	
	<i>Bidens cernua</i>	Nodding Beggerticks					X	X	X	X			24"	12"	Full to Part	
	<i>Blechnum spicant</i>	Deer Fern		X	X	X	X	X		X			24"	24"	Shade	
	<i>Brodiaea coronaria</i>	Harvest Brodiaea			X	X				X	X		36"	12"	Full	
	<i>Bromus carinatus</i>	California Brome Grass	X						X	X	X			18"	Seed	Full to Part
	<i>Bromus sitchensis</i>	Alaska Brome	X						X		X			18"	Seed	Full to Part
	<i>Bromus vulgaris</i>	Columbia Brome	X						X		X			18"	Seed	Full to Part
		<i>Carex densa</i> *	Dense Sedge		X	X	X	X	X		X	X		24"	12"	Full to Part

Herbaceous Plants	<i>Carex deweyana</i>	Dewey Sedge		X	X		X	X		X	X		36"	12"	Part to Shade
	<i>Carex hendersonii</i>	Henderson Sedge		X				X		X	X	X	40"	12"	Full to Part
	<i>Carex obnupta</i>*	Slough Sedge		X	X	X	X	X		X	X	X	4'	12"	Full to Part
	<i>Carex stipata</i>*	Sawbeak Sedge		X	X	X	X	X		X	X		20"	12"	Full to Part
	<i>Carex tumulicola</i>*	Foothill Sedge		X	X	X	X	X		X	X	X	24"	12"	Full to Shade
	<i>Carex unilateralis</i>	Lateral Sedge		X	X	X	X	X		X	X		24"	12"	Full to Part
	<i>Carex vesicaria</i>	Inflated Sedge		X	X	X	X	X		X	X	X	36"	12"	Part
	<i>Danthonia californica</i>	California Oatgrass	X					X		X			18"	Seed 12"	Full to Part
	<i>Deschampsia cespitosa</i>	Tufted Hair Grass	X	X			X	X	X	X	X		36"	Seed 12"	Full to Part
	<i>Eleocharis acicularis</i>	Needle Spike Rush		X	X	X	X	X		X	X	X	30"	12"	Part
	<i>Eleocharis ovata</i>	Ovate Spike Rush	X	X	X	X	X	X		X	X	X	30"	12"	Part
	<i>Eleocharis palustris</i>	Creeping Spike Rush		X	X	X	X	X		X	X	X	30"	12"	Part
	<i>Elymus glaucus</i>	Blue Wild Rye	X					X	X	X			24"	Seed	Full to Part
	<i>Eriophyllum lanatum</i>	Oregon Sunshine		X		X	X	X	X	X			18"	12"	Full
	<i>Festuca occidentalis</i>	Western Fescue Grass	X					X		X			24"	Seed	Full to Part
	<i>Festuca roemerii</i> var. <i>roemerii</i>	Roemer's Fescue	X	X		X		X	X	X	X		24"	Seed 12"	Full
	<i>Festuca rubra</i>	Red Fescue	X						X	X			24"	Seed	Full to Part
	<i>Fragaria chiloensis</i>*	Coastal Strawberry	X	X		X	X		X	X	X	X	6"	12"	Full to Part
	<i>Fragaria vesca</i>	Woodland Strawberry	X	X		X	X		X	X	X	X	6"	12"	Full to Part
	<i>Fragaria virginiana</i>	Wild Strawberry	X	X		X	X		X	X	X	X	6"	12"	Full to Part
	<i>Glyceria occidentalis</i>	Western Manna Grass	X					X		X			18"	Seed	Part
	<i>Grindelia integrifolia</i>	Gumweed		X			X	X		X	X		30"	12"	Full
	<i>Hordeum brachyantherum</i>	Meadow Barley	X					X		X			30"	Seed	Full
	<i>Iris douglasiana</i>*	Douglas Iris		X		X	X		X	X	X		18"	12"	Full to Part
	<i>Iris tenax</i>*	Oregon Iris		X		X	X		X	X	X		18"	12"	Full to Part
	<i>Juncus acuminatus</i>*	Tapertip Rush		X	X	X	X	X		X	X		24"	12"	Full
	<i>Juncus balticus</i>	Baltic Rush		X	X	X	X	X		X	X	X	20"	12"	Full to Part
	<i>Juncus effusus</i>	Common/Soft		X	X	X	X	X		X	X	X	36"	12"	Full to

	<i>var. gracilis*</i>	Rush													Part
	<i>Juncus effusus</i> <i>var. pacificus*</i>	Common Rush		X	X	X	X	X		X	X	X	36"	12"	Full to Part
	<i>Juncus ensifolius*</i>	Dagger-leaf Rush		X	X	X	X	X		X	X		10"	12"	Full to Part
	<i>Juncus oxymeris</i>	Pointed Rush	X	X	X	X	X	X		X	X	X	24"	12"	Full to Part
	<i>Juncus patens*</i>	Spreading or Grooved Rush		X	X	X	X	X		X	X	X	36"	12"	Full to Part
	<i>Juncus tenuis</i>	Slender Rush	X	X	X	X	X	X		X	X	X	36"	12"	Full to Part
	<i>Koeleria macrantha</i>	Junegrass	X					X	X	X			24"	Seed	Full
	<i>Lupinus polyphyllus</i>	Large-leaved Lupine	X	X		X	X	X	X	X			12"	12"	Full to Part
	<i>Lupinus rivularis</i>	Riverbank Lupine	X	X		X	X	X	X	X			36"	24"	Full
	<i>Olsynium douglasii</i>	Purple-eyed Grass	X	X	X	X	X	X		X			12"	24"	Full to Part
	<i>Polystichum munitum</i>	Sword Fern	X	X		X	X		X	X		X	24"	24"	Part to Shade
	<i>Rubus calycinoides* (pentalobus)</i>	Creeping Bramble	X	X	X	X	X		X		X	X		12"	Full to Part
	<i>Sagittaria latifolia</i>	Wapato					X	X		X			24"	12"	Full
	<i>Solidago canadensis</i>	Canada Goldenrod		X	X	X	X	X		X			4'	24"	Full to Part
	<i>Schoenoplectus acutus</i> var. <i>acutus</i>	Hardstem Bulrush					X	X		X	X	X	5'	12"	Full
Herbs	<i>Schoenoplectus americanus</i>	American Bulrush					X	X		X	X	X	7'	12"	Full
	<i>Schoenoplectus microcarpus</i>	Small Fruited Bulrush	X	X		X	X	X		X	X	X	24"	12"	Full to Part
	<i>Schoenoplectus validus</i>	Softstem Bulrush	X	X		X	X	X		X	X	X	5'	24"	Full to Part
	<i>Sidalcea campestris</i>	Meadow Sidalcea	X	X	X	X	X	X	X	X			36"	12"	Full to Part
	<i>Sisyrinchium idahoense</i>	Blue-eyed Grass	X	X	X	X	X	X	X	X			6"	12"	Full to Part
	<i>Viola glabella</i>	Stream Violet	X	X	X	X	X	X		X			4"	6"	Full to Part
Small Shrubs	<i>Cornus sericea</i> 'Kelseyii'*	Kelsey Dogwood		X	X	X	X		X				24"	24"	Full to Part
	<i>Gaultheria shallon</i>	Salal		X			X		X	X		X	24"	24"	Part
	<i>Mahonia nervosa*</i>	Dull Oregon Grape		X		X	X		X	X		X	24"	24"	Part
	<i>Mahonia repens*</i>	Creeping Oregon Grape		X		X	X		X	X		X	18"	18"	Part
	<i>Spiraea betulifolia</i>	Birchleaf Spiraea	X	X	X	X	X	X	X				3'	24"	Full to Part
	<i>Spiraea spp.*</i>	Dwarf Spirea	X	X	X	X	X		X				3'	3'	Full

	<i>Symphoricarpos alba</i>	Common Snowberry	X	X		X	X		X	X			4'	3'	Full to Part
Large Shrubs	<i>Ceanothus cuneatus</i>	Buckbrush	X	X		X	X	X		X		X	7'	7'	Full
	<i>Ceanothus integerrimus</i>	Deerbrush		X			X		X	X			13'	10'	Full to Part
	<i>Ceanothus sanguineus</i>	Oregon Redstem Ceanothus	X	X		X	X		X	X		X	7'	4'	Full
	<i>Ceanothus velutinus</i>	Snowbrush	X	X		X	X		X	X		X	5'	3'	Full
	<i>Cornus sericea</i>	Red-twig Dogwood	X	X	X	X	X	X	X	X			6'	6'	Full to Part
	<i>Holodiscus discolor</i>	Oceanspray	X	X		X	X		X	X			6'	6'	Full to Part
	<i>Lonicera involucrata</i>	Black Twinberry	X	X		X	X	X	X	X			5'	4'	Full to Part
	<i>Mahonia (Berberis) aquifolium</i>	Tall Oregon Grape	X	X		X	X		X	X		X	5'	3'	Full to Part
	<i>Morella (Myrica) californica</i>	Pacific Wax Myrtle	X	X		X	X	X	X	X		X	10'	10'	Full to Part
Large Shrubs	<i>Oemleria cerasiformis</i>	Osoberry	X	X		X	X		X	X			6'	4'	Full to Part
	<i>Philadelphus lewisii</i>	Wild Mock Orange	X	X		X			X	X			6'	4'	Full to Part
	<i>Physocarpus capitatus</i>	Pacific Ninebark	X	X	X	X	X	X	X	X			10'	5'	Full to Part
	<i>Ribes sanguineum</i>	Red-flowering Currant	X	X	X	X	X		X	X			8'	4'	Full to Part
	<i>Rubus parviflorus</i>	Thimbleberry	X	X	X	X	X	X	X	X			8'	4'	Full to Part
	<i>Rubus spectabilis</i>	Salmonberry	X	X	X	X	X	X		X			10'	4'	Full to Part
	<i>Salix lucida</i> var. 'Lasiandra'	Pacific Willow					X	X		X			13'	6'	Full
	<i>Sambucus nigra</i> ssp. <i>cerulea</i>	Blue Elderberry	X	X		X	X		X	X			10'	10'	Full to Part
	<i>Sambucus racemosa</i>	Red Elderberry	X	X		X	X		X	X			10'	10'	Full to Part
	<i>Spiraea douglasii</i>	Douglas Spiraea	X			X	X	X	X	X			7'	4'	Full to Part
	<i>Viburnum edule</i>	Highbush Cranberry		X		X	X	X	X	X			6'	6'	Full to Part
Tree	<i>*Approved street tree species</i>														
	<i>Abies koreana</i>	Silver Korean Fir	X	X		X	X		X			X	50'		Full to Part
	<i>*Acer circinatum</i>	Vine Maple	X	X	X	X	X	X	X	X			15'	10'	Full to Part
	<i>*Acer griseum</i>	Paperbark Maple	X	X		X	X		X				30'		Full to Part
	<i>Alnus rhombifolia</i>	White Alder	X	X		X	X	X	X	X			100'		Full to Part
	<i>Alnus rubra</i>	Red Alder	X	X		X	X	X	X	X			80'		Full to

	<i>Amelanchier alnifolia</i>	Western (Saskatoon) Serviceberry	X	X		X	X		X	X			20'	10'	Part Full to Part
	* <i>Amelanchier x grandiflora</i>	Apple Serviceberry	X	X		X	X		X				25'		Full to Part
	<i>Arbutus x 'Marina'</i>	Marina Strawberry Tree	X	X		X	X		X			X	40'		Full to Part
Trees	<i>Arbutus menziesii</i>	Madrone	X	X		X	X		X	X		X	35'		Full
	* <i>Arbutus unedo</i>	Strawberry Madrone	X	X		X	X		X				15'		Full
	* <i>Carpinus betulus</i>	European Hornbeam		X		X	X		X				40'		Full
	* <i>Celtis occidentalis</i>	Common Hackberry	X	X		X	X	X	X				100'		Full to Part
	<i>Celtis reticulata</i>	Netleaf Hackberry	X	X		X	X		X				25'		Full to Part
	* <i>x Chitalpa tashkentensis</i>	Chitalpa	X	X		X	X		x				35'		Full to Part
	<i>Cornus nuttallii</i> (and hybrids)	Western Flowering Dogwood	X	X		X	X		X	X			20'		Full to Part
	<i>Corylus cornuta</i>	Western Beaked Hazelnut	X	X	X	X		X	X	X			15'		Full to Part
	<i>Crataegus douglasii</i>	Black Hawthorn		X			X	X		X			40'	10'	Full
	* <i>Lagerstroemia indica x fauriei</i>	Crepe Myrtle	X	X		X	X		X				15'		Full
	<i>Malus fusca</i>	Pacific Crabapple	X	X		X	X	X		X			30'	10'	Full to Part
	* <i>Nyssa sylvatica</i>	Black Tupelo	X	X		X	X		X				75'		Full to Part
	* <i>Parrotia persica</i>	Persian Ironwood	X	X		X	X		X				50'		Full to Part
	* <i>Pistacia chinensis</i>	Chinese Pistache	X	X		X			X				35'		Full
	* <i>Quercus bicolor</i>	Swamp White Oak	X	X		X	X	X	X				60'		Full to Part
	* <i>Quercus douglasii</i>	Blue Oak	X	X		X	X		X				80'		Full to Part
	* <i>Quercus garryana</i>	Oregon White Oak	X	X		X	X		X	X			100'		Full to Part
	<i>Quercus kelloggii</i>	California Black Oak	X	X		X	X		X	X			100'	20'	Full to Part
	* <i>Quercus shumardii</i>	Shumard Oak	X	X		X	X	X	X				60'		Full
	<i>Quercus suber</i>	Cork Oak	X	X		X	X		X			X	100'		Full
	<i>Rhamnus purshiana</i>	Cascara	X	X		X	X	X	X	X			30'		Full to Part
	<i>Taxodium distichum</i>	Bald Cypress	X	X		X	X		X				100'		Full

APPENDIX G

APPROVED STREET TREE LIST

APPENDIX G
APPROVED STREET TREE LIST

Street Trees for Under Powerlines	
Botanical Name	Common Name
<i>Acer ginnala</i>	Amur Maple
<i>Acer Grandidentatum</i>	Bigtooth Maple
<i>Acer tartaricum</i>	Tartarian Maple
<i>Acer truncatum</i>	Shantung Maple
<i>Amelanchier arborea</i>	Shadbush
<i>Amelanchier x grandiflora 'var.'</i>	'Autumn Brilliance' Serviceberry
<i>Amelanchier x grandiflora 'var.'</i>	'Robin Hill' Serviceberry
<i>Amelanchier leavis</i>	Smooth Shadbush, Smooth Serviceberry
<i>Arbus unedo</i>	Strawberry Tree
<i>Carpinus Caroliana</i>	American Hornbeam
<i>Cercis</i>	Redbud most varieties
<i>Clerodendrum trichotomum</i>	Glorybower Tree
<i>Cornus florida</i>	Flowering Dogwood
<i>Cornus kousa</i>	Korean Dogwood
<i>Syringa reticulata 'var.'</i>	'Summer Snow' Japanese Tree Lilac

Street Trees for Parking Strips 4 Feet to 6 Feet Wide	
Botanical Name	Common Name
<i>Acer campestre</i>	Hedge Maple
<i>Acer campestre</i> 'var.'	'Queen Elizabeth' Hedge Maple
<i>Acer cappadocicum</i>	Coliseum Maple
<i>Acer grandidentatum</i>	Bigtooth Maple
<i>Acer griseum</i>	Paperbark Maple
<i>Acer platanoides</i> 'var.'	'Olmsted' Norway Maple
<i>Acer rubrum</i>	Red Maple
<i>Acer rubrum</i> 'Armstrong'	'Armstrong' Red Maple
<i>Acer rubrum</i> 'var.'	'Autumn Flame' Red Maple
<i>Acer rubrum</i> 'var.'	'Bowhall' Red Maple
<i>Acer rubrum</i> 'var.'	'Karpick' Red Maple
<i>Acer rubrum</i> 'var.'	'October Glory' Red Maple
<i>Acer rubrum</i> 'var.'	'Red Sunset' Red Maple
<i>Acer x freemanii</i> 'var.'	'Armstrong II' Maple
<i>Acer x freemanii</i> 'var.'	'Autumn Blaze' Maple
<i>Acer x freemanii</i> 'var.'	'Autumn Fantasy' Maple
<i>Acer x freemanii</i> 'var.'	'Scarlet Sentinel' Maple
<i>Aesculus x carnea</i> 'var.'	'Briotti' Red Horsechestnut
<i>Aesculus x carnea</i> 'var.'	'Ft. McNair' Red Horsechestnut
<i>Amelanchier x grandiflora</i>	Serviceberry
<i>Amelanchier x grandiflora</i> 'var.'	'Cumulus' Serviceberry
<i>Betula jacquemontii</i>	Jacquemontii Birch
<i>Carpinus betulus</i> 'var.'	'Fastigiata' European Hornbeam
<i>Carpinus carolinia</i>	American Hornbeam
<i>Celtis laevigata</i> 'var.,'	'All Seasons' Sugar Hackberry
<i>Celtis occidentalis</i>	Hackberry
<i>Celtis occidentalis</i> 'var.'	'Chicagoland' Hackberry
<i>Celtis occidentalis</i> 'var.'	'Prairie Pride' Hackberry
<i>Cercidiphyllum japonica</i>	Katsura
<i>Cercis canadensis</i>	Redbud
<i>Chionanthus virginicus</i>	Fringe Tree
<i>Chitalpa tashkentensis</i>	Chitalpa
<i>Cornus nuttallii</i>	Pacific Dogwood
<i>Koelreuteria paniculata</i>	Goldenrain Tree
<i>Ostrya virginiana</i>	American Hop Hornbeam
<i>Parrotia persica</i>	Persian Parrotia

Street Trees for Parking Strips 6 Feet to 8 Feet Wide	
Botanical Name	Common Name
<i>Acer campestre</i>	Hedge Maple
<i>Acer campestre</i> 'var.'	'Queen Elizabeth' Hedge Maple
<i>Acer cappadocicum</i>	Coliseum Maple
<i>Acer rubrum</i>	Red Maple
<i>Acer rubrum</i> 'var.'	'Autumn Flame' Red Maple
<i>Acer rubrum</i> 'var.'	'Bowhall' Red Maple
<i>Acer rubrum</i> 'var.'	'Karpick' Red Maple
<i>Acer rubrum</i> 'var.'	'October Glory' Red Maple
<i>Acer rubrum</i> 'var.'	'Red Sunset' Red Maple
<i>Acer saccharum</i>	Sugar Maple
<i>Acer saccharum</i> 'var.'	'Legacy' Sugar Maple
<i>Acer saccharum</i> 'var.'	'Bonfire' Sugar Maple
<i>Acer saccharum</i> 'var.'	'Commemoration' Sugar Maple
<i>Acer saccharum</i> 'var.'	'Green Mountain' Sugar Maple
<i>Acer saccharum</i> 'var.'	'Seneca Chief' Sugar Maple
<i>Acer truncatum</i> x 'var.'	'Norwegian Sunset' Maple
<i>Acer truncatum</i> x 'var.'	'Pacific Sunset' Maple
<i>Acer x freemanii</i> 'var.'	'Autumn Blaze' Maple
<i>Acer x freemanii</i> 'var.'	'Autumn Fantasy' Maple
<i>Acer x freemanii</i> 'var.'	'Celebration' Maple
<i>Acer x freemanii</i> 'var.'	'Scarlet Sentinel' Maple
<i>Aesculus hippocastanum</i> 'var.'	'Bauman' Horsechestnut
<i>Aesculus x carnea</i> 'var.'	'Briotti' Red Horsechestnut
<i>Aesculus x carnea</i> 'var.'	'Ft. McNair' Red Horsechestnut
<i>Castanea Dentata</i>	Blight Resistant Chestnut
<i>Carpinus betulus</i>	European Hornbeam
<i>Carpinus betulus</i> 'var.'	'Fastigate' European Hornbeam
<i>Carpinus carolinia</i>	American Hornbeam
<i>Celtis laevigata</i> 'var.,'	'All Seasons' Sugar Hackberry
<i>Celtis occidentalis</i>	Hackberry
<i>Celtis occidentalis</i> 'var.'	'Chicagoland' Hackberry
<i>Celtis occidentalis</i> 'var.'	'Prairie Pride' Hackberry

Street Trees for Parking Strips 6 Feet to 8 Feet Wide (continued)	
Botanical Name	Common Name
<i>Ginkgo biloba</i>	Ginkgo Male Only
<i>Ginkgo biloba</i> 'var.'	'Autumn Gold' Ginkgo Male only
<i>Ginkgo biloba</i> 'var.'	'Lakeview' Ginkgo Male only
<i>Ginkgo biloba</i> 'var.'	'Magyar' Ginkgo male only
<i>Halesia carolina</i>	Carolina Silverbell
<i>Halesia monticola</i>	Mountain Silverbell
<i>Koelreuteria paniculata</i>	Goldenrain Tree
<i>Ostrya virginiana</i>	American Hop Hornbeam
<i>Quercus robur</i>	English Oak
<i>Quercus robur</i> 'var.'	'Skymaster' English Oak
<i>Quercus rubra</i>	Northern Red Oak
<i>Quercus garryana</i>	Oregon White Oak
<i>Quercus shumardii</i>	Shumard Oak
<i>Sophora japonica</i>	Scholartree
<i>Sophora japonica</i> 'var.'	'Princeton Upright' Scholartree
<i>Sophora japonica</i> 'var.'	'Regent' Scholartree
<i>Umbellularia californica</i>	Oregon Myrtle
<i>Zelkova serrata</i>	Japanese Zelkova
<i>Zelkova serrata</i> 'var.'	'Green Vase' Japanese Zelkova
<i>Zelkova serrata</i> 'var.'	'Halka' Japanese Zelkova
<i>Zelkova serrata</i> 'var.'	'Village Green' Japanese Zelkova

Street Trees for Parking Strips 10 Feet Wide and Larger	
Botanical Name	Common Name
<i>Acer macrophyllum</i>	Bigleaf Maple
<i>Acer nigrum</i>	Black Maple
<i>Acer pseudoplatanus</i>	Sycamore Maple
<i>Acer pseudoplatanus</i> 'var.'	'Lustre' Sycamore Maple
<i>Acer pseudoplatanus</i> 'var.'	'Spaethii' Sycamore Maple
<i>Acer saccharum</i>	Sugar Maple
<i>Acer saccharum</i> 'var.'	'Legacy' Sugar Maple
<i>Acer saccharum</i> 'var.'	'Bonfire' Sugar Maple
<i>Acer saccharum</i> 'var.'	'Commemoration' Sugar Maple
<i>Acer saccharum</i> 'var.'	'Green Mountain' Sugar Maple
<i>Acer saccharum</i> 'var.'	'Seneca Chief' Sugar Maple
<i>Aesculus hippocastanum</i> 'var.'	'Bauman' Horsechestnut
<i>Castanea dentata</i>	Blight Resistant Chestnut
<i>Carpinus betulus</i>	European Hornbeam
<i>Celtis laevigata</i>	Sugar Hackberry
<i>Cladrastis lutea</i>	Yellowwood
<i>Eucommia ulmoides</i>	Hardy Rubber Tree
<i>Ginkgo biloba</i>	Ginkgo male only
<i>Ginkgo biloba</i> 'var.'	'Autumn Gold' Ginkgo male only
<i>Ginkgo biloba</i> 'var.'	'Lakeview' Ginkgo male only
<i>Ginkgo biloba</i> 'var.'	'Magyar' Ginkgo male only
<i>Ginkgo biloba</i> 'var.'	'Princeton Sentry' Ginkgo male only
<i>Gymnocladus dioicus</i>	Kentucky Coffeetree
<i>Gymnocladus dioicus</i> 'var.'	'Expresso' Kentucky Coffeetree
<i>Halesia carolina</i>	Carolina Silverbell
<i>Liriodendron tulipifera</i>	Tulip Tree
<i>Lithocarpus densiflorus</i>	Tanbark Oak
<i>Magnolia grandiflora</i>	Southern Magnolia
<i>Nyssa sylvatica</i>	Blackgum
<i>Quercus bicolor</i>	Swamp White Oak
<i>Quercus coccinea</i>	Scarlet Oak
<i>Quercus douglassi</i>	Blue Oak
<i>Quercus lobata</i>	Valley Oak
<i>Quercus frainetto</i> 'var.'	'Forest Green' Hungarian Oak
<i>Quercus macrocarpa</i>	Bur Oak
<i>Quercus phellos</i>	Willow Oak
<i>Quercus robur</i>	English Oak
<i>Quercus robur</i> 'var.'	'Skymaster' English Oak
<i>Quercus rubra</i>	Northern Red Oak
<i>Quercus shumardii</i>	Shumard Oak
<i>Sophora japonica</i>	Scholartree
<i>Sophora japonica</i> 'var.'	'Princeton Upright' Scholartree
<i>Sophora japonica</i> 'var.'	'Regent' Scholartree
<i>Tilia americana</i>	American Linden
<i>Tilia americana</i> 'var.'	'Redmond' American Linden

Street Trees for Parking Strips 10 Feet Wide and Larger	
Botanical Name	Common Name
<i>Tilia americana</i> 'var.'	'Legend' American Linden
<i>Tilia tomentosa</i>	Silver Linden
<i>Tilia platyphyllos</i>	Bigleaf Linden
<i>Tilia x euchlora</i>	Crimean Linden
<i>Ulmus accolade</i>	Accolade Elm Dutch elm disease tolerant only
<i>Ulmus parvifolia</i>	Chinese Elm Dutch elm disease tolerant only
<i>Umbellularia californica</i>	Oregon Myrtle
<i>Zelkova serrata</i>	Japanese Zelkova
<i>Zelkova serrata</i> 'var.'	'Green Vase' Japanese Zelkova
<i>Zelkova serrata</i> 'var.'	'Halka' Japanese Zelkova
<i>Zelkova serrata</i> 'var.'	'Village Green' Japanese Zelkova

APPENDIX H

Onsite Source Stormwater Controls

(A) Overview

- (1) Some site characteristics and uses may generate specific pollutants that are not addressed solely through implementation of the stormwater quality measures identified in 4.3.110. The site characteristics and uses in this chapter have been identified as potential sources for chronic loadings or acute releases of pollutants such as oil and grease, toxic hydrocarbons, heavy metals, toxic compounds, solvents, abnormal pH levels, nutrients, organics, bacteria, chemicals, and suspended solids. This appendix presents source controls for managing these pollutants at their source.
- (2) Industrial facilities may be subject to additional requirements through State of Oregon issued NPDES permits or as outlined in Oregon Administrative Rules (OAR) 340 Division 041.
- (3) Springfield Municipal Code 4.372 lists prohibited discharges to the City's storm sewer system. The City has used these standards in the development of the listed source controls so stormwater discharges can better meet these criteria. The implementation of this chapter is in addition to the applicable water quality, flow control, and flood control requirements.
- (4) Applicants may propose alternatives to the source controls identified in this chapter. Proposal of an alternative source control or alternative design element will require an additional review process and may delay issuance of related building or public works permits.

(B) Site Uses and Characteristics That Trigger Source Controls

- (1) As provided in SDC 4.3.110(C)(8), development that includes any of the following uses and characteristics are subject to the design methodologies of this chapter:
 - (a) Fuel Dispensing Facilities and Surrounding Traffic Areas (Section C)
 - (b) Above-Ground Storage of Liquid Materials (Section D)
 - (c) Solid Waste Storage Areas, Containers, and Trash Compactors (Section E)
 - (d) Outdoor Storage of Bulk Materials (Section F)
 - (e) Material Transfer Areas/Loading Docks (Section G)

- (f) Equipment and/or Vehicle Washing Facilities (Section H)
- (g) Covered Vehicle Parking Areas (Section I)

Applicants are required to address all of the site characteristics and uses listed in Sections (C) through (I). For example, if a development includes both a fuel dispensing area and a vehicle washing facility, the source controls in both Sections (C) and (H) will apply.

(2) Source Control Goals and Objectives

- (a) The specific source control standards are based on the following goals and objectives:
 - (i) Prevent stormwater pollution by eliminating pathways that may introduce pollutants into stormwater.
 - (ii) Protect soil, groundwater and surface water by capturing acute releases and reducing chronic contamination of the environment.
 - (iii) Direct wastewater discharges (including wash water) to a sanitary sewer system.
 - (iv) Direct areas that have the potential for acute releases or accidental spills, and are not expected to regularly receive flow or require water use (such as covered fuel islands or covered containment areas), to an approved method of containment or destination.
 - (v) Safely contain spills on-site, avoiding preventable discharges to sanitary sewer facilities, surface water bodies, or underground injection control structures (UICs).
 - (vi) Emphasize structural controls over operational procedures. Structural controls are not operator dependent and are considered to provide more permanent and reliable source control. Any proposals for operation-based source controls need to describe the long-term viability of the maintenance program.

(3) Signage

- (a) Informational signage is required for certain site uses and activities that may pollute stormwater. Signage addresses good housekeeping rules and provides emergency response measures in case of an accidental spill. Required spill response supplies must be clearly marked, located where the signage is posted (or the location of the supplies must be

clearly indicated by the signage), and must be located near the high-risk activity area. Required spill response supplies, such as absorbent material and protective clothing, should be available at all potential spill areas. Employees must be familiar with the site's operations and maintenance plan and proper spill cleanup procedures.

- (b) All signage must conform to the standards described below. Additional signage for specific activities is noted in applicable Sections C through I.
- (c) Signs must be 8.5" x 11" or larger and located and plainly visible from all activity areas. More than one sign may be needed to accommodate larger activity areas. Signs must be water-resistant and include the following information:
 - (i) Safety precautions for self-protection and spill containment.
 - (ii) Immediate spill response procedures—for example: "Turn the valve located at..." or "Use absorbent materials"
 - (iii) Emergency contact(s) and telephone number(s)—for example: "Call 911" and "City of Springfield Public Works"

(C) Fuel Dispensing Facilities

- (1) Fuel Dispensing Facilities include areas where fuel is transferred from bulk storage tanks to vehicles, equipment, and/or mobile containers (including fuel islands, above ground fuel tanks, fuel pumps, and the surrounding pad). This applies to large-sized gas stations as well as single-pump fueling operations.
- (2) **Cover**
 - (a) The fuel dispensing area must be covered with a permanent canopy, roof, or awning so precipitation cannot come in contact with the fueling activity areas. Rainfall must be directed from the cover to an approved stormwater destination.
 - (b) Covers 10 feet high or less must have a minimum overhang of 3 feet on each side. The overhang must be measured relative to the perimeter of the hydraulically isolated fueling activity area/pad it is to cover.
 - (c) Covers higher than 10 feet must have a minimum overhang of 5 feet on each side. The overhang must be measured relative to the perimeter of the hydraulically isolated fueling activity area/pad it is to cover.

(3) Pavement

- (a) A paved fueling pad must be placed under and around the fueling activity area with asphalt or concrete and must meet all applicable building code requirements.
- (b) Sizing of the paved areas must be adequate to cover the activity area, including placement and number of the vehicles or pieces of equipment to be fueled by each pump.
- (c) Fuel pumps must be located a minimum of seven feet from the edge of the fueling pad.

(4) Drainage

- (a) The paved area beneath the cover must be hydraulically isolated through grading, berms, or drains. This will prevent uncontaminated stormwater from running onto the area and carrying pollutants away.
- (b) Drainage from the hydraulically isolated area must be directed to an approved City sanitary sewer system, or authorized pretreatment facility.
- (c) Surrounding runoff must be directed away from the hydraulically isolated fueling pad to a stormwater destination that meet all stormwater management practices of the Springfield Development code and other applicable code requirements.

(5) Signage

- (a) Signage must be provided at the fuel dispensing area and must be plainly visible from all fueling activity areas.
- (b) Signage must clearly specify the location of any applicable spill control kits, shut-off valves, etc. and include all necessary instructions for their use.

(6) Spill Control Manhole

- (a) A spill control manhole must be installed on the discharge line of the fueling pad (before the domestic waste line tie-in).
- (b) The tee section must extend 18 inches below the outlet elevation, with an additional 3 feet of dead storage volume below the tee to provide storage for oil and grease.
- (c) The total containment volume must be no less than 110% the volume of the largest container or 10% of the total volume of product stored, whichever is larger.
- (d) The manhole must be located on private property.

(7) Shut-Off Valves

- (a)** Shut-off valves are required to protect the City sewer systems or onsite infiltration facilities of spill risks from chemicals and other constituents that provide a danger for wide spread contamination, system damages or risk to the public health. Manual shut-off valves must not be permitted unless a request for an adjustment is approved by the City.
- (b)** Shut-off valves will be required in the following situations:
 - (i)** Site or activity areas where corrosives or oxidizers are used or stored (for example, concentrated acids are corrosives having a pH of less than or equal to 5.0 and bases such as sodium or ammonium hydroxide having a pH of greater than or equal to 12.0, common oxidizers are hydrogen peroxide and bleach); or
 - (ii)** Substances which are water soluble or float on water; or
 - (iii)** Solvents and petroleum products
- (c)** Traffic pathways that surround the fueling pad, also designated as high-use/high-risk areas, will require a shut-off valve on the storm drainage system.
 - (i)** Valves installed on storm drainage systems must be installed downstream of all private stormwater quality facilities to accommodate spill containment.
 - (ii)** These valves should be left open to facilitate stormwater flows during normal conditions, and immediately closed in the event of a spill.
 - (iii)** The switch or handle to operate the shut-off valve must be clearly marked and accessible, and identified on the signage at the fuel dispensing area. In the event of a spill the valve must remain closed until all spilled fuel and residue has been properly removed and disposed of.
- (d)** Fueling pads will require a shut-off valve downstream of the spill control manhole.
 - (i)** Valves installed on sanitary sewer systems must be installed before the domestic waste line tie-in.
 - (ii)** These valves must automatically revert to the closed position.

(iii) These valves must be kept closed, and opened only to allow incidental drainage activities that do not pose to be a threat or risk to the destination system.

(e) Shut-off valves must be located on private property and downstream of the exposed area's collection system.

(i) All valves must be installed and maintained as per manufacturer's recommendations. For more information about shut-off valves and associated valve boxes, contact Building & Permit Services at 541-682-5086.

(8) Additional Requirements

(a) Installation, alteration, or removal of above-ground fuel tanks larger than 55 gallons, and any related equipment, are subject to additional permitting requirements by the Springfield-Eugene Fire Marshal's Office. For technical questions and permitting, call the Fire Marshal's Office Permit Center at 541-682-5411, or visit them at Permit & Information Center, 99 W. 10th Avenue, Eugene, OR 97401.

(b) Bulk fuel terminals, also known as tank farms, will require the following:

(i) Secondary containment equal to 110 percent of the product's largest container or 10 percent of the total volume of product stored, whichever is larger.

(ii) A separate containment area for all valves, pumps and coupling areas with sub-bermed areas either in front of or inside the main containment areas. These sub-bermed areas are required to have rain shields and be directed to a City sanitary sewer destination that meets all applicable code requirements if no City sanitary sewer facility is available, drainage must be directed to a temporary holding facility for proper disposal.

(iii) An impervious floor within all containment areas. Floors must be sealed to prevent spills from contaminating the groundwater.

(iv) Truck loading and off-loading areas. These areas must follow cover, pavement, drainage, spill control, and shut-off valve requirements identified for fuel dispensing facilities.

(v) Shut-off valves installed for the drainage of the tank yard, must be installed downstream of the drainage system of the primary containment area, and kept closed. Valves installed for the drainage of the truck pad and sub-bermed containment areas must be installed on the sanitary sewer line downstream of the spill control manhole.

(vi) A batch discharge authorization before draining a containment area. This authorization will determine appropriate disposal methods, identify pretreatment requirements (if applicable), and authorize the discharge. Pretreatment may be required for oil and grease removal, and testing may be required to establish the specific characteristics of the discharge.

(c) Underground fuel tanks less than 4,000 gallons in size are subject to additional permitting requirements by Oregon's Department of Environmental Quality (DEQ) and tanks larger than 4,000 gallons are referred to the Federal Environmental Protection Agency (EPA). For technical questions and permitting, call DEQ's NW Region main office at 1-800-844-8467 and ask for the Underground Storage Tank Permitting Department.

(D) Above-ground Storage of Liquid Materials

(1) Above-Ground Storage of Liquid Materials include places where exterior storage (either permanent or temporary) of liquid chemicals, food products, waste oils, solvents, or petroleum products in above-ground containers, in quantities of 50 gallons or more exist.

(2) Containment

(a) Liquid materials must be stored and contained in such a manner that if the container(s) is ruptured, the contents will not discharge, flow, or be washed into a receiving system.

(b) A containment device and/or structure for accidental spills must have enough capacity to capture a minimum of 110 percent of the product's largest container or 10 percent of the total volume of product stored, whichever is larger. Containers, such as double-walled containers, with internal protection are considered to meet this requirement.

(3) Cover

(a) Storage containers (other than tanks) must be completely covered to prevent stormwater contact. Runoff must be directed from the cover to a stormwater destination that meets all applicable code requirements.

(b) Covers 10 feet high or less must have a minimum overhang of 3 feet on each side. The overhang must be measured relative to the perimeter of the hydraulically isolated activity area.

- (c) Covers higher than 10 feet must have a minimum overhang of 5 feet on each side. The overhang must be measured relative to the perimeter of the hydraulically isolated activity area.

(2) Pavement

- (a) All above ground storage of liquid material must occur in paved areas. The storage area must be paved with asphalt or concrete and must meet all applicable building code requirements. Sizing of the paved areas must be adequate to cover the area intended for storage.

(3) Drainage

- (a) All paved storage areas must be hydraulically isolated through grading, berms, or drains to prevent uncontaminated stormwater run-on to a storage area.
- (b) Covered storage areas:
 - (i) Significant amounts of precipitation are not expected to accumulate in covered storage areas, and drainage facilities are not required for the contained area beneath the cover.
 - (ii) If the applicant elects to install drainage facilities, the drainage from the hydraulically isolated area must be directed to a sanitary sewer destination that meets all applicable code criteria.
- (c) Uncovered storage areas with containment:
 - (i) Water will accumulate in uncovered storage areas during and after rain. Any contaminated water cannot simply be drained from the area. It must be collected, inspected, and tested at the expense of the property owner before proper disposal can be determined.
 - (ii) Some type of monitoring may also be needed to determine the characteristics and level of contamination of the stormwater.
- (d) All discharges to the sanitary sewer system must be considered batch discharges and must require approval and meet applicable code requirements.
 - (i) Pretreatment requirements must be set as part of the discharge approval process, based on the types and quantities of material to be discharged.
 - (ii) A discharge evaluation must be performed before connection to a sanitary sewer facility.
 - (iii) Testing may be required to establish characteristics of the sanitary sewer or contaminated stormwater and to verify that local

discharge limits are not exceeded. MWMC illicit discharge staff can be contacted to start this process.

(4) Signage

- (a)** Signage must be provided at the liquid storage area and must be plainly visible from all surrounding activity areas.

(E) Solid Waste Storage

- (1)** Solid Waste Storage Areas, Containers, and Trash Compactors include outdoor areas with one or more facilities that store solid waste (both food and non-food waste) containers.
 - (a)** One- and two-family residential solid waste storage areas, containers, and trash compactors are exempt from this code subsection.
 - (b)** Solid waste includes both food and non-food waste or recycling. Solid waste containers include compactors, dumpsters, compost bins, grease bins, recycling areas, and garbage cans.
 - (c)** Debris collection areas used only for the storage of wood pallets or cardboard is excluded from these requirements.
 - (d)** The following site uses and activities include all commercial and industrial development with facilities that store solid wastes, both food and non-food.
 - (i)** Outdoor solid waste storage areas.
 - (ii)** Multi-family residential sites if a shared trash collection area is proposed.
 - (iii)** Activity areas used to collect and store refuse or recyclable materials, such as can or bottle return stations and debris collection areas.
 - (iv)** Facilities whose business is to process and/or recycle wood pallets or cardboard.

(2) Design

- (a)** For approval of solid waste storage and handling activity areas in the City of Springfield, the following design requirements will apply. See below for a clarification of each requirement:

Activity/Use	Requirements
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	Cover	Pavement	Hydraulically Isolated	Sanitary Sewer Drain
Multi Residential (with shared trash areas)	X	X	X	X
Commercial	X	X	X	X
Industrial	X	X	X	X
Compactors (regardless of use)	X	X	X	X
Can and Bottle Return Stations	X	X	X	X

(3) Cover

- (a) A permanent canopy, roof, or awning must be provided to cover the solid waste storage activity area and must be constructed to cover the activity area so rainfall cannot come in contact with the waste materials being stored. The cover must be sized relative to the perimeter of the hydraulically isolated activity area it is to cover. Runoff must be directed from the cover to a stormwater destination that meets all applicable code requirements.

(F) Outdoor Storage of Bulk Materials

Any bulk materials storage location that is not completely enclosed by a roof and sidewalls is an outdoor storage area.

(1) Bulk Materials Categories

- (a) Bulk materials are separated into three categories based on risk assessments for each material stored: high-risk, low-risk, and exempt.

High-Risk Materials	Low-Risk Materials	Exempt Materials
<ul style="list-style-type: none"> • Recycling materials with potential effluent • Corrosive materials (e.g. lead-acid batteries) • Storage and processing of food items • Chalk/gypsum products • Feedstock/grain • Material by-products with potential effluent • Asphalt • Fertilizer 	<ul style="list-style-type: none"> • Recycling materials without potential effluent • Scrap or salvage goods • Metal • Sawdust/bark chips • Sand/dirt/soil (including contaminated soil piles) • Material by-products without potential effluent • Unwashed gravel/rock • Composting Operations 	<ul style="list-style-type: none"> • Washed gravel/rock • Finished lumber • Plastic products (hoses, gaskets, pipe, etc.) • Clean concrete products (blocks, pipe, etc.) • Glass products (new, non-recycled)

<ul style="list-style-type: none"> • Pesticides • Lime/lye/soda ash • Animal/human wastes • Treated Lumber 		
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(2) Cover

- (a)** Low-risk materials must be covered with a temporary plastic film or sheeting at a minimum.
- (b)** High-risk materials are required to be permanently covered with a canopy or roof to prevent stormwater contact and minimize the quantity of rainfall entering the storage area. Runoff must be directed from the cover to a stormwater destination that meets all applicable code requirements.
- (c)** Covers 10 feet high or less must have a minimum overhang of 3 feet on each side. The overhang must be measured relative to the perimeter of the hydraulically isolated activity area.
- (d)** Covers higher than 10 feet must have a minimum overhang of 5 feet on each side. The overhang must be measured relative to the perimeter of the hydraulically isolated activity area.

(3) Pavement

- (a)** Low-risk and exempt material storage areas are not required to be paved.
- (b)** High-risk material storage areas must be paved beneath the structural cover.

(4) Drainage

- (a)** Low-risk material storage areas are allowed in areas served by standard stormwater management systems. However, all erodible materials being stored must be protected from rainfall.
- (b)** If materials are erodible, a structural containment barrier must be placed on at least three sides of every stockpile to act as a barrier to prevent uncontaminated stormwater from running onto the storage area and carrying pollutants away.
 - (i)** If the area under the stockpile is paved, the barrier can be constructed of asphalt berms, concrete curbing, or retaining walls.
 - (ii)** If the area under the stockpile is unpaved, sunken retaining walls can be used. The applicant must clearly identify the method of containment on the building plans.

- (c) For high-risk material storage areas, the paved area beneath the structural cover must be hydraulically isolated through grading, structural containment berms or walls, or perimeter drains to prevent runoff.
 - (i) Significant amounts of precipitation are not expected to accumulate in covered storage areas, and drainage facilities are not required for the containment area beneath the cover.
 - (ii) If the applicant elects to install drainage facilities, the drainage from the hydraulically isolated area must be directed to the City's sanitary sewer (with approval from the MWMC Illicit discharge division) and must meet all applicable code criteria.

(5) Additional Requirements

- (a) Storage of pesticides and fertilizers may need to comply with specific regulations outlined by the Oregon Department of Environmental Quality (DEQ). For answers to technical questions, call DEQ's NW Region main office at 1-800-844-8467.
- (b) A sampling manhole or other suitable stormwater monitoring access point may be required to monitor stormwater runoff from the storage area. This may apply to certain types of storage activities and materials or if an alternative source control is proposed. This requirement complies with Springfield Development Code 4.3.110D, which requires discharge to be treated. PW staff will review for applicability of this requirement.
- (c) Signage must be provided at the storage area if hazardous materials or other materials of concern are stored. Signage must be located so it is plainly visible from all storage activity areas. More than one sign may be needed to accommodate large storage areas.
- (d) If the applicant elects to install drainage facilities to the City's sanitary sewer system, a shut-off valve must be required for the structurally covered storage area.

(6) Alternative Protection Measures

- (a) In lieu of covering mineral resource mining, recovery, stockpiling, and processing operations and low-risk material storage areas receiving land use approval, the applicant may propose alternative protection measures that demonstrate that stormwater runoff from the site will not contaminate adjoining properties, surface waters, and ground water as part of their land use application.

(G) Material Transfer Areas/Loading Docs

- (1)** Material Transfer Areas/Loading Docks include areas that are either interior or exterior to a building, designed to accommodate a commercial truck/trailer being backed up to or into them, and used specifically to receive or distribute materials to and/or from commercial trucks/trailers. Includes loading/unloading facilities with docks, and large bay doors without docks.
 - (a)** These requirements also apply to all development proposing the installation of new material transfer areas or structural alterations to existing material transfer areas (e.g., access ramp regrading, leveler installations) with the following characteristics:
 - (i)** The area is designed (size, width, etc.) to accommodate a commercial truck (1 ton and larger) or trailer being backed up to or into it; and
 - (ii)** The area is designed so that it can be used to receive or distribute materials to and from trucks or trailers from any side.
 - (b)** Two standard types of material transfer areas associated with buildings are:
 - (i)** Loading/unloading facilities with docks
 - (ii)** Large bay doors without docks
 - (c)** The requirements in this section do not apply to material transfer areas or loading docks used only for mid-sized to small-sized passenger vehicles and areas restricted by lease agreements or other regulatory requirements to storing, transporting or using materials that are classified as domestic use, for example, primary educational facilities (elementary, middle or high schools), or buildings used for temporary storage, and churches.
- (2) Cover**
 - (a)** The hydraulically isolated areas in front of loading docks are required to be permanently covered with a canopy or roof to prevent stormwater contact and to minimize the quantity of rainfall entering the loading dock area. Runoff must be directed from the cover to a stormwater destination that meets all applicable code requirements.
 - (b)** Covers 10 feet high or less must have a minimum overhang of 3 feet on each side. The overhang must be measured relative to the perimeter of the hydraulically isolated activity area.

- (c) Covers higher than 10 feet must have a minimum overhang of 5 feet on each side. The overhang must be measured relative to the perimeter of the hydraulically isolated activity area.

(3) Pavement

- (a) A paved material transfer area must be placed underneath and around the loading and unloading activity area with asphalt or concrete that meets all applicable building code requirements. This will reduce the potential for soil contamination with potential impacts on groundwater and will help control any acute or chronic release of materials present in these areas.

(4) Drainage

- (a) Loading Docks:
 - (i) Drainage from the hydraulically isolated area must be directed to a sanitary sewer that meets all applicable code requirements. Surrounding runoff and drainage from the access ramp must be directed away from the hydraulically isolated area to a stormwater destination that meets all applicable requirements of the Springfield Development Code.
 - (ii) The requirement for the drainage from the hydraulically isolated area of the loading dock to be directed to the City's sanitary sewer, or authorized pretreatment facility may be waived if PW determines there is no gravity sanitary sewer service available and an appropriately sized, underground temporary storage structure (such as a catch basin with no outlet or dead-end sump) is provided.

(5) Non-Gravity Option

- (a) Activity areas that cannot achieve gravity sanitary sewer service may be allowed to install a pressurized (pumped) system. These types of installations will require the following to be provided at the time of building permit application:
 - (i) Proof that gravity sanitary sewer service cannot be obtained; and
 - (ii) Details of an electronic sump pump system equipped with a float switch
- (b) Pressurized system installations are considered "permanent equipment" and deemed the property owner's liability in the event of system failure or if the property becomes vacated.

- (c) The Building & Permit Services will review all sump pump or sewage ejector installations for compliance with Uniform Plumbing Code and Oregon State Plumbing Specialty Code.
- (d) Bay Doors and Other Interior Transfer Areas: Because interior material transfer areas are not expected to accumulate precipitation, installation of floor drains is not required or recommended. It is preferable to handle these areas with a dry-mop or absorbent material. If interior floor drains are installed, they must be plumbed to the City's sanitary sewer facility or authorized pretreatment facility. Interior transfer areas may not be sloped to drain to the exterior of the building.
- (e) Bay doors and other interior transfer areas must be designed so that stormwater runoff does not enter the building. This can be accomplished by grading or drains. Interior surfaces may not drain or be washed down to the exterior of the building.

(6) Signage

- (a) Signage must be provided at the material transfer area and must be plainly visible from all surrounding activity areas.

(5) Additional Requirements

- (a) Bay doors and other interior transfer areas must provide a 10-foot "no obstruction zone" beyond the entrance within the building. This will allow the transfer of materials to occur with the truck or trailer end placed at least 5 feet inside the building, with an additional staging area of 5 feet beyond that. The "no obstruction" zone must be clearly identified on the stormwater management plan and on the building plan at the time of the building permit application. The area must be identified at the facility by painting the "no obstruction zone" with bright or fluorescent floor paint.
- (b) Shut-off valves will be required under the following situations:
 - (i) Site activity areas that are exposed to corrosives or oxidizers that can harm conveyance system components (such as battery acid).
 - (ii) Substances that do not settle or remain in one location, but are capable of being dissolved in or float on top of water (such as oil and grease). These substances can spread rapidly into downstream systems, causing widespread impacts and difficult clean-up situations.
 - (iii) Substances that are known to infiltrate through soils and contaminate groundwater.

- (c) Valves located in material transfer areas are typically left open to facilitate drainage during normal conditions, and immediately closed in the event of a spill.
- (d) Prior to transfer activities of harmful substances, the valves should be closed and only re-opened after the transfer is complete. The shut-off valves must be located on private property and downstream of the exposed area's collection system.

(H) Equipment and/or Vehicle Washing Facilities

- (1) Equipment and/or Vehicle Washing Facilities include designated equipment and/or vehicle washing or steam cleaning areas, including smaller activity areas such as wheel washing stations.
- (2) **Cover**
 - (a) The washing area must be covered with a permanent canopy or roof so precipitation cannot come in contact with the washing activity area. Precipitation must be directed from the cover to a stormwater destination that meets all applicable code requirements.
 - (b) Covers 10 feet high or less must have a minimum overhang of 3 feet on each side. The overhang must be measured relative to the perimeter of the hydraulically isolated washing activity area it is to cover.
 - (c) Covers higher than 10 feet must have a minimum overhang of 5 feet on each side. The overhang must be measured relative to the perimeter of the hydraulically isolated washing activity area it is to cover.
- (3) **Pavement**
 - (a) A paved wash pad must be placed under and around the washing activity area with asphalt or concrete that meets all applicable building code requirements. Sizing of the paved area must adequately cover the activity area, including the placement of the vehicle or piece of equipment to be cleaned.
- (4) **Drainage**
 - (a) The paved area beneath the cover must be hydraulically isolated through grading, berms, or drains to prevent uncontaminated stormwater from running onto the area and carrying pollutants away.

- (b) Drainage from the hydraulically isolated area must be directed to the City's sanitary sewer, or authorized pretreatment facility.
- (c) Surrounding runoff must be directed away from the hydraulically isolated washing pad to a stormwater destination that meets all applicable requirements of the Springfield Development Code.

(5) Oil Control

- (a) All vehicle and equipment washing activities will be reviewed for needed oil controls to comply with the City's adopted plumbing code and Metropolitan Wastewater Management Commission requirements for pretreatment.
- (b) The following design criteria are established for oil/water separators discharging to a sanitary sewer facility:
 - (i) Washing Areas Protected with a Cover or Located Inside a Structure:

Baffled oil/water separators and spill control (SC-Type) separators must not be allowed for use with equipment and/or vehicle washing applications.

Note: activities and processes of a washing facility change over time and the introduction of heat and surfactants may occur.
 - (ii) Coalescing plate separators must be designed to achieve 100 ppm non-polar oil and grease in the effluent from the peak flow generated by the washing activity. Testing information must be submitted by the manufacturer of the unit that supports the 100 ppm effluent standard at the calculated flow rate. Standard flow from a 5/8" hose is estimated to be 10 gpm. For specially designed washing units, check the vendor specifications for maximum flow rates.
 - (iii) Any pumping devices must be installed downstream of the separator to prevent oil emulsification.
 - (iv) Separator details must be shown on the building plans submitted for permit, and must match manufacturer specifications and details, including the unit flow rate, effluent water quality, and maximum process flow rate.
- (c) On-site Wash Recycling Systems Wash may be used for oil control as long as they can meet effluent discharge limits for the City's sanitary sewer system. A detail of the wash recycling system and vendor

specifications identifying effluent efficiencies must be submitted as part of the building plans at the time of building permit application.

(I) Covered Vehicle Parking Structures

(1) Covered Vehicle Parking Structures include enclosed buildings, not including single-level covers such as canopies, overhangs, and carports, used to cover parked vehicles.

(2) Drainage

(a) Stormwater runoff from the top floor of a multi-level parking structure must be directed to a stormwater destination that meets all water quality requirements of the Springfield Development Code and any other applicable code requirements.

(b) Drainage from lower floor of a multi-level parking structure is not expected to accumulate significant amounts of precipitation runoff and drainage facilities are not required for the lower floors.

(c) If the applicant elects to install drainage facilities, the drainage from the lower floors must be directed to the sanitary sewer.

(3) Adjacent, Uncovered Portions of the Site

(a) The surrounding uncovered portions of the site must be designed so stormwater does not enter the covered parking areas. This can be accomplished through grading, drains, or exterior walls