CITY OF EDGEWOOD
Department of Community Development
2224 104th Avenue East
Edgewood, WA 98372-1513
Phone (253) 952-3299 Fax (253) 952-3537

Storm Drainage Minimum Design Requirements for Small Projects

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The City of Edgewood has adopted the December 2015 Pierce County Stormwater Management and Site Development Manual (PCM) with local amendments, per Edgewood Municipal Code (EMC) Title 13.05, as the City's standards for stormwater drainage design for all new and redevelopment projects on public and private property. **All projects are required to demonstrate Surface Water Compliance following EMC 13.05 and the 2015 PCM.**

To assist applicants and simplify the process for small and single-family residential projects, the City has prepared this handout. For sites that disturb less than 22,000 square feet and propose less than 5,000 square feet of new or replaced **impervious surface***, the facilities described herein are the minimum acceptable in the City. All applicants using this handout must also submit a completed SWPPP Short Form for review and acceptance (separate handout).

However, if either of these thresholds is exceeded, if *non-impervious* **hard surfaces**** are proposed for stormwater mitigation purposes, or if any critical areas exist within 300 feet of proposed project areas, applicants must have a stormwater design prepared by a practicing Washington State registered engineer. Please note that some of the guidance in this handout is made available from the Department of Ecology's Stormwater Management Manual for Western Washington (SWMMWW), and additional Low Impact Development (LID) rain garden design guidance has been adapted from the Rain Garden Handbook for Western Washington.

The following pages contain a step-by-step procedure for how to implement prescriptive stormwater Best Management Practices (BMPs), including design details and specifications. Please use this guide to size and locate the required facilities and prepare your site plan for application submittal.

We strongly encourage you to contact the City of Edgewood at (253) 952-3299 to review your proposal and discuss any questions you may have prior to application.

* ***Impervious surface*** *is defined as a hard surface area which prevents or retards the entry of water into the soil mantle, and/or causes water to run off the surface in greater quantities or at an increased rate of flow as compared to natural conditions. Common impervious surfaces include, but are not limited to, roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, gravel roads, packed earthen materials, and oiled, macadam or other surfaces which impede the natural infiltration of stormwater.*

** ***Hard surface*** *is defined as an impervious surface, permeable pavement, or vegetated roof.*

STEP-BY-STEP DESIGN PROCEDURE FOR SMALL PROJECTS

Step 1 – Are you proposing **less than 5,000 square feet of new or replaced impervious surface** and performing **less than 22,000 square feet of land-disturbing activity**?

☐ **No – Stop here**; you must have a stormwater design prepared by a practicing Washington State registered engineer.

☐ **Yes – Proceed to Step 2.**

Step 2 – Are you proposing **non-impervious hard surfaces for stormwater mitigation purposes** or is your site **within 300 feet of critical areas**?

☐ **No – Proceed to Step 3.**

☐ **Yes – Stop here**; you must have a stormwater design prepared by a practicing Washington State registered engineer.

Step 3 – Prepare a draft site plan for your project, following the Site Plan Requirements Checklist (separate handout). Once you have laid out your existing and proposed improvements, you can determine where stormwater BMPs can be installed. Have Soil Evaluation(s) prepared at potential stormwater BMP locations, as described on Page 4. **Are there 3 feet or more of permeable soil between the proposed final grade and any impermeable soils and/or seasonal high groundwater**?

☐ **No –** You must either:

1. Revise the proposed final grade to maintain at least 3 feet of permeable soil and **reconsider Step 3**,
2. (*if the site is more than ½-acre*) Consider and implement Dispersion Trench(s) / Splashblock(s) and **skip to Step 5**, or
3. **Stop here** and have the stormwater design prepared by a practicing Washington State registered engineer.

☐ **Yes – Proceed to Step 4.**

Step 4 – You must consider BMPs in a particular order, depending on your project's size. Are you proposing **less than 1,000 square feet of new and/or replaced hard surface area**?

☐ **No –** Consider and implement BMPs in the following order then **proceed to Step 5**:

1. Low Impact Development (LID) / Rain Garden(s)
2. Infiltration Trench(es)
3. (*If site is more than ½-acre and other options are infeasible due to location constraints*) Dispersion Trench(es) / Splashblock(s)

☐ **Yes –** Consider and implement BMPs in the following order then **proceed to Step 5**:

1. Infiltration Trench(es)
2. Low Impact Development (LID) / Rain Garden(s)
3. (*If site is more than ½-acre and other options are infeasible due to location constraints*) Dispersion Trench(es) / Splashblock(s)

Step 5 – As determined in Steps 3 and 4, consider and implement the applicable stormwater BMPs and update your site plan. Design details and specifications for each BMP can be found on the following pages:

- **Page 7:** Low Impact Development (LID) / Rain Garden(s)
- **Page 11:** Infiltration Trench(es)
- **Page 13:** Dispersion Trench(es) / Splashblock(s)

Determine an initial size of your proposed BMP(s) using the USDA textural class of the soil at the proposed facility's bottom. **Are you able to fit the selected BMP(s) on your site plan as required to address your proposed hard surface areas?**

☐ **No –** You must either:
1. **Revise the proposed site plan** to reduce or relocate impervious areas,
2. (if applicable) **Return to Step 4** and consider the next available BMP, or
3. **Stop here** and have the stormwater design prepared by a practicing Washington State registered engineer.

☐ **Yes – Proceed to Step 6.**

Step 6 – *For all proposed BMPs except for Dispersion Trench(es) / Splashblock(s)*, perform field infiltration testing to determine the Design Infiltration Rate (I_{design}), following the procedures described under Soil Evaluation Requirements (Page 4). Using I_{design}, re-size your stormwater BMP(s) as needed (Step 5) and **complete your site plan**.

Step 7 – Complete a SWPPP Short Form (separate handout), and submit to the City with your Surface Water Compliance Application and two copies of your site plan for review.

APPROVAL PROCESS

Applicants must submit:

1. A site plan of sufficient detail to facilitate review of the proposed storm drainage system by the City Engineer. At a minimum, a 1"=40' scale development site plan with contours and each element of the proposed system will be required. ***See the Site Plan Requirements Checklist (separate handout).***

2. A narrative report addressing all applicable Minimum Requirements from the 2015 PCM (***i.e., SWPPP Short Form, separate handout***).

3. A vicinity map showing adjacent properties, structures, streets, contours, drainage and septic facilities (***may be included on the site plan provided under item 1***).

4. A copy of the onsite septic system design as approved by the Tacoma-Pierce County Health Department (if applicable).

5. Soil logs (as described under "Soil Evaluation Requirements," Page 4)

In areas of risk to the public, a storm drainage performance bond may be required as determined by the City Engineer.

SOIL EVALUATION REQUIREMENTS

Soil log(s) must be prepared for any proposed stormwater BMP location(s) by an onsite sewage designer, professional engineer, geologist, hydrogeologist, or engineering geologist registered in the State of Washington. Each soil exploration must be to a minimum of 4 feet in depth (from proposed grade), identifying the SCS series of the soil and the USDA textural class of the soil horizon through the depth of the log, and noting any evidence of high groundwater (such as mottling). If the soil logs demonstrate there are less than 3 feet of permeable soil between the proposed final grade and impermeable soils and/or seasonal high groundwater, then the applicant must either:

1. Revise the proposed final grade to maintain at least 3 feet of permeable soil (if possible),
2. Evaluate the feasibility of dispersion (if the site is ½-acre or larger), or
3. Have the stormwater design prepared by a practicing Washington State registered engineer.

If 3 feet or more permeable soil is available, field infiltration testing may be required (as follows):

	Proposed BMP	
Testing Method	**Infiltration**	**LID / Rain Garden**
Falling Head (Pierce County)	Recommended *(for verification)*	Allowed
Small-Scale PIT	Not Required	Recommended *(Required to prove infeasibility)*

The following field testing procedures are taken from Appendix III-A of the PCM, adapted for use in the City of Edgewood. Initial sizing of BMPs may be performed based on the soil's USDA textural class, and then confirmed based on field testing results.

General Field Testing Procedures:

1. At least 5 feet away from the original soil log location, excavate to the bottom elevation of the proposed BMP and measure the infiltration rate of the underlying soil, using one of the aforementioned testing methods (described in more detail below).
2. For all testing methods, apply the following safety factors to the Measured / Short-Term Infiltration Rate ($I_{measured}$) and calculate the Design Infiltration Rate (I_{design}):

$$I_{design} = I_{measured} \times F_{testing} \times F_{geometry}$$

$\mathbf{I_{design}}$	*Design Infiltration Rate (in/hr), result of equation above*	
$\mathbf{I_{measured}}$	*Measured / Short-Term Infiltration Rate (in/hr)*	
$\mathbf{F_{testing}}$	Falling Head (Pierce County) = 0.40	Small-Scale PIT = 0.50
$\mathbf{F_{geometry}}$	*Depends on proposed BMP width, see below*	

W *(width of proposed BMP)*	4 ft or less	5 ft	6 ft	7 ft	8 ft	10 ft	15 ft	20 ft or more
$\mathbf{F_{geometry}}$	1.0	0.85	0.72	0.62	0.55	0.45	0.32	0.25

Falling Head (Pierce County) Testing Method:

1. A minimum of one test for every 500 square feet of proposed facility bottom area shall be performed within the area proposed for an absorption system. Tests pits shall be spaced uniformly throughout the area. *If soil conditions are highly variable, more tests may be required.*
2. Each test hole shall have a minimum diameter of 8 inches, dug or bored to the bottom of the proposed facility. To expose a natural soil surface, the bottom of the hole shall be scratched with a sharp pointed instrument, and then the loose material shall be removed. A 6-inch-inner-diameter, 4-foot long, PVC pipe is set into the hole and pressed into the soil 6 inches. At least 2 inches of one-half to three-fourths-inch rock are placed in the pipe to protect the bottom from scouring when water is added.
3. The pipe is carefully filled with at least 12 inches of clear water. The depth of water must be maintained for at least 4 hours (preferably overnight if clay soils are present). A funnel with an attached hose or similar device may be used to prevent water from washing down the sides of the hole. Automatic siphons or float valves may be employed to automatically maintain the water level during the soaking period. It is extremely important that the soil be allowed to soak for a sufficiently long period of time to produce accurate results. *In sandy soils with little or no clay, soaking is not necessary. If, after filling the pipe twice with 12 inches of water, the water seeps completely away in less than 10 minutes, the test can proceed immediately.*
4. Except for sandy soils, measurements are made between 15 and 30 hours after the soaking period began. The water level is adjusted to 6 inches above the gravel (or 8 inches above the bottom of the hole). At no time during the test is the water level allowed to rise more than 6 inches above the gravel. Immediately after adjustment, the water level is measured from a fixed reference point to the nearest 1/16th-inch at 30 minute intervals. The test is continued until two successive water level drops do not vary by more than 1/16-inch within a 90-minute period. At least three measurements are to be made. After each measurement, the water level is readjusted to the 6-inch level. The last water level drop is used to calculate $I_{measured}$. *In sandy soils or soils in which the first 6 inches of water added after the soaking period seeps away in less than 30 minutes, water level measurements are made at 10 minute intervals for a 1-hour period. The last water level drop is used to calculate* $I_{measured}$.
5. $I_{measured}$ is calculated for each hole by dividing the last water level drop by the time interval used between measurements (i.e., inches per hour). To determine $I_{measured}$ based on multiple holes, the rates obtained from each hole are averaged. (*If tests in the area vary by more than 2 inches/hour, variations in soil type are indicated. Under these circumstances, the lowest rate should be used.*) To compute I_{design}, $I_{measured}$ must then be adjusted by the appropriate safety factors outlined previously.
   Example: If the last measured drop in water level after 30 minutes is five-eighths-inch, then $I_{measured}$ = (⅝ inch)/(30 minutes) x (60 minutes/hour) = 1.25 inches/hour.

I_{design} Calculation example:
Assuming a 5-foot-wide rain garden with D = 1 foot:

$$\mathbf{I_{design}} = I_{measured} \times F_{testing} \times F_{geometry} \times F_{plugging}$$
$$= 1.25 \text{ inches/hour} \times 0.40 \times (4 (1 / 5) + 0.05) \times 1.0$$
$$= 1.25 \times 0.40 \times 0.85 \times 1.0 = \mathbf{0.425 \text{ inches per hour}}$$

Small-Scale PIT Testing Method:

1. At least one test pit shall be excavated within the proposed facility area. In the case of a rain garden, excavate to the estimated elevation at which the imported soil mix will lie on top of the underlying native soil. Lay back the slopes sufficiently to avoid caving and erosion during the test. Alternatively, consider shoring the sides of the test pit.
2. The horizontal surface area of the bottom of the test pit should be at least 12 square feet. It may be circular or rectangular, but accurately document the size and geometry of the test pit.
3. Install a vertical measuring rod adequate to measure the ponded water depth and that is marked in half-inch increments in the center of the pit bottom.
4. Use a 3-inch diameter rigid pipe with a splash plate to add water to the pit, to prevent side-wall erosion and disturbance of the pond bottom (either may result in reduced infiltration rates).
5. Pre-soak period: Add water to the pit so that there is standing water for at least 6 hours. Maintain the pre-soak water level at least 12 inches above the bottom of the pit.
6. At the end of the pre-soak period, add water to the pit at a rate that will maintain a 12 inch water level above the bottom of the pit over a full hour.
7. Every 15 minutes, record the cumulative volume and instantaneous flow rate in gallons per minute necessary to maintain the water level at 12 inches on the measuring rod.
8. After one hour, turn off the water and record the rate of infiltration (the drop rate of the standing water) in inches per hour from the measuring rod data, until the pit is empty. A self-logging pressure sensor may also be used to determine water depth and drain-down.
9. Calculate and record $I_{measured}$ in inches per hour in 30 minutes or 1-hour increments until 1 hour after the flow has stabilized. Note: Use statistical/trend analysis to obtain the hourly flow rate when the flow stabilizes. This would be the lowest hourly flow rate. To compute I_{design}, $I_{measured}$ must then be adjusted by the appropriate safety factors outlined previously.
   <u>Example:</u> The area of the bottom of the test pit is 8.5-feet by 11.5-feet. Water flow rate was measured and recorded at intervals ranging from 15 to 30 minutes throughout the test. Between 400 minutes and 1,000 minutes, the flow rate stabilized between 10 and 12.5 gallons per minute or 600 to 750 gallons per hour, or an average of (9.8 + 12.3) / 2 = 11.1 inches per hour.

I_{design} Calculation example:
Assuming a 5-foot-wide rain garden with D = 1 foot:

$$\mathbf{I_{design}} = I_{measured} \text{ x } F_{testing} \text{ x } F_{geometry} \text{ x } F_{plugging}$$
$$= 11.1 \text{ inches/hour x } 0.50 \text{ x } (\ 4\ (\ 1 / 5) + 0.05\ ) \text{ x } 1.0$$
$$= 1.25 \text{ x } 0.50 \text{ x } 0.85 \text{ x } 1.0 = \mathbf{4.72 \text{ inches per hour}}$$

LID / RAIN GARDEN REQUIREMENTS

A rain garden is a shallow stormwater system with specific soils and plantings, performing as small project site landscape feature that also handles stormwater. They function by storing stormwater on the surface prior to filtration through the underlying soil, designed to mimic a forested condition by controlling stormwater through detention, infiltration, and evapotranspiration. Rain gardens also provide water quality treatment through sedimentation, filtration, absorption, and phytoremediation. Treated stormwater is infiltrated into the underlying soil, with excess flows being routed to an adjacent drainage system and/or dispersed through adjacent vegetation (depending on site conditions).

Rain gardens should be used to receive rooftop runoff (particularly where infiltration is not feasible) and other impervious surface runoff, being integrated into proposed landscape areas. They are functional in areas where underlying soils may not be conducive to rapid infiltration (such as underlying glacial till or high ground water), but where surface soils allow shallow stormwater migration (i.e. interflow).

Design Criteria for Rain Gardens:

Figure 1 (attached, derived from PCM, Volume III, Figure 3.6) shows a typical rain garden system, designed as follows:

1. Sizing of a rain garden in the City of Edgewood is based on the design infiltration rate of underlying soils (see Soil Evaluation Requirements) and the square footage of tributary impervious surface area, using the following table (maximum ponding depth of six (6) inches):

USDA textural class	Design Infiltration Rate (inches/hour)	Water Surface Area per 1,000sf tributary impervious surface area (square feet)
Coarse sands and cobbles*	2.50 or more	170
Medium sand*	1.00 to 2.49	250
Fine sand, loamy sand	0.50 to 0.99	300
Sandy loam	0.25 to 0.49	360
Loam	0.1 to 0.24	450

**Note: These soil types are not typically found in the City of Edgewood*

2. If lawn/landscape area will also be draining to the rain garden, the facility's area shall be increased by 2 percent of the tributary lawn/landscape area.
3. All rain gardens designed following this handout shall maintain a minimum of 1 foot of clearance from seasonal high groundwater or other impermeable layer to the bottom of the facility. The rain garden bottom shall not be oversized, as vegetation in oversized rain gardens may not receive sufficient stormwater runoff for irrigation, increasing O&M requirements.
4. Rain gardens must be sized for all tributary flows. **However, public roadway runoff shall not be directed toward rain gardens.** Stormwater flows from other areas (beyond the area for which the rain garden is sized) must be bypassed around the rain garden.
5. Rain gardens should not be built on slopes steeper than 8 percent (12H:1V). A geotechnical analysis is required if located within 200 feet of the top of steep slope and/or landslide hazard area. *This review may be subject to consultant peer review at an additional cost at the time of submittal.* See PCM Volume 3, Section 3.4.3 for a full list of infeasibility criteria.

6. All rain gardens shall maintain a minimum of 1 foot positive vertical clearance from the maximum ponding water surface to any structures within 25 feet.

7. All rain gardens shall be at least 10 feet from any structure or property line. Reduced setbacks to Native Growth Protection Easement or sensitive area tract / setback areas may be allowed by the City (except steep slopes, see below).

8. All rain gardens must be at least 50 feet from the top of any sensitive area steep slope. This setback may be reduced based on a geotechnical evaluation, but in no instances may it be less than the slope buffer width. *Geotechnical review may be subject to consultant peer review at an additional cost at the time of submittal.*

9. For sites with onsite or adjacent septic systems, all rain gardens shall be a minimum of 5 feet from septic tanks and distribution boxes. Also, the overflow discharge point must be at least 30 feet upgradient, or 10 feet downgradient, of the drainfield primary and reserve areas (per WAC 246-272A-0210). This requirement may be modified by the Tacoma-Pierce County Health Department if site topography clearly prohibits flows from intersecting the drainfield or where site conditions (soil permeability, distance between systems, etc.) indicate that this is unnecessary.

10. In no case should rain gardens be placed closer than 100 feet from drinking water wells and springs used for drinking water supplies. Where water supply wells exist nearby, the applicant may need a design prepared by a practicing Washington State registered engineer.

11. Flow entrances should be sized to handle tributary flows and designed to reduce clogging potential and prevent inflow erosion. Water can be directed across a landscaped area, through an open swale with plants and decorative rock, or through a pipe. If the slope is gentle (2% or less) and the entrance is well protected with vegetation or rock, then no special design is needed. If the slope is steeper and water is directed through a swale, consider adding small rock check dams every 5 to 10 feet to slow the water. Where water enters from a swale or pipe, place a pad of rock to slow the water and guard against erosion. See the Rain Garden Handbook for Western Washington for additional details and information (https://fortress.wa.gov/ecy/publications/documents/1310027.pdf)

12. Cell ponding area design criteria are the same as those specified in the Rain Garden Handbook for Western Washington (referenced above), except for the following:
    a. The ponding depth for rain gardens shall be a maximum of 6 inches.
    b. The minimum freeboard measured from the invert of the overflow pipe or earthen channel to facility overtopping elevation shall be 6 inches.
    c. If berming is used to achieve the minimum top elevation needed to meet ponding depth and freeboard needs, the maximum slope on berm shall be 3H:1V, and the minimum top width of design berm shall be 1 foot. Soil used for berming shall be imported bioretention soil or amended native soil.

13. Recommended maximum and minimum dimensions include:
    a. The maximum planted side slope shall be 3H:1V: If steeper side slopes are necessary rockeries, concrete walls or soil wraps may be effective design options
    b. The bottom width shall be no less than 2 feet.

14. An overflow route must be identified for stormwater flows that overtop the rain garden area, flowing to a downstream conveyance system or other acceptable discharge point. Rain garden

overflow can be provided by a drain pipe installed at the designed maximum ponding elevation and connected to a downstream BMP or an approved discharge point. See the Rain Garden Handbook for Western Washington (referenced above) for additional details and information.

15. Bioretention Soil Mix - See the Rain Garden Handbook for Western Washington (referenced above) for soil mix information. For amending the native soil within the rain garden, the City recommends use of compost that meets the PCM's compost specification for bioretention (provided below). Compost that includes biosolids or manure shall not be used.

16. Planting - Refer to the Rain Garden Handbook for Western Washington (referenced above) for guidance on plant selection and recommendations for increasing survival rates. The minimum requirements associated with the vegetation design include the following:
    a. The design plans must specify that vegetation coverage of selected plants will achieve 90 percent coverage within 2 years or additional plantings will be provided until this coverage requirement is met.
    b. Plant spacing and plant size must be designed to achieve specified coverage by a certified landscape architect.
    c. The plants must be sited according to sun, soil, wind, and moisture requirements.
    d. At a minimum, provisions must be made for supplemental irrigation during the first two growing seasons following installation.

17. Mulch Layer - Refer to the Rain Garden Handbook for Western Washington (referenced above) for mulch layer requirements. Properly selected mulch material also reduces weed establishment, regulates soil temperatures and moisture, and adds organic matter to soil. Mulch should consist of compost in the bottom of the facilities (compost is less likely to float than wood chip mulch and is a better source for organic materials).

Construction Criteria for Rain Gardens:

1. Rain gardens rely on water movement through the surface soils as infiltration and interflow to underlying soils. Therefore, it is important to always consider the pathway of interflow and assure that the pathway is maintained in an unobstructed and uncompacted state. This is true during the construction phase as well as postconstruction.

2. During construction, it is critical to prevent clogging and over-compaction of the native soil, bioretention soils, or amended soils. Additionally, excavation, soil placement, or soil amendment must not be allowed during wet or saturated conditions.

3. Place bioretention soils per the mix requirements specified in Volume 3, Section 3.4.6 of the PCM, and amend the soil per Volume 3, Section 3.1.

4. The rain garden is to be protected from sediment-laden runoff during site construction through the use of erosion and sediment controls as outlined in the 2015 PCM (and any revisions thereto).

5. **Prior to final acceptance of any rain garden, the City Inspector shall perform the following inspections:**
    - **Upon pit excavation (prior to placement of any materials)**
    - **After placement of bioretention soil and mulch (prior to plantings)**
    - **Upon final stabilization and tributary area connection(s)**

PCM Bioretention Compost Specification

- Material must meet the definition of "composted material" in WAC 173-350-100 and complies with testing parameters and other standards in WAC 173-350-220.
- Material must be produced at a composting facility that is permitted by a jurisdictional health authority. Permitted compost facilities in Washington are included on a list available at <www.ecy.wa.gov/programs/swfa/organics/soil.html>.
- The compost must originate from a minimum of 65 percent by volume from recycled plant waste comprised of "yard debris," "crop residues," and "bulking agents" as defined in WAC 173-350-100. A maximum of 35 percent by volume of "postconsumer food waste" as defined in WAC 173-350-100, but not including biosolids, may be substituted for recycled plant waste.
- Moisture content must be such that there is no visible free water or dust produced when handling the material.
- The material shall be tested in accordance with the U.S. Composting Council "Test Method for the Examination of Compost and Composting" (TMECC), as established in the Composting Council's "Seal of Testing Assurance" (STA) program. Most Washington compost facilities now use these tests.
- Composted material shall meet the size gradations established in the U.S. Composting Council's Seal of Testing Assurance (STA) program, as follows:

Gradation by dry weight	Min.	Max.
Percent passing 2"	100	
Percent passing 1"	99	100
Percent passing 0.625"	90	100
Percent passing 0.25"	75	100

- The pH shall be between 6.0 and 8.5 (TMECC 04.11-A). "Physical contaminants" (as defined in WAC 173-350-100) content shall be less than 1 percent by weight (TMECC 03.08-A) total, not to exceed 0.25 percent film plastic by dry weight.
- Manufactured inert material (plastic, concrete, ceramics, metal, etc.) shall be less than 1.0 percent by weight as determined by TMECC 03.08-A "percent dry weight basis."
- Minimum organic matter content shall be 40 percent by dry weight basis as determined by TMECC 05.07A, "Loss-On-Ignition Organic Matter Method."
- Soluble salt contents shall be less than 4.0 mmhos/cm tested in accordance with TMECC 04.10-A, "1:5 Slurry Method, Mass Basis."
- Maturity indicators from a cucumber bioassay shall be greater than 80 percent, in accordance with TMECC 05.05-A, "Germination and Vigor."
- The material must be stable (low oxygen use and CO_2 generation) and mature (capable of supporting plant growth). This is critical to plant success in a bioretention soil mixes. Stability shall be 7 or below in accordance with TMECC 05.08-B, "Carbon Dioxide Evolution Rate."
- Fine Compost shall have a carbon to nitrogen (C:N) ratio of < 25:1 as determined using TMECC 04.01 "Total Carbon" and TMECC 04.02D "Total Kjeldhal Nitrogen." The Engineer may specify a C:N ratio up to 35:1 where plants selected are entirely Puget Sound lowland native species.
- Compost not conforming to the above requirements or taken from a source other than those tested and accepted shall be removed and replaced immediately. Acceptable compost product sources include:
  - Cedar Grove Composting, Washington
  - Other approved equal.

INFILTRATION TRENCH REQUIREMENTS

It is the City's policy to infiltrate as much development runoff as feasible with existing site and soil conditions. The following infiltration trench design may be suitable for some sites, but may not be utilized on slopes greater than 25% or when soil data show less than three feet of permeable soil. Other infiltration options may be possible, if developed and stamped by a practicing Washington State registered engineer in compliance with the 2015 PCM and EMC 13.05, and subsequently permitted by the City. Every effort will be made by the City to facilitate review and assist the applicant in constructing a functional and safe drainage system.

Design Criteria for Infiltration Trenches:

Figure 2 (attached and derived from PCM Attachments, Section A, Figure 11.1) shows a typical downspout infiltration trench system, designed as follows:

1. The following table may be used for sizing infiltration trenches with a minimum 2-foot-deep gravel section, as described herein:

USDA textural class	**Measured / Short-Term Infiltration Rate (in/hr)**	**Trench Bottom Area per 1,000sf tributary area (square feet)**	
Depth from finish grade to high groundwater and/or impermeable soil layer		*3 feet*	*3.5 feet*
Coarse sands and cobbles*	60	40	24
Medium sand*	12	60	58
Fine sand, loamy sand	4	150	101
Sandy loam	2	250	144
Loam	1	380	206

**Note: These soil types are not typically found in the City of Edgewood*

If more than 3.5 feet of permeable soil is available, alternate trench depths and/or dry wells may be considered per Table 3.5 in Volume 3, Section 3.9 of the PCM.

2. A catch basin with a minimum 12-inch sump is required immediately upstream of the infiltration trench, and all tributary runoff must be routed through this catch basin. A trap shall be provided using a minimum 4" diameter, non-perforated tee with a fine mesh screen covering the openings (see Figure 2). *In lieu of using fine mesh screen, caps with several 1/4-inch-diameter holes are allowable, with at least one being removable for maintenance purposes.*
3. Maximum trench width allowed is six (6) feet. Minimum trench separation is two (2) feet. If grades allow, an infiltration bed may be considered, with maximum spacing of six (6) feet between perforated distribution pipe centerlines.
4. Maximum length of perforated pipe must not exceed 100 feet from the catch basin.
5. A cleanout is required at the end of each perforated pipe, using 45 degree bends to bring the pipe to the surface for observation and maintenance. A slip-by-thread coupling and cap shall be installed at finish grade.

6. Geotextile filter fabric must be wrapped entirely around the trench drain rock prior to backfilling as shown on Figure 2, EXCEPT that a 6-inch layer of ASTM-33 sand may be used in lieu of geotextile on the trench bottom.
7. The bottom of infiltration trenches may be placed in fill material if the fill is placed and compacted under the direct supervision of a geotechnical engineer or professional civil engineer with geotechnical expertise, and if the measured infiltration rate is at least eight (8) inches per hour. Trench length in fill must be 60 linear feet per 1,000 square feet of roof area. *Infiltration rates can be tested using the methods described in PCM Volume 3, Section 3.9.*
8. Infiltration trenches should not be built on slopes steeper than 25 percent (4H:1V). A geotechnical analysis and report is required if constructed on slopes over 15 percent or if located within 200 feet of the top of steep slope and/or landslide hazard area. *This review may be subject to consultant peer review at an additional cost at the time of submittal.*
9. Trenches may be located under pavement if a small yard drain or catch basin with grate cover is placed at the end of the trench pipe (in lieu of a cleanout), such that overflow would occur out of the catch basin at an elevation at least one foot below that of the pavement and in a location which can accommodate the overflow without creating a significant adverse impact to downhill properties or drainage systems. This is intended to prevent saturation of the pavement in the event of a system failure.
10. All infiltration systems should be at least 10 feet from any structure, property line, Native Growth Protection Easement, or sensitive area tract / setback (except steep slopes, see below).
11. All infiltration systems must be at least 50 feet from the top of any sensitive area steep slope. This setback may be reduced to a minimum of 15 feet based on a geotechnical evaluation, but in no instances may it be less than the slope buffer width. *Geotechnical review may be subject to consultant peer review at an additional cost at the time of submittal.*
12. For sites with septic systems, infiltration systems must be at least ten (10) feet down gradient of the septic drainfield, unless the site topography clearly prohibits subsurface flows from intersecting the drainfield. All drainage facilities must be designed so they do not interfere with any on-site sewage disposal system or water supply well. Current applicable Tacoma–Pierce County Health Department setbacks and requirements also apply.

Construction Criteria for Infiltration Trenches:

1. All pipe-to-catch basin interfaces must be mortared using non-shrink grout.
2. Wet/dry glue shall be used to seal all pipe-pipe and pipe-fitting interfaces.
3. The infiltration trench is to be protected from sediment-laden runoff during site construction through the use of erosion and sediment controls as outlined in the 2015 PCM (and any revisions thereto).
4. **Prior to final acceptance of any infiltration trench system, the City Inspector shall perform the following inspections:**
    - **Upon trench excavation (prior to placement of any materials)**
    - **After placement of the rock and pipe (prior to native soil backfill)**
    - **Upon final stabilization and roof drain connection**

DISPERSION SYSTEM REQUIREMENTS

Dispersion Systems include splash blocks and/or gravel-filled trenches, which serve to spread impervious surface runoff over vegetated pervious areas (i.e., undisturbed native landscape or a proposed lawn / landscape area that meets PCM Volume III, Section 3.1). Dispersion systems may be used to satisfy the Minimum Requirements of the 2015 PCM and EMC 13.05 using this handout on project sites greater than or equal to 22,000 square feet, only if the total disturbed area is under 22,000 square feet and the total new and replaced impervious surface area is less than 5,000 square feet. *Dispersion may be allowed in other situations if designed by a practicing Washington State registered engineer.*

General Design Criteria for Dispersion Systems:

1. Dispersion in accordance with Figures 3 and 4 (attached and derived from PCM Volume III, Figures 3.9a and Attachments, Section A, Figure 1, respectively) shall be used for all dispersion applications except where splash blocks are allowed as described below.
2. Splash blocks shown in Figure 5 (attached and derived from PCM Volume III, Figure 3.10) may be used for downspouts discharging to a vegetative flowpath of at least 50 feet in length measured from the downspout to the downstream property line, structure, sensitive area, or other impervious surface.
3. Natural resource protection areas and critical area buffers may count towards flowpath lengths. **This does not include steep slopes.** However, the natural resource protection area must be permanently protected from modification through a covenant or easement, or a tract dedicated by the proposed project.
4. Dispersion systems must be down gradient of septic drainfields unless site topography clearly prohibits surface and subsurface flows from intersecting the drainfield.
5. Dispersion systems shall not be allowed to discharge stormwater toward the up-slope edge of Landslide or Erosion Hazard Areas. If the natural discharge location of the site is to the Landslide or Erosion Hazard Area, stormwater shall be conveyed down the slope in a pipe as required by EMC 14.80 and 14.110. If the natural discharge location of the site is away from the Landslide or Erosion Hazard Area, a piped storm system shall be used to convey stormwater away from the hazard area. Stormwater management facilities for the site shall be implemented in accordance with the requirements of EMC 13.05 and the 2015 PCM.
6. Dispersion systems may not be placed on or above slopes greater than 20% without evaluation by a geotechnical engineer. *This review may be subject to consultant peer review at an additional cost at the time of submittal.*
7. No erosion or flooding of downstream properties may result.
8. To preserve the vegetative flowpath area from alteration, the dispersion system and flowpath length shall be documented on a site plan and to be recorded on the property title (EMC 13.05.170). The site plan shall include the following requirements:
    a. Maintenance of vegetation in the flowpath area shall be in accordance with BMP T5.13 (or otherwise approved design).

b. Splashblocks or gravel-filled trenches shall not be covered or removed but shall be maintained in accordance with the approved design.

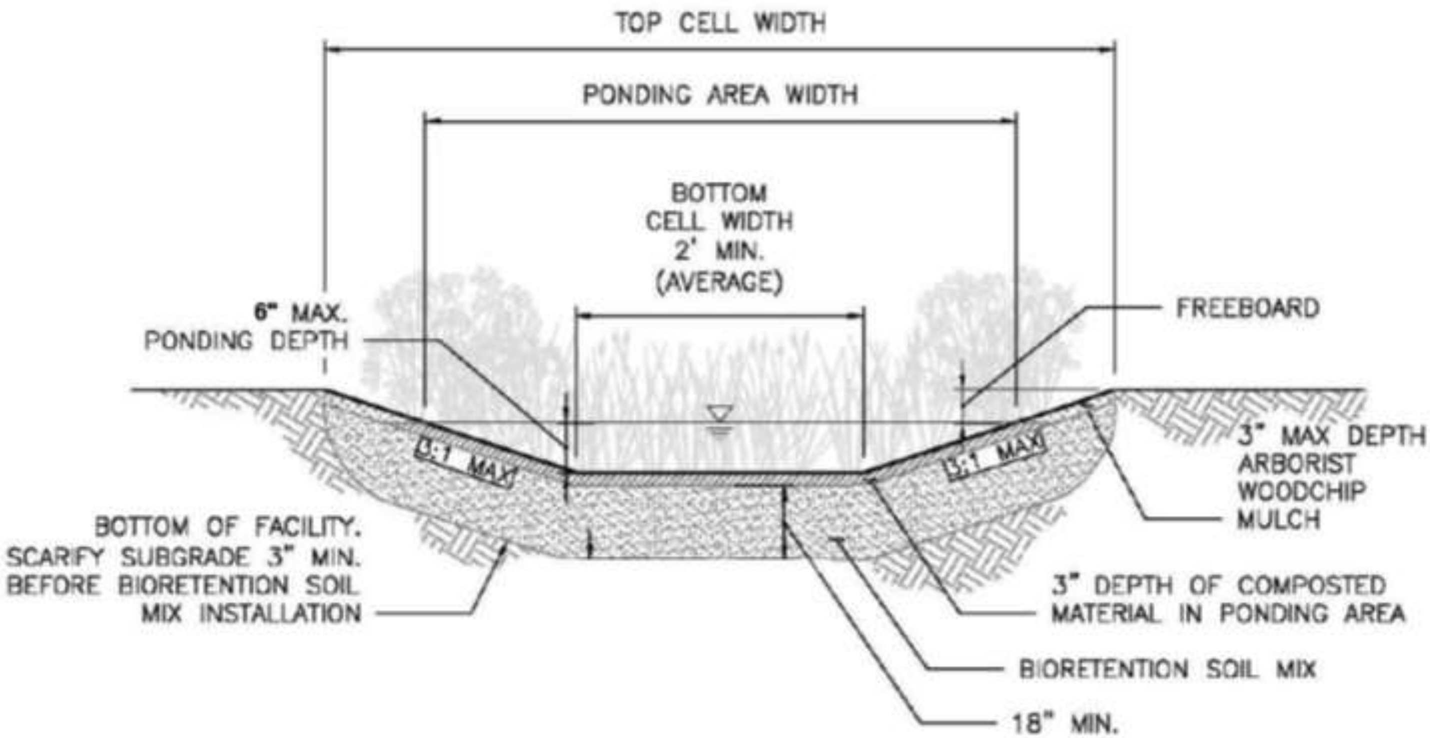
c. If the flowpath area, splashblocks, or gravel-filled trenches are disturbed, additional stormwater management facilities shall be designed and constructed in accordance with EMC 13.05.

Design Criteria for Dispersion Trenches (Figures 3 and 4):

1. A vegetative flowpath of at least 25 feet in length must be maintained between the outlet of the trench and any property line, structure, sensitive area, or impervious surface.
2. Trenches serving no more than 700 square feet of roof area may be simple 10-foot long by two-foot wide gravel filled trenches as shown in Figure 3, attached.
3. For larger roof areas and runoff other impervious surfaces, a dispersion trench with a notched grade board as shown in Figure 4 (attached) may be used. The total length of this trench may not exceed 50 feet and must provide 10 feet of trench per 700 square feet of impervious surface area (3,500 square feet maximum tributary area per trench).
4. Soils on the downslope edge of the dispersion trench (see Figure 3) and notched grade board (see Figure 4), as applicable, shall be compacted to prevent excessive groundwater interflow and ensure proper operation of the system.
5. Setbacks of at least five (5) feet should be maintained between any edge of the trench and any structure or property line.

Design Criteria for Splashblocks (see Figure 5):

- A vegetative flow path of at least 50 feet shall be maintained between the discharge point and any property line, structure, sensitive area, lake, or other impervious surface.
- A maximum of 700 square feet of roof area may drain to each splashblock.
- A splashblock or pad of crushed rock (2-feet wide by 3-feet long by 6 inches deep) shall be placed at each downspout discharge point.



Source Drawing from:

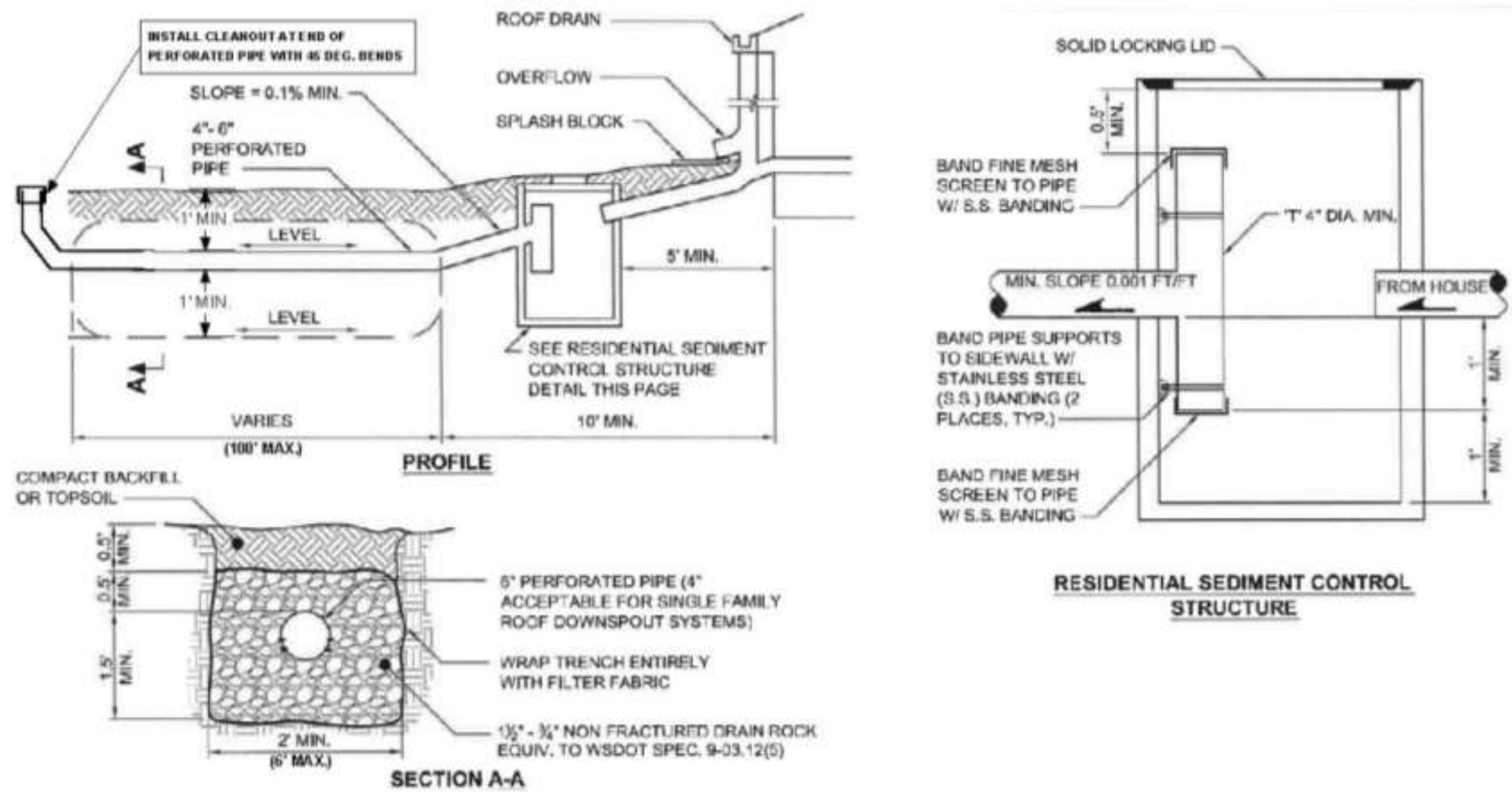
Pierce County

Public Works
Surface Water Management Division
2702 S 42nd Street, Suite 201
Tacoma, Washington 98409-7322

NOTE: The Pierce County Stormwater Management and Site Development Manual (PCM) has been adopted by the City of Edgewood as edited in the Edgewood Municipal Code for stormwater management standards. The source of this figure is the PCM Volume III, Figure 3.6. The figure has been modified to account for local design requirements.

Not to Scale

FIGURE 1
BIORETENTION DETAIL



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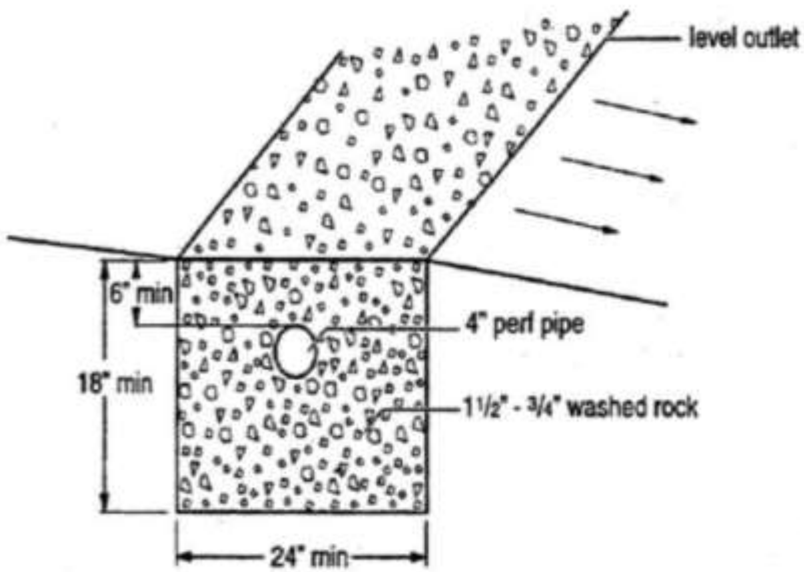
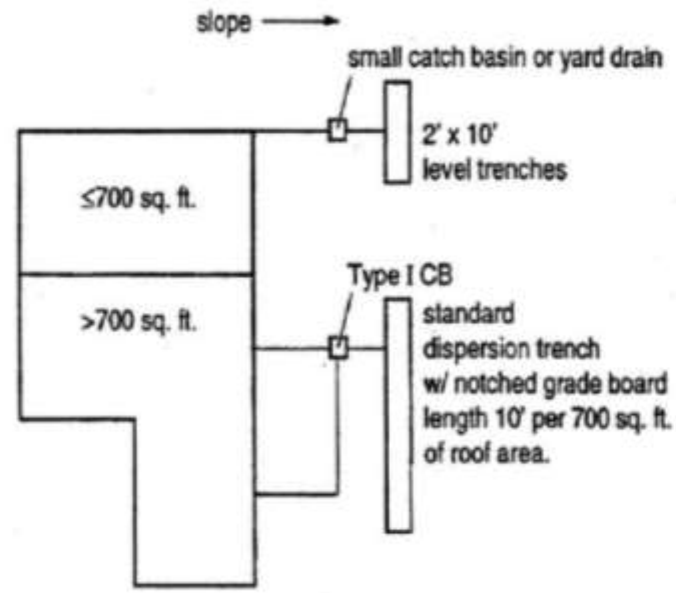
Not to Scale

FIGURE 2
DOWNSPOUT
INFILTRATION TRENCH



TRENCH X-SECTION
NTS



PLAN VIEW OF ROOF
NTS

Source Drawing from:

Pierce County
Public Works
Surface Water Management Division
2702 S 42nd Street, Suite 201
Tacoma, Washington 98409-7322

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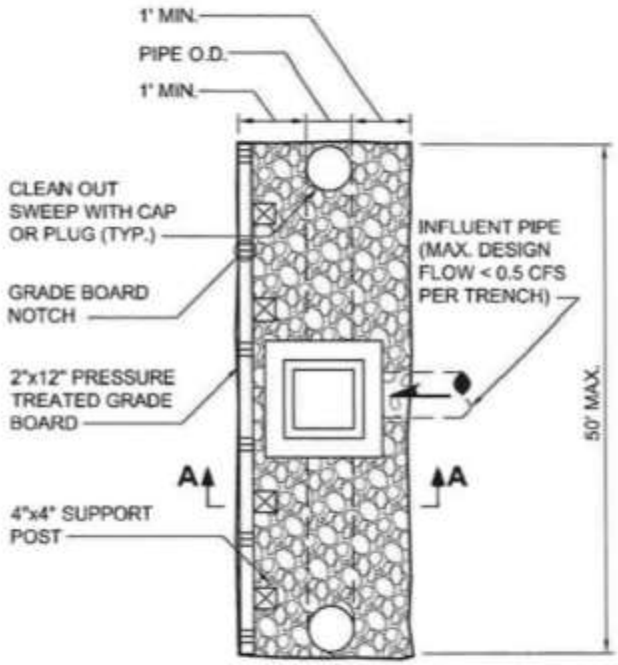
Not to Scale

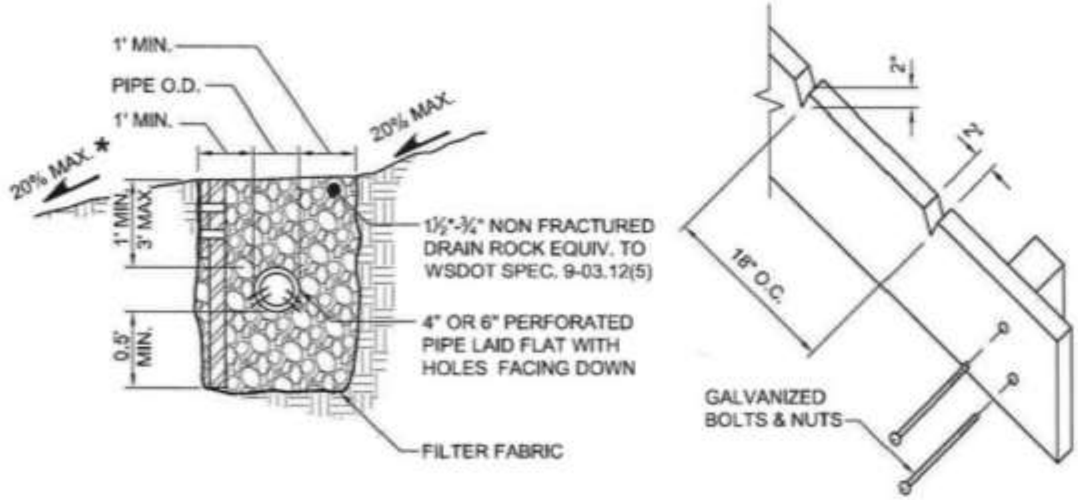
FIGURE 3
TYPICAL DOWNSPOUT
DISPERSION TRENCH



TYPE 1 CB W/ SOLID COVER (LOCKING)

PLAN

★ 15% MAX. FOR FLOW CONTROL / WATER QUALITY TREATMENT



SECTION A-A

GRADE BOARD WITH NOTCHES

NOTES:

1. THIS TRENCH SHALL BE CONSTRUCTED SO AS TO PREVENT POINT DISCHARGE AND/OR EROSION.
2. TRENCHES MAY BE PLACED NO CLOSER THAN 50 FEET TO ONE ANOTHER. (100 FEET ALONG FLOW LINE.)
3. TRENCH AND GRADE BOARD MUST BE LEVEL. ALIGN TO FOLLOW CONTOURS OF SITE.
4. GRADE BOARD SUPPORT POST SPACING AS REQUIRED BY SOIL CONDITIONS.
5. THE END OF EACH PIPE RUN SHALL HAVE AN ACCESSABLE CLEAN OUT SWEEP. PIPE END SHOULD BE VISIBLE OR THE LOCATION STAKED.

Source Drawing from:

Pierce County
Public Works
Surface Water Management Division
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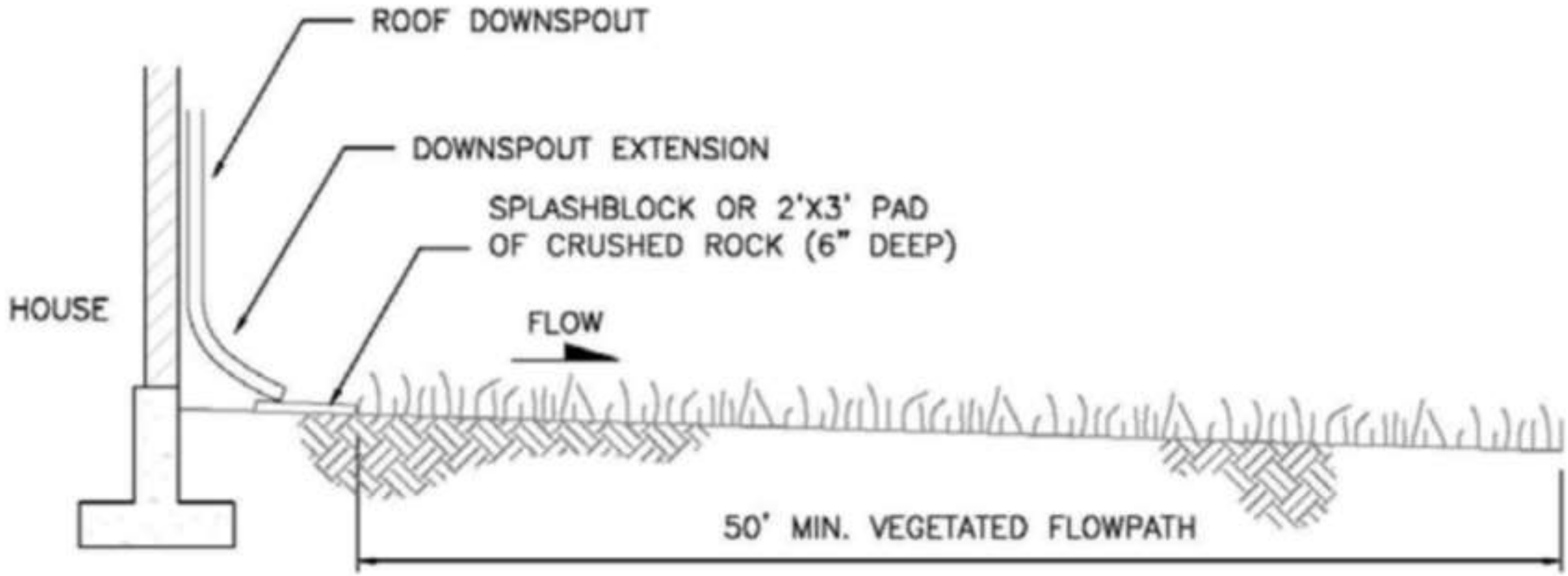
Not to Scale

FIGURE 4
FLOW DISPERSION TRENCH



PROFILE

NTS

Source Drawing from:

Pierce County

Public Works
Surface Water Management Division
2702 S 42nd Street, Suite 201
Tacoma, Washington 98409-7322

NOTE: The Pierce County Stormwater Management and Site Development Manual (PCM) has been adopted by the City of Edgewood as edited in the Edgewood Municipal Code for stormwater management standards. The source of this figure is the PCM Volume III, Figure 3.10. The figure has been modified to account for local design requirements.

Not to Scale

FIGURE 5
DOWNSPOUT SPLASHBLOCK DISPERSION