

SECTION I: GREEN STORMWATER INFRASTRUCTURE (GSI)

The City of Seattle's Stormwater Code requires that single-family residential projects implement Green Stormwater Infrastructure (GSI) to the maximum extent feasible. GSI is a stormwater Best Management Practice (BMP) that utilizes infiltration, dispersion, evaporation, transpiration, and/or detention. The intent of GSI is to help mitigate the impacts of development. GSI provides a function in addition to stormwater management such as water reuse, open space or providing green space and/or wildlife habitat in the City. The goal is to encourage a smaller building footprint and to effectively manage stormwater runoff as close to the point of origin as possible. To meet submittal requirement for a single-family residential projects, fill out the Pre-Sized Worksheet below. Refer to Director's Rule – Requirements for Green Stormwater Infrastructure for Single Family Residential and Parcel-Based Projects for further information, Credits and Sizing Factors.

The interactive GSI calculator is located at:

http://www.seattle.gov/dpd/cms/groups/pan/@pan/@forms/documents/web_informational/dpd018515.xls

SECTION II: GSI WORKSHEET

City of Seattle GSI to MEF Requirement Calculator (2012-05-01)

Building Permit No. Project Type

Project Address Project Area sf

New plus Replaced Impervious Area sf

Area Requiring Mitigation sf

Runoff Reduction Methods

Facility Size **Credit** **Area Mitigated**

Retained Trees

Existing Evergreen # Trees Total Canopy Area of Trees sf x 20% Canopy (or min 100 sf tree) = sf

Existing Deciduous # Trees Total Canopy Area of Trees sf x 10% Canopy (or min 50 sf tree) = sf

New Trees

New Evergreen # Trees x 50 sf tree = sf

New Deciduous # Trees x 25 sf tree = sf

Total Area Mitigated by Trees = sf

Dispersion

Downspout or Sheet Flow Dispersion Dispersed Impervious Area sf x 100.0% = sf

Infiltration and Reuse Facilities

Facility Size **Sizing Factor** **Area Mitigated**

Bioretention Cell (without Underdrain)

1. Contributing Area sf Bioretention Bottom Area sf = sf

Ponding Depth in

Design Infiltration Rate in/hr

2. Contributing Area sf Bioretention Bottom Area sf = sf

Ponding Depth in

Design Infiltration Rate in/hr

3. Contributing Area sf Bioretention Bottom Area sf = sf

Ponding Depth in

Design Infiltration Rate in/hr

Detention Cistern to Bioretention Cell (BC) (without Underdrain)

Contributing Area sf Bioretention Bottom Area sf = sf

Number Cisterns

BC Ponding Depth in

BC Design Infiltration Rate in/hr

Permeable Pavement Facility (may require run-on?)

Contributing Area sf Permeable Pavement Area sf = sf

Ponding Depth in

Design Infiltration Rate in/hr

Plus Permeable Pavement Facility Area = sf

Reuse Facilities

Rainwater Harvesting Applicant must provide documentation of area mitigated by rainwater harvesting sf

Impervious Surface Reduction Methods

Facility Size **Credit** **Area Mitigated**

Alternative Pavement Surfaces

Permeable Pavement Surface (Subgrade Slope <2%) Permeable Pavement Area sf x 100.0% = sf

Permeable Pavement Area sf x 50.0% = sf

Alternative Roof Surfaces

Green Roof (Single/Multi-Course / 4" Growth Medium) Green Roof Area sf x 55.0% = sf

Green Roof (Multi-Course / 8" Growth Medium) Green Roof Area sf x 84.0% = sf

Special Infiltration

Bioretention Cell with Detention (without Underdrain)

Contributing Area sf Bioretention Bottom Area sf = sf

Ponding Depth in

Design Infiltration Rate in/hr

Non-Infiltrating Facilities

Facility Size **Credit** **Area Mitigated**

Bioretention Planter (with underdrain)

Contributing Area sf Bioretention Bottom Area sf = sf

Ponding Depth in

Detention Cistern with Harvesting Capacity

Contributing Area sf Min Cistern Area sf = sf

Min Live Cistern Volume gal

Total Area Mitigated sf

Area Requiring Mitigation sf

% Impervious Area Mitigated %

GSI to MEF Target Achieved? %

Notes:

GSI - Green Stormwater Infrastructure sf - square feet in - inch eqn - equation BC - bioretention cell

min - minimum ft - feet in/hr - inch per hour gal - gallons inft - infiltration

1. Single family residential projects and trailside/walkway projects are not required to evaluate this BMP.

2. Each above ground cistern must have 6.68 ft minimum bottom area, a 0.25 inch orifice and a minimum of 3 feet of live storage above the orifice. If using two cisterns they must be connected and have only one orifice. Flow from cistern orifice must be routed to bioretention cell.

3. The area contributing runoff to a facility shall be no larger than 3 times the permeable pavement facility area corresponding to a minimum sizing factor of 33.3%.

4. Average subsurface ponding depth in aggregate storage reservoir.

5. Cistern must be above ground. Cistern area must be rounded up to next commercially available product. Cistern need not have more than 3 feet of live storage volume above orifice.

6. Water collected using the detention cistern may be used for non-potable uses only (e.g., irrigation). For additional uses of harvested water consider the "Rainwater Harvesting" BMP.

This calculator does not provide conveyance flow calculations.

Applicant is responsible to ensure system overflow conveyance is provided per Section 4.2.5 of the Stormwater Manual Volume 3.

SECTION III: GSI PLANTINGS

Complete the following calculator to determine the minimum number of plantings required for:

Facility Size Area	Multi- plication Factor	Total Number of Plants (round up)*
Bioretention Cell(s)		
Small Trees (if used)	Bottom & Sides <input type="text"/> sf x 0.012 = <input type="text"/> ea	
Shrubs	Bottom & Sides <input type="text"/> sf x 0.028 = <input type="text"/> ea	
Groundcover/Herbaceous Plants	Bottom & Sides <input type="text"/> sf x 0.084 = <input type="text"/> ea	
Bioretention Planter(s)		
Small Trees (if used)	Bottom <input type="text"/> sf x 0.012 = <input type="text"/> ea	
Shrubs	Bottom <input type="text"/> sf x 0.028 = <input type="text"/> ea	
Groundcover/Herbaceous Plants	Bottom <input type="text"/> sf x 0.084 = <input type="text"/> ea	
Green Roofs		
Groundcover/Succulent Plants	Footprint <input type="text"/> sf x 0.088 = <input type="text"/> sf	

Planting General Notes:

- For a list of approved plants, see the Seattle Green Factor plant list: <http://www.seattle.gov/dpd/Permits/GreenFactor/GreenFactorTools/default.asp>
- Plans shall specify that vegetation coverage of selected plants will achieve 90-percent coverage within 2 years or additional plantings shall be provided until this coverage requirement is met.
- Plants shall be sited according to sun, soil, wind and moisture requirements
- At a minimum, provisions must be made for supplemental irrigation during the first two growing seasons following installation.

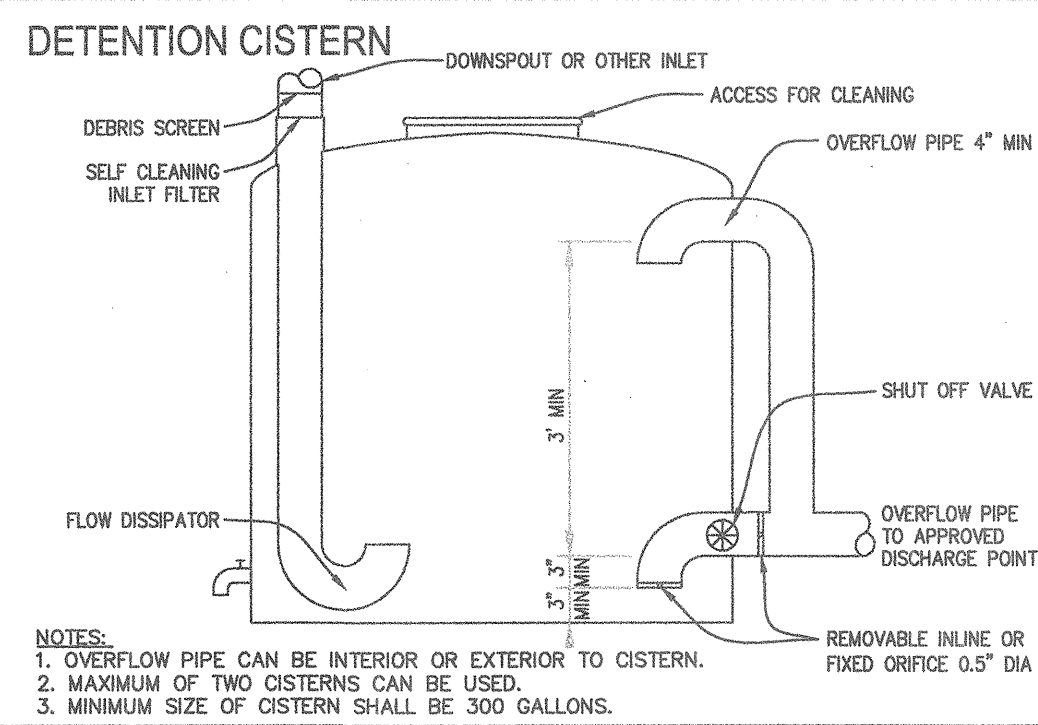
Bioretention Cells and Planters Notes:

- Provide a minimum of three different species of shrubs and herbaceous plants.

Green Roofs Notes:

- Appropriate plants include succulents, grasses, herbs, and wildflowers that are adapted to harsh conditions. Plants can be installed as pre-grown mats, individual plugs, cuttings, or spread as seeds.
- A Landscape Management Plan shall be developed and implemented.

SECTION IV: GSI STANDARD DETAILS



SECTION V: DRAINAGE CONTROL PLAN REQUIREMENTS

General requirements:

Address and permit number of project.

North arrow.

Identification of the drawing's scale (min. 1" = 10').

Property lines and dimensions.

Identification of adjacent streets (by name), alleys or other adjacent public property.

Curbs and sidewalks and street trees: type, location, dimensions.

Street and alley improvement types (asphalt, concrete, gravel, etc.).

Creeks, streams or any ECA areas, per CAM 103B, if they exist on the site.

Location and dimensions of all driveways, parking areas, and other paved areas (existing and proposed).

General location, size and shape of any structures presently on the site and of those proposed for construction, including buildings, retaining walls, patios, decks, porches, rockeries and driveways (existing and proposed).

Specific location, size and shape of any structures presently on the site and those proposed for construction, including buildings, retaining walls, patios, decks, porches, rockeries and driveways (existing and proposed).

Show specific location, size and species of all trees at least 6 inches in diameter measured 4 1/2 feet above the ground.

Areas not to be disturbed by construction must be indicated.

Ground elevations and contour lines with labeled contour intervals on sloping sites or where earth grading is proposed.

Identify top and bottom of slopes and show dimensions from slope top/bottom to the building(s).

Identify drainage ditches, natural watercourses, and culverts (near shorelines).

Sewer mains (sanitary only [psa] and/or combined sewers [psa]).

Storm drains [psa] and catch basins.

Water mains, fire hydrants and water meters.

Power poles, street lights, signal and transit poles, bus zones, street signs, etc. adjacent to the subject property.

All other elements between the pavement edge and the property line (such as side sewer, electrical ducts and vaults, electrified conduits, manholes, ditches, culverts, etc.).

On-site green stormwater infrastructure facilities. See below for further instructions.

Green stormwater infrastructure requirements:

Identify contributing areas to each GSI facility.

Bioretention Cells and Planters: Locations of top and bottom of cell, square footage of bottom area.

Trees: Locations of newly planted and existing trees used for reduction credit.

Permeable pavement: Location, type of pavement, slope, and total square footage.

Impervious pavement: Location and total square footage.

Green Roofs: Locations and square footage.

Cisterns: Locations, contributing roof areas, discharge locations and use.

Standard Drainage features:

Pump systems (wet wells), pump sizes, maintenance holes (MHs), cleanouts, downspouts, catch basins, and area drains.

Footing drain connections to on-site basins.

Sanitary Sidesewer features:

Show the new sidesewer from the structure to its point of connection with an existing sidesewer or the public main sewer in the street, whichever is applicable.

An increase in living units using an existing sidesewer will require the evaluation and certification of the existing sidesewer prior to drainage plan approval. See Directors Rule 4-2011/M.

SECTION VI: GSI AFFIRMATION

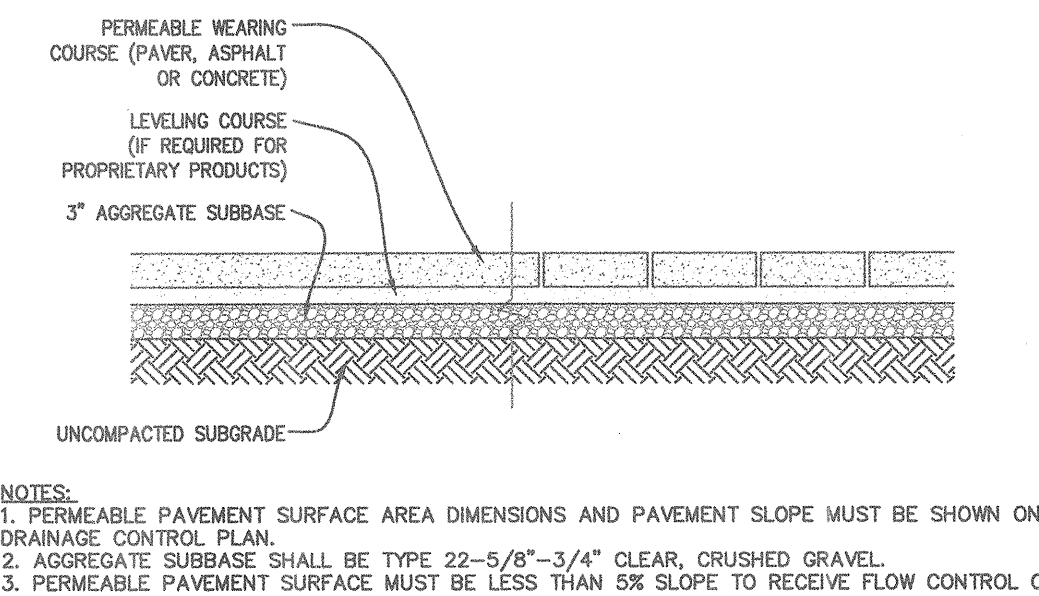
Affirmative statement for Green Stormwater Infrastructure to the Maximum Extent Feasible:

I, _____, certify that Green Stormwater Infrastructure has been implemented to the Maximum Extent Feasible for this project.

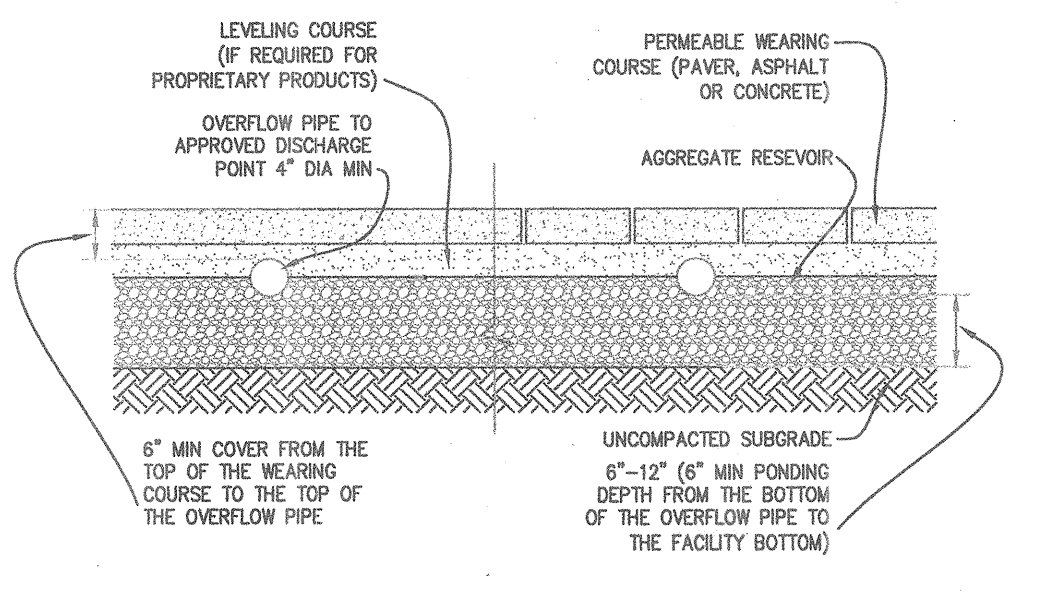
Owner/Owner's Rep Signature: _____

Date: _____

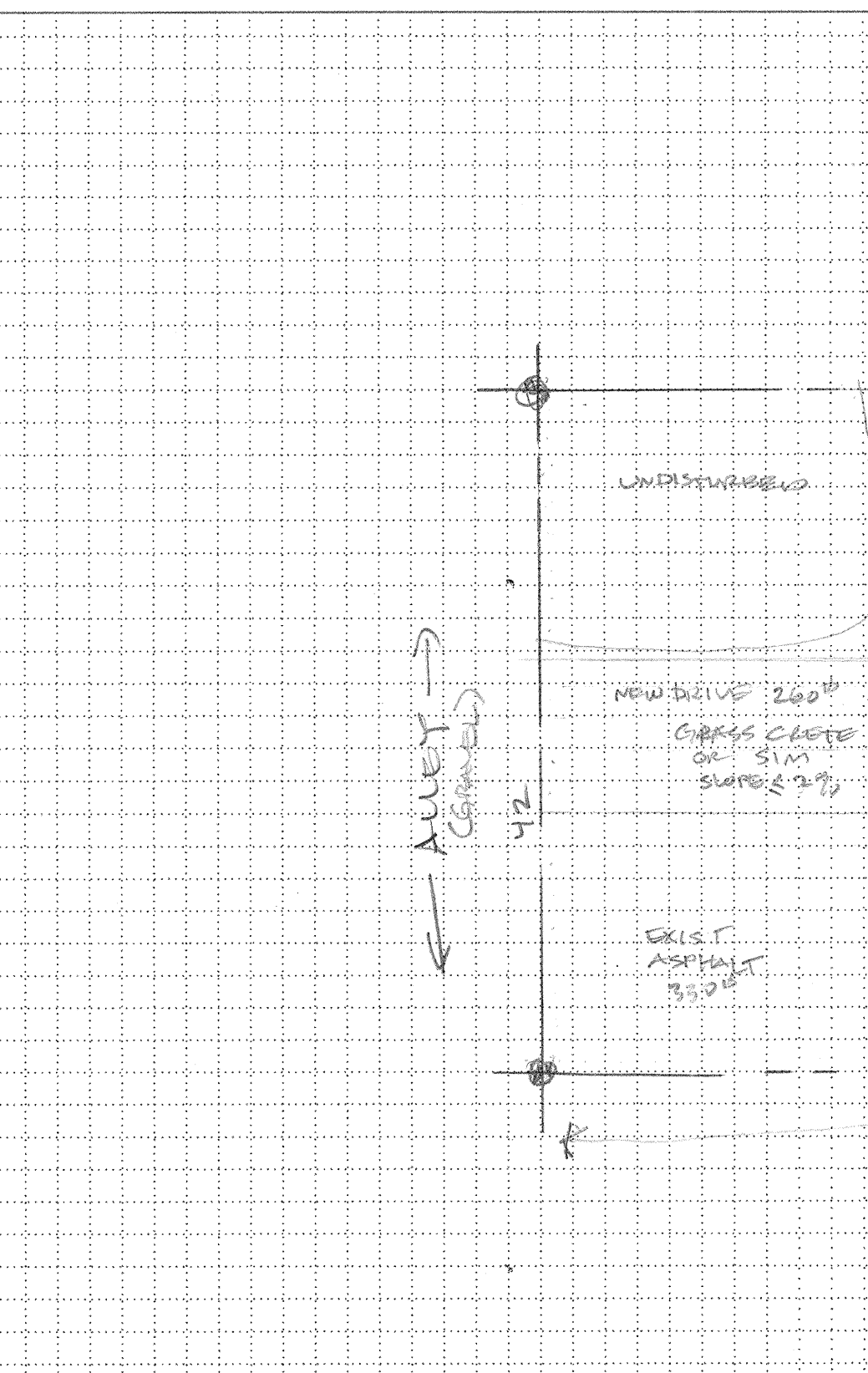
PERMEABLE PAVEMENT SURFACE



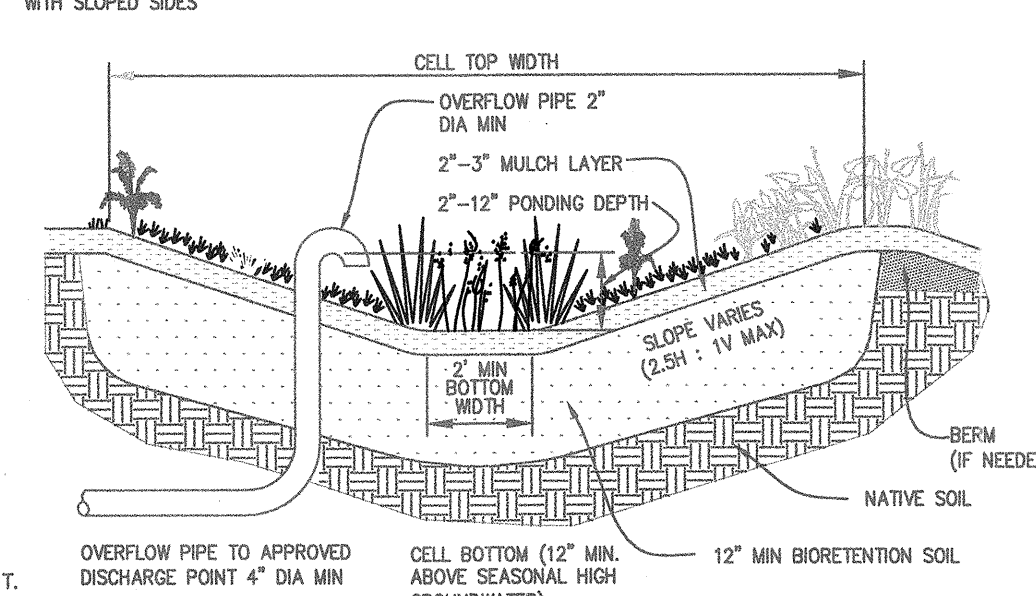
PERMEABLE PAVEMENT FACILITY



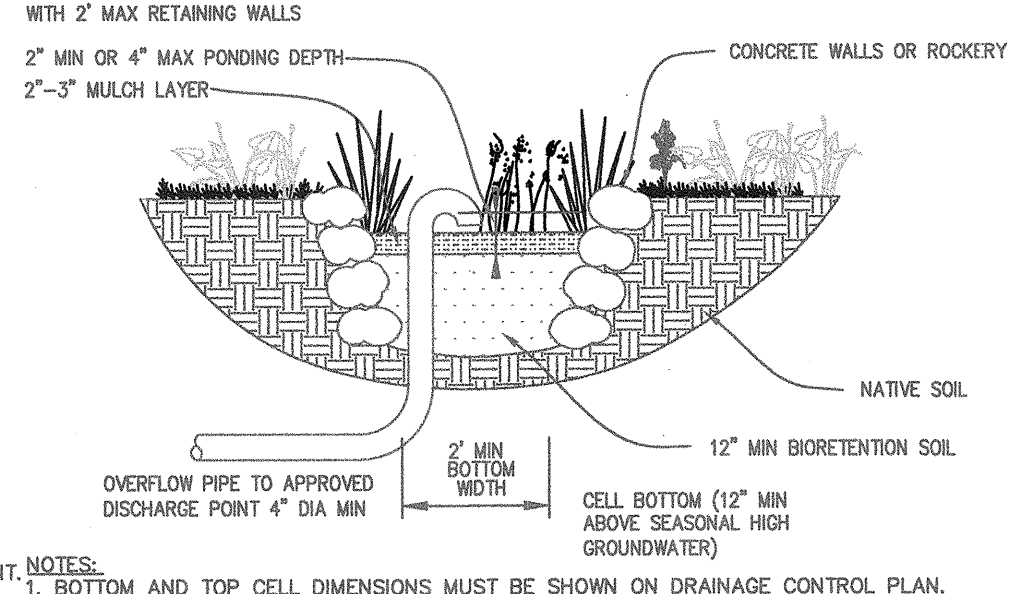
DRAINAGE CONTROL PLAN



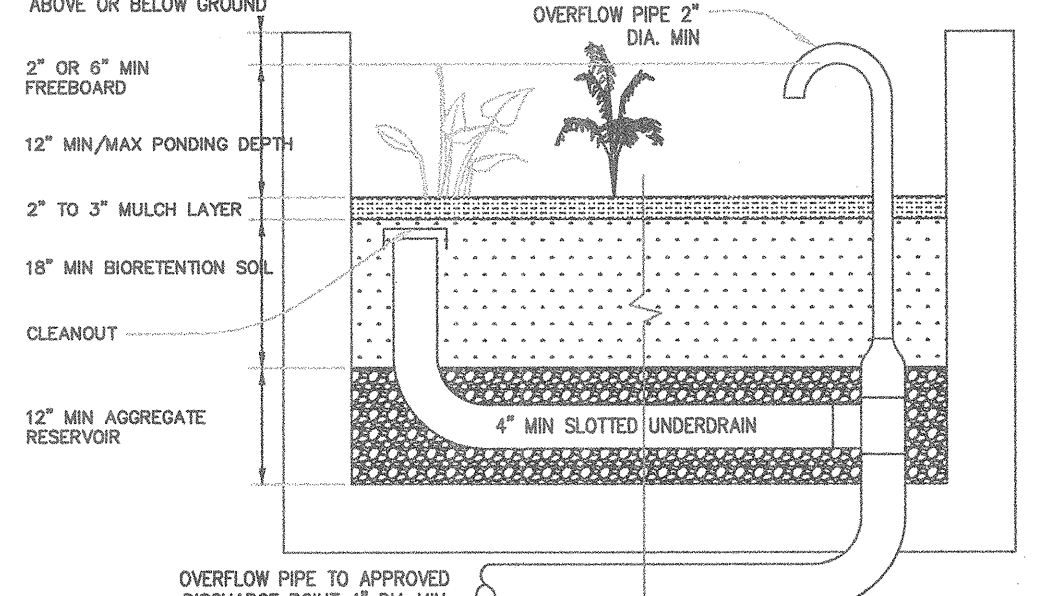
BIORETENTION CELL WITH SLOPED SIDES



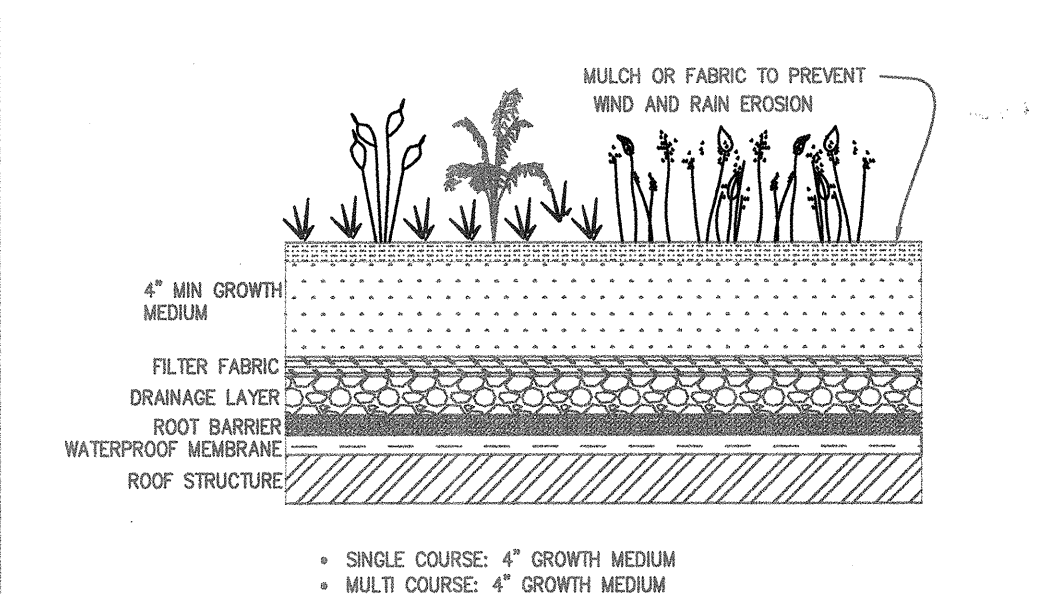
BIORETENTION CELL WITH 2" MAX RETAINING WALLS



BIORETENTION PLANTER



GREEN ROOF



CHECK SCALE USED:

- ☐ ONE SQUARE = ONE FOOT (1"=5')
- ☐ ONE SQUARE = TWO FEET (1"=10')
- ☐ ONE SQUARE = FOUR FEET (1"=20')

June 2012

STANDARD DRAINAGE CONTROL PLAN - Small Projects

Applicant Plan Sheet

CITY OF SEATTLE
DEPARTMENT OF PLANNING AND DEVELOPMENT

SHEET

DRAINAGE
STANDARD
PLAN

Project Number: _____

Address: _____

