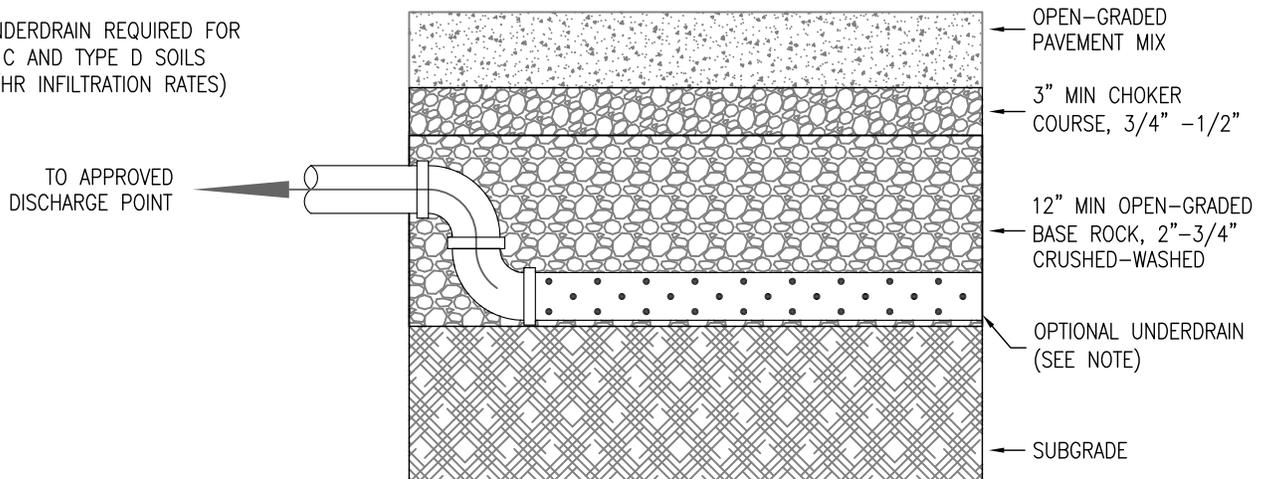


DESIGN REQUIREMENTS FOR TOP LIFT DEPTH

	RESIDENTIAL DRIVEWAY OR PEDESTRIAN ONLY	PRIVATE STREET, PARKING LOT, OR FIRE LANE	PUBLIC STREET
CONCRETE	4"	4"	7"
ASPHALT	2 1/2"	3"	6"
PAVERS	2 3/8"	3 1/8"	3 1/8"
ENGINEERING REQ'D	NO	YES	YES
COMPACTION REQ'D	NO	YES	95%

PERMEABLE CONCRETE BLOCK OR "PAVER" SYSTEMS

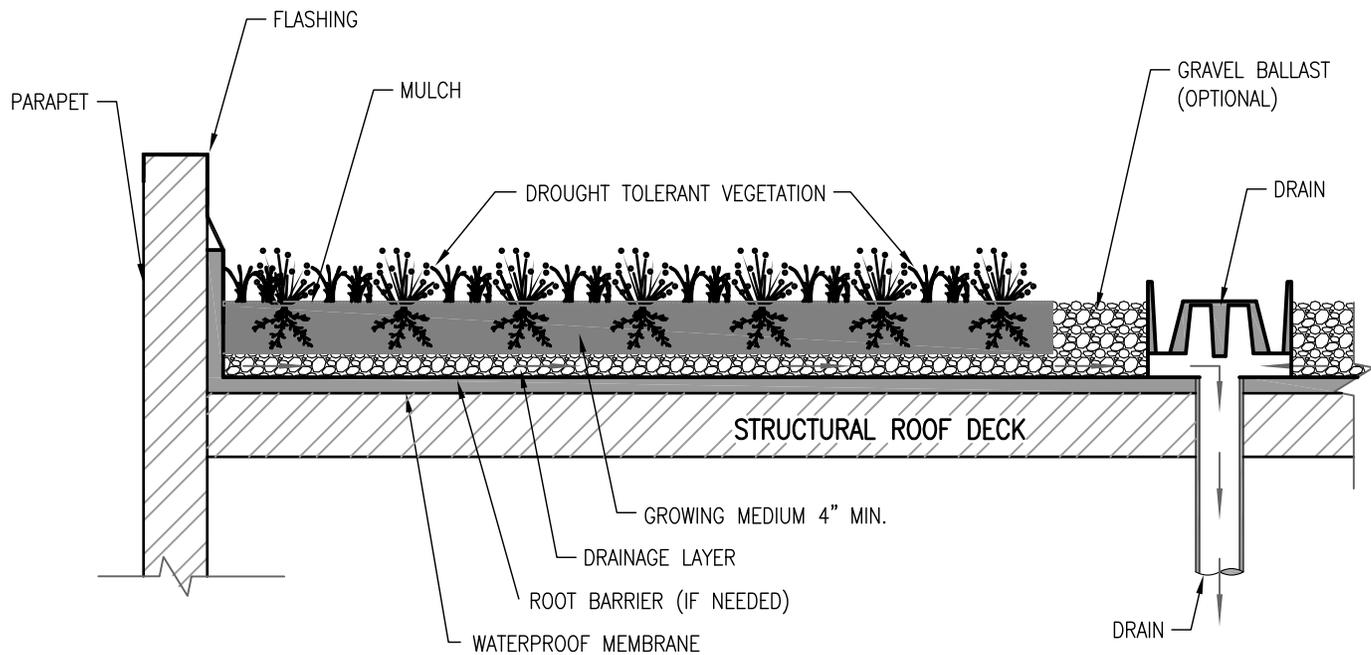
NOTE: 6" UNDERDRAIN REQUIRED FOR TYPE C AND TYPE D SOILS (<2"/HR INFILTRATION RATES)



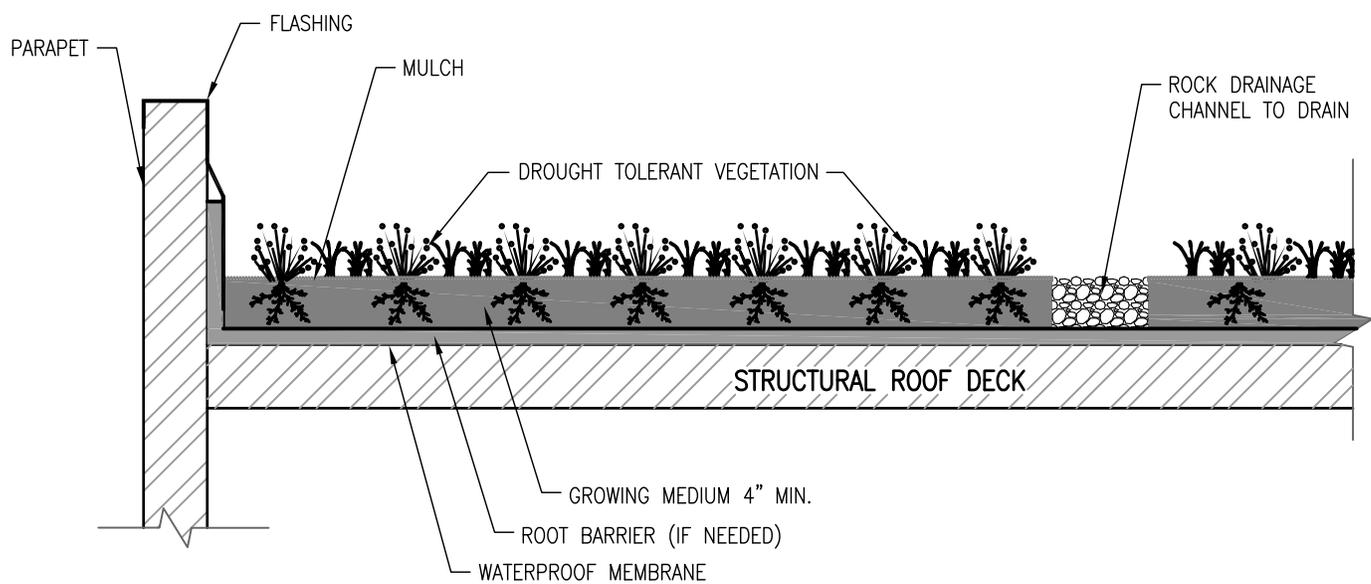
PERVIOUS (OPEN GRADED) CONCRETE AND ASPHALT SYSTEMS

- DRAWING NOT TO SCALE -

CITY OF GRESHAM	POROUS PAVEMENT	DRAWN RMS
		DATE APR 2018
		APPR.
		DWG. NO. ST-100



ECOROOF WITH DRAINAGE LAYER



ECOROOF WITH DRAINAGE CHANNELS

CITY OF
GRESHAM

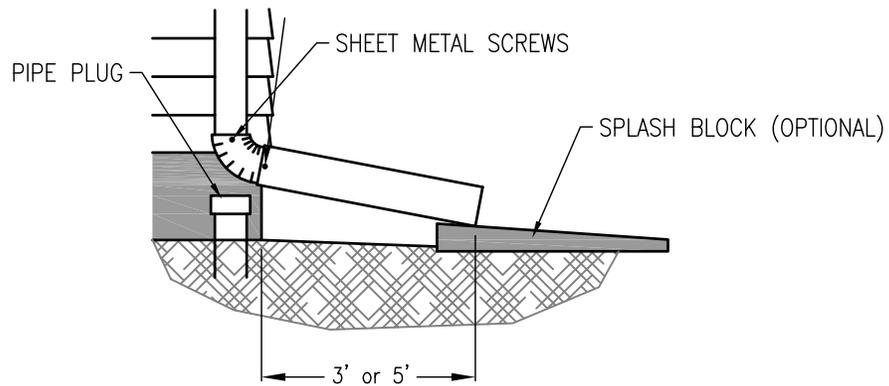
ECOROOF

DRAWN DRO

DATE APR 2018

APPR.

DWG. NO. ST-110



1. Site Suitability: Downspout extensions are suitable for single family residential sites that have well draining soils, >2" per hour, and have an overall slope of 10% or less.
2. Sizing: Area of discharge must be 10% of the contributing roof area. A maximum of 500 sf of roof area is allowed to drain to each downspout.
3. Downspouts must drain at least 5 feet from basement walls and at least 3 feet from crawl spaces and concrete slabs.
4. The end of the downspout must be at least 5 feet from the property line, and possibly more if the landscape slopes toward the neighbor's property.
5. Do not discharge onto driveways, hardscape or other impervious areas including public sidewalks and streets.
6. Using a splash block at the end of the extension is optional, but it will help prevent soil erosion.

CITY OF
GRESHAM

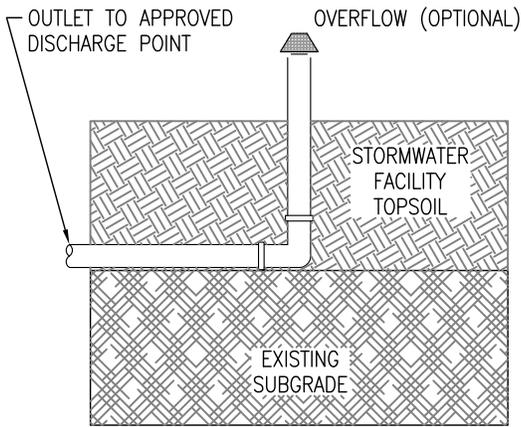
DOWNSPOUT EXTENSION

DRAWN DRO

DATE APR 2018

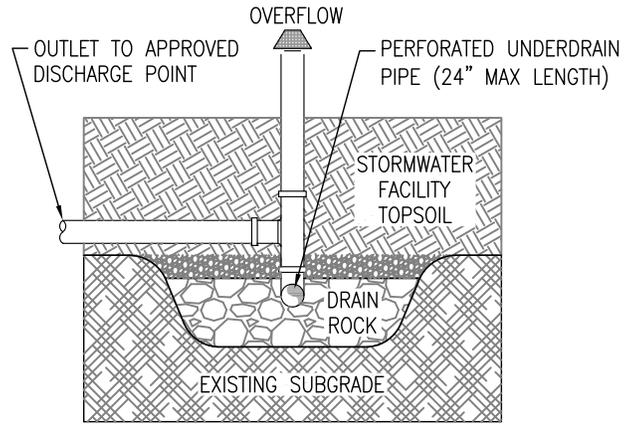
APPR.

DWG. NO. ST-120



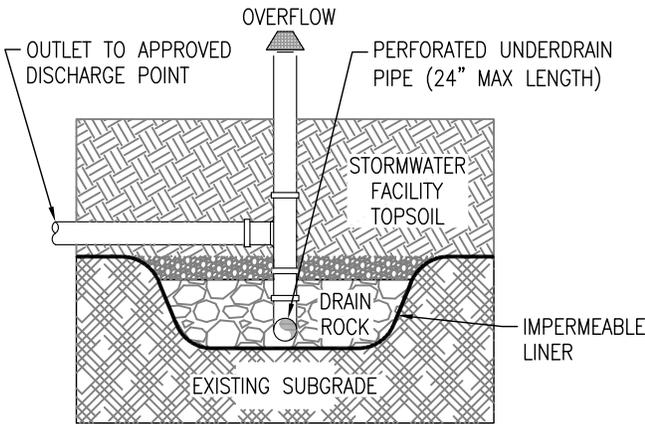
FULL INFILTRATION

TYPE A AND B SOILS
OVERFLOW IS OPTIONAL



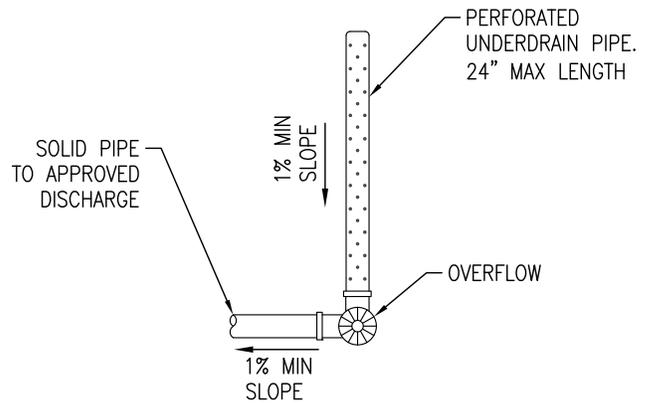
PARTIAL INFILTRATION

TYPE C & D SOILS
DRAIN ROCK OPTIONAL FOR TYPE C SOILS
OVERFLOW AND UNDERDRAIN REQUIRED FOR TYPE D SOILS
SET UNDERDRAIN TOWARD TOP OF DRAIN ROCK



LINED/FILTRATION

STEEP SLOPES, CONTAMINATED SOILS, UNCONSOLIDATED FILL
OVERFLOW AND UNDERDRAIN REQUIRED.
SET UNDERDRAIN AT BASE OF DRAIN ROCK.



PLAN VIEW

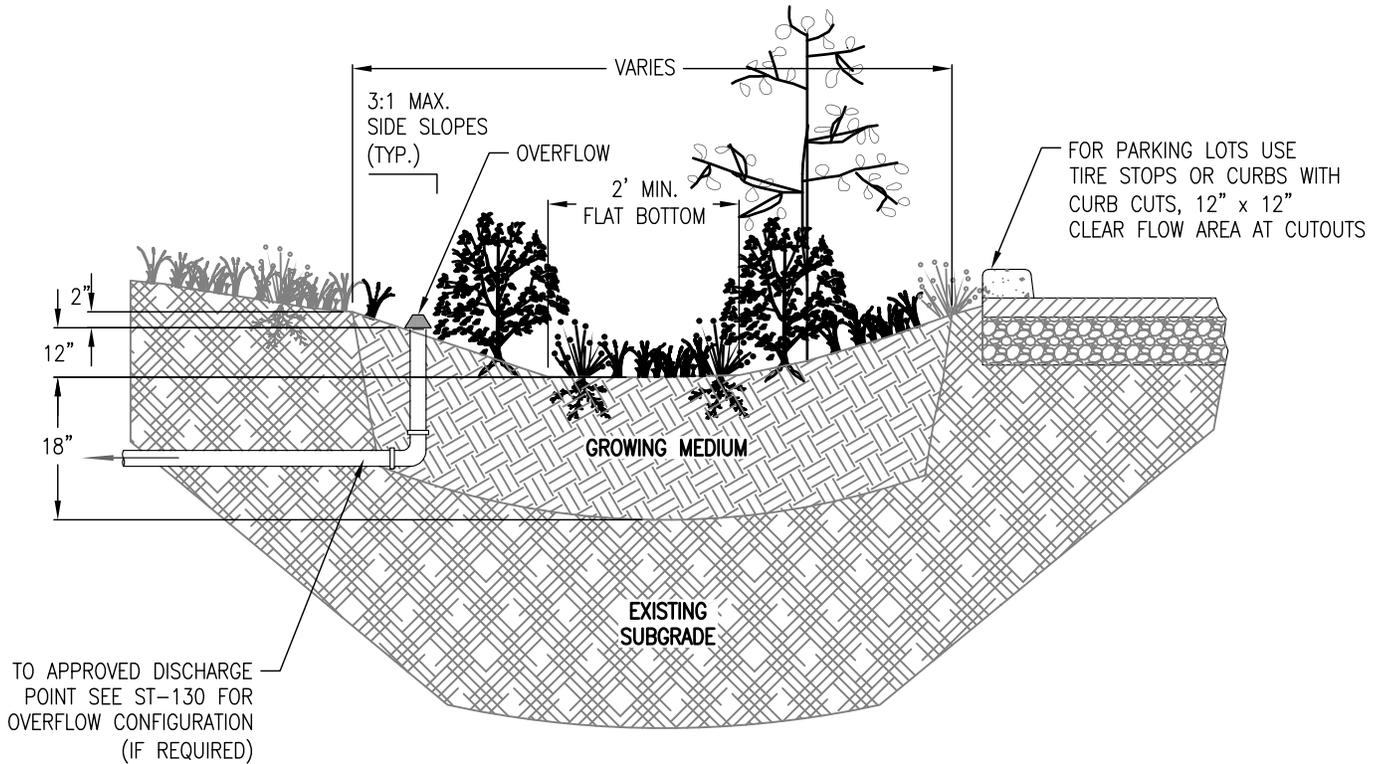
PIPE W/ UNDERDRAIN & DISCHARGE POINT

1. Drain rock not required in Type A and B soils. It may be used for storage in Type C soils. An overflow is required for Type C soils.
2. Type D soils require drain rock and an underdrain located at the top of the rock. Perforated underdrain pipe shall be a maximum of 24" long and located at opposite end of facility from inlet.
3. Sites with contaminated soils, steep slopes (within hillside constraint district), or on unconsolidated fill must be lined and have drain rock with an underdrain.
4. Facilities with an underdrain may have the outlet pipe tee into the overflow standpipe at an elevation above the top of the underdrain.

- DRAWING NOT TO SCALE -

ORIGINAL DRAWING AND SPECIFICATIONS FROM PORTLAND BUREAU OF ENVIRONMENTAL SERVICES

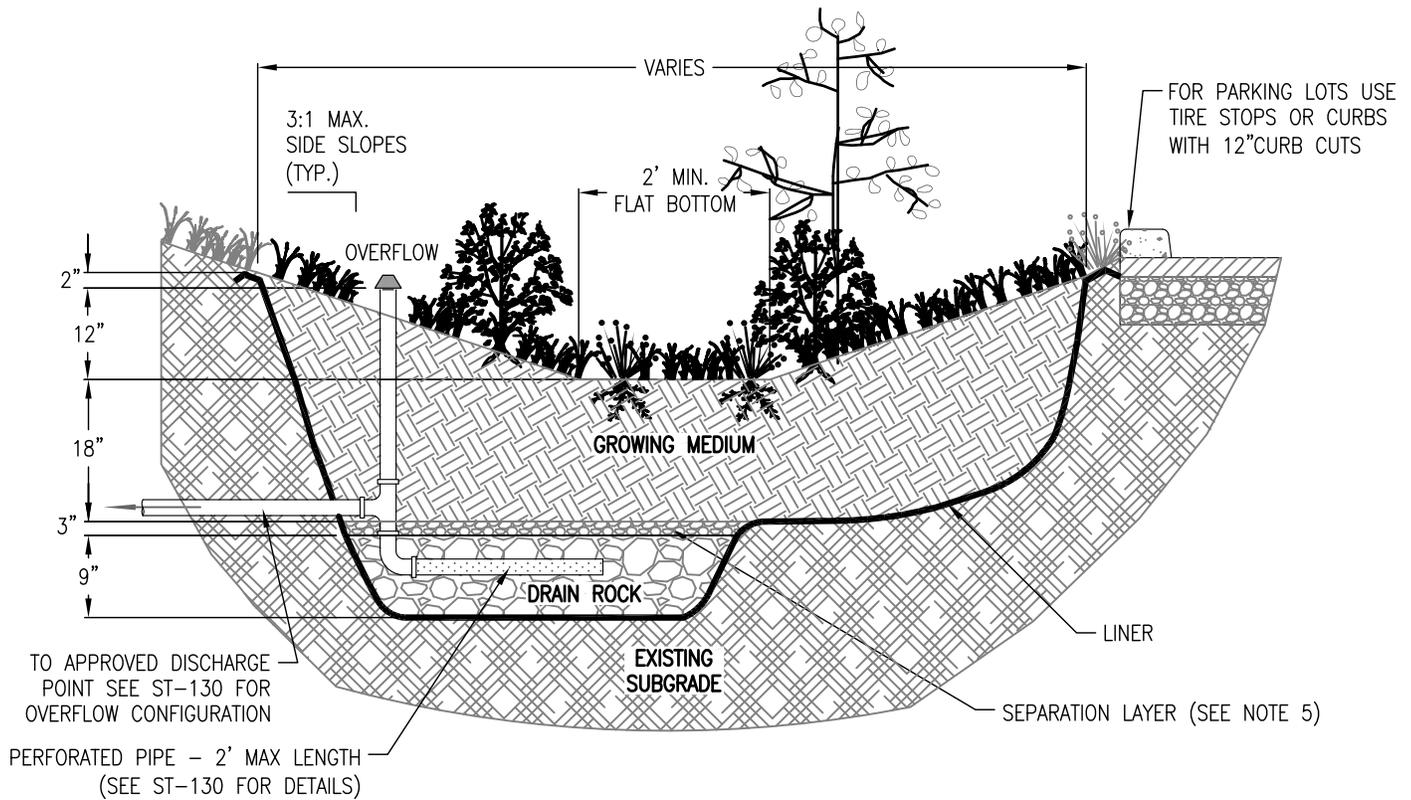
CITY OF GRESHAM	FACILITY OVERFLOW CONFIGURATION	DRAWN DRO
		DATE OCT 2019
		APPR.
		DWG. NO. ST-130



1. Provide protection from all vehicle traffic and equipment staging in proposed infiltration areas prior to, during, and after construction.
2. Dimensions:
Width and length vary. Dimensions to be specified on plans based on sizing form.
Depth (from top of growing medium to overflow elevation): 12".
Flat bottom width: 2' minimum.
Side slopes: 3:1 maximum.
3. Setbacks:
Facility should be 10' away from foundations and 5' away from property lines.
4. Overflow:
Facility must connect to approved discharge point per detail ST-130.
Overflow elevation must allow for 2" of freeboard, minimum.
Protect from debris and sediment with strainer or grate.
5. Piping must be cast iron, ABS or PVC. 3" pipe required for facilities draining up to 1500 s.f., otherwise 4" minimum pipe. Oregon Plumbing Specialty Code also applies.
6. Growing Medium:
18" minimum depth. Use sand/loam/compost 3-way mix, or approved mix that will support healthy plants.
7. Vegetation: Follow landscape plans otherwise refer to plant list in Appendix G. Minimum container size is #1. # of plantings per 100sf of facility area:
Zone A (wet): 80 herbaceous plants OR 72 herbaceous plants and 4 small shrubs.
Zone B (moderate to dry): 7 large or small shrubs AND 70 groundcover plants.
The delineation between Zone A and B must be either at the outlet elevation or the check dam elevation, whichever is lowest.
If facility area is over 200sf consider adding a tree.
8. Splash Block: Install 4-6" washed river rock or splash pad for erosion control at inlets and downspout.
9. Rain garden can be elongated to create a swale for larger developments. Slope should be 6% or less.

- DRAWING NOT TO SCALE -
ORIGINAL DRAWING AND SPECIFICATIONS FROM PORTLAND BUREAU OF ENVIRONMENTAL SERVICES

CITY OF GRESHAM	INFILTRATION RAIN GARDEN/SWALE	DRAWN DRO
		DATE OCT 2019
		APPR.
		DWG. NO. ST-140



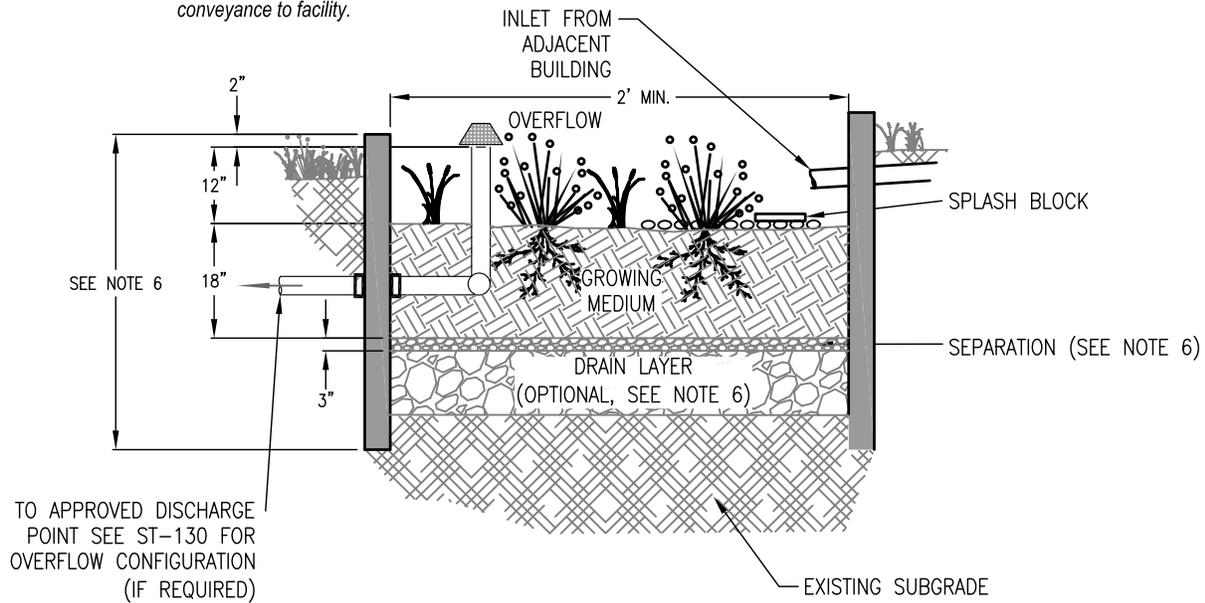
1. Dimensions:
 - Width and length vary. Dimensions to be specified on plans based on sizing form.
 - Depth (from top of growing medium to overflow elevation): 12".
 - Flat bottom width: 2' recommended.
 - Side slopes of swale: 3:1 maximum.
2. Setbacks: None required for lined facilities. Partial infiltration facilities should be 10' from foundations and 5' from property lines..
3. Overflow:
 - Facility must connect to approved discharge point per detail ST-130.
 - Overflow elevation must allow for 2" of freeboard, minimum.
 - Protect from debris and sediment with strainer or grate.
 - Overflow must have a 6"-12" upturn prior to discharge.
4. Piping must be cast iron, ABS or PVC. 3" pipe required for facilities draining up to 1500 s.f., otherwise 4" minimum pipe. Oregon Plumbing Specialty Code also applies.
5. Drain Layer:
 - Not allowed for type A and B soils (unless lined facility). Optional for type C soils, and required for type D soils.
 - 3/4"-1 1/2" washed round rock. Depth: 9".
 - Separation between drain rock and growing medium:
 - 1/4" - #10 rock, 2 to 3 inches deep.
6. Growing Medium:
 - 18" minimum depth. Use sand/loam/compost 3-way mix, or approved mix that will support healthy plants.
7. Vegetation: Follow landscape plans otherwise refer to plant list in Appendix G. Minimum container size is #1. # of plantings per 100sf of facility area:
 - Zone A (wet): 80 herbaceous plants OR 72 herbaceous plants and 4 small shrubs.
 - Zone B (moderate to dry): 7 large or small shrubs AND 70 groundcover plants.
 - The delineation between Zone A and B must be either at the outlet elevation or the check dam elevation, whichever is lowest.
 - If facility area is over 200sf consider adding a tree.
8. Waterproof Liner: 30 mil EPDM, HDPE or approved equivalent required for lined/filtration facilities per SWMM section 1.2.2.
9. Splash Block: Install 4-6" washed river rock or splash pad for erosion control at inlets and downspout.
10. Rain garden can be elongated to create a swale for larger developments. Slope should be 6% or less.

- DRAWING NOT TO SCALE -
ORIGINAL DRAWING AND SPECIFICATIONS FROM PORTLAND BUREAU OF ENVIRONMENTAL SERVICES

CITY OF GRESHAM	PARTIAL INFILTRATION - LINED/FILTRATION RAIN GARDEN/SWALE	DRAWN DRO
		DATE OCT 2019
		APPR.
		DWG. NO. ST-141

FREESTANDING

Design professional is responsible for verifying that grades will allow piped conveyance to facility.



1. Provide protection from all vehicle traffic and equipment staging in proposed infiltration areas prior to, during, and after construction.
2. Dimensions:
Width of planter: 24" minimum.
Depth of planter (from top of growing medium to overflow elevation): 12".
Longitudinal slope of planter: 0.5% or less.
3. Setbacks:
Planters should be 5-feet from property line and 10-feet from building foundations.
4. Planter Walls:
Material must be concrete, unless otherwise approved. Walls must be included on foundation plans.
Height: 44" minimum with drain rock, 32" minimum without drain rock.
5. Piping must be cast iron, ABS or PVC. 3" pipe required for facilities draining up to 1500 s.f., otherwise 4" minimum pipe. Oregon Plumbing Specialty Code also applies.
6. Drain Layer:
Not allowed for type A and B soils, optional for type C soils, and required for type D soils.
3/4" - 1 1/2" washed.
Depth: 9".
7. Overflow:
Planters must connect to approved discharge point per detail ST-130.
Overflow elevation must allow for 2" of freeboard, minimum. Protect from debris and sediment with strainer or grate.
8. Growing Medium:
18" minimum depth. Use sand/loam/compost 3-way mix, or approved mix that will support healthy plants.
9. Vegetation: Refer to plant list in Appendix G. Minimum container size is #1. # of plantings per 100sf of facility area:
80 herbaceous plants OR;
72 herbaceous plants and 4 small shrubs.
10. Splash Block: Install 4-6" washed river rock or splash pad for erosion control at inlets and downspout.
11. Perforated pipe to be added for facilities in poorly infiltrating soils (Type D) per ST-130.
12. Lined/Filtration Planter to be used on steep slopes or within 10' of buildings.

Separation between drain rock and growing medium:
3/4" - #10 rock, 2 to 3 inches deep.

**- DRAWING NOT TO SCALE -
ORIGINAL DRAWING AND SPECIFICATIONS FROM PORTLAND BUREAU OF ENVIRONMENTAL SERVICES**

**CITY OF
GRESHAM**

INFILTRATION PLANTER

DRAWN DRO

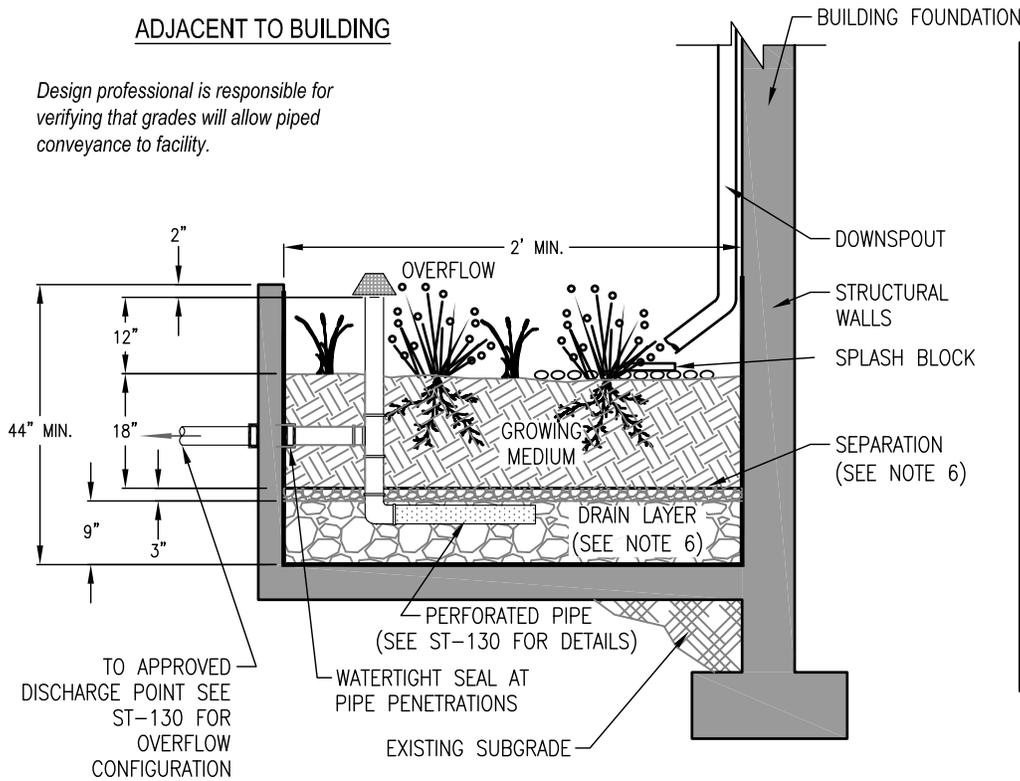
DATE OCT 2019

APPR.

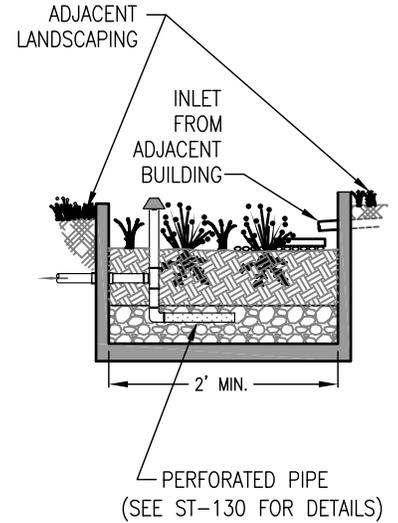
DWG. NO. ST-150

ADJACENT TO BUILDING

Design professional is responsible for verifying that grades will allow piped conveyance to facility.



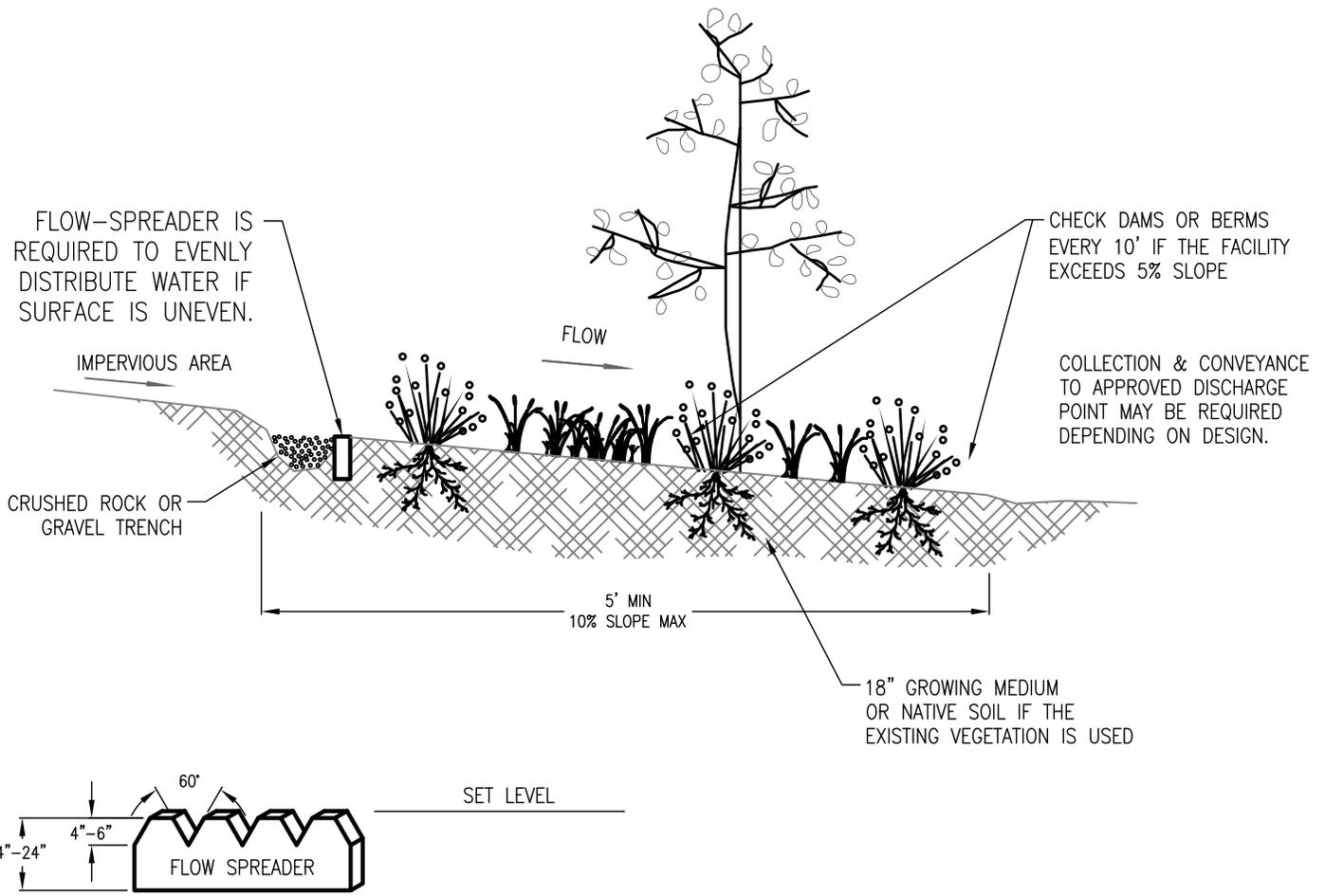
FREESTANDING PLANTER



1. Dimensions:
Width of planter: 24" minimum.
Depth of planter (from top of growing medium to overflow elevation): 12".
Longitudinal slope of planter: 0.5% or less.
2. Setbacks:
Planters must be less than 30" in height above finish grade if within 5-feet of property line.
3. Planter Walls:
Material must be monolithically poured concrete. Walls must be included on foundation plans.
4. Waterproofing:
Monolithically poured planter, without joints is required. Check state structural requirements for foundations.
5. Piping must be cast iron, ABS or PVC. 3" pipe required for facilities draining up to 1500 s.f., otherwise 4" minimum pipe. Oregon Plumbing Specialty Code also applies.
6. Drain Layer:
3/4" - 1 1/2" washed round rock.
Depth: 9".
Separation between drain rock and growing medium:
1/4" - #10 rock, 2 to 3 inches deep.
7. Overflow:
Planters must connect to approved discharge point per detail ST-130. Overflow elevation must allow for 2" of freeboard, minimum. Protect from debris and sediment with strainer or grate.
8. Growing Medium:
18" minimum depth. Use sand/loam/compost 3-way mix, or approved mix that will support healthy plants.
9. Vegetation: Refer to plant list in Appendix G. Minimum container size is #1.
of plantings per 100sf of facility area:
80 herbaceous plants OR;
72 herbaceous plants and 4 small shrubs.
10. Splash Block: Install 4-6" washed river rock or splash pad for erosion control at inlets and downspout.

- DRAWING NOT TO SCALE - ORIGINAL DRAWING AND SPECIFICATIONS FROM PORTLAND BUREAU OF ENVIRONMENTAL SERVICES

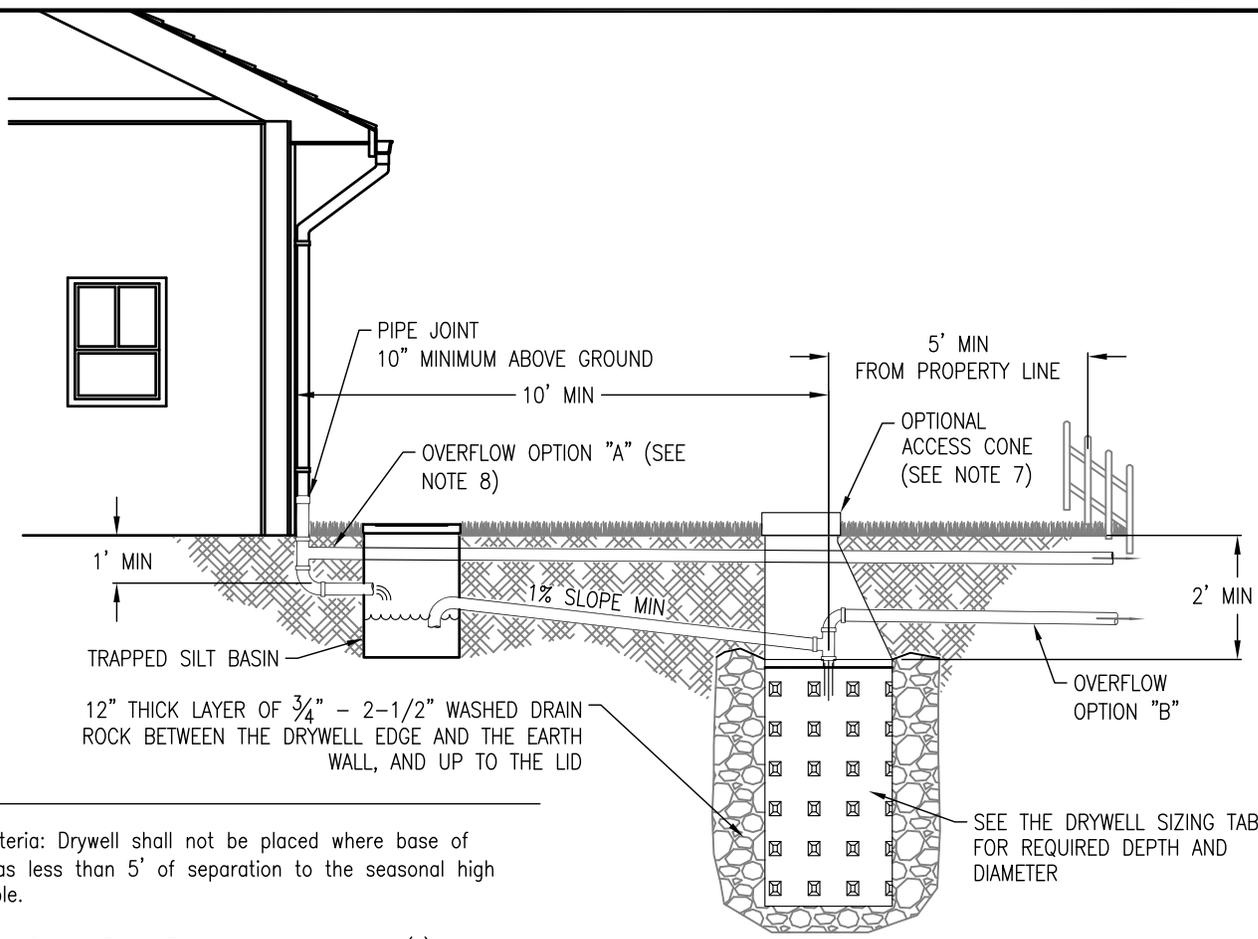
CITY OF GRESHAM	FILTRATION PLANTER	DRAWN DRO
		DATE OCT 2019
		APPR.
		DWG. NO. ST-151



1. Provide protection from all vehicle traffic and equipment staging 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 18" (Use sand/loam/compost 3-way mix or approved mix that will support healthy plants).
6. Vegetation: The entire filter strip must have 100% coverage by native grasses, native wildflower blends, native ground covers, or any combination thereof.
7. Flow Spreaders: A grade board or sand/gravel 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 sheetflow directly to the soil without scour. Level spreaders shall not hold a permanent volume of runoff. Grade boards can be made of any material that will withstand weather and solar degradation. Trenches used as level spreaders can be filled with washed crushed rock, pea gravel, or sand
8. Check Dams: shall be placed according to facility design otherwise:
 - a. 12" in length
 - b. Equal to the width of the filter
 - c. 3 to 5" in height
 - d. Every 10' where slope exceeds 5%.

- DRAWING NOT TO SCALE -
ORIGINAL DRAWING AND SPECIFICATIONS FROM PORTLAND BUREAU OF ENVIRONMENTAL SERVICES

CITY OF GRESHAM	FILTER STRIP	DRAWN DRO
		DATE APR 2018
		APPR.
		DWG. NO. ST-160



1. Siting Criteria: Drywell shall not be placed where base of facility has less than 5' of separation to the seasonal high water table.
2. Sizing: Use Drywell Sizing Table to size the drywell(s) based on impervious area.
3. Top of drywell must be below lowest finished floor.
4. Setbacks from center of drywell: Drywell must be 10' from foundations, 5' from property lines, and 20' from cesspools.
5. Piping must be cast iron, ABS or PVC. 3" pipe required for facilities draining up to 1500 sf, otherwise 4" minimum pipe. Oregon Plumbing Specialty Code also applies.
6. Silt Basin: Shall be included as pre-treatment for residential roofs. Silt basin shall be in accordance with design specifications for catch basin standards per Oregon Plumbing Specialty Code 1101.11.1-1101.11.5. Material may be plastic or metal. Lid must be solid.
7. Add maintenance access manhole and cone for drywell installed in non-residential settings. Access is optional in residential settings but highly recommended.
8. Overflow: Not required for sites with infiltration rates ≥ 2 "/hour. For areas with infiltration rates < 2 "/hour, install overflow pipe to approved discharge point. For flatter sites, option "A" may be used, where overflow is set 2"-6" higher than inlet to silt basin. For sloped sites, use overflow option "B" from top of drywell. Option "B" overflow pipe should be 4"-6" higher than pipe to drywell.

9. Drywells receiving flow from anything other than single-family residential roofs must be registered with DEQ as an Underground Injection Control (UIC).

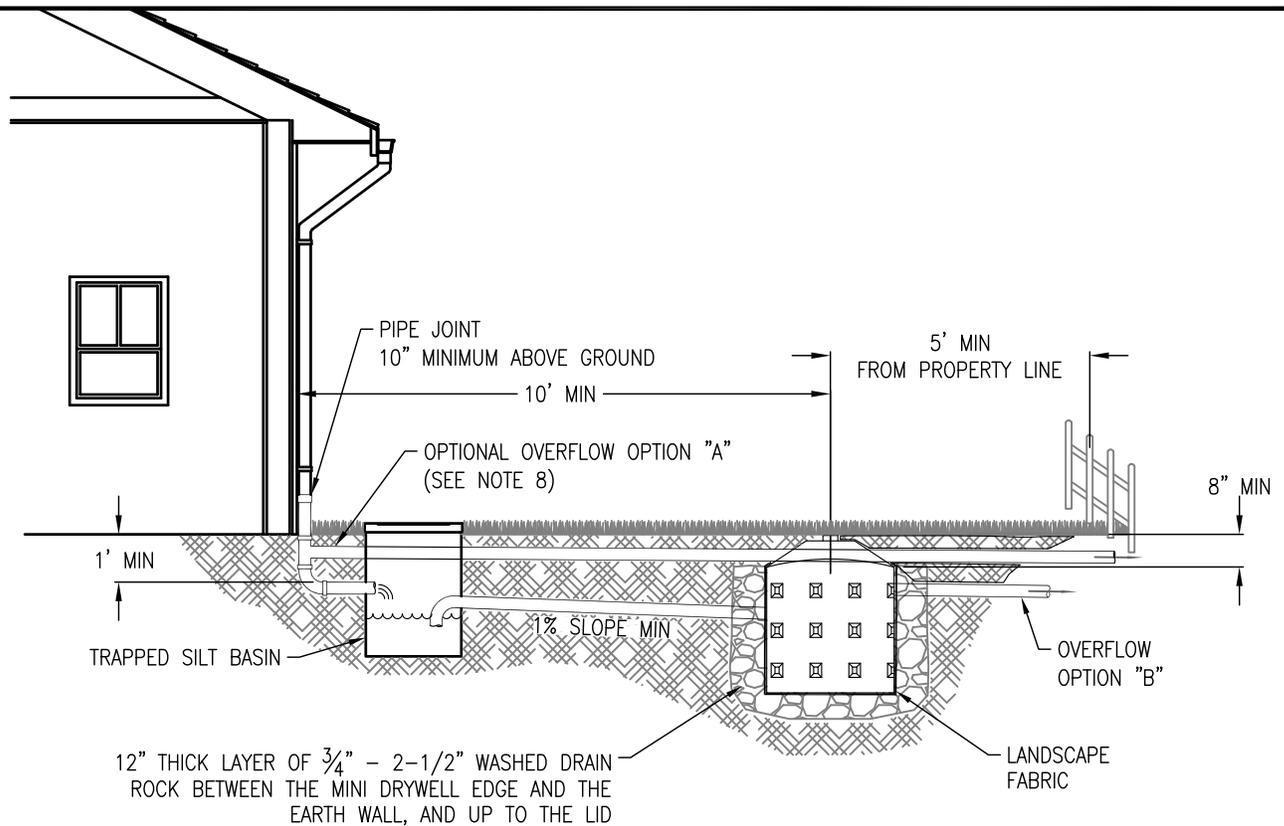
Drywell Sizing Table

Once approval has been given by City of Gresham for onsite infiltration of stormwater, the following chart shall be used to select the number and size of drywells. Gray boxes are acceptable.

IMPERVIOUS Area (sq-ft)	28" Diameter			48" Diameter			
	Drywell Depth						
	10'	15'	20'	5'	10'	15'	20'
1000							
2000							
3000							
4000							
5000							
6000							
7000							
8000							
9000							
10000							

- DRAWING NOT TO SCALE - ORIGINAL DRAWING AND SPECIFICATIONS FROM PORTLAND BUREAU OF ENVIRONMENTAL SERVICES

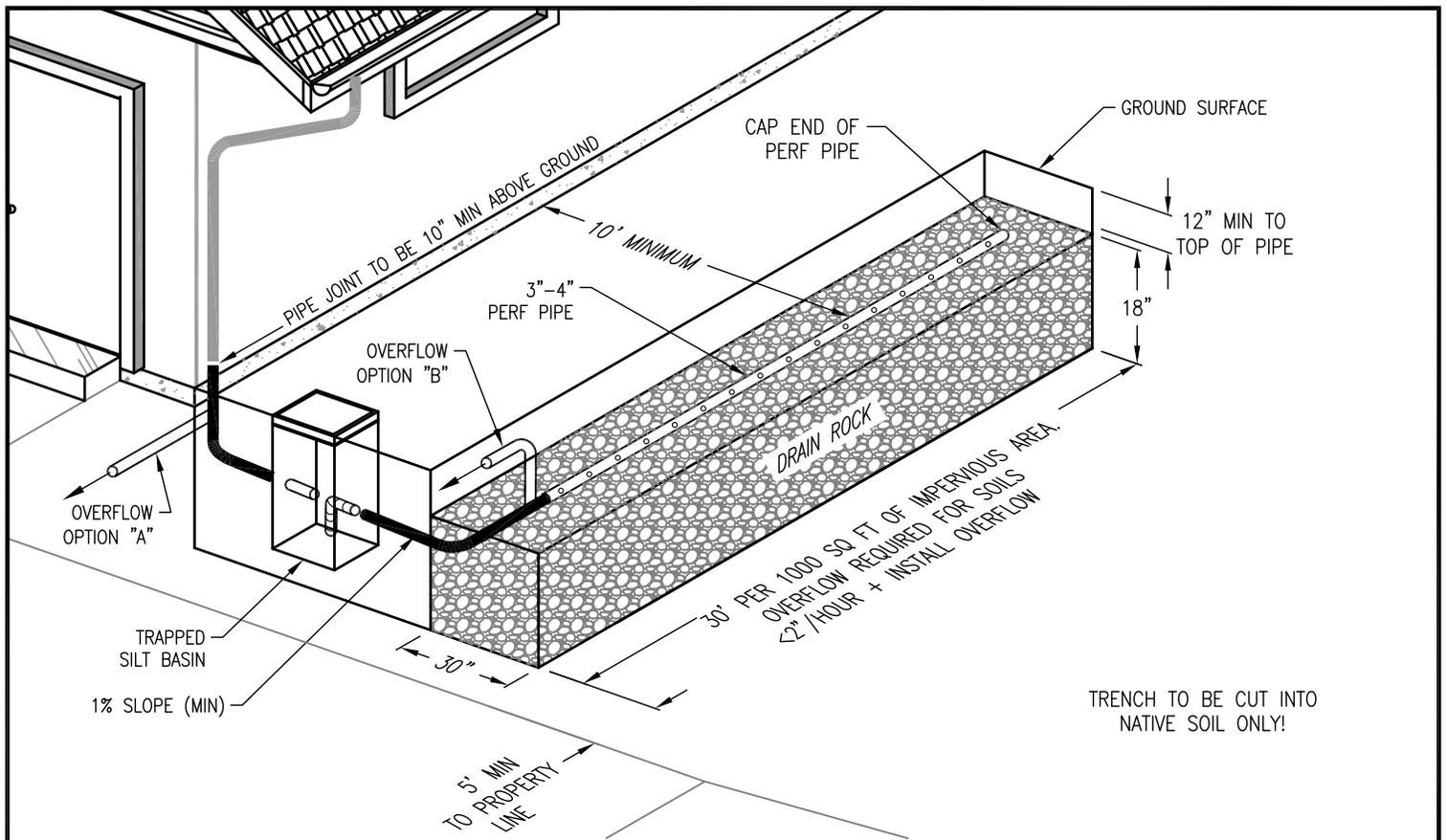
CITY OF GRESHAM	DRYWELL	DRAWN DRO
		DATE OCT 2019
		APPR.
		DWG. NO. ST-170



1. Siting Criteria: Mini drywell shall not be placed where base of facility has less than 5' of separation to the seasonal high water table.
2. Sizing: Only 500 sf of single family residential roof area may be connected to each mini drywell.
3. Top of mini drywell must be below lowest finished floor.
4. Wrap mini drywell with landscape fabric prior to backfilling with drain rock.
5. Setbacks from center of mini drywell: Mini drywell must be 10' from foundations, 5' from property lines, and 20' from cesspools.
6. Piping must be 3" cast iron, ABS or PVC. Oregon Plumbing Specialty Code also applies.
7. Silt Basin: Shall be included as pre-treatment for residential roofs. Silt basin shall be in accordance with design specifications for catch basin standards per Oregon Plumbing Specialty Code 1101.11.1-1101.11.5. Material may be plastic or metal. Lid must be solid.
8. Overflow: Not required for sites with infiltration rates ≥ 2 " / hour. For areas with infiltration rates < 2 " / hour, install overflow pipe to approved discharge point. For flatter sites, option "A" may be used, where overflow is set 2"-6" higher than inlet to silt basin. For sloped sites, use overflow option "B" from top of mini drywell. Option "B" overflow pipe should be 4"-6" higher than pipe to mini drywell.
9. Mini drywells for single-family residential roofs do not need to be registered with DEQ as an Underground Injection Control (UIC).

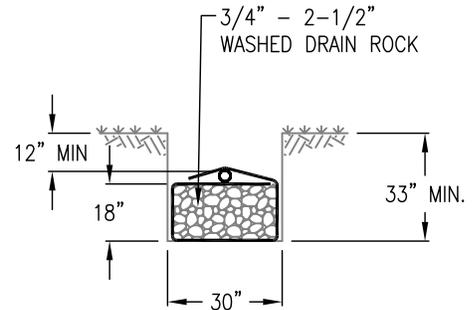
**- DRAWING NOT TO SCALE -
ORIGINAL DRAWING AND SPECIFICATIONS FROM PORTLAND BUREAU OF ENVIRONMENTAL SERVICES**

CITY OF GRESHAM	MINI DRYWELL	DRAWN DRO
		DATE OCT 2019
		APPR.
		DWG. NO. ST-171



1. Provide protection from all vehicle traffic and equipment staging in proposed infiltration areas prior to, during and after construction.
2. Siting Criteria: Soakage trench shall not be placed where base of facility has less than 5' of separation to the seasonal high water table.
3. Sizing: 30" wide x 18" tall x 30' long per 1000 square feet of impervious surface.
4. Setbacks: Soakage trench must be 10' from foundations, 5' from property lines, and 20' from cesspools.
5. Piping must be cast iron, ABS or PVC. 3" pipe required for facilities draining up to 1500 sf, otherwise 4" minimum pipe. Oregon Plumbing Specialty Code also applies.
6. Silt Basin: Shall be included as pre-treatment for residential roofs. Silt basin shall be in accordance with design specifications for catch basin standards per Oregon Plumbing Specialty Code 1101.11.1-1101.11.5. Material may be plastic or metal. Lid must be solid.
7. Overflow: Not required for sites with infiltration rates $\geq 2''/hour$. For areas with infiltration rates $< 2''/hour$, install overflow pipe to approved discharge point. For flatter sites, option "A" may be used, where overflow is set 2"-6" higher than inlet to silt basin. For sloped sites, use option "B" with Tee that is 4"-6" higher than pipe in trench.
8. Soakage trenches receiving flow from anything other than single-family residential roof runoff must be registered with DEQ as a (UIC).

SOAKAGE TRENCH CONSTRUCTION



FILTER FABRIC TO BE PLACED ON SIDES AND ENDS OF TRENCH. ADD DRAIN ROCK AND FOLD ONE SIDE OF FABRIC OVER ROCK. PLACE PERFORATED PIPE IN CENTER AND THEN INSTALL GREEN TRACER WIRE ON PIPE. COVER ALL WITH REMAINING SIDE OF FABRIC PRIOR TO BACKFILL.

- DRAWING NOT TO SCALE -

ORIGINAL DRAWING AND SPECIFICATIONS FROM PORTLAND BUREAU OF ENVIRONMENTAL SERVICES

CITY OF
GRESHAM

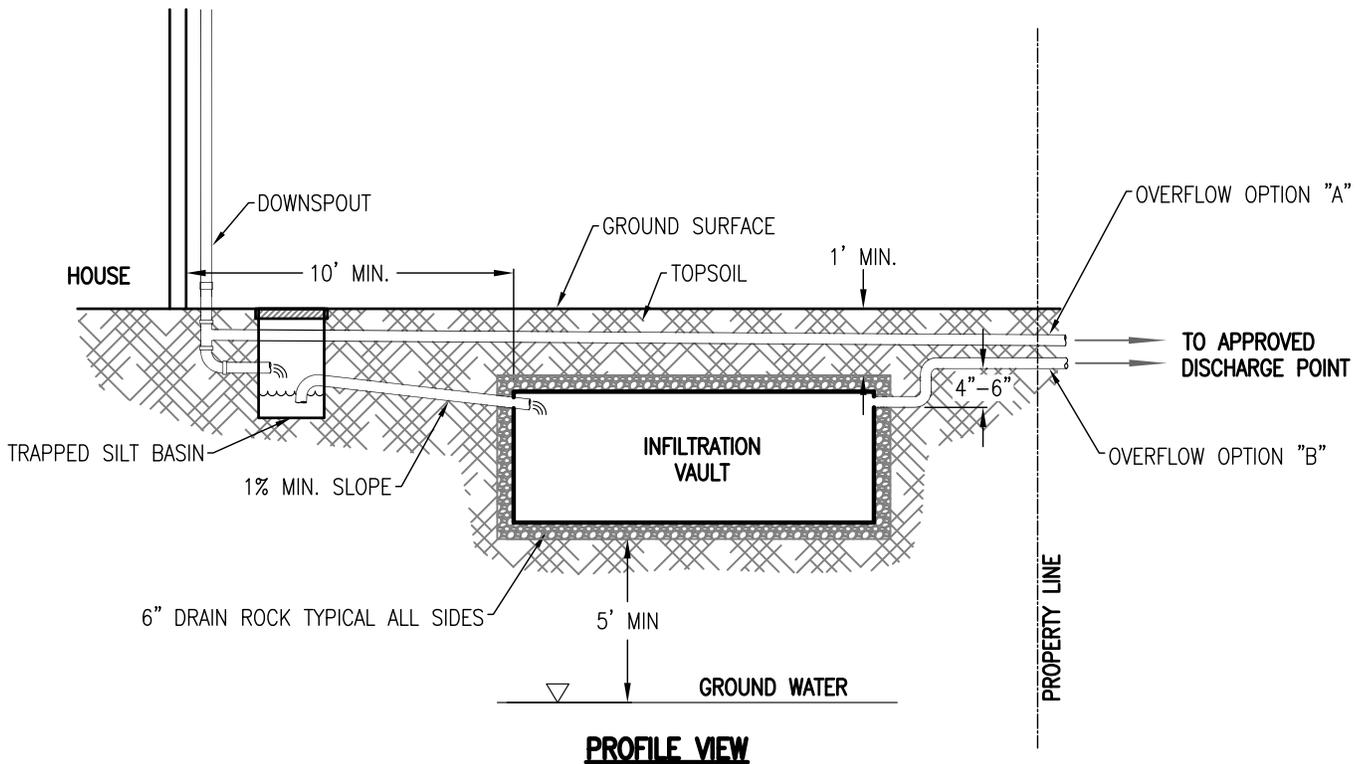
SOAKAGE TRENCH

DRAWN DRO

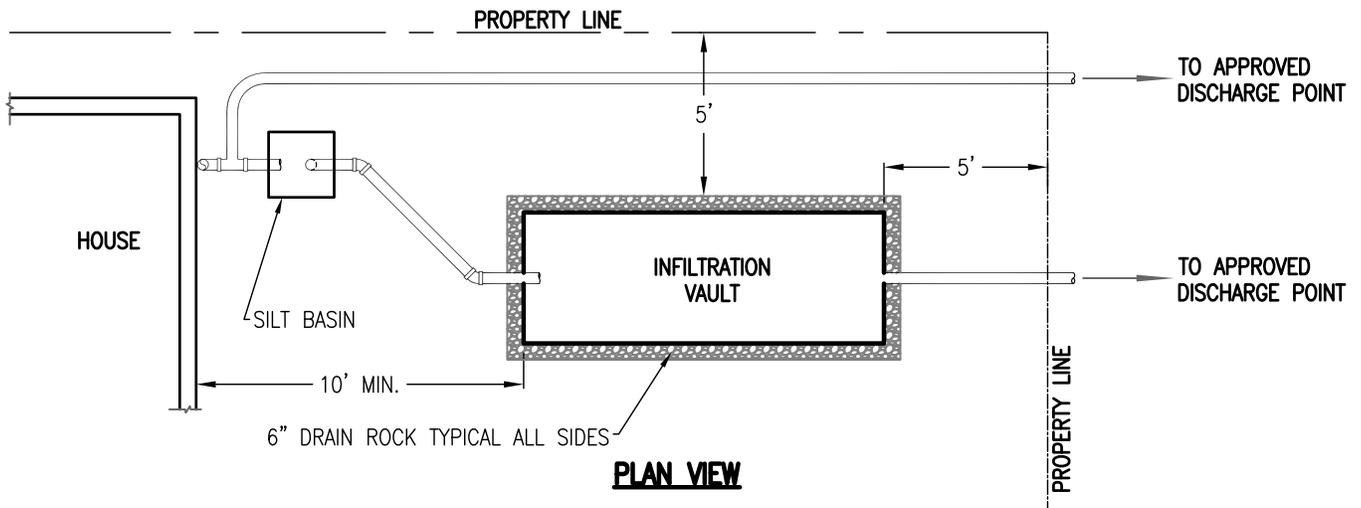
DATE OCT 2019

APPR.

DWG. NO. ST-180



PROFILE VIEW



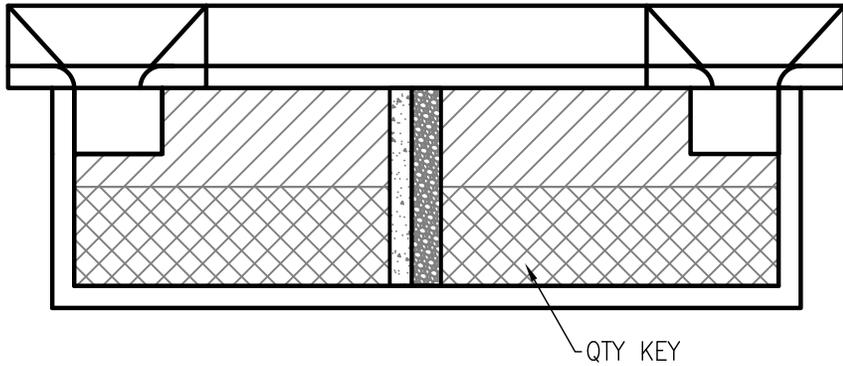
PLAN VIEW

1. Silt basin shall be included as pre-treatment for all residential roofs. Silt basin shall be W12" x L12" with depth that allows for 6"-12" of sedimentation.
2. Infiltration vaults receiving flow from anything other than single-family residential roofs must be registered with DEQ as an underground injection control device.
3. Overflow: Not required for sites with soil infiltration rates ≥ 2 " /hour. For areas with infiltration rates < 2 " /hour, install overflow pipe to approved discharge point. For flatter sites, use overflow option "A", where overflow is set 2"-6" higher than inlet to silt basin. For sloped sites, use option "B", where overflow leaves vault with a 4"-6" upturn.
4. Setbacks: 5' from property lines and 10' from foundations.

- DRAWING NOT TO SCALE -

<p>CITY OF GRESHAM</p>	<p>INFILTRATION VAULT</p>	<p>DRAWN RMS</p>
		<p>DATE JUNE 2018</p>
		<p>APPR.</p>
		<p>DWG. NO. ST-190</p>

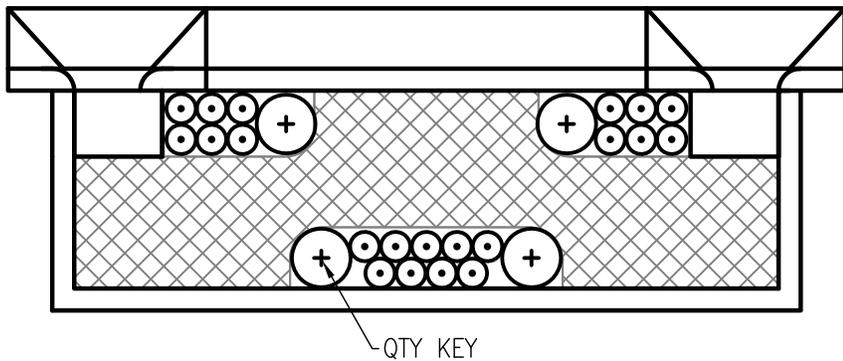
TEMPLATE 1



PLANT LEGEND 1

SYMBOL	BOTANICAL NAME
	COMMON NAME
	JUNCUS PATENS SPREADING RUSH
	CAREX OBNUPTA SLOUGH SEDGE

TEMPLATE 2



PLANT LEGEND 2

SYMBOL	BOTANICAL NAME
	COMMON NAME
	JUNCUS PATENS SPREADING RUSH
	CAREX OBNUPTA SLOUGH SEDGE
	SPIRAEA JAPONICA 'GOLD MOUND' GOLDMOUND JAPANESE SPIREA

SAMPLE PLANTING LEGEND

SYMBOL	BOTANIC NAME	COMMON NAME	SPACING	SQ. FOOT AREA = X	
				SPACING	QTY.
	Xxxxxx xxxxxx	xxxxxx	X	X	X
	Xxxxxx xxxxxx	xxxxxx	X	X	X

INSTRUCTIONS:

1. Choose a template and alter it to design. These are examples of approved planting templates. Other planting plans may be approved.
2. Plant lists and on-center spacing requirements are found in the stormwater management manual.
3. Planting legend required. State plant species, spacing, and quantities.
4. Planting plans shall include labels for each plant group identifying the plant species and quantity in the group.

- DRAWING NOT TO SCALE -

ORIGINAL DRAWING AND SPECIFICATIONS FROM PORTLAND BUREAU OF ENVIRONMENTAL SERVICES

NTS

<p>CITY OF GRESHAM</p>	<p>PUBLIC FACILITY LANDSCAPING TEMPLATE</p>	<p>DRAWN DRO</p>
		<p>DATE APR 2018</p>
		<p>APPR.</p>
		<p>DWG. NO. ST-200</p>