

# Appendix G.1 Table of Contents

SW-100: Ecoroof

SW-110: Pervious Pavement (For Private Only)

SW-120: Swale

SW-130: Planter

SW-140: Basin

SW-150: Facility Overflow Configurations

SW-151: Facility Hybrid Configuration E

SW-152: Facility Hybrid Configuration F

SW-160: Filter Strip

SW-170: Drywell

SW-180: Soakage Trench – East Side

SW-181: Soakage Trench – West Side

- DRAWING NOT TO SCALE -

## STORMWATER MANAGEMENT TYPICAL DETAILS

### Simplified and Presumptive Facilities Table of Contents

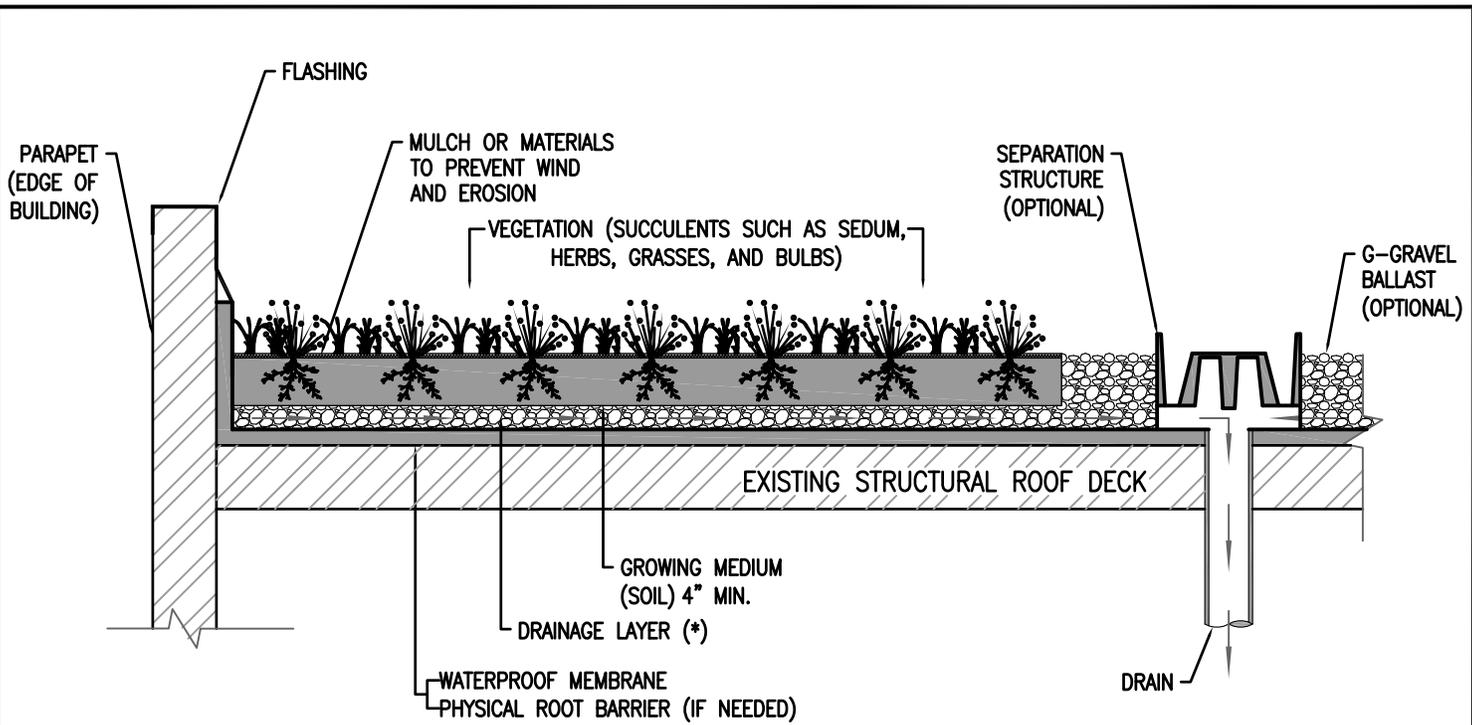
NUMBER

TOC



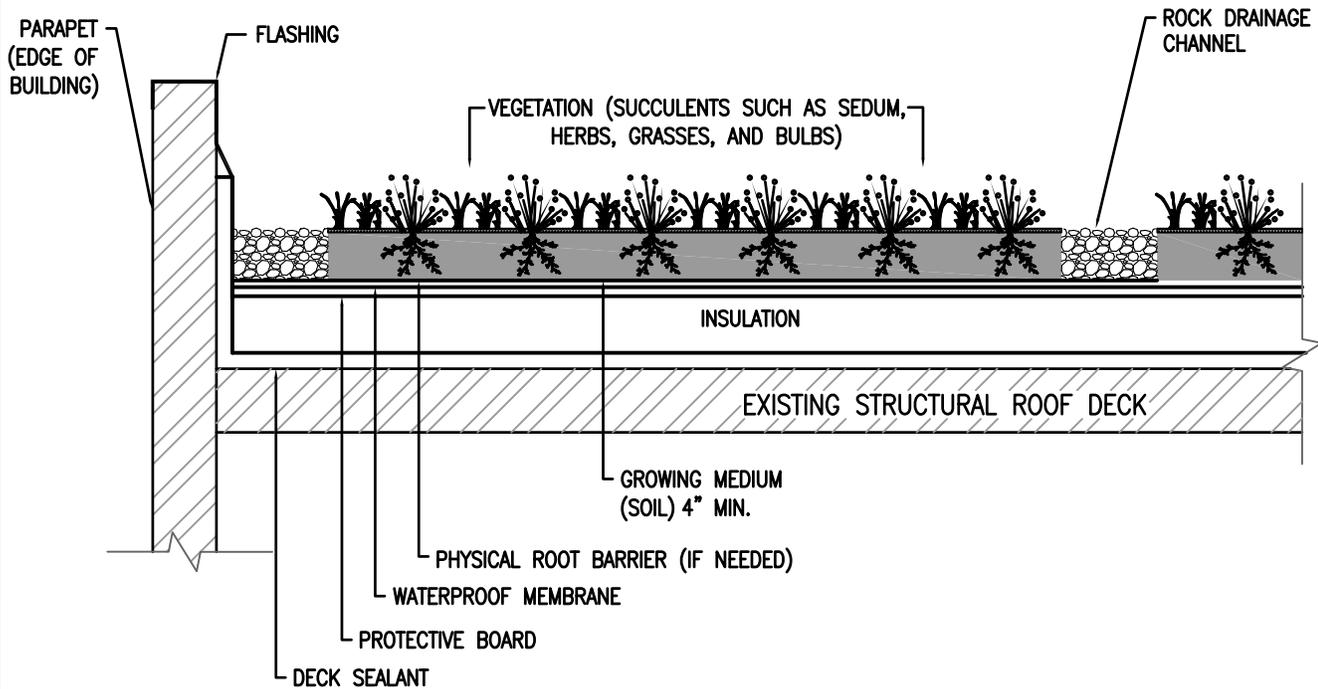
Bureau of Environmental Services





\* SEE OTHER DETAIL BELOW FOR OPTION.

ECOROOF WITH DRAINAGE LAYER



ECOROOF WITH DRAINAGE CHANNELS

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT TYPICAL DETAILS

- Simplified / Presumptive / Performance Design Approach -

Ecoroof

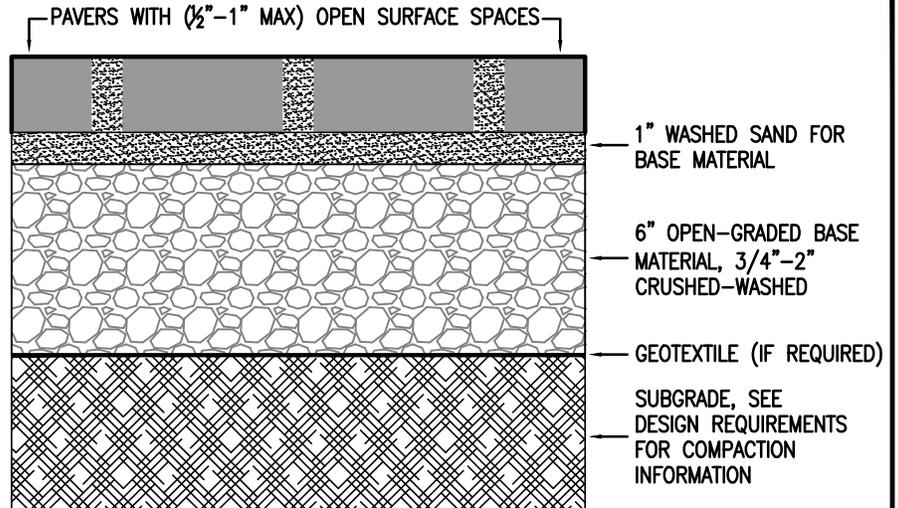
NUMBER

SW-100



Bureau of Environmental Services



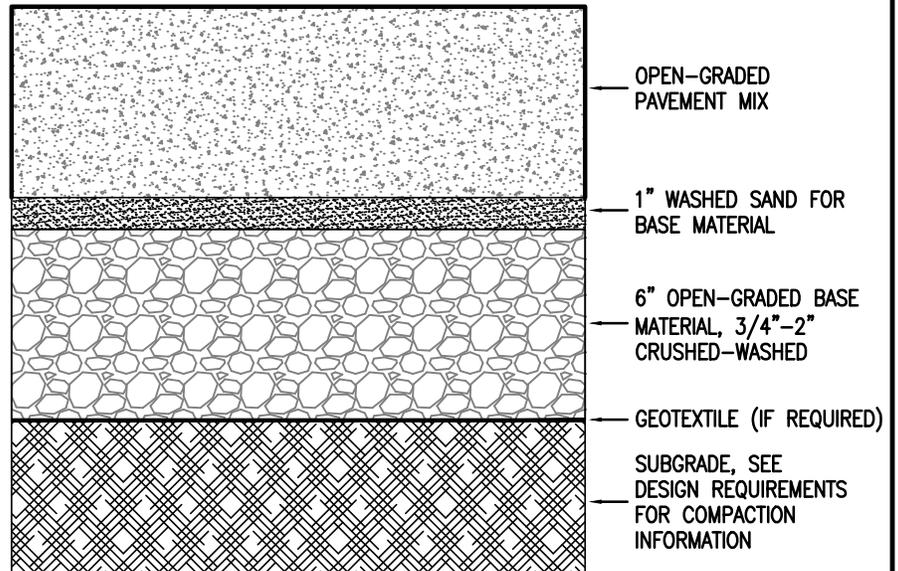


PERMEABLE CONCRETE BLOCK  
OR "PAVER" SYSTEMS

	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%

EXHIBIT 2-8

PERVIOUS PAVEMENT REQUIREMENTS FOR TOP LIFT DEPTH, ENGINEERING, AND COMPACTION.



PERVIOUS (OPEN GRADED) CONCRETE  
AND ASPHALT SYSTEMS

- DRAWING NOT TO SCALE -

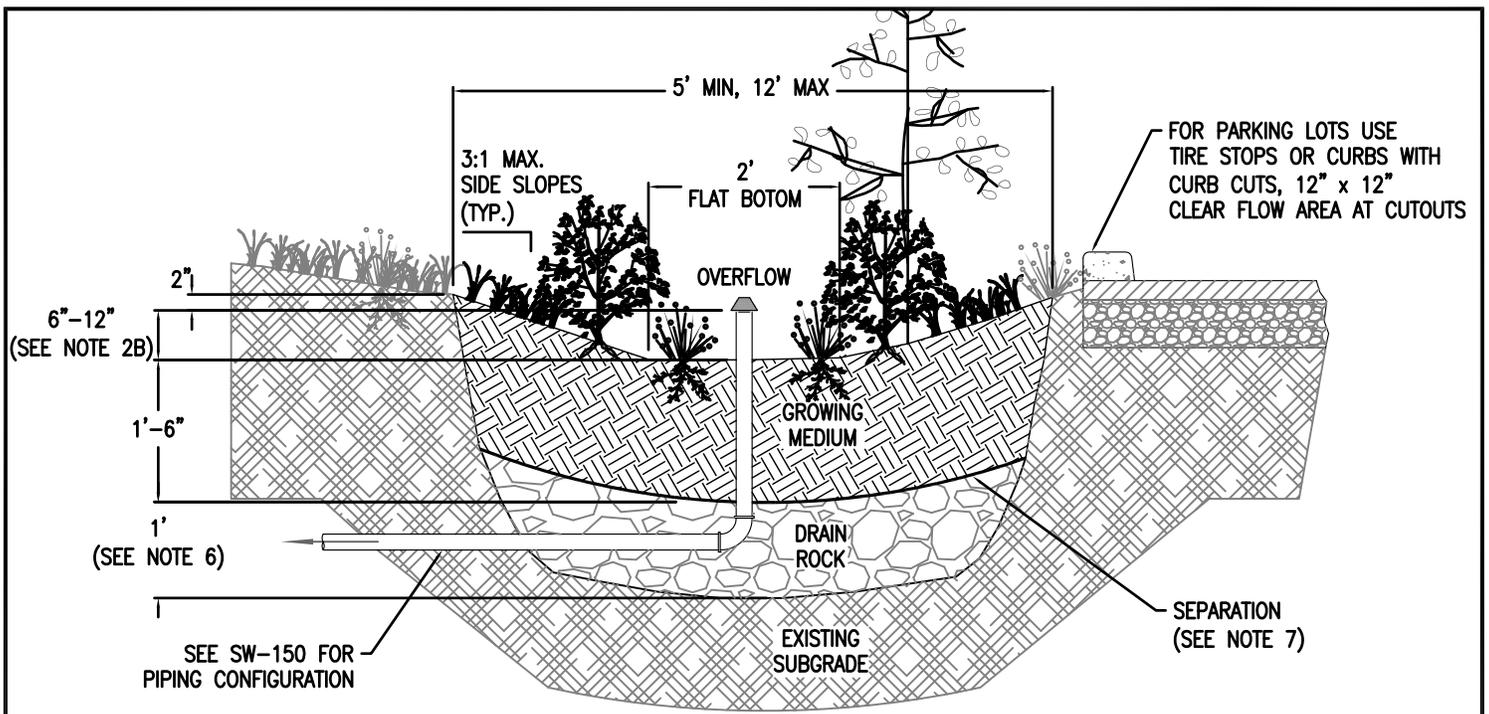
STORMWATER MANAGEMENT TYPICAL DETAILS

- Simplified / Presumptive / Performance Design Approach -  
Pervious Pavement

NUMBER

SW-110





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'.
  - b. Depth of swale (from top of growing medium to overflow elevation); Simplified: 9", Presumptive: 6" - 12" .
  - c. Longitudinal slope of swale: 6.0% or less.
  - d. Flat bottom width: 2'.
  - e. 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. Lined, flow-through swales must connect to approved discharge point according to SWMM Section 1.3.
4. Overflow:
  - a. Overflow required for Simplified Approach
  - b. Inlet elevation must allow for 2" of freeboard, minimum.
  - c. Protect from debris and sediment with strainer or grate.
5. Piping: shall be ABS Sch.40, cast iron, or PVC Sch.40. 3" pipe required for up to 1,500 sq ft of impervious area, otherwise 4" min. Piping must have 1% grade and follow the Uniform Plumbing Code.
6. Drain rock:
  - a. Size for infiltration swale: 1-1/2" - 3/4" washed
  - b. Size for lined, flow-through swale: 3/4" washed
  - c. Depth for Simplified: 12"
  - d. Depth for Presumptive: 0-48" , see calcs.
7. Separation between drain rock and growing medium: Use a gravel lens (3/4 - 1/4 inch washed, crushed rock 2 to 3 inches deep) or approved equivalent.
8. Growing medium:
  - a. 18" minimum
  - b. See Appendix F.3 for topsoil specification or use sand/loam/compost 3-way mix.
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. Zone A (wet): 115 herbaceous plants OR 100 herbaceous plants and 4 small shrubs.
  - b. Zone B (moderate to dry): 1 tree AND 3 large shrubs/small trees AND 4 small shrubs AND 140 groundcover plants. The delineation between Zone A and B shall be either at the outlet elevation or the check dam elevation, whichever is lowest.
10. Waterproof liner: Shall be 30 mil PVC or equivalent when lining is required.
11. Install washed pea gravel or river rock to transition from inlets and splash pad to growing medium.
12. Check dams: Shall be placed according to facility design. Refer to SW-340 for profile and spacing.
13. Inspections: Call BDS IVR Inspection Line, (503) 823-7000, for appropriate inspections.

- DRAWING NOT TO SCALE -

## STORMWATER MANAGEMENT TYPICAL DETAILS

- Simplified / Presumptive Design Approach -  
Swale

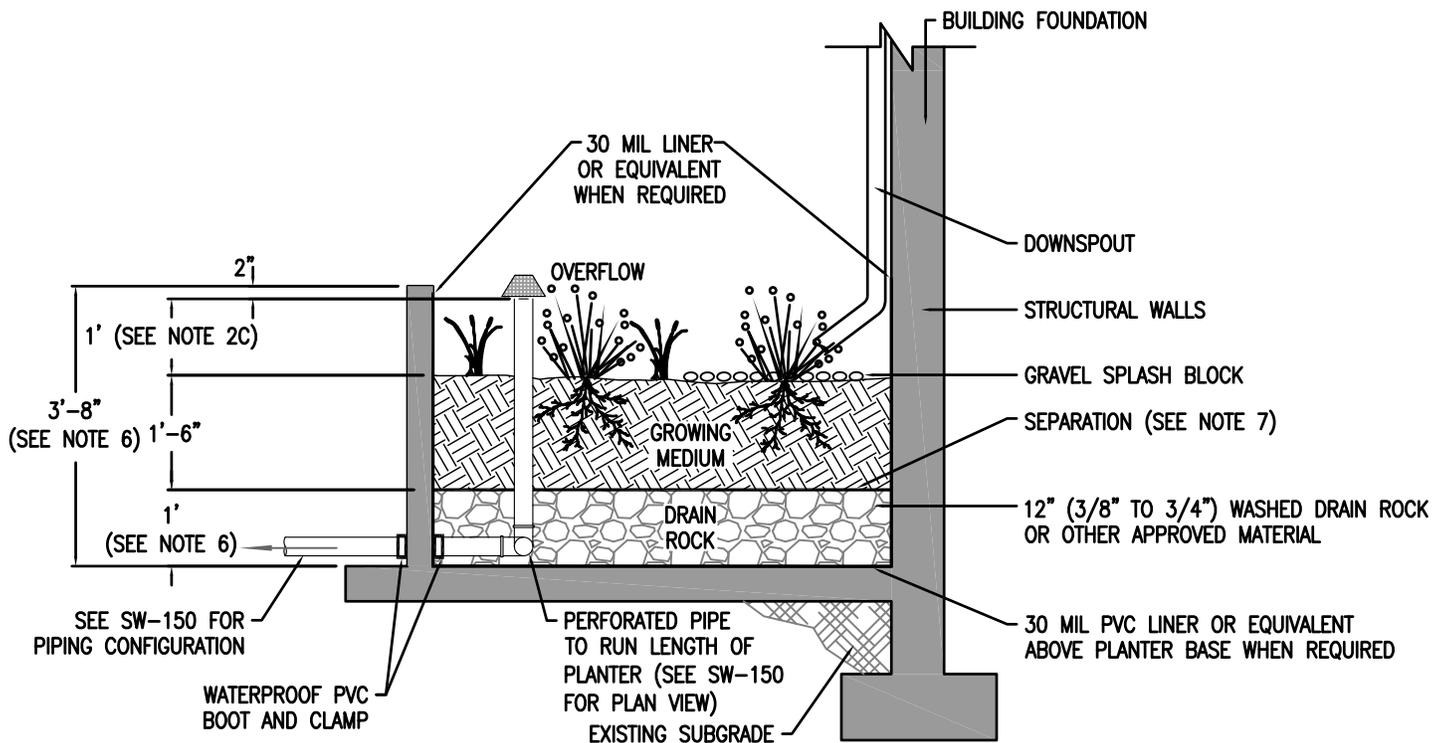
NUMBER

SW-120



Bureau of Environmental Services





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 flow-through planter: 18" minimum.
  - b. Width of infiltration planter: 30" minimum.
  - c. Depth of planter (from top of growing medium to overflow elevation); Simplified: 12", Presumptive: 6" - 18".
  - d. Longitudinal slope of planter: 0.5% or less.
3. Setbacks (from centerline of facility):
  - a. Infiltration planters must be 10' from foundations and 5' from property lines.
  - b. Flow-through planters must be less than 30" in height above surrounding area if within 5-feet of property line.
4. Overflow:
  - a. Overflow required for Simplified Approach
  - b. Inlet elevation must allow for 2" of freeboard, minimum.
  - c. Protect from debris and sediment with strainer or grate.
5. Piping: shall be ABS Sch.40, cast iron, or PVC Sch.40. 3" pipe required for up to 1,500 sq ft of impervious area, otherwise 4" min. Piping must have 1% grade and follow the Uniform Plumbing Code.
6. Drain rock:
  - a. Size for infiltration planter: 1-1/2" - 3/4" washed
  - b. Size for lined, flow-through planter: 3/4" washed
  - c. Depth for Simplified: 12"
  - d. Depth for Presumptive: 0-48", see calcs.
7. Separation between drain rock and growing medium: Use filter fabric (see SWMM Exhibit 2-4 Geotextile table) or a gravel lens (3/4 - 1/4 inch washed, crushed rock 2 to 3 inches deep).
8. Growing medium:
  - a. 18" minimum
  - b. See Appendix F.3 for topsoil specification or use sand/loam/compost 3-way mix.
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:
  - Zone A (wet):
    - a. 115 herbaceous plants OR;
    - b. 100 herbaceous plants and 4 small shrubs.
10. Planter 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.
11. Waterproof liner: Shall be 30 mil PVC or equivalent for flow-through facilities.
12. Install washed pea gravel or river rock to transition from inlets and splash pad to growing medium.
13. Inspections: Call BDS IVR Inspection Line, (503) 823-7000, for appropriate inspections.

- DRAWING NOT TO SCALE -

## STORMWATER MANAGEMENT TYPICAL DETAILS

- Simplified / Presumptive Design Approach -  
Planter

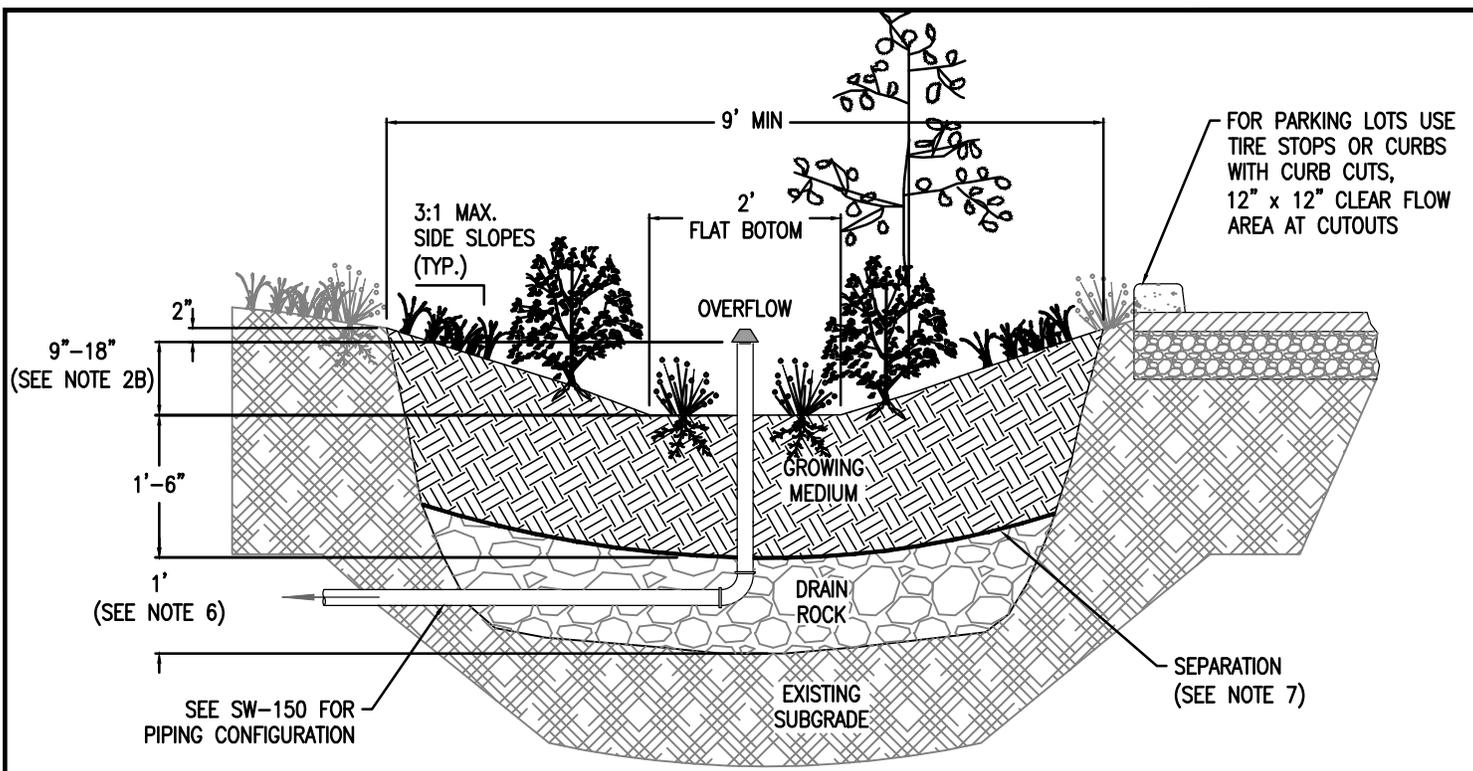
NUMBER

SW-130



Bureau of Environmental Services





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 basin: 9' minimum.
  - b. Depth of basin (from top of growing medium to overflow elevation); Simplified: 12", Presumptive: 9"-18".
  - c. Flat bottom width: 2' min.
  - d. Side slopes of basin: 3:1 maximum.
3. Setbacks (from midpoint of facility):
  - a. Infiltration basins must be 10' from foundations and 5' from property lines.
  - b. Flow-through swales must connect to approved discharge point according to SWMM Section 1.3.
4. Overflow:
  - a. Overflow required for Simplified Approach.
  - b. Inlet elevation must allow for 2" of freeboard, minimum.
  - c. Protect from debris and sediment with strainer or grate.
5. Piping: shall be ABS Sch.40, cast iron, or PVC Sch.40. 3" pipe required for up to 1,500 sq ft of impervious area, otherwise 4" min. Piping must have 1% grade and follow the Uniform Plumbing Code.
6. Drain rock:
  - a. Size for infiltration basin: 1-1/2" - 3/4" washed
  - b. Size for flow-through basin: 3/4" washed
  - c. Depth for Simplified: 12"
  - d. Depth for Presumptive: 0-48", see calcs.
7. Separation between drain rock and growing medium: Use a gravel lens (3/4" - 1/4" washed, crushed rock 2 to 3 inches deep) or approved equivalent.
8. Growing medium:
  - a. 18" minimum
  - b. See Appendix F.3 for topsoil specification or use sand/loam/compost 3-way mix.
9. Vegetation: Follow landscape plans otherwise refer to plant list in SWMM Appendix F. Minimum container size is 1 gallon. Number of plantings per 100sf of facility area:
  - a. Zone A (wet): 115 herbaceous plants OR 100 herbaceous plants and 4 shrubs
  - b. Zone B (moderate to dry): 1 tree AND 3 large shrubs AND 4 medium to small shrubs.
 The delineation between Zone A and B shall be either at the outlet elevation or the check dam elevation, whichever is lowest.
10. Install washed pea gravel or river rock to transition from inlets and splash pad to growing medium.
11. Inspections: Call BDS IVR Inspection Line, (503) 823-7000 for appropriate inspections.

- DRAWING NOT TO SCALE -

## STORMWATER MANAGEMENT TYPICAL DETAILS

- Simplified / Presumptive Design Approach -  
Basin

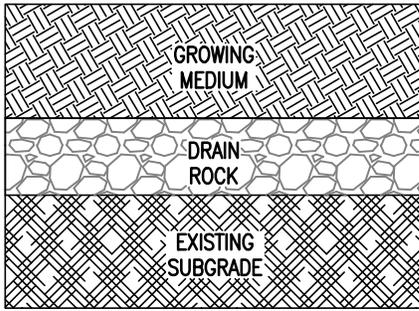
NUMBER

SW-140

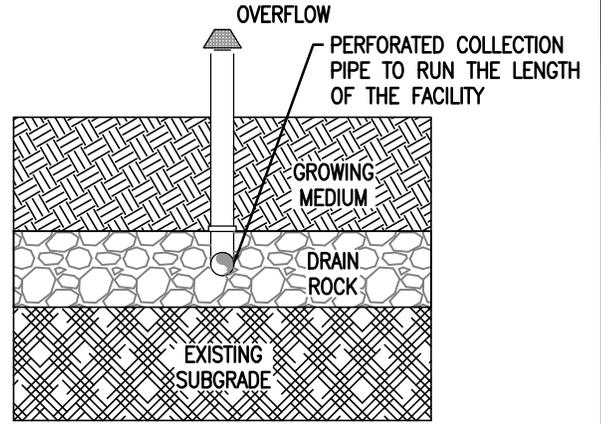


Bureau of Environmental Services

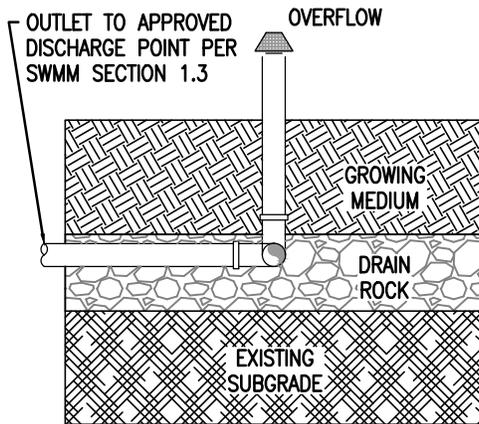




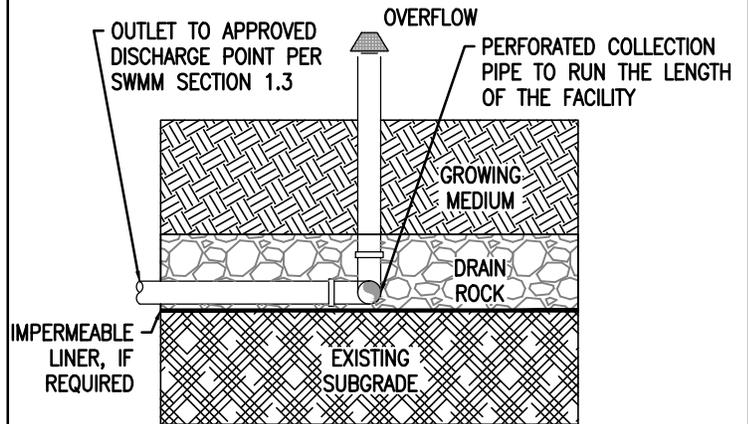
**INFILTRATION**  
STORMWATER HIERARCHY CATEGORY 1



**HYBRID**  
STORMWATER HIERARCHY CATEGORY 2  
OVERFLOW DIRECTED TO DRAIN ROCK. (SEE SW-151 AND SW-152 FOR MORE INFORMATION)

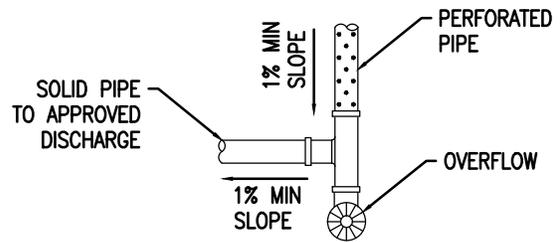


**PARTIAL INFILTRATION**  
STORMWATER HIERARCHY CATEGORY 3 or 4  
OVERFLOW AND UNDERDRAIN REQUIRED.  
SET UNDERDRAIN WITHIN DRAIN ROCK



**FLOW-THROUGH**  
STORMWATER HIERARCHY CATEGORY 3 or 4  
OVERFLOW AND UNDERDRAIN REQUIRED.  
SET UNDERDRAIN AT BASE OF DRAIN ROCK LINER.

**NOTE:**  
HYBRID FACILITIES MUST BE REGISTERED AS A UIC DESIGNED UNDER THE PRESUMPTIVE APPROACH.



**PLAN VIEW**  
PIPE W/ UNDERDRAIN & DISCHARGE POINT

- DRAWING NOT TO SCALE -

**STORMWATER MANAGEMENT TYPICAL DETAILS**

- Simplified / Presumptive Design Approach -  
Facility Overflow Configurations

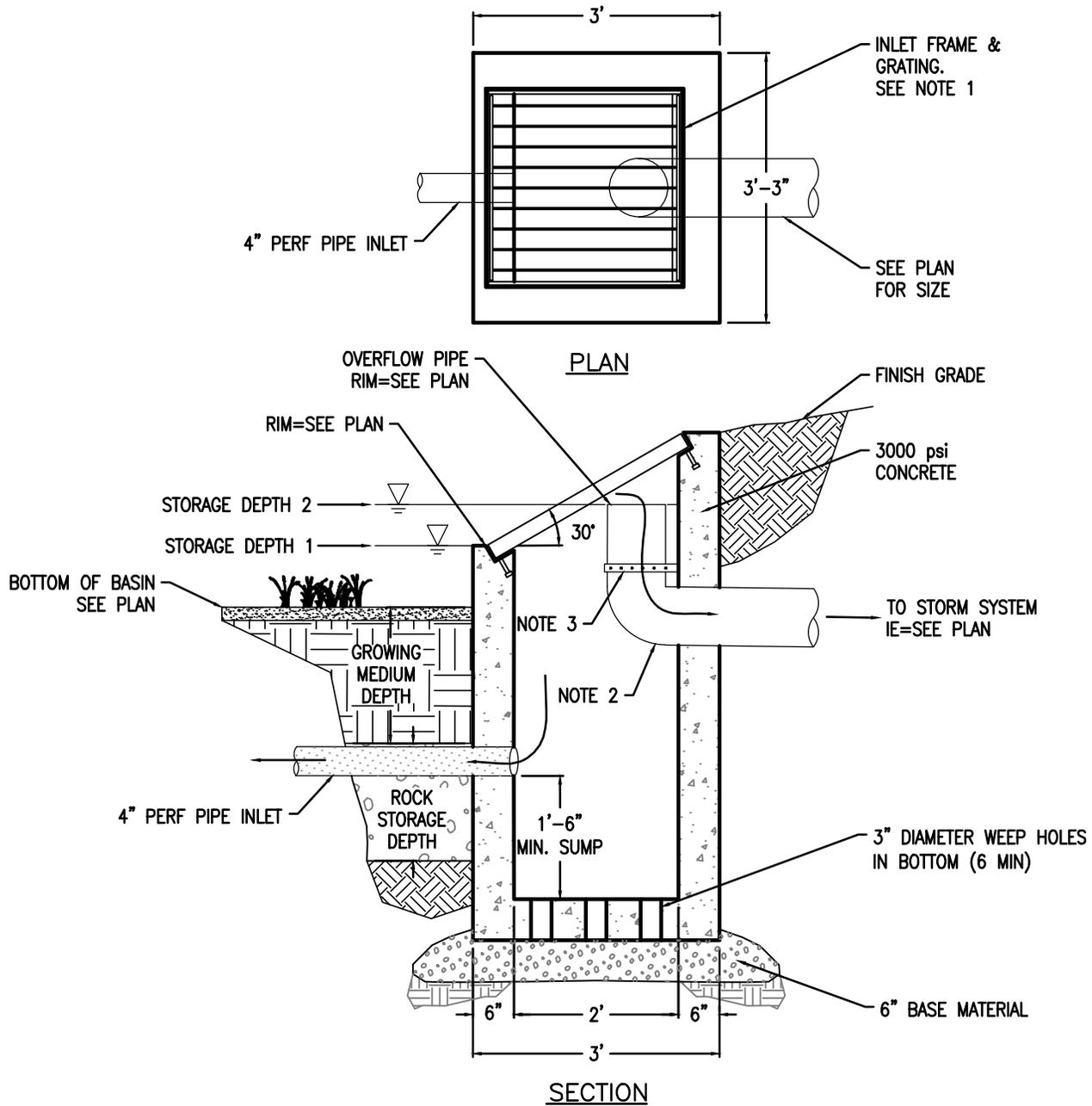


Bureau of Environmental Services



NUMBER

SW-150



**NOTE:**

1. GRATING AND FRAME SHALL BE GALVANIZED STEEL MEDIUM DUTY.
2. 8" DIA. OUTLET PIPE WITH UPTURNED ELBOW,
3. SECURE OUTLET PIPE WITH S/S BAND EMBEDDED 2" IN WALL.

- DRAWING NOT TO SCALE -

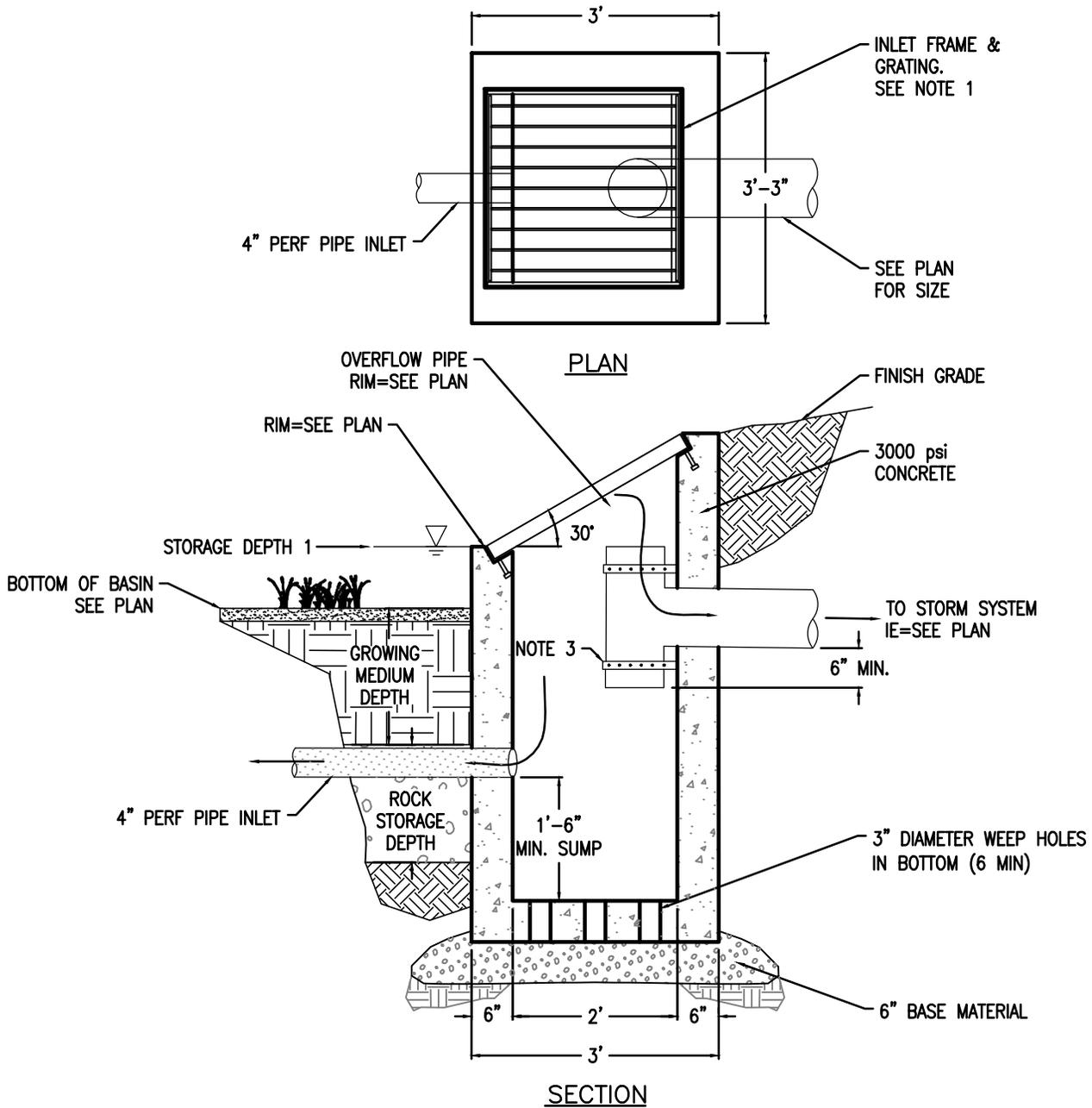
**STORMWATER MANAGEMENT TYPICAL DETAILS**

- Presumptive Design Approach -  
Hybrid Configuration E

NUMBER

SW-151





**NOTE:**

1. GRATING AND FRAME SHALL BE GALVANIZED STEEL MEDIUM DUTY
2. 8" DIA. OUTLET PIPE WITH UPTURNED ELBOW
3. SECURE OUTLET PIPE WITH S/S BAND EMBEDDED 2" IN WALL

- DRAWING NOT TO SCALE -

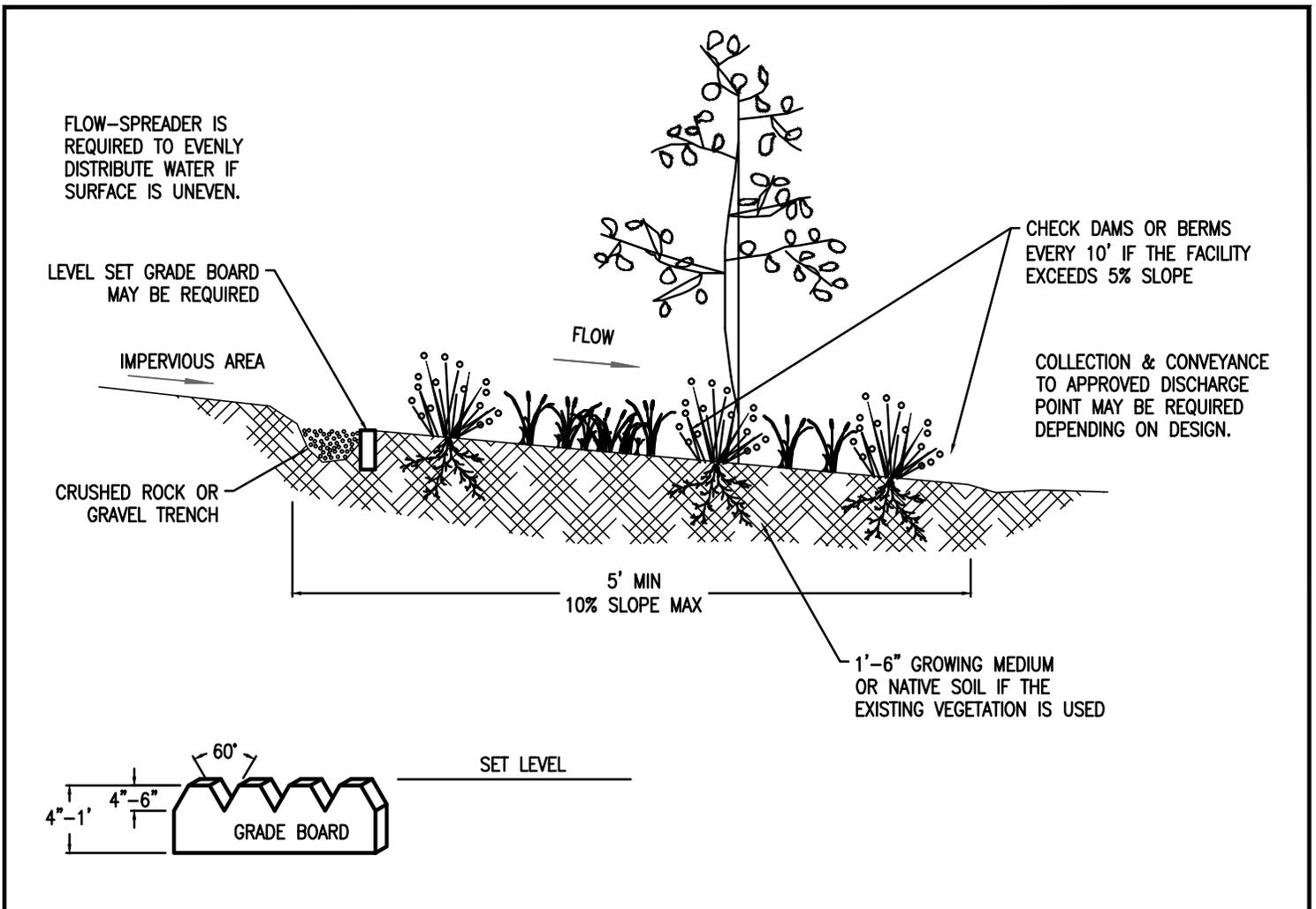
**STORMWATER MANAGEMENT TYPICAL DETAILS**

- Presumptive Design Approach -  
Hybrid Configuration F

NUMBER

SW-152





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 according to SWMM Section 1.3.
5. Growing medium: Unless existing vegetated areas are used for the filter strip, growing medium shall be used within the top 18" (See Appendix F.3 for topsoil specifications or use sand/loam/compost 3-way mix).
6. Vegetation: The entire filter strip must have 100% coverage by native grasses, native wildflower blends, native ground covers, or any combination thereof.
7. Level 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%.
9. Inspections: call BDS IVR Inspection Line, (503) 823-7000, for appropriate inspections.

- DRAWING NOT TO SCALE -

## STORMWATER MANAGEMENT TYPICAL DETAILS

- Simplified / Presumptive / Performance Design Approach -  
Filter Strip

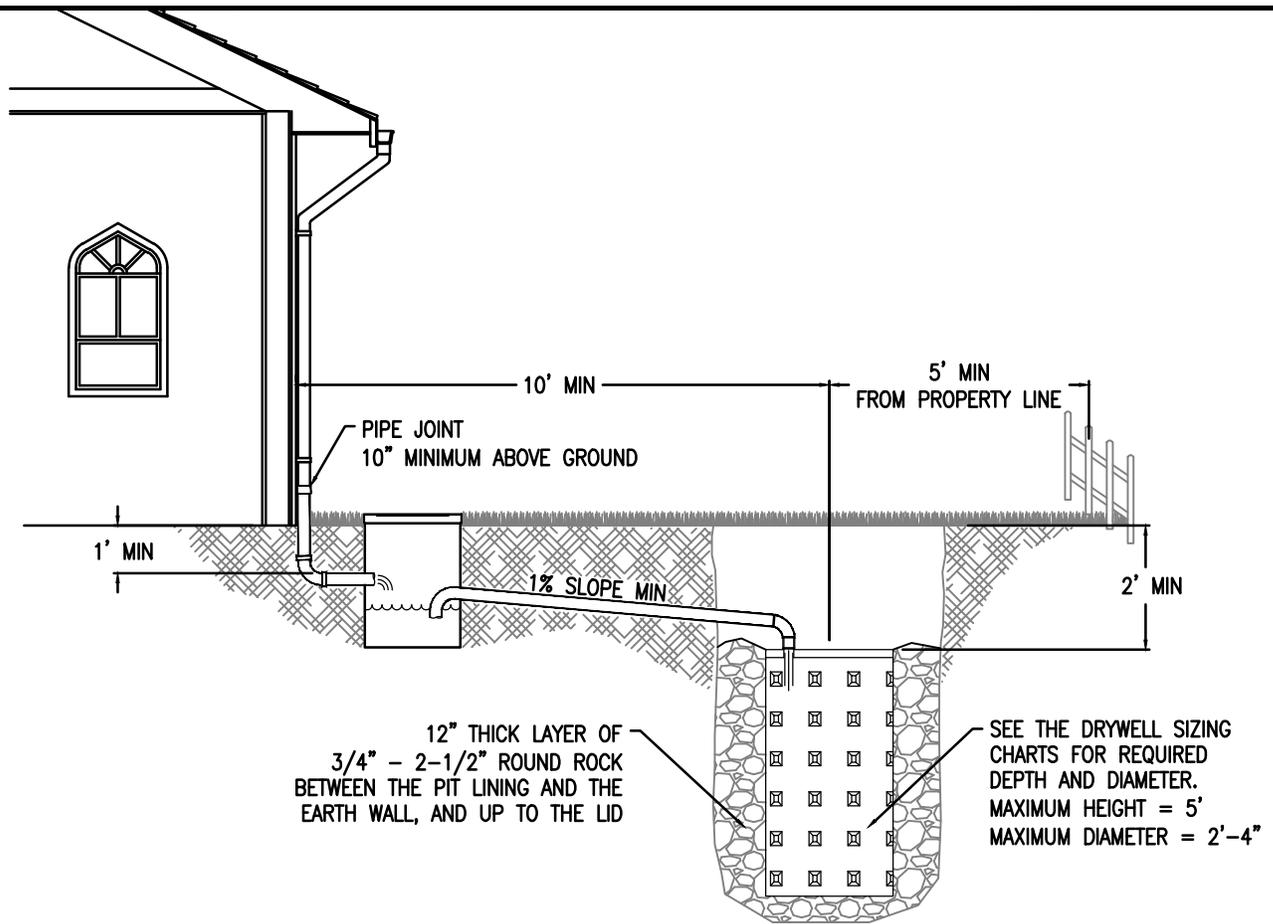


Bureau of Environmental Services



NUMBER

SW-160



1. Provide protection from all vehicle traffic, equipment staging, and foot traffic in proposed infiltration areas prior to, during, and after construction.
2. Siting criteria: Gravelly sand, gravelly loamy sand, or other equally porous material must occur in a continuous 5' deep stratum within 12' of the ground surface.
3. Sizing: Exhibit 2-36 is used to appropriately size the drywell(s) based on the amount of impervious area that each drywell is designed to manage. This chart shall be used as guidance, is based on field experience, and should be used as minimums only.
4. Drywell shall not be installed where base of facility has less than 5' of separation to water table.
5. Top of drywell must be below lowest finished floor.
6. Setbacks (from center of facility):
  - a. 10' from foundations
  - b. 5' from property lines
  - c. 20' from cesspools.
7. Piping shall be ABS SCH40, cast iron, or PVC SCH40. 3" pipe must be used for up to 1500sf of impervious area, otherwise 4" minimum. Piping must have 1% grade and must follow current Uniform Plumbing Code.

Exhibit 2-36: Drywell Sizing Table

Once approval has been given by BeS 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							
	5'	10'	15'	20'	5'	10'	15'	20'
1000								
2000								
3000								
4000								
5000								
6000								
7000								
8000								
9000								
10000								

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT TYPICAL DETAILS

- Simplified / Presumptive Design Approach -  
Drywell

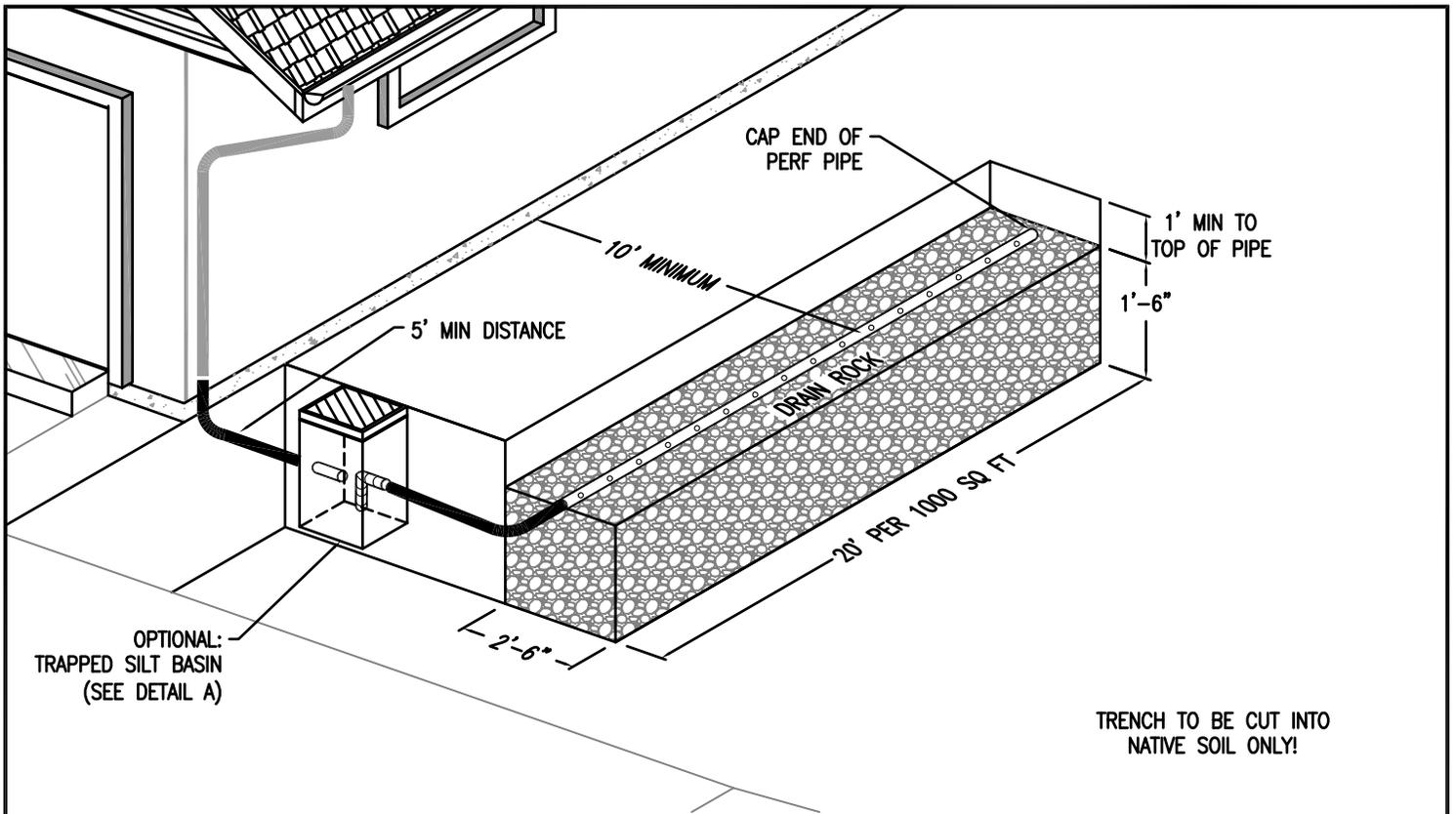
NUMBER

SW-170

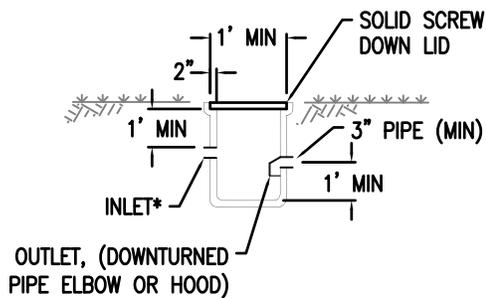


Bureau of Environmental Services



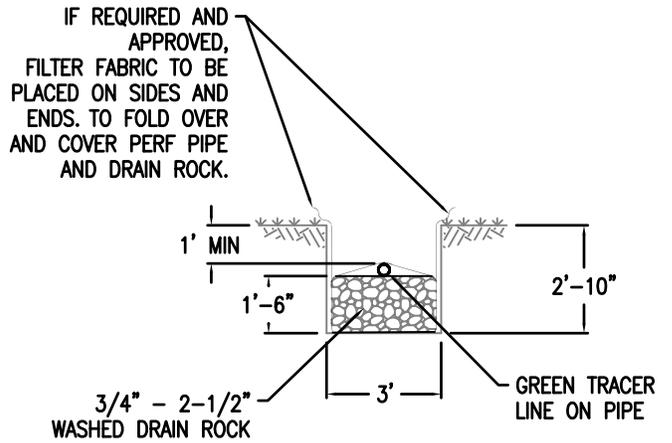


**DETAIL A: OPTIONAL TRAPPED SILT BASIN DETAIL**



\* THE BOTTOM OF THE INLET PIPE MUST NOT BE LOWER THAN THE TOP OF THE OUTLET PIPE.

**DETAIL B: SOAKAGE TRENCH CONSTRUCTION**



IF REQUIRED AND APPROVED, LINE TRENCH SIDES WITH FILTER FABRIC AS SHOWN, ADD 18" OF DRAIN ROCK. PLACE PERF. PIPE AND COVER ALL.

- DRAWING NOT TO SCALE -

**STORMWATER MANAGEMENT TYPICAL DETAILS**

- Simplified / Presumptive Design Approach -

**Soakage Trench**

East Side

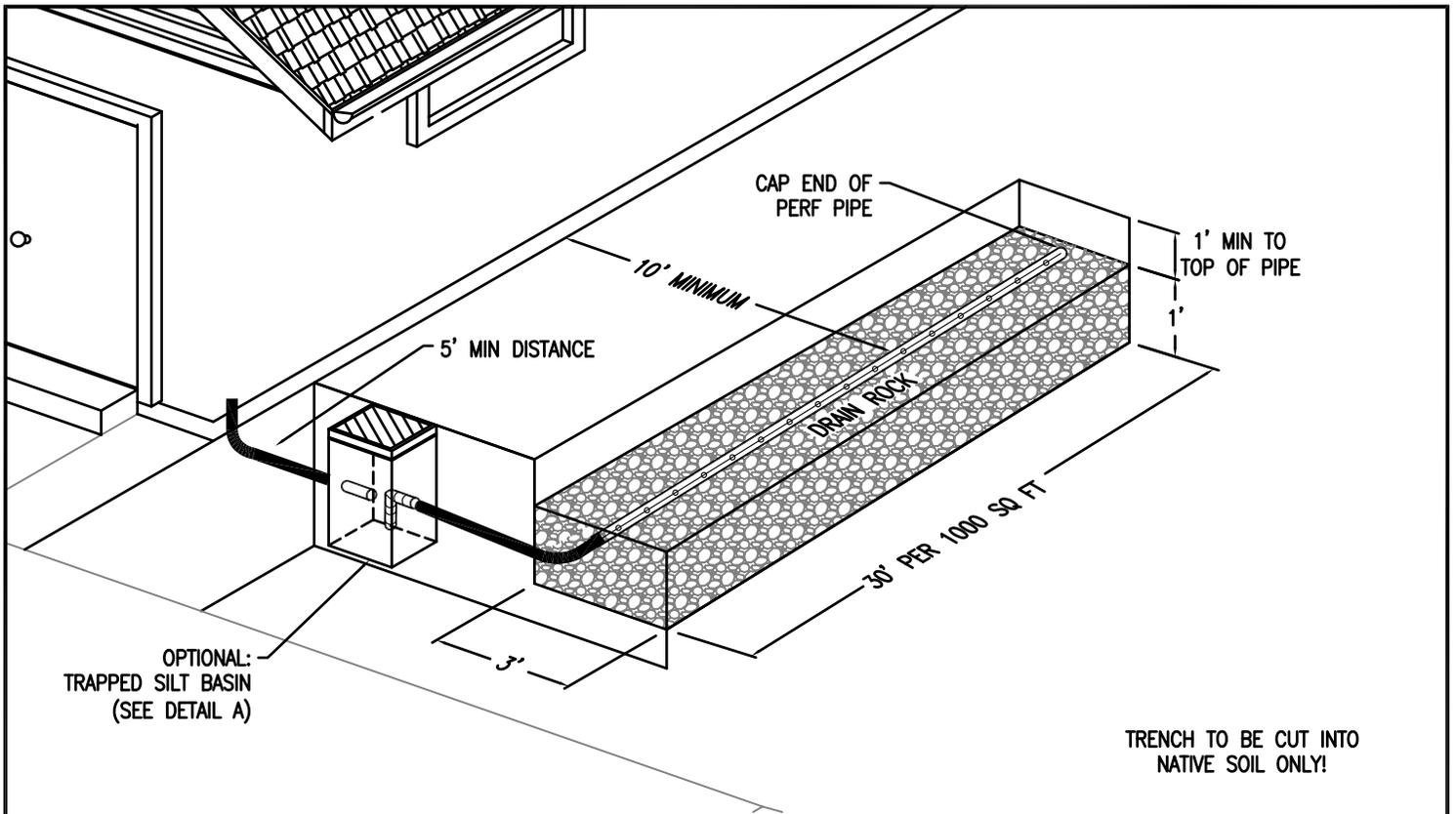
NUMBER

SW-180



Bureau of Environmental Services

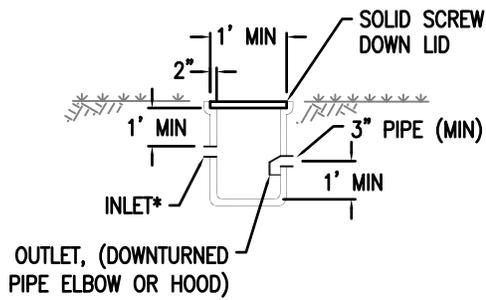




OPTIONAL:  
TRAPPED SILT BASIN  
(SEE DETAIL A)

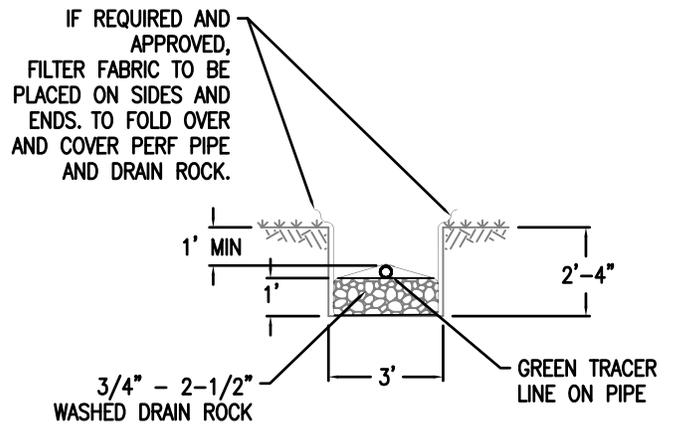
TRENCH TO BE CUT INTO  
NATIVE SOIL ONLY!

**DETAIL A: OPTIONAL TRAPPED  
SILT BASIN DETAIL**



\* THE BOTTOM OF THE  
INLET PIPE MUST NOT BE  
LOWER THAN THE TOP OF  
THE OUTLET PIPE.

**DETAIL B: SOAKAGE TRENCH  
CONSTRUCTION**



IF REQUIRED AND APPROVED,  
LINE TRENCH SIDES WITH  
FILTER FABRIC AS SHOWN,  
ADD 18\"/>

- DRAWING NOT TO SCALE -

**STORMWATER MANAGEMENT TYPICAL DETAILS**

- Simplified / Presumptive Design Approach -

**Soakage Trench**

West Side



Bureau of Environmental Services



NUMBER

SW-181