APPENDIX A: **Common Design Elements**

Many BMPs have similar elements or standards. Those common elements and associated design standards are outlined in this section.

GEOTECHNICAL INVESTIGATION

The design of most BMPs will rely on an initial geotechnical investigation. Performing soil tests early in the conceptual and preliminary design phases will ensure that the proposed system is optimized to actual site conditions and to prevent costly change orders resulting from poorly estimated soil parameters.

The investigation should include both desktop and field analyses to fully characterize the structural and hydrologic characteristics of a site. Desktop analyses can be used to generate a conceptual site design but should always be verified with field investigation. The following parameters can be determined by desktop analyses:

- Underlying geology (especially presence of karst geology or shallow bedrock)
- Site location with respect to Edwards Aquifer Recharge Zone
- Proximity to steep slopes
- Proximity to structural foundations, roadway subgrades, utilities, and other infrastructure
- Proximity to water supply wells
- Proximity to septic drain fields.

Field investigations should be performed by a licensed soil scientist or geotechnical engineer. All soil testing should be performed at the depth of the initially proposed subgrade because this is the soil strata where infiltration could occur. If a detention (non-infiltrating system) is proposed, soil tests must still be performed to determine structural requirements and to identify the elevation of the seasonal high water table.

Sufficient test pits or borings should be done to adequately characterize the site soil conditions, but, at a minimum, the greater of 2 samples or 1 sample per 50,000 square feet of BMP area should be collected. Soils should be investigated to a depth of at least 3 feet below the proposed BMP subgrade. The following key parameters should be determined or verified by field investigation:

- The infiltration rate of the soils at the potential subgrade (ASTM D 3385 Standard Test Method for Infiltration Rate of Field Soils Using Double-Ring Infiltrometer, or a comparable method)
- The depth and texture of subsoils
- The depth to the seasonal high groundwater table
- Structural capacity of soils (if surface BMP, such as cistern or planter box, is intended)
- Presence of expansive clay minerals
- Presence of compacted or restrictive layers
- Underlying geology (especially presence of karst geology or shallow bedrock)
- Proximity to steep slopes
- Proximity to structural foundations, roadway subgrades, utilities, and other infrastructure
- Proximity to water supply wells
- Proximity to septic drain fields.

In the Edwards Aquifer Recharge, Contributing, and Transition zones, at least 12 inches of natural soil must be provided wherever a practice is intended to discharge stormwater for infiltration (e.g. permeable pavement in the Contributing Zone or irrigation with harvested water from a cistern). Fill material may be used, but it must have a texture comparable to natural site soils. All soils should contain no wastes, debris, deleterious material, or material that can leach contaminants. Soils should contain less than 30 percent coarse material by volume, which is defined as material larger than 0.5 inch in diameter.

APPENDIX A: Common Design Elements

SITE INVESTIGATION

Siting and selecting appropriate LID practices is an iterative process that requires comprehensive site planning. A thorough site assessment is needed initially to identify the development envelope and minimize site alterations. The primary objective of the site assessment process is to identify limitations and development opportunities specific to LID. For example, development opportunities include available space, use of right-of-way as appropriate, and maximizing opportunities where properly infiltrating soils exist. Constraints or limitations that need to be factored into site planning when implementing LID practices include

- Slow-infiltrating soils (typically clays).
- Soil contamination.
- Steep slopes.
- Adjacent foundations of structures.
- Wells.
- Shallow bedrock.
- High seasonal water table.

For both new development and redevelopment, in the preliminary site plan, the development envelope (construction limits) is delineated. Applicable zoning, land use, subdivision, local road design regulations, and other local requirements should be identified to the extent applicable at this.

To make the best and most optimal use of LID techniques on a site, a comprehensive site assessment must be completed that includes an evaluation of

- Existing site topography,
- Soils,
- Vegetation, and
- Hydrology including surface water and ground water features.

High quality ecological resources (e.g., wildlife habitat, mature trees) should also be identified for conservation or protection. With such considerations, the site assessment phase provides the foundation for consideration of and proper planning around existing natural features and to retain or mimic the site's natural hydrologic functions.

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LID IN URBAN ENVIRONMENTS

Once a list of possible BMPs has been created, narrow down BMP options based on site constraints which may include:

- Available space
- Access for maintenance
- Limitations of infiltration related to soil type
- Soil contamination
- Depth to groundwater
- Presence of structures
- Utility conflicts, and/or depth to bedrock
- Regulatory requirements that affect the BMP volume or footprint, targeted post-construction ratios (e.g., impervious cover ratios), and compatibility with other site uses, such as green space requirements, public spaces, and structures.

Planter boxes have been implemented around paved streets, parking lots, and buildings to provide initial stormwater detention and treatment. Such applications offer an ideal opportunity to minimize directly connected impervious areas in highly urbanized areas.

Stormwater cisterns can be a useful method of reducing stormwater runoff volumes in urban areas where site constraints limit the use of other BMPs.

Bioswales are designed to be narrow and linear to fit within certain site constraints. Bioretention areas are well suited to the San Antonio region because they can be adapted to a variety of site constraints, can be incorporated into landscape design elements, and take advantage of the semi-arid climate for evapotranspiration.

Proprietary systems such as cartridge membrane filters are also a treatment option where the available development footprint is severely limited. Hydrodynamic separators function in small footprint locations where surface or sub-surface stormwater can be conveyed for treatment or where they are part of a treatment train to capture sediment and floatables. Another BMP that works well where the surface footprint is limited is below ground stormwater cisterns. These BMPs may be considered to help meet target impervious cover percentages.

APPENDIX A: Common Design Elements

CURB CUTS

When BMPs are incorporated into highly impervious areas, such as parking lots and in road rights-of-way, curb cuts can be required to allow surface runoff to enter the BMP. Curb cuts are designed such that the design storm can pass through the curbing without causing water to pond in the travel lanes. Example curb cuts are shown in Figure A-1 through Figure A-4.

Designs have the following recommendations:

- The opening should be at least 18 inches wide at the base to prevent clogging and to provide dispersed flow.
- The curb cut can have vertical sides or have chamfered sides at 45 degrees.
- Slope the bottom of the concrete curb cut toward the stormwater facility.
- Provide a minimum 2-inch drop in grade between the curb cut entry point and the finished grade of the stormwater facility.
- The curb cut must pass the design storm flow without causing backup that would disrupt normal travel in the lane.

The curb cut opening should be armored to prevent erosion. Concrete, stone, or sod can be used to armor the flow path to the base of the bioretention area. If a vegetated filter strip is provided downstream from the curb cut, a turf reinforcement mat may be required to stabilize the soil if flows are expected to exceed 3 ft/sec.

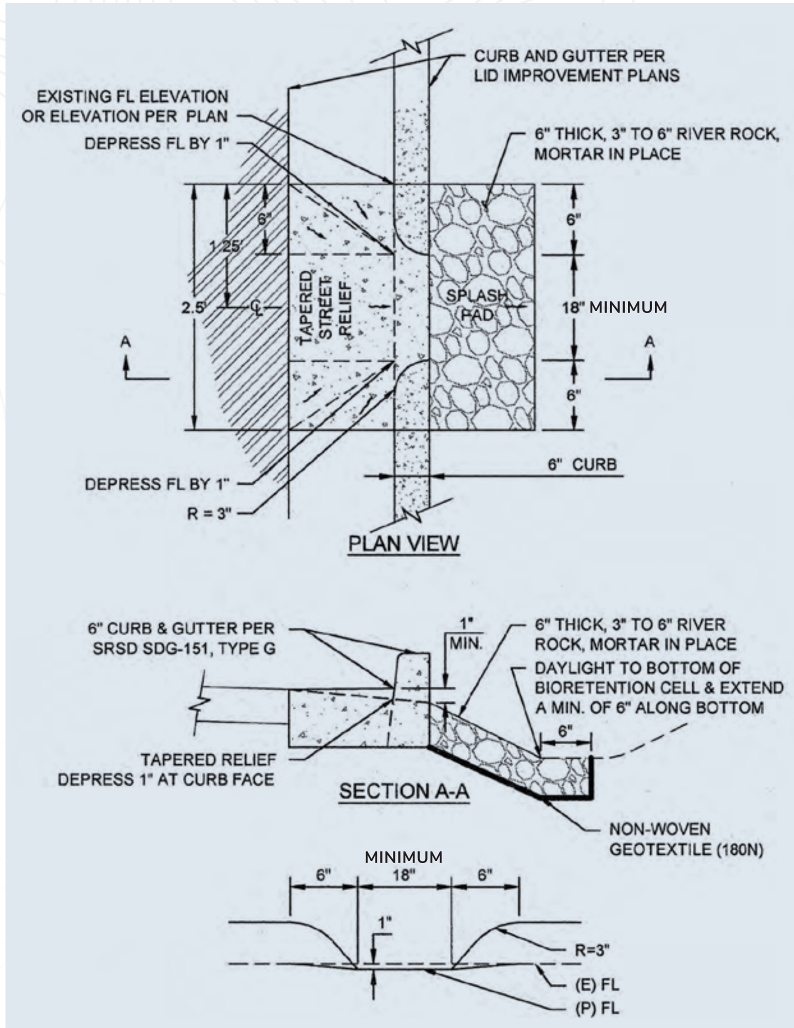

Figure A-1. *Typical curb cut diagram*

RIBBON, OR FLUSH, CURBS

Another curb option used with LID features is the ribbon, or flush, curb. These curbs are designed to have a curb edge that is flush with the road or parking lot surface, allowing stormwater runoff to sheet flow into BMPs. When used in parking lots, ribbon curbs are often paired with wheel stops as shown in Figure A-4.

If sheet flow (such as parking lot runoff) is conveyed to the treatment area, the site must be graded in such a way that minimizes erosive conditions. Any slopes that convey flow should be routinely inspected for rill erosion, which can contribute excessive sediment to the bioretention area and often represents the most common maintenance issue (Wardynski and Hunt 2012). Take care to prevent flow from concentrating between parking lot curb stops/blocks.

Figure A-2. *A typical curb cut, San Antonio, Texas.*

Figure A-3. *Multiple, small curb cuts distribute parking lot runoff to bioretention area without erosive force at Mission Library, San Antonio, Texas. Source: Bender Wells Clark Design*

Some pretreament flow reduction can be provided by using multiple, smaller curb cuts to minimize the flow at each opening and by armoring the curb opening from the back of the curb to the base elevation of the bioretention area (Figure A-2).

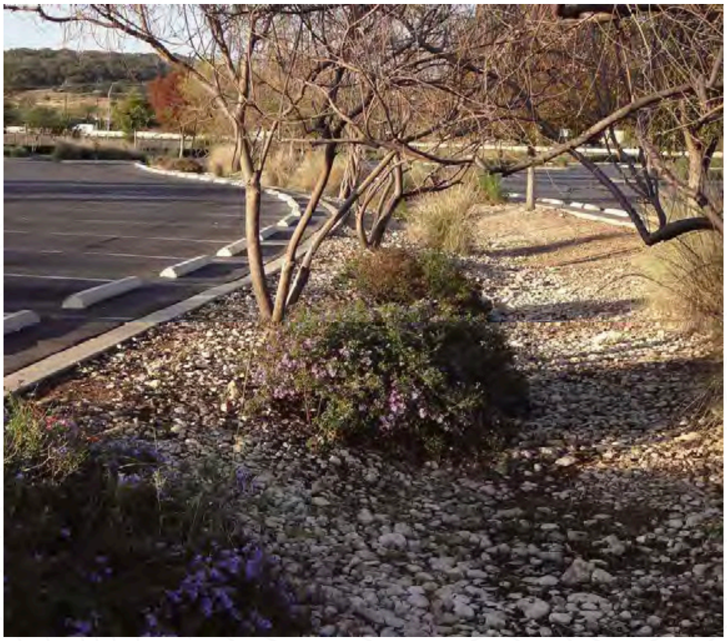

Figure A-4*. A ribbon, or flush, curb with the wheel stops at The Rim in San Antonio, Texas.*

Figure A-5 shows an example of a curb cut configuration. Figure A-6 shows a covered curb cut that would be appropriate in areas experiencing high levels of pedestrian traffic. Inlets can be covered or protected for pedestrians or other traffic using a covered curb cut. Covered curb cuts, such as the one shown in Figure A-6 are preferred over other curb inlet methods including the use of pipes or linear cuts in the curbing for ease of maintenance. Covering the inlet with a removable grate allows for easy visual inspection of the inlet and can reduce the effort required for maintenance. Such curb cuts can also be modified with a small sump or lip to capture coarse sediments and trash. Armoring the curb opening from the back of the curb to the base elevation of the bioretention will reduce inlet velocities, preventing scour and erosion in the BMP.

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Common Design Elements

Figure A-5 (left). *Example of curb cut configuration. Downey, California (left). Source: Tetra Tech*
Figure A-6 (right). *Rendering showing a covered curb cut with a sump. Source: City of San Diego LID Design Manual*

STABILIZATION AND ENERGY DISSIPATION

In some cases, the inlet or outlet can be a pipe with concentrated flow. Flow dissipation is difficult yet critical in such situations. Several options can be used for dissipating flow from a pipe. The flow can be discharged into a shallow forebay. Energy dissipation can be implemented at the outlet of the pipe, such as by using sod or stones, to slow the flow as shown in Figure A-7. All stone armoring should be sized such that it is not mobilized during high flows and should be underlain with appropriate geotextile fabric to prevent scour of underlying soils. Another option to dissipate energy from small pipes would be to install an elbow at the end of the pipe, with stable materials around the elbow, to slow the flow and allow the water to cascade onto a gravel pad. A small weep hole should be used to prevent water from permanently ponding in the elbow. An example of a constructed energy dissipater is shown in Figure A-8, and an upturned elbow used for energy dissipation is shown in Figure A-9.

Figure A-7 (left). *Angular stone flow dissipater/forebay, Cary, North Carolina. Source: Tetra Tech*

Figure A-8 (left). *Concrete energy dissipater, University of Texas at San Antonio, San Antonio, Texas. Source: Tetra Tech*

APPENDIX A: Common Design Elements

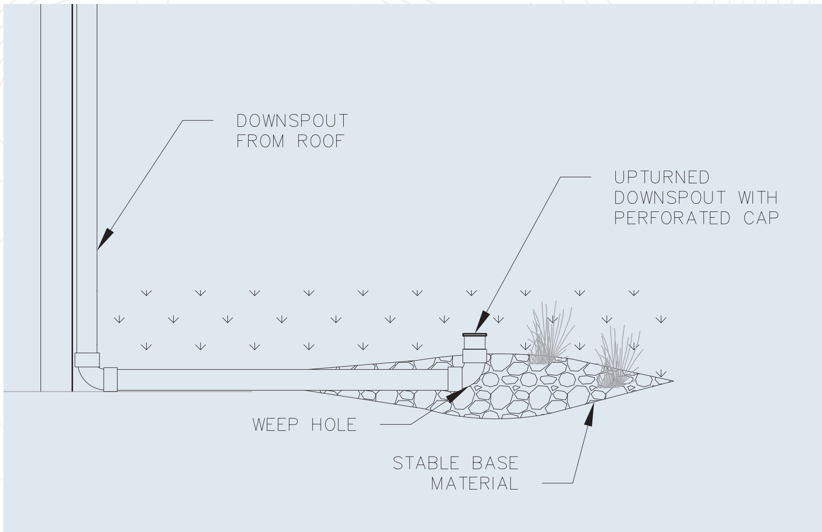

Figure A-9. *Upturned roof downspout energy dissipater, Chocowinity, North Carolina. Source: Tetra Tech*

Level spreaders are another technique for converting concentrated flows into diffuse, sheet flow. Runoff is distributed through a dead-end channel (sometimes called a blind swale) along the upslope side of the vegetated filter strip and evenly dispersed onto the vegetated filter strip along the level spreader as shown in Figure A-10 and Figure A-11. It is important that the lip of the level spreader be accurately level across the entire length and that a minimum 2-inch drop is provided from the lip to the gravel pad below. Level spreaders can be installed in an "arced" configuration if necessary, but the arc should always be convex such that flow is never concentrated (Figure A-12). Weir overflow equations can be used to determine the required level spreader length to produce non-erosive flows (Chow 1959).

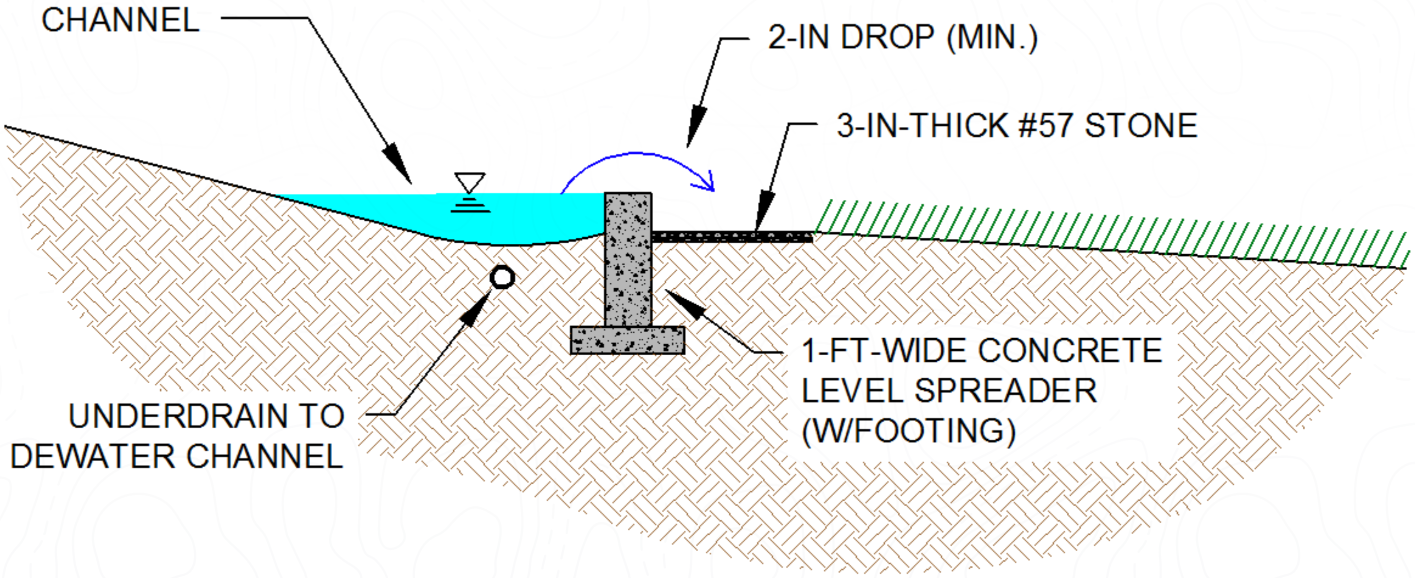

Figure A-10. *Typical level spreader profile view*

Chow, V.T. 1959. Open-Channel Hydraulics. McGraw-Hill, New York, NY.

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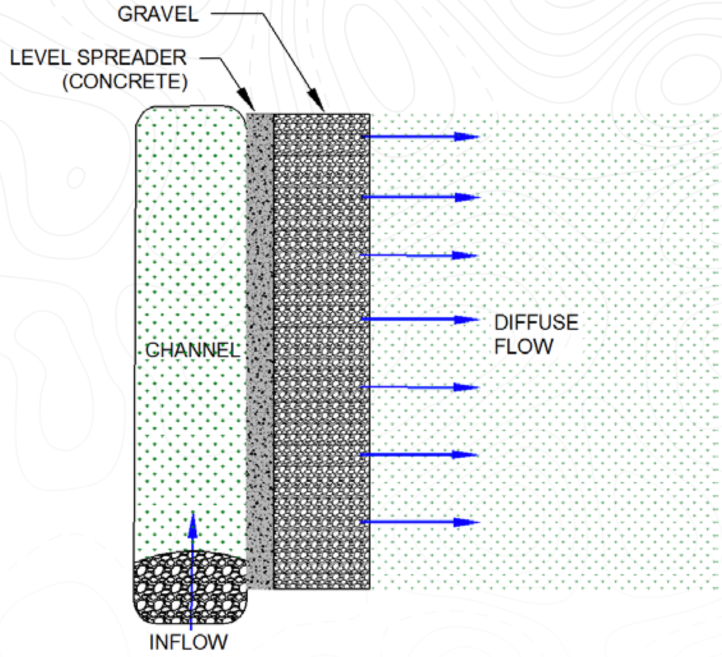


Figure A-11 *(above). Typical level spreader plan view*

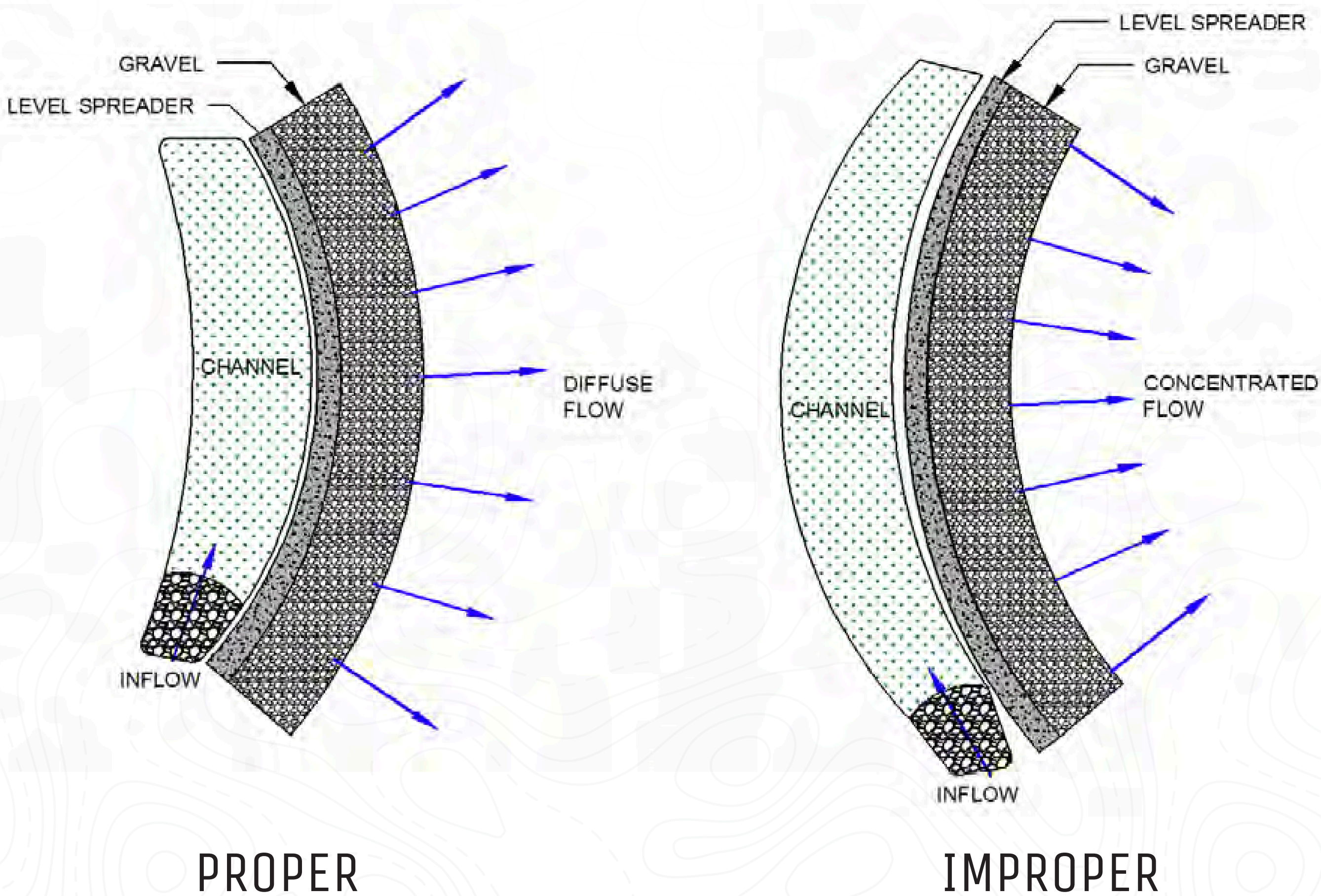


Figure A-12. *Figure illustrating proper installation of arced level spreader (left) and improper level spreader arc (right)*

APPENDIX A: Common Design Elements

UNDERDRAIN DESIGN

Underdrains are common design elements in bioretention areas, bioswales, planter boxes, and sand filters. Soil testing should be performed at the site by a licensed soil scientist or geological engineer to determine the infiltration rate of the soils and the depth to the seasonally high groundwater table. If the infiltration rate of the soils where the infiltrating practice will be installed is less than 0-0.5 in/hour, or if a site is near a steep slope, underdrains will be required.

A barrier to separate the soil media from the drainage layer should be installed. Two options can be used for providing the separation from the soil media and the drainage layer:

- Option 1: Place a thin, 2- to 4-inch layer of pure sand and a thin layer (nominally 2 inches) of choking stone (such as ASTM No. 8) between the soil media and the drainage stone as shown in Figure A-13
- Option 2: The drainage stone should be a washed No. 57 stone, or similar alternative that has been washed to remove all fines. The drainage stone should be used to provide a gravel blanket and bedding for the underdrain pipe. Place the underdrain on a 3-foot-wide bed of the drainage stone 6 inches deep and cover with the same drainage stone to provide a 16-inch minimum depth around the bottom, sides, and top of the slotted pipe.

A geotextile fabric should be placed between the soil media and the drainage layer as shown in Figure A-14. If a geotextile fabric is used, it must meet the minimum materials requirements listed in Table A-1.

TABLE A-1. GEOTEXTILE LAYER SPECIFICATIONS (BARRETT 2005)

Geotextile property	Value	Test method
Trapezoidal tear (lbs)	40 (min)	ASTM D4533
Permeability (cm/sec)	0.2 (min)	ASTM D4491
AOS (sieve size)	#60–#70 (min)	ASTM D4751
Ultraviolet resistance	70% or greater	ASTM D4355

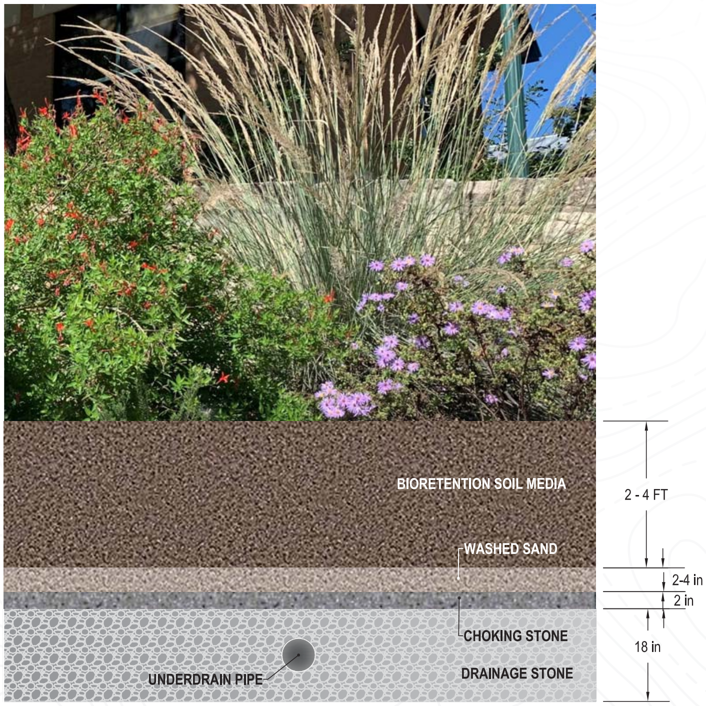


Figure A-13. *Underdrain barrier option 1: soil media barrier*

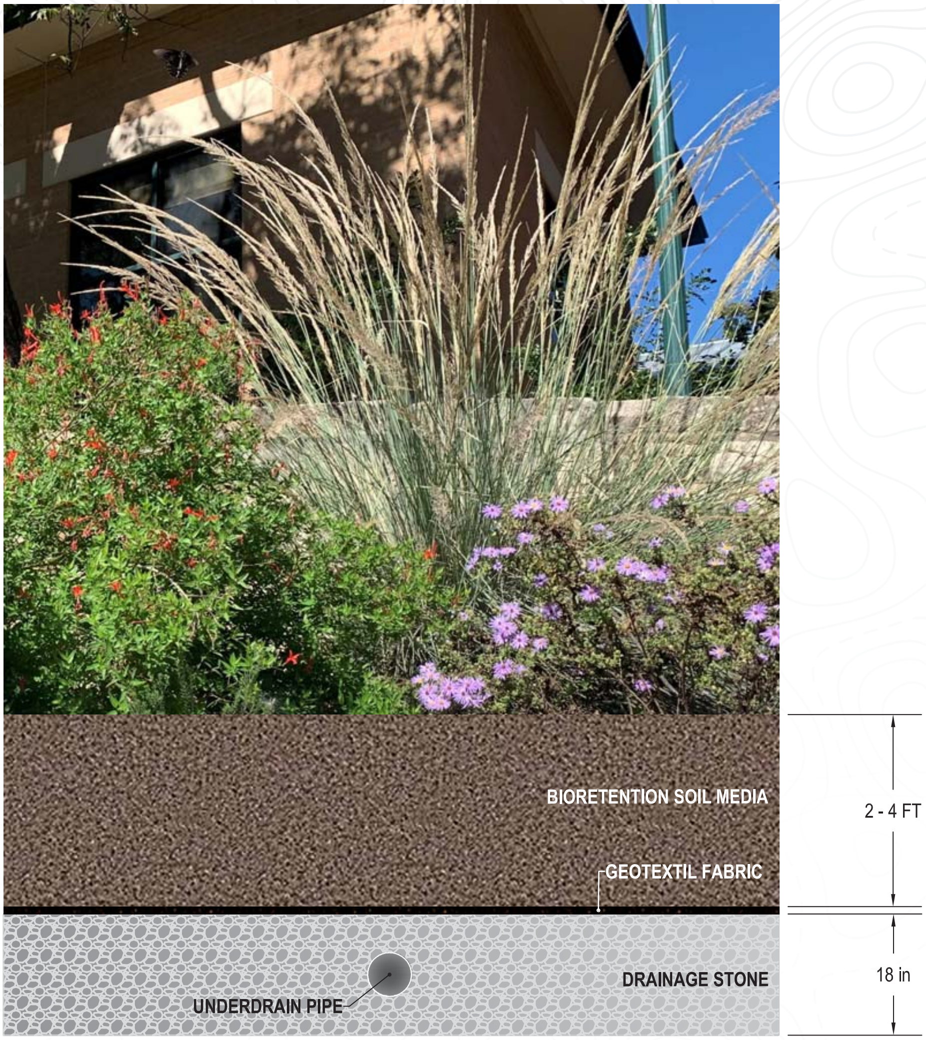


Figure A-14. *Underdrain barrier option 2: geotextile liner*

Option 2 is a common method; however, geotextile clogging and biofouling has been observed in field investigations. In situations where there is concern of clogging around the geotextile, option 1 is recommended.

APPENDIX A: **Common Design Elements**

TRASH BINS

Non-clogging intake designs should be specified whenever litter or debris pose a risk of clogging drawdown pipes. For stormwater wetlands, an intake pipe with downturned opening extending 6 to 12 inches below the permanent pool (Figure A-15) or enclosing the drawdown orifice (Figure A-16) will reduce the risk of clogging by floating debris. Providing a downward slope on the entire intake pipe can also reduce deposition of sediment within the pipe itself.

Figure A-15 (left). *Drawdown pipe with a downturned elbow*
Figure A-16 (right).*Outlet structure with a trash rack and protected downspout orifice*

When additional exclusion of trash and debris is required (such as in sand filter sedimentation chambers or for emergency/maintenance dewatering intakes in stormwater wetlands) a trash rack or other debris exclusion device should be specified. A simple trash rack can be designed by nesting a perforated riser pipe within a wire mesh cage. The bottom portion of the pipe should be enveloped in a cone of washed stone (ASTM No. 57 stone is adequate) as shown in Figure A-17. The specific trash rack configuration will depend on site conditions and design goals, but regardless of configuration all trash rack should allow for safe bypass of high flows. For further guidance on trash rack design, see Barrett (2005) and UDFCD (2010).

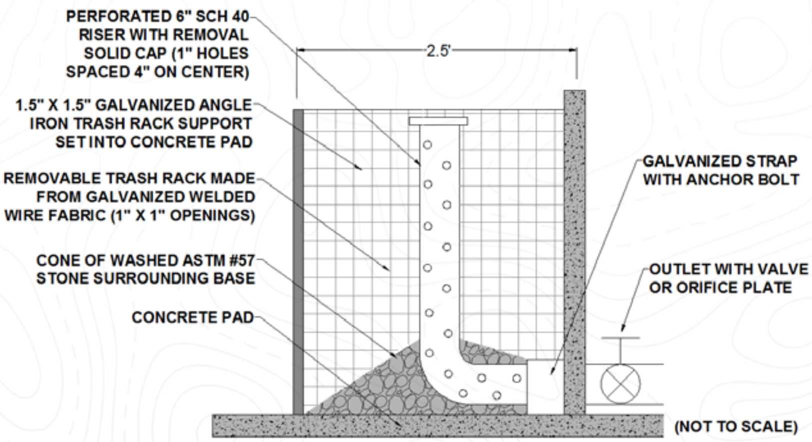
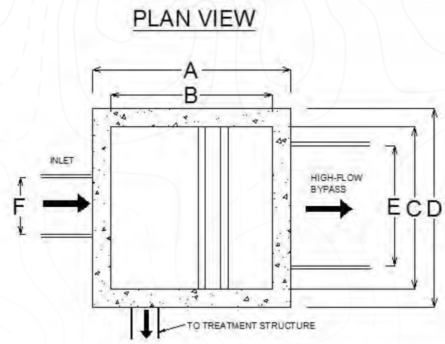


Figure A-17. *Schematic of a trash rack for dewatering sedimentation chambers and stormwater wetlands (Adapted from Barrett 2005)*

DIVERSION STRUCTURES

If a BMP is designed to be an offline system, a structure will be required to divert the design volume into the BMP. Figure A-18 shows an example of a typical diversion structure. When the capacity of the BMP is exceeded or the flow exceeds the capacity of the diversion pipe, the flow bypasses over the weir and flows directly to the stormwater drainage system. The bypass pipe should be sized to limit the flow into the BMPs to non-erosive flows. When flows through a BMP could exceed the recommended maximum flow rates, regardless of whether a system is online or offline, a diversion structure is recommended to prevent erosion in the BMP. The flow velocity in a mulched system should not exceed 1 ft/sec. Flow in a grassed system should not exceed 3 ft/sec. Flows can be greater (up to 14 ft/sec) with the use of reinforced turf matting and will depend on the matting selected. A diversion structure should be used to ensure that flows through the system do not exceed the recommended design flow. More information on determining erosive flows can be found in TxDOT (2011).



	DESCRIPTION
A	OUTSIDE WIDTH OF DIVERTER BOX
B	INSIDE WIDTH OF DIVERTER BOX
C	INSIDE WIDTH OF DIVERTER BOX
D	OUTSIDE WIDTH OF DIVERTER BOX
E	DIAMETER OF OUTLET PIPE
F	DIAMETER OF INLET PIPE
G	WIDTH OF DROP INLET GRATE
H	OVERHANG
J	DISTANCE TO WEIR
K	TOP WIDTH OF WEIR
L	DISTANCE TO WEIR
M	HEIGHT OF WEIR
N	DIAMETER OF PIPE TO TREATMENT
P	DEPTH OF BOX
Q	DISTANCE TO WEIR
R	BOTTOM WIDTH OF WEIR

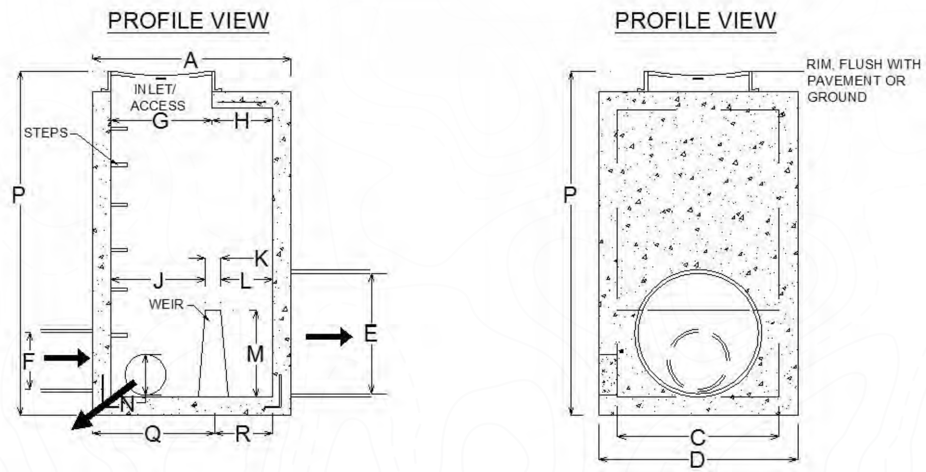


Figure A-18. *Typical diversion structure*

In situations where stormwater is collected in a pipe and routed to a BMP, a diversion structure should be designed at the inlet of the BMP to divert flows that exceed the volume or flow capacity of the BMP.

IMPERMEABLE LINERS & HYDRAULIC RESTRICTION BARRIERS

The most ideal configuration, from a stormwater pollutant-removal perspective, is to infiltrate as much runoff as possible. Types of clay that have a high potential for expansion when saturated should be protected from moisture in load bearing conditions; however, expansive clays do not preclude infiltration. When infiltrating BMPs are hydraulically isolated from structures (by vertical or horizontal distance or by using hydraulic restriction layers), systems installed in tight clays soils can still experience significant volume reductions (Fassman and Blackbourn 2010). In situations where conditions require limiting infiltration, two basic options can be used for hydraulic restriction layers.

The preferred option is to restrict lateral flow while allowing for deep percolation infiltration of stormwater. To allow infiltration, the bottom of the bioretention area should remain unlined. The hydraulic restriction layer should extend the full depth of the media to the base of the drainage layer in situations where underdrains are required. In situations where underdrains are not required, the hydraulic restriction layer should extend to a depth where saturation will not affect any adjacent load-bearing soils. Areas that have a potential for settling under saturated conditions should be protected from lateral flows. An example is shown in Figure A-19.

Figure A-19. *Lateral hydraulic restriction layers in a roadside bioretention area prevent horizontal seepage while allowing infiltration at a safe depth*

In situations where infiltration is not possible, because of limiting soil capacity or aquifer protection (i.e., Edwards Aquifer Recharge, Contributing, and Transition zones), the entire perimeter of the soil media should be lined to prevent infiltration into the existing soils while gaining some pollutant removal from the soil media. Infiltration pathways might also need to be restricted using impermeable barriers because of the close proximity of roads, foundations, other infrastructure, or hotspot locations as determined in the geotechnical investigation. A full geotechnical investigation should be performed by a licensed soil scientist or geotechnical engineer, as detailed in Geotechnical Investigation. That should be done for all sites to determine the effect of infiltration, including the appropriate depth and type of the hydraulic restriction layer.

In the Edwards Aquifer Recharge, Transition, and Contributing zones, three types of hydraulic restriction layers are recommended: clay liners, concrete, or geomembranes (Barrett 2005). Specifications for clay liners are provided in Table A-2 and an example is shown in Figure A-20.

TABLE A-2. CLAY LINER SPECIFICATIONS (BARRETT 2005)

Property	Test method	Unit	Specifications
Thickness	**--**	**inch**	**12**
Permeability	ASTM D-2434	cm/sec	1 x 10-6
Plasticity Index of Clay	ASTM D-423 & D-424	%	Not less than 15
Liquid Limit of Clay	ASTM D-2216	%	Not less than 30
Clay Particles Passing	ASTM D-422	%	Not less than 30
Clay Compaction	ASTM D-2216	%	95% of Standard Proctor Density

If geomembrane is used, it should be a minimum of 30 mils thick and ultraviolet resistant. A suitable geotextile fabric should be placed on both sides (inside and out, top and bottom) of the membrane for puncture protection and the liners covered with a minimum of 6 inches of compacted topsoil. The topsoil should be stabilized with appropriate vegetation. The geotextile fabric (for protection of geomembrane) should be nonwoven geotextile fabric and meet the specifications in Table A-3. Construction plans should specify the method for sealing the seams of the geomembrane (per manufacturer recommendations). Seams are typically head sealed by the manufacture but can be sealed in the field following ASTM D7408 standards and all manufacture requirements. An example of a geomembrane liner is shown in Figure A-21.

TABLE A-3. PROTECTIVE GEOTEXTILE FABRIC SPECIFICATIONS (BARRETT 2005)

Property	Test Method	Unit	Specifications
Unit weight	--	oz/yd2	8
Filtration rate	ASTM D-423 & D-424	0.08	0.08
Puncture strength	ASTM D-751*	lb	125
Mullen burst strength	ASTM D-751	psi	400
Tensile strength	ASTM D-1682	lb	200
Equiv. opening size	US Standard Sieve	No.	80

In addition to geomembranes and clay liners, project sites can use concrete barriers along roadways or other structural features to prevent lateral seepage to adjacent utilities or areas of concern (as shown in Figure A-22). Concrete barriers can be constructed as extensions of the surrounding curb installed vertically to the depth where saturation will not affect the stability of the load-bearing soils. Concrete barriers will prevent damage that can occur from maintenance required for utilities in the right-of-way.

APPENDIX A: Common Design Elements

UTILITIES

When implementing BMPs, avoid utilities where possible. In many cases, the BMP can be shifted in the landscape to prevent implementation over utilities. In cases where utilities cannot be avoided, take care to prevent effects from infiltration or saturation by using hydraulic restricting layers to direct infiltration away from the utility. The utility should pass through the hydraulic restriction layer, and the liner should be appropriately sealed to prevent any lateral seepage from the BMP. Liners can be easily sealed by using a patch that adheres to the utility line and sealed directly to the liner. Local plumbing codes should be reviewed for restrictions pertaining to water and sewer utilities.

The location of future utilities should also be considered in the site layout and location of BMPs. Long, linear BMPs, such as a bioretention area or bioswale in the right-of-way, should have periodic breaks to allow for future utility trenches. At least one access point should be placed along any BMP for each parcel where there is a separation or break in the liner for a utility trench. BMPs in such a scenario should be designed as separate systems with separate hydraulic restriction layers, but they could be connected at the subsurface through the underdrain or at the surface by a trench with a grate similar to a covered curb cut. For more details, see Connectivity below.

CONNECTIVITY

When BMPs are implemented in the right-of-way and parking lots, it is important to maintain pedestrian access routes to prevent disturbance to the BMP, prevent harm to the public, and provide connections for future utilities. It is also important that sections of the BMP remain hydraulically connected to fully use as much of the BMP as possible. BMPs should be connected by open channels covered with an appropriate grate to allow visual inspection of the channel and ease of maintenance. Culverts can be used for larger facilities, but they should be inspected regularly for blockages. Figure A-24 shows pedestrian access over BMPs while maintaining appropriate hydraulic connectivity.

Figure A-20. Bioretention area with clay liner and lateral hydraulic restriction barriers

Figure A-21. Bioretention area with geomembrane liner

Figure A-22. Bioretention area completely lined with concrete barrier (planter box)

APPENDIX A: **Common Design Elements**

Figure A-23. *Low-level fencing*
Figure A-24. *Low-profile curbing, and access over linear BMPs.*

ADA REQUIREMENTS

BMPs typically require surfaces with little to no slope. Therefore, Americans with Disabilities Act (ADA) requirements are rarely an issue. However, in areas with high levels of pedestrian traffic, some effort should be made to delineate the BMP. Several options—including low-level and decorative fencing, such as the one shown in Figure A-23, or a low-profile curb, as shown in Figure A-24, can often be used to delineate the space around the BMP and alert pedestrians of the change in grade.

DESIGNING FOR FUTURE MAINENANCE ACCESS

Permanent structural stromwater control BMPs require smaller operation and maintenance budgets over the design life when important life-cycle activities, including inspections and maintenance, are considered early in the planning and design process. Because post construction inspections and maintenance are essential to facility function, it is important to ensure that necessary equipment, access, and methods to complete maintenance and BMP evaluation tasks during the operation phase are considered during the design phase. Thus when siting BMPs, consideration must always be given to providing access for routine, intermittent, and rehabilitative maintenance activaties.

BMP execution can be complicated by problems stemming from design needs that are not understood, inexperienced contractors performing the construction, or inadequiate operation and maintenance, including inadequate maintenance access.

APPENDIX A: Common Design Elements

REFERENCES

Barrett, M.E. 2005. Complying with the Edwards Aquifer Rules. Technical Guidance on Best Management Practices. RG-348. Prepared for Texas Commission on Environmental Quality, Field Operations Division, Austin, TX.

Fassman, E.A. and S. Blackbourn. 2010. Urban runoff mitigation by a permeable pavement system over impermeable soils. Journal of Hydrologic Engineering 15(6):475-485.

TxDOT (Texas Department of Transportation). 2011. Chapter 13, Section 2. Soil Erosion Control Considerations. Hydraulic Design Manual. Austin, TX.

UDFCD (Urban Drainage and Flood Control District). 2010. T-12 Outlet Structures. Urban Storm Drainage Criteria Manual, Volume 3 – Best Management Practices. Denver, CO. http://www.udfcd.org/downloads/down_critmanual_volIII.htm.