

# Special Environmental Considerations

## Discharges to Water Quality Impaired Waters

Riverdale City has determined that there is no discharge from any part of the MS4 that contributes to a 303(d) listed waterbody.

The 303(d) list of impaired waterbodies is found at:

<http://www.waterquality.utah.gov/TMDL/index.htm>

## Threatened or Endangered Species

Where applicable, compliance efforts to this law shall be reflected in the SWMP document. (Small MS4 General UPDES Permit 3.2) The following web sites are helpful in determining the status of any species of interest.

<http://wildlife.utah.gov/habitat/pdf/endgspec.pdf>.

<http://www.fws.gov/endangered/>

## Historic Properties

Where applicable, compliance efforts to this law shall be reflected in the SWMP document. (Small MS4 General UPDES Permit 3.2) Web sites include the following, along with possible county and city listings:

[http://history.utah.gov/historic\\_buildings/index.html](http://history.utah.gov/historic_buildings/index.html)



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## HYDROLOGIC METHODS AND DESIGN STANDARDS

- 4.2.5.3. The Permittee's new development/redevelopment program must have requirements or standards to ensure that any storm water controls or management practices for new development and redevelopment will prevent or minimize impacts to water quality.
- 4.2.5.3.4 Each Permittee shall develop and define specific hydrologic method or methods for calculating runoff volumes and flow rates to ensure consistent sizing of structural BMPs in their jurisdiction and to facilitate plan review. Specific criteria which require that Best Management Practices (BMPs) are designed to treat the water from a specific design storm (e.g., the 2-year, 24-hour event) must be incorporated into the permittee's post-construction minimum control measure and documented in the SWMP. Permittees may allow other unique or complex methodologies.

### DESIGN STANDARDS SHOULD INCLUDE:

In developing/revising standards you are encourage (not required) to work with neighboring communities to develop consistency with analytical methods within the same watershed. The following subjects should be addressed.

1. Hydrology
  - a. Design storm (frequency and duration) for peak flows
  - b. Design storm for piping (\_\_\_yr- \_\_\_hr event)
  - c. Design storm for storage (\_\_\_yr- \_\_\_hr event)
  - d. Design storm for construction site BMPs (\_\_\_yr- \_\_\_hr event)
  - e. Storm hydrograph (unit hydrograph, Farmer-Fletcher, etc...)
2. Hydrologic methods
  - a. See handouts for options and applications
3. Storage
  - a. Peak discharge allowances
    - i. 0.2 cfs per acre?? (should not be a standard)
    - ii. Match predevelopment runoff hydrograph
  - b. Minimum storage requirements
  - c. Freeboard requirements
  - d. Maximum depths
  - e. Dimensional requirements (length/width ratios)
  - f. Water quality requirements
4. System policies
  - a. No stormwater in irrigation ditches and canals
  - b. On-site detention required
  - c. Deal with storm water at the source
  - d. Underground Injection Wells (UIW)
5. Permitting requirements
  - a. Possible Storm Water Utility Credits
  - b. Activity and Connection Permits
  - c. Possible Permits from others: 404, Stream Alteration

# Low-Impact Development Techniques

The permit requires that MS4's consider Low Impact Developments (LID's) for your community referenced in 4.2.5.3.2, 4.2.6.4, and 4.2.4.3.3. The following 7 categories with associated links are intended to assist communities in proper planning and Construction to encourage LID practices.

**Bio-Retention areas:** designed for site specific conditions to optimize the effectiveness of water filtration and retention. There is no standard. Creativity, ingenuity and dedication are the key to success.

- Aquatic Buffers
- Green Parking Lots
- Bioretention
- Soil Amendments
- Soil Restoration
- Created Wetlands
- Dispersal Trench
- Conveyance Furrow
- Urban Forestry
- Vegetation Restoration
- Biofiltration
- Stormwater Planters

**Green Roofs:** A bio retention area as well as a form of rain water collection; it also adds a public place and social element.

- Green Roofs
- Biofiltration

**Permeable Pavements:** allow for water to permeate through the surface, yet still give a hard surface for pedestrian and vehicular traffic.

- Break Up Flow Directions From Paved Surfaces
- Use Alternative Surfaces
- Green Parking Lots

**Rain water collection:** Utah law allows for re-use on site. For larger buildings such as offices and malls this is an impact that could greatly reduce storm drain usage in the area.

- Water Harvesting and Reuse
- Parking Lot and Street Storage
- Dispersal Trench
- Pop-Up Emitter

**Riparian Buffers:** Applied along a watershed by restricting development along creeks, streams, washes, ect. This keeps the natural flow of water, mitigates erosion and contamination, as well as provides an interconnected habitat for animals, and recreation opportunities.

- Protect Natural Site Functions
- Preserve Natural Corridors
- Aquatic Buffers

**Green Street System:** Includes the different aspects of rain gardens and swales along roads into an incorporated system for retention and filtration of storm water.

- Reduced Clearing and Grading
- Functional Grading
- Locate Impervious Surfaces to Drain to Natural Systems
- Minimize Directly Connected Impervious Areas
- Break Up Flow Directions From Paved Surfaces
- Trail and Path Network
- Narrow Roadways
- Reconfigure Driveways
- Alternative Turnarounds
- Green Parking Lots
- Stormwater Planters
- Urban Forestry
- Alternative Street Layouts
- Eliminate Curb and Gutter

**Zoning/Alternative Development Configurations and Standards:** creative zoning and development standards directed towards minimizing disturbances of the natural habitat and hydrology of the area.

- Site Fingerprinting
- Fit Development to Natural Gradient
- Alternative Development Configurations
- Define Development Envelope
- Identify Sensitive Areas
- Alternative Lot Configuration
- Reconfigure Driveways
- Alternative Turnarounds
- Reduced Sidewalk Application
- Alternative Street Layouts
- Eliminate Curb and Gutter
- Large lot sizes – higher impervious area percentage
- Cluster Zoning – consolidating development – fewer impacted areas
- Development credits – limiting overall development in a community
- Considering conservation easements
- Limit maximum Directly Connected Impervious Areas (DCIA)

References:

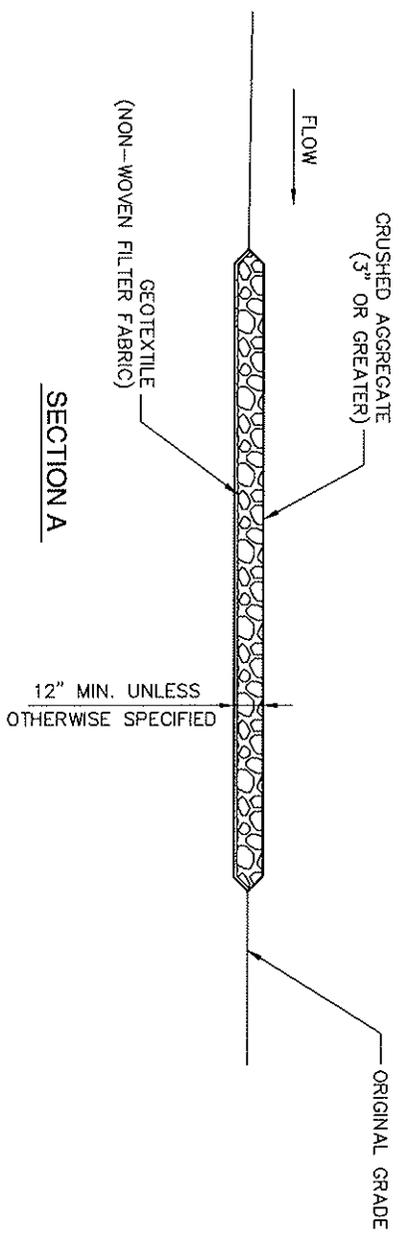
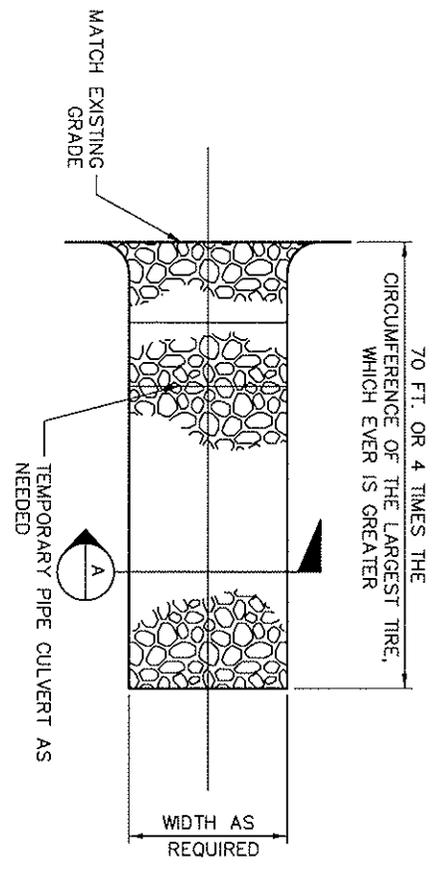
[www.lid-stormwater.net](http://www.lid-stormwater.net) (Tool created through Cooperative Assistance Agreement under the US EPA Office of Water 104b(3) Program)

<http://www.epa.gov/owow/NPS/lid/lid.pdf>

[http://www.deq.idaho.gov/water/data\\_reports/storm\\_water/catalog/sec\\_3/text.pdf](http://www.deq.idaho.gov/water/data_reports/storm_water/catalog/sec_3/text.pdf)

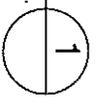
SWMP Update 2010

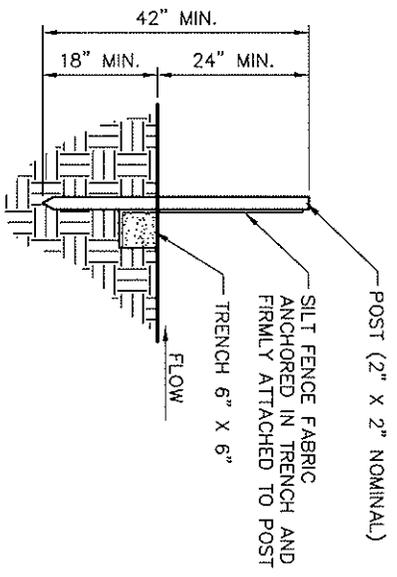
Permit Reference #: 4.2.5.3.2, 4.2.6.4, 4.2.4.3.3



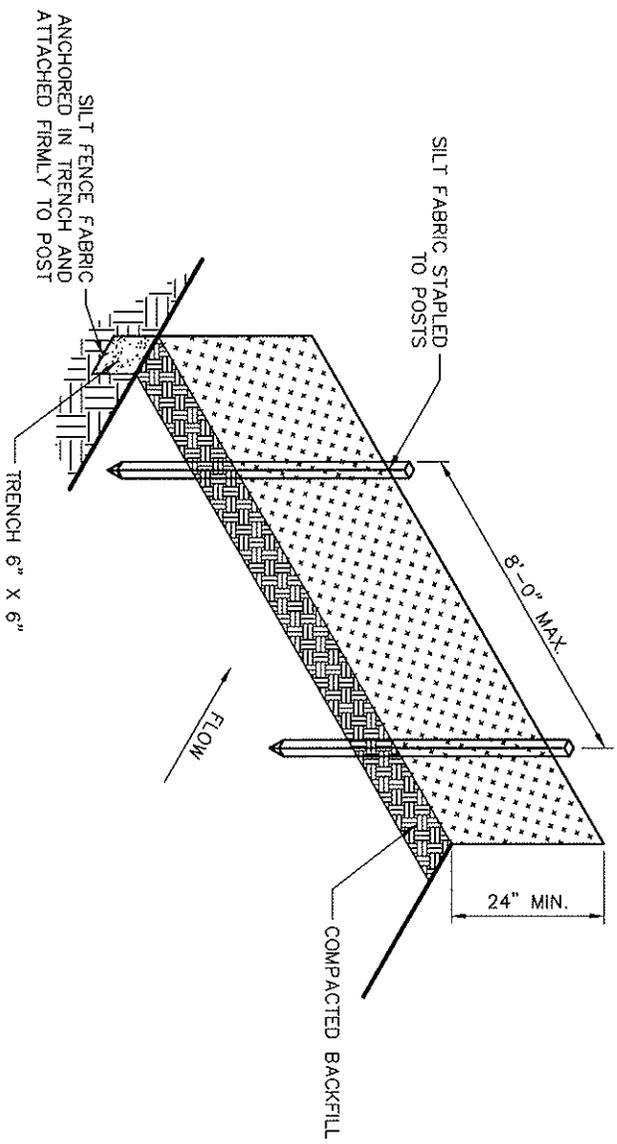
STABILIZED CONSTRUCTION  
ENTRANCE DETAIL

SCALE: N.T.S.



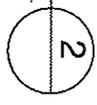


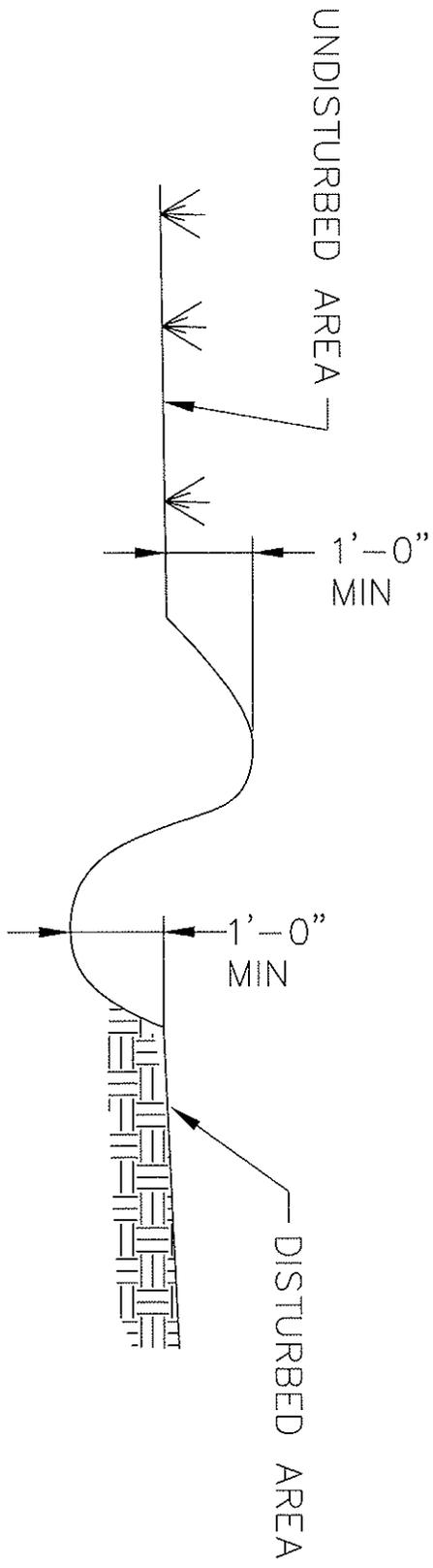
- NOTES:
1. MINIMUM FILTER FABRIC HEIGHT SHALL BE 24".
  2. POSTS FOR SILT FENCES SHALL BE METAL OR HARD WOOD WITH A MINIMUM LENGTH OF 36". WOOD POSTS SHALL HAVE A MINIMUM DIAMETER OR CROSS SECTION OF 2". METAL POSTS SHALL BE "STUDDED TEE" OR "U" TYPE WITH MINIMUM WEIGHT OF 1.33 LBS./FOOT.
  3. DRIVE POSTS VERTICALLY INTO THE GROUND TO A MINIMUM DEPTH OF 18", AND EXCAVATE A TRENCH APPROXIMATELY 6" WIDE AND 6" DEEP ALONG THE LINE OF POSTS AND UPSLOPE FROM THE BARRIER. NO LESS THAN THE BOTTOM 1 FOOT OF THE FABRIC SHALL BE BURIED INTO THIS TRENCH.
  4. THE FILTER FABRIC MATERIALS SHALL BE FASTENED SECURELY TO METAL OR WOOD POSTS USING WIRE TIES, OR TO THE WOOD POSTS WITH 3/4" LONG #9 HEAVY DUTY STAPLES.
  5. POSTS SHALL BE SPACED A MAXIMUM OF 8 FEET APART.



**SILT FENCE DETAIL**

SCALE: N.T.S.

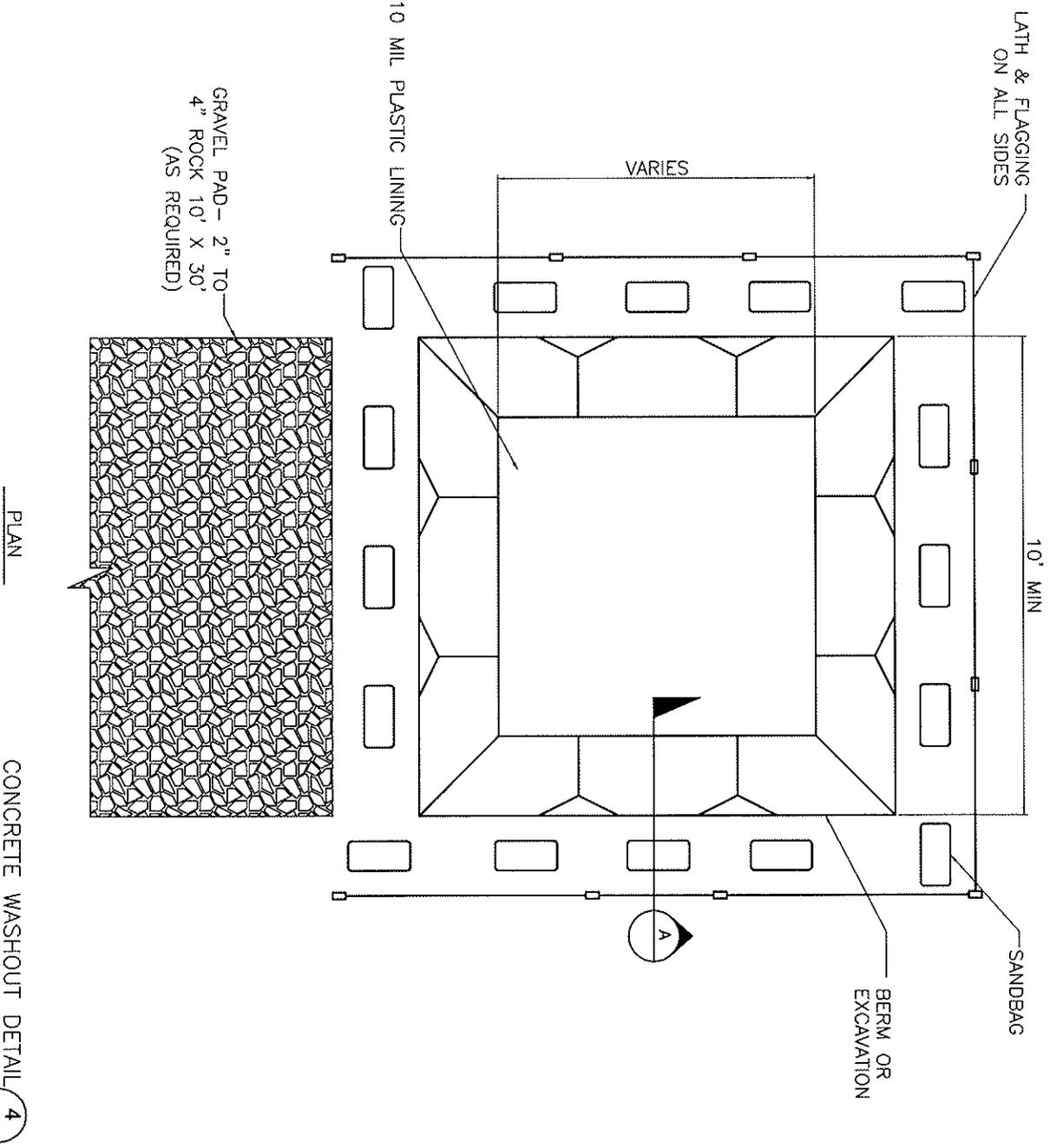




**SWALE / BERM DETAIL**

SCALE: N. T. S.

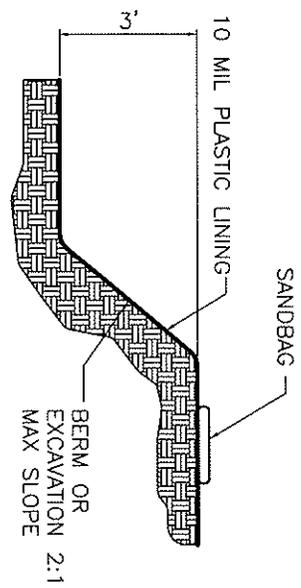




PLAN

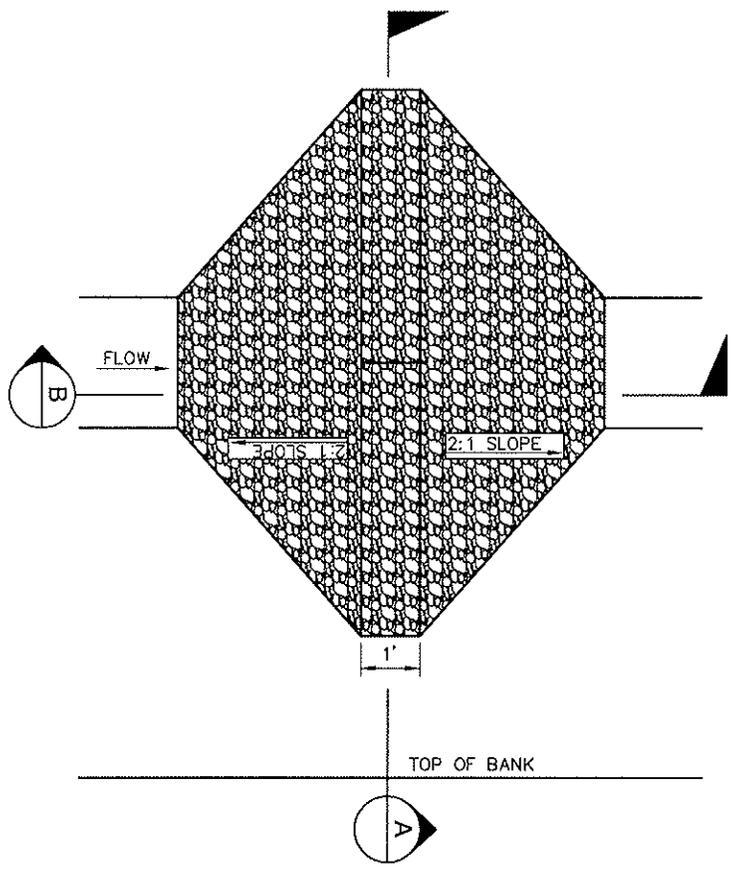
CONCRETE WASHOUT DETAIL 4

SCALE: N.T.S.

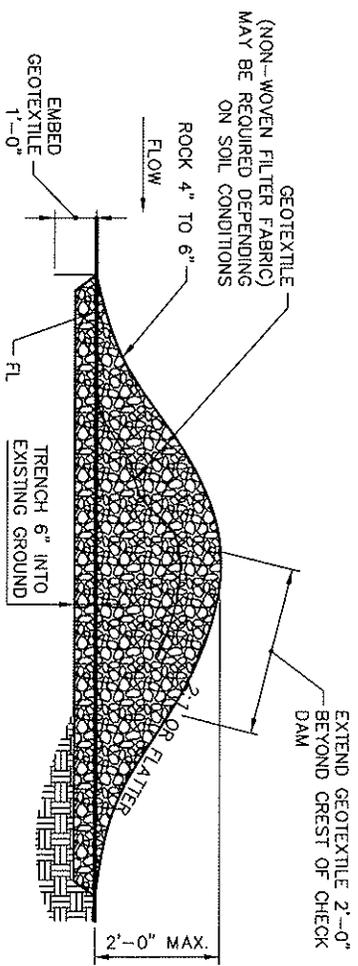
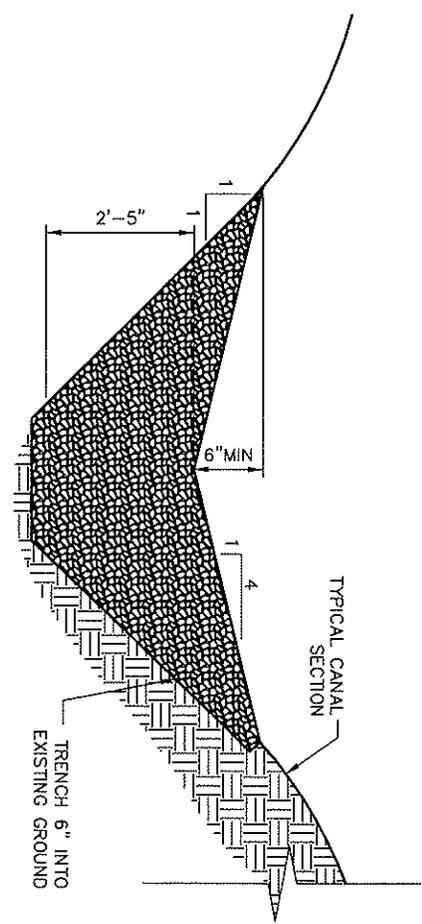


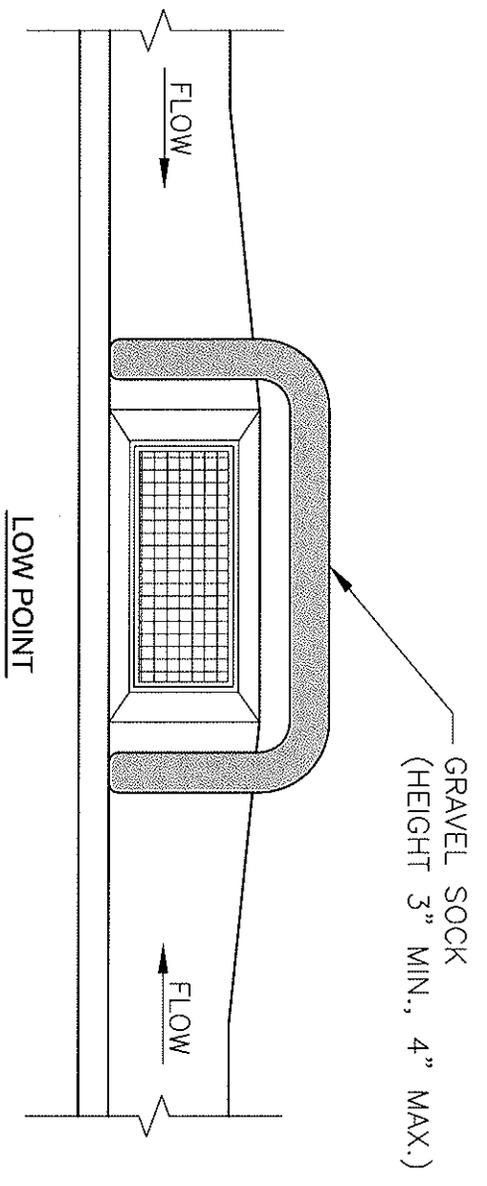
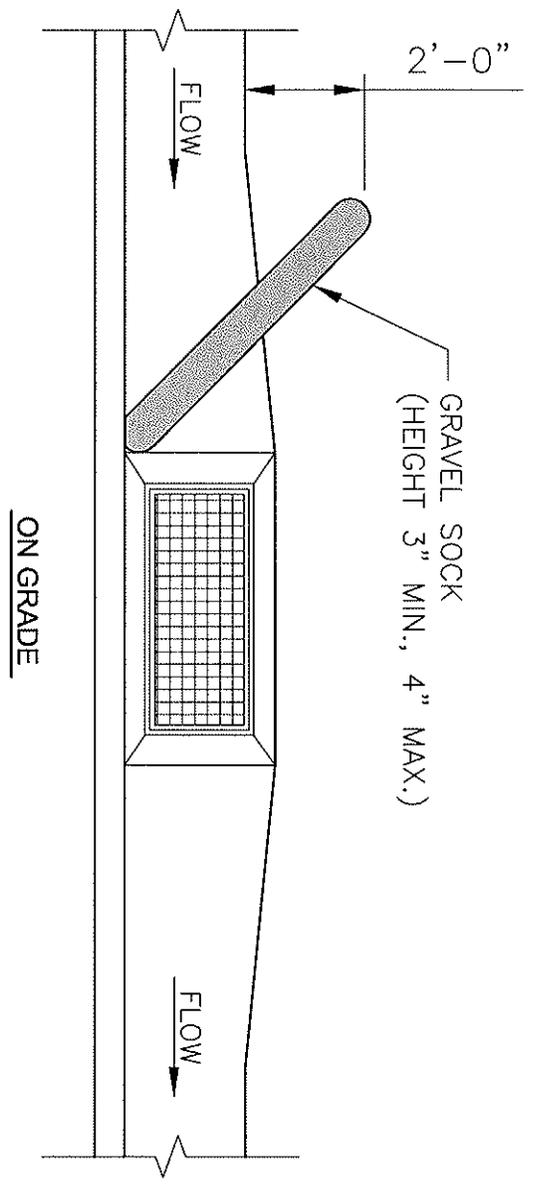
SECTION A

- NOTES:
1. ACTUAL LAYOUT DETERMINED IN FIELD.
  2. CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.
  3. WASHOUT NEEDS TO BE EMPTIED AND REPAIRED WHEN 75% OF STORAGE CAPACITY IS FILLED.
  4. DEVELOPER/CONTRACTOR RESPONSIBLE FOR REMOVAL & PROPER DISPOSAL OF CONCRETE PRIOR TO FILING N.O.T



DITCH ROCK CHECK DAM 5  
 SCALE: N.T.S.





**6** INLET PROTECTION DETAIL  
SCALE: 1/8" = 1'-0"



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## SWPPP Inspection Checklist

### Pre-inspection Items

- Contact Site Superintendent or Project Manager
- Review previous inspections – are there reoccurring problems?
- Proper equipment
  - Hard hat
  - Vest
  - Safety shoes
  - Safety glasses
  - Camera
  - GPS unit?
  - Inspector credentials

### On-Site before inspecting

- Review SWPPP – updates and changes
- Review any specific concerns
- Check contractors inspection forms/issues

### Inspection

- Use State Form – keep notes
- Check outfalls
- Check perimeter control
- Check entrances/exits
- Check erosion control BMPs
- Check sediment control BMPs
- Check for mud tracking
- Check stockpile/storage areas
- Check staging areas
- Take photos of good and bad
- Keep photo log
- Review findings with superintendent/project manager

### Post Inspection

- Review form, complete and clarify as needed
- File inspection form and photos
- Send copy of form to State – can be done monthly

Name of Development \_\_\_\_\_

Developer \_\_\_\_\_ Phone: \_\_\_\_\_

Responsible Contact \_\_\_\_\_ Phone: \_\_\_\_\_

Submittal Date \_\_\_\_\_ Reviewed Date \_\_\_\_\_ Reviewed by \_\_\_\_\_

References are given from both the Small MS4 General UPDES Permit (section 4.2) and the Construction General Permit (section 3.5).

I- SWPPP Document (4.2.4.3.1)

Site Description

- Nature of activity or project – 3.5.1.a  
\_\_\_\_\_
- Intended sequence of major soil disturbing activities – 3.5.1.b  
\_\_\_\_\_
- Total area of site, area to be disturbed – 3.5.1.c \_\_\_\_\_
- Runoff coefficient – 3.5.1.d
  - o Pre-construction \_\_\_\_\_
  - o Post-construction \_\_\_\_\_
- General location map – 3.5.1.e
  - o Existing drainage patterns and slopes
  - o Final drainage patterns and slopes
  - o Construction boundaries
  - o Existing vegetation description
  - o Areas of soil disturbance
  - o Areas of no soil disturbance
  - o BMP locations
  - o Off-site areas used for construction support (may be non-applicable)
  - o Final stabilization treatment
  - o Discharge locations
- Description and location of discharges associated with off-site facilities (portable asphalt or concrete plants, stockpile areas, etc...) – 3.5.1.f

- \_\_\_\_\_
- \_\_\_\_\_
- Name and location of receiving waters – 3.5.1.g \_\_\_\_\_
- Area and boundary of any associated wetlands (may be non-applicable) – 3.5.1.g
- Copy of the current General Permit for Construction Activities

Erosion and Sediment Controls - 3.5.2.a.1

- Control measures for each major soil disturbing activity
  - o Activity \_\_\_\_\_
  - o Control Measure to be used \_\_\_\_\_
  - o Timing \_\_\_\_\_
  - o Installation details
  - o Anticipated maintenance requirements

Stabilization Practices – 3.5.2.a.2

- Site specific stabilization
  - o Interim stabilization practices – including timing
  - o Permanent stabilization practices – including timing

Structural Controls - 3.5.2.a.3

- Flow control
  - o Description of flow diversion BMPs

Name of Development \_\_\_\_\_

- 
- Description of flow storage BMPs
- 
- If site is 10 acres or more – Sediment Basin required
    - Basin sized for 3,600 cf/acre or 10-yr 24 hour storm

Post-Construction BMPs – 3.5.2.b

- Description of how pollutants are controlled after construction. (ie. permanent detention or retention basins, flow attenuation swales, infiltration, combination of BMPs, etc.)
- 
- Technical basis for selecting post-construction BMPs
- 
- Velocity dissipation devices at discharge points (as necessary)

Other Controls – 3.5.2.c

- Waste Disposal – location and practices to control
- Off-Site Tracking – off-site tracking and dust control
- Septic, Waste and Sanitary Sewer Disposal – location and practices to control
- Vehicle/Equip. maintenance areas and controls.
- Exposure to construction materials – inventory, storage practices, locations, spill response, and practices to control
- Off-site support area controls (if applicable)

Maintenance – 3.5.3

- Maintenance requirements and schedules
- Maintenance Agreements

Non-Storm Water Discharges – 3.5.5

- Identify non-storm water discharges that may be associated with project (water used to clean or flush improvements, etc...)
- 
- Describe measures to be taken to implement pollution prevention for non-storm water discharges
- 

Inspections – 3.5.4

- Inspection requirements (at least once every 7 days, or once every 14 days and within 24 hours after a storm of 0.5 inches or greater)
- Qualifications of the inspector
- Linear project inspection requirements (0.25 miles above and below each access point)
- Inspection report forms
  - Inspection date
  - Name, title and qualifications of inspector
  - Weather information since last inspection
  - Current weather information
  - Locations of pollutant discharges
  - Locations of BMPs needing maintenance
  - Locations of BMPs that aren't working
  - Locations where additional BMPs are needed

Name of Development \_\_\_\_\_

- Any corrective actions that may be required, including changes that need to be made to the SWPPP – with implementation dates
- Requirements to keep records as part of SWPPP for at least 5 years

**II- Water Quality Review (4.2.4.3.2)**

- Urban Pollutants of Concern
  - Sediments
  - Nutrients (Phosphorus, Nitrogen...)
  - Metals
  - Hydrocarbons/oils
  - Pesticides
  - Chlorides
  - Trash and Debris
  - Bacteria
  - Organics matter
  - Others \_\_\_\_\_
- Consider options to include water quality aspects to this project.
- Identify any highly impacted areas.
- Identify and limit directly connected impervious areas (DCIA) on this project.
- Identify measures to minimize runoff.

**III- Low Impact Development Design (4.2.4.3.3)**

- Identify any low-impact development concepts and ideas that might work for this project. Consider the following LID Techniques:
  - Bio-Retention Areas
  - Green Roof
  - Permeable Pavements
  - Rain Water Collection
  - Riparian Buffers
  - Green Street System
  - Non Structural

**IV- Sensitive Areas (4.2.4.3.4)(3.5.2.d)**

List any of the following within the proximity:

- Impaired water bodies
- High Quality Waters
- TMDL
- Wetlands
- Wildlife issues (Threatened & Endangered Species)
- Historic
- Priority Construction sites (7.36)
- Other \_\_\_\_\_

Any variance of Permit \_\_\_\_\_

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

This document and attachments must be maintained by the MS4 for a period of five years or until construction is completed, whichever is longer. (4.2.4.3)



# UPDES STORM WATER INSPECTION EVALUATION FORM FOR SWPPP COMPLIANCE



## BACKGROUND INFORMATION

Site Name:		UPDES Permit #:	
Site Address:			
Local Jurisdiction or County:			
Permit Effective Date:		Permit Expiration Date:	
Total Project Area:		Total Disturbed Area:	
Project Type: (circle)	<i>Subdivision</i>	<i>Commercial</i>	<i>Industrial</i>
		<i>Linear (Road/Pipe/Power)</i>	<i>Land Disturbance</i>

## OPERATOR CONTACT INFORMATION

	NAMES	PHONE NUMBERS	E-MAIL
Operator:			
Onsite Facility Contact:			
Important Contacts:			
Important Contacts:			

## SWPPP PRE-SITE REVIEW INFORMATION

	YES	NO
1. Has a pre-construction review of the SWPPP been conducted by the appropriate municipal agency?		
2. Are contact names and telephone numbers listed in the SWPPP?		
3. Does the SWPPP include a site map showing storm drains, slopes/surface drainage patterns, SW discharge points, construction boundaries, limits of disturbance, surface waters (name of receiving water), structural controls, and does it define/explain non-structural controls?		
4. Does the SWPPP have an estimate of the area to be disturbed, a sequence of construction activities, the SW runoff coefficient for after completion, a description of the soil types, controls for discharges from (asphalt/concrete) batch plants if any, show wetland areas, and have a description of the nature of the construction activity?		
5. Does the SWPPP and site map show erosion and sediment controls placement & details (e.g. erosion blankets, mulch, slope drains, check dams, sediment basins, grass-lined channels, fiber rolls, sediment traps, silt fence, inlet protection, curb cut-back, dust control, etc?)		
6. Does the SWPPP and site map show and describe good housekeeping controls (e.g. track out pad, street sweeping, material storage, construction waste containment and removal, sanitary waste, concrete washout pits, etc)		
7. Are post-construction elements included in the SWPPP? (i.e. grass swales, detention basins, vegetated filter strips, infiltration, depression storage, landscaping/xeriscaping, discontinuous concrete or hard surface SW conveyance, etc.)		
8. Does the SWPPP address endangered species and historic preservation?		
9. Is the SWPPP signed by a responsible corporate officer with the certification statement (see permit part 5.16.c.)?		
10. Are the NOI and a copy of the State permit in the SWPPP?		

## NOTICE OF TERMINATION (NOT) INSPECTION

Site Name:		Date of Evaluation:	
Site Address:			
Inspected By:		Title/Organization:	
	YES	NO	COMMENTS:
1. Has the site been properly stabilized according to permit requirements?			
2. Have all temporary BMPs been removed?			
3. Have post-construction (permanent storm water system) elements been constructed and inspected in accordance with approved project drawings?			
4. Is the site acceptably clean?			

*I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.*

Inspector:	(Print Name)	(Title)	(Signature)	(Date)
Operator:	(Print Name)	(Title)	(Signature)	(Date)

modified 8/12/10

**(Attach additional sheets of narrative, pictures and checklists, as necessary)**









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## NOTICE OF TERMINATION PROCESS

The Notice of Termination has been a topic of discussion for some time on the State level. The Notice of Termination formally brings to a close the temporary permit to discharge stormwater from construction sites. This is a permit issued by the State and as such the State of Utah is the entity that grants a termination to that permit. However, the State of Utah does not have the resources or man-power required to ensure that all construction sites meet the requirements necessary to obtain an NOT and are leaning on MS4s state-wide to aid in the process. In this light the 2010 MS4 permit states:

4.2.4.4.2 The Permittee must inspect all phases of construction: prior to land disturbance, during active construction, and following active construction. The Permittee must include in its SWMP document a procedure for being notified by construction operators/owners of their completion of active construction so that verification of final stabilization and removal of all temporary control measures may be conducted.

### **Possible Steps for Terminating the Discharge of Water Associated with Construction Activities**

When a Construction Site is nearing completion and the permittee is desirous of terminating their permit with the State of Utah for discharging water associated with construction activities the following steps should be taken:

1. The Contractor's SWPPP coordinator for the project should notify the city storm water inspector that they are ready for final inspection.
2. The city storm water inspector visits the site to determine if the site has reached final stabilization as determined by the UPDES Storm Water General Permit for Construction Activities, UTR300000. The city storm water inspector also checks to see if all temporary BMP have been removed.
3. If there is work still to be completed they are included in the Additional Comments and Corrective Actions for SWPPP Compliance portion of the State's UPDES Storm Water Inspection Evaluation Form for SWPPP Compliance (State's inspection form) and provides a copy for the SWPPP coordinator.
4. When the city storm water inspector is satisfied that all requirements have been met, the city storm water inspector uses the State's inspection form and completes the Notice of Termination (NOT) Inspection section of that form and sends a copy to the State for their records.
5. *(This step is not currently needed, but may become effective in January 2011)*. The city storm water inspector or designated individual then needs to log into the State's database and change the status of the permit for the given permit.
6. Once the State has received confirmation that the site meets all the requirements the NOT is granted.

## Including Water Quality on All Projects



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- 4.2.6.7. The Permittee must develop and implement a process to assess the water quality impacts in the design of all new flood management structural controls that are associated with the Permittee or that discharge to the MS4. This process must include consideration of controls that can be used to minimize the impacts to site water quality and hydrology while still meeting project objectives. A description of this process must be included in the SWMP document
- 4.2.6.8. Construction Projects. Public construction projects shall comply with the requirements applied to private projects. All construction projects disturbing greater than or equal to one acre, including projects less than one acre that are part of a larger common plan of development or sale, owned or operated by the Permittee are required to be covered under the General UPDES Permit for Storm Water Discharges Associated with Construction Activities. All public projects approved after the effective date of this Permit shall include construction and post-construction controls selected and implemented pursuant to the requirements in Parts 4.2.4. and 4.2.5.

### Ideas for including water quality on all projects

1. Review Storm Drain Master Plan for opportunities to include water quality projects or water quality aspects to Capital Improvement Projects.
2. Update Master Plan to include water quality issues.
3. During conceptual design review meetings – ask the questions –
  - a. *Is there opportunity to include water quality aspects to this project?*
  - b. *Are there any highly impacted areas?*
  - c. *Are there low-impact development concepts and ideas that might work for this project?*
  - d. *Can we limit directly connected impervious areas (DCIA) on this project?*
  - e. *What could be done to minimize runoff?*
4. Train all employees, contractors and developers on SOP's and BMP's for all projects.
5. Include SWPPP discussion as part of the agenda for preconstruction meetings for all projects.
6. Look for “green money” funding options for water quality aspects of all projects.
7. Follow normal SWPPP review process/checklist review for all projects.



**APPLICATIONS**

- Manufacturing
- Material Handling
- Vehicle Maintenance
- Construction
- Commercial Activities
- Roadways
- Waste Containment
- Housekeeping Practices

**DESCRIPTION:**

Inspect and maintain all structural BMP's (both existing and new) on a routine basis to remove pollutants from entering storm drain inlets. This includes the establishment of a schedule for inspections and maintenance.

**APPROACH:**

Regular maintenance of all structural BMP's is necessary to ensure their proper functionality.

- Annual inspections.
- Prioritize maintenance to clean, maintain, and repair or replace structures in areas beginning with the highest pollutant loading.
- Clean structural BMP's in high pollutant areas just before the wet season to remove sediments and debris accumulated during the summer and fall.
- Keep accurate logs of what structures were maintained and when they were maintained.
- Record the amount of waste collected.

**LIMITATIONS:**

- Cost
- Availability of trained staff



**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Staffing
- Training
- Administrative

- High
- Medium
- Low

<b>BMP: Classroom Education On Storm Water</b>	<b>CESW</b>
	<p style="text-align: center;"><b>APPLICATIONS</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Manufacturing</li> <li><input checked="" type="checkbox"/> Material Handling</li> <li><input type="checkbox"/> Vehicle Maintenance</li> <li><input type="checkbox"/> Construction</li> <li><input type="checkbox"/> Commercial Activities</li> <li><input type="checkbox"/> Roadways</li> <li><input checked="" type="checkbox"/> Waste Containment</li> <li><input checked="" type="checkbox"/> Housekeeping Practices</li> </ul>
<p><b>DESCRIPTION:</b> Classroom education is an integral part of any storm water pollution outreach program. Providing storm water education through schools exposes the message not only to students but to their parents as well. Topics can include Water conservation, proper lawn and garden care, and proper disposal of hazardous household wastes.</p> <p><b>APPROACH:</b></p> <ul style="list-style-type: none"> <li>➤ Building a strong relationship with the school district is the most important step in getting storm water education into the schools.</li> <li>➤ When developing an outreach message for children, choose the age ranges to target.</li> <li>➤ Many additional classroom materials are available for use free of cost. Educational materials available for downloading from the Internet at <a href="http://www.csu.org/water/watereducation/watereducation.html">www.csu.org/water/watereducation/watereducation.html</a>.</li> <li>➤ Should make students aware of the potential impacts of hazardous household materials on water quality and inform residents of ways to properly store, handle, and dispose of the chemicals</li> <li>➤ Water usage in the home can easily be reduced by 15 to 20 percent—without major discomfort—by implementing a program to conserve water in the home.</li> <li>➤ Lawn and garden activities can result in contamination of storm water through pesticide, soil, and fertilizer runoff. Proper landscape management, however, can effectively reduce water use and contaminant runoff and enhance the aesthetics of a property.</li> </ul> <p><b>LIMITATIONS:</b></p> <ul style="list-style-type: none"> <li>➤ One of the limitations of classroom education is being able to incorporate storm water issues into the school curricula. With so many subjects to teach, environmental issues might be viewed as less important.</li> </ul> <p><b>MAINTENANCE:</b></p> <ul style="list-style-type: none"> <li>➤ Programs and educational materials can be re-used, but they must be presented on a continual basis.</li> </ul>	<div style="text-align: center;">  </div> <p style="text-align: center;"><b>TARGETED POLLUTANTS</b></p> <ul style="list-style-type: none"> <li>■ Sediment</li> <li>■ Nutrients</li> <li>■ Heavy Metals</li> <li>■ Toxic Materials</li> <li>■ Oxygen Demanding Substances</li> <li>■ Oil &amp; Grease</li> <li>■ Floatable Materials</li> <li>■ Bacteria &amp; Viruses</li> </ul> <div style="border: 1px solid black; padding: 5px;"> <ul style="list-style-type: none"> <li>■ High Impact</li> <li><input checked="" type="checkbox"/> Medium Impact</li> <li><input type="checkbox"/> Low or Unknown Impact</li> </ul> </div> <p style="text-align: center;"><b>IMPLEMENTATION REQUIREMENTS</b></p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Capital Costs</li> <li><input type="checkbox"/> O&amp;M Costs</li> <li><input type="checkbox"/> Maintenance</li> <li><input type="checkbox"/> Training</li> </ul> <p style="text-align: center;"> <input checked="" type="checkbox"/> High    <input checked="" type="checkbox"/> Medium    <input type="checkbox"/> Low </p>



**Municipalities can establish training programs to educate contractors about erosion and sediment control practices**



**Construction reviewers periodically inspect construction sites to ensure that contractors have installed and maintained their erosion and sediment controls properly (Source: University of Connecticut Cooperative Extension System, 2000)**

**APPLICATIONS**

- Manufacturing
- Material Handling
- Vehicle Maintenance
- Construction
- Commercial Activities
- Roadways
- Waste Containment
- Housekeeping Practices

**DESCRIPTION:**

One of the most important factors determining whether or not erosion and sediment controls will be properly installed and maintained on a construction site is the knowledge and experience of the contractor. Many communities require certification for key on-site employees who are responsible for implementing the ESC plan. Several states have contractor certification programs. The State of Delaware requires that at least one person on any construction project be formally certified. The Delaware program requires certification for any foreman or superintendent who is in charge of onsite clearing and land-disturbing activities for sediment and runoff control associated with a construction project.

**APPROACH:**

- Training and certification will help to ensure that the plans are properly implemented and that best management practices are properly installed and maintained.
- Inspector training programs are appropriate for municipalities with limited funding and resources for ESC program implementation.
- Contractor certification can be accomplished through municipally sponsored training courses, or more informally, municipalities can hold mandatory pre-construction or pre-wintering meetings and conduct regular and final inspection visits to transfer information to contractors (Brown and Caraco, 1997).
- To implement an inspector training program, the governing agency would need to establish a certification course with periodic recertification, review reports submitted by private inspectors, conduct spot checks for accuracy, and institute fines or other penalties for noncompliance.
- Curb systems should be maintained through curb repair (patching and replacement).
- To minimize the amount of spilled material tracked outside of the area by personnel, grade within the curbing to direct the spilled materials to a down-slope side of the curbing, thus keeping the spilled materials away from personnel and equipment. Grading will also facilitate clean-up.

**LIMITATIONS:**

- Contractor certification and inspector training programs require a substantial amount of effort on the part of the municipality or regulatory agency.
- They need to develop curricula for training courses, dedicate staff to teach courses, and maintain a report review and site inspection staff to ensure that both contractors and inspectors are fulfilling their obligations and complying with the ESC program.



**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**DESCRIPTION:**

Educational Materials to present information to the public on storm water issues and water quality awareness is an integral part of any storm water education program. Providing storm water education by sending out information with bills, newsletters, or presented at city activities, in city offices, schools, and fair booths, exposes the message to a wide variety of people, if not city-wide. Topics can include Water conservation, proper lawn and garden care, and proper disposal of hazardous household wastes. Many educational materials can be used for city personnel, contractors as well as homeowners or businesses.

**APPROACH:**

- Building a strong relationship with citizens is the most important step in getting storm water education city-wide.
- Educational materials can be tailored to all different age groups and technical background.
- Should make people aware of the potential impacts of hazardous household materials on water quality and inform residents of ways to properly store, handle, and dispose of the chemicals
- Water usage in the home can easily be reduced by 15 to 20 percent—without major discomfort—by implementing a program to conserve water in the home.
- Lawn and garden activities can result in contamination of storm water through pesticide, soil, and fertilizer runoff. Proper landscape management, however, can effectively reduce water use and contaminant runoff and enhance the aesthetics of a property.

**LIMITATIONS:**

- Not everyone will actually read or incorporate the information into their lives.
- Budgets need to have sufficient funds to obtain educational materials and their distribution.

**MAINTENANCE:**

- Programs and educational materials can be re-used, but they must be presented on a continual basis.

**APPLICATIONS**

- Manufacturing
- Material Handling
- Vehicle Maintenance
- Construction
- Commercial Activities
- Roadways
- Waste Containment
- Housekeeping Practices



**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low

## BMP: Employee Training

ET



### DESCRIPTION:

Employee training, like equipment maintenance, is a method by which to implement BMPs. Employee training should be used in conjunction with all other BMPs as part of the facility's SWPPP.

The specific employee training aspects of each of the source controls are highlighted in the individual information sheets. The focus of this information sheet is more general, and includes the overall objectives and approach for assuring employee training in stormwater pollution prevention. Accordingly, the organization of this information sheet differs somewhat from the other information sheets in this chapter.

### OBJECTIVES:

Employee training should be based on four objectives:

- < Promote a clear identification and understanding of the problem, including activities with the potential to pollute stormwater;
- < Identify solutions (BMPs);
- < Promote employee ownership of the problems and the solutions; and
- < Integrate employee feedback into training and BMP implementation.

### APPROACH:

- < Integrate training regarding stormwater quality management with existing training programs that may be required for other regulations.
- < Employee training is a vital component of many of the individual source control BMPs included in this manual.

### PROGRAM ELEMENTS

- : New Development
- : Residential
- : Commercial Activities
- : Industrial Activities
- : Municipal Facilities
- : Illegal Discharges



### TARGETED POLLUTANTS

- # Sediment
- # Nutrients
- # Heavy Metals
- # Toxic Materials
- # Oxygen Demanding Substances
- # Oil & Grease
- # Floatable Materials
- # Bacteria & Viruses

- |   |
|---|
| <input type="checkbox"/> High Impact              |
| <input checked="" type="checkbox"/> Medium Impact |
| <input type="checkbox"/> Low or Unknown Impact    |

### IMPLEMENTATION REQUIREMENTS

- : Capital Costs
- : O&M Costs
- 9 Regulatory
- # Training
- : Staffing
- : Administrative

- |                               |  |                              |
|-------------------------------|--|------------------------------|
| <input type="checkbox"/> High | <input checked="" type="checkbox"/> Medium | <input type="checkbox"/> Low |
|-------------------------------|--|------------------------------|



**Diversion dikes can be used to contain storm water onsite**

**DESCRIPTION:**

Erosion and sediment control are generally two of the biggest problems on construction sites. Erosion control measures must be taken during a construction project. An Erosion Control Plan will be submitted and approved before work can begin on the project. An Erosion Control Plan describes what erosion control BMPs will be implemented, when and where, during the project. Erosion and sediment control measures should be installed before other construction activities begin.

**APPROACH:**

- Create a list of possible erosion control BMPs that could be implemented in any given project.
- Require submittal of erosion & sediment control plans for projects that are on 1 acre and larger sites.
- Develop a review checklist for plan review personnel.
- Provide the review checklist to contractors/developers so they know what is expected.
- Provide inspectors with a copy of the approved plans.
- Check to make sure erosion control measures are properly installed before beginning other construction activities.

**LIMITATIONS:**

- Must be enforced to be affective.
- Sometimes site conditions are different than planned on and the plans have to be modified.
- The erosion control measures have to be maintained.
- The BMPs have to be installed early on in the project.
- The BMPs have to be removed after the threat of erosion is no longer present.

**APPLICATIONS**

- Manufacturing
- Material Handling
- Vehicle Maintenance
- Construction
- Commercial Activities
- Roadways
- Waste Containment
- Housekeeping Practices



**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

## BMP: Housekeeping Practices

HP



### DESCRIPTION:

Promote efficient and safe housekeeping practices (storage, use, and cleanup) when handling potentially harmful materials such as fertilizers, pesticides, cleaning solutions, paint products, automotive products, and swimming pool chemicals.

### APPROACH:

< Pattern a new program after the many established programs from municipalities around the country. Integrate this best management practice as much as possible with existing programs at your municipality.

< This BMP has two key audiences: municipal employees and the general public.

< For the general public, municipalities should establish a public education program that provides information on such items as storm water pollution and beneficial effects of proper disposal on water quality; reading product labels; safer alternative products; safe storage, handling, and disposal of hazardous products; list of local agencies; and emergency phone numbers. The programs listed below have provided this information through brochures or booklets that are available at a variety of locations including municipal offices, household hazardous waste collection events or facilities, and public information fairs.

Municipal facilities should develop controls on the application of pesticides, herbicides, and fertilizers in public right-of-ways and at municipal facilities.

Controls may include:

- < List of approved pesticides and selected uses.
- < Product and application information for users.
- < Equipment use and maintenance procedures.
- < Record keeping and public notice procedures.

### LIMITATIONS:

There are no major limitations to this best management practice.

### PROGRAM ELEMENTS

- New Development
- Residential
- Commercial Activities
- Industrial Activities
- Municipal Facilities
- Illegal Discharges



### TARGETED POLLUTANTS

- # Sediment
- # Nutrients
- 9 Heavy Metals
- # Toxic Materials
- # Oxygen Demanding Substances
- # Oil & Grease
- 9 Floatable Materials
- 9 Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

### IMPLEMENTATION REQUIREMENTS

- 9 Capital Costs
- : O&M Costs
- 9 Regulatory
- # Training
- : Staffing
- 9 Administrative

- High
- Medium
- Low



**Developers can design streets and pedestrian paths to maximize convenience and safety while at the same time minimizing impervious surface area (Source: The Rouse Company, no date)**

**APPLICATIONS**

- Manufacturing
- Material Handling
- Vehicle Maintenance
- Construction
- Commercial Activities
- Roadways
- Waste Containment
- Housekeeping Practices

**DESCRIPTION:**

This practice requires changes in the regional growth planning process to contain sprawl development. Sprawl development is the expansion of low-density development into previously undeveloped land. The American Farmland Trust has estimated that the United States is losing about 50 acres an hour to suburban and exurban development (Longman, 1998). This sprawl development requires local governments to extend public services to new residential communities whose tax payments often do not cover the cost of providing those services. For example, in Prince William County, Virginia, officials have estimated that the costs of providing services to new residential homes exceeds what is brought in from taxes and other fees by \$1,600 per home (Shear and Casey, 1996).

Infrastructure planning makes wise decisions to locate public services—water, sewer, roads, schools, and emergency services—in the suburban fringe and direct new growth into previously developed areas, discouraging

Low-density development. Generally, this is done by drawing a boundary or envelope around a community, beyond which major public infrastructure investments are discouraged or not subsidized. Meanwhile, economic and other incentives are provided within the boundary to encourage growth in existing neighborhoods.

**APPROACH:**

- Sprawl development negatively impacts water quality in several ways. The most significant impact comes from the increase in impervious cover that is associated with sprawl growth. In addition to rooftop impervious area from new development, extension of road systems and additions of paved surface from driveways create an overall increase in imperviousness.
- *Urban Growth Boundaries.* This planning tool establishes a dividing line that defines where a growth limit is to occur and where agricultural or rural land is to be preserved. Often, an urban services area is included in this boundary that creates a zone where public services will not be extended.
- *Infill/Community Redevelopment.* This practice encourages new development in unused or underutilized land in existing urban areas. Communities may offer tax breaks or other economic incentives to developers to promote the redevelopment of properties that are vacant or damaged.

**LIMITATIONS:**

- Intense development of existing areas can create a new set of challenges for storm water program managers. Storm water management solutions are often more difficult and complex in ultra-urban areas than in suburban areas
- Infrastructure planning is often done on a regional scale and requires a cooperative effort between all the communities within a given region in order to be successful.



**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**DESCRIPTION:**

All developers are required to submit a landscape and irrigation plan for their developments. Lawn and garden activities can result in contamination of storm water through pesticide, soil, and fertilizer runoff. Proper landscape management, however, can effectively reduce water use and contaminant runoff as well as enhance the aesthetics of a property.

**APPROACH:**

- Develop landscape and irrigation plan preparation guidelines.
- Require a landscape and irrigation plan for each new commercial development.
- Educate local developers on how to create effective landscape and irrigation plans for their new developments.
- Educate municipal staff to review property landscape and irrigation plans to minimize runoff.
- Check all new irrigation plans to ensure that there will be no overspray onto impervious surfaces and that the irrigation water will be contained on site.
- Uniform coverage for sprinkler systems should be checked to help minimize over watering.

**LIMITATIONS:**

- More time and effort will be required of the municipal staff to review new development plans.
- Some communities do not have the expertise to complete proper reviews in-house.

**MAINTENANCE:**

- Programs and educational materials can be repeatedly sent out or emphasized. Extension service continues to research and provide current data.

**APPLICATIONS**

- Manufacturing
- Material Handling
- Vehicle Maintenance
- Construction
- Commercial Activities
- Roadways
- Waste Containment
- Housekeeping Practices



**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training



**APPLICATIONS**

- Manufacturing
- Material Handling
- Vehicle Maintenance
- Construction
- Commercial Activities
- Roadways
- Waste Containment
- Housekeeping Practices

**DESCRIPTION:**

Existing ordinances relating to storm water are reviewed for compliance. New ordinances are written to prohibit non-storm water discharges into the Municipal Separate Storm Sewer System (MS4), require proper erosion and sediment controls on construction sites, require the implementation of post-construction runoff controls, and to ensure proper planning/zoning protections.

**APPROACH:**

- Review existing storm drain ordinances for consistency and compliance with state and federal regulations and make improvements, if necessary. Ensure that no conflicts will occur with new ordinances that will be written and adopted.
- Write and adopt an ordinance that prohibits (to the extent allowable under State, Tribal, or local law) the discharge of non-storm water discharges into the MS4 with appropriate enforcement procedures and actions.
- Write and adopt an ordinance, with sanctions to ensure compliance, requiring the implementation of proper erosion and sediment controls, and controls for other wastes, on applicable construction sites.
- Write and adopt an ordinance requiring the implementation of post-construction runoff controls to the extent allowable under State, Tribal, or local law.
- Educate the public about the new ordinances.
- Enforce the new ordinances.

**LIMITATIONS:**

- Wording of ordinances is often difficult. It should be specific to serve the intended purpose, but not too specific to cause potential conflicts with other ordinances or situations.
- Once an ordinance is adopted, it can be difficult to modify ordinances to meet changing needs.
- Ordinances have to be enforced to be beneficial.
- Ordinances take time to change.



**TARGETED POLLUTANTS**

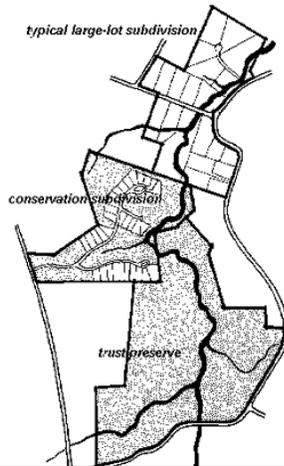
- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

- High Impact
- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

- High
- Medium
- Low



**APPLICATIONS**

- Manufacturing
- Material Handling
- Vehicle Maintenance
- Construction
- Commercial Activities
- Roadways
- Waste Containment
- Housekeeping Practices

**DESCRIPTION:**

Zoning is a classification scheme for land use planning. Zoning can serve numerous functions and can help mitigate storm water runoff problems by facilitating better site designs. By correctly applying the right zoning technique, development can be targeted into specific areas, limiting development in other areas and providing protection for the most important land conservation areas.

**APPROACH:**

- Impervious Overlay Zoning: This type of overlay zoning limits future impervious areas.
- Incentive Zoning: This planning technique relies on bonuses or incentives for developers to encourage the creation of certain amenities or land use designs. A developer is granted the right to build more intensively on a property or given some other bonus in exchange for an amenity or a design that the community considers beneficial.
- Performance Zoning: Performance zoning is a flexible approach that has been employed in a variety of fashions in several different communities across the country. Some performance factors include traffic or noise generation limits, lighting requirements, storm water runoff quality and quantity criteria, protection of wildlife and vegetation, and even architectural style criteria
- Urban Growth Boundaries: Urban growth boundaries are sometimes called development service districts and include areas where public services are already provided (e.g., sewer, water, roads, police, fire, and schools).

**LIMITATIONS:**

- Some zoning techniques may be limited by economic and political acceptance and should be evaluated on these criteria as well as storm water management goals.



**TARGETED POLLUTANTS**

- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substances
- Oil & Grease
- Floatable Materials
- Bacteria & Viruses

<input type="checkbox"/> High Impact <input checked="" type="checkbox"/> Medium Impact <input type="checkbox"/> Low or Unknown Impact
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**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training

<input checked="" type="checkbox"/> High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low
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**See Appendix B for Standard  
Operating Procedures**

## Maintenance Agreements and Arrangements

The Small MS4 General UPDES Permit (4.2.5.5.1) requires the use of Maintenance Agreements between developer and the MS4 for any post construction BMP or Stormwater Treatment Practices (STP).

4.2.5.5.1 The ordinance or other regulatory mechanism shall include provisions for both construction-phase and post-construction access for Permittees to inspect storm water control measures on private properties that discharge to the MS4 to ensure that adequate maintenance is being performed. The ordinance or other regulatory mechanism may, in lieu of requiring that the Permittee's staff inspect and maintain storm water controls on private property, instead require private property owner/operators or qualified third parties to conduct maintenance and provide annual certification that adequate maintenance has been performed and the structural controls are operating as designed to protect water quality. In this case, the Permittee must require a maintenance agreement addressing maintenance requirements for any control measures installed on site. The agreement must allow the Permittee to conduct oversight inspections of the storm water control measures and also account for transfer of responsibility in leases and/or deeds. The agreement must also allow the Permittee to perform necessary maintenance or corrective actions neglected by the property owner/operator, and bill or recoup costs from the property owner/operator as needed.

A stormwater maintenance agreement is a formal contract between a local government and a property owner designed to guarantee that specific maintenance functions are performed in exchange for permission to develop that property. Local governments benefit from these agreements in that responsibility for regular maintenance of the Stormwater Treatment Practice (STP) can be placed upon the property owner or other legally recognized party, allowing agency staff more time for plan review and inspection.

Maintenance agreements can be an effective tool for ensuring long-term maintenance of on-site STPs. The most important aspect of creating these maintenance agreements is to clearly define the responsibilities of each party entering into the agreement. Basic language that should be incorporated into an agreement includes the following:

### **1. Performance of routine maintenance**

Local governments often find it easier to have a property owner perform all maintenance according to the requirements of a Design Manual. Other communities require that property owners do aesthetic maintenance (i.e., mowing, vegetation removal) and implement pollution prevention plans, but elect to perform structural maintenance and sediment removal themselves.

### **2. Maintenance schedules**

Maintenance requirements may vary, but usually governments require that all STP owners perform at least an annual inspection and document the maintenance and repairs performed. An annual report must then be submitted to the government, who may then choose to perform an inspection of the facility.

### **3. Inspection requirements**

Local governments may obligate themselves to performing an annual inspection of an STP, or may choose to inspect when deemed necessary instead. Local governments may also wish to include language allowing maintenance requirements to be increased if deemed necessary to ensure proper functioning of the STP.

### **4. Access to STPs**

The agreement should grant permission to a local government or its authorized agent to enter onto property to inspect STPs. If deficiencies are noted, the government should then provide a copy of the inspection report to the property owner, and provide a timeline for repair of these deficiencies.

### **5. Failure to maintain**

In the maintenance agreement, the government should repeat the steps available for addressing a failure to maintain situation. Language allowing access to STPs cited as not properly maintained is essential, along with the right to charge any costs for repairs back to the property owner. The government may wish to include deadlines for repayment of maintenance costs, and provide for liens against property up to the cost of the maintenance plus interest.

### **6. Recording of the maintenance agreement**

An important aspects to the recording of the maintenance agreement is that the agreement be recorded into the local deed records. This helps ensure that the maintenance agreement is bound to the property in perpetuity.

Finally, some communities elect to include easement requirements into their maintenance agreements. While easement agreements are often secured through a separate legal agreement, recording public access easements for maintenance in a maintenance agreement reinforces a local government's right to enter and inspect an STP

Source including additional examples:

[http://www.stormwatercenter.net/Manual\\_Builder/Maintenance\\_Manual/4Maintenance\\_Agreements/Maintenance%20Agreements%20Introduction.htm](http://www.stormwatercenter.net/Manual_Builder/Maintenance_Manual/4Maintenance_Agreements/Maintenance%20Agreements%20Introduction.htm)