

# Design Methods and Considerations

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## 1. Overview

The County covers a very large area, and has many different characteristics. This provides a problem with determining which storm is the storm that requires the proper detention. We require that designers get the rainfall data from the NOAA website located at [http://hdsc.nws.noaa.gov/hdsc/pfds/sa/ut\\_pfds.html](http://hdsc.nws.noaa.gov/hdsc/pfds/sa/ut_pfds.html) This will provide the different rainfall storms. We required the designer to check all the storms between 1 hour and 24 hours, and use the storm that requires the most detention.

## 2. Acceptable Methods

Condition	Allowable Requirement
Watersheds $\leq$ 30 acres	Rational Method may be used
Watersheds $\geq$ 0 acres	SCS Curve Number method and SCS Unit Hydrograph methods

## 3. Precipitation and return periods

System	Return Period Required
Initial collection and conveyance	10 year
Major collection of multiple initial systems	100 year
Conveyance of rivers, streams, or any large drainage	100 year or maximum

## 4. Allowable Discharge

Item	Allowable Requirement
Maximum post development runoff	0.1 cfl/acre
Maximum post development runoff	Other limits as approved by the County Engineer, e.g. Pre and Post development runoff being equal

## **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.

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)

# Special Environmental Considerations

## Discharges to Water Quality Impaired Waters

The permittee “must determine whether storm water discharge from any part of the MS4 contributes to a 303(d) listed (i.e. impaired) waterbody.” (Small MS4 General UPDES Permit 3.1.1.1) 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.

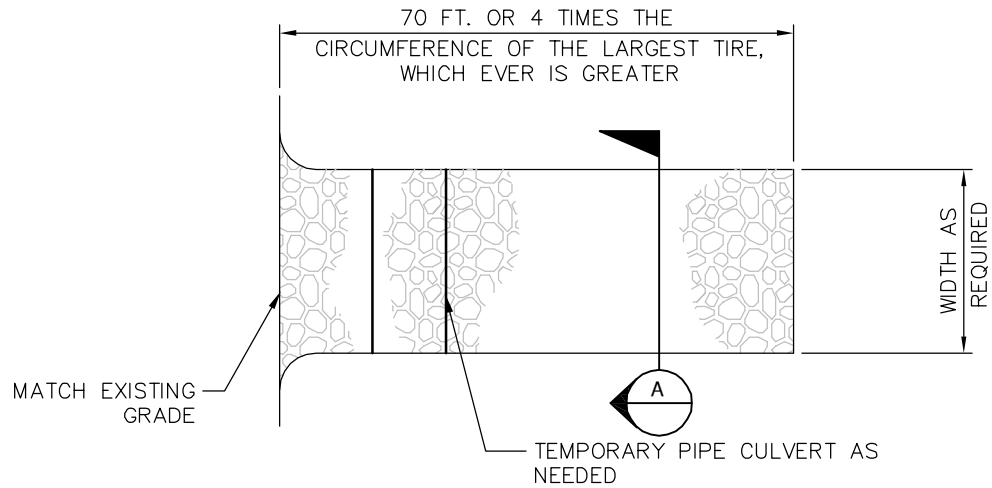
<http://wildlife.utah.gov/habitat/pdf/endgspec.pdf>.

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

## Historic Properties

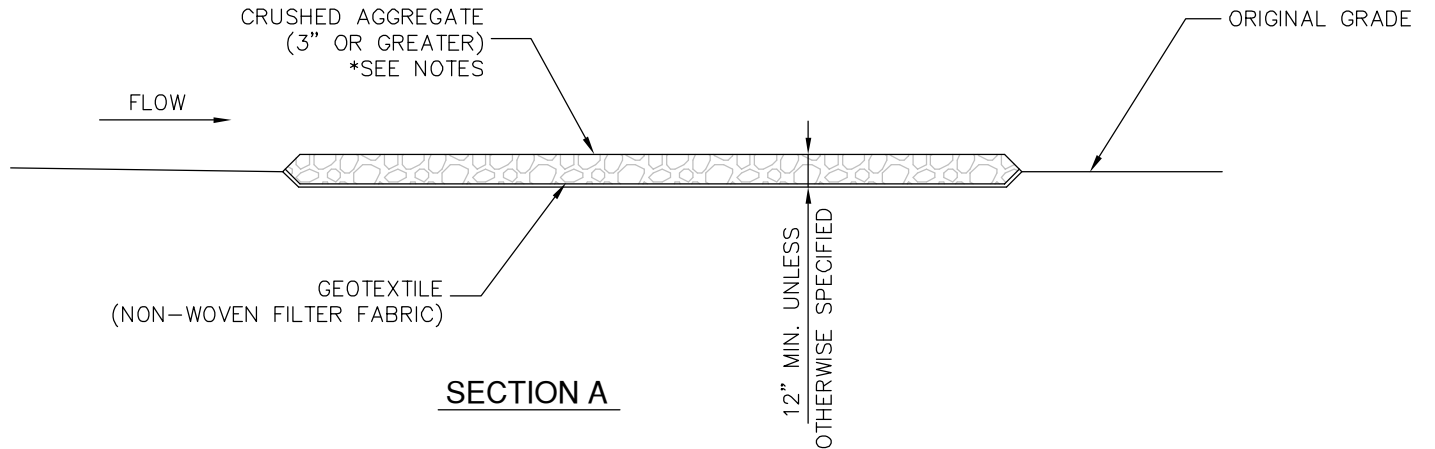
Where applicable, compliance efforts to this law shall be reflected in the SWMP document. (Small MS4 General UPDES Permit 3.2) Web sites include the following, along with possible county and city listings:

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



**PLAN VIEW**

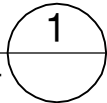
- NOTES:
1. TO BE CLEANED AND MAINTAINED AS OFTEN AS NECESSARY TO KEEP THE BMP WORKING PROPERLY.
  2. CRUSHED GRAVEL SIZE WILL VARY DEPENDING ON SITE CONDITIONS AND TRAFFIC.



**SECTION A**

**STABILIZED CONSTRUCTION  
ENTRANCE DETAIL**

SCALE: N. T. S.



Plans Prepared By  
**WEBER COUNTY ENGINEERING DEPARTMENT**  
STANDARD CONSTRUCTION BMP DETAILS

STABILIZED CONSTRUCTION ENTRANCE DETAIL

Designed by  
R. PFEASTER

Checked by  
C. CHRISTENSEN

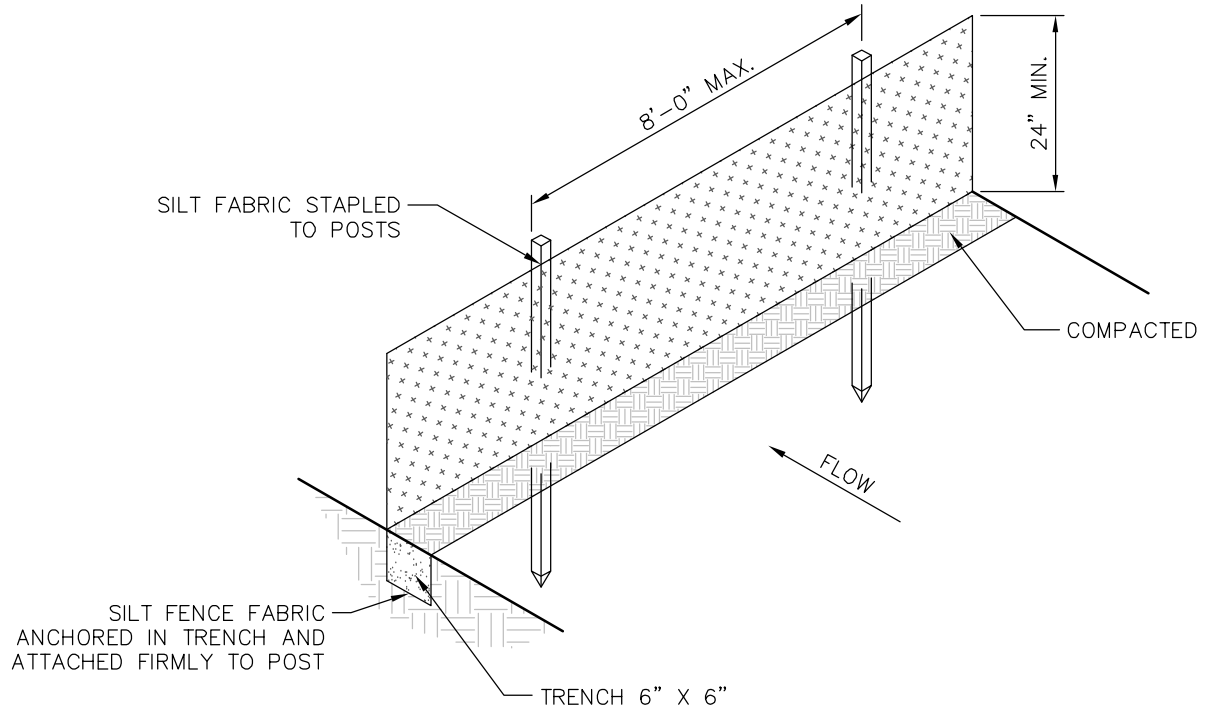
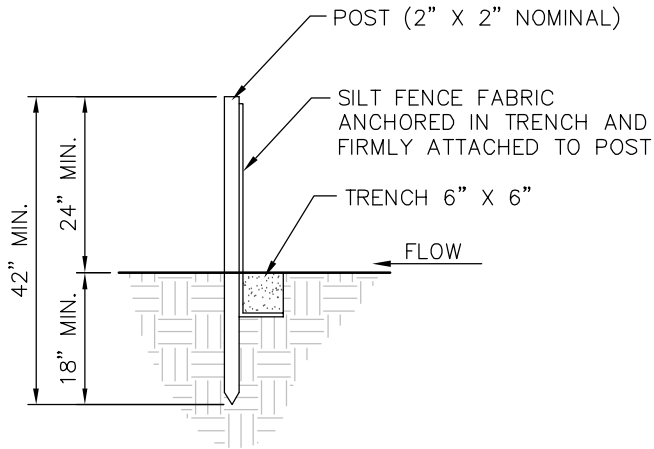
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Date  
9/29/2010

**SHEET**

**1**

OF 6 SHEETS



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.
6. TO BE CLEANED, MAINTAINED AND/OR REPLACED AS OFTEN AS NECESSARY TO KEEP THE BMP WORKING PROPERLY.

**SILT FENCE DETAIL** 2  
SCALE: N. T. S.



WEBER COUNTY ENGINEERING DEPARTMENT  
STANDARD CONSTRUCTION BMP DETAILS

SILT FENCE DETAIL

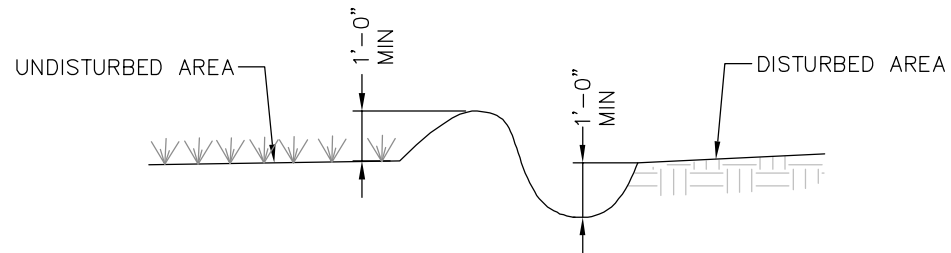
Designed by R. PFEASTER	Checked by C. CHRISTENSEN	Filename BMPS.DWG	Date 9/29/2010
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**SHEET**

**2**

OF 6 SHEETS





NOTES:  
 1. DEPENDING ON SPECIFIC SITE  
 CONDITIONS, STABILIZATION OF SWALE  
 AND/OR BERM MAY BE NECESSARY TO  
 PREVENT EROSION AND SEDIMENTATION.

**SWALE/BERM DETAIL** 3  
 SCALE: N. T. S.



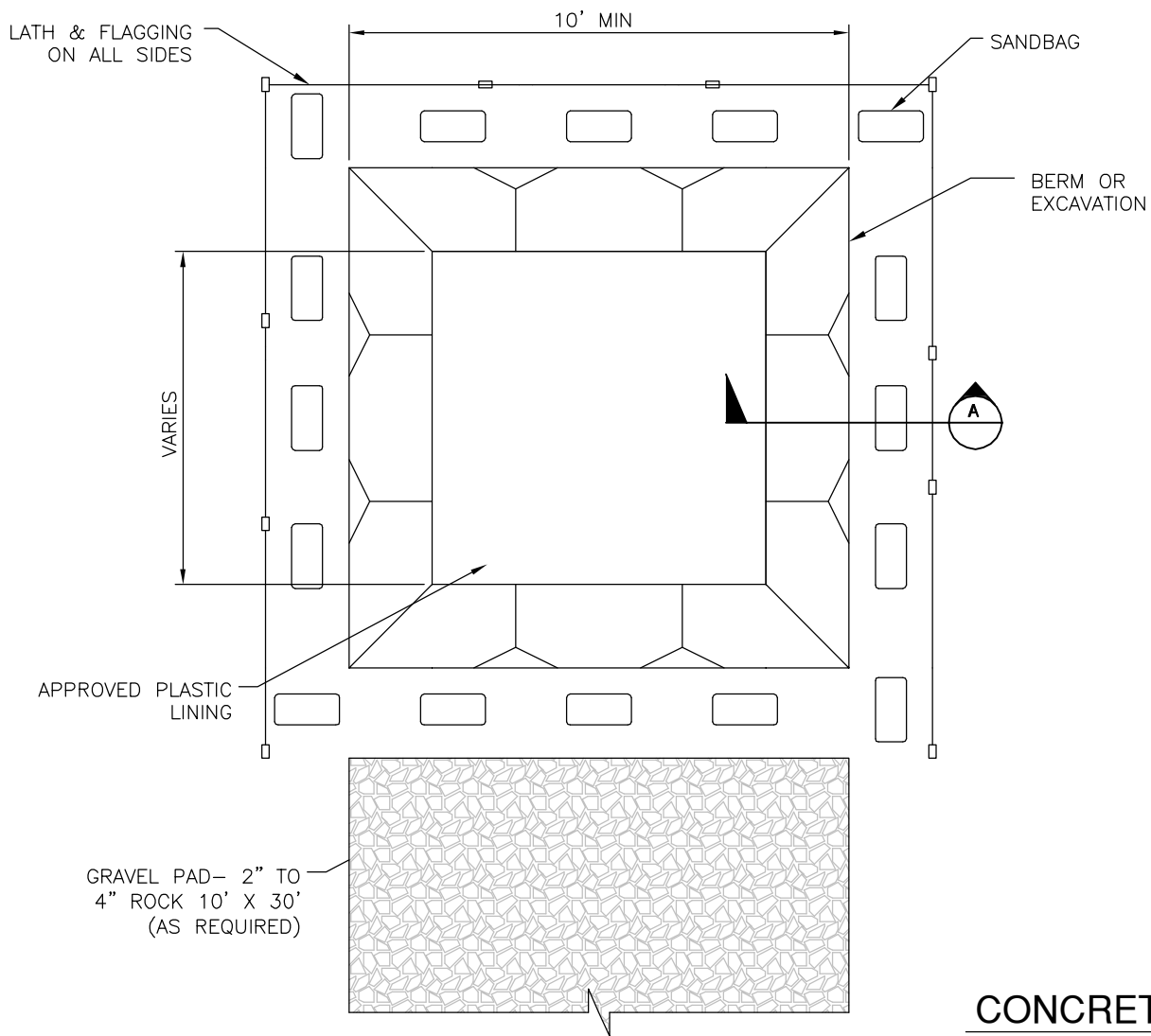
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SWALE/BERM DETAIL

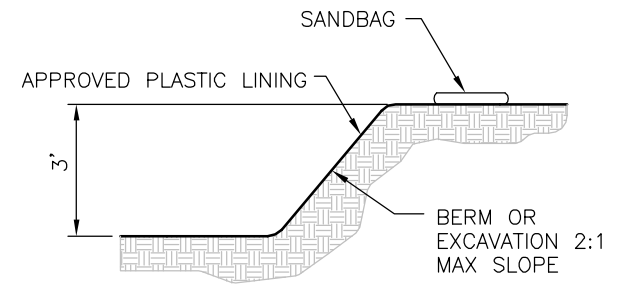
Designed by R. PFEASTER	Checked by C. CHRISTENSEN	Filename BMPS.DWG	Date 9/29/2010
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**SHEET**  
**3**

OF 6 SHEETS



PLAN



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 (NOTICE OF TERMINATION)
5. TO BE CLEANED AND MAINTAINED AS OFTEN AS NECESSARY TO KEEP THE BMP WORKING PROPERLY.

CONCRETE WASHOUT DETAIL

4

SCALE: N. T. S.



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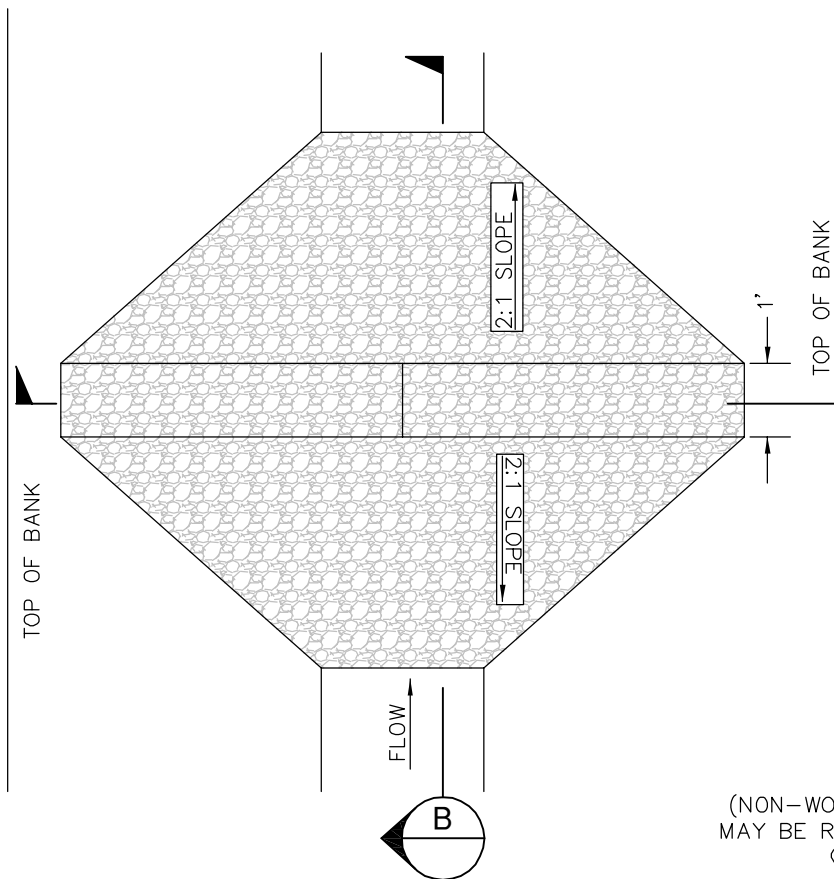
**CONCRETE WASHOUT DETAIL**

Designed by R. PFEASTER	Checked by C. CHRISTENSEN	Filename BMPS.DWG	Date 9/29/2010
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**SHEET**

**4**

OF 6 SHEETS



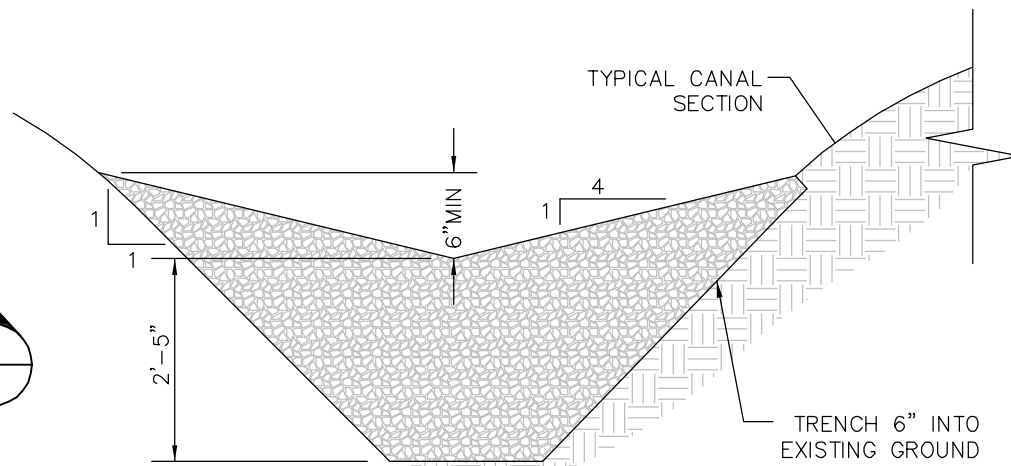
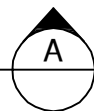
PLAN VIEW

DITCH ROCK CHECK DAM

SCALE: N.T.S.

5

TOP OF BANK



SECTION A

SCALE: N.T.S.



GEOTEXTILE (NON-WOVEN FILTER FABRIC) MAY BE REQUIRED DEPENDING ON SOIL CONDITIONS

ROCK 4" TO 6"

FLOW

EMBED GEOTEXTILE 1'-0"

1'-0"

FL

TRENCH 6" MIN INTO EXISTING GROUND

EXTEND GEOTEXTILE 2'-0" BEYOND CREST OF CHECK DAM

2:1 OR FLATTER

2'-0" MAX.

SECTION B

SCALE: N.T.S.



WEBER COUNTY ENGINEERING DEPARTMENT  
STANDARD CONSTRUCTION BMP DETAILS

DITCH ROCK CHECK DAM DETAIL

Designed by  
R. PFEASTER

Checked by  
C. CHRISTENSEN

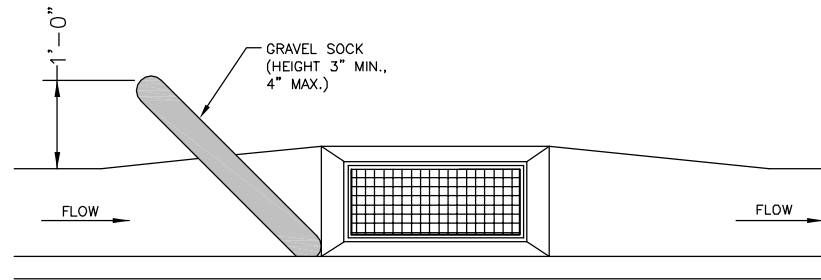
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9/29/2010

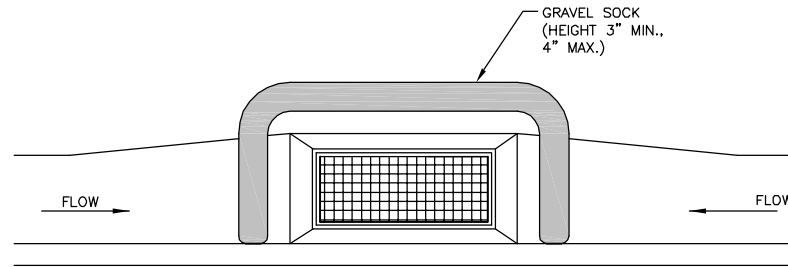
SHEET

5

OF 6 SHEETS



ON GRADE



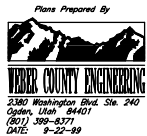
LOW POINT

NOTES:  
 1. TO BE CLEANED AND MAINTAINED  
 AS OFTEN AS NECESSARY TO KEEP  
 THE BMP WORKING PROPERLY.

INLET PROTECTION DETAIL

6

SCALE: N. T. S.



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 STANDARD CONSTRUCTION BMP DETAILS

INLET PROTECTION DETAIL

Designed by R. PFEASTER	Checked by C. CHRISTENSEN	Filename BMPS.DWG	Date 9/29/2010
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**SHEET**

**6**

OF 6 SHEETS

# BMP Master List

<b><u>BMP's</u></b>	<b><u>Abbreviation</u></b>
<b><i>1- Public Education and Outreach</i></b>	
Building and Grounds Maintenance	BGM
Classroom Education on Storm Water	CESW
Educational Materials	EM
Housekeeping Practice	HP
Materials Use	MU
Public Education / Participation	PEP
Storm Drain System Signs	SDSS
Used Oil Recycling	UOR
Using Media	UM
Watershed Organization	WO
<b><i>2- Public Participation/Involvement</i></b>	
Community Cleanup	CC
Community Hotline	CH
Watershed Organization	WO
Service Group Participation	SGM
Storm Channel / Creek Maintenance	SCCM
Stream Cleanup and Monitoring	SCM
<b><i>3- Illicit Discharge Detection and Elimination</i></b>	
Identify Illicit Connections	IIC
Aboveground Tank Leak & Spill Control	ATL
Illegal Dumping Controls	IDC
Illegal Solid Dumping Control	ISDC
Leaking Sanitary Sewer Control	LSSC
Map Storm Water Drains	MSWD
Non-Storm Water Discharge to Drains	NSWD
Ordinance Development	OD
Used Oil Recycling	UOR

# BMP Master List

<b><u>BMP's</u></b>	<b><u>Abbreviation</u></b>
<b><i>4- Construction Site Runoff Control</i></b>	
Benching	BE
Brush or Rock Filter	BRF
Building, Repair, Remodeling, & Construction	BRRC
Chemical Mulching	CM
Compaction	CP
Concrete Waste Management	CWM
Construction Road Stabilization	CR
Construction Sequencing	CS
Contaminated or Erodible Surface Areas	CESA
Contractor Certification and Inspector Training	CCIT
Diversion Dike	DD
Dust Controls	DC
Earth Berm Barrier	EB
Equipment & Vehicle Wash Down Area	EVWA
Erosion Control Blankets	ECB
Erosion Control Plan	ECP
Establish/Compile Design Standards	ECDS
Extended Detention Basins	EDB
Filter Strips	FS
Flotation Silt Curtain	FSC
Geotextiles and Mats	GM
Grassed Swales	GS
Infrastructure Planning	IPL
Inlet Protection	IP
Landscape & Irrigation Plan	LIP
Materials Storage	MS
Mulching	ML
Ordinance Development	OD
Outlet Protection	OP
Portable Toilets	PT
Preservation of Existing Vegetation	PEV
Riprap	RR
Rock Check Dams	CD
Sand Bag Barrier	SBB
Sediment Basin	SB
Sediment Trap	ST
Silt Fence	SF
Slope Drain	SD
Spill Clean-Up	SCU
Stabalized Construction Enterance	SCE
Straw Bale Barrier	STB
Surface Roughening	SR
Temporary and Permanent Seeding	TPS
Temporary Drains and Swales	TDS
Temporary Stream Crossing	TSC
Vehicle and Equipment Cleaning	VEC
Veheil and Equipment Fueling	VEF
Waste Disposal	WD

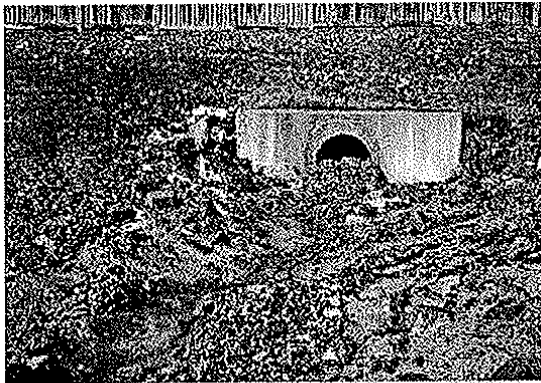
# BMP Master List

<b><u>BMP's</u></b>	<b><u>Abbreviation</u></b>
<b><i>5- Post-Construction Runoff Control</i></b>	
Alternative Turnarounds	AT
Bioengineering	BIO
Biofilters	BF
Conservation Easements	CE
Constructed Wetlands	CW
Double Trench Sand Filter	DTSF
Extended Detention Basins	EDB
Filter Strips	FS
Floatable Skimmers	FS
Grassed Swales	GS
Hydromulching	HM
Infiltration	IN
Infrastructure Planning	IPL
In-line Storage	ILS
Land Use Planning / Management	LIP
Level Spreaders	LS
Map Storm Water Drains	MSWS
Media Filtration	MF
Minimizing DCIA's	DCIA
Oil/Water Separators & Water Q Inlets	OWS
Open Space Design	OSD
Ordinance Development	OD
Outlet Protection	OP
Peat-Sand Filter System	PSFS
Riprap	RR
Rock Check Dams	CD
Seeding and Planting	SP
Surface Sand Filter System	SSFS
Trench Sand Filter System	TSFS
Urban Forestry	UF
Wet Ponds	WP
Zoning	ZO

# BMP Master List

<b><u>BMP's</u></b>	<b><u>Abbreviation</u></b>
<b><i>6- Pollution Prevention/Good Housekeeping</i></b>	
Above Tank Leak & Spill Control	ATL
Alternative Discharge of Chlorinated Water	ADCW
Alternative Products	AP
Animal Carcass Removal	ACR
Area Control Procedures	ACP
BMP Inspection and Maintenance	BMPIM
Building and Grounds Maintenance	BGM
Catch Basin Cleaning	CBC
Concrete Waste Management	CWM
Containment Dikes	CD
Covering	CO
Curbing	CU
De-Icing Chemical Use Storage	DCUS
Detention/Infiltration Device Maintenance	DIDM
Drip Plans	DP
Employee Training	ET
Establish/Compile Design Standards	ECDS
Gelling Agents	GA
Hazardous Waste Management	HWM
Housekeeping Practices	HP
Illegal Dumping Control	IDC
Infrastructure Planning	IPL
Long Term Operation and Maintenance	LTOM
Map Storm Water Drains	MSWD
Manure Composting Program	MCP
Outdoor Container Storage of liquids	OCSL
Outdoor Loading/Unloading of Materials	OLUM
Outdoor Process Equipment Operations	OPE
Outdoor Storage of Raw Materials	OSRM
Pest Control	PC
Portable Toilets	PT
Roadway/Bridge Maintenance	RBM
Sediment Basin	SB
Septic System Controls	SSC
Signs & Labels	SL
Sorbents	SO
Spill Clean-Up	SCU
Storm Drain Flushing	SDF
Street Cleaning	SC
Sumps	S
Used Oil Recycling	UOR
Vehicle and Equipment Cleaning	VEC
Vehicle and Equipment Maintenance & Repair	VEMR
Vehicle Use Reduction	VUR
Waste Handling and Disposal	WHD
Watershed Organization	WO





Regular inspection and maintenance of storm water best management practices is important to ensure that the practices are functioning properly and to remove trash and organic debris

## DESCRIPTION:

To maintain the effectiveness of post-construction storm water control best management practices (BMPs), regulation inspection of control measures is essential. Inspection and maintenance can be categorized into two groups – expected routine maintenance and nonroutine (repair) maintenance.

## APPROACH:

- ▶ Curbing can be used at all industrial facilities. It is particularly useful in areas where liquid materials are transferred and as a stormwater runoff control.
- ▶ As with diking, common materials for curbing include earth, concrete, synthetic materials, metal, or other impenetrable materials. Asphalt is also a common material used to curbing. For maximum efficiency, spilled materials should be removed immediately, to allow spaced for future spills.
- ▶ Curbs should have pumping systems, instead of drainage systems, for collecting spilled materials.
- ▶ 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:

- ▶ Curbing is not effective for holding large spills.
- ▶ May require more maintenance than diking.

## MAINTENANCE:

- ▶ Inspection should be conducted before and after storm events.

## OBJECTIVES

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



# WEBER COUNTY

## ENGINEERING DEPARTMENT

2380 Washington Blvd., Suite 240  
Ogden, UT 84401  
(801) 399-8374

## TARGETED POLLUTANTS

- Sediment
- Nutrients
- Heavy Metals
- Toxic Materials
- Oxygen Demanding Substance
- 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



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)

## OBJECTIVES

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



# WEBER COUNTY

## ENGINEERING DEPARTMENT

2380 Washington Blvd., Suite 240  
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(801) 399-8374

## 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.

## APPLICATION:

- ▶ 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 Substance
- 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



**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.

## APPLICATION:

- ▶ 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.

## OBJECTIVES

- Manufacturing
- Material Handling
- Vehicle Maintenance
- Construction
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- Roadways
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## 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.

**APPLICATION:**

- ▶ 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.

**OBJECTIVES**

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- Medium Impact
- Low or Unknown Impact

**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Training
  
- High
- Medium
- Low



## OBJECTIVES

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



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## 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:

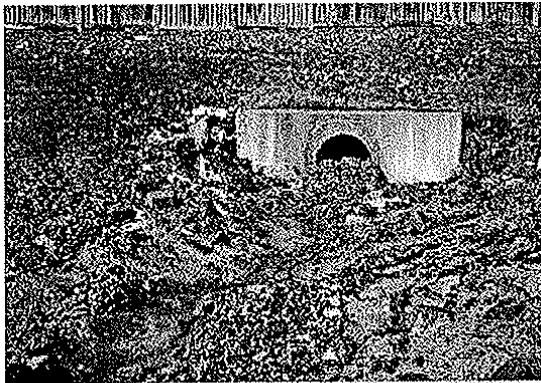
- ▶ There are no major limitations to this best management practice.

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## IMPLEMENTATION REQUIREMENTS

- Capital Costs
- O&M Costs
- Regulatory
- Training
- Staffing
- Administrative
- High
- Medium
- Low



Regular inspection and maintenance of storm water best management practices is important to ensure that the practices are functioning properly and to remove trash and organic debris

## 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 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.

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## 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.

## APPLICATION:

- 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.

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## IMPLEMENTATION REQUIREMENTS

- Capital Costs
- O&M Costs
- Maintenance
- Staffing
- High
- Medium
- Low



## DESCRIPTION:

By locating and correcting illegal dumping practices through education and enforcement measures, the many risks to public safety and water quality associated with illegal disposal actions can be prevented. Illegal dumping control is important to preventing contaminated runoff from entering wells and surface water, as well as averting flooding due to blockages of drainage channels for runoff.

## APPLICATION:

- ▶ 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.

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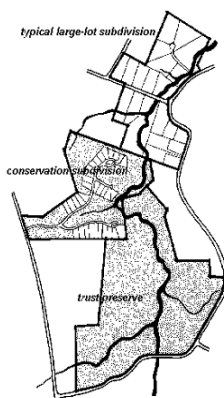
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## IMPLEMENTATION REQUIREMENTS

- Capital Costs
- O&M Costs
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- Training
- High
- Medium
- Low





Property boundaries differ widely between traditional large-lot zoning, which maximizes the acreage of individual properties, and conservation zoning, which maximizes the amount of shared open space (Source: Arendt, 1996)

**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.

**APPLICATION:**

- 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.

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**IMPLEMENTATION REQUIREMENTS**

- Capital Costs
- O&M Costs
- Maintenance
- Staffing
- High
- Medium
- Low